

The Impact of the Sustainable Financing Ratio on Credit Risk and Profitability of KBMI IV Banks in Indonesia for the Period 2015 - 2025

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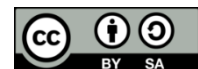
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ABSTRACT

This study analyzes the impact of the Sustainable Financing Ratio (SFR) on the credit risk and profitability of KBMI IV banks in Indonesia during the 2015–2025 period. Credit risk is proxied by the Non-Performing Loan (NPL) ratio, while profitability is proxied by Return on Assets (ROA). The Capital Adequacy Ratio (CAR), Loan-to-Deposit Ratio (LDR), and Bank Size are used as control variables. The sample comprises Bank Mandiri, Bank Negara Indonesia, Bank Rakyat Indonesia, and Bank Central Asia, yielding 44 observations. Secondary data were obtained from annual reports, sustainability reports, financial statements, and publications by the Financial Services Authority (OJK). The analysis employs panel data regression using the Random Effect Model (REM), Nerlove transformation, and bank-level clustered standard errors. The results indicate that SFR has a positive and significant effect on NPLs, with a coefficient of 0.0439874 and a p-value of 0.0000821. Conversely, SFR has a negative and significant effect on ROA, with a coefficient of -0.0139732 and a p-value of 0.0005. Collectively, SFR, CAR, LDR, and Bank Size significantly influence both NPLs and ROA. These findings suggest that the increase in the proportion of sustainable financing among KBMI IV banks during the observation period is associated with higher credit risk and lower profitability. Therefore, the expansion of sustainable financing must be accompanied by strengthened risk management, monitoring of credit quality, and attention to the banks' efficiency and financial performance.

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1. INTRODUCTION

The banking industry plays a strategic role in the Indonesian economy through its intermediary activities, particularly the collection and distribution of funds. Bank performance is reflected not only in credit growth but also in the ability to

maintain credit quality, manage risk, and maintain profitability. As the financial sector develops, sustainability principles are increasingly integrated into financing activities, requiring decisions on fund

distribution to consider economic, social, and environmental aspects [1], [2].

The Financial Services Authority (OJK) is developing sustainable finance through its Sustainable Finance Roadmap, Phase I (2015–2019) and Phase II (2021–2025). Phase I emphasizes building foundations, capacity, and regulations, while Phase II focuses on strengthening the ecosystem and accelerating the implementation of sustainable finance. In banking, one form of implementation is Sustainable Financing, which is financing directed at activities that provide economic benefits while considering social and environmental aspects [3].

The development of Indonesian banking intermediation shows dynamics throughout 2015–2025. Total credit increased from Rp4,057.904 trillion in 2015 to Rp5,683.757 trillion in 2019, then decreased to Rp5,482.054 trillion in 2020. After that, credit increased again to Rp5,820.636 trillion in 2021, Rp6,497.620 trillion in 2022, Rp7,186.935 trillion in 2023, Rp7,673.175 trillion in 2024, and Rp8,167.461 trillion in June 2025 based on data used in the thesis.

At the same time, credit quality and profitability experience dynamics that do not always align with credit growth. The industry's gross NPL increased from 2.53% in 2019 to 3.06% in 2020, then declined to 2.08% in 2024 before rising again to 2.22% in June 2025. ROA fell from 2.47% in 2019 to 1.59% in 2020, then recovered to 2.74% in 2023 and declined to 2.58% in June 2025. This phenomenon indicates that intermediation expansion does not automatically result in improvements in credit quality and profitability.

KBMI Group IV is relevant for study because it controlled 50.88% of the banking industry's asset share in June 2025. This study uses four banks that have historically been subject to KBMI IV: Bank Mandiri, BNI, BRI, and BCA. It should be emphasized that the KBMI classification began to be used by the Financial Services Authority (OJK) in 2021; the 2015–2025 period in this study utilizes historical data from these four banks and does not assume that the KBMI IV classification has been in effect since 2015 [3], [4].

Conceptually, sustainable financing can influence risk and profitability through portfolio characteristics, financing assessment and monitoring processes, and the economic opportunities of sustainable activities. However, previous research has shown mixed results. [5], [6] and [7] reported a positive relationship with profitability, whereas [8] and [9] found a negative relationship. At risk, [10] found green credit was associated with a reduction in NPL, while other studies showed results that depended on the period and bank characteristics.

This study's research gap lies in the measurement of the primary variables, objects, and combinations of dependent variables. Previous studies have primarily used Green Finance, Green Credit, Green Lending, or Green Loans. This study uses the Sustainable Financing Ratio, which is the proportion of Sustainable Financing to total credit. Furthermore, the study simultaneously examines NPL and ROA at Bank KBMI IV Indonesia, with CAR, LDR, and Bank Size as control variables.

Based on these phenomena and research gaps, this study aims to examine the effect of the Sustainable Financing Ratio on credit risk proxied by NPL and profitability proxied by ROA at Bank KBMI IV in Indonesia during the period 2015–2025.

2. LITERATURE REVIEW

2.1 *Financing Ratio*

Sustainable Financing is part of the implementation of sustainable finance in bank intermediation activities. In this study, the Sustainable Financing Ratio (SFR) is used to measure the proportion of sustainable financing to total bank credit. This ratio-based measurement was chosen to allow comparisons between banks and between periods, taking into account differences in credit portfolio size.

$$\text{SFR} = \frac{\text{Sustainable Financing}}{\text{Total Credit}}$$

2.2 Credit Risk

Credit risk in this study is proxied by Non-Performing Loans (NPL). NPL reflects the proportion of non-performing loans in a credit portfolio and is used as an indicator of asset quality and bank credit risk. Empirically, sustainable financing can have different risk characteristics because it requires a process of identifying, assessing, and monitoring sustainability aspects.

2.3 Profitability

Profitability is measured by Return on Assets (ROA), which reflects a bank's ability to generate profits based on assets under management. Sustainable financing can provide income opportunities from emerging economic sectors undergoing sustainable transition, but it can also face different monitoring, selection, and return characteristics costs.

2.4 Control Variables

CAR is used to represent capital adequacy, LDR to describe intermediation intensity, and Bank Size is measured by the natural logarithm of total assets. These three variables are used to control for internal bank characteristics that could potentially affect NPL and ROA.

2.5 Hypothesis

H1: Sustainable Financing Ratio has an effect on Non-Performing Loans at Bank KBMI IV in Indonesia for the period 2015–2025.

H2: Sustainable Financing Ratio has an effect on Return on Assets at Bank KBMI IV in Indonesia for the period 2015–2025.

3. METHODS

The study used a quantitative approach with panel data from four banks for the period 2015–2025. The sample consisted of Bank Mandiri, BNI, BRI, and BCA, resulting in 44 observations. The data is secondary and sourced from Annual Reports, Sustainability Reports, financial statements, and OJK publications.

Two empirical models are used. Model I examines NPL as a function of SFR, CAR, LDR, and SIZE. Model II examines ROA as a function of SFR, CAR, LDR, and SIZE. Panel model selection is performed using the Chow, Hausman, and Lagrange Multiplier tests. The test results select a Random Effects Model for both models. The final estimation uses the Nerlove transformation and clustered standard errors by bank unit because diagnostic tests indicate heteroscedasticity and autocorrelation.

Model I: $NPL_{it} = \beta_0 + \beta_1 SFR_{it} + \beta_2 CAR_{it} + \beta_3 LDR_{it} + \beta_4 SIZE_{it} + \varepsilon_{it}$

Model II: $ROA_{it} = \beta_0 + \beta_1 SFR_{it} + \beta_2 CAR_{it} + \beta_3 LDR_{it} + \beta_4 SIZE_{it} + \varepsilon_{it}$

Hypothesis testing was performed at the 5% significance level through partial and simultaneous testing. In Gretl's REM output, the model fit measure is reported as $\text{corr}(y, \hat{y})^2$ and is not interpreted as the conventional R^2 .

4. RESULTS AND DISCUSSION

4.1 Descriptive Statistics

Variables	Obs.	Mean	Median	Minimum	Maximum
SFR	44	0.28604	0.24670	0.02270	0.62610
NPL	44	0.02302	0.02170	0.00700	0.04300
ROA	44	0.03066	0.03160	0.00540	0.04190
CAR	44	0.21983	0.21375	0.16800	0.29800
Long Distance Relationship	44	0.83975	0.85700	0.62000	0.98480
SIZE	44	13,997	13,969	13,139	14,856

The SFR averaged 0.28604 with a range of 0.02270–0.62610. The NPL averaged 0.02302, while the ROA averaged 0.03066. The CAR averaged 0.21983, the LDR 0.83975, and the SIZE 13.997. These statistics indicate sufficient interbank and interperiod variation for panel analysis.

4.2 Model Selection and Estimation

The Chow test yields a probability of 0.00009044 for NPL and 0.000145953 for ROA, making FEM more appropriate than CEM in the initial stage. The Hausman test then yields a probability of 0.43006 for NPL and 0.440349 for ROA, making REM the preferred method.

The Lagrange Multiplier test further supports the use of the individual effects model. Based on all these steps, the final estimation uses REM.

Diagnostic tests revealed heteroscedasticity and autocorrelation. These conditions were addressed in the final estimation using clustered standard errors at the bank level. This approach was used to make coefficient inference more robust against inconsistencies in variance and error correlation within the panel unit.

4.3 Hypothesis Testing Results

Model	Variables	Coefficient	p-value	Decision
NPL	SFR	0.0439874	0.0000821	Positive & significant
NPL	CAR	0.0775074	0.4229	Not significant
NPL	Long Distance Relationship	-0.0393111	0.0001	Negative & significant
NPL	SIZE	-0.0139526	0.1032	Not significant
ROA	SFR	-0.0139732	0.0005	Negative & significant
ROA	CAR	0.0477729	0.5600	Not significant
ROA	Long Distance Relationship	0.0465524	3.03×10^{-10}	Positive & significant
ROA	SIZE	0.00172551	0.7886	Not significant

Discussion

SFR has a positive and significant effect on NPL. A coefficient of 0.0439874 with a p-value of 0.0000821 indicates that an increase in the proportion of sustainable financing is associated with an increase in NPL, with control variables held constant. This finding differs from some studies that found green lending can reduce credit risk, but is consistent with existing literature emphasizing that sustainable financing can have different risk characteristics and monitoring processes. For Bank KBMI IV, these results indicate that an increase in the proportion of sustainable financing does not automatically lead to a decrease in credit risk.

SFR also has a negative and significant effect on ROA with a coefficient of -0.0139732 and a p-value of 0.0005. These results indicate that an increase in the proportion of sustainable financing is associated with a decrease in profitability. This finding is in line with [8] and Del Gaudio et al. (2022), but different from Zheng et al. (2025) and Sutrisno et al. (2024) which found a

positive relationship. This difference shows that the profitability consequences of sustainable financing can depend on bank characteristics, financing portfolio, period, and institutional context.

Of the control variables, CAR had no significant effect on NPL or ROA. LDR had a negative and significant effect on NPL and a positive and significant effect on ROA. SIZE had no significant effect on NPL or ROA. These results indicate that bank internal characteristics do not have an equal influence on the two performance dimensions analyzed.

Simultaneously, SFR, CAR, LDR, and SIZE have a significant effect on NPL with a Chi-square of 21.3508 and a p-value of 0.000269775. In the ROA model, a Chi-square of 9.84128 with a p-value of 0.0431879 also indicates a significant simultaneous effect. The model fit measure displayed by Gretl in the form of $\text{corr}(y, \hat{y})^2$ is 0.0400207 for NPL and 0.00213944 for ROA; these figures are not interpreted as conventional R^2 .

5. CONCLUSION

The study shows that the Sustainable Financing Ratio has a positive and significant effect on credit risk, as measured by NPL, at Bank KBMI IV Indonesia during 2015–2025. Therefore, H1 is accepted. The SFR also has a negative and significant effect on profitability, as measured by ROA, thus H2 is accepted. Simultaneously, the SFR, CAR, LDR, and SIZE significantly influence NPL and ROA.

The implication is that the development of sustainable financing needs to be balanced with strengthening credit risk management, prudential principles, monitoring debtor quality, and attention to efficiency and financial performance. For

regulators, standardization and transparency in sustainable financing data disclosure are crucial to improving comparability between banks and across time periods.

Limitations of this study include the limited number of subjects in four banks, the use of NPL and ROA as the sole proxies for credit risk and profitability, the failure to include all internal and external factors that can influence bank performance, and differences in the availability and consistency of Sustainable Financing disclosures between banks and between periods. Future research could expand the sample, add risk and profitability indicators, and consider macroeconomic variables or financing characteristics.

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