

The effect of credit risk and income diversification on financial sustainability with operational efficiency as a moderating



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ABSTRACT

This research intends to investigate and assess the influence of credit risk and revenue diversification on the financial sustainability of banking businesses listed on the Indonesia Stock Exchange throughout the 2020–2024 period. The study applies a quantitative method with a descriptive approach. The population contains 47 banking companies, whereas the sample consists of 34 companies selected through purposive selection. Data analysis was carried out using SPSS version 24, applying multiple linear regression and Moderated Regression Analysis (MRA). The findings suggest that credit risk and income diversification positively influence financial sustainability. In contrast, operational efficiency has a detrimental influence on financial sustainability. Furthermore, operational efficiency, as a moderating variable, is found to have a significant negative moderating influence on the link between credit risk and financial sustainability, as well as between income diversification and financial sustainability.

Keywords: Credit Risk; Operational Efficiency; Financial Sustainability;
Income Diversification



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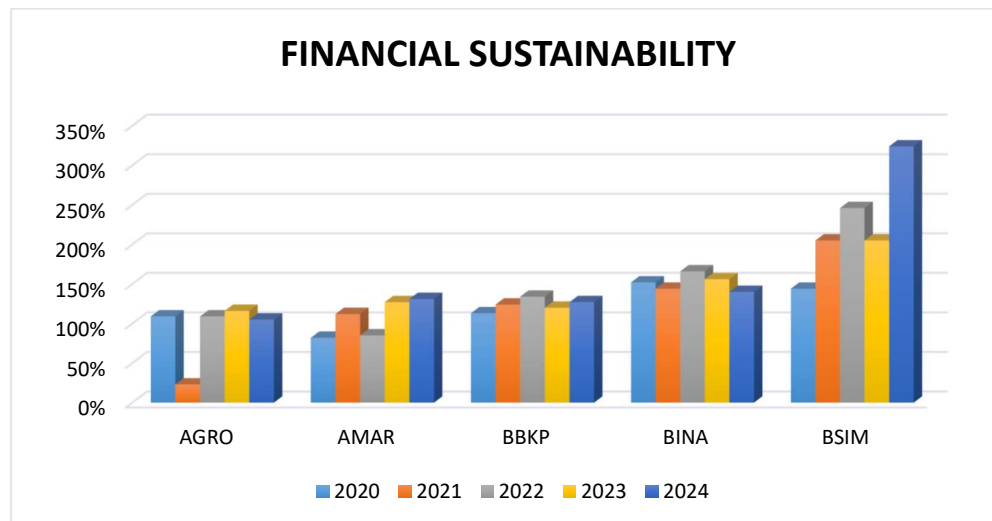
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INTRODUCTION

The banking sector holds a crucial position in the national economy by facilitating the flow of funds between surplus units and deficit units. Furthermore, banks are crucial for preserving financial stability, improving operational effectiveness, and building public trust all of which are necessary for reaching long-term financial sustainability (Amanda et al., 2026). Financial sustainability plays a crucial role in assessing and forecasting the future operational potential of banking institutions (Pungus et al., 2024).

Banking institutions' main job is to raise money from the general public and then return it to the community as credit or finance (Dewi, 2018). Alongside the growth of the banking industry, banks are increasingly expected to diversify their activities in collecting and distributing funds by adopting digital technology advancements, including mobile banking, internet banking, and various digital financial product innovations. One clear form of this innovation is the introduction of paylater services provided by several banking institutions.

According to data from the Financial Services Authority (OJK), as of March 2025, bank paylater debit balances amounted to IDR 22.78 trillion, reflecting an annual increase of 32.18%, with the number of accounts reaching 24.59 million (Santia, 2025). This condition suggests that the growing adoption of digital innovations may increase the potential risk of default. It can subsequently affect the financial sustainability of banks. This assertion is additionally corroborated by a graph that presents an assessment of several banks in terms of their financial sustainability, as shown in the following illustration Figure 1.



Source: Processed by the researcher, 2025

Figure 1
Level of Financial Sustainability

Figure 1 depicts the financial sustainability of the five banking firms listed on the Indonesia Stock Exchange (IDX) during the last five years reflects the banks' capacity to sustain their financial stability, despite variations in financial sustainability values across the observed period. This is indicated by the fact that the ratios of the five banks are close to 100%. However, there was a significant decline in PT. Bank Raya Indonesia in 2021, which stood at 23%. This reflects that banks with low or declining financial sustainability

scores indicate problems in financing or suboptimal financing income. Good financial sustainability is reflected in a bank's ability to control risk at a low level so that it can maintain long-term financial growth (Li et al., 2022).

A bank's capacity to preserve financial quality in order to achieve financial sustainability is affected by several aspects, encompassing credit risk (Hidayati et al., 2024). Credit risk denotes the potential for loss when borrowers fail to fulfill their obligations to the bank (Sitepu, 2023). An elevated credit risk may undermine a bank's financial sustainability, potentially resulting in diminished profitability (Silitonga & Manda, 2022). As a result, stakeholders will question the level of financial sustainability of the bank.

Another factor that affects the level of financial sustainability is income diversification (Paramitha & Prasetya, 2023). Income diversification is an activity carried out by banks to maximize income (Setiawan & Arrafi, 2022). Bank income does not only depend on interest income, but non-interest income has also experienced significant growth. Non-interest income is obtained through income diversification strategies, such as fee-based income, income from trading activities, and other sources of income (Melsyawitri, 2023). Banks with high credit risk must have the ability to diversify their income so that they are not dependent on one type of income and are able to function optimally for continued financial sustainability.

Financial sustainability cannot be viewed solely in terms of credit risk and income diversification. Another factor that contributes to change is operational efficiency in banking activities. Operational efficiency reflects the bank's capacity to produce stable income adequate to meet operational expenses and maintain its revenue stream (Supeno & Aminudin, 2023). Operational efficiency is essential to help optimize operational management of problems that arise and cause financial failure, which can help improve the bank's financial sustainability in the future (Geminarqi & Purnomo, 2023). Operational efficiency functions as a moderating factor that determines the extent to which credit risk and income diversification influence financial sustainability, either by reinforcing or reducing their relationship.

Previous studies have shown inconsistencies regarding financial sustainability. Research conducted by Ratnasari & Putra (2024) and Tiara et al., (2024) indicate that credit risk and income diversification affect financial sustainability. However, research conducted by Dewi (2025), Githaiga (2022) indicates that credit risk and income diversification do not affect financial sustainability. In addition, research conducted by Fathurohman et al., (2025), Septiani & Murwaningsari (2024). The finding demonstrates that operational efficiency can augment the impact of credit risk and income diversity on financial sustainability.

Based on these conditions, this study formulates the research problem concerning how credit risk and different sources of income affect a company's ability to stay in business, both directly and when operating efficiency is taken into account. This study aims to examine the relationships among banking sector firms listed on the Indonesia Stock Exchange (IDX) from 2020 to 2024.

LITERATURE REVIEW

Signaling Theory

According to Spence (1973) Signaling theory explains how companies convey relevant information to investors as a basis for assessing future business prospects and fulfilling the interests of shareholders. In this context, financial statements serve as a medium for banks to signal their financial condition, including their financial sustainability. An

increase in credit risk, along with the company's ability to diversify income and improve operational efficiency, may have implications for the bank's future financial sustainability (Rahayu & Cahyati, 2015). Signaling theory provides a framework for understanding how financial information users interpret signals from companies as a consideration in making future decisions, particularly investment-related decisions (Juli, 2024).

Financial Sustainability

Financial sustainability represents a fundamental component in banking because it serves as a basis for assessing and forecasting banks' long-term continuity and future performance potential (Pangestu & Hati, 2024). Financial sustainability can be assessed through the FSR. This ratio quantifies the degree to which a bank can maintain its sustainability by carrying out its operational functions and business activities. (Fitria, 2023). The Financial Sustainability Ratio (FSR) is determined by juxtaposing total financial receipts against entire financial expenditures (Putri et al., 2024). FSR can be said to be in a healthy condition if its value exceeds 100% (Alim et al., 2014). This ratio's formula is (Trisakti & Murwaningsari, 2023) :

$$FSR = \frac{\text{Total Financial Revenue}}{\text{Total Financial Costs}} \times 100\%$$

Credit Risk

Credit risk is the potential for loss due to a debtor's failure to meet contractual obligations, which may occur in the form of declining interest payments, delayed loan repayment, or complete default on the loan (Indrawan & Rikumahu, 2023). The metric employed to evaluate credit risk is the NPL ratio. This ratio is measured by comparing total non-performing credit, consisting of bad loans, substandard loans, and doubtful loans, to the total amount of credit provided. (Fitri & Peratiwi, 2022). The banking NPL ratio is generally below 5%, (OJK, 2023). The NPL calculation formula is as follows (Pungus et al., 2024) :

$$NPL = \frac{\text{Non performing loans}}{\text{Total Credit}} \times 100\%$$

Income Diversification

Income diversification is a strategy used to reduce the risk of unexpected declines in income from primary sources of income (Septiani & Murwaningsari, 2024). Income diversification in banking is measured through the Non-Interest Income (NII) ratio, a measure of non-interest revenue as a percentage of overall operational income earned by the bank. Banks with good income diversification have a maximum value of around 0.50 (Ali & Widarjono, 2025). The formula used to determine the Non-Interest Income (NII) ratio is presented as follows: (Susanto et al., 2024) :

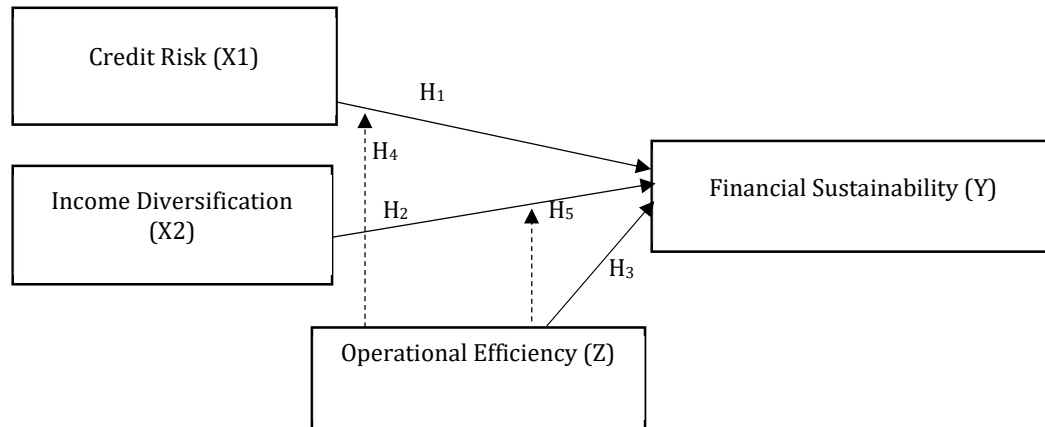
$$NII = \frac{\text{Non interest income}}{\text{Operating Revenue}} \times 100\%$$

Operational Efficiency

Efficiency of operation is a measure of how well a bank can generate continuous income, manage operational costs, and sustain stable operating revenue. (Supeno & Aminudin, 2023). The BOPO ratio measures the level of operational efficiency achieved by a bank in controlling operational expenses in relation to the operating revenue it produces

(Artha et al., 2022). BOPO ratio value of 93.52% is considered good and reflects a healthy bank (Rerung, 2022) . The formula for calculating BOPO is as follows (Putri et al., 2024) :

$$\text{BOPO} = \frac{\text{Operating Costs}}{\text{Operating Revenue}} \times 100\%$$



Source: Developed by the author for this study, 2025

Figure1
Research Framework

METHOD

The research method used in this work is quantitative, and the approach is descriptive. The information came from the annual reports of banks that are traded on the Indonesia Stock Exchange (IDX). The companies in this study's population are all 47 banking sector companies that will be listed on the IDX between 2020 and 2024. Purposive sampling was used as the selection method in this study. (Candrain, 2017). Based on criteria that were already known, the sample was chosen in the way shown in Table 1.

Table 1
Sample Criteria

No	Sample Selection Criteria	Accumulation
1.	Banking institutions listed on the IDX from 2020 to 2024.	(47)
2.	Banking companies that failed to publish annual financial statements consecutively on the IDX during the 2020-2024 observation period.	(1)
3.	Banks that did not provide the required data and information relevant to the research variables throughout the 2020-2024 period.	(12)
Number of Companies		34
Final Number of Research Samples (34 x 5 Years)		170

Source : Developed by the author for this study, (2025)

Data collected through purposive sampling (Candrain, 2017) This study selected a sample of 34 banking organizations, analyzing a total of 170 financial reports based on established criteria. This research utilized secondary data. One way the data was gathered was by using indirect documentation, like going to www.idx.co.id, the Indonesia

Stock Exchange's main website. The information came from yearly reports and sustainability reports of IDX-listed banking companies from 2020 to 2024.

This study employs Credit Risk (X1) and Income Diversification (X2) as independent variables, Financial Sustainability (Y) designating the dependent variable as Y and Operational Efficiency (Z) as the moderating variable. The investigation utilized SPSS version 25, employing multiple linear regression and MRA. The regression equation is expressed as follows:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 Z + e$$

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 Z + \beta_4 X_1 * Z + \beta_5 X_2 * Z + e$$

Explanation:

Y = Financial Sustainability
 α = Constant
 β = Regression Coefficient
X1 = Credit Risk
X2 = Income Diversification
Z = Operational Efficiency
e = Error

RESULTS AND DISCUSSION

Descriptive Statistical Test

SPSS version 25 was used to help with the descriptive statistical analysis in this study. The analysis included the minimum, maximum, and average values of the variables consisting of credit risk (X1), income diversification (X2), financial sustainability (Y), and operational efficiency (Z). The outcomes of the descriptive analysis are presented in Table 2.

Table 2
Descriptive Statistics Results

	Mean	Min	Max	Std. Deviation
Y	1.9514	0.23	10.41	1.29737
X1	0.0284	0.00	0.10	0.01659
X2	0.7463	0.00	25.10	3.11251
Z	0.8635	0.34	2.88	0.32362

Source: Processed by researcher, 2025

On the basis of Table 2, the financial sustainability variable has 170 valid data observations, with the lowest FSR value recorded at 0.23 and the highest at 10.41. The analysis results show that the average value of FSR is 1.9514 and the standard deviation is 1.29737. The relatively large standard deviation indicates that there is variability in the financial sustainability data across banking companies.

The independent variables examined in this study consist of credit risk and income diversification. Table 2 presents the credit risk variable, This has a minimum non-performing loan (NPL) value of 0.00 and a maximum value of 0.10. The descriptive statistics indicate that the mean credit risk value is 0.0284, accompanied with a standard deviation of 0.016. Additionally, income diversification, the second independent variable, exhibits a minimum DP value of 0.00, a maximum value of 25.10, a mean value of 0.7463, and a standard deviation of 3.11251. These results indicate that the independent variables in this study demonstrate variation across banking sub-sector companies.

Operational efficiency functions as the moderating variable in this research. The results indicate that the BOPO value fluctuates between a low of 0.34 and a maximum of

2.88. The mean BOPO value is 0.8635, with a standard deviation of 0.32363. This signifies that the operational efficiency variable exhibits a diverse data distribution among banking sub-sector firms.

Classical Assumption Test

Normality Test

The normality test seeks to ascertain if the regression residuals follow a normal distribution, as a valid regression model necessitates residuals that conform to the assumption of normality (Ghozali, 2018). The findings of the normalcy test conducted in this study are presented in Table 3.

Table 3
Normality Test Results

<i>One-Sample Kolmogorov-Smirnov Test</i>		
		Unstandardized Residual
N		170
Normal Parameters ^{a, b}	Mean	0.00000
	Std. Deviation	0.39011614
Most Extreme Differences	Absolute	0.111
	Positive	0.062
	Negative	-0.111
Test Statistic		0.111
Asymp. Sig. (2-tailed)		0.066 ^c

Source: Processed by researcher , 2025

According to Table 3, the Asymp. Sig. (2-tailed) value is 0.066, exceeding the significance threshold of 0.05. This indicates that the residual data follow a normal distribution, as the normality criterion is satisfied when the significance value exceeds 0.05.

Multicollinearity Test

The multicollinearity test seeks to detect significant correlations among independent variables in the regression model, (Ghozali, 2018). The findings of the multicollinearity test conducted in this study are presented in Table 4.

Table 4
Multicollinearity Test Results

Model	Collinearity Statistics	
	Tolerance	VIF
Credit Risk	0.889	1.112
Income Diversification	0.987	1.013
Operational Efficiency	0.920	1.098

Source: Processed by researcher , 2025

The credit risk variable (X1) got a VIF value of 1.112 and a tolerance value of 0.889, as shown in Table 4. Another variable, X2, which was about income diversity, had a VIF value of 1.0313 and a tolerance value of 0.987. There was a VIF value of 1.098 and a tolerance value of 0.910 for the operating efficiency variable. The data show that multicollinearity does not happen in the regression model because all tolerance values are greater than 0.10 and all VIF values are less than 10.

Heteroscedasticity Test

Ghozali (2018) states that the heteroscedasticity test seeks to determine if the residual variance in the regression model are unequal across the data. Here are the findings of the heteroscedasticity test that were achieved for this study.

Table 5
Heteroscedasticity Test Results

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	0.877	0.229		3.830	0.000
Credit Risk	-7,205	4,802	-0.212	-1,500	0.135
Income	-0.034	-0.024	-0.106	-1.377	0.170
Diversification					
Operational Efficiency	0.122	0.245	0.040	0.500	0.618

Source: Processed by researcher , 2025

The significance value was used to determine the assessment of heteroscedasticity. Table 4 shows that there is no heteroscedasticity in the regression model because all variables have significance values greater than 0.05.

Autocorrelation Test

By comparing the disturbance error from one period (t-1) to the previous period (t), the autocorrelation test seeks to determine if a link exists inside the regression model (Ghozali, 2018). Below are the findings of the autocorrelation test that were obtained for this study.

Table 6
Autocorrelation Test Results

Model	R	R Square	Adjusted R Square	Standard Error of the Estimate	Durbin-Watson
1	.292 ^a	0.069	-0.015	1.25204	2.027

Source: Processed by researcher , 2025

Table 6 shows that the Durbin-Watson value is 2.027. A 4-dU value of 2.2149 and a dU value of 1.7851 are displayed in the Durbin-Watson table. So, it can be concluded that the regression model does not exhibit autocorrelation since the requirement of $1.7851 < 2.027 < 2.2149$ is satisfied.

Multiple Regression Analysis

The t-test and coefficient of determination are components of linear regression analysis that were used to assess hypotheses H1, H2, and H3. And yet, MRA was used to test H5 and H4 instead.

t-Test (Partial)

In order to determine how each independent variable in the regression model affects the dependent variable, researchers use the t-test (Candrain, 2017). Here are the t-test results from this study.

Table 7
Results of the t-Test (Partial)

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	2.663	0.049		54,439	0.000
Credit Risk	1,623	0.130	0.779	12,510	0.000
Income Diversification	0.121	0.042	0.294	2.875	0.004
Operational Efficiency	-0.993	0.052	-0.248	-18.984	0.000

Source: Processed by researcher , 2025

With reference to Table 7, the following is a systematic formulation of the results of the multiple linear regression analysis:

$$Y = 2.663 + 1.623X_1 + 0.121X_2 - 0.993Z$$

Explanation:

Y = Financial Sustainability

X₁ = Credit Risk

X₂ = Income Diversification

Z = Operational Efficiency

Using the linear regression equation as a guide, we find that all three hypotheses H₁, H₂, and H₃ are correct. With a coefficient of 1.623 and a significance level of 0.000 (below 0.05), credit risk positively affects financial sustainability. Also, financial sustainability is positively affected by income diversification, as indicated by a coefficient value of 0.121 and a significance value of 0.004 < 0.05. On the other hand, operational efficiency has a negative impact on financial sustainability, as indicated by a coefficient value of -0.993 and a significance value of 0.000 < 0.05.

Determination Coefficient Test

According to (Candrain, 2017), the R Square (R²) value is a way to find the coefficient of determination. The results of this study's R-squared value can be seen in Table 8.

Table 8
Determination Coefficient Test Results

Model	R	R Square	Adjusted R Square	Standard Error of the Estimate
1	.987 ^a	0.974	0.974	0.21509

Source: Processed by researcher , 2025

The R-squared value is 0.974, which is 97%, according to Table 8. Credit risk, income diversification, and operational efficiency account for 97% of financial sustainability, with other factors accounting for the remaining 3%.

Moderate Regression Analysis

In order to determine if operational efficiency moderates the relationship between financial sustainability, credit risk, and income diversification, MRA is employed (Candrain, 2017). Here are the magnetic resonance imaging MRA data from this study.

Table 9
MRA Test Results

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	2.663	0.049		54,439	0.000
Credit Risk*Operational Efficiency	-0.602	0.233	-0.045	-2.584	0.011
Income Diversification*operational efficiency	-0,169	0,043	-0,406	-3,967	0,000

Source: Processed by researcher , 2025

With a significant value of $0.011 < 0.05$, the interaction between credit risk and operational efficiency is acceptable according to Table 9 of the MRA results. Financial sustainability tends to diminish when both operational efficiency and credit risk grow at the same time, as indicated by the coefficient value of -0.602 for the interaction between the two variables ($X1*Z$).

With a significant value of $0.000 < 0.05$ for the interaction between revenue diversification and operational efficiency, H5 is also acceptable. An rise in both revenue diversification and operational efficiency ($X2*Z$) at the same time may harm financial sustainability, as indicated by the negative coefficient value of -0.169 .

The Effect of Credit Risk on Financial Sustainability

A significance value of $0.000 < 0.05$ indicates that credit risk has a positive effect on financial sustainability, according to the results of the investigation. This leads us to accept the null hypothesis (H1). According to signalling theory, which postulates that competently controlled credit risk is a reflection of competent management, this finding lends credence to that idea. Funding stability and the capacity to sustain long-term financial viability can be enhanced by sending a good signal to investors about the bank's sustainability prospects through a regulated credit risk level.

This result is consistent with research showing that credit risk significantly affects banks' capacity to stay in business (Rahim, 2021; Putra, 2024). Based on these results, it seems that banks can better prepare for future financial challenges by being able to recognise and comprehend credit risk.

The Effect of Income Diversification on Financial Sustainability

The significance score of $0.004 < 0.05$ reflects the test results that show that income diversification positively affects financial sustainability. We can thus conclude that H2 is correct. This finding is in line with signalling theory, which asserts that stakeholders are given a good indication of the robustness and operational flexibility of a bank's business model when it is able to produce non-interest revenue through income diversification.

This conclusion is backed by prior research that shows that income diversification improves financial sustainability Qintharah & Murwaningsari (2024), Tiara et al., (2024). The findings suggest that banks can effectively navigate market changes and competitive challenges by diversifying their income streams. So, one of the most important things banks can do to ensure their financial viability in the long run is to diversify their income streams.

The Effect of Operational Efficiency on Financial Sustainability.

With a significance value of $0.000 < 0.05$, the results of the analysis and testing show that operational efficiency has a negative impact on financial sustainability. Increasing the operational efficiency ratio has the tendency to decrease banks' financial sustainability, as shown by the negative coefficient in the model estimation results. Because of this, we adopt the third hypothesis (H3), which has an adverse consequence. According to signalling theory, stakeholders may get the impression that the bank isn't good at managing its resources and keeping operating costs in check if operational efficiency is low. There may be less hope for the bank's long-term viability if its operational expense ratio is large, since this suggests ineffective internal controls and low operational performance.

A high operational efficiency ratio negatively affects financial sustainability indicators in banking, according to prior research Qintharah & Murwaningsari (2024), Tiara et al., (2024). There is conflicting evidence about the relationship between operational efficiency and financial sustainability; for example, Apriliyanto & Putra Prasetya (2024), Hidayati et al., (2024) found the opposite. These contradictory results highlight the importance of operational efficiency in predicting banks' long-term financial health.

Operational Efficiency Moderates the Effect of Credit Risk on Financial Sustainability

Operational efficiency reduces the impact of credit risk on financial sustainability, according to the results of the hypothesis testing. The MRA results prove this with a coefficient value of -0.602 and a significance value of $0.011 < 0.05$. This leads us to accept, with a moderate bias, the fourth hypothesis (H4). An essential signal that management sends to stakeholders and investors is operational efficiency, according to signalling theory. The operational condition of the bank may be negatively impacted by a high operational cost ratio, which could be an indication of poor cost control and resource management.

This confirms what other research has shown, which is that credit risk interacts with operational efficiency and is not necessarily the primary determinant in deciding financial sustainability. According to research conducted by Ida & Sanfa (2023), Pungus et al., (2024), operational efficiency plays a much larger effect in determining financial sustainability than credit risk. This study's findings lend credence to the idea that operational efficiency has the potential to moderate the impact of credit risk on long-term financial viability.

Operational Efficiency Moderates the Influence of Income Diversification on Financial Sustainability

Analysis and hypothesis testing show that operational efficiency reduces the impact of revenue diversification on long-term financial viability. The results of the magnetic resonance angiography (MRA) confirm this, since they display a significance level of $0.000 < 0.05$ and a coefficient value of -0.169 . A negative moderating direction is thus adopted for the fifth hypothesis (H5). The finding implies that the beneficial effect of revenue diversification on financial sustainability could be diminished if the operational efficiency ratio were to be increased. According to signalling theory, a diversified income stream might provide investors confidence in the bank's ability to generate profits. Nevertheless, the impact of income diversification on financial sustainability diminishes

when it is coupled with a high operational expense ratio, since the positive signal becomes less robust.

Previous research has shown that operational efficiency is often more important than income diversification when it comes to deciding financial sustainability, thus this finding makes sense. Research by Ida & Sanfa (2023), Pangestu & Hati (2024) found that operational efficiency is frequently more important than income diversification when it comes to evaluating financial sustainability. Thus, operational efficiency can mitigate the impact of income diversification on financial sustainability, as these results show. This means that having a good handle on operational costs is crucial for banks in order for income diversification to improve financial sustainability.

CONCLUSION AND SUGGESTION

The results of the tests and analyses show that diversifying revenue streams and reducing exposure to credit risk improve long-term financial health. What this means is that banks can ensure their financial viability through diversifying their income streams and effectively managing credit risk. At the same time, operational efficiency hurts financial sustainability, therefore a high operational cost ratio could spell trouble for a bank's long-term viability. It has also been demonstrated that operational efficiency, when used as a moderating variable, considerably and adversely reduces the impact of revenue diversification and credit risk on financial sustainability. Both variables can have a favourable impact, but operational efficiency might mitigate it. Credit risk management, income diversification, cost control, and operational performance are the three pillars upon which the financial viability of banks rests, according to these results.

Future studies should take into account the study's shortcomings. Because this research solely looks at financial institutions that were listed on the Indonesia Stock Exchange between 2020 and 2024, its findings won't apply to other industries or time periods of study. Credit risk, income diversification, and operational efficiency are the only variables included in this study. Other aspects like excellent corporate governance, capital sufficiency, liquidity risk, bank size, and macroeconomic conditions were not taken into account either.

Consequently, additional variables that may impact financial sustainability, such as capital sufficiency, liquidity risk, bank size, other internal banking issues, and macroeconomic variables, should be included in future study to expand the model. To get better results and stronger generalisations, future studies will likely use other analytical approaches, explore longer periods, and a wider range of objects. Therefore, a more holistic view of the factors that determine the financial viability of banks over the long term can be provided by future studies.

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