The Impact of ESG Implementation on the Sovereign Bond Yield Spreads: An Empirical Analysis of ASEAN Countries

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ABSTRACT: Sovereign bond performance is gaining traction in ASEAN countries, but there are challenges, such as high sovereign risk. This can happen for a number of reasons, such as economic downturns, political instability, or ineffective fiscal management. Investors may be less willing to invest in a country's bonds if the country is perceived to have a high bond risk. By maintaining sustainable performance such as implementing ESG can be a solution for lowering risk and gaining investor interest in portfolio diversification. The aggregated ESG score and bond spread have a statistically significant relationship, according to the study's findings, with a negative relationship of -0.112 and the component social indicator being the most powerful. With a significance of 0.033, the relationship between ESG score and bond yield spread becomes stronger over time. The author recommends that countries assess current ESG practices, establish ESG targets and goals, develop an implementation plan, engage stakeholders, monitor progress, and make necessary changes to reduce sovereign risk. This demonstrates a country's commitment to ESG while also improving its performance, making it more appealing as an investment destination.

KEYWORDS: Sustainability performance, bond yield spread, ESG Score, ASEAN countries.

INTRODUCTION

A sovereign bond is a type of debt security issued by a government to raise money from investors. It is frequently used in developing countries to fund infrastructure projects, social programs, and other government initiatives. In comparison to developed countries, developing countries' sovereign bond markets are also small and illiquid. As a result, large quantities of sovereign bonds may be difficult to buy or sell in these markets, making them less appealing to investors [70]. Because of weaker economies, less developed financial markets, and higher levels of political and economic insecurity, sovereign bonds issued by developing countries can be riskier than those issued by developed countries. The Association of Southeast Asian Nations (ASEAN) is a regional organization comprised of developing nations such as Indonesia, Malaysia, Philippines, Thailand, and Vietnam. Some ASEAN countries have actively issued sovereign bonds in international capital markets to gain access to a broader pool of investors, diversify funding sources, and reduce reliance on domestic banks.

However, sovereign bond issuance varies significantly across the region, with ASEAN countries having fewer opportunities to raise funds through bond issuance due to high sovereign risk and investor interest. Implementing ESG can help a country reduce its sovereign risk while also encouraging investors to invest. In ASEAN countries, ESG criteria in sovereign bonds are still in their early stages, but they have gained traction in recent years. However, challenges remain in the implementation of ESG criteria, such as a lack of standardization, data availability, and investor awareness and understanding of ESG risks [71]. To address these issues, governments and investors should collaborate to improve data availability, strengthen the legal and regulatory framework, and encourage the adoption of international standards.

ESG factors can have a significant impact on a sovereign bond issuer's credit risk and long-term performance. There is a wealth of economic literature that investigates the interdependence of sovereign credit risk, economic development, environmental resources, social welfare, and governance [53]. Natural resources such as land, water, and minerals are critical for economic growth, but their depletion can harm the economy and increase the risk of sovereign debt. Social welfare and governance also have an impact on an economy's health, with good governance protecting human rights and the rule of law and bad governance causing social unrest. Depletion of natural resources can reduce economic growth, sovereign credit risk, and social welfare, creating a vicious circle. Governments must understand and address these interconnections in order to ensure long-term economic growth and development.

This research focuses on five ASEAN countries: Indonesia, Malaysia, the Philippines, Thailand, and Vietnam, with a focus on sovereign bonds in each country and how they implement ESG. The indicator over bonds yield spread, ESG index, GDP growth, inflation, fiscal condition, primary balance to GDP, current account, trade openness, liquidity ratio, corruption perception index, covid-19 effect, and research period from 2007 to 2021.

BACKGROUND

ASEAN countries, like any other, are vulnerable to sovereign risk, which is the risk that a government will be unable to meet its financial obligations or repay its debt. However, the level of sovereign risk varies across ASEAN countries and is influenced by a variety of factors such as economic stability, political stability, debt levels, and credit ratings. The performance of a country's ESG sectors in terms of sustainability can be used to assess sovereign risk. A country with a high ESG performance may be considered less risky because it is more likely to have a stable political and economic environment, as well as a functional legal system.

Furthermore, ESG-performers are more likely to have better governance, which may lead to less corruption and greater transparency, and thus less sovereign risk. Higher inflation rates, especially above a certain threshold, are associated with increased macroeconomic instability and are harmful to a country's creditworthiness.

Few researchers investigate the relationship between ESG performance and sovereign bond spreads. Some research stated that environmental and social information helps to assess the expected value and volatility of sovereign bond spreads in emerging markets According to [73], financial institutions should account for ecological dimensions because they can inform financial institutions and stakeholders about their societal and economic roles. While other research, environmental indicators may be an "early warning" system that can help predict a nation's financial collapse before conventional economic indicators [40]. The investigation of country risk and ratings reveals that sovereign bond spreads are sensitive to governance factors [21] [22]. Therefore, we hypothesize that a country with good ESG performance may have lower default risk and, hence, lower costs of debt.

H1. The higher ESG score of a country, the lower its sovereign bond spread

According to some research, combining distinct sustainability features to create a single monolithic construct dilutes the observable financial effects of unidimensional features [2] [67]. As a result, we want to directly link governance to sovereign bond spreads. We anticipate that if there is an impact, it will be visible in the governance dimension of ESG [16] [50]. While some research suggests that a firm's social performance can be beneficial to its financial performance in equity markets [6]. On the other hand, concerning the environmental dimension, the risks that this factor poses to firms and economic growth are well understood, and existing evidence supports the broader economic impact of climate change, pollution, loss of ecosystem services, large-scale environmental accidents, and so on. [11] [48]. Given the lack of theory and limited empirical evidence, a hypothesis about how each of environmental, social, and governance index affect bond spreads is proposed.

H2. The financial materiality of government factors is stronger than for social and environmental factors, which may have a greater influence on bond yield spreads.

According to some research, a 10% increase in the ESG score reduces sovereign bond spreads by 10.9% in the short run and 16.3% in the long run [80].

H3. The relationship between ESG score and sovereign bond yield spread is higher for the longer period

DATA

Country ESG Performance : ESG Index

ESG (Environmental, Social, and Governance) index are a popular way to evaluate sustainability performance. ESG index typically assess based on specific ESG criteria such as emissions reduction targets, labor practices, and governance structure, drawing on a variety of data sources such as company disclosures, publicly available data, and third-party data providers. There is a plethora of ESG index, each with their own methodology and focus. It is critical to carefully consider the methodology and criteria used when selecting an ESG index to use as a measure of sustainability performance. According to [26], in order to create the composite ESG index, rating agencies and asset managers generate reports. To capture the most recent issues such as climate change, human rights,

discrimination, and political contribution, the author decided to add one source from [17] as shown in table 1 ESG Dimension Analysis.

Table 1. ESG Dimension Analysis

Pillar	Measuring Items	Indicator	VIGEO	HBC AM	Natixis AM	MSCI ESG	Neuberger Berman	Bloomberg
Environment	Resource depletion	Forest area (% of land area)	x	x	x	x	x	x
	Waste disposal	Combustible renewables and waste (% of total energy)	x					x
	Climate change effect	Total greenhouse gas emissions (kt of CO_2 equivalent)						x
	Renewable energy	Renewable energy consumption (% of total final energy consumption)	x					x
	Carbon Emissions	PM2.5 air pollution, population exposed to levels exceeding WHO guideline value (% of total)	x	x	x	x		x
	Pollution	CO_2 emissions (metric tons per capita)	x	x	x	x		x
Social	Diversity	Life expectancy at birth, total (years)	x	x	x			x
	Human rights	Current health expenditure (% of GDP)		x	x	x		x

Pillar	Measuring Items	Indicator	VIGEO	HBC AM	Natixis AM	MSCI ESG	Neuberger Berman	Bloomberg
	Discrimination	Ratio of female to male labor force participation rate (%) (national estimate)						x
	Gender Equality	Gender Parity	x		x		x	x
	Community relations	Nonvulnerable employment, total (% of total employment) (modeled ILO estimate)	x	x	x			x
	Political contributions	Contributing family workers, total (% of total employment) (modeled ILO estimate)						x
	Control of Corruption	Control of Corruption	x					x
	Rule of Law	Rule of Law	x			x		x
	Voice and Accountability	Voice and Accountability	x				x	x
Governance	Government Effectiveness	Government Effectiveness	x					x
	Political Stability	Political Stability	x					x
	Regulatory Quality	Regulatory Quality	x					x

Sovereign Bond Yield Spread

Type of debt security issued by the government of a country. Bondholders lend money to the government in exchange for the government promising to repay the principal plus interest over a specified time period. These bonds are commonly used as a standard for other types of debt securities. Spreads are yield on sovereign bonds of the considered country minus yield on US sovereign bonds. [40] [63]

Control Variables

To attain objective, this research is included into correlational research. Correlational research is defined as research that finds the relation between certain variables to others. To obtain the data, purposive sampling is used as the type of sampling. Purposive

sampling can be defined as non-probability sampling technique when the researchers choose the sample based on their knowledge and purpose of the study. This research uses data from verified website and by library research to find theoretical foundation. Library research is finding theories that suitable to achieve objective in academic sources.

Table 2. Source of data

Variable Name	Code	Source
10-year sovereign spread	Spread (10YR)	Investing.com
ESG factor	ESG index	Sustainable Development Report
Environment Index	Refer to table 1	WDI
Social Index	Refer to table 1	WDI
Governance Index	Refer to table 1	WGI
GDP growth	GDP Growth=ΔGDP/GDP	IMF
Inflation rate	Inflation=ΔP/P	IMF
Fiscal Condition	$Fiscal\ Condition = \dfrac{Debt}{GDP}$	IMF
Primary balance to GDP ratio	$Primary\ balance\ to\ GDP\ ratio = \dfrac{PB}{GDP}$	IMF
Current account to GDP ratio	$Current\ Account = \dfrac{CA}{GDP}$	IMF
Trade Openness	$Openness\ Ratio = \dfrac{(X+M)}{GDP}$	WB
Reserve import	$Liquidity\ Ratio = \dfrac{Reserves}{Import}$	WB
Corruption Perception Index	Score of corruption	Transparency International

Model and Method

Principal Component Analysis (PCA)

PCA is a linear transformation method for identifying patterns and representing data in a way that emphasizes the most important features. It is used to visualize high-dimensional data in lower dimensions and decrease the number of features, making it easier to analyze and interpret. [53]

KMO and Barlett's Test

The Kaiser-Meyer-Olkin (KMO) measure is used to analyze the degree to which the fundamental indicators are correlated with one another, with a minimum KMO statistic of 0.6. [3] [78]

Data Panel Regression

Panel data regression is a regression data analysis using cross-sectional and time-series data to estimate both within-unit and between-unit effects.

The author uses this regression model by following the previous research done by [26], but then the author modified the model in order to answer the research question by adding variables such as corruption index and pandemic in order to adjust the situation of the object research. According to this object research, the majority of countries are developing countries, with corruption being a major challenge that may influence the bond yield spread. Because the time period of this object research is over the pandemic, there is a possibility that the impact of the Covid-19 pandemic will influence the bond yield spread.

$$y = \beta0 + \beta1 Yi_{t-1} + \beta2 ESG_{t-1} + \beta3\left(\frac{\Delta GDP}{GDP}\right)_{1.t} + \beta4\left(\frac{\Delta P}{P}\right)_{1.t} + \beta5\left(\frac{Debt}{GDP}\right)_{1.t} + \beta6\left(\frac{PB}{GDP}\right)_{1.t} + \beta7\left(\frac{CA}{GDP}\right)_{1.t}$$
$$+ \beta8\left(\frac{X+M}{GDP}\right)_{1.t} + \beta9\left(\frac{Reserves}{import}\right)_{1.t} + \beta10 Corruption\ index_{1.t} + \beta11 Pandemic_{1.t} + \varepsilon_{1.t}$$

Robustness

Robustness is the ability of a model, algorithm, or system to perform well in the presence of variations or uncertainties in the input data or parameters. In the context of econometrics, robustness can refer to an econometric model's resistance to outliers, measurement errors, and other types of data contamination. The Durbin-Watson test can be used to determine the presence of autocorrelation in regression model residuals. The test is carried out as follows: fit a regression model to data and calculate residuals. Determine the sum of squared residuals: to calculate the SSR, add the squared residuals from the regression model. Summing the squared differences of the consecutive residuals and dividing it by SSR. Explain the test statistic: 0 to <2 is positive autocorrelation (common in time series data). >2 to 4 is negative autocorrelation. [27] [38]

RESULT

Hypothesis 1 Analysis

The author then employs panel data regression analysis, which includes cross-section and time series data, with SPSS as the statistical tool. The main model in this study is based on the assumption of a constant slope with a variable intercept for each individual. Durbin Watson is used to test autocorrelation in residuals from a regression analysis.

Table 3. Result of Hypothesis 1

Variable	Sig.
(Constant)	.000
X1_Yield1yearbefore	.021
X2_ESG	.033
X3_GrowthGDP	.636
X4_Inflation	.647

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X5_FiscalCondition	.140
X6_PrimaryBalance	.854
X7_CurrentAccount	.620
X8_TradeOpenness	.050
X9_LiquidityRatio	.055
X10_CorruptionIndex	.074
X11_Pandemic	.322
DumPHI	.040
DumMYS	.598
DumTHA	.124
DumVIT	.727

Based on the table 3, it can be interpreted that there are three independent variables (X1_yield1before, X2_ESG and X8_TradeOpenness) that significance or does affect to the dependent variable (bond yield spread).

Based on the findings, the author can conclude that hypothesis 1 is accepted because there is a relationship between ESG score and bond yield spread. Table 4 shows the author's use of correlation to investigate the relationship between ESG score and bond yield spread. It has a -0.112 negative relationship. As a result, a higher ESG score corresponds to a lower sovereign bond spread and influences sovereign risk reduction.

Table 4. Correlation of Hypothesis 1

Correlations			
		Yield	*X2_ESG*
Yield	Pearson Correlation	1	-.112
	Sig. (2-tailed)		.000
	N	75	75
X2_ESG	Pearson Correlation	-.112	1
	Sig. (2-tailed)	.000	
	N	75	75

Hypothesis 2 Analysis

Following data generation from WDI and WGI, the author used principal component analysis with KMO and Bartlett's Test to produce the result shown below.

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Table 5. KMO and Bartlett's Test Hypothesis 2

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.654
Bartlett's Test of Sphericity	Approx. Chi-Square	1.638.315
	df	153
	Sig.	.000

Table 6. Rotated Component Analysis Hypothesis 2

Rotated Component Matrix	Component		
	1	**2**	**3**
E_ForestArea	.114	.676	.254
E_Combustible	-.850	.193	.125
E_GreenshouseEmission	-.038	.831	-.075
E_RenewableEnergy	-.800	.059	.029
E_Co2Emission	.229	.816	-.052
E_ControlAirPollution	-.452	.525	.466
S_LifeExpectanty	.213	.037	.905
S_HealthExpenditure	-.049	.191	.918
S_RatioMaletoFemale	-.011	-.360	.658
S_GenderParity	.053	-.054	.295
S_NonVulnerableEmployee	-.379	.028	.878
S_ContributingFamilyWorker	-.721	-.116	.479
G_ControlCorruption	.832	.447	-.027
G_RuleofLaw	.785	.499	.024
G_VoiceandAccountability	.316	-.532	.351
G_GovernmentEffectiveness	.896	.336	.044
G_PoliticalStability	.396	.262	-.158
G_RegulatoryQuality	.893	.073	.123

The rotated component matrix includes estimates of the correlation between each variable and its estimated components. In factor analysis, rotation is a standard step. It specifies a criterion for removing the indeterminacy inherent in factor analysis results. The rotation changes the factor loadings and, as a result, the interpretation of the factors, but the different factor analysis solutions are mathematically equivalent in that they explain the same portion of the sample variance. The varimax method is used to obtain factor rotation, which attempts to minimize the number of variables with high loadings (so-called salient loadings) on the same factor. This is a factorial axes transformation that allows us to approximate a "simple structure" of the factors, in which each indicator is "loaded" exclusively on one of the retained factors. This improves the interpretability of these variables.

1. The six variables Governance in component 1 have moderate to strong correlations.
2. The six variables Environment in component 2 have moderate to strong correlations.
3. The six variables Social in component 3 have moderate to strong correlations.

Table 7. Result of Hypothesis 2

	Sig.
(Constant)	.000
X1_Yield1yearbefore	.044
X2_Environment	.231
X2_Social	.000
X2_Governance	.133
X3_GrowthGDP	.096
X4_Inflation	.685
X5_FiscalCondition	.911
X6_PrimaryBalance	.984
X7_CurrentAccount	.645
X8_TradeOpeness	.008
X9_LiquidityRatio	.002
X10_CorruptionIndex	.263
X11_Pandemic	.020
DumPHI	.014
DumMYS	.892
DumTHA	.004
DumVIT	.986

Based on table 7, regarding the three dimensions having a heterogeneous impact on sovereign bond yield spread with the social indices is significance or does affect to the bond yield spread.

Hypothesis 3

The empirical evidence [25] indicates that there is a statistically significant relationship between the aggregated ESG score and bond spread. Based on table 8, the 10-year sovereign bond spread (Sig.0.033) is a better predictor of the dependent variable than the 1-year ESG score (Sig. 0.195).

Table 8. Result of Hypothesis 3

	1Y Bond Yield Spread	*10Y Bond Yield Spread*
(Constant)	.090	.000
X1_Yield1yearbefore	.007	.021
X2_ESG	.195	.033
X3_GrowthGDP	.378	.636
X4_Inflation	.391	.647
X5_FiscalCondition	.553	.140
X6_PrimaryBalance	.389	.854
X7_CurrentAccount	.219	.620
X8_TradeOpeness	.637	.050
X9_LiquidityRatio	.315	.055
X10_CorruptionIndex	.170	.074
X11_Pandemic	.188	.322
DumPHI	.134	.040
DumMYS	.847	.598
DumTHA	.912	.124
DumVIT	.818	.727

CONCLUSION

Hypothesis		Result
H1	The higher ESG score of a country, the lower its sovereign bond spread.	The ESG score has a significant impact on lowering the sovereign bond spread.

H2	The financial materiality of government factors is stronger than for social and environmental factors, which may have a greater influence on bond yield spreads.	In terms of influencing bond yield spreads, social index outperforms governance and environmental index.
H3	The relationship between ESG score and sovereign bond yield spread is higher for the long term.	ESG implementation has a greater impact on bond spreads over a longer time period.

ESG practices can help reduce sovereign risk by improving a country's reputation, increasing investor confidence, and promoting long-term economic growth. They can also reduce political and regulatory risks, as well as natural disaster and climate change risks. Countries can attract more investors, improve financial performance, and reduce risks by incorporating ESG into their policies, thereby contributing to economic growth and development. To reap long-term benefits, each country must recognize the potential benefits of sustainability and actively support its implementation.

The following steps may be included in a country's for implementing ESG to reduce sovereign risk:

1. Assess current ESG practices: The first step is to understand a country's current ESG practices. Internal audits, benchmarking against peer countries, and engagement with stakeholders such as investors, civil society organizations, and experts can all help.
2. Establish ESG targets and goals: Based on the assessment, the country should establish ESG targets and goals in order to improve its ESG performance. Specific targets for reducing greenhouse gas emissions, improving social outcomes, or strengthening governance practices can be included.
3. Create an implementation plan: The country should create a comprehensive plan for implementing its ESG goals and targets. This should include specific timetables, resource allocation, and actions to be taken.
4. Engage stakeholders: Effective ESG implementation necessitates collaboration with a wide range of stakeholders, including investors, civil society organizations, and the general public. The country should solicit feedback and input from these groups to ensure that its ESG strategy meets their needs and expectations.
5. Monitor and report on progress: It is critical to ensure accountability and transparency by regularly monitoring and reporting on the country's progress toward its ESG goals. This data can also be used to make necessary changes and improvements to the ESG plan.

By taking these steps, a country can demonstrate its commitment to ESG practices and improve its ESG performance, lowering sovereign risk and making it more appealing as an investment destination.

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