

DETERMINANTS OF LOAN LOSS PROVISIONS: NPL, INCOME DIVERSIFICATION, OPERATIONAL EFFICIENCY, AND BANK SIZE AS MODERATOR

Elyta Dwi Cahyati ¹⁾, Liliek Nur Sulistiyowati ²⁾, Rollis Ayu Ditasari ³⁾

^{1,2,3} Faculty of Economics and Business, Universitas PGRI Madiun

email: elyta_2203102155@mhs.unipma.ac.id

email: liliek1702@gmail.com

email: rolisayuditasari@unipma.ac.id

Abstract

This study aims to analyze the effects of Non-Performing Loans (NPL), Income Diversification, dan Operational Efficiency on Loan Loss Provisions (LLP), with Bank Size as a moderating variable, in conventional banks listed on the Indonesia Stock Exchange (IDX) during the 2020-2025 period. The data used were secondary data in the form of annual financial statements obtained from the Indonesia Stock Exchange and the official websites of each bank. Data were collected through documentation techniques using purposive sampling. The research sample consisted of 40 banks. Data were analyzed using multiple linear regression dan Moderated Regression Analysis (MRA) with the assistance of IBM SPSS Statistics 26. The results indicate that Non-Performing Loans (NPL) have a positive dan significant effect on Loan Loss Provisions (LLP), while Income Diversification has a negative dan significant effect on Loan Loss Provisions (LLP). Operational Efficiency also has a positive and significant effect on Loan Loss Provisions (LLP). Furthermore, Bank Size moderates the effect of Operational Efficiency on Loan Loss Provisions (LLP) by strengthening the relationship. However, Bank Size does not moderate the effects of Non-Performing Loans (NPL) dan Income Diversification on Loan Loss Provisions (LLP).

Keywords: NPL, Income Diversification, Operational Efficiency, Bank Size, LLP

A. INTRODUCTION

The banking industry plays a strategic role as a financial intermediary that collects funds from the public and channels them in the form of credit. Therefore, banking stability and soundness are essential prerequisites for the sustainability of economic activities. In performing this function, banks are exposed to credit risk, which may affect asset quality and financial performance (Siddika et al., 2025). Accordingly, credit risk management and the establishment of Loan Loss Provision (LLP) constitute important components of the prudent banking

principle. Since the implementation of PSAK 71 on January 1, 2020, the recognition of LLP has adopted the expected credit loss (ECL) approach, requiring banks to estimate potential credit losses using a more forward-looking approach rather than relying solely on losses that have already occurred (Supervision, 2022).

The provisioning phenomenon in the Indonesian banking industry indicates that LLP remains an important aspect of credit risk management. The development of LLP among conventional banks listed on the Indonesia Stock Exchange (IDX) during 2023-2025 shows considerable variation across banks. AGRO, for example, recorded an LLP ratio of 7.71% in 2023, which increased to 10.85% in 2025, whereas several large banks, such as BBNI and PNB, experienced decreases in their LLP ratios. Most banks recorded LLP ratios below 5%; however, substantial differences remain across banks, reflecting variations in credit risk, portfolio characteristics, and provisioning policies. At the same time, credit distribution by commercial banks continued to increase, with credit growth reaching 12% in 2024 and 10% in 2025. This phenomenon indicates that credit expansion continues to be accompanied by the need for banks to anticipate potential losses through adequate provisioning policies.

One factor theoretically associated with LLP is Non-Performing Loan (NPL), as NPL reflects credit quality and the level of borrowers' default risk. A higher NPL indicates greater potential credit losses that need to be anticipated through adequate provisioning. However, the Indonesian banking phenomenon shows that the average Gross NPL ratio actually declined from 3.17% in 2021 to 2.18% in 2025, while LLP levels continued to vary across banks. Empirically, Kesuma et al., (2026), Evriansyah et al., (2026), and Pratiwi et al., (2026) support the relationship between increasing credit risk and LLP, whereas Roni and Oktavia (2023) and Sinaga et al. (2023) indicate that changes in LLP following the implementation of PSAK 71 were not always accompanied by consistent changes in NPL.

In addition to credit risk, Income Diversification and Operational Efficiency (BOPO) may also influence banks' provisioning requirements. Income Diversification enables banks to reduce their reliance on interest income through non-interest income, potentially reducing risk concentration and the need for LLP. The study data show variations in diversification indices across banks during 2020-2025. However, empirical findings remain mixed. Wijaya, (2025)

and Dzakiyani & Hermanto, (2024) found that diversification may reduce credit risk, whereas Gustama & Danarsar, (2025); Tambunan et al., (2024) indicated that its benefits for banking risk or stability are not consistently demonstrated.

Operational Efficiency (BOPO) is relevant because a higher ratio indicates relatively high operating expenses compared with operating income. During 2023-2025, most banks recorded BOPO ratios of 70%-100%, while BBKP reached 223.20% in 2023 before declining to 119.60% in 2025. This variation reflects differences in cost management that may relate to risk and provisioning needs. However, Anggraini et al., (2025) found that the relationship between Operational Efficiency and LLP is not necessarily direct or consistent.

Bank Size may influence the relationships between NPL, Income Diversification, Operational Efficiency (BOPO), and LLP, as larger banks generally have greater resources and more developed risk management systems. The data show increasing Bank Size for BBKA, BBTN, and BBRI during 2020–2025. However, findings remain inconsistent. Herlina & Wilujeng, (2025) and Sakti & Rachmawati, (2024) support the role of Bank Size in relationships involving NPL, BOPO, and LLP, while Ariefianto et al., (2026), Huynh & Phan, (2024), and Sihombing et al., (2025) report that its moderating effect is not always significant. Thus, a research gap remains regarding the moderating role of Bank Size in the relationships between these variables and LLP.

Based on these research gaps, this study examines the effects of NPL, Income Diversification, and Operating Efficiency (BOPO) on Loan Loss Provision (LLP), with Bank Size as a moderating variable in conventional banks listed on the IDX during 2020-2025. This study contributes by examining both the direct effects of these factors and whether Bank Size alters their relationships with LLP, addressing the inconsistent findings reported by Herlina & Wilujeng, (2025), Sakti & Rachmawati, (2024), Ariefianto et al., (2026), Huynh & Phan, (2024), and Sihombing et al., (2025). Accordingly, the study aims to analyze the effects of NPL, Income Diversification, and Operating Efficiency on LLP and the moderating role of Bank Size.

Theory and Hypothesis Study

Grand Theory of Banking Risk

Signaling Theory was introduced by Spence (1973) and explains how information owned by internal parties can be conveyed to external parties through signals to reduce information asymmetry. In the banking industry, financial information such as credit quality, operational efficiency, income diversification, and loan loss provisions can provide signals regarding the bank's financial condition and risk profile. In this study, Loan Loss Provision (LLP) represents a form of management signal concerning the bank's prudence in anticipating potential credit losses. Therefore, Signaling Theory provides a theoretical basis for explaining the relationship between Non-Performing Loan (NPL), Income Diversification, Operating Efficiency (BOPO), and Bank Size on LLP.

Non-Performing Loan (NPL)

According to Prasetyo, (2025), Non-Performing Loan (NPL) is an important indicator for assessing credit quality and the level of credit risk faced by banks. A high NPL indicates a deterioration in asset quality and an increase in the possibility of debtor default (Chandra et al., 2025) Consequently, banks need to increase loan loss provisions to anticipate potential losses arising from problematic loans. Irwan et al., (2024) also explain that higher NPL increases credit loss risk and encourages banks to establish larger LLP. From the perspective of Signaling Theory, a high NPL provides a negative signal regarding the bank's credit quality and financial condition. Therefore, an increase in NPL is expected to be followed by an increase in LLP. Thus, the following hypothesis is proposed:

H1: Non-Performing Loan (NPL) has a significant effect on Loan Loss Provision (LLP).

Income Diversification

Income Diversification refers to a bank's strategy of obtaining income from various sources rather than relying solely on interest income from lending activities. Non-interest income may originate from fee-based income, transfer services, digital banking, treasury activities, bancassurance, and other financial services (Sakti & Rachmawati, 2024). Diversification allows banks to reduce their dependence on lending activities and potentially maintain more stable income when credit conditions deteriorate.

According to Nguyen et al., (2023), diversification of income sources can reduce the concentration of bank income and strengthen financial stability. From the perspective of

Signaling Theory, stronger income diversification may provide a positive signal regarding the bank's ability to manage income and financial risk. Therefore, greater income diversification is expected to reduce the pressure on banks to establish LLP. Thus, the following hypothesis is proposed:

H2: Income Diversification has a significant negative effect on Loan Loss Provision (LLP).

Operating Efficiency (BOPO)

Operating Efficiency describes a bank's ability to manage operating resources and control operating costs in generating operating income. Operating efficiency is commonly measured using the Operating Expenses to Operating Income ratio (BOPO). A lower BOPO indicates better efficiency, while a higher BOPO indicates that operating expenses are relatively high compared with operating income (Sumayyah et al., 2026).

High BOPO indicates lower operational efficiency and may reflect weaknesses in the bank's management of resources. Such conditions can reduce financial flexibility and affect the bank's ability to manage risks, including credit risk and loan loss provisioning. From the perspective of Signaling Theory, a high BOPO may provide a negative signal concerning the bank's operational condition. Therefore, higher BOPO is expected to increase the amount of LLP established by the bank. Accordingly, the following hypothesis is proposed:

H3: Operating Efficiency (BOPO) has a significant positive effect on Loan Loss Provision (LLP).

Bank Size as a Moderating Variable

Bank Size represents the scale of a bank's operations and is generally measured based on total assets. Larger banks tend to possess greater financial resources, operational capacity, technological infrastructure, and risk-management capabilities. These characteristics may cause the relationship between credit risk, income diversification, operational efficiency, and LLP to differ between large and small banks.

H4: Bank Size moderates the effect of Non-Performing Loan (NPL) on Loan Loss Provision (LLP).

H5: Bank Size moderates the effect of Income Diversification on Loan Loss Provision (LLP).

H6: Bank Size moderates the effect of Operating Efficiency (BOPO) on Loan Loss Provision (LLP).

B. METHOD

This study uses a quantitative method with secondary data obtained from the annual financial reports of conventional commercial banks listed on the Indonesia Stock Exchange (IDX) during 2020-2025, published through the official IDX website, OJK website, and the official websites of the respective banks. The population consists of conventional commercial banks listed on the IDX during the 2020-2025 period, with the sample selected using purposive sampling based on predetermined criteria. The dependent variable is Loan Loss Provision (LLP). The independent variables include Non-Performing Loan (NPL), measured by non-performing loans to total credit; Income Diversification, measured using a modified Herfindahl-Hirschman Index (HHI); and operational efficiency, measured by the Operating Expenses to Operating Income ratio (BOPO). Bank Size is used as a moderating variable and measured by the natural logarithm of total assets. The data are analyzed using descriptive statistics, classical assumption tests, linear regression, Moderated Regression Analysis (MRA), t-test, and coefficient of determination.

C. RESULTS AND DISCUSSIONS

Multiple Linear Regression Test

Tabel 1 Multiple Linear Regression Test

Coefficients ^a						
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	
	B	Std. Error	Beta			
1	(Constant)	,221	,043	5,091	,000	
	NPL	,356	,054	,377	6,622	,000
	INDEKS	-,163	,033	-,245	-4,865	,000
	BOPO	,289	,049	,322	5,875	,000
a. Dependent Variable: CKPN						

Source: Data processed using IBM SPSS Statistics 26

The multiple linear regression results show that the constant coefficient is 0.221, with a t-statistic of 5.091 and a significance value of 0.000, indicating that the predicted LLP is 0.221

when NPL, Income Diversification, and BOPO are held constant. NPL has a positive and significant effect on LLP, with a coefficient of 0.356, t-statistic of 6.622, and significance value of 0.000, indicating that higher NPL is associated with higher LLP.

Income Diversification has a negative and significant effect on LLP, with a coefficient of -0.163, t-statistic of -4.865, and significance value of 0.000, indicating that greater income diversification is associated with lower LLP. Meanwhile, BOPO has a positive and significant effect on LLP, with a coefficient of 0.289, t-statistic of 5.875, and significance value of 0.000, indicating that higher operational inefficiency is associated with higher LLP.

Moderated Regression Analysis (MRA)

Tabel 2 Moderated Regression Analysis

Coefficients^a					
	Model	Unstandardized Coefficients		Standardized Coefficients	Sig.
		B	Std. Error	Beta	
1	(Constant)	,164	,039		,000
	NPL	,170	,051	,180	,001
	INDEKS	-,099	,030	-,149	,001
	BOPO	,118	,047	,131	,013
	Bank Size	,358	,057	,398	,000
	NPL*Bank Size	-,050	,031	-,072	,107
	INDEKS*Bank Size	-,020	,024	-,036	,408
	BOPO*Bank Size	,111	,039	,150	,005

a. Dependent Variable: CKPN

Source: Data processed using IBM SPSS Statistics 26

The Moderated Regression Analysis (MRA) was conducted to examine whether Bank Size moderates the effects of NPL, Income Diversification, and BOPO on LLP. The interaction between NPL and Bank Size has a coefficient of -0.050, t-statistic of -1.619, and significance value of 0.107, while the interaction between Income Diversification and Bank Size has a coefficient of -0.020, t-statistic of -0.830, and significance value of 0.408. Since both significance values exceed 0.05, Bank Size does not significantly moderate the relationships between NPL and LLP or Income Diversification and LLP.

In contrast, the interaction between BOPO and Bank Size has a coefficient of 0.111, t-statistic of 2.854, and significance value of 0.005. Since the significance value is below 0.05 and the coefficient is positive, Bank Size significantly and positively moderates the relationship

between BOPO and LLP, strengthening the positive effect of BOPO on LLP. Overall, Bank Size only significantly moderates the relationship between BOPO and LLP.

Statistical Test t

Tabel 3 Statistical Test t

Coefficients ^a					
	Model	Unstandardized Coefficients		Standardized Coefficients	Sig.
		B	Std. Error	Beta	
1	(Constant)	,164	,039		,000
	NPL	,170	,051	,180	,001
	INDEKS	-,099	,030	-,149	,001
	BOPO	,118	,047	,131	,013
	Ukuran Bank	,358	,057	,398	,000
	NPL*Bank Size	-,050	,031	-,072	,107
	INDEKS*Bank Size	-,020	,024	-,036	,408
	BOPO*Bank Size	,111	,039	,150	,005

a. Dependent Variable: CKPN

Source: Data processed using IBM SPSS Statistics 26

The results of the t-test indicate differences in the effects of NPL, Income Diversification, BOPO, and their interactions with Bank Size on LLP. The hypothesis testing was based on a significance level of 5% ($\alpha = 0.05$) and a critical t-value of 1.972. A hypothesis is accepted when the significance value is below 0.05 and the absolute t-value exceeds 1.972.

H1, NPL has a regression coefficient of 0.170, a t-value of 3.298, and a significance value of 0.001. The positive coefficient indicates a positive relationship between NPL and LLP. Because the significance value is below 0.05 and the t-value exceeds 1.972, H1 is accepted. Thus, NPL has a positive and significant effect on LLP.

H2, Income Diversification has a regression coefficient of -0.099, a t-value of -3.231, and a significance value of 0.001. The negative coefficient indicates a negative relationship between Income Diversification and LLP. Since the significance value is below 0.05 and the absolute t-value exceeds 1.972, H2 is accepted. Thus, Income Diversification has a negative and significant effect on LLP.

H3, BOPO has a regression coefficient of 0.118, a t-value of 2.500, and a significance value of 0.013. The positive coefficient indicates a positive relationship between BOPO and LLP. Since the significance value is below 0.05 and the t-value exceeds 1.972, H3 is accepted. Thus, BOPO has a positive and significant effect on LLP.

H4, the interaction between NPL and Bank Size has a regression coefficient of -0.050, a t-value of -1.619, and a significance value of 0.107. The negative coefficient indicates a negative direction of the interaction effect. However, because the significance value exceeds 0.05 and the absolute t-value is below 1.972, H4 is rejected. Thus, the $NPL \times Bank\ Size$ interaction does not have a significant effect on LLP.

H5, the interaction between Income Diversification and Bank Size has a regression coefficient of -0.020, a t-value of -0.830, and a significance value of 0.408. The negative coefficient indicates a negative direction of the interaction effect. Nevertheless, the significance value is greater than 0.05 and the absolute t-value is below 1.972, so H5 is rejected. Thus, the $Income\ Diversification \times Bank\ Size$ interaction does not have a significant effect on LLP.

For H6, the interaction between BOPO and Bank Size has a regression coefficient of 0.111, a t-value of 2.854, and a significance value of 0.005. The positive coefficient indicates a positive direction of the interaction effect. Since the significance value is below 0.05 and the t-value exceeds 1.972, H6 is accepted. Thus, the $BOPO \times Bank\ Size$ interaction has a positive and significant effect on LLP.

DISCUSSIONS

The Effect of NPL on LLP

The results show that NPL has a positive and significant effect on LLP, with a regression coefficient of 0.170, t-value of 3.298, and significance value of 0.001, so H1 is accepted. This indicates that higher NPL increases LLP as banks respond to deteriorating credit quality and anticipate potential credit losses under the PSAK 71 Expected Credit Loss (ECL) approach. The finding is consistent with Evriansyah et al., (2026), Pratiwi et al., (2026), and Citrahayu et al., (2025), which show that higher credit risk and NPL are associated with greater LLP. Overall, the results confirm that NPL is an important determinant of LLP, as higher credit risk leads to greater provisioning.

The Effect of Income Diversification on LLP

The results show that Income Diversification has a negative and significant effect on LLP, with a regression coefficient of -0.099, t-value of -3.231, and significance value of 0.001, so H2 is accepted. This indicates that greater income diversification can reduce dependence on

lending income, improve income stability, and reduce provisioning pressure. Consistent with Signaling Theory, effective diversification may signal stronger revenue capacity and risk management. This finding is consistent with Dzakiyani & Hermanto (2024), Sakti & Rachmawati (2024), and Wijaya (2025), which indicate that income diversification can reduce credit risk and improve asset quality. Thus, greater income diversification is associated with lower LLP.

The Effect of Operating Efficiency (BOPO) on LLP

The results show that Operating Efficiency (BOPO) has a positive and significant effect on LLP, with a regression coefficient of 0.118, t-value of 2.500, and significance value of 0.013, so H3 is accepted. A higher BOPO indicates greater operational inefficiency, which can increase operational risk and weaken banks' ability to manage resources efficiently. Under these conditions, banks may increase LLP as a precaution against potential credit losses. Consistent with Signaling Theory, a high BOPO may signal weaker operational and risk management. This finding is consistent with Dzakiyani & Hermanto (2024), who found that BOPO has a positive and significant effect on NPL. Thus, greater operational inefficiency is associated with higher LLP.

The Moderating Role of Bank Size in the Effect of NPL on LLP.

The MRA results show that the interaction between NPL and Bank Size has a negative and insignificant effect on LLP, with an interaction coefficient of -0.050, t-value of -1.619, and significance value of 0.107. Since the significance value exceeds 0.05 and the absolute t-value is below 1.972, H4 is rejected. Thus, Bank Size does not significantly moderate the relationship between NPL and LLP. This finding is consistent with Jasman & Murwaningsari (2022), who stated that LLP formation is more strongly influenced by credit quality than Bank Size. It is also supported by Ariefianto et al. (2026), who found that the moderating role of Bank Size in the relationship between credit risk and provisioning is not consistent. Thus, the effect of NPL on LLP is not significantly dependent on Bank Size.

The Moderating Role of Bank Size in the Effect of Income Diversification on LLP

The MRA results show that the interaction between Income Diversification and Bank Size has a negative but insignificant effect on LLP, with an interaction coefficient of -0.020, t-

value of -0.830, and significance value of 0.408. Since the significance value exceeds 0.05 and the absolute t-value is below 1.972, H5 is rejected. Thus, Bank Size does not significantly moderate the relationship between Income Diversification and LLP. This finding is supported by Daria et al. (2025), which indicates that the relationship between income diversification and banking risk is not necessarily determined by Bank Size. Therefore, the effect of Income Diversification on LLP appears to depend more on the effectiveness of diversification and banks' risk-management capabilities than on asset size.

The Moderating Role of Bank Size in the Effect of BOPO on LLP

The MRA results show that the $\text{BOPO} \times \text{Bank Size}$ interaction has a positive and significant effect on LLP, with an interaction coefficient of 0.111, t-value of 2.854, and significance value of 0.005, so H6 is accepted. The positive interaction indicates that Bank Size strengthens the positive relationship between BOPO and LLP, meaning that operational inefficiency has a stronger effect on LLP as Bank Size increases. Consistent with Signaling Theory, higher BOPO may signal weaker operational and risk management. This finding is consistent with Herlina & Wilujeng (2025) and Sakti & Rachmawati (2024). Thus, larger banks need to improve operational efficiency and cost control to limit increases in LLP.

D. CONCLUSIONS

This study concludes that Non-Performing Loan (NPL) has a significant positive effect on Loan Loss Provision (LLP), indicating that higher credit risk leads banks to set aside larger provisions; Income Diversification has a significant negative effect on LLP, indicating that banks with more diversified income sources tend to record lower provisioning needs; and Operational Efficiency (BOPO) has a significant positive effect on LLP, indicating that less efficient banks tend to form larger provisions. In terms of the moderating role of Bank Size, the results show that Bank Size does not significantly moderate the effect of NPL on LLP and does not significantly moderate the effect of Income Diversification on LLP, meaning that the strength of these two relationships does not differ across banks of different sizes. In contrast, Bank Size significantly moderates the effect of BOPO on LLP, strengthening the positive

relationship between operational inefficiency and provisioning, which indicates that the effect of operational efficiency on LLP is more pronounced in larger banks.

E. SUGGESTIONS

Based on the findings above, several practical and academic suggestions can be drawn. For bank management, credit risk monitoring and operational efficiency should be strengthened to control NPL and BOPO, particularly in larger banks where the effect of BOPO on LLP is stronger, while non-interest income sources should be expanded given their provisioning-reducing effect. For investors and stakeholders, NPL, income diversification, and BOPO can serve as practical indicators of a bank's credit risk and provisioning burden, with closer attention warranted for large banks due to the amplified effect of operational inefficiency. For future researchers, it is suggested to extend the observation period, add variables such as capital adequacy or macroeconomic factors to better explain the non-significant moderation of Bank Size, broaden the research object to include Islamic banks, and apply panel data regression to account for cross-sectional heterogeneity.

REFERENCES

- Anggraini, A., Fuadi, F., & Susanto, I. (2025). The Impact of Cost-to-Income Ratio, Net Benefit, and Operating Expenses on Islamic Commercial Bank Loss Reserves. *Mutanaqishah: Journal of Islamic Banking*, 5(1), 30-44. <https://doi.org/10.54045/Mutanaqishah.v5i1.2614>
- Ariefianto, M. D., Nur, T., & Meivitawanli, B. (2026). Credit Risk Management Dynamics: Evidence from Indonesian Rural Banks. *Risks*, 14, 9. <https://doi.org/10.3390/risks14010009>
- Chandra, J. C., Putri, A. E., Ongko, A. Z., & Manurung, E. T. (2025). The Effect of Non-Performing Loan (NPL) on Net Income at PT Bank Central Asia Tbk. *Account: International Journal for Accountancy, Finance, and Banking*, 12(1), 2610-2616.
- Dzakiyani, W. H., & Hermanto. (2024). Faktor–Faktor Rasio Keuangan Yang Mempengaruhi Non-Performing Loan (NPL). *Jurnal Ilmiah Komputerisasi Akuntansi*, 17(1), 48-63. <https://doi.org/10.51903/kompak.v17i1.1721>
- Evriansyah, E., Ulupui, I. G. K. A., & Musyaffi, A. M. (2026). The Effect of the Allowance for Impairment Losses (CKPN) and Net Interest Margin (NIM) on Profitability, with Bank Size As a Moderating Variable, in Banks Listed on the Indonesian Stock Exchange (2021-

- 2024). *Journal of Accounting, Finance, and FinTech Advancements*, 1(4). <https://doi.org/10.70865/jaffa.v1i4.190>
- Gustama, A., & Danarsar, D. N. (2025). The Impact of Income Diversification and Liquidity Risk on Stability of Conventional Banks In Indonesia. *Eduvest - Journal of Universal Studies*, 5(9), 10950-10963. <http://eduvest.greenvest.co.id>
- Herlina, & Wilujeng, F. R. (2025). Ukuran Bank sebagai Faktor Moderasi Hubungan Risiko dan Profitabilitas pada Perbankan ASEAN di Masa Pandemi COVID-19. *Journal of Indonesian Economic Research*, 3(1), 13-19.
- Huynh, J., & Phan, T. M. H. (2024). Uncertainty and Bank Risk in an Emerging Market: The Moderating Role of Business Models. *PLOS ONE*, 19(2), e0297973. <https://doi.org/10.1371/journal.pone.0297973>
- Irwan, I., Kristin, Arnelia, G., & Renata. (2024). Analisis Kredit Macet dalam Menilai Profitabilitas Pada BPR Hasamitra. *EKOMA : Jurnal Ekonomi, Manajemen, Akuntansi*, 3(5), 724-729.
- Kesuma, A. P., Nasution, F. N., & Sembiring, M. T. (2026). Analysis of The Effect of Loan Distribution, Non-Performing Loans, and Loan at Risk on The Allowance For Impairment Losses at PT Bank Sumut Conventional Unit. *TALENTA Conference Series: Local Wisdom, Social, and Arts*, 9(2). <https://doi.org/10.32734/lwsa.v9i2.2796>
- Linggadjaya, R. I. T., Atahau, A. D. R., Ugut, G. S. S., & Suk, K. S. (2025). The Moderating Role of Capital Adequacy on Bank Specific Characteristics to Sustainable Growth: Evidence From Commercial Banks in Indonesia. *SAGE Open*, 15(3). <https://doi.org/10.1177/21582440251353042>
- Nguyen, H. P. T., Tran, N. M., & Pham, V. M. (2023). The Impact of Size on Income Diversification: An Empirical Study on Commercial Banks in Vietnam. *Future Business Journal*, 9(1), 91-100. <https://doi.org/10.1186/s43093-023-00273-6>
- Prasetyo, H. D. (2025). Analisis Faktor-faktor yang Mempengaruhi Non-Performing Loan (NPL) di Sektor Perbankan. *Jurnal Manajemen dan Administrasi Bisnis (JUMASIS)*, 1(2), 52-57.
- Pratiwi, R. I., Mas'ud, A., Saleh, S., & Hamid, W. (2026). The Role of Profitability and Liquidity Risk in Mediating the Effect of Credit Risk on Stability in Regional Development Banks in Indonesia. *Architectural Image Studies*, 7(1), 498-509. <https://doi.org/10.62754/ais.v7i1.867>
- Sakti, J. P., & Rachmawati, N. A. (2024). Does the Size of a Bank Moderate the Relationship Between CKPN, BOPO, and NPL Toward Bank Financial Performance? *Jurnal Bisnis Dan Akuntansi*, 26(1), 123-138.
- Siddika, A., Sarwar, A., Tareq, M. A., & Siddiqua, P. (2025). Between Stability and Exposure: The Dual Effects of Income Diversification on Bank Risk. *Journal of Risk and Financial Management*, 18(11), 631. <https://doi.org/10.3390/jrfm18110631>

- Sihombing, S., Sahputri, R. A. M., Ali, H., Rini, L. E., & Ramadhan, M. P. (2025). Analisis LDR, BOPO, NPL, dan Bank Size terhadap Financial Performance dan Market Value Perbankan Tahun 2022–2024. *Jurnal Manajemen Dan Bisnis*, 4(1), 183-207.
- Sumayyah, S., Pakawaru, M. I., Kahar, A., & Rhamadhani, R. F. (2026). The Impact of Good Corporate Governance and Profitability on Operational Risk Management at State Owned Banking Companies Listed on the IDX. *Journal of Accounting and Financial Management (JAFM)*, 7(2), 483-498. <https://doi.org/10.38035/jafm.v7i2>
- Supervision, B. C. on B. (2022). *Principles for the Management of Credit Risk*. Bank for International Settlements. <https://www.bis.org/bcbs/publ/d591.pdf>
- Tambunan, A. L., Indriyanti, D. F., Puspita, G. F., & Lestari, H. S. (2024). The Effect of Income Diversification on Default Risk in Conventional Banking Companies in Indonesia. *Jurnal Manajemen Bisnis*, 11(2), 1519-1529. <https://doi.org/10.33096/jmb.v11i2.791>
- Wijaya, S. (2025). The Mediating Role of Non-Performing Loans on the Relationship Between Income Diversification and Bank Performance: Evidence from Indonesia. *Indonesian Journal of Finance and Economics*, 8(1), 45-60