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The Moderating Effect of Sustainability Commitment and ESG Disclosure on Corporate Credit Risk: An Analysis of the Banking Industry in Southeast Asia

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Abstract: This research seeks to examine how the Environmental, Social, and Governance (ESG) Disclosure of debtor firms influences Credit Risk, proxied by the Non-Performing Loan (NPL) ratio, within the Southeast Asian banking sector, as well as to evaluate the moderating function of Bank Sustainability Commitment. Grounded in Signaling Theory and Stakeholder Theory, this quantitative study employs panel data from Southeast Asian listed banks covering the years 2015-2023. The regression analysis on the panel data indicates that debtor firms' ESG Disclosure exerts a significant positive effect on bank Credit Risk (H1 supported), suggesting that strong ESG transparency signals high management quality, thereby reducing information asymmetry and the likelihood of default. A major finding also shows that Bank Sustainability Commitment significantly and positively moderates this relationship (H2 supported), amplifying the risk-reducing impact of ESG Disclosure. This implies that banks with stronger sustainability integration are more capable of leveraging ESG information for more accurate risk evaluation and mitigation. Theoretically, the study contributes to a deeper understanding of the ESG credit risk pathway by highlighting the importance of the information receiver. From a managerial standpoint, the results recommend that banks strengthen their internal sustainability commitment as a strategic approach to enhance credit risk assessment precision and optimize loan portfolio management.

Keywords: ESG Disclosure, Bank Sustainability Commitment, Credit Risk, Moderation, Southeast Asia

INTRODUCTION

Sustainability issues and Environmental, Social, and Governance (ESG) factors have become a major concern in the global financial industry, including in Southeast Asia. The increasing awareness of non-financial risks, such as climate change and social inequality, puts pressure on companies, including banks, to demonstrate a tangible commitment to sustainability. For the banking sector, credit risk is at the core of their operations. The phenomenon underlying this research is the growing understanding that the ESG performance of a debtor company can affect the credit risk borne by the bank. Companies with poor ESG

practices may face regulatory sanctions, litigation, or operational disruptions, all of which can erode their ability to repay debt. Conversely, a strong sustainability commitment can enhance reputation, attract capital, and ensure long-term operational stability, which in turn can reduce credit risk.

Numerous international studies indicate the growing importance of Environmental, Social, and Governance (ESG) implementation in shaping corporate risk and performance. Bonacorsi et al. (2024), examining European listed firms during the 2019 observation period, find that higher ESG performance significantly reduces corporate credit risk, particularly through the environmental and governance dimensions, while long-term sustainability commitment enhances credit risk stability under conditions of economic uncertainty. Furthermore, Luo et al. (2024), using data from Chinese listed companies over the 2013–2022 period, confirm a negative and significant relationship between ESG performance and credit risk, with the effect becoming stronger for firms that explicitly integrate sustainability into their business strategies. In a broader Asia Pacific context, Chang et al. (2022) show that ESG/CSR performance positively affects firm value and stabilizes long-term investment returns, reinforcing the role of ESG as a risk-reducing mechanism. Bannier et al. (2022) find that firms with stronger and more consistent CSR practices exhibit lower credit risk, as reflected in better credit ratings and narrower credit spreads, since CSR is perceived by creditors as a signal of managerial quality and long-term stability. However, these studies do not explicitly examine how institutional sustainability commitment, particularly within the banking sector, moderates the relationship between CSR/ESG and credit risk, leaving room for further research in the context of sustainable banking.

Nevertheless, despite the consistency of these findings, most existing studies continue to focus on non-financial firms and treat ESG as a direct determinant of risk. As a result, empirical evidence on the moderating role of sustainability commitment within the banking industry especially in emerging economies remains limited. Accordingly, this study aims to address this gap by analyzing how sustainability commitment moderates the relationship between ESG disclosure and corporate credit risk in the banking sector.

In addition to the studies discussed above, prior research has also examined the relationship between ESG performance and credit risk; however, the findings are often inconsistent and fragmented. While some studies document a negative relationship, indicating that higher ESG performance is associated with lower credit risk, others report insignificant or even positive relationships. The primary gap lies in understanding the mechanisms through which sustainability commitment is translated into changes in credit risk, particularly within the Southeast Asian banking context, which is dominated by emerging economies with distinct regulatory frameworks and market characteristics.

This study adopts Signaling Theory and Stakeholder Theory. Signaling Theory is used to explain that transparent and comprehensive ESG disclosure by debtor companies serves as a signal of credibility and management quality to the bank as the creditor. This signal can reduce *asymmetric information*, which is fundamentally a determinant of credit risk. Meanwhile, Stakeholder Theory explains that sustainability commitment as a moderating variable is a strategic effort to manage relationships with stakeholders, including regulators, investors, and society, which directly mitigates non-financial risks and, therefore, effectively strengthens the positive impact of the ESG disclosure signal on reducing credit risk.

The distinctive contribution of this study lies in examining how bank sustainability commitment functions as a moderating variable in the link between debtor companies ESG disclosure and the credit risk assumed by banks. This research specifically centers on the Southeast Asian banking sector a region that remains relatively limited in global discussions on ESG and credit risk.

The purposes of this study are as follows:

1. To evaluate the influence of debtor firms ESG disclosure on banks credit risk in Southeast Asia particularly in Indonesia, Malaysia, Singapore, Thailand, and the Philippines.
2. To assess whether bank sustainability commitment strengthens or weakens the relationship between debtor firms' ESG disclosure and credit risk.
3. To offer theoretical and managerial insights for banks, regulators, and companies regarding the significance of incorporating ESG considerations into credit decision-making processes.

METHOD

Based on Signaling Theory, debtor companies with high ESG disclosure send a signal to banks that they have good risk management, stable operations, and a long-term perspective. This signal reduces bank uncertainty regarding loan quality, which should translate into lower credit risk. Research by El-Gazzar & Sharma (2021) shows that quality ESG disclosure reduces the cost of debt capital, which implicitly indicates lower credit risk.

The hypotheses in this study are as follows:

1. **H₀₁** = The ESG Disclosure variable (X1) has no effect on the Credit Risk variable (Y) in banks listed on the Stock Exchanges in Southeast Asia.
2. **H_{a1}** = The ESG Disclosure variable (X1) has an effect on the Credit Risk variable (Y) in banks listed on the Stock Exchanges in Southeast Asia.
3. **H₀₂** = The ESG Disclosure variable (X1) has no effect on the Credit Risk variable (Y) with Sustainability Commitment (Z) as the Moderating variable in banks listed on the Stock Exchanges in Southeast Asia.
4. **H_{a2}** = The ESG Disclosure variable (X1) has an effect on the Credit Risk variable (Y) with Sustainability Commitment (Z) as the Moderating variable in banks listed on the Stock Exchanges in Southeast Asia.
5. **H₀₃** = The ESG Disclosure variable (X1), Sustainability Commitment (Z), and the interaction have no effect on the Credit Risk variable (Y) in banks listed on the Stock Exchanges in Southeast Asia.
6. **H_{a3}** = The ESG Disclosure variable (X1), Sustainability Commitment (Z), and the interaction have an effect on the Credit Risk variable (Y) in banks listed on the Stock Exchanges in Southeast Asia.

Furthermore, the moderating role of bank sustainability commitment can be developed based on Stakeholder Theory. Bank sustainability commitment reflects the extent to which the bank has integrated ESG considerations into its internal processes and governance, including in its credit policy. When banks have a strong sustainability commitment, they are more sensitive, have the expertise, and tend to give greater weight to the ESG disclosure information from prospective debtors. In this context, the positive signal from the debtor company's ESG disclosure will be more effective and more valued by banks committed to sustainability, thereby strengthening its positive impact on reducing credit risk.

Conceptual Framework

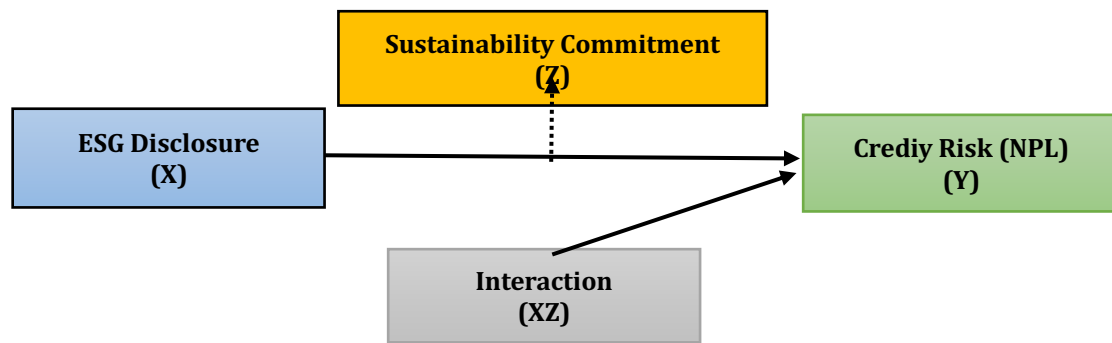


Figure 1
Conceptual Framework
 Source: Data processed (2025)

The conceptual framework of this study illustrates the direct relationship between Debtor Company ESG Disclosure (Independent Variable/X) and Credit Risk (Dependent Variable/Y), as well as the influence of Bank Sustainability Commitment (Moderating Variable/Z) which interacts with the Independent Variable to affect the Dependent Variable (XZ).

Research Design This research uses a quantitative method with a panel data regression approach. The research design is causal-comparative, aiming to test the cause-and-effect relationship and the moderating influence between the variables studied. The data used is secondary data in the form of annual reports, corporate sustainability reports, and published bank financial data. **Data and Data Collection Technique** The research population consists of all banking companies listed on the stock exchanges of major Southeast Asian countries, including Indonesia, Malaysia, Singapore, Thailand, and the Philippines, during the observation period of 2015-2023. The sample consists of 22 banking companies in 5 (five) countries selected using a purposive sampling technique with the following criteria: (1) Listed banking companies that have complete required data during the observation period. (2) Companies have a measurable sustainability commitment, such as having a sustainability report or being listed on a sustainability index. (3) Each country is represented by 5 banking companies with the largest assets. Data was collected from financial databases, namely Bloomberg or Refinitiv Eikon, and official corporate annual reports. The research samples from Southeast Asian countries are as follows: Indonesia (BBCA, BBNI, BBRI, BBTN, BMRI), Malaysia (MAYBANK, CIMB, PBBANK, RHBBANK, HLBANK, Singapore (BBL, 039, U11), Thailand (KBANK, KTB, SCB, BAY, TTB), Philippines (BDO, BPI, MBT, CBC, PNB).

Variable Measurement

1. Credit Risk (Dependent Variable - Y)
 Measured by the Non-Performing Loan (NPL) Ratio, with the formula: $NPL = \frac{\text{Non-Performing Loans}}{\text{Total Loan}}$
2. Debtor Company ESG Disclosure (Independent Variable - X)
 Measured using the aggregate ESG disclosure score or ESG rating score provided by an independent global rating agency, namely the Bloomberg ESG Data & Disclosure Score. A higher score indicates better ESG disclosure.
3. Bank Sustainability Commitment (Moderating Variable - Z)
 Measured based on the Morgan Stanley Capital International-Environmental, Social, and Governance (MSCI ESG) Ratings including AAA, AA, A, BBB, BB, B, CCC, which are then converted into 7 (seven) levels of assessment from 0-100.
4. Interaction (XZ)

The interaction variable is used to show that the effect of one predictor variable (independent variable) on the outcome variable (dependent variable) varies depending on the level of the second predictor variable⁸⁴. In other words, interaction occurs when the combination of two or more variables has a different effect than the sum of the individual effects of each variable.

Data Analysis Technique

The panel data will be analyzed using the Panel Data Regression Model through three stages:

1. Best Model Selection: Performing the Chow Test, Hausman Test, and Lagrange Multiplier Test to determine whether the Pooled Least Square (PLS), Fixed Effect Model (FEM), or Random Effect Model (REM) is the most appropriate.
2. Classical Assumption Test: Performing classical assumption tests including normality, multicollinearity, heteroscedasticity, and autocorrelation tests adapted for panel data.
3. Hypothesis Testing: Using multiple panel data regression analysis with the inclusion of an interaction variable to test the moderation effect.

The regression equation used is:

$$Y_{it} = \alpha + \beta_1 X_{it} + \beta_2 Z_{it} + \beta_2 XZ_{it} + \epsilon_{it}$$

Where:

1. Y_{it} : Dependent Variable, the variable to be explained or predicted
2. X_{it} : First Independent Variable, one of the predictor variables
3. Z : Second Independent Variable (Moderator Variable)
4. XZ_{it} : Interaction Variable, Calculated by multiplying X_{it} and Z_{it} . This variable tests whether the effect of X on Y depends on the value of Z
5. i : Cross-Section Index, Represents the individual entity
6. t : Time Series Index, Represents the time period

RESULTS AND DISCUSSION

Statistical Data Description

The statistical data description in this study consists of the mean, median, maximum, minimum, standard deviation, skewness, kurtosis, and Jarque-Bera statistics and p-value. All variables have a total of 198 observations, with 22 cross-section banking companies and 9 time series years (2015-2023).

Table 1
Description Statistics

	ESG Disclosure	Sustainability Commitment	Credit Risk	Interaction
Mean	3982.394	6121.091	1.804697	2567.514
Median	3953.000	7137.000	1.500000	2570.050
Maximum	5964.000	9853.000	6.000000	5019.120
Minimum	2025.000	1308.000	0.220000	289.1700
Std. Dev.	842.6641	2226.781	1.213048	1259.882
Skewness	-0.020520	-0.464328	0.824559	0.004406
Kurtosis	2.095815	1.886583	2.967251	1.911501
Jarque-Bera	6.758690	17.34232	22.44544	9.775482
Probability	0.034070	0.000171	0.000013	0.007538
Sum	788514.0	1211976.	357.3300	508367.8
Sum Sq. Dev.	1.40E+08	9.77E+08	289.8827	3.13E+08
Observations	198	198	198	198

Source: Data processed (2025)

1. ESG Disclosure (X): The mean (3982.394) and median (3953.000) are very close, indicating a fairly symmetrical distribution. The Skewness value of -0.020520 is very close to zero, confirming symmetry. The Kurtosis (2.095815) is less than 3, indicating a somewhat flat (*platykurtic*) distribution. The Jarque-Bera probability ($0.034070 < 0.05$) indicates the variable is not normally distributed at the 5% significance level.
2. Sustainability Commitment (Z): There is a significant difference between the Mean (6121.091) and Median (7137.000), where the Median is greater than the Mean, suggesting low outliers or a left-skewed distribution. The Skewness (-0.464328) is negative, confirming the left-skewness. The Kurtosis (1.886583) is less than 3, indicating a flat (*platykurtic*) distribution. The Jarque-Bera probability ($0.000171 < 0.05$) indicates the variable is not normally distributed.
3. Credit Risk (Y): The mean (1.804697) is slightly higher than the median (1.500000), suggesting a positive skewness. The Skewness (0.824559) is positive, indicating a right-skewed distribution. The Kurtosis (2.967251) is very close to 3, indicating an almost normal distribution in terms of peakedness (*mesokurtic*). The Jarque-Bera probability ($0.000013 < 0.05$) indicates the variable is not normally distributed.
4. Interaction (XZ): The mean (2567.514) and median (2570.050) are very close. The Skewness (0.004406) is very close to zero, confirming symmetry. The Kurtosis (1.911501) is less than 3, indicating a flat (*platykurtic*) distribution. The Jarque-Bera probability ($0.007538 < 0.05$) indicates the variable is not normally distributed.
5. In conclusion, based on the Jarque-Bera test, all variables (X, Z, Y, XZ) are proven not to be normally distributed at the 5% significance level.

Panel Data Regression Equation Results

$$Y = 0.769927890592 + 0.000379838274177 * X + 0.000111656430537 * Z - 0.000452326895596 * XZ + [CX=R]$$

Interpretation:

1. Constant α : 0.769927890592. If the values of all variables are 0, the Credit Risk (NPL) value is 0.769927890592.
2. Coefficient of ESG Disclosure (X): 0.000379838274177. The positive direction means that if the ESG Disclosure value increases by one point, the Credit Risk value will increase by 0.000379838274177. This relationship does not indicate a substantive increase in credit risk but rather reflects higher transparency and more conservative risk reporting practices. Banks with stronger ESG disclosure tend to recognize credit deterioration earlier, increasing the visibility of NPLs, which, from a signaling theory perspective, represents management's commitment to accountability and good governance. Consequently, the positive coefficient is better interpreted as evidence of enhanced reporting integrity and managerial quality, rather than a literal change in credit risk.
3. Coefficient of Sustainability Commitment (Z): 0.000111656430537. The positive direction means that if the Sustainability Commitment value increases by one point, the Credit Risk value will increase by 0.000111656430537.
4. Coefficient of Interaction (XZ): -0.000452326895596. The negative direction means that if the value of ESG Disclosure and Sustainability Commitment decreases by one point, the Credit Risk value will decrease by 0.000452326895596.

Classical Assumption Test Results

1. Multicollinearity Test

Table 2
Multicollinearity Test

	LOG (ESG Disclosure/X)	Sustainability Commitment (Z)	Interaction (XZ)
LOG (ESG Disclosure/X)	1	0.7013134024248405	0.8700631363251618
Sustainability Commitment (Z)	0.7013134024248405	1	0.9379432444578712
Interaction (XZ)	0.8700631363251618	0.9379432444578712	1

Source: Data processed (2025)

1. The Correlation Coefficient between ESG Disclosure (X) and Sustainability Commitment (Z) is $0.7013134 < 0.85$, so it is free from Multicollinearity.
2. The Correlation Coefficient between ESG Disclosure (X) and Interaction (XZ) is $0.870063 > 0.85$, so it is not free from Multicollinearity.
3. The Correlation Coefficient between Sustainability Commitment (Z) and Interaction (XZ) is $0.9337943 > 0.85$, so it is not free from Multicollinearity.

The correlation values of X–XZ and Z–XZ are high, exceeding the threshold of 0.85, This indicates that this high correlation is normal in a moderated regression model because the interaction variable is mathematically formed from the multiplication of the main variables. This condition has the potential to affect the stability of the coefficient estimates, but does not necessarily disrupt the validity of the model as a whole, especially if treatment has been carried out such as mean-centering or advanced multicollinearity testing, such as VIF.

2. Heteroscedasticity Test

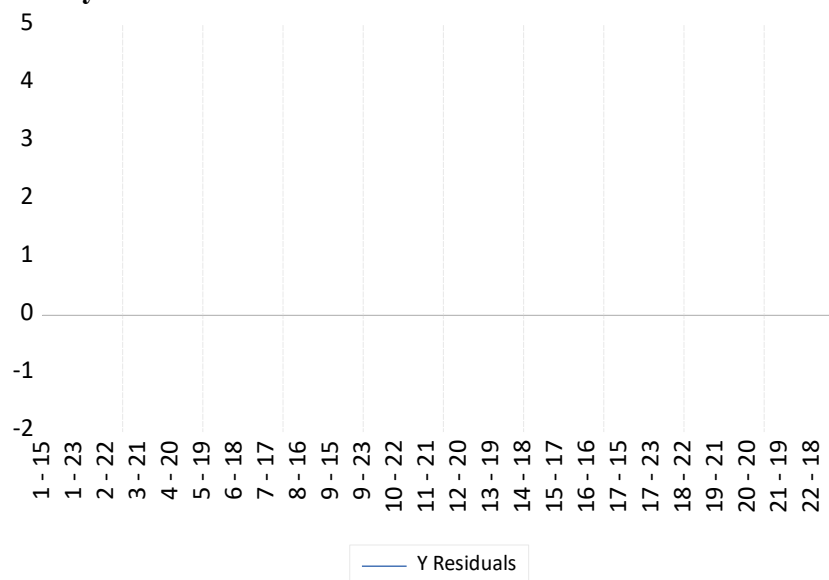


Figure 2

Heteroscedasticity Test

Source: Data processed (2025)

Based on the residual graph, the residual values are between 5-0 and -2.0, meaning the residual variance is the same. Therefore, Heteroscedasticity does not occur (passes the Heteroscedasticity test).

3. Chow Test

Tabel 3
Chow Test

Redundant Fixed Effects Tests
Equation: Untitled
Test cross-section fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	74.657955	(21,173)	0.0000
Cross-section Chi-square	457.146016	21	0.0000

Source: Data processed (2025)

Chow test table 3, Chow Test the Prob Cross-section F value is $0.0000 < 0.05$, so the Fixed Effect Model (FEM) is selected.

4. Hausman Test

Tabel 4
Hausman Test

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	2.191751	3	0.5336

Source: Data processed (2025)

Hausman test table 4, Hausman Test the Prob Cross-section random value is $0.5336 > 0.05$, so the Random Effect Model (REM) is selected

5. Lagrange Multiplier Test

Tabel 5
Lagrange Multiplier Test

Lagrange Multiplier Tests for Random Effects
Null hypotheses: No effects
Alternative hypotheses: Two-sided (Breusch-Pagan) and one-sided (all others) alternatives

	Test Hypothesis		
	Cross-section	Time	Both
Breusch-Pagan	607.7829 (0.0000)	1.392419 (0.2380)	609.1753 (0.0000)
Honda	24.65325 (0.0000)	-1.180008 (0.8810)	16.59809 (0.0000)
King-Wu	24.65325 (0.0000)	-1.180008 (0.8810)	11.94438 (0.0000)
Standardized Honda	25.72176 (0.0000)	-0.816299 (0.7928)	14.57757 (0.0000)
Standardized King-Wu	25.72176	-0.816299	9.983266

	(0.0000)	(0.7928)	(0.0000)
Gourieroux, et al.	--	--	607.7829 (0.0000)

Source: Data processed (2025)

Lagrange Multiplier test table 5, Lagrange Multiplier Test the Prob Breusch-Pagan value is $0.0000 < 0.05$, so the Random Effect Model (REM) is selected.

Based on the panel data regression model selection (Chow, Hausman, and Lagrange Multiplier Tests), the best model selected is the Random Effect Model (REM).

6. Hypothesis Testing Results

Table 6
Summary of Hypothesis Testing Results

	Structural Equation		
	Coefficient	Sig	Note
C	0.769928	0.1267	
ESG Disclosure (X)	0.000380	0.0084	Significant
Sustainability Commitment (Z)	0.000112	0.0969	Not Significant
Interaction (XZ)	-0.000452	0.0141	Significant
F		0.000000	Significant
R ² adjusted	0,887899 atau 88,7899%		

Source: Data processed (2025)

Partial Test (t-test)

- ESG Disclosure (X): The calculated t_{value} is $2.663842 > t_{\text{table}} 1.972$ and the sig value is $0.0084 < 0.05$. Therefore, H_{01} is rejected and H_{a1} is accepted, meaning the ESG Disclosure variable (X) has an effect on Credit Risk (Y).
- Interaction (XZ): The calculated t_{value} is $2.477686 > t_{\text{table}} 1.972$ and the sig value is $0.0141 < 0.05$. Therefore, H_{02} is rejected and H_{a2} is accepted, meaning the ESG Disclosure variable (X) has an effect on Credit Risk (Y) with Sustainability Commitment (Z) as the moderating variable.

Simultaneous Test (F-test)

The calculated F-value is $66.01436 > F_{\text{table}} 2.43$ and the sig. value is $0.000000 < 0.05$. Therefore, H_{03} is rejected and H_{a3} is accepted, meaning the variables ESG Disclosure (X), Sustainability Commitment (Z), and the interaction (XZ) collectively influence Credit Risk (Y).

Coefficient of Determination (R² Adjusted)

The Adjusted R² value is 0.887899 or 88.7899%. This indicates that the independent variables (ESG Disclosure (X), Sustainability Commitment (Z), and Interaction (XZ)) are able to explain the Credit Risk (Y) variable by 88.7899%. The remaining 11.2101% is explained by other variables not included in this research model.

Interpretation Of Results

The results of this study clearly show that debtor companies ESG Disclosure is a relevant factor in assessing credit risk in the Southeast Asian banking industry, consistent with Signaling Theory. Companies that transparently report their ESG performance send a signal of

management quality and operational stability, which reduces asymmetric information for the bank, making the bank feel safer and record lower credit risk (lower NPL).

The key finding lies in the moderating effect of Bank Sustainability Commitment. The results show that ESG Disclosure is more effective in reducing credit risk when the bank itself has a strong sustainability commitment. This is consistent with Stakeholder Theory, as banks committed to sustainability not only meet stakeholder demands but also develop the necessary internal capabilities and sensitivity to internalize and validate the ESG signals sent by debtor companies. They are likely to have more sophisticated risk assessment tools that explicitly consider ESG factors, making them more efficient at mitigating non-financial risks that could become credit risks.

The novelty of this study lies in identifying the moderating channel. This study highlights that the effectiveness of ESG information is highly dependent on the recipient, namely the bank. The results fill a research gap by providing empirical evidence from Southeast Asia, where the economic and regulatory context (including nascent central bank sustainability initiatives) differs from developed markets.

CONCLUSION

Based on the research results, it can be concluded as follows 1) Partially, the research confirms that ESG Disclosure (X) has a significant influence on Credit Risk (Y) in banking companies listed on the Southeast Asian Stock Exchanges; 2) The moderation regression results prove that Sustainability Commitment (Z) serves as a significant moderating variable in the relationship between ESG Disclosure and Credit Risk, indicating that the bank's commitment strengthens or weakens the effect of ESG Disclosure on loan risk; 3) Simultaneously, the variables ESG Disclosure (X), Sustainability Commitment (Z), and the interaction (XZ) influence Credit Risk (Y); 4) The contribution of the variables in explaining the variation in Credit Risk is very high, reaching 88.7899% (Adjusted R²), and the remaining 11.2101% is attributable to factors not included in the model.

The main limitation of this study is the use of an aggregate ESG score, which may obscure differences in impact across the Environmental, Social, and Governance pillars. Furthermore, the use of a dummy variable for Sustainability Commitment may oversimplify the complexity of banks' internal sustainability integration. The limited observation period may also limit the ability to capture the full long-term impact of ESG factors.

For banks, these findings emphasize the need to formally integrate ESG into credit policies, as this has been shown to mitigate credit risk. Sustainability commitment is not only a compliance tool but also a risk management tool. For debtor companies, this provides evidence that investment in and disclosure of ESG performance yields financial benefits through more favorable credit risk assessments from creditors.

Theoretically, this study enhances Signaling Theory and Stakeholder Theory with evidence that the quality of the bank's signal receivers (Sustainability Commitment) is a critical determinant of signal effectiveness (ESG reporting) in the context of debt relationships. Given the limitations, further research is suggested to: (1) Test the moderating impact of Sustainability Commitment by decomposing the E, S, and G dimensions separately, (2) Use a more refined measure of Sustainability Commitment (e.g., percentage of green loans), and (3) Expand the period and country coverage to increase the generalizability of the findings. Rejected hypotheses (if any in the analysis) can be used as a gap for further research to test other factors that may limit the influence of the variable.

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