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# **The Effect of Countries' ESG Ratings on Sovereign Credit Default Swaps: An Empirical Evidence on OECD Countries (2008–2019)**



## RESEARCH PAPER

# The Effect of Countries' ESG Ratings on Sovereign Credit Default Swaps: An Empirical Evidence on OECD Countries (2008-2019)

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## ABSTRACT

**PURPOSE:** The purpose of this paper is to examine whether countries' Environmental, Social, and Governance (ESG) ratings can affect their 5-year Credit Default Swaps (CDS), and whether there is a significant association between ESG ratings and CDS.

**DESIGN/METHODOLOGY/APPROACH:** The econometric analysis of this research (Fixed effect panel least squares regression) incorporates data from 25 OECD countries from 2008 to 2019. ESG ratings calculated by Thomson Reuters Eikon, Standard & Poor's (S&P) CDS ratings, GDP growth rate, inflation rate, the general government gross debt to GDP ratio and trade openness are used as independent variables, while sovereign CDS with 5-year maturity are used as the dependent variable in the analysis.

**FINDINGS:** A significantly negative but modest association was found between countries' ESG Ratings and their CDS. The analysis also shows that countries with good ESG scores experienced lower CDS.

**ORIGINALITY/VALUE:** This research extends previous studies by revealing the significant relationship between countries' ESG and CDS based on empirical evidence, using up-to-date data (last 11 years) from 25 OECD countries.

**KEYWORDS:** *Sustainability; ESG Ratings; Credit Default Swaps; Panel Data Analysis*

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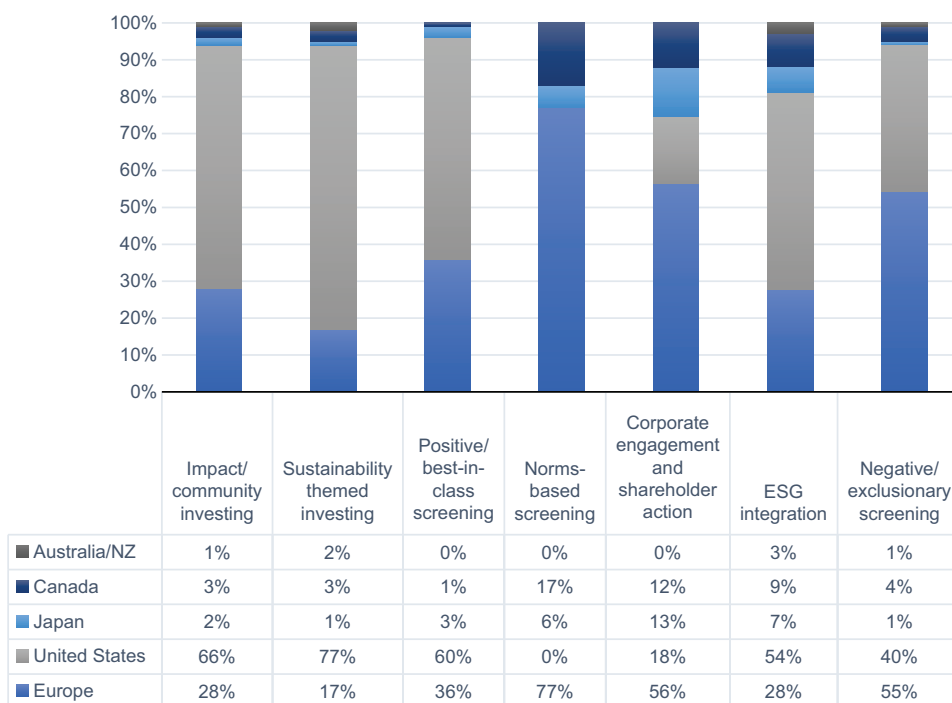
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## INTRODUCTION

Environmental, Social and Governance (ESG) investing has expanded dramatically in recent years. One of the most important factors is the substantial advances achieved in the area of sustainability. For instance, at the beginning of 2005, the former UN Secretary General (Kofi A. Annan), called on a group of international investment community representatives to develop global best-practice Principles for Responsible Investment (PRI), the intent being to create a sustainable financial system. Following this invitation, with the support of the United Nations Environment Programme Finance Initiative (UNEP FI) and UN Global Compact, six PRIs were launched, the first being to bring ESG matters into the investment analysis and decision-making continuum. Subsequently, the 2030 Agenda for Sustainable Development was adopted by all United Nations Member States in 2015. This agenda contains 17 Sustainable Development Goals (SDGs) that were an immediate call for action in a broad partnership between all nations, both developed and developing.

The “Big Reset” announcement by the World Economic Forum (WEF) to create a more sustainable world following the COVID-19 pandemic is another important step in sustainable development. In addition to international organisations, investment institutions indicate that they are more concerned with sustainability. As an example, with more than US\$7.4 trillion in assets under management, BlackRock, the world’s largest asset manager, declared in a “letter to our clients” in 2020 that they would put the sustainability strategy at the heart of their investment decisions. In the light of these developments, Global Sustainable Investment Alliance (2018) reported that, as of 2018, with US\$10.37 trillion in assets under management (AuM), ESG integration is the second largest sustainable investment policy worldwide, see Figure 1. In addition, the Responsible Investment Survey conducted by RBC Global Asset Management (2020), provides us with valuable opinions on ESG awareness. According to the survey, 75% of global investors incorporate ESG criteria into their investment strategies and decision-making processes, and 84% of investors agree that ESG-integrated funds would perform as well as, or better than, non-ESG-integrated portfolios. The survey also shows us that global supply chain risk, climate change, and workplace culture are the top three issues among investors who say that the COVID-19 outbreak has prompted them to pay more attention to ESG factors.



**Figure 1: Regional shares of Sustainable Investment Strategies, 2018**

Source: Global Sustainable Investment Alliance, 2018

Aras and Crowther (2009) emphasise that businesses that adopt the sustainability approach gain advantages over their competitors in long-term cost savings, more convenient access to capital resources, being effective in determining sectoral standards and increasing corporate reputation.

In their study on Brazil, Russia, India, China, and South Africa (BRICS countries) to better understand the relationship between ESG and financial performance, Garcia *et al.* (2017) concluded that ESG has strong effects, not only on developed economies but also on the capital markets of developing economies. According to Lodh (2020), in both developed and developing countries during 2015 and 2019, firms with high ESG scores faced lower costs of capital relative to firms with low ESG scores. Additionally, Nagy and Giese (2020) indicate that ESG indices outperformed their non-ESG indices during the COVID-19 crisis. These developments further reveal how important ESG is for both companies and countries. For instance, Bank of England (2018) and Cojoianu *et al.* (2021) demonstrated that environmental issues have an effect on financial stability.

Together with the increase of ESG concerns, there is also the issue of whether sovereign credit default markets correctly reflect countries' ESG risks. This paper therefore examines the relationship between the ESG performance of countries and their CDS. This study, that uses data from 25 OECD



countries between 2008 and 2019, contributes to the literature in two ways. It discusses, first, the existence of a significant relationship between CDS and the ESG performances of countries, and second, whether countries' ESG performances are accurately reflected in the CDS markets.

The rest of this article is structured as follows. The next section addresses both the literature review related to CDS and ESG, and the paper's hypotheses. Data information and their descriptive statistics and methodological procedures, and empirical findings are then explained, followed by a conclusions section.

## LITERATURE REVIEW

Credit default swaps (CDS) are types of financial insurance policies purchased in order to efficiently control credit risk, i.e., they are indicators of a country's likelihood to default. Changes in countries' CDS markets affect their borrowing costs, either positively or negatively (Delatte *et al.*, 2012). The variables that determine sovereign CDS are the subject of a variety of empirical studies in the literature. Among them, Edwards (1984) clarifies the relationship between the probability of default and debt, and Reinhart and Rogoff (2011) believe that the link between default, domestic debt, and inflation is significant. Aizenman *et al.* (2013) underlined that while CDS spreads have been affected adversely by inflation, GDP growth rate, government fragility, foreign debt, and trade volatility, trade openness and a more desirable fiscal balance/GDP ratio have had a favourable impact on CDS spreads.

Ho (2016) also emphasised the significant effect of current account, external debt and international reserves on the long-run spread of sovereign CDS. Micu *et al.* (2006) suggested that positive as well as negative ranking announcements significantly impact CDS prices. Doshi *et al.* (2017) analysed determinants of credit risk premiums by using CDS spreads with 5 maturities for 25 countries from 2001 to 2012. According to their study, the level and scope of the US Treasury, the VIX stock market volatility index, unemployment rate, inflation rate, debt-to-GDP ratio, and the consumer confidence index are seven determinants of a country's default probability.

From an empirical point of view, substantial literature shows that macro-economic indicators, such as debt-to-GDP ratio, GDP growth, inflation, trade openness, and political stability, have an impact on the ability of countries to repay their sovereign debt.

With the increase of awareness in the concept of sustainability, ESG research has started to be added to the CDS determinants to the literature. For instance, using a panel regression model over a dataset of 23 OECD countries from 2007 to 2012, Crifo *et al.* (2017) analysed whether countries' extra financial performance on ESG factors were important to the markets for 2-year sovereign bond spreads. According to their analysis, ESG ratings substantially reduced government bond spreads (see Table 1). Tang (2017) investigated 69 countries between 2011 and 2017, and found a correlation between MSCI's ESG ratings and sovereign CDS spreads. Margaretic and Pouget (2018) studied the relationship between countries' bond spreads and their extra financial performance by using a sample of countries where bonds were traded in JP Morgan Emerging Markets Bond Index

Global between 2001 and 2010; they found that there was a negative relationship between their social and governance performance and cost of capital.

Drut (2010) investigated the relationship between the mean-variance efficient frontier of 20 developed countries' sovereign bonds and their socially responsible investments (SRI) between 1995 and 2008; the results showed that socially responsible sovereign bond portfolios could be created without a substantial loss of mean-variance efficiency. Capelle-Blancard *et al.* (2019) examined whether countries' ESG ratings had an effect on their sovereign bond yield spreads using 20 OECD countries between 1996 and 2012; their studies showed that lower default risk and lower foreign yield spread were negatively correlated with ESG performance. In addition, they indicated that there was a major negative correlation between social and governance ratings and sovereign bond yield spreads, although not within the environmental rating.

Hübel (2020) researched the impact of countries' ESG rating on CDS markets using data from 60 countries between 2007 and 2017; it was found that countries with good ESG ratings had lower CDS and a more flat-topped CDS curve. Narrowing the dimension of ESG, De Boyrie and Pavlova (2020) examined the effects of a country's environmental performance on sovereign credit risk; they found a negative link between environmental performance of countries and their credit risk. Martellini and Vallée (2021) investigated the relationship between E, S and G scores and 1-year, 5-year and 10-year bond yield spreads for 20 developed and 15 developing countries from 2010-2020. It was found that a higher environmental score was linked with a lower spread in developed countries, while the influence of other dimensions was less evident. In addition, a higher social score was associated with a lower spread in developing countries, while the impact of other dimensions was less prominent.

**Table 1: Variables used in Country-Level Studies in the Literature**

Author/s	Year	Country	Period	Dependent Variable	Independent Variables
Crifo <i>et al.</i>	2017	23 OECD countries	2007-2012	Government bond spreads	<ul style="list-style-type: none"> <li>• Vigeo ESG</li> <li>• GDP growth rate</li> <li>• Inflation rate</li> <li>• Gross debt to GDP ratio</li> <li>• Fiscal balance to GDP</li> <li>• Trade-Openness ratio</li> <li>• S&amp;P's CDS ratings</li> </ul>
Margaretic and Pouget	2018	Emerging countries	2001-2010	Sovereign bond spreads	<ul style="list-style-type: none"> <li>• Average life</li> <li>• Average life squared</li> <li>• Bid- ask spread</li> <li>• GDP growth rate</li> <li>• World Governance Indicator Index Total</li> <li>• Human Development Index</li> <li>• Environmental Performance Index</li> </ul>

(continued)

**Table 1: Variables used in Country-Level Studies in the Literature** *(continued)*

Author/s	Year	Country	Period	Dependent Variable	Independent Variables
Capelle-Blancard <i>et al.</i>	2019	20 OECD countries	1996-2012	Sovereign bond spreads	<ul style="list-style-type: none"> <li>• ESG indicator</li> <li>• GDP growth rate</li> <li>• Inflation rate</li> <li>• Gross gov. Debt/GDP ratio</li> <li>• Primary balance/GDP</li> <li>• Current account/GDP</li> <li>• Trade-Openness ratio</li> <li>• Reserves to imports</li> <li>• S&amp;P's CDS ratings</li> </ul>
Hübel	2020	60 Countries	2007-2017	1-year CDS spread 10-year CDS spread Credit curve slope	<ul style="list-style-type: none"> <li>• ESG rating</li> <li>• Environmental rating</li> <li>• Governance rating</li> <li>• Social rating</li> <li>• Gross gov. Debt/GDP ratio</li> <li>• GDP per capita</li> <li>• GDP growth rate</li> <li>• Inflation rate</li> <li>• Economic volatility</li> <li>• Exports/GDP</li> <li>• Reserves/GDP</li> <li>• Currency return</li> <li>• World stock return</li> <li>• UST rate</li> <li>• UST yield curve</li> <li>• VIX</li> </ul>
De Boyrie and Pavlova	2020	50	2012-2016	5-year and 10-year CDS	<ul style="list-style-type: none"> <li>• Environmental Index</li> <li>• Stock Index Return</li> <li>• Debt/GDP</li> <li>• GDP Growth</li> <li>• Inflation</li> <li>• Current Account/GDP</li> <li>• Total Reserves/GDP</li> </ul>
Martellini and Vallée	2021	23	2010-2020	1-year, 5-year and 10-year bond yield spreads	<ul style="list-style-type: none"> <li>• Environmental rating</li> <li>• Governance rating</li> <li>• Social rating</li> <li>• GDP growth</li> <li>• External Balance</li> <li>• Inflation</li> <li>• Import Cover</li> <li>• Fiscal Balance/GDP</li> <li>• Public Debt/GDP</li> </ul>

Source: Constructed by author



Although studies at the macro-level are limited, there are many studies in the literature specifically for companies, funds, bonds and stocks. A significant number of studies highlight the rewarding impacts of implementing sustainable development policies on the basis of the corporation. Similar to the study of Nagy and Giese (2020), Nofsinger and Varma (2014) stated that socially responsible mutual funds have been shown to outperform traditional peers in times of market crisis.

When looking at the literature it is clear that the ESG effect has a favourable impact on green bonds. For instance, Ge and Liu (2015) analysed 4,260 bonds issued between 1992 and 2009, and found that CSR performance was associated with better credit ratings and lower yield margins on new corporate bond issues. Zerbib (2019) investigated the yield differential between green bonds and conventional bonds between July 2013 and December 2017; they highlighted that green bonds had a lower premium against conventional peers (-2 bp on average). Similarly, Immel *et al.* (2021) investigated whether ESG had an effect on green bond premiums and emphasised that with every one-point increase in the weighted average ESG score, the yield narrows by 6 to 13 basis points.

In terms of institutions, Fatemi *et al.* (2018), Wang *et al.* (2017) and Lee *et al.* (2016) showed that corporations with good ESG scores have good financial performance. Brooks and Oikonomou (2018) reviewed the last 45 year studies on the relationship between Corporate Social Performance (CSP)-ESG and financial performance of corporations; they found a significant positive relationship between CSP and financial performance of corporations. According to Ng and Razaee's (2015) study that used 3,000 institutions between 1990 and 2013, there is a negative link between ESG and their cost of equity. Additionally, Miralles-Quirós *et al.* (2019) show that ESG performance has a significant effect on stock prices. On the other hand, Murè *et al.* (2021) reveal that adoption of ESG also positively affects a company's reputation. Höck *et al.* (2020) researched the impact of environmental sustainability of European institutions on their credit risk and found that more sustainable corporations have lower credit risk premiums. Similarly, another recent study by Kim and Li (2021) stressed that ESG incorporation should be offered when building investment management and portfolios in order to optimise value and mitigate risk. In addition to these findings, Friede *et al.* (2015) found that approximately 90% of the 2,200 academic studies conducted on the relationship between ESG and Corporate Financial Performance (CFP) since 1970 indicated a favourable relationship between ESG and CFP.

Sustainable development has therefore been seen to be deserving of concern, not only for businesses but also for the national economy. Hereby, the hypotheses of this study are:

- H1:** There is a significant correlation between the ESG performance of a country and its sovereign Credit Default Swaps.
- H2:** There is a negative association between the ESG performance of a country and its sovereign Credit Default Swaps.

## DATA AND METHODOLOGY

### Data

This study examines whether there is an association between countries' ESG score and their sovereign credit default swaps, and whether countries' credit default swaps are influenced by their ESG scores. The dataset includes observations on credit default swaps with 5-year maturity, ESG ratings, Standard & Poor's ratings, GDP growth, inflation and general government debt-to-GDP ratios for a panel of 25 OECD countries from 2009 to 2019. The country sample consists of Australia, Austria, Belgium, Chile, Colombia, Czechia, Finland, France, Germany, Greece, Hungary, Ireland, Israel, Italy, Japan, Korea, Mexico, New Zealand, Poland, Portugal, Spain, Sweden and Turkey. The dependent and independent variables used in the equation shown in Table 2 are explained below:

1. *Credit default swaps (CDS)*: are a form of financial insurance policy acquired to effectively reduce credit risk, and are an indication of a country's risk of default. The CDS variable is used as the dependent variable in this study.
2. *ESG*: ESG ratings obtained from the Thomson Reuters Eikon Database reflect a country's environmental, social and governance performance.
3. *S&P*: Credit rating agencies provide a large variety of information about the creditworthiness of corporate and sovereign issuers of debt securities. In this study, S&P rating is used by transforming into a numerical variable, ranging from 1 (CCC+) to 17 (AAA).
4. *GDP Growth Rate*: The annual percentage change in GDP is used to calculate the growth rate of GDP, illustrating how fast the economy is growing or shrinking.
5. *Inflation*: Inflation is defined as a change in the price of a basket of goods and services purchased by a certain group of households, as measured by the consumer price index (CPI). When it is considered that an increase in the inflation rate will harm financial stability, it is expected that high inflation rates can increase CDS premiums. According to Hur *et al.* (2018), and Figlewski *et al.* (2012), an increase in the inflation rate increases the default risk of countries by causing debt crisis. Therefore, it is anticipated that there will be a positive relationship between the inflation rate and CDS.
6. *Debt/GDP*: General government debt-to-GDP ratio demonstrates the gross debt of the general government as a proportion of GDP. The total amount of debt is equal to the sum of currencies and deposits, debt securities, loans, insurance, pensions, and standardised guarantee programmes, as well as other accounts payable. According to the OECD, general government debt-to-GDP ratio is a crucial metric for gauging the government's financial sustainability and credibility. Furthermore, the IMF and European Commission assume that the risk premium rises by 3-4 basis points for every 1% increase in the debt-to-GDP ratio above 60%, according to Alcidi and Gros (2018).
7. *Trade-Openness*: this is calculated by the ratio sum of exports and imports to GDP. It is important to mention that, as noticed by Yanikkaya (2003) and Huchet-Bourdon *et al.* (2018), a country's

trade openness has an impact on its economic growth and, additionally, countries with a greater trade openness ratio can generate the necessary trade surpluses for the purpose of repaying existing debt or incurring additional debt. As a consequence, a negative relationship between trade openness and CDS is expected.

**Table 2: Data Description**

	Variable	Description	Data Source
Dependent variable	CDS	Sovereign Credit Default Swaps with 5-year maturity	Thomson Reuters Eikon
Independent variables	ESG	Environmental, Social and Governance ratings of countries	Thomson Reuters Eikon
	S&P	S&P's Sovereign CDS rating (Ratings range between CCC+ and AAA. 1 is assigned to CCC+ and 18 are assigned to AAA)	Thomson Reuters Eikon
	GDP growth	GDP growth rate of the countries, $\Delta\text{GDP}/\text{GDP}$	World-Bank Open Data
	Inflation	Inflation rate of countries, $\Delta\text{P}/\text{P}$	World-Bank Open Data
	Debt/GDP	The general government gross debt to GDP ratio of the countries	World-Bank Open Data
	Trade-Openness	The export and imports of countries to their GDP, $(X + M) / \text{GDP}$	World-Bank Open Data

Source: Constructed by author

Median values of the 25 OECD countries over the years 2008 to 2019 are given in Table 3. According to this table, the five countries with the highest median CDS level are Greece, Turkey, Hungary, Portugal and Italy, the five countries with lowest median CDS level are Sweden, Germany, Finland, Austria and the UK. The five countries with highest median CDS level are Greece, Turkey, Hungary, Portugal and Italy, and the five countries with the lowest median CDS level are Sweden, Germany, Finland, Austria and the UK. Regarding ESG ratings, Czechia, Poland, Chile, the United States, and Israel have the lowest median ESG rating, whereas Spain, Portugal, Italy, Germany, and France have the highest median ESG rating.

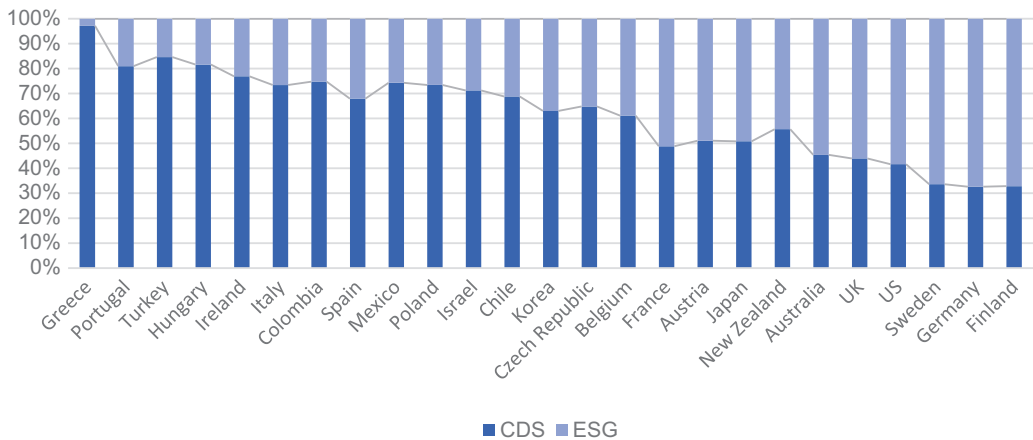
**Table 3: Median Values of Samples**

	<i>CDS<sup>a</sup></i>	<i>ESG<sup>b</sup></i>	<i>S&amp;P<sup>c</sup></i>	$\Delta GDP/GDP^d$	$\Delta P/P^e$	<i>Debt/GDP<sup>f</sup></i>	$(X + M)/GDP^g$
Australia	40.97	56.09	17.00	2.50	1.93	32.25	42.21
Austria	34.31	51.83	16.00	1.54	1.91	81.35	103.78
Belgium	45.58	46.91	15.00	1.48	2.01	102.65	159.76
Chile	85.80	42.55	13.00	2.92	2.78	13.85	65.12
Colombia	129.47	55.93	8.00	3.30	3.47	40.45	37.74
<b>Czechia</b>	56.54	40.35	14.00	2.51	1.69	36.85	147.76
Denmark	24.93	58.82	16.50	1.75	0.98	40.00	103.15
Finland	25.48	59.48	15.00	0.88	1.06	57.60	76.28
France	38.29	60.93	17.00	1.10	1.07	94.15	60.12
Germany	21.97	62.51	2.50	1.63	1.48	72.60	85.14
Greece	693.62	56.53	8.00	-0.39	0.87	178.60	62.44
Hungary	200.87	49.61	13.00	2.08	3.09	76.50	165.53
Ireland	80.65	55.67	13.00	2.74	0.41	75.45	196.76
Israel	100.28	44.41	9.00	3.53	1.21	66.40	64.31
Italy	157.60	66.67	14.00	0.50	1.18	133.30	55.34
Japan	45.14	49.08	13.00	0.59	0.41	231.75	33.38
Korea	65.15	52.53	10.00	2.98	1.71	38.70	88.37
Mexico	121.93	50.99	15.00	2.47	4.07	47.40	65.37
Poland	85.56	41.79	11.00	3.72	2.15	51.05	92.19
Portugal	196.95	69.54	8.00	1.26	0.80	124.05	78.69
Spain	93.42	71.20	10.50	1.14	1.54	95.65	62.88
Sweden	20.83	60.35	17.00	2.01	1.07	39.50	84.59
Turkey	221.39	44.72	6.00	4.98	8.71	31.80	50.88
UK	38.12	56.16	17.00	1.72	2.29	84.80	59.83
US	33.14	43.37	16.00	2.23	1.73	104.55	27.90

*Note:* *a* indicates Credit Default Swaps of countries, *b* indicates Thomson Reuters Eikon ESG ratings, *c* indicates numerical variable from 1(CCC+) to 17(AAA) of Standard & Poor's, *d* indicates GDP growth, *e* indicates inflation rate, *f* indicates gross debt to GDP ratio and *g* indicates trade-openness ratio.

*Source:* Constructed by author

A 100% stacked bar chart helps researchers to perform rapid relative comparisons of variables and identify a pattern such as a trend between the variables compared (Indratmo *et al.*, 2018). By countries' CDS and ESG median values, Figure 2 shows that, proportionally, the countries with the highest CDS have the lowest ESG ratings in the percentage of the ratio.



**Figure 2: Comparisons of CDS and ESG Rating of Countries (100% stacked bar chart)**

Source: Constructed by author

## MODELS AND EMPIRICAL RESULTS

### Spearman's Rank Correlation

The rank correlation introduced by Spearman (1904) is one of the most well-known non-parametric techniques; it measures the strength and direction of association between two ranked variates that do not have normal distribution (see Appendix 1). The rank correlation, represented by  $\rho$ , can be shown as:

$$\rho = 1 - \frac{6 \sum d_i^2}{n^3 - n}$$

where  $n$  is the number of pairs in the correlation and  $d_i$  is the ranked difference between the  $i^{th}$  values for the two pairs.  $\rho$  ranges from  $-1$  to  $+1$ , with  $0$  indicating no correlation,  $-1$  indicating a strong negative correlation, and  $+1$  indicating a high positive correlation.

In order to test the significance of rank correlation, a Student's  $t$  test is employed. According to Thornton (1943) and Zar (1972), this yields an accurate result for  $N > 11$ . The formula of the  $t$ -test can be shown as:

$$t = \frac{\rho}{\sqrt{(1 - \rho^2)/(n - 2)}}$$

with  $n-2$  freedom.

**Table 4: Spearman Correlation Analysis**

	<i>CDS<sup>a</sup></i>	<i>ESG<sup>b</sup></i>	<i>S&amp;P<sup>c</sup></i>	$\Delta GDP/GDP^d$	$\Delta P/P^e$	<i>Debt/GDP<sup>f</sup></i>	$(X + M)/GDP^g$
<i>CDS<sup>a</sup></i>	1						
<i>ESG<sup>b</sup></i>	-0.16***	1					
<i>S&amp;P<sup>c</sup></i>	-0.47***	0.02	1				
$\Delta GDP/GDP^d$	-0.09	-0.16***	-0.16***	1			
$\Delta P/P^e$	0.32***	-0.30***	-0.05	0.10	1		
<i>Debt/GDP<sup>f</sup></i>	0.08	0.23***	-0.03	-0.39***	-0.40***	1	
$(X + M)/GDP^g$	-0.06	-0.01	0.02	0.07	-0.10	-0.10	1

Note: \*\*\*indicates significant levels, respectively at 1%, *a* indicates Credit Default Swaps of countries, *b* indicates Thomson Reuters Eikon ESG ratings, *c* indicates numerical variable from 1(CCC+) to 17(AAA) of Standard & Poor's, *d* indicates GDP growth, *e* indicates inflation rate, *f* indicates general government gross debt to GDP ratio and *g* indicates trade-openness ratio

Source: Constructed by author

Table 4 shows the findings of rank correlation with significant levels. In line with the literature, based on correlation results, it is possible to conclude that the significant negative correlation (-0.16) between CDS with a 5-year maturity and ESG ratings indicates a negative relationship between country sustainability and sovereign credit default swaps. Therefore, greater levels of ESG are linked to decreased CDS. This empirical result supports the H1 hypothesis of this article. Additionally, there are significant correlations between ESG and GDP growth, inflation rate and general government gross debt to GDP ratio, respectively.

## PANEL OLS FIXED EFFECT MODEL

Our sample group is a panel that is also known as a longitudinal dataset, consisting of 25 OECD countries for the period 2008 to 2019. As the dataset has both cross-section and time period data, a panel OLS fixed effect model regression is employed in this analysis. As can be seen in Table 4, there is no high correlation between the independent variables and this demonstrates that the estimation used in this analysis does not have a high-collinearity problem. Prior to the regression, Pesaran (2021) proposed a Pesaran-scaled LM test, when *N* is large and *T* is small, to test for existing cross-section dependency; pursuant to results, there is a cross-section dependence among the samples. According to Baltagi (2005), if there is a cross-section dependency, a CIPS unit root test should be employed in order to test the unit root in the variables. Based on CIPS unit root test results, there is no unit root in variables of this data. Fixed effect and random effect regression estimates are then performed. A Hausman specification test (see Appendix 2), where the random effects model is the null hypothesis and the fixed effects is an alternative hypothesis, can be used to distinguish either fixed or random effects (Baltagi, 2005). The results show that a fixed effect panel OLS regression is found to be more accurate. The fixed effect OLS equation is shown as:



$$\ln\text{CDS} = \beta_0 + \beta_1(\ln\text{ESG})_{it} + \beta_2(\ln\text{S\&P})_{it} + \beta_3(\ln(\Delta\text{GDP}/\text{GDP}))_{it} + \beta_4(\ln(\Delta\text{P}/\text{P}))_{it} \\ + \beta_5(\ln(\text{Debt}/\text{GDP}))_{it} + \beta_6(\ln((\text{X} + \text{M})/\text{GDP}))_{it} + \lambda_t + u_{it}$$

where  $i = 1$  to  $n$  (the number of countries) and  $t = 1$  to  $T$  (the number of years). The dependent variable  $\ln\text{CDS}$  for the logged 5-year bond maturity credit default swaps, the independent variables are Eikon Thomson Reuters logged ESG scores showing sustainability of countries; logged  $\Delta\text{GDP}/\text{GDP}$  showing GDP growth rate; logged  $\Delta\text{P}/\text{P}$  showing the inflation rate; logged  $\text{Debt}/\text{GDP}$  showing the general government gross debt to GDP ratio; logged  $(\text{X} + \text{M})/\text{GDP}$  showing the Trade-Openness ratio; and logged S&P showing the Standard & Poor's CDS ratings of countries' that are based on numerical variables from 1(CCC+) to 17(AAA),  $\lambda_t$  indicates the time effect, and finally  $u_{it}$  indicates the error term.

**Table 5: Panel OLS Fixed-Effect Regression Result**

	<b><math>\ln\text{CDS}^a</math></b>
<b>Intercept</b>	17.240*** (7.810)
<b><math>\ln\text{ESG}^b</math></b>	-1.366*** (-4.493)
<b><math>\ln\text{S\&amp;P}^c</math></b>	-1.266*** (-7.333)
<b><math>\ln(\Delta\text{GDP}/\text{GDP})^d</math></b>	-0.519*** (-4.456)
<b><math>\ln(\Delta\text{P}/\text{P})^e</math></b>	0.618*** (4.767)
<b><math>\ln(\text{Debt}/\text{GDP})^f</math></b>	-0.11952 (-0.725)
<b><math>\ln(\text{X} + \text{M})/\text{GDP}^g</math></b>	-0.883** (-2.105)
<b><math>R^2</math></b>	0.77***
<b>Prob(F-statistic)</b>	0.0000

*Note:* \*\*\*, \*\* indicates significant levels at 1%, 5%, respectively. All variables are in natural logarithms: *a* indicates Credit Default Swaps of countries, *b* indicates Thomson Reuters Eikon ESG ratings, *c* indicates numerical variable from 1(CCC+) to 17(AAA) of Standard & Poor's, *d* indicates GDP growth, *e* indicates inflation rate, *f* indicates general government gross debt to GDP ratio, and *g* indicates trade-openness ratio.

*Source:* Constructed by author

The results of the fixed effect regressions are shown in Table 5. The model explains 77% of the variation in CDS based on  $R$  squared, suggesting that it corresponds to the majority of country CDS determinants. Considering the model result, as expected, S&P credit ratings have a significant and negative association with CDS. As a result, it is possible to conclude that an increase in credit

ratings decreases the country's CDS (Ismailescu and Kazemi, 2010; Arezki *et al.*, 2011; Micu *et al.*, 2006). GDP growth, indicating the economic growth of a country, has a significant and favourable impact on sovereign CDS (Pan and Singleton, 2008; Aizenman *et al.*, 2013). With this result, it can be said that a 1% point improvement in economic growth will reduce the 5-year government CDS by 5%.

The significant negative relationship between inflation rates and sovereign CDS is consistent with the literature and fits the expectations of this study. This means that every 1% increase in the inflation rate causes a 6% increase in a country's 5-year CDS. Eichler and Maltritz (2013) indicate that while a high trade openness ratio helps to reach the funds for debt payments, it also enhances the economy's competitive capability and, therefore, reduces the danger of default. The estimation demonstrates the negative relationship between CDS and trade openness and backs up the literature by demonstrating that every 1% rise in the trade openness ratio reduces CDS by 8%. Looking at the ESG score, representing a country's sustainability performance, the result shows that there is a significantly strong link between ESG and CDS, which is consistent with the literature and supports the study's hypothesis. According to empirical findings, a 1 percentage point increase in the ESG score allows a 13% decrease in countries' CDS. More noticeable, countries with greater ESG ratings indicate a significantly lower CDS.

## CONCLUSIONS

When international investors decide to invest in a country in the form of direct investment and portfolio investments, it is of great importance to correctly evaluate the country's credit risk; CDS premiums are commonly used to assess a country's credit risk and assess international investors' risk perceptions of the country. In addition, an increase in the CDS premiums of a country increases the borrowing cost of that country. As a result, grasping risk premium determinants from the point of external financing costs is crucial for policy-makers.

It is clearly seen that investing and lending approaches of individuals, investment institutions and creditors change with the increase of awareness on ESG issues. For instance, the United Nations states that 130 banks around the world have signed the Responsible Banking Principles; with this signature, banks now integrate responsible banking principles, environmental, social and governance sustainability issues into their lending strategies. These developments highlight the importance of environmental, social, and governance (ESG) matters.

This paper contributes to the literature by analysing the impact of a country's ESG performance on sovereign credit default swaps as the determinant for measuring the cost of sovereign borrowing. By demonstrating that nations with higher ESG ratings have lower borrowing costs, this study suggests that like other macro-economic and fiscal factors, ESG issues should be taken into account and accepted by both authorities and policy-makers. Governments may therefore make their economies more sustainable by enacting rules that promote sustainability.

Owing to data availability, the analysis has limitations but by the wider samples and through the post-pandemic dataset, future research could offer a clearer understanding of the sustainability effect on the economy.

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## APPENDIX

### Appendix 1: Shapiro Test Results

	Statistic	p-value
$\ln \text{CDS}^a$	0.88	1.000
$\ln \text{ESG}^b$	0.98	0.000
$\ln \text{S\&P}^c$	0.75	0.000
$\ln(\Delta \text{GDP}/\text{GDP})^d$	0.74	0.000
$\ln(\Delta \text{P}/\text{P})^e$	0.88	0.000
$\ln(\text{Debt}/\text{GDP})^f$	0.98	0.000
$\ln(\text{X} + \text{M})/\text{GDP}^g$	0.97	0.000

*Note:* All variables are in natural logarithms *a* indicates Credit Default Swaps of countries, *b* indicates Thomson Reuters Eikon ESG ratings, *c* indicates numerical variable from 1(CCC+) to 17(AAA) of Standard & Poor's, *d* indicates GDP growth, *e* indicates inflation rate, *f* indicates general government gross debt to GDP ratio and *g* indicates trade-openness ratio.

*Source:* Constructed by author

### Appendix 2: Hausman's Specification Test Result

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.		Prob.
Cross-section random	44.961036	6		0.0000
Variable	Fixed	Random	Var (Diff.)	Prob.
$\ln \text{ESG}^a$	-1.366287	-0.905994	0.037395	0.0173
$\ln \text{S\&P}^b$	1.266527	-1.454391	0.018403	0.1661
$\ln(\Delta \text{GDP}/\text{GDP})^c$	-0.519524	-0.664764	0.003803	0.0185
$\ln(\Delta \text{P}/\text{P})^d$	0.618532	0.536198	0.002799	0.1196
$\ln(\text{Debt}/\text{GDP})^e$	-0.119523	0.024369	0.019687	0.3051
$\ln(\text{X} + \text{M})/\text{GDP}^f$	-0.883600	0.122651	0.164074	0.0130

*Note:* All variables are in natural logarithms *a* indicates Thomson Reuters Eikon ESG ratings, *b* indicates numerical variable from 1(CCC+) to 17(AAA) of Standard & Poor's, *c* indicates GDP growth, *d* indicates inflation rate, *e* indicates general government gross debt to GDP ratio and *f* indicates trade-openness ratio.

*Source:* Constructed by author

