SUSTAINABILITY AND CREDIT SPREAD: EVIDENCE FROM LISTED COMPANIES IN ASEAN 4

BY

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ABSTRACT

This study aims to analyze the relationship between ESG score (including subcategory which are E, S and G pillars) with the credit spread of corporate bond in ASEAN 4 countries (Thailand, Malaysia, Philippines and Indonesia) which is the emerging market by using panel regression with fixed effect and confirm robustness test with 2SLS method and sensitivity analysis in country level. This study contains 2 type of bond which are conventional bond and Sukuk bond with time period in 2019 to 2023.

The study for conventional bond show ESG including E and S had significantly reduce the credit spread meaning that investor give premium to company that has more sustainability. However, when analyze on each country, that relationship only happen in Thailand, the others are not. For sukuk bond, found that ESG and the subcategory score have a negative trend on credit spread but it is not significant due to small sample size and it may be in early stage of ESG adoption.

Keywords: ESG score, Credit spread, Sukuk bond, Emerging Markets

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INTRODUCTION

As climate change and environmental problems impact the world, the public is increasingly focused on how to improve the environment to make it more livable. Consequently, companies whose business activities contribute to pollution problems must undergo significant changes. This shift is evident as regulators continue to control and enact more environmental control laws. As a result, corporations must transform themselves to expand their control in environmental, social, and governance (ESG) aspects, ensuring transparency, reducing pollution, and benefiting society.

In the past before the emerge of ESG investment, Derwall et al. (2005) provide evidence that investing in eco-efficiency companies—firms that have higher corporate social responsibility (CSR)—can lead to superior portfolio performance by measure through 1. Resource efficiency 2. Waste management 3. Environment impact 4. Innovation and Sustainability so the more eco-efficiency portfolio showed higher return which linked to next research, Eccles et al. (2014) also stated that high sustainability firms, which integrate environmental and social policies into their business, exhibit distinct governance and organizational processes. These processes contribute to superior long-term performance because they focus on long-term value creation.

In developed market such as European countries, which it is supported by European Central Bank announce it will be support the sustainable finance by accepting green bond as collateral which can implied the growing of institution backing for ESG theme or in Asia, Japan, Okimoto and Tokaoka (2024) find that ESG scores have impacts on firms credit spread that lead to lower cost of funding especially for the companies that has lower credit rating which they might have pool risk management so it can imply that companies with higher ESG score have more sustainability and also lower default risk. It also can link to environment that affect global warming which is important factor that in the ESG pillars that the market like to evaluate the most instead of governance or social pillars.

Likewise, in emerging market, ESG investment is increasingly gaining attraction by rising of awareness of environment, social challenge that from the regulator. Budiarto and Nainggolan (2023) use the data in ASEAN 5 (Thailand, Indonesia, Malaysia, Philippines and Vietnam) to examine whether ESG scores have impacts on sovereign bond yield spread or not. They find that ESG scores has a negative correlation with sovereign bond and the better ESG scores, the better country's attractiveness for investors but there is limited research conduct on firm level on ASEAN country and limited research on Sukuk bond relationship with ESG pillar. Unlike government bond, corporate bond will subject to credit risk, financial or governance transparency which might react differently from government and Sukuk might be too so this study seeks to fill these gaps by answering the question on examining 1. how ESG score (including the subcategory in E, S, and G pillars) helps reduce the credit spread of firm and 2. whether Sukuk bond yield also reflect the ESG score of the firm compare to conventional bond to provide new insight in emerging market.

To address these gaps, this study will focus on ASEAN countries which are Thailand, Malaysia, Indonesia and Philippines for several reasons. Firstly, these countries are having economic significant emerging market in ASEAN countries. Secondly, its economic are similarly structure that depend on service sector mostly then manufacturing and agriculture sectors (see Figure 1.1 – 1.4). Thirdly, ESG on these countries are developing providing us the context to observe the impact of awareness on ESG to credit spread of bond and forth, it also driven by data availability, these 4 countries are classified in financial indies which are MSCI emerging market (see Figure 1.5). The others which are Vietnam which still in frontier and others such as Brunei, Myanmar, Cambodia and Laos are classified outside emerging market and will address the financing of the firm on type of bond those are conventional and Sukuk.

The objective of the study is, firstly, examine whether higher ESG score narrowed the credit spread. Secondly, the subcategory effect of ESG pillar on dimension of credit spread and thirdly, identified whether issuance of Sukuk have the impact of ESG in it like conventional or not. All of this will be use to answer by the regression analysis to estimate the coefficient to test the hypothesis.

Figure 1.1

Thailand GDP contribute

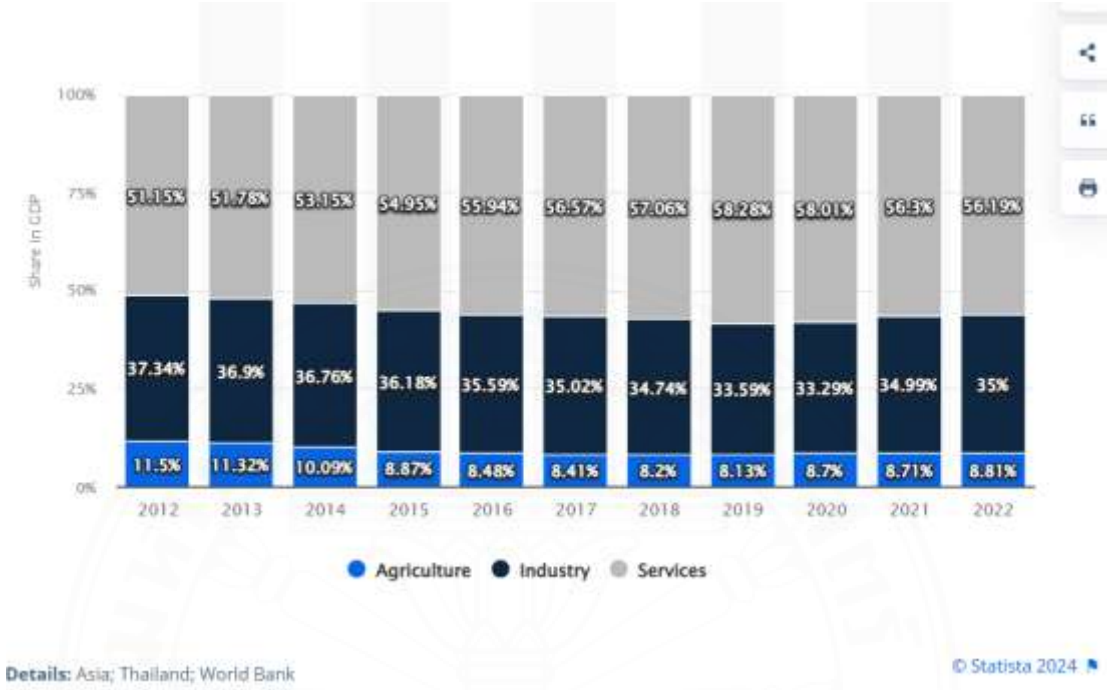


Figure 1.2

Malaysia GDP contribute

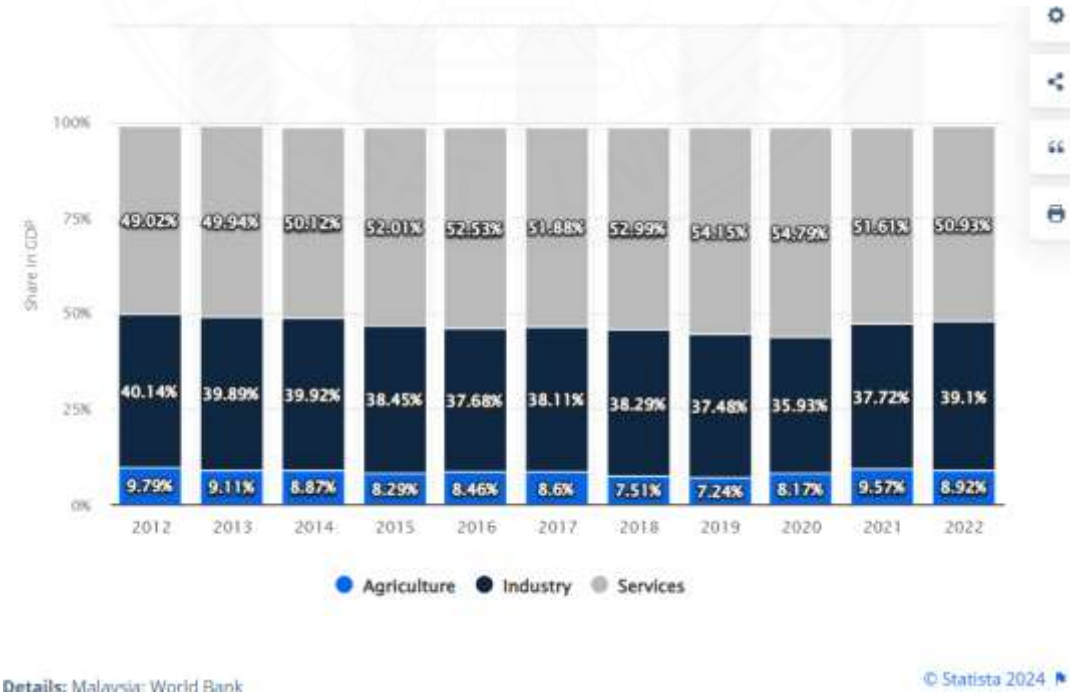


Figure 1.3

Philippines GDP contribute

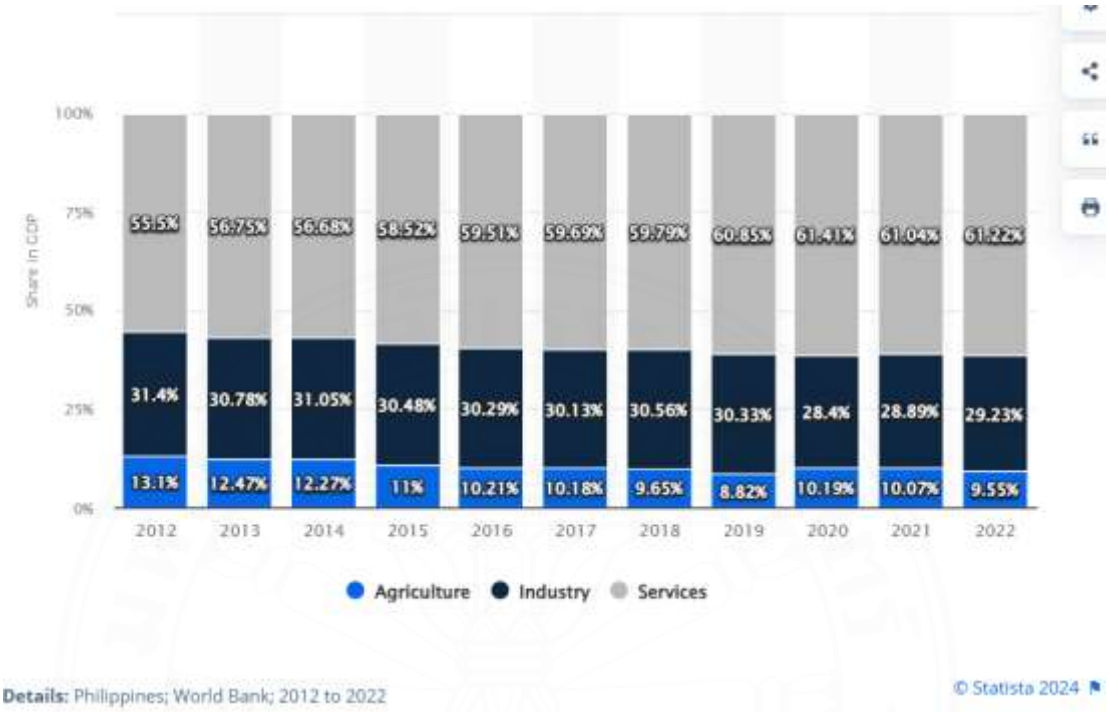


Figure 1.4

Indonesia GDP contribute

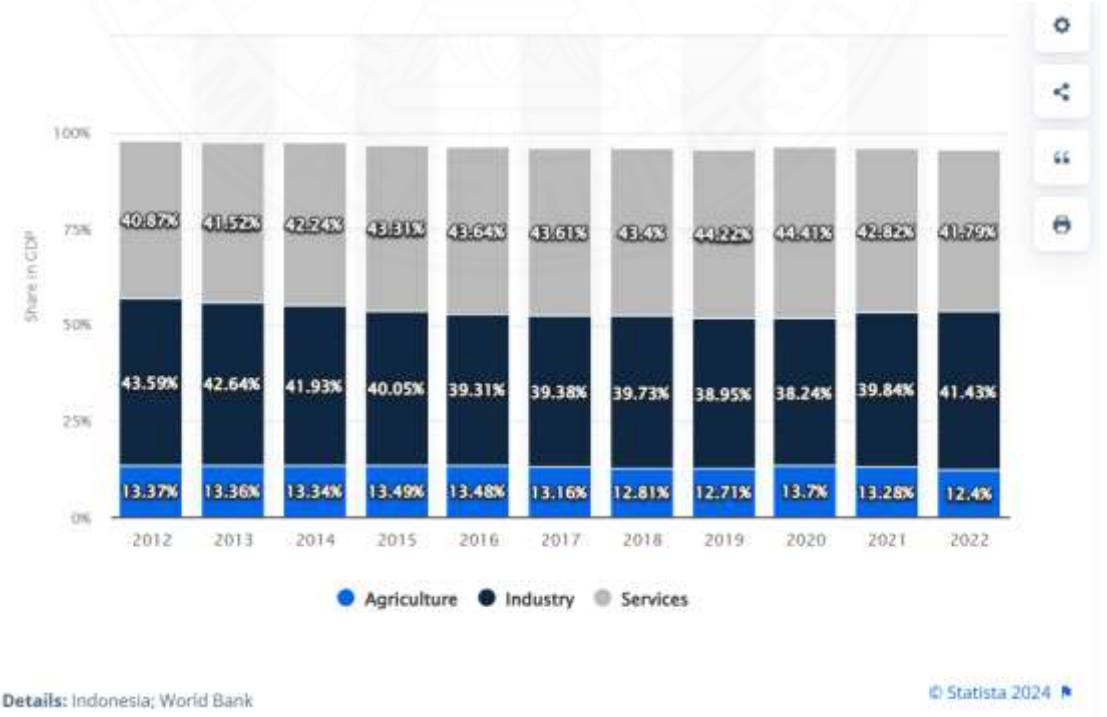
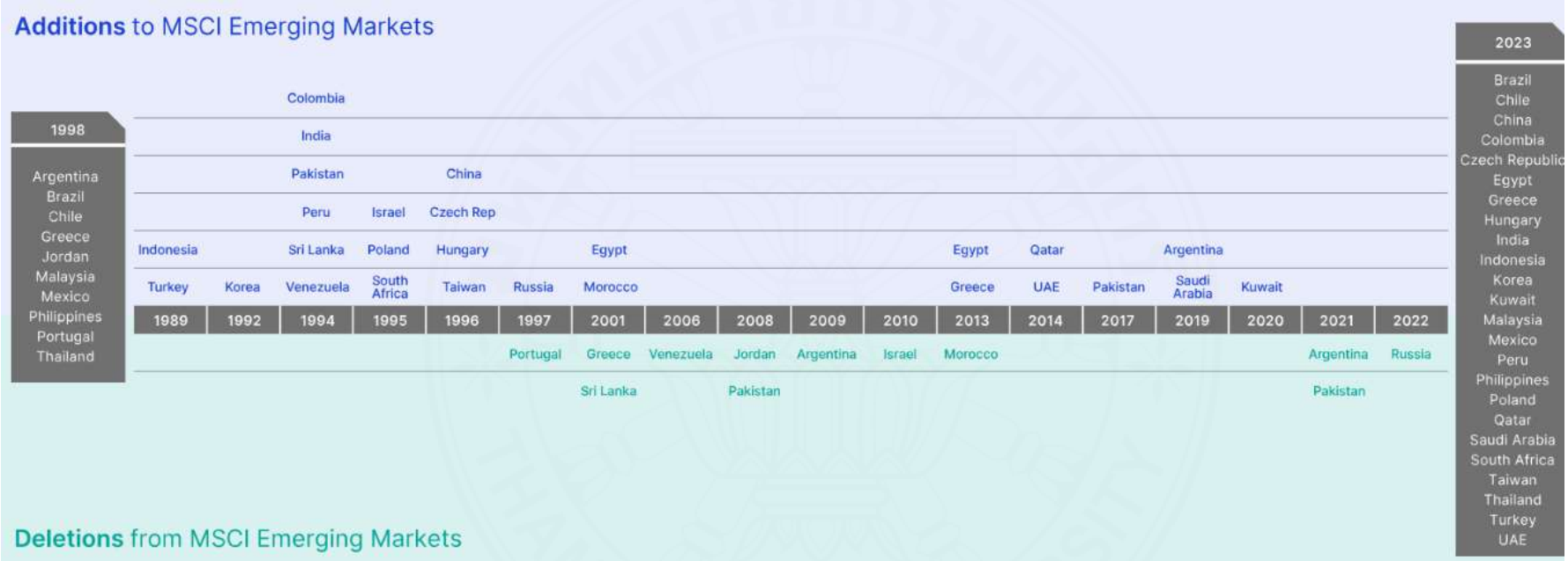


Figure 1.5

MSCI Emerging Market



CHAPTER 2
REVIEW OF LITERATURE

2.1 Theoretical Foundation

2.1.1 Stakeholder Theory, CSR Theory and ESG Relevance

The development of ESG investment theme beginning with the Stakeholder theory, Freeman (2010) provides the concept of the stakeholder, it is about addressing interest of all group who has been affect by the company such as shareholders, employees, customers, suppliers and communities. They state that it is about balancing the relationship of this group for long term goal by integrating this into company strategies. It is about the sustainability as the outcome of enduring the relationship with stakeholder and can be linked to the concept of competitive advantage or performance. Then the concept of Corporate social responsibility (CSR) emerges, it is business practices that for social or environmental but not required by the regulation, CSR quite the philosophy of corporate responsibility to act follow the stakeholder's theory, next, the emerging from ESG investment score to systematic evaluate and can be comparable across company. The study from Kumar (2023) finds that firms' ESG scores are correlated with stakeholder valuation by environment build trust in the sustainability, social help enhance corporate acceptance and government help stakeholders trust which help us reinforce the correlation between stakeholder theory and ESG score. In the terms of corporate sustainability performance can be measured by growth of the company can be express through ESG, it is an open concept for example the pioneer research it is an interconnected pillars of economic, environmental and social. The SDGs (the United Nations Sustainable Development Goals) offer several goals that can be described by ESG as the lens of investor so it can use ESG to measure in company long term growth in the lens of investors from this, can be link to Glavič and Lukman (2007) sought to clarify meanings particular emphasis to environment engineering field. Sustainability system introduces interconnections between environmental protection, economic performance and social welfare, guided by a political will, and ethical and ecological imperatives and consistent with Di Simone

et al. (2022), find the positive association between economic sustainability of environmental, social and governance but with different impact, especially for social, they suggest that firms should pay attention to this.

2.1.1.1 ESG theory

Many research suggests that company that has high ESG score will be reward by the narrowing cost of debt which we can measure on credit spread which help reduce financial distress.

ESG which stand for "Environmental, Social and Governance". Zhou et al. (2022) is considered an indicator technique adopted to capture firm's performance in various area of social responsibility. It has been spreading to companies, regulators and investors around the world such as investment theme or a law that force companies to make themselves more sustainability and provide less pollution. Each component can be explained below.

For ESG score, most paper find that higher ESG score help reduce credit spread. For example, Okimoto and Takaoka (2024) find that ESG score has significant reduce Japan 's Firm credit spread. In emerging market Low et al. (2025) find that ESG scores negatively correlate with yield spreads in conventional bonds.

(1) Environment

which measures through the carbon dioxide that the companies generate from their operation by employee or whole corporate and it also include paper, water or consumption wasting. In this paper, which is from Refinitiv, we will use the metric emission, innovation and resource use to represent environmental. Gerged et al. (2021) state that Environment responsibility also records the ability of company to improve it ecosystem, reduce environment cost in unit of output value so that mean this factor may help improving operation. Now, look through the numerical impact, Priem and Gabellone (2024) find that it is true that higher ESG score tend to have lower cost of capital, but this relationship only exists when firms domiciled in countries with a weaker legal environment also social factors too while the governance factor positively impacts the cost of capital by allowing to borrow more.

Bauer and Hann (2010) state that legal, reputational and regulatory risk might increase default risk which mean firm with pool environment practice subject to the likelihood of financial distress but this research is conduct in US

which might vary when compare with emerging market, however, we see that regulator or stakeholder weight on that. However, Chava (2014) find the evidence that if firm has high environment concern, the higher interest rate from bank so this is the penalty but when firm has environment strength high, good behavior, there is no reward which mean market only react to bad news which is research are conduct on US database only though it is the evidence from bank lending instead of bond market.

All in all, E pillar has mix finding from who find it has significant relationship that mention previously to who find it insignificant such as Okimoto and Takaoka (2024), also with Low et al. (2025), these two research use fixed effect model to find relationship.

(2) Social

which measure through the responsibilities of companies through the stakeholders such as the fair payroll, safety standards or Health standards, Action with the communities and or customer satisfaction so from this factor if companies can behave themselves in these rules without annoy so it will lead to more smoothing operation. In this paper, which from Refinitiv, we will use the metric Human right, product responsibility, workforce and community to represent social.

Despite several research find that S is significant but Khanchel and Lassoued (2022) find that if the firms do more social it will increase cost of capital because investor see it as hidden costs linked to Agency theory that Social activity might disagree with shareholders benefit. So S pillar has mixed finding when compare with the paper that S significant help reduce credit spread like Low et al. (2025) that S reflect the social responsibility. In context of Japan market, Okimoto and Takaoka (2024) show that the S pillar significantly reduces credit spreads, so investor give value on stability and labor relationship and also Amiraslani et al. (2023), find S pillar help too because it like insurance to reduce moral hazard and firm that do social activity are less likely to face default.

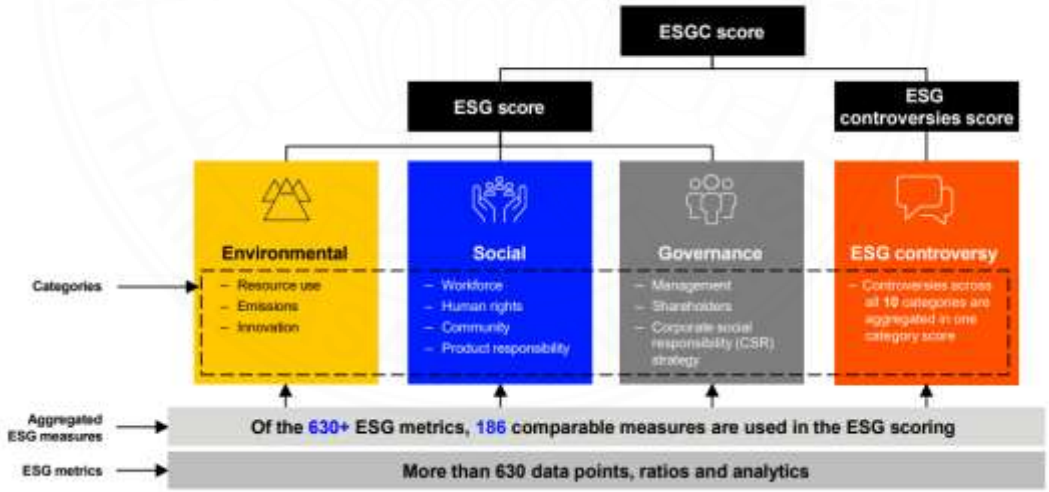
(3) Governance

which is measure through the transparency in operating business including anti-corruption to make sure that all of stakeholder have all benefit without being annoyed by the culture of working, structure of the board, policy or rules. In this paper, which from Refinitiv, we will use the metric management, Shareholders

and CSR strategy to represent Governance. Razak et al. (2023) provide the empirical study that governance pillar is the most significant ESG component that can reduce credit risk, they use CDS to do the research so that mean this pillar increase investor confidence and lowering the probability of default and link to stakeholder that good governance fosters trust and creditworthiness which consistent with Bradley et al. (2008), point that company that have the better corporate governance can lower credit risk but this study focus on bond yield and credit rating rather than spread. Nevertheless, not all study point agree to that effect such as Okimoto and Takaoka (2024), they also found that the impact of G pillar and number of PRI (which refers to the organizations committed to the UN-supported Principles for Responsible Investment) signatories is significant which PRI signatories represent the awareness of ESG so this may due to the early stage of the adoption in ESG investing awareness in each country.

Figure 2.1

ESG score in Refinitiv



2.2 Evidence from Developed market

Okimoto and Tokaoka (2024) found that the corporate bond credit in Japan, ESG scores can decrease the credit spread and they also found that ESG scores would have more implications on the low rating companies, it can lead to the conclusion that the more ESG scores, the more sustainability the companies have. So higher ESG score

implied the ability of companies to manage risk so it will lower the likelihood that could negative for company's financial stability and higher ESG also affect the reputation of the company and build reliability to invest in a company's bond that it is stable and can pay the liability back in the future with its cash flow.

Capelle-Blancard et al. (2023) investigate the effect of ESG performance on sovereign bond spreads and find that ESG performance is relevance with narrowing sovereign bond spread in Eurozone because it can represent the stability of the country since 2008 that the market gives important to creditability.

Similarly to Li et al. (2024) investigate the effect of ESG score on Corporate bond in United states from 2010 to 2020, find that ESG performance is significant relevant with lower credit spread because investor value ESG implement.

2.3 Evidence from Emerging market

Several studies have investigated the role of ESG in reducing the cost of debt in emerging markets, where information asymmetry tends to be more severe than in developed economies.

Yang et al. (2021), find the effect of ESG disclosure on corporate bond in secondary market in China, they use panel data to analyses it and found that disclosure of ESG can help reduce credit spread so the result support that ESG help mitigate information asymmetry which improving investor confidence.

Jang and Lee (2020), they study the impact of ESG in Korean corporate bond market and found that ESG score, especially E pillars help reduce cost of debt especially in small firm so this finding support ESG as a non-financial indicator that can capture credit risk and also found that ESG can reduce credit spread in Korea, especially in small firms.

Lavin and Montecinos-Pearce (2022) has examine the relationship of ESG and cost of debt financing in emerging market (Chilean), find that greater ESG disclosure is associated with a significantly lower cost of debt, aligning with the view that enhanced transparency reduces information asymmetries and agency costs but they highlight that this is not the same for all firm, such as the growth firm if disclose may

see the risk from future expansion might cause the higher cost of debt and in emerging market where information might be asymmetric.

All in all, these studies provide evidence that ESG can help reduce the credit spread in emerging market, investor can use it with the traditional financial number and ESG also help reduce information asymmetry in investment.

2.4 Sukuk and ESG

2.4.1 Definition of Sukuk

Islamic law (Shari'ah) prohibits charging interest rate. The Accounting and Auditing Organization for Islamic Financial institutions (AAOIFI) in Shari'ah Standard no.17 provide explanation on the "investment sukuk" as "certificates of equal value representing udivided share in ownership of tangible assets, usufruct, and services or (in the ownership of) the assets of particular projects or special investment activity". Sukuk must link the return and cash flows from financing asset that purchase because trading in Islamic is prohibited.

2.4.1.1 Ijarah Sukuk

The issuer transfers assets to special vehicle purpose (SVP) at fixed price then SVP will issue sukuk to investor at par, the holder get interest on SPV asset for the year till the lease end.

2.4.1.2 Musharakah Sukuk

The originator and SVP enter to the musharakah agreement for specific period and profit-sharing ratio.

2.4.1.3 Mudarabah Sukuk

Based on a lawful Mudarabah contract with capital provider and labor and share of profit are determined, it gives the owner the right to receive capital at the time that sukuk are surrender.

2.4.1.4 Murabaha Sukuk

Issue for the purpose of financing the purchase of goods through Murabaha so holders become owner of Murabaha commodity.

2.4.1.5 Salam Sukuk

The business wishes to produce goods, so they issue bonds and promise to deliver future goods/commodities. This bond is created and sold by SPV.

From Fadzli (2024), find that there has been the intersect between sustainable finance and fixed income markets from growing ESG then the study emphasizes the emergence of green sukuk and sustainability liked sukuk that align with global environmental and social objective. However, the paper of Fadzli (2024) does not provide empirical analysis on ESG's effect on Sukuk bond credit spread, only conceptually. The country like Malaysia and Indonesia are leading issuers of sukuk bond and Low et al. (2025) do the study between Sukuk bond and Conventional bond from Malaysia, Indonesia, Saudi Arabia, the UAE, and Turkey between 2008 and 2022. The result tells that E pillar has positive sign but not significant, S tell negative sign with significant and G and ESG and negative sign with G only significant at $P<0.1$ but ESG is not.

To compare Sukuk bond with Conventional bond, Sukuk will be different in term of the structure and principal in Islamic finance that it has to link the cash flow and return from financing asset that purchase because trading and charging interest rate are prohibited in Islamic law (Shari'ah) while the conventional bond is the debt obligation with fixed interest rate and this principal align with the ESG concept in Social such as S is linked to religious values such as fairness to workers, transparency and it linked to credibility which in Sukuk emphasizes ethical finance so investors give premium to this from Low et al. (2025).

However, while there is growing literature on ESG and credit spreads in developed markets, empirical research in emerging markets remains limited and fragmented. Even fewer studies focus on Islamic finance instruments like Sukuk that investor might value it differently, despite their growing market share and the sub category of E, S and G pillars are limited. This study seeks to fill that gap that Institution or investor might value this non-financial number to price the corporate bond yield by 1.Do the sub category of ESG pillar in ASEAN -4 Country and 2.Examine the effect of ESG score on Sukuk bond in ASEAN.

H1: Higher ESG scores help lower credit spreads in EM corporate bonds.

H2: Each ESG component (E, S, G) help reduce effect on credit spreads in EM corporate bonds.

H3: ESG scores influence Sukuk by reducing credit spreads in EM.

CHAPTER 3
RESEARCH METHODOLOGY

3.1 Model specifications

To see whether doing ESG help Hedging the risk or not we can follow Okimoto and Tokaoka (2024) to capture the effect:

For Pool Regression

$$Credit\ spread_{it} = \delta Escore_{it} + \gamma Controls_{it} + \beta Macro_t + \mu_i + \theta_t + v_i + \varepsilon_{it} \quad \dots (1)$$

$$Credit\ spread_{it} = \delta Sscore_{it} + \gamma Controls_{it} + \beta Macro_t + \mu_i + \theta_t + v_i + \varepsilon_{it} \quad \dots (2)$$

$$Credit\ spread_{it} = \delta Gscore_{it} + \gamma Controls_{it} + \beta Macro_t + \mu_i + \theta_t + v_i + \varepsilon_{it} \dots (3)$$

$$Credit\ spread_{it} = \delta ESGscore_{it} + \gamma Controls_{it} + \beta Macro_t + \mu_i + \theta_t + v_i + \varepsilon_{it} \dots (4)$$

For Country-Level Regression

$$Credit\ spread_{it} = \delta Escore_{it} + \gamma Controls_{it} + \beta Macro_t + \mu_i + \theta_t + \varepsilon_{it} \quad \dots (5)$$

$$Credit\ spread_{it} = \delta Sscore_{it} + \gamma Controls_{it} + \beta Macro_t + \mu_i + \theta_t + \varepsilon_{it} \quad \dots (6)$$

$$Credit\ spread_{it} = \delta Gscore_{it} + \gamma Controls_{it} + \beta Macro_t + \mu_i + \theta_t + \varepsilon_{it} \dots (7)$$

$$Credit\ spread_{it} = \delta ESGscore_{it} + \gamma Controls_{it} + \beta Macro_t + \mu_i + \theta_t + \varepsilon_{it} \dots (8)$$

We use linear functional form because

1. It is easy to interpret the result of the relationship between ESG performance and credit spread.

2. It supports fixed effects to do unbalanced panel to avoid bias from firms such as its strategy or governance style.

3. It is corresponding with hypothesis that to do whether ESG score (and also E, S and G pillars) helps hedging risk or not by seeing the relationship with credit spread while other variables are constant.

Okimoto and Tokaoka (2024) use ESG score base on which one is higher correlation in ESG, environmental, social, governance.

The macro variables following Wu and Zhang (2008) and the control variable based on company fundamentals such as financial based on company risk

characteristic performance which may affect bond credit spread. We include it into the equation the year-on-year change in GDP, the inflation rate (CPI), and the change in stock market index. These factors are the effect from economic condition which might affect bond spread.

Wu and Zhang (2008) find that Positive inflation shock relevant to the higher treasury yield which might narrowing the credit spread. For GDP growth, it increases treasury yield in short maturity more than long maturity, for credit spread is positive for high rating but negative for low rating. Lastly, market volatility tells us the limited impact on risk free but tend to increase credit spread. We include it to control the effect of ESG score not to confuse with macroeconomic factors.

The control variables such as EBIT Margin, Debt to Capital etc., we include it follow Okimoto and Tokaoka (2024) that use prior literature from Stellner et al. (2015) which these variables can expect to influence credit risk so to exclude them to see clear effect of ESG score to credit spread.

From the above explanation, the model will contain fixed effects which are v_i is the Fixed effect countries, θ_t is time fixed effect and μ_i is industry fixed effect. The δ represents whether ESG score driving or help reducing the credit spread. Then we will do sensitivity analysis by doing Country level analysis to see robustness of result.

3.2 Data description

This study aims to analyze the yearly data from 2019 to 2023 across the ASEAN 4 (Thailand, Malaysia, Indonesia and Philippines). The selection of firms based on data available on DataEikon and the firms must have one bond available data and ESG score available in these periods.

3.2.1 Dependent Variable

The dependent variable of this study is the credit spread which represents the additional return that investors require to compensate the risk they have to bear such as liquidity risk, default risk, inflation risk. Elton et al. (2001) provides the concept of Credit spread is the spread between corporate and government bond which

differs across the bond classes from expected default loss, tax premium and risk premium

The credit spread across the 4 countries may vary due to central bank policy interest rate which refers to risk free rate. Credit spread will be calculated from the following formula:

$$S_{imt}[k] = y_{imt}[k] - y^{f}{}_{imt}[k]$$

The credit spread in this paper, the equation is yield of corporate bond k with maturity m at year t minus the government bond yield with the same maturity at time t. the higher credit spread, the more higher default risk which can tell the cost of funding of the company.

$S_{imt}[k]$ is the credit spread for corporate bond k with maturity m issue by firm I at time t.

$y_{imt}[k]$ is the credit spread for corporate bond k with maturity m issue by firm I at time t.

$y^{f}{}_{imt}[k]$ is the corresponding government bond yield of the thereafter same maturity at time t.

In case of the company have so many bonds, we will find the average of its credit spread by this formula:

$$CS_{jt} = \frac{1}{N_{it}} \sum_{k} S_{it}[k]$$

CS_{jt} is the credit spread at the end of year.

N_{it} is the credit spread at the end of year.

So, this equation will give us the arithmetic average of credit spread at the year end. The method will have to eliminate extreme observations with credit spreads greater than 2000 basis and below zero basis point to avoid negative credit spread which are economically nonsensical.

3.2.2 Independent Variables

The data in this research would be ASEAN 4 bond pricing that must include the information about coupon, yield to maturity, issue and redemption date. we have to use the financial number that contain the risk from Stellner et al. (2015) such

as revenue growth, EBIT margin, ROIC, and capex expenditure. So, all these data, we can obtain them from Thomson Reuters Eikon.

For the ESG information, we obtain them from Refinitiv (Thomson Reuters) or Bloomberg, MSCI so we will cover the score through 10 metrics which are emission, innovation, resource use, CSR strategy, management, shareholders, community, human rights, product responsibility and workforce from the DataStream.

Wu and Zhang (2008) find that the macroeconomic factor can impact bond price too so the factors that they find are inflation, GDP and market volatility which is on the market of that country that represents such as SET for Thailand. For Macro variable from the research will contain of:

1. Change in GDP
2. Change in CPI and
3. Change in Market index.

The macroeconomic factors, Wu and Zhang (2008) find that positive inflation shocks increase treasury yields which is strong great, for credit spread are smaller and decline with lower rating, Positive shock on real output increase treasury yield in short maturity more than long maturity, for credit spread is positive for high rating but negative for low rating. For market volatilities only have a small impact on treasury yield but have the strong positive on credit spread.

To evaluate control variable, the higher revenue should reflect the credit spread to go down. Debt to Capital, the more leverage such as lower EBITDA/interest expense ratio or have high debt structure the more default risk, Capex to revenue may be led to lower spread because it means company has the free cash flow left to reinvest to make more profit which will lead to higher ROIC in the future. And there is also much research examine the relationship between credit spread and equity index. They found that the higher volatility will lower rating and higher credit spread.

Table 3.1

Factors Used in Analysis

Variable	Definition	Measurement	Source	Sign	Citation
ESG Score which can separate 4 part: ESG, E,S,G	It's a framework used to evaluate the sustainability and ethical impact of an investment.	Measure through the matrix in Fig 1 and then rank as the percentile.	Thomson Reuters Eikon	-	Okimoto and Tokaoka (2024)
Ln (Revenue)	Money that the business has the right to collect from its operation.	Collect from financial report of company depend on how company recognize revenue.	Company financial report, Thomson Reuters Eikon	+	Okimoto and Tokaoka (2024)
EBIT Margin	Profitability ratio	Earnings before interest and tax divide by total revenue.	Company financial report, Thomson Reuters Eikon	-	Stellner et al. (2015)
Debt/Capital	Measurement of company's financial leverage	Interest bearing debt divide by invested capital	Company financial report, Thomson Reuters Eikon	+	Stellner et al. (2015)

Table 3.1

Factors Used in Analysis (Cont.)

Variable	Definition	Measurement	Source	Sign	Citation
Capex/Revenue	Measurement of how much company spending for fixed asset compare with revenue.	Capex paid for fixed assets divide by revenue	Company financial report, Thomson Reuters Eikon	-	Stellner et al. (2015)
ROIC	Measure how company allocate its resource to make profit.	Net Operating profit after tax divide by Invested capital	Company financial report, Thomson Reuters Eikon	-	Stellner et al. (2015)
Price volatility	Measure how price fluctuate.	Stock price volatility (year-on-year)	Thomson Reuters Eikon	+	Stellner et al. (2015)
$\Delta\, GDP$	Measure the average change in the price of all goods and service produced by the domestic economy.	The real output growth (year-on-year) of gross domestic product	Official Government Sources or International Organization such as IMF, World bank	+	Wu and Zhang (2008)

Table 3.1

Factors Used in Analysis (Cont.)

Variable	Definition	Measurement	Source	Sign	Citation
$\Delta\, CPI$	The average change in price of a basket of goods and services bought by a typical urban household.	The growth rate (year-on-year) of consumer price index	Official Government Sources or International Organization such as IMF, World bank	+	Wu and Zhang (2008)
$\Delta\, Market\ index$	Measure economywide business risk and financial leverage.	The percent change in Market index (year-on-year)	Thomson Reuters Eikon	+	Wu and Zhang (2008)

3.3 Estimation method

3.3.1 Ordinary least squares (OLS)

The assumption of OLS is

1. Linear regression model
2. x_i is assumed to be nonstochastic
3. Zero mean value of disturbance ε_{it}
4. Homoscedasticity or equal variance of ε_{it}
5. No autocorrelation between the disturbance
6. Zero covariance between the ε_{it} and x_i
7. Observations are greater than parameters
8. Variability in x_i values
9. Regression model is correctly specified
10. No perfect multicollinearity
11. Normal distribution

This study aims to use Ordinary least squares (OLS) regression to analyze the impact of ESG score (separate into 4 parts) on corporate bond credit spreads for simplicity since the coefficient that obtain from the regression can be used to interpret directly about the relationship between ESG and credit spread because of we use linear relationship. The panel will be firm-year include the firm fixed effects to control firm specific unobserved factors that will not cause the biased and reduce omitted variables. Nevertheless, only using OLS might cause the problem call endogeneity problem.

3.3.2 Instruments and 2SLS

This study aims to use Instrumental variables (IV) within a two stage least square (2SLS) to solve the endogeneity problem which may be cause the biased of the result from ordinary least square method and 2SLS also don't correlate with the error term and 2SLS also consistent and asymptotically efficient.

2SLS is used

1. Exactly identified systems

Enough instruments (external variables) to deal with the endogeneity problem.

2. Over identified systems

More instruments than necessary can robustness if they are valid.

2SLS will inclusion of OLS and Instrument variables

1. Estimate the reduce form model which will predict as $\hat{Y}$

2. Use $\hat{Y}$ as an instrument variable which will free from endogeneity problem.

We use the Instrument variable (IV) following the methodology of Okimoto and Takaoka (2024), which using the average of ESG score of the firm in the same industry, year and within each country. So, this instrument variable expects to correlate with firm ‘s ESG score but do not affect the credit spread and this method also align with Jiraporn et al. (2014), that they use CSR average of the peer companies in the same zip code as their instrument variable to solve the endogeneity problem to see the effect of CSR on credit rating.

3.4 Robustness Test

To ensure the robustness baseline we do

3.4.1 Instruments and 2SLS

This is to address potential endogeneity problem to ensure that the coefficient we get capture the true impact.

3.4.2 Country-level regression

By separately estimate by country in samples (Thailand, Philippines, Malaysia and Indonesia) because in each country it may different in policy and adoption of ESG, investor awareness, transparency and the disclosure so it may not generalize.

CHAPTER 4
RESULT

4.1 Descriptive statistics

Table 4.1 present the descriptive statistics for the study, across the ASEAN country which is Thailand, Philippine, Indonesia and Malaysia under the conventional bond type. ESG disclose the average scoring 62.08, separating pillar as E scoring 59.53, S scoring 68.39 and G scoring 57.53. However, E has the minimum value at 0

For the control variables, Ln (Revenue) average 21.70, EBIT margin average 0.21, Debt/Capital average 0.49, Capex/Revenue average 0.12, ROIC average 0.07, Price volatility average 0.017, Δ GDP average 0.025, Δ CPI average 0.02, Δ Market index average -0.018.

Table 4.1

Descriptive statistics of the variables in study under conventional bond

Stats	N	Mean	S.D.	Min	Max
Credit spreads	271	118.4303	70.92855	2.48	442.5
ESG	271	62.07841	16.35967	22.93	91.35
E	271	59.52506	23.79248	0	97.01
S	271	68.38716	18.76762	19.96	96.35
G	271	57.52738	21.52148	14.2	94.99
Ln (Revenue)	271	21.70317	2.923972	14.65	28.21
EBIT Margin	271	.2118081	.2185729	-1.35	0.7
Debt/Capital	271	.485941	.172478	0.01	0.85
Capex/Revenue	271	.1195203	.1563855	0.01	1.58
ROIC	271	.0690037	.0592118	-0.22	0.27
Price Volatility	271	.0166421	.3134211	-0.62	2.55
Δ GDP	271	.0249815	.0216175	-0.01	0.06
Δ CPI	271	.0205535	.0442642	-0.1	0.09
Δ Market index	271	-.0182657	.0813289	-0.18	0.13

Table 4.2 present the descriptive statistics for the study, across the ASEAN country which is Thailand, Philippine, Indonesia and Malaysia under the Sukuk bond type. ESG disclose the average scoring 62.91, separating pillar as E scoring 63.43, S scoring 66.49 and G scoring 64.95.

For the control variables, Ln (Revenue) average 19.74, EBIT margin average 0.20, Debt/Capital average 0.45, Capex/Revenue average 0.09, ROIC average 0.07, Price volatility average 0.13, Δ GDP average 0.023, Δ CPI average 0.04, Δ Market index average -0.005.

Table 4.2

Descriptive statistics of the variables in study under Sukuk bond

Stats	N	Mean	S.D.	Min	Max
Credit spreads	117	88.34282	59.48995	12.87	390
ESG	117	62.90556	14.72949	31.58	88.69
E	117	63.42574	19.48358	24.55	90.07
S	117	66.49419	14.16323	35.25	93.1
G	117	64.94701	22.40447	9.82	95.75
Ln (Revenue)	117	19.73795	3.176307	15.85	26.96
EBIT Margin	117	0.1970085	0.1577933	-0.36	0.65
Debt/Capital	117	0.4509402	0.1565302	0.19	0.85
Capex/Revenue	117	0.0932479	0.0979693	0	0.47
ROIC	117	0.0682906	0.0406688	-0.05	0.2
Price Volatility	117	0.1339316	0.441789	-0.53	2.55
Δ GDP	117	0.0234188	0.0151522	-0.01	0.04
Δ CPI	117	0.0357265	0.0437729	-0.06	0.09
Δ Market index	117	-0.0050427	0.0446176	-0.09	0.13

4.2 Impact of ESG score and Credit spread

Table 4.3 show the significant result that ESG, E, S and G and negative relationship with the credit spreads, indicate that the more sustainability of the firm, the more reduce cost of debt when they issue conventional bond.

With ESG, E and S show significant result with credit spread (p value < 0.05), corresponding with Okimoto and Tokaoka (2024); Mendiratta et al. (2021); Jang and Lee (2020) that the higher ESG lead to the lower credit spread which mean investor price the firm with high sustainability with less risky that implied from this finding, ESG, E and S reduce cost of debt on conventional bond and investor give premium to it. Nevertheless, G show negative relationship but insignificant, this may due to relatively early stage of ESG investing awareness in our sample, corresponding with Okimoto and Tokaoka (2024) found the impact of G pillar and number of PRI signatories is significant which PRI signatories represent the awareness of ESG.

From the table, a 1 point of increase in ESG score can decrease credit spreads for 0.55 basis point, compare to prior study Okimoto and Tokaoka (2024), this finding might be slightly less (0.65 basis point) so in ASEAN, the relationship might be weaker when compare with Developed country like Japan.

For the Ln(Revenue) have a significant negative relationship to the credit spread, except E, showing the result is corresponding with Stellner et al. (2015) in European bond market that larger revenue are less risky but E pillar is contrary, however corresponding with Okimoto and Tokaoka (2024), they state that the different may come from, larger revenues tend to issue more corporate bonds so they have to pay more premium and it may implied that firm size base on Revenue may vary based on market structure of bond.

Other factors find no significant but the sign of the coefficient of Debt to Capital, Capex to Revenue, ROIC, Equity volatility is corresponding with Stellner et al. (2015) reflect that firms with lower leverage, higher investment and stable in stock price then to have lower credit risk even it is not significant statistically except EBIT margin. For CPI is contrarian with Wu and Zhang (2008) but consistent with Okimoto and Tokaoka (2024) from the improve of economy after Covid-19 help spread drop, for change in GDP show positive sign consistent with Wu and Zhang (2008), they state that if GDP growth the spread might be increased. For Market volatility, the sign is contrarian with Wu and Zhang (2008); Okimoto and Tokaoka (2024) but Elton et al. (2001) state that this may due to flight to quality effect that investor shift to treasury bond or investment grade during volatility period.

Table 4.3

Credit spread and Sustainability measure: Panel OLS result under conventional bond

Variables	ESG	E	S	G
Sustainability	-0.552**	-0.527**	-0.841***	-0.212
measurement	(0.2274)	(0.2235)	(0.23705)	(0.1762378)
Ln (Revenue)	-12.99***	12.06***	-10.56***	-14.836***
	(4.1896)	(4.3255)	(3.973119)	(4.22249)
EBIT Margin	53.72*	52.02*	40.89	62.14321*
	(29.68583)	(28.08238)	(28.22067)	(30.23557)
Debt/Capital	31.2399	26.96654	31.83065	31.92126
	(45.4383)	(43.7100)	(44.08032)	(46.20581)
Capex/Revenue	-23.6016	-18.2193	-17.10009	-28.73333
	(28.53671)	(27.87638)	(28.53054)	(28.06341)
ROIC	-130.4812	-136.144	-109.1538	-142.1212
	(129.2723)	(127.821)	(125.2842)	(-130.1044)
Price Volatility	5.697491	4.610456	3.613313	6.212853
	(11.31347)	(11.35461)	(10.8047)	(11.51246)
Δ GDP	273.1183	283.7329	256.7669	261.0572
	(373.031)	(372.0218)	(366.4153)	(374.9076)
Δ CPI	-344.1821*	-372.5846*	-329.425	-372.4171*
	(207.8022)	(206.226)	(201.2759)	(210.4901)
Δ Market index	-117.5791*	-104.9011	-111.9078*	-119.7903*
	(69.3486)	(68.52983)	(67.39234)	(70.02627)
Constant	418.0682***	397.6642***	388.78291***	436.0307***
	(96.06515)	(97.86895)	(92.75424)	(97.66069)
Year FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes

Standard errors in parentheses

***p<0.01, **p<0.05, *p<0.1

Table 4.4

Credit spread and Sustainability measure: Panel 2SLS result under conventional bond

Variables	**ESG**
Sustainability measurement	-1.3701**
	(0.4428779)
Ln (Revenue)	10.3163***
	(3.841987)
EBIT Margin	39.6541
	(33.21423)
Debt/Capital	29.072
	(28.9184)
Capex/Revenue	-16.89
	(28.28996)
ROIC	-113.5131
	(121.1954)
Price Volatility	4.3346
	(13.39042)
Δ GDP	298.0096
	(366.708)
Δ CPI	-285.0805
	(241.0136)
Δ Market index	-114.7826*
	(65.02577)
Year FE	Yes
Country FE	Yes
Industry FE	Yes
Anderson canon. corr. LM statistic	93.912
P-val	0.00
Cragg-Donald Wald F statistic	129.397
Sargan statistic	0.00

Standard errors in parentheses

***p<0.01, **p<0.05, *p<0.1

Table 4.4 To check the robustness of the model we integrate 2SLS with Instrument variable, the result shows the significant result that ESG still has negative relationship with the credit spreads, indicate that the more sustainability of the firm, the more reduce cost of debt when they issue conventional bond for robustness test and Cragg-Donald F and Sargan test tell us Instrument variable is valid and do not have over-identification problem.

Table 4.5

Correlation between Credit spread, ESG and IV

Correlation	**Credit spread**	**ESG**	**IV**
Credit spread	1.000	-0.127	-0.103
ESG	-0.127	1.000	0.700
IV	-0.103	0.700	1.000

Table 4.5 Show the valid of our instrument variable, we use Industry–Year–Country Avg. ESG, from 1. The instrument variable is correlate with the endogenous variable which is ESG score, the table show 0.700 meaning the strong positive relationship and 2. The instrument variable is not correlate with the dependent variable which is the credit spread, the table show -0.103 which is very low.

Table 4.6

Sensitivity analysis: Panel OLS result under conventional bond

Variables	**PH**	**TH**	**MY**	**IN**
ESG	-0.2953	-0.7739**	-0.7738	0.38565
	(0.35896)	(0.36522)	(0.57706)	(0.5973)
E	-0.33945	-0.8928***	0.1682	-0.1306
	(0.36245)	(0.3318)	(0.2807)	(0.4815)
S	-0.3293	-0.7511**	-0.5348	-0.01854
	(0.37105)	(0.37633)	(0.3919)	(0.7860)
G	-0.0592	-0.5437*	-0.1863	0.1446
	(0.3820)	(0.2999)	(0.4609)	(0.4332)

Table 4.6

Sensitivity analysis: Panel OLS result under conventional bond (Cont.)

Variables	PH	TH	MY	IN
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes

Standard errors in parentheses

***p<0.01, **p<0.05, *p<0.1

Table 4.6 show sensitivity analysis of countries, the significant result that Thailand only has statically significant on negative ESG that impact credit spread and Philippines and Malaysia also have negative result but not significant only Indonesia that has ESG as a positive sign but still not significant

For the subcategory which are E, S and G, they are affect the credit spread too. For E pillar, we see only Thailand has statically negative on credit spread but for Philippines and Indonesia that not significant and for Malaysia, we see E pillar as positive but also not significant. S pillar, only Thailand has significant result on negative coefficient impact on credit spread, others countries we see negative effect but not significant impact. Finally, G pillar, we also see Thailand that only have negative significant coefficient on credit spread ($p<0.1$), other countries we see negative effect but not significant effect only left for Indonesia that have positive effect but not significant.

Ultimately, while panel analysis shows statistically significant negative impact of ESG, E and S only G left with negative but not significant to credit spread but under country analysis (sensitivity analysis) show mixed result, especially for Thailand that has significant negative impact on credit spread while other countries do not. From Amel-Zadeh and Serafeim (2018), they find that investor may not use ESG efficiently from lack of reliability, timeliness and cannot be quantify so they cannot truly use it, from these issues may lower investor confidence.

The first reason we can explain is that sample size in country level regression is lower than the pool size which lower the regression power make it harder to detect significant relationship even it is exist. The second reason is that, ESG (including E, S and G pillar) may vary, which may depend on regulatory environment,

investor awareness and data available in the bond market so we may see the impact of ESG might not be universal and it depend on context of each country to develop.

Table 4.7

Credit spread and Sustainability measure: Panel OLS result under Sukuk bond

Variables	**Sukuk**
ESG	-0.1438
	(0.5556)
E	0.1809
	(0.4498)
S	-0.6509
	(0.5283)
G	-0.4616
	(0.3285)
Year FE	Yes
Industry FE	Yes
Country FE	Yes

Standard errors in parentheses

***p<0.01, **p<0.05, *p<0.1

Table 4.8

Sensitivity analysis: Panel OLS result under Sukuk bond

Variables	**MY**	**IN**
ESG	-0.0703	-1.7943
	(0.4509)	(1.7584)
E	0.3124	5.1284
	(0.3343)	(4.1745)
S	-0.9096*	-2.8658
	(0.4674)	(4.9136)
G	-0.1163	-0.1320
	(0.1889)	(2.3543)

Table 4.8

Sensitivity analysis: Panel OLS result under Sukuk bond (Cont.)

Variables	MY	IN
Year FE	Yes	Yes
Industry FE	Yes	Yes

Standard errors in parentheses

***p<0.01, **p<0.05, *p<0.1

Table 4.7 show the baseline regression with the pool model of Sukuk bond, the result show it is not statistically significant at all but in the negative relationship trend.

Table 4.8 show sensitivity analysis of Sukuk bond under OLS regression, we see the ESG for Malaysia and Indonesia have negative impact to credit spread but not significant and for S and G pillar too, note that for S pillar Malaysia has significant impact to credit spread ($p<0.1$) consistent with Low et al. (2025) that S is linked to religious values such as fairness to workers, transparency and it linked to credibility which in Sukuk emphasizes ethical finance. Nevertheless, both countries have positive result on E pillar but not significant and these model from the result of fixed effected model.

These result show ESG (including E, S and G pillar) may have limit influence on credit spread of Sukuk bond for the following reason. The first one is the sample size quite small if compare with conventional bond which may reduce the statistical power. The second is investor awareness or integration on Sukuk market may be in early stage.

Overall, this study subject to several limitation, Sukuk bond is very small compare to prior literature Low et al. (2025) so the error may be too large for model to detect the significant. ESG impact remain vary across the country due to sample size and data availability and we only see Thailand significant but others are not so in other country investor might not price it like Thailand even when do the pool analysis we can capture the effect so impact are not generalized and this research might have timeframe because it includes shock in Covid-19 where credit spread quite widen.

CHAPTER 5
CONCLUSION

This research aims to investigate how ESG score of the firm (including separate pillars E, S and G) relates to the credit spread when the firm issue bond in the ASEAN countries which are Thailand, Malaysia, Indonesia and Philippines. This research compares conventional bond and Sukuk bond market. Using panel regression, robustness test to check and do sensitivity of the country to see the effect of ESG score.

The study finds the significant negative relationship correlation of overall ESG score with the credit spread (especially E and S pillars) which may imply that the firms with higher sustainability score can lead to lower cost of debt which firms can enjoy lower borrowing cost.

Move to the closer look when doing sensitivity analysis of the country, Thailand shows significant coefficient relationship between overall ESG, E and S pillar to the credit spread while other countries present the weak result so from the sensitivity analysis can imply that the ESG impact are not universal and it may depend on country internal factors such as adoption, investor awareness or available information.

Next, for Sukuk bond, ESG overall score and the subcategory score show negative but not statistically significant relationship to credit spread. Nevertheless, this finding only has two country which are Malaysia and Indonesia so it might be smaller sample than conventional bond.

All in all, this study has contributed the gap on limit study of relationship on ESG score and credit spread in ASEAN 4 market with providing country level analysis to show that investor pricing ESG different across country and examine the impact of ESG on Sukuk and Conventional bond.

To answer the hypothesis:

H1: Higher ESG scores help lower credit spreads in EM corporate bonds: We Accept, ESG score shows significant negative relationship in both pooled OLS and IV regressions.

H2: Each ESG component (E, S, G) help reduce effect on credit spreads in EM corporate bonds: from our finding, partially supported (some countries), E and S are significant, G is not significant.

H3: ESG scores influence Sukuk by reducing credit spreads in EM: from our finding, ESG scores not significant in Sukuk; only S pillar is weakly significant in Malaysia.

For implication this study can help, for issuer, suggest that firm should invest more in ESG to reduce their cost of funding. For investor, ESG score can help reduce credit risk and for regulator, promoting ESG may help reduce risk premium of the market.

The limited of this research are sample size and availability of ESG score in the emerging market so investor might not have awareness like the developed market. Future research could expand the sample size to see the impact of the ESG score across other country to clarify more impact.

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