

Assessing the determinants and risk moderation in banking performance



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ABSTRACT

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Keywords

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The study examines the factors affecting banking performance from 2014 to 2021, with a focus on the moderating role of bank risk. Internal factors explored include net interest margin (NIM), non-performing loans (NPL), good corporate governance (GCG), and the loan-to-deposits ratio (LDR). External factors, such as oil prices and a pandemic dummy variable representing COVID-19 versus pre-pandemic periods, are also analyzed. Banking performance is assessed through price-to-book value (PBV), return on assets (ROA), and return on equity (ROE). The results show NIM significantly influences PBV but not ROA or ROE. NPL significantly affects ROA and ROE while showing no impact on PBV. GCG positively impacts PBV but does not significantly affect ROA or ROE. LDR significantly improves ROA and ROE but has no effect on PBV. Bank risk weakens the effect of LDR, NPL, and the pandemic dummy on ROE, while also moderating the influence of GCG, NIM, and the pandemic dummy on PBV. However, it is not significant for key relationships involving oil prices. By analyzing both internal and external contributions to banking performance, this study provides insights into how these factors and risk interactions shape key metrics like PBV, ROA, and ROE.

Contribution/ Originality: This study advances the literature by simultaneously analyzing internal factors (NIM, NPL, GCG, LDR) and external factors (oil prices, pandemic) affecting banking performance, while uniquely incorporating bank risk as a moderating variable. Unlike prior research, it highlights nuanced interactions between these variables and their differential impacts on PBV, ROA, and ROE.

1. INTRODUCTION

The role of the banking sector in Indonesia is profoundly significant in fostering economic growth and enhancing national development to sustain economic stability (Hidayat & Kassim, 2026). The strategic importance of the banking sector to the economy is evident, particularly as an intermediary institution. Its primary function is to mobilize and allocate public funds, thereby facilitating financing, especially for activities within the real sector of the economy that strengthen the country's economic activities (Ariefianto, Trinugroho, & Yustika, 2024). According to the Financial Services Authority (OJK), Indonesian banks primarily collect and distribute public funds (Makmur, 2024). It aims to support the implementation of national development to increase equitable growth and its outcomes, economic development, and national stability, ultimately improving the lives of many people. In their operations, banks must adhere to the principle of prudence (Prudential Banking). Banking is a transformative institution, involving size transformation, liquidity transformation, risk transformation, and time transformation. The contribution of banks to the economy can be observed from the added value they provide. Banking is considered the heart of the entire sector because it supplies companies with funding, akin to blood. The activities carried out by banks position them as

intermediary institutions within the economy (Kasri, Indrastomo, Hendranastiti, & Prasetyo, 2022; Soedarmono, Gunadi, Pambudi, & Nurhayati, 2023).

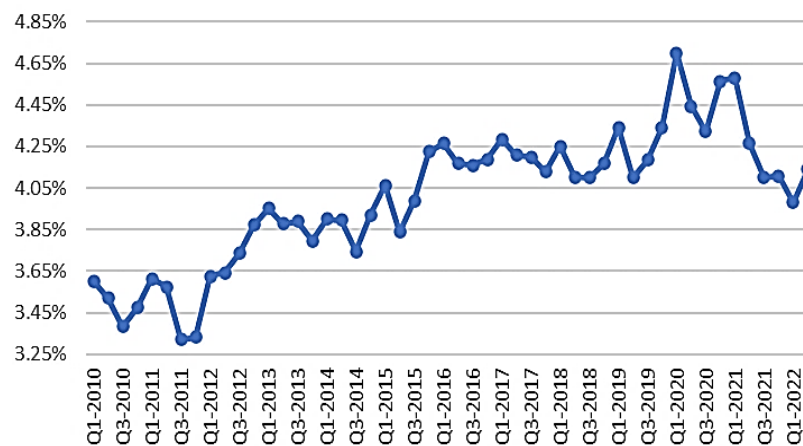


Figure 1. Contribution of the banking sector in Indonesia.

Based on statistical data, Indonesian banking lending development from February 2018 to February 2019 increased from Rp 4,662 trillion to Rp 5,227 trillion, representing a growth of 12.12%. During the same period, non-performing loans decreased from 2.88% to 2.59%. Conversely, banks are considered risky institutions because they manage public funds. Fakhrunnas and Imron (2019) stated that it is difficult to calculate a company's risk of insiders and outsiders because internal and external funding influences it. Therefore, the Bank's business is a so, so the government banking regulations in order to supervise it (Hidayat & Kassim, 2026). Anwar et al. (2023) state that banks are an opaque industry because the bank itself has assets that change constantly. This means that the bank needs to seek attention from the government. As mentioned earlier, banking is a risky industrial sector that receives significant attention from the government and the public because it makes a major contribution to the national economy. Referring to OJK regulation No. 18/POJK.03/2016 from March 2016 and Bank Indonesia PBI No. 11/25/PBI/2009, banks manage eight types of risks, as shown below (Kasri et al., 2022; Priyadi, Utami, Muhammad, & Nugraheni, 2021).

Implementing risk management is a requirement of Bank Indonesia for risk profile management in banking risk management. The challenge lies in managing bank performance alongside risk management to ensure that the banking intermediation function remains consistent and integrated. Banks' profits are derived solely from margins and fees generated by their activities. Raby et al. (2025) state that banks have a role in the financial system and are a fundamental issue in economic and financial theory. Banking has played a significant role in developing Indonesia since independence until the crisis in 1998. The role of banking as an intermediary in mobilizing and distributing funds, directly or indirectly, gives this institution the ability to transform and distribute risk. In this dissertation, LDR, as an intermediary in mobilizing and distributing funds, becomes a mediating variable (intervening) (Ariefianto et al., 2024; Mulyana, Rusu, & Perjons, 2024).

In contrast, risk management becomes moderation to determine whether risk strengthens or weakens the bank's performance results. The problem is that surplus funds will be concentrated in unproductive economic activities if risk cannot be distributed. Economic activities with high risk can provide enormous benefits to the economy (Gourdel, Monasterolo, & Gallagher, 2025). Banking institutions play a crucial role in maintaining the stability and balance of the macroeconomy, meaning that the course of a country's economy is generally influenced by macroprudential policies, which can result in volatility, namely rapid changes in prices in the short term due to various influencing factors (Anwar, 2019). One of the factors affecting the economy and banking performance is the oil price, which is one of the external variables used to calculate performance. After experiencing a downward trend throughout the third quarter of 2022, world oil prices rose again in October 2022. According to World Bank data, in October 2022,

the average price of Brent crude oil rose to US\$93.13/barrel, while West Texas Intermediate (WTI) rose to US\$87.26/barrel, as shown in Figure 1. Contribution of the banking sector in Indonesia. This increase aligns with projections by the United States Energy Information Administration (EIA), which anticipates a rise in global oil prices due to OPEC policies. Last month, OPEC announced it would begin reducing oil production by 2 million barrels per day. Additionally, in November 2022, Saudi Arabia, OPEC's de facto leader, stated that cutting oil production was necessary to respond to rising interest rates from Western central banks and the weakening global economy (Aidarova et al., 2024; Al Jabri, Raghavan, & Vespignani, 2022).

Changes in oil prices have an impact on the performance of the Bank, which also has an impact on the issuer's share price in the capital market. According to Xiao, Chen, Li, and Wen (2022) oil price shocks have a negative impact both directly and indirectly on a company's performance; the direct impact of rising oil prices will increase company costs, while the indirect impact will forecast the Company's profit limit and then make decisions about the effect of the stock market index. According to Ryandono, Imron, and Wildan (2022), company performance and stock prices are related because stock prices depend on the market's assessment of company performance. This study will analyze the performance of all banks listed on the Indonesia Stock Exchange (IDX) that influence the movement of world oil prices and the risk of volatility on the stock price return of bank issuers on the IDX. Of the 107 banks in Indonesia, 46 are included. Various parties, especially researchers, use GCG as a research variable to minimize the company's risks. GCG measurements vary greatly for research, especially for banking. This study uses GCG, which was determined by Inforbank magazine and distributed to regulators, serving as a proxy for banking GCG. This measure is an indicator used by Infobank magazine to rate banks in Indonesia. Infobank has conducted research on bank ratings since 2014. Previous research on banking has focused on NPL, NIM, bank profitability, and the capital adequacy ratio. Banks as intermediaries have also been studied, with research on the Loan Deposit Ratio (LDR) being limited (Fan et al., 2024; Kouretas, Pawłowska, & Szafranski, 2020).

Karadima and Loury (2020) discussed bank lending in the Euro area. Soedarmono et al. (2023) investigated the determinants of loan distribution in Indonesian banks. Dia and VanHoose (2019) discussed the tendency of bank activity, especially the increase in LDR and retail loans. Thus, this study aims to investigate LDR as an intermediary variable influenced by internal and external variables and its impact on bank performance. LDR is a characteristic variable of banking, serving as an intermediary between fund owners and fund buyers. Bank performance, specifically bank profitability (Return on Assets and Return on Equity), and bank performance as assessed by investors, is reflected in bank share prices, with the indicator known as Price to Book Value (PBV) (Chiu, Chen, & Che, 2021; Hilliard & Zhang, 2015).

Previous studies have discussed the direct effects of antecedent variables on banking performance variables. While research using intervening variables on banking performance variables is limited, this study identifies a research gap. This study aims to use intervening variables as important factors to illustrate the characteristics of banks with a Deposit Ratio (LDR) (Pop & Pop, 2024; Shi, Xia, He, Sun, & Zheng, 2025). It is an intermediary or mediating variable before banking performance variables. On the other hand, this study uses risk as a moderating variable that strengthens or weakens the relationship between antecedent variables, intermediate variables, and banking performance variables. Risk variables are used as moderating variables because they are of concern to all parties, including bank management and regulators, in managing banks (Begum, Rahman, & Faruq, 2024).

This study makes a substantive contribution to the scholarly discourse on banking performance by integrating a comprehensive framework that encompasses both internal factors, such as net interest margin (NIM), non-performing loans (NPL), good corporate governance (GCG), and the loan-to-deposits ratio (LDR), and external determinants like fluctuating oil prices and pandemic-related disruptions. By introducing the LDR as a pivotal intermediary variable, the research adds a novel dimension to existing models that primarily focus on direct relationships. Furthermore, the innovative use of bank risk as a moderating variable sheds light on its role in modulating the effects of both internal and external factors on key banking performance metrics, namely return on assets (ROA), return on

equity (ROE), and price-to-book value (PBV). This integrative approach effectively addresses a significant gap in the extant literature, offering nuanced insights that are not only academically enriching but also pragmatically valuable for enhancing strategic risk management practices in the banking sector.

2. LITERATURE REVIEW

2.1. Bank Theory

Discussion of banking performance: First, discuss banks' duties and daily activities. A bank is an institution that collects public funds according to regulations and channels them back to the public through credit or other means that stimulate the economy. [Álvarez-Botas and González \(2021\)](#) discuss the concept of a bank as an institution engaged in accepting deposits in the form of accounts or foreign exchange, issuing loans, and other activities. They also state that a bank is a financial institution that accepts deposits and uses those deposits for lending activities. Banks primarily provide financial services to customers while raising funds from investors. Government regulations on banking activities vary significantly over time and across different jurisdictions.

Based on this concept, the bank collects public funds and distributes them to the public, making it an intermediary institution. Banks manage public funds, which must be withdrawn immediately or at maturity. This means there is a risk in the bank's business that the borrower of funds cannot return the funds obtained (borrowed) from the bank, and investors (depositors of funds) also face the risk of being unable to do so ([Karadima & Louri, 2020](#); [Soedarmono et al., 2023](#)). To return their funds, risk calculation is very difficult to perform outside the bank or by the bank itself, as it depends on the risks faced by the bank ([Freriks & Kakes, 2024](#)). As a result, the Bank needs to be carefully regulated to fulfil the public interest ([Jung & Kim, 2023](#)). On the other hand, the bank's assets change at any time because depositors can withdraw their funds at any time, so banks are also known as opaque industries ([Agiomirgianakis, Arvanitis, Mamatzakis, & Sfakianakis, 2024](#); [Nguyen, Pham, Nguyen, Nguyen, & Nguyen, 2020](#)). The form of the bank balance sheet, according to this description, is as follows:

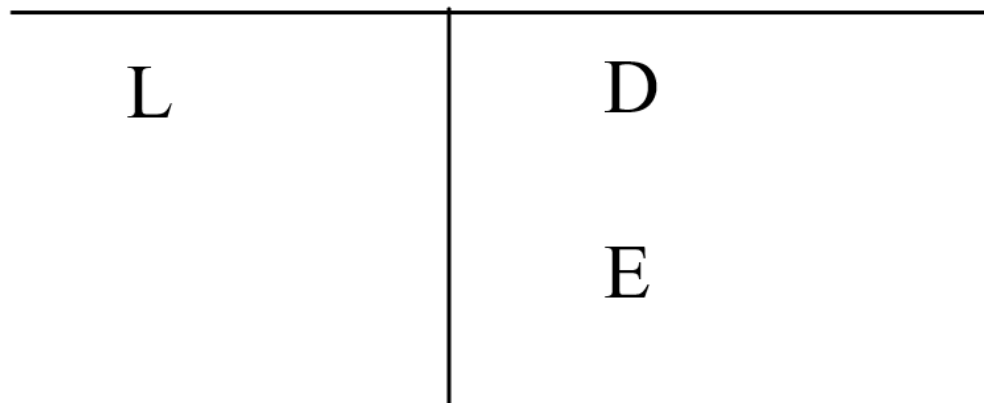


Figure 2. Bank balance sheet.

Note: L= Loan.
D= Deposits.
E= Equity.

[Figure 2](#) Bank Balance Sheet clearly shows that $L = D + E$, where, in MM theory, D is debt, so E and D are considered capital. The problem is that D in the company has a definite period, meaning that the debt has a known maturity. In contrast, in the bank, deposits, which are also debt (D), have a definite maturity, and some have no maturity period. Generally, banks favor deposits that do not have a maturity period because the cost is very low. As a result, there is a risk in D due to the uncertainty of the D maturity period. L also carries the risk of non-repayment from the borrower, even though the bank has the required collateral, and the value of the collateral may decline over time. The collateral's liquidity also poses a risk due to the importance of fund availability for payment D. Because of the bank's risks, E plays a significant role. [Li, Du, Chao, and Gao \(2024\)](#) discuss the role of capital in banks to ensure

business continuity in the face of unexpected losses. Bank capital must be substantial, including paid-up capital, retained earnings from previous years, current year profits, reserves for loan losses, and agio/disagio (Pop & Pop, 2024). Bank capital is critical to its operations, and all bank regulators require it to be strong. Bank capital can be expressed in an equation as follows:

$$\begin{aligned} E_1 &= E_0 + \pi_1 \\ E_2 &= E_1 + \pi_2 = E_0 + \{\pi_1 + \pi_2\} \\ E_n &= E_0 + \{\pi_1 + \pi_2 + \dots + \pi_n\} \end{aligned} \quad (1)$$

Description:

E_i = Bank equity in period i , where $i = 0, 1, 2, \dots, n$.

π_i = The Company's profit at the end of year period i , $i = 1, 2, 3, \dots$.

Equation 1 shows that bank capital is highly dependent on two sources: profit generated by the Company (Riyanti, Wulandari, Prijadi, & Tortosa-Ausina, 2025) and capital through the issuance of shares. Kleff and Weber (2008) also added that issuing debt for a very long period is known as subordinate debt. Issuing shares is not an option for banks because the cost of equity is very expensive. If the profit equation of the Company has the following mathematical Equation.

$$\pi = (1 - T) (r * L - i * D)$$

Description:

π = Bank profits.

T = Tax of the Bank concerned.

r = Interest rate on loans to customers.

L = Loans granted to customers.

i = The deposit interest rate paid to depositors.

D = Amount of funds (third-party funds) received.

If $L = (1 - \alpha) * D + E$, where L is a loan, α is the cash ratio that banks must prepare, known as reserve, according to Nguyen et al. (2020) and Soedarmono et al. (2023) where in Indonesia it is known as the minimum reserve requirement (GWM) then the bank profit equation or Equation 2 can be rewritten as follows:

$$\begin{aligned} \pi &= (1 - T) * [r * \{(1 - \alpha) * D + E\} - i * D] \\ \pi &= (1 - T) * [E * r + \{(1 - \alpha) * r - i\} * D] \\ \frac{\pi}{E} &= (1 - T) * [r + \{(1 - \alpha) * r - i\} * (\frac{D}{E})] \end{aligned} \quad (2)$$

$$\frac{\partial \frac{\pi}{E}}{\partial \frac{D}{E}} = (1 - T) * \{(1 - \alpha) * r - i\} \quad (3)$$

Ratio (π/E , better known as RoE) maximum if the first derivative is equal to zero, so that Equation (2.3) becomes as follows:

$$(1 - T) * \{(1 - \alpha) * r - i\} = 0$$

$$r = \frac{i}{1 - \alpha} \quad (4)$$

Description:

π = Bank profits.

T = Tax of the Bank concerned.

L = Bank's Tax.

D = Amount of funds (Third party funds) received.

A = Bank Assets.

α = Reserve bank (GWM) deposited with Bank Indonesia.

r = Interest rate on loans to customers.

i = The deposit interest rate paid to depositors.

Profit occurs in a bank by increasing the bank's capital as follows:

$$r \geq i/(1 - \alpha) \quad (5)$$

Description:

α = Reserve bank (GWM) deposited with Bank Indonesia.

r = Interest rate on loans to customers.

i = The deposit interest rate paid to depositors.

Equation 4 states that the Bank can profit if r is greater than i/α . Fulfilling r results in the bank making a profit and increasing its capital.

2.2. Company Performance Theory

Company performance has become a popular topic among academics and practitioners, both directly and indirectly. The theory of the Firm is shown in Figure 3 (Amendola, Barra, Boccia, & Papaccio, 2025; Nwosu, Obidike, Ugwu, Udeze, & Okolie, 2022).

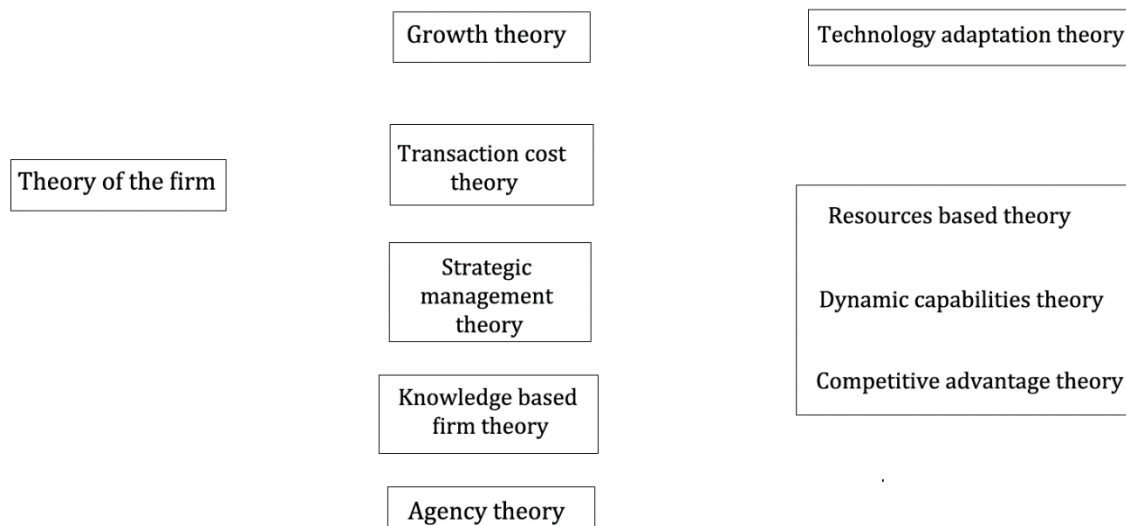


Figure 3. The approach of company performance theories.

Figure 3: The approach of company performance theories includes five groups: Growth Theory, Transaction Cost Theory, Strategic Management Theory, Knowledge-Based Firm Theory, and Agency Theory. Fasih (2012) started the discussion on firm growth, which is part of the Theory of the Firm. The growth theory that various parties have discussed is the growth theory of the country described after this theory. Adomako, Abdelgawad, Ahsan, Amankwah-Amoah, and Liedong (2023) state that "when a firm operates within a perfectly competitive market, the generally accepted theory asserts that the objective of the firm is to maximize net revenue given prices and a technologically determined production function. The performance of the company is often measured by ratios such as Return on Assets (RoA), Return on Equity (RoE), and the Market Value of shares relative to their book value (PBV)"(Chiu et al., 2021; Parlak, Yildiz, & Yilmaz, 2024).

3. METHOD

This study employs two primary constructs as independent variables: bank financial ratios and macroeconomic variables. Furthermore, it incorporates 'Risk' as a moderating variable and the 'Deposit Ratio' as an intervening variable. The measures of bank performance utilized are Return on Assets (ROA), Return on Equity (ROE), and Price-to-Book Value (PBV). The unit of analysis comprises banks listed on the Indonesian Stock Exchange, which currently includes 40 banks (Li et al., 2024; Ryandono et al., 2022). The data collection was conducted independently

using both library resources and digital sources. This data, generally published by government agencies and the banks listed on the stock exchange, was primarily obtained from the banks' official websites. Specifically, financial report data from 2014 to 2021 were collected for analysis. These financial reports are accessible through the respective bank websites and the official site of the Indonesia Stock Exchange. The variables were either directly available or derived, such as financial ratios. Macroeconomic data, such as oil prices, were sourced from official publications by Bank Indonesia, Indonesia's central bank.

This study aims to examine bank performance under the influence of the independent variables: Net Interest Margin (NIM), Non-Performing Loans (NPL), Corporate Governance (CG), and oil prices. This examination was conducted through the moderating role of risks faced by the banks and mediated by the Loan Deposit Ratio (LDR). Given the annual data from 2014 to 2021, a balanced panel data approach was adopted, ensuring that the same units of analysis were investigated each year. The analytical model underpinning this study is described as follows, in accordance with Al Jabri et al. (2022).

$$ROA = LDR + GCG + NIM + NPL + OIL + Risk + D + LDR * Risk + GCG * Risk + NIM * Risk + NPL * Risk + Oil * Risk + D * Risk \quad (6)$$

$$ROE = LDR + GCG + NIM + NPL + OIL + Risk + D + LDR * Risk + GCG * Risk + NIM * Risk + NPL * Risk + Oil * Risk + D * Risk \quad (7)$$

$$PBV = LDR + GCG + NIM + NPL + OIL + Risk + D + LDR * Risk + GCG * Risk + NIM * Risk + NPL * Risk + Oil * Risk + D * Risk \quad (8)$$

Description:

ROA = Return on Assets

ROE = Return on Equity

PBV = Price to Book Value

NIM= Net Interest Margin.

GCG= Good Corporate Governance.

Oil= Oil Price.

LDR= Loan to deposit ratio

Risk = Loan Loss Provisions

D= Dummy variable for pandemic period (D = 1) and non-pandemic (D = 0).

The next model that influences the intervening model in this research is the Loan Deposits Ratio variable. This variable also influences the response variable of ten, called the dependent variable in this dissertation, known as Company Performance, shown in Equation 6. The intermediate variable is LDR, and the model is as follows:

$$LDR = GCG + NIM + NPL + OIL + Risk + D + GCG * Risk + NIM * Risk + NPL * Risk + Oil * Risk + D * Risk \quad (9)$$

With:

LDR= Loan to deposit ratio.

NIM= Net Interest Margin.

CG= Good Corporate Governance.

Oil= Oil Price.

Risk= Total of bank risk.

D= Pandemic period (D = 1) and non-pandemic (D = 0).

4. FINDINGS

4.1. Descriptive Statistics

In discussing these results, descriptive statistics of the research variables used in this dissertation will be presented and shown in Table 1. Descriptive statistics are data concerning the behavior of the data used in this dissertation research.

Table 1. Descriptive statistics of banks listed on the IDX.

Descriptive stat.	GCG	Risk	NPL	ROA	ROE	PBV	NIM	LDR	OIL price
Minimum	9.4875	9.4875	0.00%	-14.75%	-95.44%	0.21	-3.52%	12.35%	37.04
Maximum	15.0000	15.0000	22.27%	4.73%	31.19%	18.90	12.00%	197.56%	75.21
Average	13.0796	13.0158	3.31%	0.89%	3.73%	1.66	4.58%	84.93%	54.35625
St.dev	0.8838	0.7449	2.55%	2.45%	18.37%	1.73	2.07%	19.12%	11.55477
Skewness	-0.6924	-1.5566	2.83	-2.72	-2.86	5.91	0.39	1.11	0.433031
Kurtosis	3.4961	6.6841	13.75	10.90	9.76	50.95	1.85	6.83	0.680879
Jarque Bera	21.91479	152.1957	1001.027	642.4638	575.2327	16898.16	38.69405	107.6132	84.9916

The lowest value of GCG was 9.4875, the highest was 15, the average was 13.0796, and the standard deviation was 88.38% during the research period. This standard deviation appears large, with a value above 50%, indicating significant variability in GCG figures. Although all banks are required to implement Good Corporate Governance, differences in GCG values still exist; this is a requirement from Bank Indonesia. The dataset on Good Corporate Governance (GCG) demonstrates a normal distribution, as evidenced by skewness, kurtosis, and the Jarque-Bera test. During the research period, the Risk variable exhibited a minimum value of 9.4875, a maximum of 15, an average of 13.0796, and a standard deviation of 74.49%. The substantial standard deviation, similar to that of the GCG variable, indicates considerable dispersion in the Risk variable, which also follows a normal distribution, as confirmed by skewness, kurtosis, and Jarque-Bera statistics. The Non-performing Loans (NPL) variable presented a minimum value of 0%, a maximum of 22.27%, an average of 3.31%, and a standard deviation of 2.55%. The relatively small standard deviation reflects a low NPL value, consistent with Bank Indonesia's guidelines for banks to manage NPL around 2%. This variable also adheres to a normal distribution, as indicated by skewness, kurtosis, and Jarque-Bera results.

For Return on Assets (ROA), the observed minimum value was -14.75%, the maximum was 4.73%, the average was 0.89%, and the standard deviation was 2.45%. The small standard deviation suggests that ROA values are closely clustered, despite the presence of some highs and lows. A negative ROA during the research period indicates that a bank experienced a loss. ROA values are normally distributed, as indicated by skewness, kurtosis, and the Jarque-Bera test. Return on Equity (ROE) ranged from a minimum of -95.44% to a maximum of 31.19%, with an average of 3.73% and a standard deviation of 18.37%. The relatively small standard deviation for ROE suggests that the values are fairly similar, despite the extremes. The normal distribution of ROE is supported by skewness, kurtosis, and the Jarque-Bera test. In the case of Price to Book Value (PBV), the minimum recorded value was 0.21x, the maximum was 18.9x, with an average of 1.66x and a standard deviation of 173.1%. The high standard deviation indicates significant variability in PBV values. A sufficiently high PBV suggests an undervalued share price. PBV follows a normal distribution, as evidenced by skewness, kurtosis, and the Jarque-Bera test. Net Interest Margin (NIM) ranged from -3.52% to 12%, with an average of 4.58% and a standard deviation of 2.07%. The low standard deviation suggests that NIM values are closely clustered. A negative NIM indicates that interest revenue earned is less than the interest costs incurred. NIM values, typically ranging between 4% and 5%, conform to a normal distribution, as shown by skewness, kurtosis, and the Jarque-Bera statistics. The Loan to Deposits Ratio (LDR) ranged from 37.04% to 197.56%, with an average of 84.93% and a standard deviation of 19.12%. The relatively small standard deviation suggests that LDR values are closely aligned with the average, which meets the expectations of bank regulators concerning statutory reserves. The normality of the LDR is affirmed by the skewness, kurtosis, and Jarque-Bera test results. Lastly, oil prices (OIL) show a minimum value of 0.21x, a maximum of \$75.21, an average of \$54.36, and a standard

deviation of 11.55%. The modest standard deviation reflects closely clustered oil price values, although there are concerns about oil prices potentially exceeding \$100 per barrel. This variable also conforms to a normal distribution, as demonstrated by skewness, kurtosis, and the Jarque-Bera test, and the results are outlined in Table 2.

Table 2. The study's result.

Dependent variable	Independent variables	Coefficients	t-test	F value	R ²
Loan to deposits ratio (LDR)	- Intercept	-1.644		17.536	76.32%
	- GCG	0.175	(0.94)		
	- NIM	5.775	(3.67)		
	- NPL	10.329	(-1.63)		
	- OIL	-0.014	(2.47)		
	- RISK	0.196	(2.38)		
	- D	0.792	(3.39)		
	- GCG * RISK	-0.013	(-2.47)		
	- NIM * RISK	-0.843	(-1.013)		
	- NPL * RISK	-0.749	(-3.25)		
	- OIL * RISK	0.001	(1.58)		
	- D * RISK	-0.067	(-3.77)		
Return on assets (ROA)	- Intercept	-0.031		32.404	86.68%
	- LDR	0.364	(3.55)		
	- GCG	-0.0079	(-0.68)		
	- NIM	-0.207	(-0.22)		
	- NPL	-2.545	(-4.704)		
	- OIL	-0.0025	(-1.83)		
	- RISK	0.0022	(0.24)		
	- D	0.0125	(3.195)		
	- LDR * RISK	-0.028	(-3.61)		
	- GCG * RISK	0.001	(0.805)		
	- NIM * RISK	0.028	(0.387)		
	- NPL * RISK	0.178	(4.29)		
	- OIL * RISK	0.002	(1.84)		
	- D * RIS	-0.0098	(-3.31)		
Return on equity (ROE)	- Intercept	-0.585		23.86	82.74%
	- LDR	1.778	(2.93)		
	- GCG	-0.0298	(-0.49)		
	- NIM	8.821	(1.39)		
	- NPL	-18.891	(-3.37)		
	- OIL	-0.013	(-1.605)		
	- RISK	0.046	(0.939)		
	- D	0.797	(2.99)		
	- LDR * RISK	-0.1395	(-3.02)		
	- GCG * RISK	0.003	(0.594)		
	- NIM * RISK	-0.570	(-1.18)		
	- NPL * RISK	1.311	(5.04)		
	- OIL * RISK	0.001	(1.60)		
	- D * RISK	-0.062	(-3.06)		
Price to book value (PBV)	- Intercept	-1.172		16.26	76.56%
	- LDR	-6.695	(-1.186)		
	- GCG	1.547	(2.375)		
	- NIM	-124.97	(-2.144)		
	- NPL	-1.009	(-0.035)		
	- OIL	-1.083	(-0.525)		
	- RIS	0.2245	(0.194)		
	- D	3.697	(2.21)		
	- LDR * RISK	0.481	(1.113)		
	- GCG * RISK	-0.177	(-2.355)		
	- NIM * RISK	9.656	(2.161)		
	- NPL * RISK	0.076	(0.033)		
	- OIL * RISK	0.136	(0.522)		
	- D * RISK	-0.271	(-2.12)		

Note: * RIS is moderated by risk.

4.2. Loan to Deposits Ratio

This research develops a model in which LDR serves as an intervening variable for the independent variables of corporate governance, net interest margin, non-performing loans, oil prices, and risk. The study period differs due to the COVID-19 pandemic; therefore, a dummy variable is included to distinguish between the periods before and after COVID-19. The regression results with the panel data model are shown in Equation 10.

$$\begin{aligned} LDR_{i,t} = & -1.644 + 0.175 GCG_{i,t} + 5.775 NIM_{i,t} + 10.329 NPL_{i,t} - 0.014 OIL_t \\ & (2.47)(0.94)(3.67)(-1.63) \\ & + 0.196 RIS_{i,t} + 0.792 Dt - 0.013 (GCG_{i,t} * RIS_{i,t}) - 0.843 (NIM_{i,t} * RIS_{i,t}) \\ & (2.38)(3.39)(-2.47)(-1.013) \\ & - 0.749 (NPL_{i,t} * RIS_{i,t}) + 0.001 (OIL_t * RIS_{i,t}) - 0.067 Dt * RIS_{i,t} \\ & (-3.25)(1.58)(-3.77) \quad (10) \end{aligned}$$

T-test Numbers in brackets:

F= 17.536.

R²= 76.32%.

Equation 10 is a fairly good model because the F-test value exceeds the F table value of F at a significance level of 5%. The significance of this model is also shown by the R² (determination coefficient) value of 76.32%, where this figure states that all antecedent variables can explain variations in LDR of 76.32% and the rest by other factors. In Equation 10 good corporate governance significantly influences the loan-to-deposit ratio. This result contradicts expectations, where the theory predicts a negative outcome, but the empirical results are positive. This positive sign indicates that the better the GCG created and implemented by the bank, the higher the Loan Deposit Ratio (LDR). Management is willing to increase loans because the GCG that has been established helps manage the LDR. This research presents a novel contribution. NPL has a significant positive influence at the 1% significance level on LDR. This aligns with expectations or theory: the higher the NPL, the higher the company's LDR. This research supports previous studies, including during the COVID-19 period, which is represented as a dummy variable. As a result, the dummy variable has a significant positive influence on LDR at the 1% significance level. COVID-19 has compelled various parties to apply for credit, thereby increasing credit volume. This research corroborates previous findings.

Banks, as institutions that transform Risk, also use this Risk as an independent and moderating variable. Risk is measured by calculating the standard deviation of stock returns. Model 10 shows that Risk significantly positively influences LDR at a significance level of 5%. This means that an increase in Risk will increase the Bank's LDR. The previous description explained that risk was used as a moderating variable for all independent variables in the research. The results showed that risk as a moderating variable significantly weakened the influence of GCG on LDR at a significance level of 5%. The NIM was also tested, and the result was that risk as a moderating variable weakened the influence of NIM on LDR at a significance level of 5%. This research also shows that risk as a moderating variable significantly weakens the influence of NPL on LDR at significance levels of 1% and 5%. Likewise, the results indicate that risk as a moderating variable significantly weakens the influence of the dummy variable on LDR at the 5% significance level. In this research, NIM does not have a significant positive influence at the 5% significance level on LDR. Similarly, oil does not significantly negatively affect LDR at the 5% significance level.

4.3. Return on Assets

The determinants of banking ROA during the research period, and the model is shown by Equation 11.

$$\begin{aligned} ROA_{i,t} = & -0.031 + 0.364 LDR_{i,t} - 0.0079 GCG_{i,t} - 0.207 NIM_{i,t} - 2.545 NPL_{i,t} \\ & (3.55)(-0.68)(-0.22)(-4.704) \\ & -0.0025 OIL_t + 0.0022 RIS_{i,t} + 0.0125 Dt - 0.028 (LDR_{i,t} * RIS_{i,t}) \\ & (-1.83)(0.24)(3.195)(-3.61) \\ & + 0.001 (GCG_{i,t} * RIS_{i,t}) + 0.028 (NIM_{i,t} * RIS_{i,t}) + 0.178 (NPL_{i,t} * RIS_{i,t}) \end{aligned}$$

$$\begin{aligned}
& (0.805)(0.387)(4.29) \\
& + 0.002 (OIL_t * RIS_{i,t}) - 0.0098 D_t * RIS_{i,t} \\
& (1.84)(-3.31) \quad (11)
\end{aligned}$$

T-test Numbers in brackets:

F= 32.404.

R²= 86.68%.

Equation 11 is a fairly good model because the F-test value exceeds the F table value of F at a significance level of 5%. The significance of this model is also shown by the R² (determination coefficient) value of 86.68%, where this figure states that all antecedent variables can explain variations in ROA of 86.68% and the rest by other factors. In Equation 11, the Loan to Deposits Ratio significantly positively influences ROA. This result aligns with expectations, where the theory and empirical results are positive. This research supports previous research by [Dia and VanHoose \(2019\)](#) and [Li et al. \(2024\)](#). In this case, the NPL variable regarding ROA was also tested. The results obtained show that NPL has a significant negative influence at a significance level of 1% on ROA. This means that an increase in NPL will increase the Bank's ROA, even though, in theory, NPL hurts ROA. An increase in NPL causes ROA to fall according to expectations or theories. This research supports previous research by [Jung and Kim \(2023\)](#) and [Kasri et al. \(2022\)](#). The COVID-19 variable is also included as an independent variable with a proxy Dummy variable. The results indicate that the Dummy has a significant positive influence on ROA at a 1% significance level. As previously explained, oil prices, good corporate governance, and net interest margin are the research variables in this study, as shown in Equation 11.

The results obtained indicate that oil does not have a significant negative influence on ROA at the 5% significance level. Regarding Good Corporate Governance (GCG), the results show that GCG does not significantly affect ROA at the 5% significance level. Similarly, for the Net Interest Margin (NIM) variable, NIM does not significantly negatively affect ROA at the 5% significance level. In terms of causality, risk is also used as a moderating variable. The results indicate that this risk does not have a significant positive influence on ROA at the 5% significance level. According to [Fan et al. \(2024\)](#), if a moderating variable included in the model is not significant, it is considered a moderating variable only if the combination of both variables is significant. The combined results for testing the moderating variable, namely risk as a moderating variable, significantly weaken the influence of LDR on ROA at the 1% significance level. Risk as a moderating variable also significantly strengthens the influence of NPL on ROA at the 1% significance level. Additionally, risk as a moderating variable significantly weakens the influence of the dummy variable on ROA at the 1% significance level. There is also a possibility that this will not be significant as a moderating variable for the ROA variable, namely LDR. Furthermore, the risk variable was tested as a moderator against the GCG, NIM, and oil price variables in relation to ROA. The results show that GCG, NIM, and oil prices are not significantly influenced by the risk variable as a moderating variable at a 5% significance level. This conclusion suggests that the risk variable has the potential to be a moderating variable ([Nguyen et al., 2020](#)).

4.4. Return on Equity

Company performance can also be assessed based on the rate of return provided by the company to shareholders, known as Return on Equity (RoE). The Equation is as follows (12).

$$\begin{aligned}
ROE_{i,t} = & -0.585 + 1.778 LDR_{i,t} - 0.0298 GCG_{i,t} + 8.821 NIM_{i,t} - 18.891 NPL_{i,t} \\
& (2.93)(-0.49)(1.39)(-3.37) \\
& -0.013 OIL_t + 0.046 RIS_{i,t} + 0.797 D_t - 0.1395 (LDR_{i,t} * RIS_{i,t}) \\
& (-1.605)(0.939)(2.99)(-3.02) \\
& + 0.003 (GCG_{i,t} * RIS_{i,t}) - 0.570 (NIM_{i,t} * RIS_{i,t}) + 1.311 (NPL_{i,t} * RIS_{i,t}) \\
& (0.594)(-1.18)(5.04) \\
& + 0.001 (OIL_t * RIS_{i,t}) - 0.062 D_t * RIS_{i,t} \\
& (1.60)(-3.06) \quad (12)
\end{aligned}$$

T-test Numbers in brackets:

$$F = 23.86.$$

$$R^2 = 82.74\%.$$

Equation 12 is a fairly good model because the F-test value exceeds the F table value of F at a significance level of 5%. The significance of this model is also shown by the R² (determination coefficient) value of 82.74%, where this figure states that all antecedent variables can explain variations in ROE of 82.74% and the rest by other factors. In Equation 12, the Loan to Deposits Ratio significantly positively influences ROE. This result aligns with expectations, where the theory and empirical results are positive. This research supports previous studies. It also tests Net Performance Loans (NPL) against ROE. It is expected that NPL will negatively affect ROE. If the company's NPL increases, the bank's ROE will decrease. The results indicate that NPL has a significant negative influence on ROE at a 1% significance level. These findings support previous theories and research. Oil prices (OIL) are also examined as an external variable influencing banking performance. Including this external factor as an independent variable is important because it significantly impacts all economic sectors and can reduce income when oil prices increase, ultimately affecting banking performance. The results show that oil does not have a significant negative influence on ROE at the 5% significance level. The results obtained are by theory and support previous research by Freriks and Kakes (2024) and Hidayat and Kassim (2024). The previous description indicates that the COVID-19 period is included as an independent variable, represented by a dummy variable. The test results show that the dummy variable significantly influences ROE at a 1% significance level. Interestingly, the pandemic does not necessarily worsen bank performance; in some cases, it may even improve it. These findings are particularly relevant when considering the duration of COVID-19. In the prior causality test involving LDR and ROA, variables such as Good Corporate Governance (GCG), Net Interest Margin (NIM), and Risk were also included as factors influencing ROE. The results indicate that GCG, NIM, and Risk do not significantly influence ROE at the 5% significance level. The previous statement suggests that Risk does not affect ROE, as it was tested to determine whether it acts as a moderating variable. Since Risk does not significantly impact ROE, it may serve solely as a moderating variable (Álvarez-Botas & González, 2021). The study concludes that Risk functions as a moderating variable for LDR, NPL, and the dummy variable. As a moderator, Risk weakens ROE in relation to LDR and the dummy variable.

Meanwhile, for the NPL variable, this risk variable strengthens the relationship between the NPL variable and the ROE variable. Other results also indicate that this risk variable has the potential to serve as a moderating variable (You & Liu, 2025). This risk variable has the potential to serve as a moderating variable in the relationship between GCG, NIM, NPL, and oil prices on RoE, as it does not significantly influence the RoE variable.

4.5. Price to Book Value

Price-to-Book Value is a company performance ratio that uses external variables, such as the stock market price, and internal variables, such as book value. This ratio is often used to compare companies, especially in the financial sector. The Equation is as follows (13).

$$\begin{aligned} PBV_{i,t} = & -1.172 - 6.695 LDR_{i,t} + 1.547 GCG_{i,t} - 124.97 NIM_{i,t} - 1.009 NPL_{i,t} \\ & (-1.186)(2.375)(-2.144)(-0.035) \\ & -1.083 OIL_t + 0.2245 RIS_{i,t} + 3.697 DM_t + 0.481 (LDR_{i,t} * RIS_{i,t}) \\ & (-0.525)(0.194)(2.21)(1.113) \\ & -0.177 (GCG_{i,t} * RIS_{i,t}) + 9.656 (NIM_{i,t} * RIS_{i,t}) + 0.076 (NPL_{i,t} * RIS_{i,t}) \\ & (-2.355)(2.161)(0.033) \\ & + 0.136 (OIL_t * RIS_{i,t}) - 0.271 (DM * RISK) \\ & (0.522)(-2.12) \end{aligned} \quad (13)$$

T-test Numbers in brackets:

$$F = 16.26.$$

$$R^2 = 76.56\%.$$

Equation 13 is a fairly good model because the F-test value exceeds the F-table value at a significance level of 5%. The significance of this model is also demonstrated by the R² (coefficient of determination) value of 76.56%, indicating that all independent variables can explain 76.56% of the variation in PBV, with the remaining variation attributable to other factors. As previously explained, the bank is an institution that must comply with regulations issued by Bank Indonesia and the Monetary Authority. Good Corporate Governance (GCG) must be implemented to adhere to the regulations issued by these two government institutions. The results of this research indicate that Good Corporate Governance has a significant positive effect on PBV at a 1% significance level. Net Interest Margin (NIM) as an independent variable in PBV causality research should have a positive effect on PBV. An increase in NIM should lead to higher net profits and, consequently, higher share prices. However, the test results show that Net Interest Margin has a significant negative effect on PBV at a 1% significance level (de Haan, Moreno, & Segev, 2025). This research supports previous research by Anwar (2019), Priyadi et al. (2021), and Soedarmono et al. (2023).

The COVID-19 period also occurred in the research period, so this period was included as an independent variable presented with a dummy variable. In Equation 13, it is seen that the Dummy significantly influences bank performance by presenting PBV at a significant level of 5%. This research is in line with expectations but supports previous research. By the causality description in LDR, RoE, and RoA, the same variables influence PBV. The GCG, NIM, and Dummy variables influence the PBV variable significantly at the 5% significance level. LDR, NPL, and Oil Price (OIL) and Risk variables do not affect the PBV variable. These results are mixed, as in the causality tests on LDR, RoA, and RoE. This research includes risk variables as moderating variables. The first result stated that the risk variable does not significantly influence PBV, so that the risk variable can be a pure moderating variable (Sharma, Durand, & Gur-Arie, 1981). This study found that the risk variable was significant as a moderating variable for the relationship between GCG, NIM, and Dummy on PBV. Risk variables strengthen the relationship between NIM and PBV, while risk variables weaken the relationship between GCG, NIM, and PBV. As a result, the risk variable can be declared a pure moderating variable in this relationship. This risk variable does not significantly strengthen or weaken the relationship between LDR, NPL, oil prices, and PBV. Therefore, the risk variable still has the potential to be a moderating variable in this relationship.

5. DISCUSSION

Based on the results of this research and the tests conducted, the findings vary significantly and can imply different meanings. Therefore, it is necessary to discuss the results in more detail to clarify the facts. Good Corporate Governance (GCG) in this study does not affect banking performance, specifically Return on Assets (ROA) and Return on Equity (ROE). However, GCG influences the Loan-to-Deposits Ratio and Price-to-Book Value. This indicates that GCG impacts the bank's performance, although the internal ratios of the bank may not be directly affected. GCG can influence bank performance through an intervening variable, namely the Loan Deposits Ratio, which reflects banking characteristics. This may occur because, within GCG, it is observed that the management of the deposit ratio has an influence, while ROA and ROE are outcomes of the company's efforts. Net Interest Margin (NIM) is the spread desired by banks as intermediary institutions. This research found that the spread was approximately 4.5%, and a negative NIM indicates that the bank incurs losses from its activities. These negative results are most likely due to the COVID-19 pandemic period during the research timeframe (de Haan et al., 2025; Nguyen et al., 2020). The pandemic period is a significant research variable and is used as a dummy variable. This dummy variable was significant in the LDR, ROA, ROE, and PBV model research, indicating that it is appropriate to include it in the research model as an independent variable or antecedent. Other researchers also create dummy variables, but their results are empirically insignificant.

This research includes non-performing loans (NPL) as an independent variable. The results indicate that this variable does not significantly influence the price-to-book value, while it significantly influences the LDR, ROA, and ROE variables. The significance of this variable lies in its relation to banking performance. The findings also state

that the NPL variable is not related to variables derived from ratios outside the company compared to internal variables, where internal variables are statements of the company's position. Oil prices are included as an antecedent variable, representing macroeconomic factors. Oil prices have a significant impact on the Indonesian economy. Fluctuations in oil prices influence economic fluctuations; however, these fluctuations do not directly affect banking performance. The lack of influence on banking performance may be because the relationship is indirect, possibly mediated through other variables. The LDR is considered an intermediary variable; it appears that oil prices have no direct relationship with it. Consequently, further research should ensure that variables are not used solely as representations of macroeconomic factors.

The risk was included as a moderating variable in this study. As a moderating variable, risk was first entered as an independent variable, as shown by Equations 10, 11, 12, and 13 (Al Jabri et al., 2022). Risk as a moderating variable is represented by multiplying the risk variable with other independent variables. When considered as an independent variable, risk only affects the dependent variable loan-to-deposits ratio, while the dependent variables are ROA, ROE, and PBV. This situation is similar to the effect of the good corporate governance (GCG) variable. If this variable is to influence the dependent variables (ROA, ROE, and PBV), it must pass through the intermediary variable, the loan-to-deposits ratio. This moderating variable strengthens the relationship between the independent variables (GCG, NIM, NPL, and oil prices) and the dependent variables (LDR, ROA, ROE, and PBV). The study results indicate that when risk is considered as a moderating variable, it can significantly weaken several key financial relationships. Firstly, it can diminish the impact of good corporate governance, non-performing loans (NPL), and the dummy loan-to-deposits ratio (LDR). However, it does not significantly affect other variables such as the net interest margin (NIM) and oil prices. Secondly, the study shows that risk can also weaken the relationships between the loan-to-deposits ratio (LDR), non-performing loans (NPL), and the dummy return on assets (ROA), with the same insignificance observed for NIM and oil prices. Moreover, risk can impact the relationships among the loan-to-deposits ratio (LDR), non-performing loans (NPL), and the dummy return on equity (ROE), while once again, NIM and oil prices remain unaffected. Lastly, risk can significantly alter the dynamics between good corporate governance, net interest margin (NIM), and the dummy price-to-book value (PBV), while NPL and oil prices do not show significant changes. This comprehensive analysis highlights how risk plays a crucial role in moderating these financial relationships, emphasizing the need for companies to consider risk management in their strategic planning (Li et al., 2024; Pop & Pop, 2024; You & Liu, 2025).

6. CONCLUSION

The conclusions from this research are as follows: Net Interest Margin (NIM) affects banking performance in terms of Price to Book Value at a 5% significance level, but it does not significantly affect Return on Assets (ROA) and Return on Equity (ROE). Non-performing loans (NPLs) influence banking performance regarding ROA and ROE, but are not significant for the Price-to-Book Value (PBV) at the 5% significance level. Good Corporate Governance (GCG) does not affect banking performance (ROA and ROE), but it does significantly influence the PBV at a 5% significance level. Oil prices do not impact banking performance (Loan to Deposit Ratio (LDR), ROA, ROE, and PBV) at the 5% significance level. The Loan to Deposit Ratio (LDR) significantly influences banking performance for ROA and ROE, but not for PBV at the 5% significance level. NIM does not have a significant positive effect on LDR at the 5% significance level. Corporate governance significantly and positively influences the LDR at a 1% significance level. NPL has a significant positive effect on LDR at the 1% significance level. Oil prices do not significantly affect LDR at the 5% significance level. Risk has a significant positive influence on LDR at the 5% significance level. The dummy variable has a significant positive effect on LDR at the 1% significance level. As a moderating variable, risk can significantly weaken the relationships between Good Corporate Governance, Non-Performing Loans (NPL), and the dummy variable on Loan Deposit Ratio (LDR). In contrast, other variables (NIM, Oil Prices) are not significant. Risk, as a moderating variable, can significantly weaken the relationships between

LDR, NPL, and the dummy variable on Return on Assets (ROA). Other variables (NIM, Oil Prices) are not significant in this context. Risk can also significantly weaken the relationships between LDR, NPL, and the dummy variable on Return on Equity (ROE). Again, other variables (NIM, Oil Prices) are not significant. As a moderating variable, risk can significantly weaken the relationships between Good Corporate Governance, Net Interest Margin (NIM), and the dummy variable on Price to Book Value (PBV). Conversely, NPL and Oil Prices are not significant in this regard.

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