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**Working Paper**

## Measuring the effect of environmental, social, and governance on sovereign funding costs

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**ADB Working Paper Series**

**MEASURING THE EFFECT OF  
ENVIRONMENTAL, SOCIAL, AND  
GOVERNANCE ON SOVEREIGN  
FUNDING COSTS**

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Naoko Nemoto and Lian Liu

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**Abstract**

This paper aims to examine the effect of Environmental, Social and Governance (ESG) performance on sovereign funding costs, with a focus on emerging countries, especially in Asia. We find that better ESG performance is associated with lower default risk, and therefore lower funding costs. We also discover that countries with better ESG performance tend to have higher credit ratings, an important benchmark of sovereign funding costs. Regarding the effects of each component of ESG, we note that the social factor is significant among Asian countries, while governance is significant among Organisation for Economic Co-operation and Development countries.

**Keywords:** ESG performance, sovereign funding cost, credit rating

**JEL Classification:** G11, F34

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# 1. INTRODUCTION

Sovereign funding costs represent a significant issue affecting countries' soundness of fiscal policy and debt sustainability. The theoretical literature (Hilscher and Nosbusch 2010; Longstaff et al. 2011; Crifo, Diaye, and Oueghlissi 2017; Jeanneret 2018; Margaretic and Pouget 2018) has attributed sovereign funding costs to three factors: financial performance measured by public debt and other fundamental indicators; investors' sentiments and risk aversion; and non-financial factors including political stability and policy effectiveness.

Recently, an increasing number of investors have incorporated non-financial factors – measured by environmental, social, and governance (ESG) issues – into their investment decision making. This trend started in equity investment and gradually expanded into fixed income area. These investors' motivations have been classified into three groups. (1) A large number of investors believe that ESG performance has a material effect on investment risks and returns (Crifo, Diaye, and Oueghlissi 2017). As regards sovereign investments, a country with good access and effective management of its natural, human and financial resources is able to implement economic policies that will help to generate more revenue, in turn affecting its ability to repay its sovereign debts (Margaretic and Pouget 2018). In contrast, poor governance is associated with the inefficient use of fiscal revenue, rather than using these funds to repay debts. (2) Some investors seek to attain certain non-financial objectives (e.g., ethical, political and societal values and preferences), without hampering their financial objectives. (3) Certain investors are willing to sacrifice some or all of their financial returns in order to achieve other social or environmental benefits (Kitzmueller and Shinmshack 2012; Crifo, Diaye, and Oueghlissi 2017).

This paper intends to empirically gauge the effect of sovereign ESG performance on government funding costs based on panel regression models with a data set of 85 countries during the period 2008–2016. We use 10-year government bond yield spreads, sovereign credit default swap (CDS) spreads, and sovereign credit ratings as the proxy measures of sovereign funding costs.

Prevailing ESG investments and greater accessibility to ESG data have led to a growing body of studies on ESG performance and financial indicators. However, most investigations have focused on equities,<sup>1</sup> with only a comparatively small number exploring non-equity assets (Friede et al. 2015). In particular, empirical studies focusing on sovereign bonds and ESG factors remain quite limited. Among fixed income studies, more than 60% suggest that high ESG performance is linked with lower funding costs, whereas others indicate neutral or even opposing results (Friede et al. 2015).

This paper intends to fill this information gap by focusing on sovereign bonds, as these comprise a large market share among total outstanding bonds and play a key role in the allocation of investors' portfolios. In particular, it will shed light on sovereign funding costs in emerging markets, in particular in Asian countries. In Asia, average credit ratings have been improving but are still lower than in Europe and the United States, indicating higher default probability. It is a critical issue for governments to ensure stable funding costs, while dependence on foreign capital markets is increasing. In addition, ESG issues are especially acute for emerging economies. Based on previous

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<sup>1</sup> Ng and Rezaee (2015) have investigated the correlation between corporate ESG performance and cost of equity capital, and have detected a significant negative link between them. Moreover, Atan et al. (2018) have found a significant positive relationship between a firm's ESG rating and its weighted average cost of capital.

research by MSCI and Beyond Ratings, which constitute external providers of ESG scores, the average ESG performance of Asian countries trails Organisation for Economic Co-operation and Development (OECD) countries. The Asia and Pacific region is home to around 40% of the world's extremely poor populations. Moreover, of the 10 countries most exposed to the risks of climate change, environmental stress and natural disasters, seven are located in Asia (ADB 2017). Our research demonstrates that good ESG performance is associated with lower debt costs. This result is useful for policy makers who are interested in the determinants of the cost of sovereign debts.

Existing literature has focused on specific aspects of qualitative factors, such as government corruption, although Crifo, Diaye, and Oueghlissi (2017) and Margaretic and Pouget (2018) have examined the effects of comprehensive ESG factors on sovereign bond spreads. Our paper aims to contribute to the previous literature from four perspectives. First, it examines the possible effect of ESG performance on sovereign funding costs in different regions, while disentangling Asia and the Pacific from other advanced regions. Most previous studies have focused on OECD countries or European countries. Second, our research not only explores the link between overall ESG performance and sovereign funding costs, but it also accounts for the role of each ESG dimension separately. Third, given varied ESG criteria and methodologies worldwide, this paper tests the results using the ESG scores of two major providers. Fourth, we make efforts to minimize endogeneity issues by using the generalized method of moments (GMM).

The remainder of this paper is structured as follows. Section 2 describes the recent development of ESG investment. Section 3 reviews the relevant literature. Section 4 explains the data and the methodology. Section 5 presents the empirical results and the robustness check. Finally, Section 6 concludes with a few policy implications.

## 2. RECENT DEVELOPMENT OF ESG INVESTMENT

ESG investment focusing on environmental, social, and governance factors has become increasingly present in global markets. This trend has been catalyzed by the United Nations' (UN) 'Principles for Responsible Investment' (PRI)<sup>2</sup> initiative in 2006 and subsequent Sustainable Development Goals (SDGs)<sup>3</sup> in 2015. A key feature of the SDGs is that they position private companies as the main players in solving such social and environmental problems. Whereas the SDGs represent guidelines for governments and private corporations, the PRI are focused at the investor side. Companies that do well in achieving SDGs are always highly evaluated from the perspective of ESG investment because they are managed in an ESG-friendly way. Consequently, under the guidance of PRI, more investment will be directed toward these ESG-friendly companies (Figure 1). As a result, PRI and SDGs provide incentives to incorporate ESG factors into the investment chain, starting from the investors and ending with the investee companies. ESG investment, SDGs and PRI are designed to work together in facilitating a society's sustainable development.

Key issues for consideration typically include:

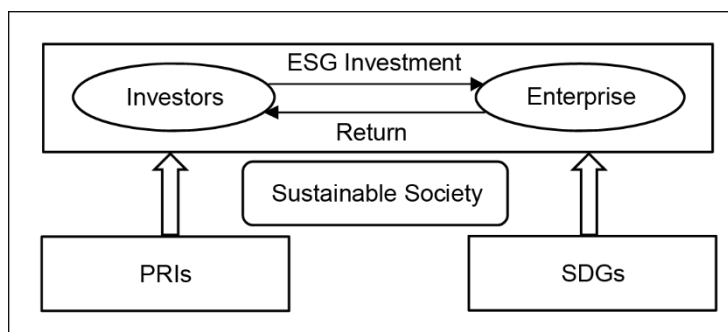
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<sup>2</sup> The PRI was launched in 2006 to incentivize investors to incorporate ESG issues into investment practice through six principles. It is a voluntary and investor-sponsored initiative, developed by an international group of institutional investors.

<sup>3</sup> The SDGs were adopted by all 193 member countries of the United Nations in 2015 as part of the UN's 2030 agenda for sustainable development. They encompass a broad range of social and economic topics that have been identified as being of considerable importance for developing a sustainable society.

- E: Climate change, carbon emissions, pollution, resource efficiency, biodiversity.
- S: Human rights, labor standards, health and safety, diversity policies, community relations, development of human capital.
- G: Corporate governance, corruption, rule of law, institutional strength, transparency.

**Figure 1: Relationship between ESG Investment, PRI, and SDGs**



Source: Government Pension Investment Fund (GPIF).

ESG investment has been widely adopted by institutional investors such as pensions, mutual funds, and endowments, and has become one of the most important strategies of responsible investment. ESG investment has continuously expanded, reaching \$30.68 trillion in the five major markets in 2018, increasing from \$18.23 trillion in 2014 (Table 1). Europe and the United States are the largest contributors of ESG investment, holding \$18.23 trillion and \$12.00 trillion ESG assets, respectively.

**Table 1: ESG Investment Assets by Region, 2014–2018**

Region	2014	2016	2018	Growth per Period	
				2014–2018	2016–2018
Europe	10,775	12,040	14,075	30.63%	16.90%
United States	6,572	8,723	11,995	82.52%	37.51%
Japan	7	474	2,180	31,042.86%	359.92%
Canada	729	1,086	1,699	133.06%	56.45%
Australia/New Zealand	148	516	734	395.95%	42.25%
Asia excluding Japan	45	52	–	–	–
Total	18,276	22,891	30,683	–	–

Note: 1. All asset values are measured in billions of US dollars.

2. This research employs the sustainable investment data from the Global Sustainable Investment Alliance (GSIA) as the proxy measure of ESG investment, as sustainable investment, defined in page 3 of GSIA (2018), is “an investment approach that consider ESG factors in portfolio selection and management”.

Source: Global Sustainable Investment Alliance (2016), Global Sustainable Investment Alliance (2018).

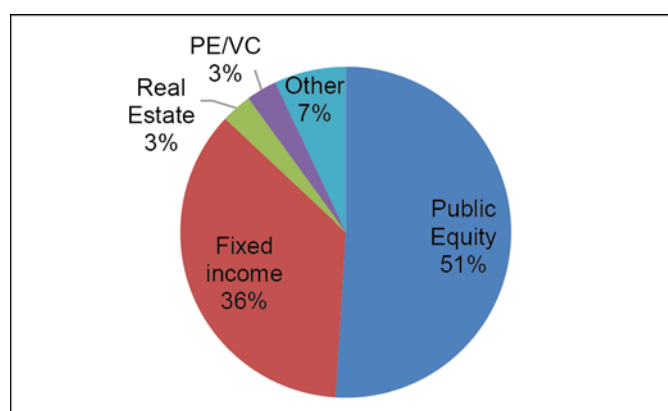
In Asia and the Pacific, Australia, New Zealand and Japan are the largest players in the ESG investment market. Japan witnessed the strongest growth in ESG investment, from \$7 billion in 2014 to \$2,180 billion 2018, rendering it the world’s third-largest center for ESG investment in 2018. Japan is followed by Australia and New Zealand, seeing the second-largest growth of 395.95% from 2014 to 2018, holding \$734 billion ESG assets. Moreover, the Australasia (Australia and New Zealand) region has the largest ratio of ESG investment assets relative to total managed assets, with 63% of total managed assets invested through ESG strategies.



ESG investment in the rest of Asia and the Pacific remains in the early stages of development. Malaysia is most active, as \$15.63 billion of assets were managed with the ESG strategy here in 2016. Hong Kong, China, and the Republic of Korea come next, with ESG investment assets of \$13.55 billion and \$7.29 billion, respectively. The People's Republic of China (PRC) saw the largest increase in ESG investment, a 105% growth from 2014 to 2016. Given the PRC's growing interest in green finance, it is expected to make further advances in ESG investment.

ESG investment began among equity investors and has expanded to the bond market in recent years. More investors now incorporate ESG-related issues in fixed income investment. As a result, the portion of fixed income to total ESG-related assets increased from 40% to 64% in Canada and Europe during 2014–2016, where 64% of assets were invested in bonds in 2016, increasing from 40% in 2014.<sup>4</sup> According to a survey conducted by Russell Investment, 92% of Europe-based fixed-income managers have an ESG-related investment policy, in contrast to just 58% of US-based managers. Globally, as of 2018, fixed income comprises 36% of global ESG investment.

**Figure 2: Global ESG Investment Asset Allocation (2018)**



Note: 1. This figure displays the asset allocation in Europe, the United States, Japan, and Canada.

2. 'Other' includes hedge funds, cash/deposits, commodities, infrastructure, and not otherwise specified.

Source: Global Sustainable Investment Alliance (2018).

### 3. RELATED LITERATURE

Despite various studies, the debate concerning the determinants of sovereign funding costs is far from settled (Crifo, Diaye, and Oueghlissi 2017). In general, we can classify the relevant factors into three groups. The first group comprises country-specific macroeconomic factors, such as inflation rate, gross domestic product (GDP) growth, foreign reserves, and current account balance. The second group is represented by global factors, such as global risk aversion, international interest rates, and so forth (Baek, Bandopadhyaya, and Du 2005; Hilscher and Nosbusch 2010; Uribe and Yue 2010; Longstaff et al. 2011; Aizenman, Jinjarak, and Park 2013; Kennedy and Palerm 2014).

The third group is another strand of academic studies that notes that extra-financial performance should be a potential determinant of sovereign credit risk, and in turn the cost of capital as well. Such investigations highlight a specific aspect of extra-financial performance, such as corruption control or human resource development, and examine

<sup>4</sup> See Global Sustainable Investment Alliance (2016).

its impact on sovereign funding costs. For instance, Ciocchini, Durbin, and Ng (2003) and Connolly (2007) have focused on corruption, finding that countries with better corruption scores pay a lower risk premium when issuing bonds. Relying on the World Bank Governance Indicators, Jeanneret (2018) has investigated the impact of government effectiveness on sovereign bond spreads, discovering that government effectiveness has a significant economic impact on sovereign credit risk. Furthermore, Bundala (2013) has concluded that countries with better equality-adjusted human development indices and lower unemployment rates are associated with lower default risks, and thus have lower funding costs.

Investigations into ESG performance and sovereign funding costs have tended to emphasize non-financial factors, although most use specific factors rather than holistic indicators such as ESG scores. Given that ESG integration in fixed-income investment is a relatively new development, there have been few studies on this topic. Indeed, there is scant information available concerning how a broad measure of ESG factors might affect sovereign funding costs. Crifo, Diaye, and Oueghlissi (2017) have used the Vigeo ESG index to estimate the impact of a country's ESG ratings on sovereign funding costs. They collected data for 23 OECD countries from 2007 to 2012. Their results reveal that better sovereign ESG ratings can reduce sovereign funding costs, but this effect is three times weaker than that of financial ratings measured by Standard & Poor's (S&P) sovereign ratings. Capelle-Blancard et al. (2016) have also analyzed OECD countries, finding a strong link between ESG performance and sovereign bond spread, especially for long-term bonds. They found that better ESG performance is associated with a lower bond yield. Moreover, Margaretic and Pouget (2018) have examined how the environmental, social, and governance factors each affect sovereign bond spreads, and demonstrate that good social and governance performance is associated with a lower cost of debt among emerging economies.

This paper refers to the methodology of Crifo, Diaye, and Oueghlissi (2017) but expands the coverage to emerging economies such as those in the Asia and Pacific region, and incorporates recent data to account for ESG investment's growing momentum. Another contribution of this paper is that it investigates the impact of each ESG component over different regions. The results are tested by using the ESG scores of two major providers. As a proxy of sovereign funding costs, we verify the link between ESG performance and sovereign credit ratings. GMM provides support to minimize endogeneity issues.

## 4. DATA

### 4.1 Data

#### 4.1.1 Dependent Variable: Sovereign Funding Cost

The data in this analysis span from 2008 to 2018 on a yearly basis. Following the literature (Hilscher and Nosbusch 2010; Crifo, Diaye, and Oueghlissi 2017), sovereign bond yield spread is used as one of the proxy measures of sovereign funding cost. It is defined as the difference between the sovereign bond yield of a given economy and the US Treasury with the same maturity, which is regarded as a risk-free interest rate.

Another proxy measure is sovereign credit rating. Long-term sovereign credit rating captures the ability of a government to meet its debt obligations in the future. We use S&P's long-term credit ratings, which have been transformed into numerical variables, ranging from 1 (AAA) to 20 (SD). Given that ESG policy and performance are generally oriented toward the long term and thus act as a credible commitment to repay a debt in the future, we employ 10-year sovereign bond yields in this analysis.

As part of robustness check, we also employ sovereign CDS spreads as the proxy measure of sovereign funding cost, which functions as an insurance contract for the buyer against the sovereign default on its debt. One of the important advantages to use sovereign CDS data is that the sovereign CDS may give accurate estimates of credit spreads and returns, since the CDS market is typically more liquid than the underlying sovereign bond market. Besides, Chan-Lau (2003) has also demonstrated the link between the CDS spread and sovereign default probability.

#### 4.1.2 Main Independent Variable: Government ESG Score

The assessment of ESG performance is based on the MSCI ESG Government Ratings provided by MSCI, a world-leading index company, as well as the sustainability profile provided by Beyond Ratings, a specialist sustainability research firm that is now integrated into FTSE Russell, part of London Stock Exchange Group (LSEG).

##### MSCI ESG Government Ratings

MSCI and Sustainalytics are two market leaders (World Bank 2018) in fixed income, and investors regard their assessments as benchmarks (METI 2019).<sup>5</sup> Due to its broad coverage, wide usage and transparent criteria, this study employs the ESG scores calculated by MSCI. Under its criteria, a government's ESG ratings reflect one country's exposure to ESG risks, as well as its performance and capacity to manage these risks, namely risk exposure and risk management. Risk exposure and management scores are computed based on the country's performance with regard to 27 sub-factors with 99 data points.<sup>6</sup> Detailed information on the sub-factors are provided in Appendix Table A1.

Finally, the overall ESG score is calculated based on the following formula:

$$\text{Government ESG Score} = \min \left\{ \begin{array}{l} \text{Average (10 - Risk Exposure Score, Risk Management Score)} \\ (\text{Risk Management} + 1) \end{array} \right\} \quad (1)$$

The government ESG scores range from 0 to 10, with a higher score indicating stronger ESG performance. This formula relies on the assumption that a country with poor risk management cannot utilize its resources effectively, even though these resources are abundant. As a result, the country's ESG score should be constrained by its risk management score if the country's risk management ability is weak.

MSCI does not disclose the aggregate score of each component. In order to determine the specific impact of each ESG dimension, we construct the performance score for each dimension based on the MSCI formula, namely, environmental quality score, social quality score, and governance quality score, as detailed below:

$$\begin{array}{l} \text{Environment} \\ \text{Quality Score} = \\ \min \left\{ \begin{array}{l} \text{Average (10 - Environmental Risk Exposure Score, Environmental Risk Management Score)} \\ (\text{Environmental Risk Management} + 1) \end{array} \right\} \end{array} \quad (2)$$

$$\begin{array}{l} \text{Social} \\ \text{Quality Score} = \\ \min \left\{ \begin{array}{l} \text{Average (10 - Social Risk Exposure Score, Social Risk Management Score)} \\ (\text{Social Risk Management} + 1) \end{array} \right\} \end{array} \quad (3)$$

<sup>5</sup> According to Russell Investment (2017), 52 of the respondent fixed-income managers exclusively utilize third-party vendors to obtain ESG scores. Thirty-five use external vendors with in-house ESG analysis. Fifteen solely use internal analysis.

<sup>6</sup> More detailed information on the 27 sub-factors and weights can be found in Appendix Table A2.

$$\text{Governance Quality Score} = \min \left\{ \begin{array}{l} (Governance Risk Management + 1) \\ Average (10 - Governance Risk Exposure Score, Governance Risk Management Score) \end{array} \right\} \quad (4)$$

### Beyond Ratings ESG Scores

A sustainability profile of Beyond Ratings, another indicator of ESG performance, has been calculated quarterly according to a systematic, quantitative approach based on 40 indicators since the end of 1999. It forms part of a sovereign credit rating methodology. Beyond Ratings determine sovereign credit ratings by taking into account a country's sustainability profile and economic and financial profile.

To calculate an aggregate ESG score, individual E, S, G scores are weighted 30%, 30%, and 40%, respectively. The weights for each indicator<sup>7</sup> are estimated using an econometric modeling technique called Partial Least Squares <PLS>, with a score for variable Importance in Projection <VIP> added on. The methodology also assesses ESG risks by considering qualitative factors as well as the country's state of development. The sovereign ESG scores of Beyond Ratings range from 0 to 100, where higher scores represent better ESG performance.

The informational contents of the MSCI ESG and Beyond Ratings ESG scores are qualified and transparent. However, it should be noted that their scope and criteria are not identical. We derived the Pearson's correlation coefficients of these two scores. The correlation coefficient of the aggregate ESG score is very high, at 0.90.<sup>8</sup> However, the correlation of the environment score is low (0.63), while the correlations of the social and governance scores are higher (0.89 and 0.83, respectively). The difference in scores reflects the fact that their methodology and criteria are varied. For instance, the MSCI environment score puts weight on risk management, including energy productivity and energy consumption efficiency. On the other hand, the Beyond Ratings scores incorporate qualitative assessments as well as the stage of development, in addition to quantitative factors. The MSCI scores are calculated based on fixed weight, while Beyond Ratings use econometric modelling. Although ESG information on government is becoming increasingly available from UN bodies, the World Bank and other multinational organizations, ESG factors, in particular environmental factors, are often difficult to attain and compare.

#### 4.1.3 Control Variables

In order to control for each country's economic characteristics, this analysis includes six country-specific macroeconomic and one global factor as the control variables, based on previous studies (Aizenman, Jinjark, and Park 2013; International Monetary Fund, IMF 2013): Chicago Board Options Exchange (CBOE) volatility, current account balance, inflation rate, government debt to GDP, foreign reserve to import ratio, GDP growth rate, and long-term sovereign ratings.

Following existing literature (Remolona et al. 2008; Beirne and Fratzscher 2012), we control for the CBOE volatility index (VIX) as a key driver of change in the sovereign funding cost. It is calculated by taking the weighted average of the implied volatility of a sub-set on the S&P 500 Index options, and represents a popular proxy measure of global investor sentiment. A higher reading on the VIX Index suggests greater market anxiety, increasing sovereign funding costs.

<sup>7</sup> More detailed information on the main factor themes can be found in Appendix Table A1.

<sup>8</sup> The correlation matrix of MSCI ESG scores and Beyond Ratings ESG scores can be found in Appendix Table A3.

As an important indicator of a country's economic health, current account balance is used as an independent variable. A current account surplus signals an increase in the country's net foreign assets, whereas a deficit indicates that it has shrunk. Similarly, foreign reserves are key to countries' defense against external shocks. Therefore, improved current account balance and foreign reserves should increase a country's credibility. Improved current account surplus is expected to reduce sovereign funding costs.

The inflation rate reflects the change in purchasing power of the domestic currency. A higher inflation rate is usually associated with economic instability, thereby reducing the creditworthiness of the country. In addition, the effectiveness of monetary policy is constrained if the country faces high inflation and a stagnant economy. The overall effect of the inflation rate is expected to be negative for sovereign funding costs.

Government debt to GDP ratio measures the country's financial leverage. A low government debt ratio indicates that the country is able to produce and sell goods and services sufficiently to pay back its debt. A higher government debt ratio is expected to increase the country's default risk, and consequently sovereign funding costs as well.

Due to the economic slowdown after the 2008 global financial crisis, a number of advanced economies (e.g., the United States, Japan, and a range of European countries) have adopted a quantitative easing (QE) policy to help unlock liquidity directly into the economy through large-scale asset purchases in capital markets. Theoretically speaking, increasing demand on the government bond may raise the bond price and in turn reduce the bond yield, as proved through an empirical analysis by Krishnamurthy and Vissing-Jorgensen (2011). As a result, QE policy is included as the control variable and is assumed to decrease sovereign funding costs.

Table 2 displays the mean distribution of all the variables. The average ESG score is 4.9 in Asia and the Pacific, 6.3 for OECD countries, and 5.9 for European and Central Asian countries. All the economies present a better performance in the social matrix. On average, OECD countries have the lowest CDS spreads, and better ESG ratings. The economies in Asia and the Pacific embrace the largest foreign reserves and have the highest economic growth. Based on the Pearson's correlation matrix of the independent variables,<sup>9</sup> the control variables and ESG scores do not exhibit strong correlation. Thus, we assume that our estimates will not suffer from multicollinearity. We have not included credit ratings as control variables in our model as they show high correlations with ESG scores.

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<sup>9</sup> The Pearson's correlation matrix can be found in Appendix Table A4.

**Table 2: Mean Distribution of All Variables**

	Asia and the Pacific				OECD Countries				All Countries			
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
YS <sup>a</sup>	1.9	2.8	-2.4	11.4	0.6	2.2	-3.3	11.5	1.8	3.2	-3.3	21.7
Rating <sup>b</sup>	8.3	5.20	1	16	4.33	3.30	1	14	9.71	5.19	1	19
ESG <sup>c</sup>	5.1	1.8	1.2	8.2	6.5	1.4	2.9	9.1	5.6	1.7	1.2	9.1
E <sup>c</sup>	4.4	1.4	2.6	7.6	5.2	1.2	2.6	7.7	5.1	1.3	2.6	7.7
S <sup>c</sup>	6.3	1.9	2.1	8.6	7.6	0.9	4.7	9.2	6.7	1.5	1.8	9.2
G <sup>c</sup>	6.2	1.6	2.8	8.8	7.2	1.4	3.0	9.7	6.4	1.7	2.1	9.7
BESG <sup>d</sup>	58.5	17.3	26.8	82.8	74.8	8.8	44.5	87.4	65.5	15.5	26.5	87.4
BE <sup>d</sup>	52.1	8.2	39.8	69.6	61.9	6.5	41.7	75.2	58.7	7.8	39.8	75.2
BS <sup>d</sup>	56.5	17.8	26.5	79.4	70.5	10.8	40.0	87.1	63.2	15.1	24.8	87.1
BG <sup>d</sup>	64.4	28.8	15.3	99.3	87.2	13.2	35.3	99.7	72.2	25.6	13.2	99.7
VIX <sup>e</sup>	19.7	6.8	11.1	32.7	19.3	6.6	11.1	32.7	19.1	6.5	11.1	32.7
Cab <sup>f</sup>	2.8	6.5	-9.2	23.4	0.9	5.1	-24.6	15.8	0.5	6.3	-26	23.4
Inf <sup>g</sup>	3.3	4.0	-6.0	20.7	1.8	2.1	-5.2	11.9	2.9	3.9	-6.0	38.9
Debt <sup>h</sup>	56.5	47.8	13.3	223.2	65.7	37.9	4.9	223.2	61.6	38.9	4.9	223.2
Res <sup>i</sup>	7.5	4.9	1.2	25.7	3.5	3.6	0.0	18.4	5.0	4.6	0.0	25.7
Growth <sup>j</sup>	4.1	2.9	-5.4	15.2	1.8	2.9	-8.3	25.6	2.4	3.2	-9.8	25.6
QE <sup>k</sup>	0.0	0.2	0.0	1.0	0.3	0.4	0.0	1.0	0.2	0.4	0.0	1.0

Note: <sup>a</sup> Sovereign CDS spread, extracted from Bloomberg.

<sup>b</sup> Standard and Poor's (S&P) sovereign credit ratings.

<sup>c</sup> MSCI ESG composite index, E, S and G represent environmental, social, and governance quality indices, respectively.

<sup>d</sup> Beyond Ratings ESG scores, E, S and G represent environmental, social, and governance quality indices, respectively.

<sup>e</sup> CBOE volatility.

<sup>f</sup> Current account balance as a percentage of GDP, extracted from the World Bank.

<sup>g</sup> Inflation rate, extracted from the World Bank.

<sup>h</sup> Government debt as a percentage of GDP, extracted from the S&P database.

<sup>i</sup> Foreign reserves as a percentage of import, extracted from the World Bank.

<sup>j</sup> GDP growth rate, extracted from the World Bank.

<sup>k</sup> Adoption of quantitative easing (QE) policy.

## 4.2 Methodology

Using the data sets explained in Sections 4.1, we develop the following dynamic panel data regression model with the aim of estimating sovereign funding costs. Given data availability, we include three sample groups in the analysis: all country group including 85 economies worldwide; the Asia and Pacific region including 16 economies; and 35 OECD countries.<sup>10</sup> Based on studies by Hilscher and Nosbusch (2010), Aizenman, Jinjark, and Park (2013), and the IMF (2013) seven variables are chosen as control variables in the baseline estimation, including GDP growth, foreign reserves, government debt, inflation rate, current account balance, CBOE volatility, and QE policy. The general model is given by the following equation:

$$YS_{it} = \alpha_0 + \alpha_1 YS_{it-1} + \alpha_2 ESG_{it} + \alpha_3 VIX_{it} + \alpha_4 Cab_{it} + \alpha_5 Inf_{it} + \alpha_6 Debt_{it} + \alpha_7 Res + \alpha_8 Growth_{it} + \alpha_9 QE_{it} + \gamma_t + \mu_{it} \quad (5)$$

<sup>10</sup> The region classification is sourced from the World Bank.

$$Rating_{it} = \alpha_0 + \alpha_1 ESG_{it} + \alpha_2 Cab_{it} + \alpha_3 Inf_{it} + \alpha_4 Debt_{it} + \alpha_5 Res + \alpha_6 Growth_{it} + \gamma_t + \mu_{it} \quad (6)$$

Where  $i$  and  $t$  denote the economies and time indices, respectively. The residuals are  $\epsilon_{it} = \gamma_t + \mu_{it}$ , where  $\gamma_t$  represents the unobserved time specific effect, while  $\mu_{it}$  represents the random error term.  $YS_{it}$  denotes 10-year government bond yield spreads.  $Yield_{it}$  denotes 10-year government bond yields.  $ESG_{it}$  denotes ESG scores.  $E_{it}$  denotes environmental quality scores.  $S_{it}$  denotes social quality scores.  $G_{it}$  stands for governance quality scores.  $VIX_{it}$  stands for CBOE volatility.  $Cab_{it}$  stands for current account balance as a percentage of GDP.  $Inf_{it}$  stands for inflation rate.  $Debt_{it}$  stands for government debt as a percentage of GDP.  $Res_{it}$  stands for foreign reserves as a percentage of imports.  $Growth_{it}$  stands for GDP growth rate.  $QE_{it}$  stands for the adoption of QE policy.

Estimating the model for 10-year government bond yield spreads with the ordinary least squares (OLS) method may produce biased results, as they would suffer from an endogeneity problem where both the independent and the dependent variables could influence each other. To avoid this problem, Arellano and Bover (1995) and Blundell and Bond (1998) have used the GMM to obtain more efficient estimates, where lagged values of independent variables are used as instruments. Therefore, this paper applies the one-step system GMM estimator, with lagged values of the independent variables as instrument variables.

We estimate a multi-year ordered Probit model for sovereign credit rating in the analysis, which has been widely used by other researchers, such as Hu, Kiesel, and Perraudin (2002), Bissoondoyal-Bheenick (2005), Afonso, Gomes, and Rother (2009), Hill, Brooks, and Fall (2010), and Gaillard (2012).

## 5. EMPIRICAL RESULTS AND DISCUSSION

### 5.1 Empirical Results

To understand the effect of ESG performance on sovereign funding costs, we begin our econometric investigation by estimating regressions on the 10-year government bond yield spreads and sovereign ESG performance. The results are reported in Tables A6 and A7. All the specifications control for global risk aversion, country-specific macroeconomic factors, and the time effect.

The following are evaluations that can be inferred from the results of the verification.

- The overall ESG rating of MSCI has significantly negative signs, which suggests that higher ESG performance is associated with lower sovereign funding costs. This result confirms the studies of Capelle-Blancard et al. (2016) and Reznick et al. (2019). As a robustness check, we have also tested estimation using Beyond Ratings ESG scores, with no alteration to the previous result identified. ESG performance seems to have a more significant impact compared to macroeconomic indicators such as current account balance and public debt.
- In relation to the control variables, most show the expected signs, suggesting the validity of the model. In Asia and the Pacific, CBOE volatility, public debt to GDP current account balance and foreign reserves have significant impacts, while they are not constantly significant for OECD countries. The dummy of QE monetary policy is significant for OECD countries.





- To assess the effect of each ESG component, we replace the overall ESG index with E (environmental quality index), S (social quality index), and G (governance quality index). In the global context, both social and governance performance have a significantly negative correlation with sovereign funding cost. This result is unchanged based on Beyond Ratings ESG scores.
- We then apply the model to subregions. Although the aggregate ESG score is significantly negative for both Asian and OECD countries, the coefficient significance of each component differs depending on the region. In Asia and the Pacific, the social factor has a significant negative effect on sovereign funding costs. This is probably because social factors such as human capital, education, and knowledge capital play the critical role for future growth and political stability. This is extremely important for Asia and the Pacific, where there are still a large portion of emerging economies with less developed social infrastructure. In Asia and the Pacific, the environmental score shows negative signs, albeit not significantly. This might indicate that the social factor has a more immediate impact on sovereign default risk, while an environmental factor such as climate risk will emerge in the long term.<sup>11</sup> The estimation using Beyond Ratings ESG scores shows that the governance factor has a significantly negative effect on sovereign funding costs in Asia and the Pacific. This contrasting result is probably attributable to the different scope and criteria used to evaluate ESG, which might be expressed more clearly in each component score.<sup>12</sup>
- Among the OECD countries, the governance performance of MSCI is found to be negatively correlated with sovereign funding costs, while the impacts of the environmental and social indicators are not significant. This is in line with the previous findings of Capelle-Blancard et al. (2016). The results are unchanged based on Beyond Ratings ESG scores. Various studies on European sovereign funding costs have noted that the governance aspect of a country's ESG performance (such as corruption and political stability) exhibits stronger explanatory power (Arghyrou and Kontonikas 2012; Bernorth and Erdogan 2012). We find that the coefficients of the ESG components are significant and consistent for OECD countries. It might therefore be interpreted that the availability and reliability of a country's ESG data are superior in OECD countries.

## 5.2 Robustness Analysis

As a robustness check, we use CDS spreads as a dependent variable. CDS spreads are regarded as a purely market-driven measure of sovereign credit risk. In most cases, they are more liquid than the underlying physical bonds, and are immune to liquidity constraints. The results remain unchanged (Appendix Table A10).

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<sup>11</sup> A different ESG factor will present greater risks over different time periods. In the longer term, ESG trends such as demographic and climatic changes are likely to have a significant impact on bond yields, but the extent is rather uncertain. Social factors tend to be given greater weight by analysts than environmental factors owing to the links between political stability, governance, and a country's ability to raise taxes or make reforms (World Bank 2018).

<sup>12</sup> The MSCI's governance score has incorporated a few numerical financial indicators, such as current account surplus, which may have had some impact on the discrepancy seen in the results.

It is next possible to conduct the robustness check through investigating the effect of the sovereign ESG scores on the sovereign credit ratings provided by S&P. The rationale behind using credit ratings is that they are a benchmark of default probability and are closely linked with sovereign funding costs. Tables A8 and A9 depict the ordered Probit model regression results. The conclusions on the comprehensive ESG scores that we can extract from Tables A7 to A9 continue to hold for the different regions. The coefficient estimates of the ESG ratings of both MSCI and Beyond Ratings have the same negative signs and statistical significance, suggesting that better ESG performance scores are associated with higher sovereign credit ratings. With regard to each component of ESG, the impact of the environmental factor of MSCI on credit ratings is not significant. This result is consistent with the statement of the S&P report<sup>13</sup> in 2018. This report commented that governance effectiveness is the most prevalent ESG factor for sovereign ratings, while the environmental consideration is less considered in the methodology, with potential rating implications in the longer term.

## 6. CONCLUSION

This paper has examined the link between the ESG performance of a country and its funding costs. We have focused on emerging countries, in particular those in Asia, as these nations are especially vulnerable to unstable funding costs and ESG risks.

The analysis has shown that there is a significantly negative relationship between overall sovereign ESG performance and sovereign yield spreads. Given varied ESG criteria, this paper has verified the results using the ESG scores of two leading companies, MSCI and Beyond Ratings.

The paper has applied the model to subregions, confirming that the aggregate ESG scores are significantly negative across regions. However, the coefficient significance of each component manifests different results depending on the region. In the Asia and Pacific region, the social factor has a significant negative effect on sovereign funding costs, whereas in OECD countries the governance factor is significant. The environmental score shows negative signs, but is not significant in Asia. The impact of each ESG component is not constant between MSCI and Beyond Ratings in the Asia and Pacific region.

As a robustness check, the paper has investigated whether ESG performance affects sovereign credit ratings, a benchmark of funding costs. The aggregate ESG score has a significant negative impact, although the impact of environmental considerations is not significant, suggesting that credit ratings have not fully captured the environmental factors.

The policy implications of this paper are that the government should be aware that ESG factors have gained greater importance in investment decisions, and that improved ESG performance could reduce funding costs. In Asia and the Pacific, it is particularly pertinent to improve social factors such as human rights, education, gender equality, and infrastructure.

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<sup>13</sup> For more details, please refer to S&P (2018).

Investors perceive that social factors are closely linked with political stability, social cohesiveness, and a country's ability to pay debts. These social factors are generally enhanced by a country's wealth and development. Considering the potential trade-off between certain environmental and social factors, policy makers need to find the right balance between economic development and environment protection or energy consumption.

One area deserving future research is to investigate how different ESG criteria and methodologies are incorporated in investors' behavior and debt pricing. It would also be worth estimating the model over a longer time span, and to explore whether each ESG component affects funding costs across a different time frame.

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## APPENDIX

**Appendix Table A1: Beyond Ratings ESG Government Rating Framework**

<b>Pillar</b>	<b>Weight (%)</b>	<b>Theme</b>	
Environmental Performance	30%	Energy	Energy policy
			Fossil fuel risks
			Energy independency
		Climate	Physical risks
			Transition risks
		Resources	Natural resources Air and water
Social Performance	30%	Human capital	
		Health	
		Societal	
		Inequality	
		Employment	
Governance	40%	Control of corruption	
		Government effectiveness	
		Rule of law	
		Regulatory quality	
		Voice and accountability	
		Political stability and absence of violence	

Source: Beyond Ratings (2019).

**Appendix Table A2: MSCI ESG Government Rating Framework**

Pillar	Risk Factor	Weight (%)	Risk Exposure	Weight (%)	Risk Management	Weight (%)
Environmental Risk	Natural resource risk	18%	Energy security risk	6%	Energy resource management	6%
			Productive land and mineral resources	6%	Resource conservation	6%
			Water resources	6%	Water resource management	6%
	Environmental externalities and vulnerability risk	7%	Vulnerability to environmental events	3%	Environmental performance	3%
			Environmental externalities	4%	Management of environmental externalities	4%
Social Risk	Human capital risk	15%	Basic human capital	5%	Basic needs	5%
			Higher education and technology readiness	6%	Human capital infrastructure	3%
					Human capital performance	3%
			Knowledge capital	4%	Knowledge capital management	4%
Governance Risk	Economic environment risk	10%	Economic environment	10%	Wellness	10%
	Financial governance risk	20%	Financial capital and trade vulnerability	20%	Financial management	20%
	Political governance risk	30%	Institution	10%	Stability and peace	10%
			Judicial and penal system	10%	Corruption control	10%
		Governance effectiveness	10%	Political rights and civil liberties	10%	

Source: MSCI (2019), MSCI ESG government ratings.

**Appendix Table A3: Pearson’s Correlation Matrix of ESG Scores**

		1	2	3	4	5	6	7	8
1	ESG	1.00							
2	E	0.46	1.00						
3	S	0.87	0.20	1.00					
4	G	0.95	0.24	0.81	1.00				
5	BESG	0.90	0.27	0.94	0.84	1.00			
6	BE	0.64	0.63	0.56	0.48	0.66	1.00		
7	BS	0.80	0.19	0.89	0.74	0.88	0.58	1.00	
8	BG	0.86	0.19	0.89	0.83	0.97	0.51	0.78	1.00

Note: The independent variables use the same abbreviations throughout the paper.

Source: Calculated based on Stata.



**Appendix Table A4: Pearson's Correlation Matrix**

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 ESG	1.00														
2 E	0.46	1.00													
3 S	0.87	0.20	1.00												
4 G	0.95	0.24	0.81	1.00											
5 BESG	0.90	0.27	0.94	0.84	1.00										
6 BE	0.64	0.63	0.56	0.48	0.66	1.00									
7 BS	0.80	0.19	0.89	0.74	0.88	0.58	1.00								
8 BG	0.86	0.19	0.89	0.83	0.97	0.51	0.78	1.00							
9 VIX	0.09	0.08	0.13	0.14	0.07	0.02	0.01	0.08	1.00						
10 Cab	0.40	-0.07	0.34	0.48	0.31	0.09	0.32	0.31	-0.07	1.00					
11 Inf	-0.38	0.03	-0.50	-0.36	-0.48	-0.19	-0.38	-0.52	0.15	-0.17	1.00				
12 Debt	-0.10	-0.27	0.14	-0.10	0.16	-0.10	0.12	0.22	-0.10	-0.10	-0.33	1.00			
13 Res	-0.29	-0.14	-0.28	-0.27	-0.41	-0.28	-0.16	-0.48	-0.09	0.01	0.18	-0.07	1.00		
14 Growth	-0.25	-0.13	-0.36	-0.19	-0.33	-0.25	-0.30	-0.31	-0.23	0.09	0.27	-0.29	0.25	1.00	
15 QE	0.12	-0.18	0.20	0.13	0.27	0.18	0.22	0.27	-0.28	0.17	-0.20	0.40	-0.17	-0.09	1.00

Note: The independent variables use the same abbreviations throughout the paper.

Source: Calculated based on Stata.

**Appendix Table A5: Countries included in the Analysis**

Asia and Pacific region	Australia; Hong Kong, China; India; Indonesia; Japan; Malaysia; Mongolia; New Zealand; Pakistan; People's Republic of China; the Philippines; Republic of Korea; Sri Lanka; Thailand; Viet Nam.
OECD countries	Australia; Austria; Belgium; Canada; Chile; Czech Republic; Denmark; Estonia; Finland; France; Germany; Hungary; Iceland; Ireland; Israel; Italy; Japan; Latvia; Lithuania; Mexico; Netherlands; New Zealand; Norway; Poland; Portugal; Republic of Korea; Slovak Republic; Slovenia; Spain; Sweden; Switzerland; Turkey; United Kingdom; United States.
Europe and Central Asia	Austria; Belgium; Czech Republic; Denmark; Estonia; Finland; France; Germany; Hungary; Iceland; Ireland; Italy; Latvia; Lithuania; Netherlands; Norway; Poland; Portugal; Slovak Republic; Slovenia; Spain; Sweden; Switzerland; Turkey; United Kingdom.
Latin America, the Caribbean, and North America	Canada; Chile; Mexico; United States
Middle East	Israel

Note: The region classification is sourced from the World Bank.

**Appendix Table A6: GMM Regressions of 10-Year Government Bond Yield Spread (with MSCI ESG Data)**

	All Sample		Asia and the Pacific		OECD	
	(1)	(2)	(3)	(4)	(5)	(6)
L.YS	0.496*** (0.0641)	0.488*** (0.0667)	0.700*** (0.0614)	0.709*** (0.0590)	0.585*** (0.0829)	0.562*** (0.0855)
ESG	-0.537*** (0.156)		-0.364** (0.121)		-0.374*** (0.129)	
E		0.0526 (0.0907)		-0.0779 (0.0620)		0.149 (0.103)
S		-0.492** (0.199)		-0.237* (0.121)		-0.195 (0.246)
G		-0.306* (0.156)		-0.161 (0.173)		-0.407** (0.200)
Vix	0.177*** (0.0574)	0.142*** (0.0501)	0.0915** (0.0406)	0.0901** (0.0374)	0.115* (0.0585)	0.0785 (0.0563)
Cab	-0.0604** (0.0282)	-0.0321 (0.0272)	-0.0352** (0.0130)	-0.0400** (0.0152)	-0.0445* (0.0224)	-0.0347 (0.0226)
Inf	0.0430 (0.0392)	0.0937* (0.0471)	0.0460 (0.0429)	0.0425 (0.0400)	0.0630 (0.0845)	0.0659 (0.0905)
Debt	-0.00113 (0.00377)	0.00193 (0.00396)	0.00476* (0.00254)	0.00632** (0.00265)	0.00133 (0.00403)	0.00283 (0.00391)
Res	-0.0238 (0.0270)	-0.0147 (0.0242)	-0.0698** (0.0286)	-0.0888** (0.0312)	0.00114 (0.0378)	0.00599 (0.0296)
Growth	-0.148 (0.0922)	-0.173* (0.101)	0.0319 (0.0483)	0.0441 (0.0478)	-0.156 (0.138)	-0.137 (0.126)
QE	-0.487* (0.248)	-0.686** (0.263)	-0.632* (0.331)	-0.697* (0.340)	-0.561** (0.206)	-0.626** (0.251)
Time effect	Yes	Yes	Yes	Yes	Yes	Yes
Obs	429	406	111	111	277	268
AR(2)	0.424	0.428	0.0627	0.0662	0.947	0.930
Hansen p-value	1	1	1	1	1	1

Note: 1. Standard errors in parentheses.

2. \*, \*\* and \*\*\* mean significance at 10%, 5%, and 1% levels, respectively, and standard errors.

**Appendix Table A7: GMM Regressions of 10-Year Government Bond Yield Spread (with Beyond Ratings ESG Data)**

	All Sample Countries		Asia and the Pacific		OECD	
	(1)	(2)	(3)	(4)	(5)	(6)
L.YS	0.514*** (0.0548)	0.468*** (0.0641)	0.682*** (0.0587)	0.669*** (0.0600)	0.576*** (0.0701)	0.530*** (0.0821)
BESG	-0.0710*** (0.0246)		-0.0348** (0.0135)		-0.0514** (0.0231)	
BE		0.0108 (0.0208)		-0.0131 (0.00768)		0.0231 (0.0205)
BS		-0.0462** (0.0193)		0.00291 (0.00935)		-0.0237 (0.0153)
BG		-0.0223** (0.00874)		-0.0217** (0.00993)		-0.0278** (0.0103)
Vix	0.130*** (0.0344)	0.191*** (0.0443)	0.0948** (0.0357)	0.127** (0.0499)	0.0779** (0.0368)	0.118* (0.0614)
Cab	-0.0594** (0.0282)	-0.0212 (0.0266)	-0.0381** (0.0131)	-0.0324* (0.0160)	-0.0329 (0.0239)	-0.000474 (0.0238)
Inf	0.0610 (0.0404)	0.0566 (0.0344)	0.0328 (0.0422)	0.0281 (0.0380)	0.0717 (0.0800)	0.0760 (0.0874)
Debt	-0.00700 (0.00424)	-0.00227 (0.00314)	0.00180 (0.00277)	0.00196 (0.00262)	-0.00211 (0.00333)	-0.000871 (0.00287)
Res	0.00368 (0.0256)	0.00697 (0.0202)	-0.0676*** (0.0206)	-0.0640** (0.0240)	-0.00680 (0.0325)	0.00165 (0.0274)
Growth	-0.144 (0.0890)	-0.173* (0.0902)	0.0256 (0.0473)	0.0214 (0.0457)	-0.170 (0.140)	-0.162 (0.125)
QE	-0.616** (0.241)	-0.695*** (0.235)	-0.531 (0.335)	-0.522 (0.321)	-0.622*** (0.206)	-0.704** (0.264)
Time effect	Yes	Yes	Yes	Yes	Yes	Yes
Obs	429	429	111	111	277	277
AR(2)	0.442	0.450	0.0705	0.0778	0.924	0.858
Hansen p-value	1	1	1	1	1	1

Note: 1. Standard errors in parentheses.

2. \*, \*\* and \*\*\* mean significance at 10%, 5%, and 1% levels, respectively, and standard errors.

**Appendix Table A8: Ordered Probit Model Regressions of Sovereign Credit Ratings (with MSCI ESG Data)**

	All Sample Countries				Asia and the Pacific			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ESG	-0.965*** (0.0323)					-1.272*** (0.0986)		
E		0.0680** (0.0272)	-0.0125 (0.0262)				0.154** (0.0697)	0.0492 (0.0627)
S		-0.561*** (0.0338)		-0.841*** (0.0293)			-1.300*** (0.138)	
G		-0.695*** (0.0381)			-0.97*** (0.0332)		-0.843*** (0.120)	
Cab	-0.042*** (0.0041)	-0.024*** (0.0043)	-0.058*** (0.0040)	-0.034*** (0.0041)	-0.03*** (0.0041)	-0.063*** (0.0105)	-0.056*** (0.0111)	-0.031*** (0.0098)
Inf	0.041*** (0.0047)	0.037*** (0.0048)	0.057*** (0.0045)	0.044*** (0.0047)	0.038*** (0.0047)	0.0288 (0.0201)	0.0401* (0.021)	0.102*** (0.0187)
Debt	-0.0005 (0.001)	0.005*** (0.001)	0.002* (0.001)	0.008*** (0.001)	-0.0005 (0.001)	0.005** (0.00222)	0.016*** (0.003)	0.0032 (0.00218)
Res	-0.020*** (0.00744)	-0.022*** (0.00751)	0.0239*** (0.00712)	-0.00662 (0.00733)	-0.015** (0.00742)	-0.100*** (0.0237)	-0.105*** (0.0275)	-0.0279 (0.0204)
Growth	-0.038*** (0.0104)	-0.042*** (0.0108)	0.0526*** (0.0100)	-0.055*** (0.0106)	0.009 (0.0101)	-0.0701** (0.0337)	-0.0408 (0.0361)	0.0639** (0.0313)
Time effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	1,067	1,067	1,067	1,067	1,067	187	187	187
LogLik	-2093	-1974	-2613	-2147	-2118	-295.1	-241.8	-414.4
	Asia and the Pacific				OECD			
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	
ESG			-1.322*** (0.0760)					
E				0.0706 (0.0592)	-0.237** (0.0526)			
S	-1.550*** (0.121)			-1.168*** (0.125)		-1.772** (0.106)		
G		-1.304*** (0.0982)		-0.956*** (0.0850)			-1.28*** (0.0731)	
Cab	-0.063*** (0.0108)	-0.034*** (0.0101)	-0.078*** (0.016)	-0.028* (0.017)	-0.137** (0.015)	-0.082** (0.015)	-0.030* (0.016)	
Inf	0.0343* (0.0205)	0.0479** (0.0197)	0.067** (0.0309)	0.040 (0.0312)	0.084*** (0.0290)	0.006 (0.0303)	0.081*** (0.0303)	
Debt	0.015*** (0.00247)	0.006** (0.00224)	0.006*** (0.00173)	0.0127*** (0.00192)	0.009*** (0.0016)	0.017*** (0.0018)	0.006*** (0.0017)	
Res	-0.105*** (0.0249)	-0.0500** (0.0227)	-0.00553 (0.0193)	0.0122 (0.0200)	0.00883 (0.0179)	0.0262 (0.0191)	0.002 (0.0191)	
Growth	-0.0539 (0.0345)	-0.00871 (0.0326)	-0.060*** (0.0233)	-0.0533** (0.0235)	-0.0163 (0.0224)	-0.0427* (0.0228)	-0.0413* (0.0232)	
Time effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Obs	187	187	360	360	360	360	360	
LogLik	-271.6	-297.7	-487.5	-446.3	-667.9	-514.1	-492.2	

Note: 1. Standard errors in parentheses.

2. \*, \*\* and \*\*\* mean significance at 10%, 5%, and 1% levels, respectively, and standard errors.

**Appendix Table A9: Ordered Probit Model Regressions of Sovereign  
Credit Ratings (with Beyond Ratings ESG Data)**

	All Sample Countries					Asia and the Pacific		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
BESG	-0.114*** (0.00409)					-0.373*** (0.0321)		
BE		-0.022*** (0.00694)	-0.089*** (0.00549)				-0.063*** (0.0182)	-0.075*** (0.0132)
BS		-0.024*** (0.00508)		-0.0792*** (0.00350)			-0.099*** (0.0165)	
BG		-0.055*** (0.00324)			-0.066*** (0.00244)		-0.166*** (0.0179)	
Cab	-0.064*** (0.00531)	-0.065*** (0.00544)	-0.067*** (0.00507)	-0.063*** (0.00528)	-0.062*** (0.00532)	-0.178*** (0.0210)	-0.172*** (0.0229)	-0.062*** (0.0122)
Inf	0.0471*** (0.00643)	0.0399*** (0.00678)	0.0712*** (0.00611)	0.0595*** (0.00648)	0.0368*** (0.00646)	0.0257 (0.0260)	0.0735** (0.0352)	0.0959*** (0.0208)
Debt	0.0105*** (0.00118)	0.0113*** (0.00122)	0.00147 (0.00111)	0.00519*** (0.00113)	0.0114*** (0.00120)	0.0379*** (0.00412)	0.0406*** (0.00490)	0.00220 (0.00227)
Res	-0.030*** (0.00834)	-0.041*** (0.00935)	0.0159** (0.00787)	0.0362*** (0.00796)	-0.050*** (0.00860)	-0.352*** (0.0455)	-0.328*** (0.0504)	-0.0240 (0.0213)
Growth	-0.056*** (0.0121)	-0.051*** (0.0128)	0.000352 (0.0117)	-0.0476*** (0.0125)	-0.0240** (0.0120)	-0.154*** (0.0537)	-0.177*** (0.0584)	0.0517 (0.0366)
Time effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	802	747	802	747	802	157	147	157
LogLik	-1437	-1302	-1767	-1459	-1482	-129.9	-106.7	-310.7
	<b>Asia and the Pacific</b>					<b>OECD</b>		
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	
BESG			-0.186*** (0.0107)					
BE				-0.0307** (0.0124)	-0.082*** (0.0106)			
BS	-0.141*** (0.0121)			-0.070*** (0.00880)		-0.113*** (0.00760)		
BG		-0.161*** (0.0129)		-0.070*** (0.00746)			-0.101*** (0.00632)	
Cab	-0.0990*** (0.0149)	-0.107*** (0.0146)	-0.084*** (0.0160)	-0.082*** (0.0165)	-0.114*** (0.0150)	-0.065*** (0.0156)	-0.104*** (0.0153)	
Inf	0.109*** (0.0245)	0.0408* (0.0240)	0.0372 (0.0311)	0.0353 (0.0316)	0.0826*** (0.0295)	0.0907*** (0.0299)	0.00196 (0.0306)	
Debt	0.00867*** (0.00255)	0.0373*** (0.00386)	0.0169*** (0.00183)	0.0171*** (0.00184)	0.0105*** (0.00164)	0.0136*** (0.00169)	0.0162*** (0.00177)	
Res	0.0353 (0.0259)	-0.277*** (0.0369)	-0.0346* (0.0201)	-0.0198 (0.0212)	-0.0219 (0.0193)	0.0458** (0.0188)	-0.0366* (0.0195)	
Growth	-0.103** (0.0466)	-0.0921** (0.0447)	-0.0206 (0.0232)	-0.0249 (0.0234)	-0.00747 (0.0225)	-0.0367 (0.0228)	-0.00607 (0.0229)	
Time effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Obs	147	157	350	340	350	340	350	
LogLik	-190.7	-160.6	-485.2	-467.1	-641.6	-527.9	-524	

Note: 1. Standard errors in parentheses.

2. \*, \*\* and \*\*\* mean significance at 10%, 5%, and 1% levels, respectively, and standard errors.

**Appendix Table A10: GMM Regressions of Sovereign CDS Spread**

	Asia and the Pacific		OECD	
	(1)	(2)	(3)	(4)
ESG	-73.84*** (18.25)		-140.1* (72.98)	
BESG		-7.878*** (2.017)		-22.28* (12.31)
Vix	22.43*** (5.459)	24.06*** (6.217)	30.08** (14.62)	52.51* (28.61)
Cab	-5.067 (3.900)	-6.471* (3.414)	3.124 (7.936)	3.725 (8.844)
Inf	21.37 (12.83)	23.32 (13.64)	4.534 (8.915)	-2.010 (11.37)
Debt	0.156 (0.424)	0.566 (0.452)	1.775 (1.547)	2.785 (1.769)
Res	-5.371 (4.540)	-5.478 (5.131)	-13.39 (15.48)	-14.58 (16.78)
Growth	-25.62 (16.04)	-28.47 (16.96)	-76.25 (50.34)	-74.59 (48.49)
Observations	133	133	341	341
AR(2)	0.603	0.631	0.275	0.270

Note: 1. Standard errors in parentheses.

2. \*, \*\* and \*\*\* mean significance at 10%, 5%, and 1% levels, respectively, and standard errors.