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DOES ESG AFFECT CREDIT RISK?

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Abstract

Environmental, social, and governance (ESG) concerns became increasingly crucial for financial institutions, including banks, as they faced new types of risks associated with ESG factors. This study aims to investigate how these ESG dimensions affected non-performing loans (NPLs) in banks across ASEAN countries. With rising investor demand for sustainable practices and intensified regulatory pressures, incorporating ESG risks into risk management frameworks became imperative. This study uses panel data regression analysis along with the Chow and Hausman tests to assess the impact of ESG factors on NPL. The sample comprised banks from Indonesia, Malaysia, the Philippines, Singapore, and Thailand, selected based on Refinitiv Eikon's ESG values. The findings revealed that while environmental and governance performance had a statistically significant negative impact on NPLs, indicating that better environmental and governance practices were associated with fewer loan defaults, social performance showed a statistically significant positive effect on NPLs, suggesting that higher social scores correlated with increased loan defaults. This study highlighted the need for banks to carefully balance their social initiatives with financial stability and underscored the importance of integrating ESG factors into risk management strategies to enhance overall financial health and sustainability.

Keywords: ASEAN, Environmental Performance, Governance Performance, Social Performance, Banking Companies

Introduction

Financial organizations face the main risk of credit risk, which refers to the possibility of borrowers defaulting on their loans or being unable to meet their repayment commitments (Ahmed et al., 2023). Several variables might affect this risk, including as economic conditions, alterations in monetary policy, insufficient credit risk management methods, and changes in the risk profile of borrowers. Thorough evaluation and control of credit risk are essential to minimize possible losses and maintain the stability of financial institutions. Financial institutions encounter market risk, which stems from the volatility in the value of financial instruments, including interest rates, exchange rates, and stock prices. These alterations can have a substantial effect on the revenue and worth of a financial institution, potentially resulting in monetary deficits. Liquidity risk pertains to the possibility of a bank encountering difficulty in meeting its financial commitments at the time they are due. Liquidity risk occurs when a bank faces substantial withdrawals or difficulties in acquiring fresh funds, resulting in financial instability and potential losses (Wirdiyanti et al., 2021).

The issue of credit risk in ASEAN nations is a major worry for financial institutions, as it relates to the possibility of loan default or the borrower's inability to meet repayment commitments. Several variables might affect this risk, including as economic conditions, alterations in monetary policy, insufficient credit risk management methods, and changes in the risk profile of borrowers (Bussmann et al., 2021). Banks in Southeast Asia are preparing for challenges due to possible credit risks and reduced interest profits, although being mostly

unaffected by the difficulties faced by banks in the Western countries. Analysis of data spanning from 2013 to 2022 indicates that geopolitical risk, credit risk, and financial risks have a significant role in shaping the economies of ASEAN countries (Andriani et al., 2024).

The influence of credit risk on banking efficiency in ASEAN nations is very significant. Studies reveal that the banking efficiency in the ASEAN region is above 80%. However, there exists a negative correlation between credit risk and banking efficiency. More precisely, the loan-to-asset ratio indication has a substantial impact on reducing efficiency (Ekananda, 2023). Higher loan-to-asset ratios in banks, which indicate more credit risk, are associated with poorer cost-efficiency values. Thus, it is imperative for bank management to mitigate credit risk to enhance the cost-effectiveness of bank operations. Furthermore, research by Rizqa and Haryono (2023) has demonstrated that both particular and macroeconomic factors exert an impact on the credit risk faced by banks.

Non-performing loans (NPLs) significantly impact credit risk in the banking sector (Khoirunisa & Karnasi, 2023). NPLs are loans that are in default or have ceased to generate income for the lender. These loans can arise due to various factors such as economic downturns, poor credit assessment, or borrower insolvency. High levels of NPLs can lead to substantial losses for banks, thereby increasing their vulnerability to risk. The presence of NPLs not only affects the bank's profitability but also restricts its ability to grant new loans, thereby limiting credit availability in the economy. This can have a ripple effect on economic activity, as reduced lending can impede business growth and job creation.

Deloitte reports the value of Non-Performing Loans (NPLs) in ASEAN banking in 2023 reflects a mix of trends and challenges across the region. In Singapore, the NPL ratio decreased from a peak of 2.6% during the pandemic to 1.8% in 2022, but it is anticipated to rise due to increasing inflation and interest rates, which are affecting borrowers' ability to repay loans. In Thailand, the NPL ratio has been relatively controlled, with a slight increase in certain sectors like construction and professional services in 2022. The overall NPL ratio in ASEAN countries is diverse, with the Philippines and Indonesia having higher average NPL ratios compared to the regional average. The average NPL ratio for ASEAN banks is around 4%, indicating a relatively stable but not risk-free banking environment. These trends highlight the need for effective risk management and proactive measures to mitigate the impact of NPLs on the financial stability of ASEAN countries.

In the specific context of Non-Performing Loans (NPL), the banking risk related to NPL encompasses a range of issues. Non-performing loans (NPLs) indicate a significant level of credit risk for the bank, since they arise when the borrower is unable to fulfil the loan repayment obligations as outlined in the contractual terms (Khoirunisa & Karnasi, 2023). A significant non-performing loan (NPL) level has the potential to adversely impact a bank's financial performance, diminish its profitability, and elevate the dangers it encounters. Non-performing loans (NPLs) may provide a liquidity risk to banks, especially when the bank is required to bear the costs of unsettled credit. Moreover, non-performing loans (NPLs) may indicate potential concerns with the borrower's corporate governance, such as deficient managerial practises or lack of transparency in financial operations. Banks may encounter reputational risk if they provide loans to borrowers who own significant non-performing loans (NPLs) (Rohadi et al., 2024).

The ESG performance has a substantial impact on the non-performing loan (NPL) ratio in banks. Research by Perdana et al. (2023) has indicated that banks with better Environmental, Social, and Governance (ESG) ratings generally exhibit lower Non-Performing Loan (NPL) levels. ESG practices enable banks to enhance their risk management capabilities, mitigate the probability of loan defaults, and uphold a resilient financial position. For example, banks that place a high importance on environmental sustainability and social responsibility are more likely to have superior credit assessment and risk management

practices, resulting in a lower occurrence of non-performing loans (NPLs). Furthermore, Rinanda (2023) explains that the disclosure of environmental, social, and governance (ESG) information and the level of ownership by institutional investors can also have an impact on the imbalance of market information, which subsequently influences the risk profile and financial performance of banks. Thus, including environmental, social, and governance (ESG) factors into banking operations can serve as a vital approach to reducing non-performing loans (NPLs) and safeguarding the overall soundness of the financial system.

Environmental, social, and governance (ESG) concerns are becoming more important for financial organisations such as banks. Institutional investors, rating agencies, customers, and workers are all interested in ESG initiatives, and banks are under growing pressure to show their commitment to environmentally responsible business practises. Environmental, social, and governance (ESG) hazards are giving rise to a new class of risks for banks. The necessity for banks to include ESG risks into their risk management framework is highlighted by the growing demand from investors for sustainable products and by regulatory pressure. In a climate of low interest rates, rising external operational and capital expenses as a result of regulation, and enormous headwinds from the COVID-19 crisis, ESG standards are becoming a major impediment for banks. As banks work to integrate ESG into their operations, operational efficiency, regulatory compliance and reporting, and measuring, reporting, and disclosing non-financial data are all becoming more important. All aspects to evaluate include ESG information that is critical for understanding strategic purpose, risks, and opportunities. ESG problems have the potential to influence all asset classes, including distressed loans, and have become important to any investor's strategy to managing and improving troubled loan performance.

The ESG (Environmental, Social, and Governance) approach is an investment strategy aimed at enhancing a company's long-term value by considering how management responds to stakeholder concerns and providing insights into the company's ability to adapt and thrive. According to the research conducted by the Group of Thirty, the cultivation of an appropriate culture and conduct within the banking sector extends beyond mere adherence to legal requirements, as it has significant importance for the economic and social sustainability of banks (G30, 2018). The concept of sustainability has significant importance, particularly in the context of depositors who assume a crucial role as stakeholders. During periods of financial crises, the phenomenon of bank runs, exemplified by the recent collapse of Silicon Valley Bank (SVB), can be understood as a self-fulfilling prophecy. This occurs when apprehensive depositors anticipate the failure of a bank and swiftly withdraw their funds, thereby demonstrating the interdependence between the sustainability of a bank and the confidence of its depositors (Dimont & Dybvig, 2023).

In Southeast Asia, ESG (Environmental, Social, and Governance) disclosure and performance are increasingly becoming focal points for investors, particularly given the region's rapid economic growth and its burgeoning influence on the global stage. Despite the economic vibrancy and the young, dynamic population of the ASEAN-5 countries (Singapore, Malaysia, Thailand, Indonesia, and the Philippines), the depth of ESG research and reporting varies significantly. Recent regulatory developments reflect a growing commitment to sustainability; for example, Singapore and Malaysia have established comprehensive ESG reporting frameworks, while countries like Indonesia and the Philippines have only recently introduced mandatory ESG disclosure requirements. The varying levels of disclosure and performance are evident in global rankings, with Thailand’s Stock Exchange standing out for its high performance, whereas other exchanges in the region, such as those in Indonesia and the Philippines, are still catching up.

The performance analysis reveals a disparity among the ASEAN-5 countries in managing ESG risks. Thailand leads with relatively robust management and moderate risk

exposure, while country like Indonesia struggle with higher ESG risks due to both higher exposure and lower management scores. This performance gap is reflected in the overall ESG risk ratings where, on average, ASEAN-5 countries exhibit higher ESG risks compared to their counterparts in Europe and North America, though they align with the broader APAC region. The results suggest that while Southeast Asia is making strides in ESG disclosure, substantial work remains to elevate performance to meet global standards, particularly in addressing the challenges posed by high-risk industries (Pan et al., 2022).

The environmental, social, and governance (ESG) performance significantly influences the ratio of non-performing loans (NPL) in banks. Research has demonstrated a correlation between banks that possess better Environmental, Social, and Governance (ESG) ratings and lower Non-Performing Loan (NPL) levels. ESG practices enable banks to enhance their risk management capabilities, mitigate the probability of loan defaults, and uphold a resilient financial position. A research conducted by Liu and Xie (2024) on commercial banks revealed a negative correlation between a bank's ESG rating and its nonperforming loans. In addition, the research conducted by Menicucci and Paolucci (2023) found that a bank's strong performance across all three aspects of ESG evaluation leads to a decrease in its nonperforming loan ratio. This indicates that when a company has good environmental, social, and governance (ESG) performance, it leads to better loan quality. This finding also offers historical evidence that ESG has a beneficial effect on managing credit risk.

The correlation between ESG performance and NPL (non-performing loan) percentages is complex and has several aspects. ESG policies may reduce credit risk by strengthening governance, minimizing environmental consequences, and boosting social responsibility. According to Koapaha (2023), banks that give importance to environmental sustainability and social responsibility are more likely to have improved credit evaluation and risk management, leading to a decrease in the occurrence of non-performing loans (NPLs). Moreover, the disclosure of environmental, social, and governance (ESG) information and the level of ownership by institutional investors can also have an impact on the imbalance of market information, which subsequently influences the risk profile and profitability of banks. Hence, the incorporation of Environmental, Social, and Governance (ESG) factors into banking operations is crucial for upholding the stability and long-term viability of the financial system. Through the implementation of robust environmental, social, and governance (ESG) standards, banks have the potential to decrease their non-performing loan (NPL) rates, boost their financial performance, and bolster their overall creditworthiness.

The previous studies highlight the impact of ESG performance on various aspects of banking. Li, Jin, and Nainar (2023) found that banks with high ESG ratings tend to have fewer Non-Performing Loans (NPLs) in their study of 1924 U.S. commercial banks using OLS regression. Ozili (2023) explored the correlation between sustainable development and bank NPLs, revealing significant regional variations in the correlation between NPLs and Sustainable Development Indicators (SDIs) across Europe, the Americas, and Africa. Galletta et al. (2023) investigated the relationship between ESG scores and operational risk in a global sample of banks, concluding that higher ESG scores are associated with reduced operational risk and capital absorption. Lastly, Alam, Banna, and Hassan (2022) examined the impact of ESG activities on bank efficiency, noting a positive influence on conventional banks but not on Islamic banks, with environmental and social activities particularly enhancing efficiency. These studies share a focus on ESG performance but differ in their specific variables, research objects, and methods. The objectives of this research are: (1) To assess the effect of the Environmental Score on non-performing loans in banks. (2) To evaluate the effect of the Social Score on non-performing loans in banks. And (4) to investigate the effect of the Governance Score on non-performing loans in banks.

Research Methods

The research approach utilized in this study is a qualitative case study. This method provides a foundation for every scientific investigation, offering direction to researchers as they strive to gain information and resolve significant issues. This systematic approach involves a series of procedures developed from core concepts driving the research process (Sugiyono, 2023). This methodology ensures the collection of relevant, reliable, and appropriate data for the intended objectives. In the context of this study, which examines the impact of Environmental, Social, and Governance (ESG) aspects on the risk levels of financial institutions, the qualitative case study method is essential for ensuring the quality and reliability of the conclusions drawn, thus facilitating informed decision-making in the banking and finance sector.

The target population for this study comprises financial institutions operating within the ASEAN member countries. Purposive sampling was employed to obtain a sample that adequately represents the target population. Based on the Environmental, Social, and Governance (ESG) scores provided by Refinitiv Eikon, the sample consists of 27 financial institutions with ESG ratings. Secondary data was collected from the Thomson Reuters Eikon database, including financial reports and ESG ratings for the period from 2018 to 2022. The data analysis method used is Multiple Linear Regression with the Ordinary Least Square (OLS) technique, including classical assumption tests such as normality, heteroscedasticity, and multicollinearity tests. Panel data regression analysis is also employed to understand the relationship between the independent variables (Environmental Pillar Score, Social Pillar Score, and Governance Pillar Score) and the dependent variable (Non-Performing Loan). Statistical tests such as the t-test, Chow test, and Hausman test are conducted to test the hypotheses and determine the most suitable model for panel data analysis.

Result and Discussion

The data analysis methods used in this study are specifically developed to tackle the issue formulation and assess the hypotheses. This chapter encompasses several methodologies, such as Descriptive Statistics, Model Selection Tests including the Chow Test and Hausman Test, and the Lagrange Multiplier Test. In addition, it entails evaluating the Fixed Effects Model (FEM) and conducting Classic Assumption Tests, such as examining residuals for Heteroscedasticity, correlation coefficients for Multicollinearity, and the Durbin-Watson statistic for Autocorrelation. The methodology further incorporates Panel Data Regression methodology, Hypothesis Testing utilizing t-tests and F-tests and assessing the Coefficient of Determination to evaluate the model's explanatory capacity.

Statistic Descriptive

Descriptive statistics employ quantitative and visual techniques to characterize and depict the characteristics of a dataset succinctly and accurately. These statistics offer a succinct summary of the main features of the data, including measurements such as the Mean, Maximum, Minimum, Skewness, and the Jarque-Bera test. They assist in comprehending the measures of central tendency, variability, and the shape of the data distribution.

Table 1. Statistic Descriptive

	EPS	SPS	GPS	NPL
Mean	50.50704	70.58007	62.57067	0.024079
Maximum	94.85000	93.90000	92.03000	0.067500
Minimum	4.930000	20.94000	18.52000	0.003100
Skewness	-0.266874	-0.964346	-0.446030	0.826249

	EPS	SPS	GPS	NPL
Jarque-Bera	4.852609	21.59805	8.242110	17.19246
Probability	0.088363	0.000020	0.016227	0.000185
Observations	135	135	135	135

The descriptive statistics for the Environmental Performance Score reveal a mean of 50.51, indicating an average environmental performance level among ASEAN banks. The scores range from a minimum of 4.93 to a maximum of 94.85, suggesting significant variability in environmental performance across institutions. The negative skewness of -0.27 implies a slight leftward skew in the distribution, indicating that most banks have scores above the mean, but there are a few with exceptionally high scores. The Jarque-Bera test statistic of 4.85 with a probability of 0.088 suggests that while the distribution of environmental scores is not perfectly normal, the deviation from normality is not severe. These statistics imply that while most banks have moderate to high environmental performance, a few outliers with very high scores exist. This variability in environmental performance could impact non-performing loans (NPLs), as banks with higher environmental scores may experience fewer NPLs due to better risk management and sustainability practices.

The descriptive statistics for the Social Performance Score show a mean of 70.58, suggesting that on average, ASEAN banks have relatively strong social performance. The scores vary widely, with a minimum of 20.94 and a maximum of 93.90, indicating substantial differences in social performance among banks. The negative skewness of -0.96 reveals a pronounced leftward skew, meaning that a majority of banks have higher social performance scores, while a few outliers exhibit notably lower scores. The Jarque-Bera test statistic of 21.60, with a very low probability of 0.000020, indicates a significant deviation from normality in the distribution. This skewness and deviation suggest that banks with higher social performance may generally experience fewer non-performing loans (NPLs), as strong social practices could enhance stakeholder trust and operational stability, reducing the likelihood of loan defaults.

The descriptive statistics for the Governance Performance Score indicate a mean of 62.57, reflecting a generally solid governance performance among ASEAN banks. The scores range from a minimum of 18.52 to a maximum of 92.03, demonstrating considerable variation in governance quality. The negative skewness of -0.45 suggests a mild leftward skew, meaning that most banks have governance scores above the mean, though there are some with lower scores. The Jarque-Bera test statistic of 8.24, with a probability of 0.016, reveals a statistically significant deviation from normality in the distribution. This skew and deviation imply that banks with higher governance scores are likely to have better management practices and oversight, which can contribute to lower non-performing loans (NPLs). Effective governance could enhance risk management and compliance, thereby reducing the incidence of NPLs.

The descriptive statistics for Non-Performing Loans (NPLs) reveal a mean of 0.024, indicating that, on average, ASEAN banks have a relatively low proportion of non-performing loans. The scores range from a minimum of 0.003 to a maximum of 0.068, demonstrating some variation in loan performance across banks. The positive skewness of 0.83 suggests a rightward skew, with most banks experiencing lower levels of NPLs, while a few have notably higher proportions. The Jarque-Bera test statistic of 17.19, with a probability of 0.000185, shows a significant departure from normality in the NPL distribution. This skew and deviation imply that while the majority of banks maintain low NPL ratios, a few outliers with higher NPLs may be influencing the overall distribution. The presence of such variability in NPLs highlights the need for targeted risk management

strategies to address potential vulnerabilities and reduce loan defaults in banks with higher NPL ratios.

Model Selection Test

Chow Test

A statistical method used to identify notable shifts in the correlations between ESG elements and risk profiles in the banking industry is the Chow test. This helps in identifying these alterations across different time periods or within distinct subsets of data.

Table 2. Chow Test Result

Effects Test	Statistic	d.f.	Prob.
Cross-section F	5.562343	-26,105	0.0
Cross-section Chi-square	116.907715	26	0.0

The Chow test is a widely used statistical method to determine whether there are significant differences in correlations between variables across different data subsets or time periods. In this study, the cross-section chi-square value obtained from the Chow test was 0.0000.

Typically, the results of the Chow test are interpreted with a significance threshold of 0.05. If the chi-square value is less than 0.05, it indicates significant differences across the data subsets or time periods, leading to the rejection of the null hypothesis. Conversely, if the chi-square value is greater than 0.05, it suggests no significant differences, thereby supporting the null hypothesis. In this case, the null hypothesis is rejected because the chi-square value of 0.0000 is below the 0.05 threshold. Consequently, the researchers concluded that the correlations between environmental, social, and governance (ESG) characteristics and risk levels in the banking industry significantly differ across various subsets of data or time periods.

Moreover, the interpretation criteria state that if the computed chi-square value is less than 0.05, the Fixed Effects Model (FEM) should be chosen, indicating that individual-specific effects are correlated with the independent variables. If the chi-square value is greater than 0.05, the Random Effects Model (REM) is preferred, suggesting no correlation between individual-specific effects and independent variables. Based on the findings of the Chow test in this study, the Fixed Effects Model (FEM) is the appropriate choice, as the null hypothesis was rejected and the significance level was below 0.05. This implies that the independent variables and individual-specific effects in the panel data analysis are linked, affecting the relationships between ESG characteristics and risk levels in the banking sector.

Hausman Test

The Hausman test is employed by researchers to assess the appropriateness of either the Fixed Effects Model or the Random Effects Model.

Table 3. Hausman Test Result

Test Summary		Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random		13.650063	3	0.0034
Cross-section random effects test comparisons:				
Variable	**Fixed**	**Random**	**Var(Diff.)**	**Prob.**
X1	-9.1e-05	-0.000135	0.0	0.2128
X2	0.000132	0.000345	0.0	0.0338
X3	2.7e-05	-0.000128	0.0	0.0006

The Hausman test is a statistical method used to decide whether the Random Effects Model (REM) or the Fixed Effects Model (FEM) is more appropriate for a given panel dataset. The FEM suggests a connection between individual-specific effects and the independent variables, while the REM assumes no such connection. In this study, the Hausman test result for the random cross-section was reported as 0.0034. The conventional significance threshold for the Hausman test is 0.05. If the p-value is below this threshold, the FEM is recommended; otherwise, the REM is preferred. Given that the p-value in this case is 0.0034, which is much lower than 0.05, the null hypothesis is rejected. Consequently, the FEM was selected as the most suitable model for this study. This indicates a relationship between individual-specific effects and the independent variables in the dataset, justifying the use of the FEM.

Lagrange Multiplier Test

Regression models that contain heteroscedasticity can be diagnosed using the Lagrange Multiplier Test, more precisely the Breusch-Pagan test.

Table 4. Langrange 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	38.28809	1.557302	39.84539
	(0.0000)	(0.2121)	(0.0000)
Honda	6.187737	1.247919	5.257803
	(0.0000)	(0.1060)	(0.0000)
King-Wu	6.187737	1.247919	3.421192
	(0.0000)	(0.1060)	(0.0003)
Standardized Honda	6.882635	1.752658	1.932055
	(0.0000)	(0.0398)	(0.0267)
Standardized King-Wu	6.882635	1.752658	0.983169
	(0.0000)	(0.0398)	(0.1628)
Gourieroux, et al.	--	--	39.84539
			(0.0000)

In this study, the Breusch-Pagan cross-section value was reported as 38.28809, with a p-value of 0.0000. Statistical significance in hypothesis testing is typically assessed at the 0.05 level. If the p-value exceeds 0.05, it suggests no evidence of heteroscedasticity, allowing the use of the Constant Effects Model (CEM). Conversely, a p-value below 0.05 indicates heteroscedasticity, leading to the selection of the Random Effects Model (REM). In this case, the p-value of 0.0000 is well below 0.05, resulting in the rejection of the null hypothesis of homoscedasticity. Due to the presence of heteroscedasticity in the data, the researcher may opt for the REM over the CEM.

Fixed Effects Model (FEM)

A statistical tool used in panel data analysis is called the Fixed Effects Model (FEM), sometimes referred to as the within-groups estimator or the least squares dummy variable (LSDV) method. The Fixed Effects Model in panel data analysis entails adding dummy variables for every person or thing in the dataset.

Table 5. Fixed Effects Model (FEM) Test

Dependent Variable: Y
Method: Panel Least Squares
Date: 07/29/24 Time: 11:16
Sample: 2018–2022
Periods included: 5
Cross-sections included: 27
Total panel (balanced) observations: 135

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.017654	0.009021	1.956905	0.0530
X1	-9.06E-05	6.03E-05	-1.503742	0.1356
X2	0.000132	0.000126	1.042154	0.2997
X3	2.72E-05	7.08E-05	0.383462	0.7022
Effects Specification				
Cross-section fixed (dummy variables)				

Statistic	Statistic
Root MSE	0.006555
Mean dependent var	0.024079
S.D. dependent var	0.013281
Akaike info criterion	-6.772729
Schwarz criterion	-6.127112
Hannan-Quinn criter.	-6.510368
Durbin-Watson stat	1.465664
R-squared	0.754564
Adjusted R-squared	0.686777
S.E. of regression	0.007433
Sum squared resid	0.005801
Log likelihood	487.1592
F-statistic	11.13138
Prob(F-statistic)	0.000000

Substituted Coefficients:

$$Y = 0.0176537647176 - 9.06109506242e\text{-}05*X1 + 0.000131798019097*X2 + 2.71640262239e\text{-}05*X3 + [CX=F]$$

The coefficient for X1 (-9.06109506242e-05) indicates that for each one-unit increase in X1, the dependent variable Y is expected to decrease by 9.06109506242e-05, assuming all other variables remain constant. Similarly, the coefficients for X2 and X3 (0.000131798019097 and 2.71640262239e-05, respectively) show the expected change in Y for a one-unit increase in X2 and X3, respectively. The coefficients in the FEM results offer insights into the estimated relationships between the dependent and independent variables, while accounting for individual-specific effects through the fixed effects or dummy variables.

Classic Assumption Test

Heteroscedasticity Test

The Heteroscedasticity Test is to determine if there's uniformity in residual variance across the dataset, which is crucial for regression analysis to exhibit homoscedasticity

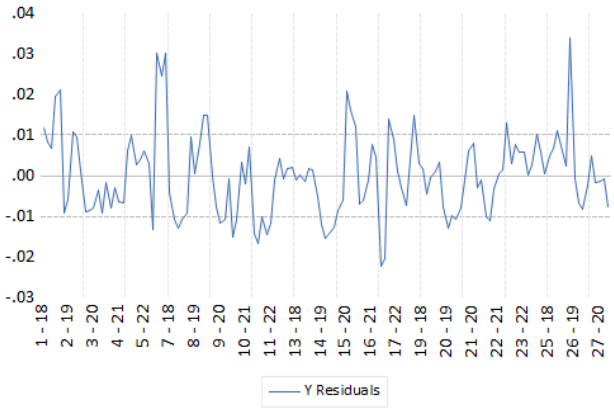

Figure 1. Heteroscedasticity Test Result

The heteroscedasticity test in this study produced p-values of 0.0250 for the constant term, 0.0336 for EPS, 0.1090 for SPS, and 0.7501 for GPS. In such tests, the null hypothesis typically assumes constant variance (homoscedasticity) across the data, while the alternative hypothesis suggests varying variance among observations. A p-value threshold of 0.05 is commonly used to determine significance. If the p-value is above 0.05, there is not enough evidence to reject the null hypothesis, indicating the data is likely homoscedastic. In this case, the p-values for the constant term, EPS is below 0.05, indicating significant evidence to reject the null hypothesis for these variables and suggesting possible heteroscedasticity. However, the p-value for EPS and GPS are above 0.05, meaning there is insufficient evidence to reject the null hypothesis for this variable, implying homoscedasticity. Despite these findings, the residual variance remains constant as the residual graph (blue) does not exceed the 500 or -500 thresholds. Consequently, there are no clear signs of heteroscedasticity or failure in the heteroscedasticity test (Napitupulu et al., 2024).

Multicollinearity Test

The Multicollinearity Test aims to identify strong correlations among independent variables within a model, highlighting instances where these variables are significantly interconnected.

Table 6. Multicollinearity Test

	X1	X2	X3
X1	1.000000	0.468427	0.108944
X2	0.468427	1.000000	-0.089817
X3	0.108944	-0.089817	1.000000

The correlation matrix provided shows the pairwise correlations between variables X1, X2, and X3:

1) The correlation coefficient between X1 and X2 is 0.468427.
2) The correlation coefficient between X1 and X3 is 0.108944.
3) The correlation coefficient between X2 and X3 is -0.089817.

When assessing multicollinearity, which refers to high correlations between predictor variables in a regression model, it's generally recommended to look for correlation coefficients below 0.85 to consider the data free from multicollinearity. In this case:

1) The correlation between X1 and X2 is below 0.85, indicating no significant multicollinearity between these two variables.

2) Similarly, the correlation between X1 and X3 is well below 0.85, suggesting no substantial multicollinearity between X1 and X3.
3) The correlation between X2 and X3 is also below 0.85, further indicating no significant multicollinearity between X2 and X3.

Based on these correlation coefficients, we can conclude that the data is free from multicollinearity concerns among the variables X1, X2, and X3. This suggests that these variables can be included in regression models without the risk of multicollinearity adversely affecting the estimation or interpretation of the coefficients.

Autocorrelation Test

The Autocorrelation Test use the Durbin-Watson (DW) statistic to identify the existence of autocorrelation in the residuals of a regression model. Autocorrelation pertains to the correlation between a variable and its own values in consecutive time periods. This can result in less efficient estimates and unreliable conclusions in regression analysis.

Table 7. Autocorrelation Test Result

R	R Square	Adjusted R Square	Std. Error	Durbin-Watson
.645	.416	.402	.01023	1.090

The results of the Autocorrelation Test indicate that the Durbin-Watson (DW) statistic is 1.090, while the Durbin-Watson upper bound (DU) is 1.665 and the Durbin-Watson upper bound plus 4 (4-DU) is 2.335. In this case, the DW statistic falls between the DU and 4-DU bounds, specifically 1.090 < 1.665 < 2.335. This positioning suggests the presence of positive autocorrelation in the residuals of the regression model.

Panel Data Regression Analysis

The current research employs panel data regression techniques, which offer distinct advantages for analyzing datasets that combine features of both time series and cross-sectional data.

```
Estimation Command:
=========================
LS(?) Y C X1 X2 X3

Estimation Equation:
=========================
Y = C(1) + C(2)*X1 + C(3)*X2 + C(4)*X3
```

Within the framework of this study, the equation for panel regression analysis is presented as follows:

Y = 0.0195130111475 - 0.000189058030014*X1 + 0.000419851139262*X2 - 0.000248009431576*X3

The explanation is as follows:

1) The constant value signifies that in the absence of variables (X1), (X2), and (X3), the variable (Y) will increase by that percentage.
2) The beta coefficient value for variable (X1) is -0.000189. If the values of the other variables remain constant and variable X1 increases by 1 unit, then variable (Y) will decrease by 0.0189%. Conversely, if the values of other variables are constant and variable X1 decreases by 1 unit, variable Y will increase by 0.0189%.

3) For variable (X2), the beta coefficient value is 0.000419. Variable (Y) will increase by 0.0420% if variable X2 grows by 1 unit and the values of the other variables stay the same. In contrast, variable Y will decrease by 0.0419% if variable X2 reduces by 1 unit and the values of the other variables remain unchanged.
4) For variable (X3), the beta coefficient value is -0.000248. Variable (Y) will decrease by 0.0248% if variable X3 grows by 1 unit and the values of the other variables stay the same. In contrast, variable Y will increase by 0.0248% if variable X3 falls by 1 unit and all other variables remain constant.

Hypothesis testing

A statistical technique called hypothesis testing is used to draw conclusions about population parameters from sample data.

T-Test

The t-test is performed to see if there is a statistically significant difference between them. To ascertain statistical significance, a critical value from the t-distribution is compared to the t-statistic, which is computed by the t-test.

Table 8. T-test Result

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.019513	0.005018	3.888636	0.0002
X1	-0.000189	4.35E-05	-4.344214	0.0000
X2	0.000420	5.98E-05	7.025129	0.0000
X3	-0.000248	4.78E-05	-5.189172	0.0000

T table	**1.977826**

Based on the provided hypotheses and the results of the t-tests conducted, we can discuss the findings as follows:

1) Environmental Performance (EPS)

The t-statistic for EPS is -4.344214, with a probability (p-value) of 0.0000. Since the p-value is less than 0.05, we reject the null hypothesis (H0) and accept the alternative hypothesis (Ha). This indicates that environmental performance has a statistically significant negative effect on non-performing loans (NPL) in banking companies. In other words, higher environmental performance is associated with lower NPL.

2) Social Performance (SPS)

The t-statistic for SPS is 7.025129, with a probability (p-value) of 0.0000. Similar to EPS, the p-value is less than 0.05, leading to the rejection of H0 and acceptance of Ha. This implies that social performance has a statistically significant positive effect on NPL in banking companies. Higher social performance is associated with an increase in the proportion of non-performing loans.

3) Governance Performance (GPS)

The t-statistic for GPS is -5.189172, with a probability (p-value) of 0.0000. Once again, the p-value is less than 0.05, resulting in the rejection of H0 and acceptance of Ha. This suggests that governance performance has a statistically significant negative effect on NPL in banking companies. Higher governance performance is associated with lower NPL.

The results support hypotheses H1 and H3, indicating that environmental and governance performance have statistically significant negative associations with non-performing loans in banking companies. However, H2 indicates that social performance has

a statistically significant positive association with non-performing loans. This suggests that stronger environmental and governance performance can contribute to reducing the likelihood of non-performing loans, potentially enhancing the overall financial health and stability of banking institutions. Conversely, higher social performance is associated with an increased likelihood of non-performing loans.

F-Test

The F-test, sometimes referred to as an analysis of variance (ANOVA), is a tool for concurrently comparing the means of three or more groups.

Table 9. F-test Result

Parameter	Value
R-squared	0.416514
Adjusted R-squared	0.403152
S.E. of regression	0.010260
Sum squared resid	0.013790
Log likelihood	428.7053
F-statistic	31.17095
Prob(F-statistic)	0.000000

f	**2.672182**

The F-statistic for the combined effect of environmental, social, and governance performance (ESG) is 31.17095, with a p-value of 0.000000, according to the given hypothesis and F-test results. This leads to the rejection of the null hypothesis (H0) and acceptance of the alternative hypothesis (Ha), as the p-value is less than 0.05 and the F-statistic exceeds the critical value from the F-table (2.672182). This indicates a statistically significant relationship between non-performing loans in financial institutions and the combined effect of ESG performance. Specifically, higher environmental and governance performance contribute to reducing non-performing loans, while higher social performance is associated with an increase in non-performing loans. In conclusion, the results support the hypothesis that ESG performance impacts non-performing loans in banking organizations, demonstrating that improved environmental and governance metrics can enhance financial stability by reducing NPLs, whereas increased social performance metrics are linked to higher NPLs.

Coefficient of Determination Test

R-squared, often known as the coefficient of determination, is a statistical metric used in regression analysis.

Table 10. Determination Test Result

Parameter	Value
R-squared	0.416514
Adjusted R-squared	0.403152
S.E. of regression	0.010260
Sum squared resid	0.013790
Log likelihood	428.7053
F-statistic	31.17095
Prob(F-statistic)	0.000000

In this analysis, it is observed that the Environmental Pillar Score (EPS), Social Pillar Score (SPS), and Governance Pillar Score (GPS) collectively explain 40.3152% of the variation in the Non-Performing Loan (NPL) variable. This indicates that around 40.3152% of the changes in NPL can be attributed to changes in EPS, SPS, and GPS. However, the remaining 59.6848% of the variation is not explained by these factors, suggesting that other variables not included in the research model influence NPL. These unexplained factors could include a variety of influences not considered or measured in the analysis, such as the regulatory environment and macroeconomic shocks.

Discussion

The Influence of Environmental Performance on Non-Performing Loans in Banking Companies in ASEAN

The study reveals a significant negative relationship between environmental performance and non-performing loans (NPLs) in ASEAN banking companies, as indicated by a t-statistic of -4.344214 and a p-value of 0.0000. This suggests that higher environmental performance is associated with a lower incidence of NPLs. The result underscores the importance of environmental considerations in banking operations, indicating that banks with stronger environmental performance metrics tend to experience fewer non-performing loans. This finding highlights how integrating environmental performance into banking practices can potentially contribute to financial stability and sustainability, suggesting that effective environmental management may help mitigate credit risks.

Considering Stakeholder Theory, which posits that organizations must address the needs and expectations of various stakeholders to maintain legitimacy and achieve long-term success, the study's findings make sense. Banks with strong environmental performance may enhance their reputation and build trust among stakeholders, including customers, investors, and regulatory bodies. By aligning their operations with environmental sustainability, these banks not only comply with regulatory requirements and societal expectations but also demonstrate a commitment to responsible business practices. This proactive approach can lead to a more stable financial environment, as stakeholders are more likely to support institutions that are seen as environmentally responsible and ethical, thereby reducing the likelihood of financial distress and NPLs.

Agency Theory provides another useful perspective on these findings. According to Agency Theory, conflicts can arise between shareholders (principals) and management (agents) due to differing objectives. High environmental performance might indicate that management is effectively aligning its goals with broader stakeholder interests, thus mitigating potential conflicts. By addressing environmental concerns, management may also be reducing the risk of regulatory penalties and enhancing the bank's overall operational efficiency. This alignment of interests can contribute to lower NPLs, as the bank’s strategic focus on sustainability may lead to more prudent lending practices and better risk management.

The results of this study align with previous research that emphasizes the relationship between environmental performance and banking outcomes. For example, Li et al. (2023) found a positive relationship between environmental, social, and governance (ESG) traits and the prevalence of non-performing loans, particularly highlighting the significance of environmental factors. Similarly, Ozili (2023) identified a positive correlation between non-performing loans and sustainable development levels, with implications for banking sectors in various regions. Gangi et al. (2019) further supported these findings by demonstrating a negative correlation between ecological sustainability and overall risk assessment. These studies underscore the multifaceted impact of environmental performance on banking

outcomes, suggesting that a robust environmental strategy not only aligns with ethical and regulatory expectations but also enhances financial stability and stakeholder trust.

The Influence of Social Performance on Non-Performing Loans in Banking Companies in ASEAN

The t-statistic for Social Performance Score (SPS) is 7.025129, with a p-value of 0.0000, which is significantly lower than the 0.05 threshold. This result leads us to reject the null hypothesis (H0) and accept the alternative hypothesis (Ha). The statistical significance indicates a meaningful positive effect of social performance on non-performing loans (NPLs) in ASEAN banking companies. Specifically, higher social performance scores are associated with a higher proportion of NPLs. This finding suggests a counterintuitive relationship where, despite improvements in social performance, banks may face an increased risk of loan defaults. Such an outcome implies that enhanced social engagement could be linked to increased financial risk or instability within these institutions.

Previous research provides context for this complex relationship between social performance and financial outcomes. For instance, Li et al. (2023) identified a positive correlation between ESG factors, particularly social performance, and the prevalence of NPLs in commercial banks. This implies that while banks with strong social performance might excel in stakeholder engagement and social responsibility, they could simultaneously face higher levels of non-performing loans. This may be due to the riskier nature of some social initiatives or the increased financial exposure associated with higher social investments. Similarly, Citterio and King (2023) noted that robust social performance might sometimes result in misclassifying financially troubled entities as stable, suggesting that social performance metrics could potentially obscure underlying financial vulnerabilities.

In alignment with Stakeholder Theory, the findings suggest that while social performance enhances stakeholder relations and bolsters a bank's reputation, it may also inadvertently increase financial risk. According to Stakeholder Theory, banks are expected to address the needs and interests of various stakeholders. However, if banks focus excessively on social performance at the expense of financial prudence, this could lead to higher NPLs. Thus, while improving social performance can strengthen stakeholder trust and support, it must be balanced with sound financial management to avoid exacerbating financial risks.

Agency Theory further explains these results by highlighting potential conflicts between management (agents) and shareholders (principals). Banks may invest in social initiatives to align with broader stakeholder expectations, but such investments might not always translate into financial stability. If management prioritizes social goals without adequately considering the associated financial risks, it could lead to an increase in NPLs, reflecting a misalignment of interests. Azmi, Hassan, Houston, and Karim (2021) suggest that while social initiatives can enhance stakeholder trust, the diminishing returns over time indicate that these initiatives need careful management. Thus, banks must balance social responsibilities with financial performance to maintain stakeholder trust while minimizing financial risks, ensuring that social performance does not inadvertently lead to increased loan defaults.

The influence of governance performance on non-performing loans in banking companies in ASEAN

The study reveals a significant negative relationship between governance performance and non-performing loans (NPLs) in ASEAN banking companies, evidenced by a t-statistic of -5.189172 and a p-value of 0.0000. This statistical significance allows us to reject the null hypothesis (H0) and affirm the alternative hypothesis (Ha), indicating that better governance

performance is associated with lower levels of NPLs. This finding underscores the importance of robust governance practices in banking operations. Strong governance performance is linked to improved risk management and financial stability, suggesting that banks with effective governance structures are better equipped to handle loan defaults and maintain healthier financial portfolios.

Previous research supports the critical role of governance in managing financial risks and influencing NPL levels. For example, Li et al. (2023) examined the relationship between Environmental, Social, and Governance (ESG) factors, focusing on governance, and found that strong governance practices are essential for mitigating financial risks. Their study underscores the importance of governance in ensuring sound banking operations and minimizing the incidence of NPLs. Similarly, Liu, Jin, and Nainar (2023) demonstrated that banks with high ESG ratings, which include strong governance metrics, tend to have fewer non-performing loans. This research highlights the comprehensive nature of ESG considerations and their positive impact on financial outcomes.

From the perspective of Stakeholder Theory, effective governance practices are crucial for aligning the interests of various stakeholders, including shareholders, employees, and customers. Banks that implement robust governance frameworks are better positioned to manage financial risks and enhance stakeholder trust. By ensuring transparency, accountability, and effective oversight, banks can mitigate the risk of non-performing loans and improve their overall financial health. This alignment with stakeholder interests not only helps in reducing NPLs but also strengthens the bank's reputation and operational efficiency.

Agency Theory further explains the findings by addressing potential conflicts between management (agents) and shareholders (principals). Effective governance helps bridge the gap between these groups by ensuring that management decisions align with the best interests of shareholders. Strong governance mechanisms, such as rigorous internal controls and transparent reporting, reduce the risk of financial mismanagement and unethical practices that could lead to higher NPLs. The study’s results, therefore, reinforce the idea that governance performance is critical in managing financial risks and ensuring that the interests of all stakeholders are adequately addressed.

Conclusion

In order to clarify whether bank risk is impacted by ESG (Environmental, Social, and Governance) issues, the research findings are provided. The following is the inference made from this research: (1) The research results indicate a notable inverse correlation between environmental performance and non-performing loans (NPLs) among banks operating in the ASEAN region. The findings suggest that there is a negative correlation between environmental ratings and non-performing loans (NPLs), indicating that banks with better environmental performance metrics are likely to have fewer occurrences of NPLs. This highlights the significance of considering environmental factors in banking operations, not only for the sake of financial stability but also for the purpose of sustainability. Prior studies have also corroborated this correlation, highlighting the wider importance of Environmental, Social, and Governance (ESG) variables in evaluating financial risk and performance in banking organizations. Banks can reduce financial risk and improve their ethical reputation by integrating environmental performance into their operational strategy. This can help restore trust among stakeholders. (2) The research results reveal a substantial inverse correlation between social performance and non-performing loans (NPLs) in banks across the ASEAN region. Specifically, the data indicates that higher social performance scores are associated with an increase in the levels of non-performing loans. This counterintuitive finding suggests that while banks may be enhancing their social performance, these improvements might coincide with a higher incidence of NPLs. This could be due to various

factors, such as increased risk-taking associated with extensive social initiatives or the possibility that banks with higher social performance are more prone to financial instability. And (3) the research results indicate a substantial inverse correlation between the performance of governance and the presence of non-performing loans (NPLs) in banks throughout the ASEAN area. Banks that have higher governance ratings tend to have lower levels of non-performing loans (NPLs), suggesting that banks with better governance performance measures are likely to have fewer cases of loans that are not being repaid. This highlights the crucial importance of governance considerations in banking operations, indicating that successful governance practices play a significant role in ensuring financial stability and effective risk management. Prior studies have also confirmed this correlation, highlighting the significance of Environmental, Social, and Governance (ESG) aspects, including governance, in reducing financial risks and guaranteeing robust banking operations.

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