



The Interplay of Liquidity, Investment Opportunities, and Corporate Social Responsibility on Banking Performance

Yura Karlinda Wiasa Putri 

¹Universitas Mahasaraswati Denpasar, Bali, Indonesia

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ABSTRACT

This study investigates the effects of liquidity, investment opportunity set (IOS), and corporate social responsibility (CSR) on the financial performance of banking firms in Indonesia during 2022–2024. Using secondary data drawn from audited annual reports and sustainability reports, this study analyzes a balanced panel of 135 bank-year observations from 45 banking companies listed on the Indonesia Stock Exchange. The hypotheses are tested using a fixed effect panel regression model with interaction terms to examine the moderating roles of IOS and CSR in the relationship between Loan to Deposit Ratio (LDR) and Return on Assets (ROA). The results show that LDR and IOS have a significant negative effect on ROA, while CSR has a significant positive effect on ROA. The interaction analysis further indicates that IOS positively moderates the effect of LDR on ROA, implying that higher IOS weakens the negative effect of LDR on profitability. In contrast, CSR negatively moderates the effect of LDR on ROA, indicating that higher CSR strengthens the negative effect of LDR on profitability. These findings suggest that bank profitability in the post-pandemic period is shaped not only by liquidity management and growth opportunities, but also by the way social responsibility interacts with lending intensity. This study contributes to the banking literature by providing recent evidence from an emerging market and by integrating financial and non-financial determinants of performance within a moderated panel-data framework.

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1. INTRODUCTION

The banking sector plays a central role in sustaining economic activity and transmitting macro-financial conditions. In recent years, banks have operated in an environment shaped by post-pandemic recovery, tightening liquidity conditions, inflationary pressure, and rising expectations regarding sustainability and governance practices (Davis et al., 2022; Chiamonte et al., 2022). Under these conditions, maintaining profitability, particularly Return on Assets (ROA), is essential not only for shareholders but also for institutional resilience and financial stability (Chiamonte et al., 2022; Fungacova et al., 2021). As financial intermediaries, banks must continuously balance liquidity creation and profitability because excessive lending may increase liquidity risk and weaken margins, whereas overly conservative strategies may reduce revenue-generating opportunities (Davydov et al., 2021; Fungacova et al., 2021; Gupta & Kashiramka, 2024).

In the Indonesian context, the banking industry remains a key pillar of the national economy and an important channel for supporting economic recovery and investment activity (Bagiana et al., 2025; Davis et al., 2022). During the 2022–2024 period, Indonesian banks faced pressures not only to maintain financial soundness, but also to strengthen digital competitiveness and respond to broader stakeholder expectations related to sustainability and responsible banking practices (Arvidsson & Dumay, 2022; Gutiérrez-Ponce & Wibowo, 2023). Consequently, bank performance should be understood through both financial and non-financial dimensions. In this regard, Loan to Deposit Ratio (LDR), Investment Opportunity Set (IOS), and Corporate Social Responsibility (CSR) represent relevant variables for explaining variations in ROA in the banking sector (Davydov et al., 2021; Tran et al., 2021). Previous studies have extensively examined the determinants of bank profitability; however, the evidence remains fragmented. Many studies focus on liquidity, growth opportunities, or social responsibility separately, with limited attention to their integrated role in shaping financial performance (Davis et al., 2022; Gupta & Kashiramka, 2024). In particular, limited evidence is available on whether IOS and CSR alter the relationship between LDR and ROA in emerging-market banking during a post-crisis adjustment

period (Davydov et al., 2021; Chiaramonte et al., 2022). This issue is important because the consequences of liquidity pressure may differ across banks depending on their growth orientation and stakeholder engagement. While IOS may reflect future expansion potential, it may also entail strategic costs and delayed returns (Aydoğmuş et al., 2022; Aras & Hacıoglu Kazak, 2022). Similarly, CSR may strengthen legitimacy and stakeholder trust, although it may also require resource commitments that influence short-term profitability (Arvidsson & Dumay, 2022; Carnini Pulino et al., 2022).

This study addresses the gap by examining the direct effects of LDR, IOS, and CSR on ROA, as well as the moderating roles of IOS and CSR in the relationship between LDR and ROA. To explain these relationships, this study draws on Agency Theory and Signaling Theory. Agency Theory is relevant because managerial decisions regarding lending, investment, and CSR may generate either efficiency gains or agency costs, depending on how resources are allocated and monitored (Jensen & Meckling, 1976; Aydoğmuş et al., 2022). Signaling Theory complements this perspective by explaining how IOS and CSR may communicate growth prospects, governance quality, and long-term commitment to the market under conditions of information asymmetry (Spence, 1973; Arvidsson & Dumay, 2022). This study makes three contributions. First, it provides recent evidence from Indonesian listed banks during 2022–2024, a period that captures the transition from post-pandemic recovery to a more normalized economic environment. Second, it integrates financial and non-financial determinants of profitability in a single empirical framework. Third, it examines the moderating roles of IOS and CSR, thereby offering a more nuanced understanding of how liquidity management relates to bank profitability in an emerging market setting.

A. Agency Theory

Agency theory, pioneered by Jensen and Meckling (1976), serves as the primary lens for this study. It posits that conflicts of interest arise when the goals of agents (managers) and principals (shareholders) diverge. In the banking sector, managers may pursue aggressive lending strategies (high LDR) to increase short-term bonuses, potentially jeopardizing the bank's long-term stability and ROA (Davydov et al., 2021; Fungacova et al., 2021). Furthermore, Agency Theory explains the role of the Investment Opportunity Set (IOS). High IOS creates an information asymmetry where managers possess more knowledge about future projects than shareholders. This asymmetry can lead to “overinvestment” or “underinvestment” problems, affecting the overall return on assets (Aydoğmuş et al., 2022). Managers might utilize the bank's resources to pursue growth that does not necessarily translate to immediate profitability, thus impacting the ROA negatively in the short term (Aras & Hacıoglu Kazak, 2022). Lastly, the theory extends to how CSR and growth opportunities act as monitoring or signaling mechanisms. In an agency framework, CSR disclosure can be seen as a tool to reduce agency costs by increasing transparency and aligning the bank's operations with broader societal expectations, which ultimately protects shareholder value from reputational risks (Arvidsson & Dumay, 2022; Carnini Pulino et al., 2022).

B. Signaling Theory

Signaling Theory suggests that in a market with information asymmetry, companies use specific actions to “signal” their underlying quality to outsiders (Spence, 1973). In this study, both IOS and CSR serve as vital signals. A high IOS signals to investors that the bank has robust future growth potential, which may attract capital but also indicates a shift in resource allocation toward future-oriented projects rather than immediate dividends (Aydoğmuş et al., 2022). CSR activities serve as a signal of corporate “goodness” and long-term sustainability (Arvidsson & Dumay, 2022). By investing in CSR, a bank signals that it is not only focused on profit but also on risk management and stakeholder relations, potentially generating “moral capital” that provides resilience during financial stress (Chiaramonte et al., 2022; Galletta et al., 2023). For Indonesian banks, where social and environmental issues are increasingly scrutinized by investors, CSR can function as a credibility signal consistent with broader ESG expectations (Gutiérrez-Ponce & Wibowo, 2023; Bagiana et al., 2025). When integrated with financial metrics, Signaling Theory suggests that the impact of liquidity (LDR) on performance is not interpreted in a vacuum (Davydov et al., 2021). A high LDR may be perceived as “aggressive growth” when accompanied by strong IOS, yet may be interpreted as “heightened risk-taking” when CSR engagement is weak and governance signals are poor (Gupta & Kashiramka, 2024; Khémiri & Alsulami, 2023). Thus, these variables interact to shape both the market's perception and the bank's financial outcomes (Aydoğmuş et al., 2022).

C. The Impact of Loan to Deposit Ratio (LDR) on Return on Assets (ROA)

The Loan to Deposit Ratio (LDR) is a central indicator of a bank's intermediation intensity and its exposure to liquidity risk (Davydov et al., 2021; Fungacova et al., 2021). From an agency perspective, a high LDR can reflect managerial incentives to accelerate credit expansion and boost short-term income, potentially at the expense of long-run stability and ROA (Davydov et al., 2021). When lending growth outpaces stable funding

capacity, banks become more reliant on costlier marginal funding, which pressures margins and weakens profitability (Andrieş & Sprincean, 2023; Davis et al., 2022). This linkage is fundamentally shaped by the risk–return trade-off: beyond an efficient range, additional lending tends to coincide with worsening credit quality and higher expected losses (Fungacova et al., 2021; Davydov et al., 2021). Elevated LDR may also signal softer underwriting standards, raising non-performing exposures and increasing provisioning burdens that directly erode earnings and ROA (Chiaramonte et al., 2022; Davis et al., 2022). Consistent with evidence from emerging markets, the liquidity–profitability relationship can be non-linear, implying diminishing profitability once liquidity creation becomes excessive (Fungacova et al., 2021; Gupta & Kashiramka, 2024). Moreover, persistent liquidity strain may amplify perceived risk and reputational concerns, translating into higher funding premia and further profitability compression (Andrieş & Sprincean, 2023; Galletta et al., 2023). Accordingly, this study posits that higher liquidity risk proxied by a high LDR reduces the sustainability of bank profitability as reflected in ROA (Gupta & Kashiramka, 2024). Synthesizing these arguments, this study proposes the following hypothesis:

H1: Loan to Deposit Ratio (LDR) has a significant negative effect on Return on Assets (ROA).

D. The Impact of Investment Opportunity Set (IOS) on Return on Assets (ROA)

The Investment Opportunity Set (IOS) captures the value of a firm’s growth options that hinge on management’s discretionary investment decisions (Aydoğmuş et al., 2022). In banking, a high IOS typically reflects an expansion posture often through technology investment, product innovation, and market penetration that reallocates resources toward future value creation (Aras & Hacıoglu Kazak, 2022; Davis et al., 2022). Within an agency framework, such growth-oriented settings can intensify underinvestment/overinvestment tensions as managers prioritize long-horizon asset accumulation over short-term earnings (Aydoğmuş et al., 2022). Consequently, liquid capital may be redirected from interest-generating activities to CAPEX and capability building with delayed payoffs, exerting short-run downward pressure on ROA (Aras & Hacıoglu Kazak, 2022). High IOS also increases operational complexity and information asymmetry because growth opportunities are difficult to value and monitor externally (Arvidsson & Dumay, 2022; Aras & Hacıoglu Kazak, 2022). Large digital investments and intangible capability development can generate substantial upfront spending and subsequent amortization or impairment risk, especially when early-stage revenues lag behind the investment “burn rate” (Carnini Pulino et al., 2022; Galletta et al., 2023). During competitive transitions, these dynamics can raise perceived risk and funding frictions, which further constrain near-term profitability (Andrieş & Sprincean, 2023). Overall, evidence from emerging-market settings suggests that governance and coordination costs in managing multiple growth options often dominate early economies of scale, implying a negative association between IOS and current accounting-based performance during transition periods (Aydoğmuş et al., 2022; Gupta & Kashiramka, 2024). Synthesizing these arguments, this study proposes the following hypothesis:

H2: Investment Opportunity Set (IOS) has a significant negative effect on Return on Assets (ROA).

E. The Impact of Corporate Social Responsibility (CSR) on Return on Assets (ROA)

Corporate Social Responsibility (CSR) has shifted from discretionary philanthropy to a strategic capability embedded in contemporary financial governance (Ali et al., 2022; Baldissera, 2023). Consistent with a stakeholder-oriented logic, CSR emphasizes that long-term performance depends on managing the interests of multiple stakeholder groups and sustaining organizational legitimacy (Arvidsson & Dumay, 2022; Tjahjadi et al., 2021). In banking where trust is a core asset CSR initiatives can accumulate social and reputational capital that strengthens customer attachment and employer attractiveness, translating into operational advantages that are ultimately reflected in ROA (Galletta et al., 2023; Carnini Pulino et al., 2022). In Indonesia’s 2022–2024 setting, stronger CSR engagement can also function as a market signal that improves investor confidence and aligns banks with sustainability-oriented capital providers (Gutiérrez-Ponce & Wibowo, 2023; Liu & Xie, 2024). This credibility effect is associated with more favorable funding conditions lower funding premia and improved access to external capital which can support margins and profitability (Andrieş & Sprincean, 2023; Loan et al., 2024). Evidence from banking studies likewise indicates that CSR can act as a performance enhancer and, in some settings, as a contextual factor that strengthens the profitability channel (Sudiyatno et al., 2024; Tran et al., 2021). Beyond performance, CSR operates as a risk-management mechanism by reducing downside exposure

linked to reputational shocks and stakeholder conflicts (Galletta et al., 2023; Chiaramonte et al., 2022). In emerging markets, CSR programs that deepen inclusion and support productive sectors may indirectly improve asset quality by strengthening borrower ecosystems and mitigating default pressures (Tran et al., 2021; Davis et al., 2022). Accordingly, the strategic integration of CSR into core banking decisions is expected to generate measurable financial benefits, making it a relevant explanatory factor for variations in ROA (Gutiérrez-Ponce & Wibowo, 2023). Synthesizing these arguments, this study proposes the following hypothesis:

H3: Corporate Social Responsibility (CSR) has a significant positive effect on Return on Assets (ROA).

F. The Moderating Role of Investment Opportunity Set (IOS)

The interaction between the Loan to Deposit Ratio (LDR) and the Investment Opportunity Set (IOS) can create a “resource crunch,” in which banks simultaneously face tight liquidity conditions and heightened execution demands from growth initiatives (Davydov et al., 2021; Aydoğmuş et al., 2022). When LDR is high, the bank operates with a thinner liquidity buffer and greater exposure to credit-risk costs, leaving less managerial slack for complex strategic programs (Fungacova et al., 2021; Davydov et al., 2021). If IOS is also high, management must allocate finite financial and cognitive resources across two intensive fronts monitoring a riskier loan book and implementing expansion projects thereby increasing coordination frictions and reducing operating efficiency (Aras & Hacıoglu Kazak, 2022; Davis et al., 2022). In an agency framework, this dual pressure can amplify managerial myopia and internal agency costs, which jointly intensify the drag on ROA (Aydoğmuş et al., 2022). From a signaling perspective, markets may penalize a high LDR more strongly when it coincides with high IOS because the bank appears exposed to both credit risk and execution risk from future-oriented investments (Aras & Hacıoglu Kazak, 2022). In high-IOS conditions, information asymmetry is elevated, and aggressive lending can be interpreted as weak internal control or a search for yield to finance costly growth options (Arvidsson & Dumay, 2022; Aydoğmuş et al., 2022). Such perceptions can raise the bank’s risk premium and funding costs, reinforcing the adverse profitability channel of excessive intermediation (Andrieş & Sprincean, 2023; Galletta et al., 2023). During competitive transition periods, the timing mismatch between near-term credit-risk provisioning and upfront investment spending can further compress profitability when LDR and IOS rise together (Chiaramonte et al., 2022; Carnini Pulino et al., 2022). Evidence from emerging-market banking also suggests that liquidity creation becomes less stabilizing once it exceeds an efficient range, particularly when coupled with strategic complexity (Gupta & Kashiramka, 2024; Fungacova et al., 2021). Accordingly, this study expects IOS to strengthen (make more negative) the effect of high LDR on ROA, such that growth opportunities act less as a buffer and more as a catalyst for profitability erosion under liquidity strain (Davydov et al., 2021). Synthesizing these arguments, this study proposes the following hypothesis:

H4: Investment Opportunity Set (IOS) significantly strengthens the negative effect of the Loan to Deposit Ratio (LDR) on Return on Assets (ROA).

G. The Moderating Role of Corporate Social Responsibility (CSR)

Corporate Social Responsibility (CSR) can operate as a strategic risk-mitigation device often framed as a “trust buffer” by building intangible reputational capital with key stakeholder groups (Arvidsson & Dumay, 2022; Galletta et al., 2023). In stakeholder-oriented terms, sustained social engagement and transparent disclosure strengthen legitimacy and enhance relational stability with depositors and the broader public (Tjahjadi et al., 2021; Carnini Pulino et al., 2022). When a bank exhibits a high Loan to Deposit Ratio (LDR), it typically signals tighter liquidity conditions and elevated credit-risk exposure, which can heighten funding sensitivity (Davydov et al., 2021; Fungacova et al., 2021). However, a strong CSR profile can partially counterbalance this adverse signal by indicating better governance and long-term orientation, thereby sustaining stakeholder confidence during aggressive intermediation (Cantero-Saiz et al., 2024; Gutiérrez-Ponce & Wibowo, 2023). From a signaling perspective, CSR helps recontextualize the risks embedded in high liquidity utilization by projecting organizational quality and ethical safeguards (Arvidsson & Dumay, 2022). This credibility can reduce perceived risk and contribute to more favorable funding conditions, limiting risk premia that would otherwise intensify the profitability drag of high LDR (Andrieş & Sprincean, 2023; Chang et al., 2021). By supporting deposit “stickiness” and stabilizing the cost of funds, CSR can prevent funding expenses from escalating and eroding ROA under liquidity strain (Loan et al., 2024; Huang et al., 2026). CSR may also buffer operational shocks that often accompany aggressive lending cycles, particularly when credit deterioration triggers higher

expected-loss provisioning (Chiaramonte et al., 2022). Evidence from emerging-market banking further suggests that CSR can strengthen performance outcomes and serve as a contextual factor that enhances resilience, rather than acting as a pure cost center (Tran et al., 2021; Sudiyatno et al., 2024). Accordingly, this study posits that CSR moderates the LDR–ROA relationship by dampening the adverse profitability effects of elevated liquidity risk and supporting a more controlled expansion path (Gupta & Kashiramka, 2024; Gutiérrez-Ponce & Wibowo, 2023). Synthesizing these arguments, this study proposes the following hypothesis:

H5: Corporate Social Responsibility (CSR) significantly weakens the negative effect of the Loan to Deposit Ratio (LDR) on Return on Assets (ROA).

2. METHOD

This study employed a quantitative approach with a causal-explanatory design to examine the effect of Loan to Deposit Ratio (LDR), Investment Opportunity Set (IOS), and Corporate Social Responsibility (CSR) on Return on Assets (ROA) in Indonesian banking companies. The data used in this study were secondary data obtained from annual reports, audited financial statements, and sustainability reports of banking companies listed on the Indonesia Stock Exchange (IDX). Panel data analysis was applied because it allows the researcher to observe both cross-sectional and time-series variation simultaneously, thereby providing a more comprehensive explanation of the relationship between financial and non-financial variables and company performance.

The population of this study consisted of all banking companies listed on the Indonesia Stock Exchange during the 2022–2024 period. The sample was selected using a purposive sampling technique based on the following criteria: (1) the banking companies were continuously listed on the IDX during 2022–2024; (2) the companies published complete annual reports and audited financial statements during the observation period; and (3) the companies disclosed CSR information in their annual reports or sustainability reports. Based on these criteria, 45 banking companies were selected, resulting in 135 firm-year observations. Although the observation period was relatively short, the 2022–2024 period was deliberately chosen because it represented a post-pandemic recovery phase and reflected the strategic adjustment of banking companies under economic normalization, liquidity pressures, and increasing expectations regarding sustainability practices. The detailed sampling process and the resulting reduction from the initial population are documented in Table 1.

Table 1. Sample Selection Method

No	Criteria / Description	Amount
1	Banking companies listed on the Indonesia Stock Exchange (IDX) during the 2022–2024 period	47
2	Banking companies with inaccessible annual financial reports for the 2022–2024 period	-1
3	Banking companies that did not publish Corporate Social Responsibility (CSR) or Sustainability Reports during the study period	-1
Total Number of Sample Companies		45
Total Number of Observations (45 companies × 3 years)		135

Furthermore, the variables in this study were operationalized using proxies relevant to the characteristics of the banking industry. The dependent variable was Return on Assets (ROA), which measures the company’s ability to generate profit from its total assets. The independent variables consisted of Loan to Deposit Ratio (LDR) as a liquidity indicator, Investment Opportunity Set (IOS) as a proxy for the company’s growth opportunities, and Corporate Social Responsibility (CSR) as an indicator of social responsibility disclosure. In this study, IOS was proxied by the market value of equity to book value of equity ratio, as this ratio reflects how the market values the company’s future growth prospects relative to its book value. Meanwhile, CSR was measured using a disclosure index based on 91 GRI indicators, applying an unweighted dichotomous scoring method in which a score of 1 was assigned if an item was disclosed and 0 otherwise. The use of an unweighted index was intended to focus on the extent of disclosure rather than on subjective differences in the importance of each indicator. The detailed operational definitions and mathematical formulations for each variable are summarized in Table 2 below.

Tabel 2. Operational Definition of Variables

Variable	Definition	Formula / Proxy
ROA	A measure of the bank’s profitability relative to its total assets (Davis et al., 2022; Aydoğmuş et al., 2022).	Net Income / Total Assets
LDR	A ratio used to assess a bank’s liquidity by comparing total loans to total deposits (Davydov et al., 2021; Fungacova et al., 2021).	Total Loans / Total Deposits
IOS	A proxy for the bank’s future growth prospects based on market valuation (Aras & Hacıoglu Kazak, 2022; Aydoğmuş et al., 2022).	Market Value of Equity / Book Value of Equity
CSR	The extent of social and environmental disclosure based on GRI standards (Arvidsson & Dumay, 2022; Carnini Pulino et al., 2022).	$\sum X_i / 91$

To test the research hypotheses, this study used panel data regression analysis. This model was selected because it accommodates both cross-sectional and time-series data simultaneously. In addition to examining the direct effects of LDR, IOS, and CSR on ROA, this study also tested the moderating roles of IOS and CSR in the relationship between LDR and ROA through interaction variables. Thus, the model was designed to explain both direct and moderating effects among the variables. The specific econometric equations for this study are defined as follows:

$$ROA_{it} = \alpha + \beta_1 LDR_{it} + \beta_2 IOS_{it} + \beta_3 CSR_{it} + \beta_4 (LDR_{it} * IOS_{it}) + \beta_5 (LDR_{it} * CSR_{it}) + \varepsilon_{it} \tag{1}$$

Where:

i = individual banking institution (1, 2, ..., 45)

t = time period (2022, 2023, 2024)

α = the intercept or constant term

$\beta_1 - \beta_5$ = regression coefficients for each independent and interaction variable

ε_{it} = idiosyncratic error term

The data analysis in this study was conducted in several stages. The first stage was descriptive statistical analysis to provide a general overview of the characteristics of the research data, including the minimum, maximum, mean, and standard deviation values of each variable. The second stage was correlation analysis to examine the direction and strength of the relationships among variables and to identify whether excessively high correlations existed among the independent variables. The third stage involved selecting the most appropriate panel data regression model. In this study, model selection was carried out using the Chow test to determine the best model between the Common Effect Model (CEM) and the Fixed Effect Model (FEM), followed by the Hausman test to choose the most appropriate model between the Fixed Effect Model (FEM) and the Random Effect Model (REM). The selected model was then used for hypothesis testing. The final stage was hypothesis testing by examining the regression coefficients, significance values, and direction of the relationships among the variables. In addition, the coefficient of determination (R^2 and adjusted R^2) was used to assess the extent to which the independent and moderating variables explained variations in ROA. The results were then interpreted to answer the research objectives concerning the effects of liquidity, growth opportunities, and corporate social responsibility on banking performance. Nevertheless, this study also acknowledges the potential for endogeneity, particularly the possibility of a two-way relationship between LDR and ROA, where liquidity may affect profitability while profitability may also influence lending and funding decisions. Therefore, the findings should be interpreted with caution as empirical associations within the selected panel regression framework rather than as definitive causal relationships.

3. RESULT AND DISCUSSION

Before hypothesis testing, descriptive statistics were used to provide an overview of the distribution of the research variables. Following the reviewer’s concern regarding extreme values, the data were treated through winsorization at the 1% level to reduce the influence of outliers, particularly in ROA, LDR, and IOS. This procedure was intended to improve the stability of the regression estimates and to ensure that the empirical results were not disproportionately driven by a small number of extreme observations. The statistical summary,

including the mean, minimum, maximum, and standard deviation for each variable, is systematically presented in Table 3.

Table 3. Descriptive Statistics

Variable	N	Minimum	Maximum	Mean	Std. Deviation
ROA	135	-6.07	50.09	1.7427	5.40220
LDR	135	11.05	494.15	99.2011	79.30228
IOS	135	0.05	161.07	2.6479	13.81693
CSR	135	0.15	0.91	0.4739	0.16096

The descriptive results indicate that the variables exhibit substantial variation across the sampled banking firms. After winsorization, the range of extreme values became more controlled, suggesting that the distribution of the data was more suitable for panel regression analysis. ROA reflects variation in bank profitability, LDR captures differences in liquidity management, IOS indicates differences in growth opportunity valuation, and CSR shows heterogeneity in the extent of sustainability disclosure across firms. These differences support the relevance of panel data analysis in explaining variations in banking performance.

A correlation matrix was employed to examine the direction and strength of the relationships among the variables and to provide an initial screening for potential multicollinearity. In response to the reviewer’s concern, the matrix was revised to include only the variables used in the research model, namely ROA, LDR, IOS, CSR, LDR×IOS, and LDR×CSR. The correlation coefficients between the liquidity, growth opportunities, social responsibility, and their respective interaction terms are detailed in Table 4.

Table 4. Pearson Correlation Matrix

	LDR	IOS	CSR	DER*IOS	LDR*IOS
LDR	1.000000	0.233174	-0.138811	-0.033553	-0.107971
IOS	0.233174	1.000000	-0.010371	-0.185799	0.099001
CSR	-0.138811	-0.010371	1.000000	-0.082201	0.992591
LDR*IOS	-0.033553	-0.185799	-0.082201	1.000000	-0.099099
LDR*CSR	-0.107971	0.099001	0.992591	-0.099099	1.000000

The correlation matrix provides several noteworthy observations. First, the correlation between the primary independent variables (LDR, IOS, and CSR) is relatively low (all coefficients are below 0.30), indicating that each variable captures a distinct dimension of the bank’s operational and strategic profile. This low inter-correlation suggests that multicollinearity is not a significant concern for the main effects of the model. Second, the matrix shows a very high correlation (0.992) between CSR and the interaction term LDR*CSR. In the context of moderated regression analysis, this high correlation is expected and mathematically inherent, as the interaction term is a product of its constituent parts. While this might suggest multicollinearity in a standard model, in moderation analysis, it is typically managed through the use of Fixed Effects or by focusing on the significance of the interaction term’s coefficient rather than the stability of the base variable’s variance. Overall, the matrix confirms the suitability of these variables for further multivariate testing in the panel data regression framework.

To ensure the statistical validity of the regression results, it is imperative to determine whether the panel data should be modeled using a common intercept or if individual-specific effects are present. The first step in this selection process is the Chow Test (Redundant Fixed Effects Test), which evaluates the null hypothesis that the Common Effect Model (CEM) is appropriate against the alternative hypothesis that the Fixed Effect Model (FEM) provides a better fit. The results of this test are displayed in Table 5.

Table 5. Chow Test Result

Effects Test	Statistic	d.f	Prob.
Cross-section F	13.906878	(44,85)	0.0000
Cross-section Chi-Square	284.039254	44	0.0000

The results of the Chow Test indicate that both the Cross-section F and Cross-section Chi-square statistics are highly significant, with probability values of 0.0000, which are well below the alpha threshold of 0.05. Consequently, the null hypothesis (H0) is rejected, suggesting that there are significant individual effects among the 45 banking institutions in the sample. This confirms that the Fixed Effect Model (FEM) is superior and more statistically appropriate than the Common Effect Model (CEM) for this dataset, as it accounts for the unique, time-invariant characteristics of each bank.

After the Chow Test confirmed the superiority of the Fixed Effect Model over the Common Effect Model, it was necessary to perform a secondary evaluation to distinguish between the Fixed Effect Model (FEM) and the Random Effect Model (REM). The Hausman Test was conducted to test the null hypothesis that the random effects are not correlated with the explanatory variables. If the null hypothesis is rejected, it implies that the random effect estimators are biased, and the Fixed Effect Model is the most consistent estimator. The results are presented in Table 6.

Table 6. Hausman Test Result

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f	Prob.
Cross-section random	124.258373	5	0.0000

The Hausman Test results show a Chi-Square Statistic of 124.2583 with a probability value of 0.0000. Since the p-value is significantly lower than the 5% significance level ($p < 0.05$), the null hypothesis is rejected. This statistical evidence confirms that there is a correlation between the unique errors of the banks and the independent variables in the model. Therefore, the Fixed Effect Model (FEM) is officially selected as the most appropriate and reliable estimation technique for testing the research hypotheses in this study.

In the hierarchy of panel data model selection, the Lagrange Multiplier (LM) Test also known as the Breusch-Pagan test is primarily utilized to decide between the Common Effect Model (CEM) and the Random Effect Model (REM). However, within the context of this study, the LM test is considered redundant and is no longer required. This conclusion is based on the robust results from the previous two diagnostic tests: the Chow Test, which rejected CEM in favor of FEM ($p = 0.0000$), and the Hausman Test, which subsequently rejected REM in favor of FEM ($p = 0.0000$). Since both tests consistently identified the Fixed Effect Model (FEM) as the most efficient and consistent estimator for capturing the idiosyncratic characteristics of the Indonesian banking sector, the comparison between CEM and REM through an LM test would not alter the final selection. Therefore, the analysis proceeds directly to the interpretation of the FEM regression results.

Having established the Fixed Effect Model (FEM) as the optimal estimation technique, Table 7 presents the final regression output, including the coefficients, t-statistics, and the coefficient of determination (R^2).

Table 7. Hypothesis Test Results

The selected model is FEM, Dependent Variable = ROA					
Variable	Coefficient	Std. Error	t-Statistic	Prob.	Desc.
LDR	-0.0732	0.0280	-2.6103	0.0107	H1 Accepted
IOS	-1.6522	0.3893	-4.2435	0.0001	H2 Accepted
CSR	11.7723	5.5013	2.1399	0.0352	H3 Accepted
LDR*IOS	0.0173	0.0041	4.2021	0.0001	H4 Accepted
LDR*CSR	-0.1373	0.0580	-2.3664	0.0202	H5 Accepted
R-squared	0.8882				
Adjusted R-squared	0.8238				

The hypothesis testing results, estimated using the Fixed Effect Model (FEM), provide robust empirical evidence for all five proposed relationships, as summarized in Table 7. The regression results show that LDR has a significant negative effect on ROA ($\beta = -0.0732$, $p = 0.0107$), indicating that higher liquidity pressure is associated with lower banking profitability. This finding suggests that more aggressive lending relative to deposits may weaken profitability, particularly when it exposes banks to tighter liquidity conditions and funding pressure. The results also show that IOS has a significant negative effect on ROA ($\beta = -1.6522$, $p = 0.0001$). This implies that greater growth opportunities, as reflected in the market-based IOS proxy, are associated with lower short-term profitability. One possible explanation is that firms with high growth expectations allocate more resources toward expansion and strategic investment, which may suppress current accounting returns. In

contrast, CSR has a significant positive effect on ROA ($\beta = 11.7723$, $p = 0.0352$). This finding indicates that broader CSR disclosure is associated with better financial performance. The result supports the view that CSR strengthens stakeholder confidence, enhances legitimacy, and contributes positively to profitability in the banking sector. The interaction term between LDR and IOS is positive and significant ($\beta = 0.0173$, $p = 0.0001$). Importantly, this coefficient indicates that IOS weakens the negative effect of LDR on ROA, rather than strengthening it. In other words, when IOS is higher, the adverse impact of LDR on profitability becomes less negative. Therefore, the moderating effect of IOS should be interpreted as a buffering or attenuating effect on the LDR–ROA relationship. The interaction term between LDR and CSR is negative and significant ($\beta = -0.1373$, $p = 0.0202$). This result indicates that CSR strengthens the negative effect of LDR on ROA. Thus, higher CSR does not mitigate the adverse relationship between liquidity pressure and profitability in this model; instead, the negative slope becomes stronger at higher levels of CSR. This finding suggests that when banks simultaneously face high lending intensity and high CSR commitment, the short-term profitability effect may become more constrained, possibly because both activities require substantial resource allocation. The model produces an R-squared of 0.8882 and an adjusted R-squared of 0.8238, indicating that the explanatory variables and interaction terms account for a substantial proportion of the variation in ROA. Although this value appears relatively high, it should be interpreted in light of the use of the Fixed Effect Model, which controls for unobserved firm-specific characteristics. In panel-data settings, particularly with firm fixed effects, a high R-squared may occur because the model captures both the explanatory power of the regressors and the time-invariant heterogeneity across firms. Therefore, the high R-squared does not necessarily indicate overfitting, but it does suggest that the model fit should be interpreted carefully given the relatively short observation period.

A. The Impact of Loan to Deposit Ratio (LDR) on Return on Assets (ROA)

The empirical results demonstrate that the Loan to Deposit Ratio (LDR) exerts a significant negative influence on the Return on Assets (ROA) of Indonesian banks (Davydov et al., 2021; Fungacova et al., 2021). This finding reinforces the existence of a non-trivial trade-off between credit expansion and balance-sheet resilience in banking (Fungacova et al., 2021; Davis et al., 2022). Over the 2022–2024 period, a rising LDR can reflect lending growth that outpaces stable funding capacity, thereby increasing sensitivity to liquidity pressure (Davydov et al., 2021; Fungacova et al., 2021). As liquidity buffers thin, banks tend to rely more on marginal and relatively expensive funding, which compresses net interest margins and weakens profitability (Andrieş & Sprincean, 2023; Davis et al., 2022).

The negative relationship is also consistent with an information-asymmetry channel, where rapid loan growth may reduce the rigor of screening and monitoring, increasing credit risk costs (Aras & Hacıoglu Kazak, 2022; Davydov et al., 2021). In such settings, higher intermediation intensity can be accompanied by deteriorating loan quality and greater expected-loss burdens, which erode current earnings (Chiaramonte et al., 2022; Fungacova et al., 2021). The resulting increase in provisioning pressure directly reduces the income generated by the asset base, lowering ROA despite higher nominal lending volumes (Chiaramonte et al., 2022; Davis et al., 2022).

Overall, the results highlight liquidity management as a core determinant of bank profitability given the maturity-transformation nature of banking (Davydov et al., 2021). An excessively high LDR leaves limited liquid capacity to absorb shocks, which can elevate perceived risk and intensify funding frictions (Andrieş & Sprincean, 2023; Galletta et al., 2023). Consistent with evidence on liquidity creation and bank fragility, operating beyond an efficient liquidity range can generate diminishing marginal returns and undermine sustainable profitability (Fungacova et al., 2021; Gupta & Kashiramka, 2024). Accordingly, while lending remains the primary revenue engine, excessive liquidity utilization ultimately weakens ROA through higher funding costs and greater credit-risk charges (Davydov et al., 2021; Davis et al., 2022).

B. The Impact of Investment Opportunity Set (IOS) on Return on Assets (ROA)

The acceptance of the second hypothesis indicates that a higher Investment Opportunity Set (IOS) is associated with lower current ROA (Aydoğmuş et al., 2022; Aras & Hacıoglu Kazak, 2022). This pattern is consistent with a growth–profitability trade-off, in which future-oriented expansion requires near-term financial sacrifice (Davis et al., 2022). For listed banks, a high IOS often proxied by elevated market to book valuations signals strong expectations about future growth, yet internally it can coincide with substantial CAPEX and capability-building commitments (Aydoğmuş et al., 2022; Aras & Hacıoglu Kazak, 2022).

These strategic investments typically entail sizeable upfront costs (e.g., technology licensing, specialist talent acquisition, and infrastructure upgrades) that are recognized through operating expenses, amortization, and

related overhead before efficiency gains materialize (Carnini Pulino et al., 2022; Arvidsson & Dumay, 2022). As a result, profitability measured by accounting-based ROA may be depressed in the short run because the cost base rises faster than incremental revenue during early implementation (Aydoğmuş et al., 2022). This interpretation aligns with evidence that performance effects of ESG- and capability-related transformations often emerge with a lag, rather than immediately upon investment (Gutiérrez-Ponce & Wibowo, 2023).

Moreover, the negative IOS–ROA association suggests that many banks are in a “build” phase rather than a “harvest” phase, where asset growth precedes income realization (Davis et al., 2022). From an agency perspective, high-growth contexts can elevate coordination and monitoring costs, as managers may pursue market-share expansion and strategic mandates that do not translate into immediate profitability (Aras & Hacıoglu Kazak, 2022; Aydoğmuş et al., 2022). While such a strategy may enhance longer-term franchise value, the near-term outcome is reduced asset efficiency and lower ROA (Aydoğmuş et al., 2022; Carnini Pulino et al., 2022). Overall, the findings imply that in emerging-market banking, pursuing growth opportunities is capital intensive and can temporarily erode historical profitability metrics during transition periods (Aras & Hacıoglu Kazak, 2022; Davis et al., 2022).

C. The Impact of Corporate Social Responsibility (CSR) on Return on Assets (ROA)

The positive and significant relationship between CSR and ROA indicates that social and environmental engagement can function as a value-creating strategy for Indonesian banks (Gutiérrez-Ponce & Wibowo, 2023; Carnini Pulino et al., 2022). From a stakeholder-oriented view, embedding CSR in core operations helps banks accumulate social capital and legitimacy that can support stronger customer relationships and more stable business outcomes (Tjahjadi et al., 2021; Tran et al., 2021). Consistent with this logic, transparent sustainability-oriented disclosure can strengthen the confidence of both retail customers and investors, which supports revenue generation and profitability (Arvidsson & Dumay, 2022; Loan et al., 2024).

From a signaling perspective, CSR performance and disclosure can proxy for managerial quality and governance strength, shaping external perceptions of risk (Arvidsson & Dumay, 2022). Banks with stronger CSR signals are more likely to be perceived as lower-risk entities, which can translate into more favorable funding conditions and lower financing premia (Andrieş & Sprincean, 2023; Aras & Hacıoglu Kazak, 2022). In turn, improved funding efficiency and reputational advantages contribute to a stronger bottom line and higher ROA (Andrieş & Sprincean, 2023; Gutiérrez-Ponce & Wibowo, 2023).

CSR may also enhance profitability through operational and risk channels by strengthening risk awareness and reducing downside exposure to reputational and stakeholder shocks (Galletta et al., 2023; Chiamonte et al., 2022). Sustainability-oriented practices can improve the screening and monitoring of exposures particularly in environmentally sensitive sectors thereby supporting asset quality and limiting credit-risk costs (Chiamonte et al., 2022). Finally, CSR engagement can foster a virtuous cycle in which ethical positioning attracts higher-quality stakeholders (borrowers, depositors, and talent), reinforcing performance advantages relative to less-engaged peers (Sudiyatno et al., 2024; Tran et al., 2021).

D. The Moderating Role of Investment Opportunity Set (IOS)

The analysis confirms that the Investment Opportunity Set (IOS) significantly moderates and strengthens the negative relationship between LDR and ROA (Davydov et al., 2021; Aydoğmuş et al., 2022). This pattern is consistent with a “double-burden” mechanism in which aggressive intermediation risk is amplified when banks simultaneously commit to intensive growth initiatives (Fungacova et al., 2021; Aras & Hacıoglu Kazak, 2022). Under high LDR, banks operate with thinner liquidity slack; when IOS is also high, managerial attention and financial capacity are split between monitoring a strained loan portfolio and executing complex investment programs (Davydov et al., 2021; Davis et al., 2022).

This interaction can elevate operational complexity and agency costs because high IOS environments are more uncertain and harder to monitor, making high-LDR balance sheets more difficult to manage efficiently (Aydoğmuş et al., 2022; Arvidsson & Dumay, 2022). From a signaling perspective, the joint presence of tight liquidity conditions and aggressive expansion can be interpreted as strategic overextension, raising perceived risk and reinforcing funding frictions (Andrieş & Sprincean, 2023; Galletta et al., 2023). As funding premia rise and coordination costs expand, the profitability penalty of high LDR becomes more pronounced, particularly when investment payoffs are delayed (Aras & Hacıoglu Kazak, 2022; Davis et al., 2022).

In practical terms, the result implies that banks pursuing rapid transformation should treat liquidity discipline as a binding constraint rather than a residual outcome (Gupta & Kashiramka, 2024). In transition periods, growth options do not necessarily cushion liquidity risk; instead, they can act as a catalyst that accelerates profitability erosion when LDR is already elevated (Fungacova et al., 2021; Gupta & Kashiramka, 2024). Accordingly, the moderation effect provides a clear managerial warning: growth strategies must be scaled and sequenced alongside liquidity stability to protect ROA (Davydov et al., 2021; Aydoğmuş et al., 2022).

E. The Moderating Role of Corporate Social Responsibility (CSR)

Finally, the study demonstrates that Corporate Social Responsibility (CSR) serves as a mitigating factor that weakens the negative impact of LDR on ROA (Gupta & Kashiramka, 2024; Sudiyatno et al., 2024). This buffering mechanism is consistent with the “moral insurance” logic, whereby CSR-based reputational capital functions as a trust cushion that reduces the severity of market skepticism under liquidity strain (Arvidsson & Dumay, 2022; Galletta et al., 2023). Even when LDR signals tighter liquidity conditions, stakeholders may remain more confident in banks perceived as ethically credible and socially responsible (Gutiérrez-Ponce & Wibowo, 2023; Tran et al., 2021).

The moderation channel operates largely through funding stability. High LDR typically increases funding sensitivity and can raise interest expenses when banks compete for deposits, yet stronger CSR can support deposit “stickiness” and dampen funding-cost pressures (Andrieş & Sprincean, 2023; Loan et al., 2024). By limiting funding premia and preserving margin conditions, CSR helps banks manage liquidity constraints without a disproportionate erosion of net interest outcomes, thereby softening the profitability penalty of high LDR (Davis et al., 2022; Andrieş & Sprincean, 2023).

CSR also works as a signal of governance quality and resilience for regulators and institutional investors, providing contextual information that can offset the raw risk implied by financial ratios (Aras & Hacıoglu Kazak, 2022; Carnini Pulino et al., 2022). In banking where trust is a core asset CSR disclosure quality can reduce perceived downside risk and strengthen reputational defenses during stress episodes (Galletta et al., 2023; Chiaramonte et al., 2022). Overall, the evidence implies that CSR is not merely philanthropic but a strategic risk-mitigation instrument that can convert social capital into a competitive advantage by insulating ROA from liquidity-related shocks (Tjahjadi et al., 2021; Tran et al., 2021).

4. CONCLUSION

This study concludes that liquidity, growth opportunities, and corporate social responsibility are important determinants of banking performance in Indonesia during the 2022–2024 period. The empirical results show that Loan to Deposit Ratio (LDR) has a significant negative effect on Return on Assets (ROA), with a coefficient of -0.0732 ($p = 0.0107$). This finding indicates that higher lending intensity relative to deposits tends to reduce bank profitability. In addition, Investment Opportunity Set (IOS) also has a significant negative effect on ROA, with a coefficient of -1.6522 ($p = 0.0001$), suggesting that greater growth opportunities are associated with lower short-term profitability. By contrast, Corporate Social Responsibility (CSR) has a significant positive effect on ROA, with a coefficient of 11.7723 ($p = 0.0352$), implying that broader CSR disclosure contributes positively to banking performance.

This study also finds that IOS and CSR significantly moderate the relationship between LDR and ROA. The interaction between LDR and IOS is positive and significant, with a coefficient of 0.0173 ($p = 0.0001$), indicating that IOS weakens the negative effect of LDR on ROA. In other words, the adverse effect of liquidity pressure on profitability becomes less severe in banks with higher growth opportunities. Meanwhile, the interaction between LDR and CSR is negative and significant, with a coefficient of -0.1373 ($p = 0.0202$), indicating that CSR strengthens the negative effect of LDR on ROA. This result suggests that under conditions of high lending intensity, broader CSR engagement may coincide with greater short-term pressure on profitability.

Overall, these findings show that bank profitability is shaped not only by liquidity management, but also by how growth opportunities and CSR interact with lending conditions. The study contributes to the banking literature by integrating financial and non-financial determinants of performance within a moderated panel-data framework in an emerging market context. Nevertheless, the findings should be interpreted with caution because the observation period is limited to three years and the possibility of endogeneity between liquidity and profitability cannot be fully ruled out. Future studies are therefore encouraged to use a longer observation period, alternative proxies for IOS, and more advanced econometric approaches to obtain stronger causal inference.

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