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SOVEREIGN BOND SPREADS AND EXTRA-FINANCIAL PERFORMANCE: AN EMPIRICAL ANALYSIS OF EMERGING MARKETS*

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Abstract

This paper studies the impact of a country's extra-financial performance on their sovereign bond spreads. Sovereign bond spreads reflect both an economic default risk and a strategic default risk. We hypothesize that a country's extra-financial performance reduces default risk by signaling good commitment ability. We test this hypothesis for the countries which bonds are included in the JP Morgan Emerging Markets Bond Index Global. Over the period from 2001 to 2010, we find that an emerging country's average cost of capital decreases with its environmental and social performance.

Resumen

Este trabajo estudia el impacto de la información extra-financiera en los spreads de los bonos soberanos. Los spreads soberanos reflejan dos tipos de riesgos de no pago: un riesgo de no pago económico y otro estratégico. Nuestra hipótesis es que la información extra-financiera de un país reduce el riesgo de no pago estratégico, en la medida que refleja un buen compromiso. Testeamos esta hipótesis para los países, cuyos bonos soberanos forman parte del Indice Global de Bonos de Mercados Emergentes del JPMorgan. Usando datos entre los años 2001-2010, encontramos que el costo de capital promedio en estos países se reduce cuando la performance ambiental y/o social mejora.

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1 Introduction

This paper studies the link between a country's sovereign bond returns and its extra-financial performance, as measured by Environmental, Social and Governance (ESG) variables. Similar to corporate bonds, government bonds bear a risk of economic default in case of major macroeconomic downturns. But government bonds also bear a strategic default risk to the extent that governments can repudiate their debt due to their sovereignty privilege.

A good extra-financial performance at the country level might serve three distinct economic roles. First, a good performance might signal a country's long-term orientation and may thus act as a credible commitment to repay its debt in the future. Second, to the extent that exploiting natural resources and social development requires the collaboration of outside parties (like foreign countries or large foreign private organizations), countries with sound extra-financial performance might have more to loose in case of default: They would not only loose some future opportunities to borrow, but also loose part of the future benefits from its natural and social resources. Third, a country's natural and social resources might have a direct long term economic impact, acting as a buffer against negative economic shocks or having a positive impact on future growth.

In this paper, we test whether emerging countries with good ESG performance, have a lower (economic and/or strategic) risk of default and therefore, a lower cost of debt. We focus on emerging countries for two reasons. First, the risk of default is pretty prevalent. This can be seen in the significant number of emerging countries which have experienced default episodes since 2000 (*e.g.*, Argentina, Ecuador, Dominican Republic, Gabon, Nigeria, Venezuela and Ukraine).

Second, ESG issues are particularly acute for emerging countries. For example, the Environmental Performance Index (EPI), published annually by Yale University, appears pretty low in 2010 for the countries included in the Emerging Market Bond Index Global, ranging from 25 (for Iraq) to 64 (for Croatia). This has to be compared to the average EPI score for OECD countries which equals 72 for the same year.

To measure the cost of debt, we focus on government bond spreads as provided by the JP Morgan's EMBI Global database.[1] The data sample is $2001 - 2010$. To proxy a country's extra-financial performance, we use three indices on Environmental, Social and Governance issues: the Environmental Performance Index (constructed by Yale University), the Human Development Index and the World Governance Index (both from the World Bank), respectively.

The environmental performance reflects how well countries manage their natural resources (access to water, biodiversity, etc), while the social performance measures the countries' human development (literacy rate, education enrollment ratios, life expectancy, among others). The governance

[1] The spread is the government bond interest rate minus the US government bond rate.

indicator, in turn, covers issues such as government effectiveness, regulatory quality, rule of law, control of corruption, voice and accountability, political stability and no violence. Finally, we also use additional data to build control variables related to technical bond issues, macroeconomic conditions and sovereign credit ratings.

We use an estimation based on the Generalized Method of Moments (GMM) which enables to regress the government bond spreads, as a function of the ESG indicators and the various control variables. Because of the long-run features of the macroeconomic control variables and the ESG factor correlation, we introduce various autoregressive variables in the estimation.

Overall, our results show that a good country's ESG performance is associated with a lower cost of debt. Furthermore, the evidence presented below suggests a dual effect of the ESG factors. On the one hand, the governance indicator is negatively associated with contemporaneous government bond spreads. On the other hand, the environmental and social factors are positively associated with contemporaneous government bond spreads and negatively associated with future spreads. These results are robust to alternative specifications of the variables used to proxy the country-specific macroeconomic conditions.

This last result indicates that changes in a country's environmental and social performance take some time to be incorporated by financial markets. This seems intuitive since the impact of environmental and social performance is likely to have a long-term impact that is difficult to evaluate. Interestingly, our results are in line with Crifo *et al.* (2014)'s conclusion that the cost of debt of 23 OECD countries is lower due to a sound ESG performance of the issuer.

Practical implications of our results are twofold. First, these results indicate that environmental, social and governance factors are priced by sovereign bond markets, good ESG performance being associated with less default risk and thus lower cost of debt. Such a conclusion is interesting for governments and policy makers, concerned about the determinants of the cost of sovereign debt. It is also relevant for responsible asset managers and investors who screen investment opportunities based on ESG criteria to avoid investing in countries that are not acting in accordance with international norms.[2] These institutions rely on the same type of information as we do, given the non-availability of high frequency data. Second, these results suggest that tactical portfolio reallocations, based on observed changes in countries ESG performance, might improve sovereign bond portfolios risk-adjusted returns.

The remainder of the paper is organized as follows. Section 2 reviews the related literature,

[2]An example of asset management firm who uses ESG factors to design its investment policy is Global Evolution, as indicated in its sovereign screening process at globalevolution.com. The Norway sovereign pension fund global is another example of a responsible investor who uses ethical principles to screen potential investments in foreign countries, as explained at regjeringen.no/en/topics/the-economy/the-government-pension-fund/responsible-investments.

whereas section 3 describes the Hypothesis we test in this paper. Section 4 presents the data and the methodology. Section 5 displays the empirical results and discusses the main findings of the paper. Finally, section 6 concludes. The appendix contains additional details and descriptive statistics, absent in the main text.

2 Literature Review

Our paper is related to two strands of literature.

First, there is the abundant literature on the empirical determinants of emerging markets (EM) sovereign bond spreads. Although the list of drivers this strand identifies is long, it is possible to classify them into two groups. On one hand, global factors, also known as "push" factors, such as, capital flows, international interest rates and risk appetite, international terms of trades and external shocks. On the other hand, country-specific macroeconomic variables or "pull" factors, like GDP growth, international reserves, export growth, fiscal and current account balance, public investment, inflation and sovereign credit ratings. Among the most recent contributions, it is possible to cite González-Rozada and Levy Yeyati (2008), Hilscher and Nosbusch (2010) and Kennedy and Palerm (2014).

One focus of this literature has been to determine whether the pull or push factors dominate. As some illustrations, González-Rozada and Levy Yeyati (2008) find that over $1993 - 2005$, a large fraction of the time variability of EMBI spreads has been explained by the evolution of global factors, such as risk appetite, global liquidity and contagion from systemic events. Kennedy and Palerm (2014), in turn, find that much of the decline in the EMBI spreads from 2002 to 2007 reflects improved country-specific fundamentals, but their sharp increase in the 2008 crisis has been due to risk aversion.[3]

Second, there is the strand examining the impact of environmental, social and governance factors on sovereign bond spreads or sovereign credit ratings. The majority of articles consider the governance indicators as a way to proxy these soft factors.[4] Among them, Ciocchini *et al.* (2003) and Depken *et al.* (2011) focus on corruption; Moser (2007), Baldacci *et al.* (2011) and Bekaert *et al.* (2014) concentrate on political risk and finally, Cosset and Jeanneret (2014) and Benzoni *et al.* (2015) examine the impact of government effectiveness and political stability, respectively.[5]

[3]Instead of EMBI spreads, several authors have looked at sovereign Credit Default Swap data. Some examples are Remolona *et al.* (2008), Longstaff *et al.* (2010) and Amstad *et al.* (2016).

[4]Most of them also include global and macro-economic country-specific variables, as additional covariates.

[5]Ciocchini *et al.* (2003) and Depken *et al.* (2011) rely on the Transparency International Corruption Perception Index; Baldacci *et al.* (2011) use the International Country Risk Guide Political Risk Indicator and Bekaert *et al.* (2014) elaborate their own index, based on the World Bank Governance Indicators. Finally, Cosset and Jeanneret

Overall, these studies conclude that governance indicators matter to explain credit risk in emerging markets. For instance, Ciocchini *et al.* (2003) show that emerging countries that are perceived as more corrupt must pay a higher risk premium when issuing bonds, while Baldacci *et al.* (2011) find that lower levels of political risk are associated with tighter sovereign bond spreads, particularly during financial turmoil.

Only two studies investigate how a broad measure of environmental, social and governance factors affect sovereign bond markets. First, Drut (2010) investigates how the mean efficient frontier of portfolios containing sovereign bonds from 20 developed countries changes, due to an integration of ESG factors. He concludes that an integration of ESG factors in sovereign bond portfolios does not affect the efficient frontier and thus the financial performance.

Second, Crifo *et al.* (2014) show that the cost of debt of 23 OECD countries, as measured by sovereign bond yield spreads, is lower due to a sound ESG performance of the issuer. The ESG performance is measured by *Vigeo* ratings. In addition, they show that the positive effect of ESG ratings on the cost of debt decreases with bond maturities.

We contribute to the aforementioned strands of literature, since in addition to global and country-specific macroeconomic variables, we examine whether ESG factors are significant non-economic, long-run determinants of EM sovereign bond spreads. To our best knowledge, we are first to examine these factors for emerging markets.

3 Hypothesis

The reasons why countries ever pay back their debt have been the object of a long standing debate in economics. Their sovereignty indeed does not put them under external authority to impose repayment. One reason for repayment as highlighted for example by Eaton and Gersovitz (1981) is that sovereign entities want to maintain a good reputation to ensure future access to borrowing. In this case, the more long-term oriented a country is, the more important its reputation is, and the less likely its default.

This logic has been questioned by Bulow and Rogoff (1989) on the ground that credibility for repayment is very hard to establish: After a country has borrowed, it has an incentive to use any money obtained or generated by positive fiscal shocks to invest and smooth future negative shocks with these savings, thus not depending on future borrowing capacities. Bulow and Rogoff (1989) then show that additional sanctions, above the fact of not lending, should be exercised in order for sovereign entities to be able to borrow.

(2014) rely on the World Bank Governance Indicators.

Cole and Kehoe (1994) elaborate on this idea by indicating that the threat of terminating non-lending relationships such as collaborations to exploit common resources, as suggested by Conklin (1998), might induce countries to repay in order to preserve these agreements. Dhillon *et al.* (2013) further show that borrowing countries and their lenders might be involved in long-term relationships, aside from the lending ones, that may also enable lenders to impose penalties on borrowers in case of default. This reduces the risk of default on the sovereign borrower. Overall, in these models, sovereign countries repay their debt because they are concerned about their long-term reputation. Finally, following the insight of Grossman and Van Huyk (1988), sovereign (partial) default might be viewed as an efficient way of smoothing shocks over time (countries pay back when they are rich but pay back less when they are poor).

Given these conceptual considerations, a good extra-financial performance at the country level might serve three distinct economic roles. First, to the extent that extra-financial performance mostly materializes in economic benefits in the long term, a good performance might act as a signal of a country's long-term orientation. Second, to the extent that exploiting natural resources and social development requires the collaboration of outside parties (like foreign countries or large foreign private organizations), countries with a high level of extra-financial performance might have more to loose in case of default, because they would not only loose future opportunities to borrow but also loose part of the future benefits from its natural and social resources. Third, a country's natural and social resources might act as a buffer against negative shocks. Finally, another reason why a good extra-financial performance might be associated with a lower cost of debt is that ESG factors might have a positive impact on future growth and thus on the future ability to repay. These considerations indicate that countries with a good extra-financial performance should have a lower (economic and/or strategic) risk of default and thus a lower cost of debt. This leads to the following Hypothesis.

Hypothesis 1: *There is a negative link between a good environmental, social and governance performance and the cost of debt, as measured by sovereign spreads.*

We focus here on the cost of debt, as measured by the spread over the US interest rate, because it is more easily observable then actual defaults which occur pretty infrequently. Moreover, it is obviously likely that other factors than the extra-financial performance of a country affect its spread. We thus include a number of control variables in our analysis, including sovereign credit ratings and macroeconomic variables.

4 Data and Methodology

4.1 Data

4.1.1 Bond Data

We use bond data on the JP Morgan's EMBI Global, from 2001 to 2010. The EMBI Global tracks total returns of dollar-denominated sovereign bonds, issued by emerging market countries. We consider the country-specific subindexes of 33 emerging economies. Debt instruments in (each country-specific subindex of) the EMBI Global must have a minimum face value outstanding of 500 million dollars. We choose the stripped mid-point spread, as our measure for the cost of debt. It corresponds to the zero-volatility spread over the US zero-coupon yield curve.

Furthermore, JP Morgans strips away those cash flows that are guaranteed by the US government, *e.g.* Brady bonds. We then take the arithmetic average of the monthly spreads for each year (which we name hereafter as *Spread*). In addition, we use the Bid Ask spread (hereafter, *Bid Ask*), to measure liquidity; the average life (*Average Life*) of the country-specific subindex and the squared average life (*Average Life Squared*), to measure duration and convexity, respectively. Finally, we rely on Fitch's long term credit rating (hereafter, *Rating*) to measure credit worthiness.[6]

4.1.2 Macroeconomic Control Variables

GDP Growth (*GDP Growth*) is a risk score from 0 to 10 that includes current and expected growth. It is part of the International Country Risk Guide (ICRG) from the Political Risk Services (PRS) group. We use the general government gross debt (which we denote hereafter as *Gov Debt*), to measure the government's performance in managing its public finances.

4.1.3 Environmental, Social and Governance Data

The **environmental indicator** is based on the Environmental Performance Index (*EPI*) constructed by Yale University. *EPI* covers environmental health, corresponding to the protection of human health (for instance, access to water and sanitation) and ecosystem vitality, corresponding

[6]Fitch makes both a qualitative and quantitative assessment of the sovereign creditworthiness to construct their sovereign ratings. The quantitative evaluation is mainly based on economic and financial variables, corresponding to structural features (such as GDP per capita and aggregate money supply), macroeconomic performance (like GDP growth), public finances (*e.g.* the stock of debt and fiscal balance) and external balance (as the current account). To complement the quantitative assessment, Fitch adds an evaluation of each sovereign's country risk. The latter includes a variety of dimensions, ranging from the level of corruption, the functionality of the administration to the perception of potential social unrest.

to the impact of human activities on the natural environment (*e.g.*, biodiversity). *EPI* scores range from 0 (worst) to 100 (best).

The **human development index** (hereafter *HDI*) combines three measures that proxy for human development. First, it contains knowledge and education, as measured by the adult literacy rate and the combined primary, secondary, and tertiary gross enrollment ratio. Second, it includes the standard of living, as indicated by the natural logarithm of GDP per capita at purchasing power parity. Third, it integrates life expectancy at birth. The data source is World Bank.

The **governance indicator** is based on the World Governance Indicators constructed by the World Bank. These indicators cover issues such as government effectiveness, regulatory quality, rule of law, control of corruption, voice and accountability, political stability and non violence. Each indicator is normally distributed, with mean 0, standard deviation of 1 and ranges from approximately -5 to 5, with higher values corresponding to better governance.

Following common practice, we add them up, to create the variable *WGIT*.[7] Appendix A contains a detailed description of each indicator, together with the correlation matrix between them. Table 1 shows the descriptive statistics, while figures 1 and 2 depict the box plot of *Spread* and the ESG factors, namely, *EPI*, *HDI* and *WGIT*, at each point in time.

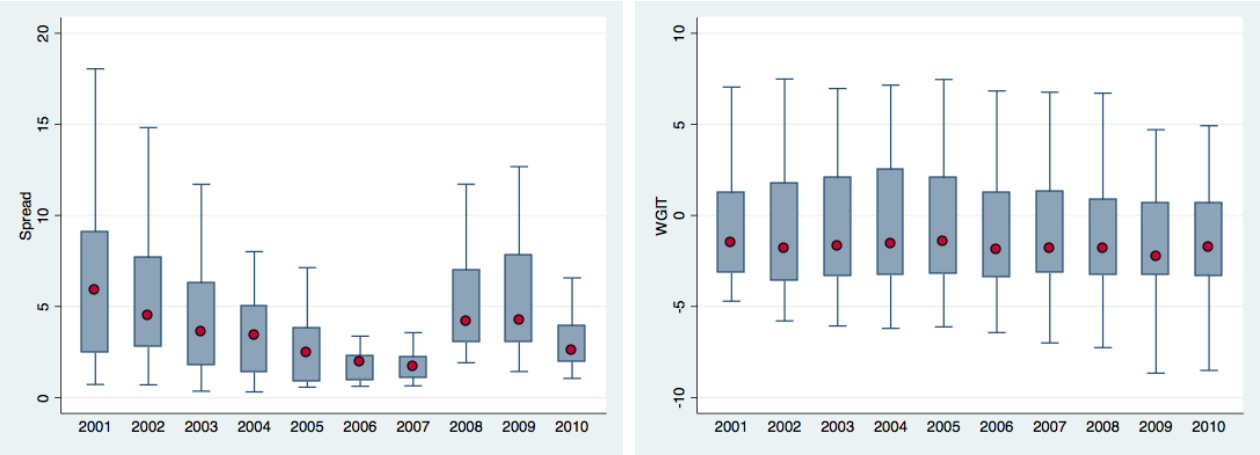
[7] See for example, Butler and Fauver (2006).

Table 1: Summary Statistics

Variable	Mean	Min	Max	N
Spread	4.66	0.31	60.67	353
	(5.95)			
Average Life	10.14	1.46	25.58	366
	(4.92)			
Average Life Squared	126.94	2.12	654.47	366
	(117.52)			
Bid Ask	0.01	0.00	0.05	353
	(0.01)			
GDP Growth	8.32	1.00	10.00	366
	(1.72)			
Gov Debt	47.78	3.89	181.91	359
	(30.56)			
Rating	12.35	1	19	309
	(3.46)			
WGIT	-1.28	-10.44	7.49	366
	(3.55)			
HDI	0.70	0.43	0.83	358
	(0.08)			
EPI	51.63	13.14	88.91	296
	(9.20)			

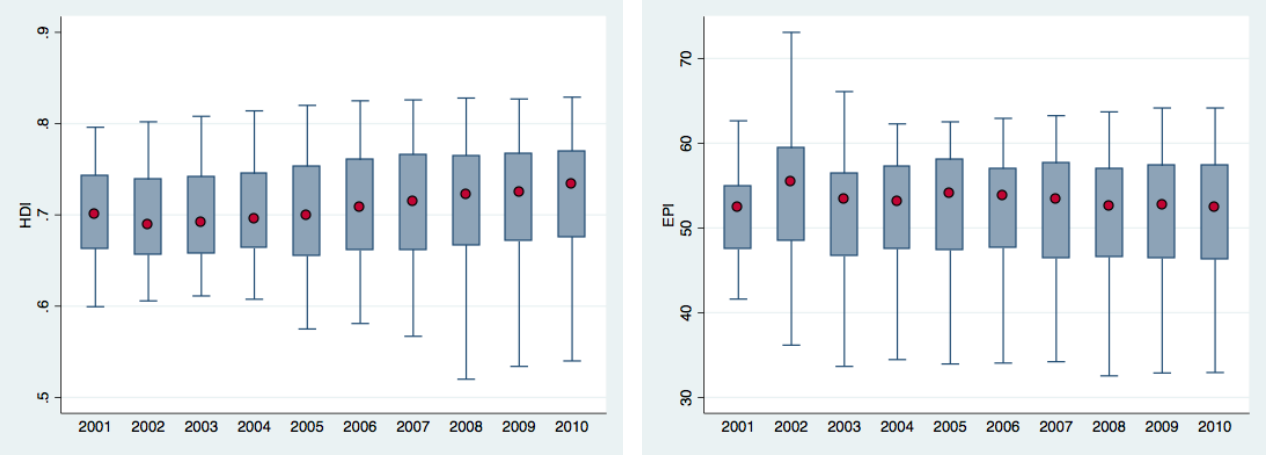
Notes: Standard deviation, in parentheses. *Spread*: Stripped Spread MidPoint. *Average Life*: Average Life. *Average Life Squared*: Average Life Squared. *Bid Ask*: Bid Ask Spread. *GDP Growth*: GDP Growth. *Gov Debt*: General Government Gross Debt. *Rating*: Fitch's Long Term Credit Rating. *WGIT*: World Governance Indicator Index Total. *HDI*: Human Development Index. *EPI*: Environmental Performance Index.

Figure 1: Box plot of *Spread* (left) and *WGIT* (right), by year



Notes: Red points depict annual median values. *Spread*: Stripped Spread MidPoint. *WGIT*: World Governance Indicator Index Total.

Figure 2: Box plot of *HDI* (left) and *EPI* (right), by year



Notes: Red points depict annual median values. *HDI*: Human Development Index. *EPI*: Environmental Performance Index.

Two comments are at place. First, tables 1 and figures 1 and 2 outline the evolution of *Spread*, as well as the heterogeneity between countries, in terms of their environmental, social and governance performance. For instance, if we consider the environmental dimension, not all the considered economies take care of their natural resources in the same way. Indeed, in 2010, the *EPI* score ranges from 25 (for Iraq) to 64 (for Croatia). To put the latter figures into perspective, the average *EPI* score for OECD countries equals 72 for the same year.

Second, over the period, some emerging economies have experienced significant disruptive episodes. For example, Argentina, Venezuela, Dominican Republic, Ecuador, Nigeria and Gabon

have suffered sovereign debt crisis,[8] whereas Lebanon entered in war in 2006.[9] Critical events like the aforementioned ones may not be well captured by the commonly used empirical determinants of *Spread* (see section 2). The inclusion of the ESG factors aims at capturing the impact of extra-financial performance information on emerging markets' cost of debt.

In order to assess the informational content of the ESG factors relative to the country-specific macroeconomic variables, we conduct the following exercise. We first construct quartiles, based on the empirical distribution of each ESG factor and *Rating*, the latter summarizing the country-specific macroeconomic determinants. We then look at whether countries with good (bad) ESG performance tend to coincide with those with high (low) credit scores.

Tables 2, 3 and 4 present bivariate contingency tables between the quartiles of each ESG factor and *Rating*, as well as the mean and standard deviation of *Rating*, for each quartile of the ESG factors. Recall that higher values of the four variables correspond to better performance.

Interestingly, tables 2, 3 and 4 suggest a distinct pattern between the environmental and social factors, on one hand, and the governance indicator, on the other: While countries with good environmental and social indicators may not necessarily be those with sound macroeconomic performance, as measured by credit scores, the evidence on *WGIT* depicts a positive relationship with *Rating*.

As an illustration, if we look at the diagonal elements of the bivariate contingency tables (left blocks of tables 2, 3 and 4), the number of matches between *WGIT* and *Rating*, by quartile, is much higher than in the other two bivariate comparisons. The latter is reflecting that Fitch Credit Rating Agency takes this information into account when evaluating the financial health of a country, as described in its credit rating model documentation.

[8] We define sovereign debt crisis as episodes at which the sovereign was unable to meet its obligations, as they became due. The latter definition thus includes sovereign defaults and/or sovereign debt restructuring plans.

[9] As an illustration, the *WGIT* score of Lebanon in 2006 is -4.34, below the -2.93 average *WGIT* score of the countries in our dataset belonging to the same region.

Table 2: Bivariate contingency table between the quartiles of *EPI* and *Rating* (left block) and mean and standard deviation of *Rating*, for each quartile of *EPI* (last column)

		Rating				
	Quartiles of	1	2	3	4	*Rating*
EPI	1	7.14	24.64	17.65	31.88	13.71 (0.39)
	2	41.43	34.78	23.53	7.25	10.97 (0.30)
	3	32.86	20.29	22.06	30.43	11.91 (0.53)
	4	18.57	20.29	36.76	30.43	12.92 (0.38)
	Total	100.00	100.00	100.00	100.00	

Notes: Standard deviation, in parentheses. Rating: Fitch's Long Term Credit Rating. EPI: Environmental Performance Index.

Table 3: Bivariate contingency table between the quartiles of *HDI* and *Rating* (left block) and mean and standard deviation of *Rating*, for each quartile of *HDI* (last column)

		Rating				
	Quartiles of	1	2	3	4	*Rating*
HDI	1	7.46	27.27	28.57	18.42	13.21 (0.30)
	2	44.78	42.42	17.46	6.58	10.94 (0.35)
	3	32.84	18.18	41.27	21.05	12.23 (0.36)
	4	14.93	12.12	12.7	53.95	13.65 (0.59)
	Total	100.00	100.00	100.00	100.00	

Notes: Standard deviation, in parentheses. Rating: Fitch's Long Term Credit Rating. HDI: Human Development Index.

Table 4: Bivariate contingency table between the quartiles of *WGIT* and *Rating* (left block) and mean and standard deviation of *Rating*, for each quartile of *WGIT* (last column)

		Rating				
	Quartiles of	1	2	3	4	*Rating*
WGIT	1	37.97	26.32	5.19	10.39	10.47 (0.36)
	2	29.11	40.79	24.68	12.99	11.63 (0.40)
	3	26.58	23.68	45.45	7.79	11.68 (0.34)
	4	6.33	9.21	24.68	68.83	15.09 (0.26)
	Total	100.00	100.00	100.00	100.00	

Notes: Standard deviation, in parentheses. Rating: Fitch's Long Term Credit Rating. WGIT: World Governance Indicator Index Total.

In the next section, we present the methodology we use to test the Hypothesis 1.

4.2 Methodology

The estimation technique is a dynamic panel data regression. This is because the data show that *Spread* are persistent. More specifically, we follow a GMM estimation, through which we regress the difference of *Spread*, as a function of the first lagged difference of *Spread*, the previously defined subindex-specific and macroeconomic control variables and the ESG factors, all in first differences.[10] For the estimation, we use the Arellano-Bover (1995)/Blundell-Bond (1998) estimator, also known as system GMM;[11] in particular, we consider the one−step System GMM. Finally, the to-be reported standard errors are robust to the presence of both arbitrary heteroskedasticity and serial correlation.

[10] Using dummy variables to estimate individual (country-specific) fixed-effects in a model which also includes a lagged value of the dependent variable results in biased estimates, when the time dimension T of the panel is small (in our case, $T = 10$). This problem is widely known in the literature as the Dynamic Panel Bias or Nickel Bias. That is why we first need to difference the equation to estimate and then instrument the first lagged difference of *Spread*.

[11] As Blundell and Bond (1998) and Blundell *et al.* (2000) point out, system GMM is particularly adequate (over Difference GMM) for applications with persistent series. To implement it, we use the *xtabond2* command, available in Stata 14.1.

Because the long-run features of any macroeconomic variable and ESG factor correlation are relevant, we allow for various autoregressive equations in the estimation. The model specification for the *Spread* equation, in levels, follows:

$$\begin{aligned} Spread_{t,k} = \alpha + \phi_1 \times Spread_{t-1,k} + \beta_1 \times Average\ Life_{t,k} + \beta_2 \times Average\ Life\ Squared_{t,k} + \\ \beta_3 \times Bid\ Ask_{t,k} + \sum_{l=0}^{L_1} \rho_{1l} \times GDP\ Growth_{t-l,k} + \sum_{l=0}^{L_2} \rho_{2l} \times Gov\ Debt_{t-l,k} + \\ \sum_{l=0}^{L_3} \tau_l \times EPI_{t-l,k} + \sum_{l=0}^{L_4} \delta_l \times HDI_{t-l,k} + \sum_{l=0}^{L_5} \mu_l \times WGIT_{t-l,k} + \epsilon_{t,k}, \text{ with} \\ \epsilon_{t,k} = \mu_k + \lambda_t + e_{t,k} \end{aligned} \tag{1}$$

where k and t denote country k and year t, respectively; μ_k, λ_t and $e_{t,k}$ are unobserved country effects, year effects and observation-specific errors, respectively, with $e_{t,k} \sim N(0, \sigma^2)$; while l, L_1, L_2, L_3, L_4, L_5 refer to lag l and potentially various maximum lags for the macroeconomic control variables and the ESG factors, respectively (to-be discussed).

We introduce lags in this manner for several reasons. First, macroeconomic control variables and ESG factors may be autoregressive. In particular, sluggish adjustment of ESG factors may occur across countries and the specification needs to allow for that. Second, the timing of economic, environmental, social and governance reforms/changes is likely to vary across countries, thereby creating lags and possible dynamics. Third, using lagged ESG factors may help mitigate possible spurious positive correlation between those factors and *Spread*. Finally, lags of the independent variables may reduce the possibility of simultaneity bias from ESG factors to macroeconomic variables. Our distributed lag model provides the flexibility to account for these aspects.

If instead of using macroeconomic control variables, we rely on *Rating*, the model specification for the *Spread* equation, in levels, becomes,

$$\begin{aligned} Spread_{t,k} = \alpha + \phi_1 \times Spread_{t-1,k} + \beta_1 \times Average\ Life_{t,k} + \beta_2 \times Average\ Life\ Squared_{t,k} + \\ \beta_3 \times Bid\ Ask_{t,k} + \sum_{l=0}^{L_1} \rho_{1l} \times Rating_{t-l,k} + \\ \sum_{l=0}^{L_2} \tau_l \times EPI_{t-l,k} + \sum_{l=0}^{L_3} \delta_l \times HDI_{t-l,k} + \sum_{l=0}^{L_4} \mu_l \times WGIT_{t-l,k} + \epsilon_{t,k}, \text{ with} \\ \epsilon_{t,k} = \mu_k + \lambda_t + e_{t,k} \end{aligned} \tag{2}$$

In the next section, we present the lag structure used in each of the previous equations to estimate.

5 Empirical Results

Tables 5 and 6 report the estimation of equations (1) and (2), respectively; the first one uses macroeconomic variables as control, the second one uses *Rating*. In each table, there are several columns of results, due to alternative lag structures for the macroeconomic control variables (or the variable *Rating*) and the ESG factors and due to different combinations of control variables.

Starting with table 5, in its first column of results, we include as covariates the first differenced subindex-specific regressors, which are standardized, as well as the macroeconomic control variables. The second column adds to the first one the differenced ESG factors, also standardized, which enter contemporaneously in the equation to estimate. The third column of results, in turn, allows for distinct lag structures for the macroeconomic control variables, on one hand, and the ESG factors, on the other hand.

More specifically, while the differenced macroeconomic control variables enter contemporaneously and with their first lag, in the case of the ESG factors, we include their first as well as their second lag. Finally, in the fourth column of results, we augment the third model specification with a dummy variable that takes the value of 1 if the country has experienced a sovereign debt crisis over the sample period.

The motivation behind the distinct lag structure for the macroeconomic control variables, on one hand, and the ESG factors, on the other hand, is as follows. Regarding the first group, the inclusion of their first lag (in the third and fourth column of results of table 5) is for robustness. Concerning the ESG factors, they seem to be autoregressive, in particular, the environmental and social factors. The correlation matrix of the differenced ESG factors and their lags in Appendix A provides evidence in favor of the environmental and social factors being moving slowly.

Table 6, in turn, reports the model estimates of equation (2), this time with *Rating* summarizing the macroeconomic control variables. As before, there are several columns of results, due to alternative lag structures and different combinations of covariates. The only difference with table 5 is that table 6 no longer reports the model estimates without the ESG factors.

Table 5: GMM Regressions of D(*Spread*) on the differenced ESG Indicators.

Variable	**Spread**$_{t,k}$	**Spread**$_{t,k}$	**Spread**$_{t,k}$	**Spread**$_{t,k}$
$Spread_{t-1,k}$	0.61***	0.57***	0.63***	0.60***
	(0.02)	(0.03)	(0.03)	(0.02)
$Average\ Life_{t,k}$	3.82***	3.93***	3.21***	3.91***
	(1.36)	(1.53)	(0.98)	(1.38)
$Average\ Life\ Squared_{t,k}$	-3.60***	-3.81***	-3.24***	-4.07***
	(1.28)	(1.51)	(1.02)	(1.50)
$Bid\ Ask_{t,k}$	2.14***	2.28**	1.50***	1.41***
	(0.79)	(0.87)	(0.39)	(0.35)
$GDP\ Growth_{t,k}$	-0.72***	-0.63***	-0.37**	-0.33*
	(0.28)	(0.21)	(0.17)	(0.18)
$GDP\ Growth_{t-1,k}$			0.02	0.07
			(0.25)	(0.23)
$Gov\ Debt_{t,k}$	0.02	0.02	0.02	0.03
	(0.02)	(0.02)	(0.03)	(0.03)
$Gov\ Debt_{t-1,k}$			-0.01	-0.01
			(0.03)	(0.03)
$WGIT_{t,k}$		-0.74**	-2.44*	-1.81*
		(0.36)	(1.46)	(1.13)
$WGIT_{t-1,k}$			0.85	0.91
			(1.82)	(1.66)
$WGIT_{t-2,k}$			1.26·	0.89
			(0.87)	(0.96)
$EPI_{t,k}$		-0.06	1.09*	0.91*
		(0.30)	(0.60)	(0.53)
$EPI_{t-1,k}$			-0.63*	-0.66*
			(0.36)	(0.36)
$EPI_{t-2,k}$			-0.44*	-0.45**
			(0.24)	(0.24)
$HDI_{t,k}$		0.97·	6.81*	6.63*
		(0.69)	(4.11)	(4.04)
$HDI_{t-1,k}$			2.03	2.06
			(3.59)	(3.51)
$HDI_{t-2,k}$			-8.34**	-8.27**
			(3.76)	(3.44)
Observations (Number of instruments)	240 (39)	237 (42)	204 (38)	204 (45)
Sovereign debt crisis dummy	No	No	No	Yes
Arellano-Bond test for AR(2) p-value	0.85	0.95	0.18	0.15
Hansen test of overid. restrictions p-value	0.54	0.61	0.39	0.97
Hansen test of exog of GMM−type instr p-value	0.76	0.72	0.76	0.93
Hansen test of exog of IV−type instr p-value	0.81	0.72	0.76	0.99

Notes: Standard deviation, in parentheses. Level of significance : . 15% ,* 10% , ** 5 % , *** 1%. *Spread*: Stripped Spread MidPoint. *Average Life*: Average Life. *Average Life Squared*: Average Life Squared. *Bid Ask*: Bid Ask Spread. *GDP Growth*: GDP Growth. *Gov Debt*: General Government Gross Debt. *WGIT*: World Governance Indicator Index Total. *HDI*: Human Development Index. *EPI*: Environmental Performance Index. Arellano-Bond test for AR(2) p-value: Arellano-Bond test for second order serial correlation in first differences, Pr > z. Hansen test of overid. restrictions p-value: Hansen test of over-identifying restrictions, Prob > chi2. Hansen test of exog of GMM-type instr p- value: Difference-in-Hansen test of exogeneity of GMM type instruments for levels (null H = exogenous), Prob > chi2. Hansen test of exog, IV-type instr p-value: Difference-in-Hansen tests of exogeneity of IV type instruments for levels (null H = exogenous), Prob > chi2.

From table 5, several comments are at place.

First, the GMM estimator we propose here aims at providing consistent estimates of the model parameters, while addressing at the same time the Dynamic Panel Bias. Indeed, one way to evaluate the performance of our estimator is to compare the coefficient estimate of the first lagged difference of *Spread*, as reported in table 5, with the one that would be obtained if estimating our model with a simple linear regression (OLS) or the within panel transformation. If consistent, the coefficient estimate of the first lagged difference of *Spread* presented here should lie between the coefficient estimates of the alternative two estimators.

More specifically, if we were to ignore the dynamic panel nature and estimate a linear regression of the model specification in equation (1) without lagged control variables, for instance, the coefficient estimate for the first lag of *Spread* would be 0.63. If instead, we were to account for the unobserved country-specific heterogeneity and apply the within transformation, the same coefficient estimate would be 0.30. Since we know that the fixed-effect (FE) estimate suffer from the Nickel Bias -downward-biased- and importantly, because the 0.57 reported here lie between the bounds of its OLS and FE counterparts, the latter provides evidence in favor of our GMM estimator.

A complementary way to assess the performance of our estimator is to consider the model diagnostics reported in the last lines of table 5. On one hand, the results of the Arellano-Bond test for AR(2) autocorrelation confirm the absence of second-order autocorrelation in the residuals (as it should be, since system GMM assumes that the twice-lagged residuals are not correlated).[12] On the other hand, the Hansen test of over-identifying restrictions and of instrument exogeneity confirm that the GMM and the IV instruments we use here are valid exogenous instruments.[13]

Third, concerning the index-specific variables, table 5 shows that *Average Life*, *Average Life*

[12]The Arellano-Bond test is applied to the residuals in differences. Thus, to check for first-order serial correlation in levels, we look for second-order correlation in differences.

[13]In addition, the results of Hausman tests (not reported) always confirm that the preferred model is the fixed effect model.

Squared and *Bid Ask* are significant, at usual confidence levels, and with the expected signs: While *Average Life* (controlling for duration) shows a positive sign, namely, the longer the duration, the higher the spread; *Average Life Squared* (which controls for non linear duration effects, that is, convexity) has a negative sign. In turn, the significant and positive coefficient for *Bid Ask* (proxying for liquidity) implies, as expected, the higher the bid ask spread, the lower the liquidity and the higher the liquidity premium.

Fourth, in relation to the macroeconomic control variables, table 5 shows that *GDP Growth*, as expected, has a negative and contemporaneous significant impact on *Spread*, whereas government debt appears non-significant, regardless of the lag structure considered. As a robustness check, instead of the stock of gross government debt, we have also used the government debt service (not reported), but still, it was non-significant.

Fifth, the estimation results allow us to extract two conclusions about the environmental, social and governance factors. On the one hand, the governance indicator always exerts a contemporaneous negative influence on *Spread*. On the other hand, the environmental and social dimensions, captured through the *EPI* and the *HDI*, respectively, exhibit strong long-term negative links with *Spread*. Indeed, the estimated coefficients for the first and second lagged *EPI* and for the second lagged *HDI* are significantly negative in the third and fourth columns of results.

The evidence on the positive contemporaneous impact for the differenced environmental and social factors is more difficult to interpret. It suggests that increases in environmental and social performance of a country are associated with higher contemporaneous spreads. This might reflect the fact that such good extra-financial performances are initially interpreted by financial markets as signs of excessive governmental spending and are thus penalizing the cost of borrowing for the country. In the case of the *EPI*, the coefficient significance is not stable and might thus be related to a statistical artefact: It might be reflecting spurious positive correlation between those factors and *Spread*.

Overall, the results on the link between environmental and social performance and the cost of debt of a country suggests that financial markets are slow to reflect the effects of these policies on the solvency of a country. This is in line with the fact that such effects mostly occur in the long term and are difficult to evaluate.

Finally, the inclusion of the sovereign debt crisis dummy variable, while being significant at 10% confidence level, does not alter the previous results. As a robustness check, we have also included regional indicator variables (not reported) and results were unaffected. In addition, we could not reject the null that the regional dummies were significantly different from zero.

Summing up, the previous results allow us to conclude that we do accept Hypothesis 1. We

view the environmental, social and governance factors as non-economic determinants of the long run evolution of *Spread*. Interestingly, our results are in line with Crifo *et al.* (2014), who, using a sample of 23 OECD countries, find that the cost of debt is lower due to a sound ESG performance of the issuer. Furthermore, they are indicative of a dual effect of the ESG factors: While the governance indicator seems to have a contemporaneous impact on *Spread*, the environmental and social factors exhibit a long-term negative influence on *Spread*.[14]

Table 6 reports the model estimates of equations (2), this time with *Rating* summarizing the macroeconomic control variables.

[14]As a robustness check, we have extracted the Hodrick-Prescott (HP) trend of *Spread*. Using the latter as the dependent variable, we have run a fixed effect estimator of the HP trend of *Spread*, as a function of the same macroeconomic control variables, as well as the ESG factors. Interestingly, we find that the environmental and social indicators continue to be significant and with the expected signs. Thus, it reinforces the conclusion that they are significant non-economic long-term determinants of the long run *Spread* evolution.

Table 6: GMM Regressions of D(*Spread*) on the differenced ESG factors, with *Rating*.

Variable	**Spread**$_{t,k}$	**Spread**$_{t,k}$	**Spread**$_{t,k}$
$Spread_{t-1,k}$	0.50***	0.60***	0.60***
	(0.05)	(0.03)	(0.03)
$Average\ Life_{t,k}$	5.29**	3.76**	3.97**
	(2.34)	(1.54)	(1.61)
$Average\ Life\ Squared_{t,k}$	-5.27**	-3.91**	-4.14**
	(2.41)	(1.72)	(1.81)
$Bid\ Ask_{t,k}$	2.98**	1.47**	1.42**
	(1.27)	(0.62)	(0.60)
$Rating_{t,k}$	-0.31*	-0.97***	-0.93***
	(0.19)	(0.26)	(0.24)
$Rating_{t-1,k}$		0.75***	0.76***
		(0.26)	(0.25)
$WGIT_{t,k}$	-0.48*	-2.60**	-2.23*
	(0.29)	(1.34)	(1.25)
$WGIT_{t-1,k}$		0.38	0.34
		(1.28)	(1.25)
$WGIT_{t-2,k}$		2.24**	2.03**
		(0.99)	(0.98)
$EPI_{t,k}$	-0.26	1.08·	1.11*
	(0.33)	(0.74)	(0.71)
$EPI_{t-1,k}$		-0.61	-0.67*
		(0.43)	(0.43)
$EPI_{t-2,k}$		-0.59**	-0.63**
		(0.29)	(0.29)
$HDI_{t,k}$	1.16*	5.96	5.85
	(0.69)	(4.35)	(4.31)
$HDI_{t-1,k}$		2.58	2.54
		(4.08)	(4.02)
$HDI_{t-2,k}$		-7.96***	-7.86***
		(2.73)	(2.60)
Observations (Number of instruments)	229 (48)	197 (47)	197 (48)
Year effects	Yes	Yes	Yes
Sovereign debt crisis dummy	No	No	Yes
Arellano-Bond test for AR(2) p-value	0.99	0.15	0.14
Hansen test of overid. restrictions p-value	0.98	0.99	0.99
Hansen test of exog of GMM−type instr, p-value	0.99	0.78	0.85
Hansen test of exog of IV−type instr p-value	0.99	0.99	0.99

Notes: Standard deviation, in parentheses. Level of significance : . 15%, * 10% , ** 5 % , *** 1%. *Spread*: Stripped Spread MidPoint. *Average Life*: Average Life. *Average Life Squared*: Average Life Squared. *Bid Ask*: Bid Ask Spread. *Rating*: Fitch's Long Term Credit Rating. *WGIT*: World Governance Indicator Index Total. *HDI*: Human Development Index. *EPI*: Environmental Performance Index. Arellano-Bond test for AR(2) p-value: Arellano-Bond test for second order serial correlation in first differences, Pr > z. Hansen test of overid. restrictions p-value: Hansen test of over-identifying restrictions, Prob > chi2. Hansen test of exog of GMM-type instr p- value: Difference-in-Hansen test of exogeneity of GMM type instruments for levels (null H = exogenous), Prob > chi2. Hansen test of exog of IV-type instr p-value: Difference-in-Hansen tests of exogeneity of IV type instruments for levels (null H = exogenous), Prob > chi2.

From table 6, several changes are worth to highlight, relative to table 5. First, interestingly, *Rating* exhibits a significant negative contemporaneous impact on *Spread*, that is, the better the country's *Rating*, the lower the sovereign bond *Spread*. Moreover, this effect seems to persist, since the first lag of the differenced *Rating* is also significant.

Second, in relation to the control variables, table 6 shows that overall, their coefficient estimates only change in a minimal way, relative to table 5. Third, concerning the ESG factors, the similarity of their estimated coefficients, relative to the previous table of results, seems encouraging: The governance indicator continues to exert a contemporaneous negative influence on *Spread*, whereas the environmental and social factors exhibit a strong negative long-term link with *Spread*.

However, in contrast to table 5, the second lagged coefficient estimates for the differenced governance indicator (second and third column of results) are now positive and statistically significant, regardless of whether we include the sovereign debt crisis dummy or not. We believe that the latter may be due to a positive correlation between *WGIT* and *Rating*. Fitch's credit rating model documentation, together with the evidence presented in section 4 that countries with good governance indicators tend to coincide with those with sound macroeconomic performance, as measured by *Rating*, reinforce this idea.

Summing up, thanks to the results reported in table 6, we continue to accept the Hypothesis 1, for the environmental, social and governance dimensions.

6 Conclusion

This paper studies the link between environmental, social, and governance (ESG) performance of a country and its cost of debt. The idea is that such extra-financial performance can decrease default risk either through a positive impact on future growth or through a positive signal regarding the long term orientation of a country. We focus on emerging markets because the risk of default is

more prevalent and the ESG issues are more acute than in more developed countries.

We measure a country's ESG performance by using well-established indicators: the Environmental Performance Index constructed by Yale University for the environmental performance, the Human Development Index constructed by the World Bank for the social performance, and the World Governance Index constructed again by the World Bank for the governance performance of a country. The cost of debt is measure by the spread between the rate of return offered by a country's sovereign bond minus the one offered by the U.S. We include the bonds that are part of the EMBI Global Index. We perform our regression analyses by using GMM. We include various control variables to account for macroeconomic conditions and technical issues related to fixed-income instruments.

The first result from this study is that the ESG performance impacts the *Spread*. We view these factors as non-economic determinants of the long run evolution of the *Spread* variable. Importantly, they can have an impact on both types of default risk. On the one hand, sound ESG policies might bring a strong and sustainable economic performance to a country, thereby reducing the risk of economic default. On the other hand, a clear engagement towards sustainable development might signal a country's willingness to address long-term issues, and may thus act as a credible commitment to repay its debt in the future. This might reduce the risk of strategic default.

Second, the environmental, social and governance factors exhibit a strong negative link with *Spread*. Interestingly, our results are indicative of a dual effect of the ESG factors: While the governance indicator seems to have a more contemporaneous impact on *Spread*, the environmental and social factors exhibit a long-term negative influence on *Spread*. The environmental and social performance also has a positive link with the contemporaneous spreads, which suggests that financial markets initially overemphasize the cost of the underlying public policies.

One possible explanation of the distinct behavior of the environmental and social factors, on one hand, and the governance indicator, on the other hand, could be that the *WGIT*, as a measure of country risk, has become a widely used piece of information. Furthermore, several studies have shown their impact on *Spread*.

The impact of environmental and social indicators on *Spread* was less straightforward: An increase in health expenditure or stricter air pollution legislation, for instance, may be evaluated as a cost in the short run by financial markets. It may thus take financial markets a certain time before they fully assess the benefits of these policies on the country's future capacity to pay back its sovereign debt. This is what we find in our analysis.

Regarding endogeneity concerns, we do not expect that a country would engage in better environmental or social policies, when benefiting from a lower *Spread*. Since the indicators include

a wide variety of criteria, we can assume that we capture a stance towards ESG policies rather than the ability to finance certain individual projects. We thus rule out reverse causality. This is particularly relevant in the face of the lagged influence that the environmental and social performance have on the cost of debt. It seems very unlikely that a country starts developing policies to improve its environmental and social performance because it expects spreads to decrease two years down the road. As a result, we believe that it is the environmental and social performance that is affecting the cost of debt and not the reverse.

We are also confident that we do not have an omitted variables bias, such as the abilities of the sitting political administration (Crifo *et al.*, 2014), *i.e.* politicians in some countries could have a broader perception of important issues and might be more prone to take into account ESG issues. If the market valued these abilities, our model would capture a link between ESG indicators and the *Spread* even though the causal link might be between the political administration's abilities and the *Spread*. We believe that these effects are constant over time and fully captured by the fixed effects.

Unfortunately, the coverage of emerging countries is not broad enough to build yield curves. Thus, we cannot test our hypothesis for different maturities. Moreover, one could argue that a sound ESG performance would stabilize *Spread*s during periods of turmoil for the same reason it decreases *Spread*s, namely, a higher commitment to repay the debt. In regressions using *Spread* volatility instead of changes in *Spread*, we find that ESG factors do not have any explanatory power. In future research, it could be interesting to study further these issues.

Another venue of future research could be to further exploit the heterogeneities that exist between countries in our database (for instance, geographical and cultural) and apply spatial data panel estimation. This estimation technique is commonly used in the regional science and the spatial econometrics literature and it could be applied in our context to further explore the role of the ESG factors on the cost of sovereign debt in emerging economies.

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A World Governance Indicators

Government effectiveness captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.

Regulatory quality captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.

Rule of law captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.

Control of corruption captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.

Voice and accountability captures perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media.

Political Stability and Absence of Violence/Terrorism measures perceptions of the likelihood of political instability and/or politically-motivated violence, including terrorism.

Table A1: Correlation matrix of the differenced ESG factors and their lags.

Variables	EPI_t	EPI_{t-1}	EPI_{t-2}	HDI_t	HDI_{t-1}	HDI_{t-2}	$WGIT_t$	$WGIT_{t-1}$	$WGIT_{t-2}$
EPI_t	1.00								
EPI_{t-1}	-0.66*	1.00							
EPI_{t-2}	-0.14	-0.66*	1.00						
HDI_t	0.04	0.04	0.01	1.00					
HDI_{t-1}	0.03	0.04	0.04	0.24*	1.00				
HDI_{t-2}	-0.12	0.03	0.04	0.19*	0.20*	1.00			
$WGIT_t$	0.10	-0.05	-0.02	0.06	-0.02	0.05	1.00		
$WGIT_{t-1}$	-0.08	0.10	-0.05	0.01	0.05	-0.03	0.01	1.00	
$WGIT_{t-2}$	0.00	-0.07	0.10	-0.07	0.01	0.05	0.03	0.02	1.00

B Descriptive Statistic, by Country

Table B1: Summary Statistics, by Country.

Country	*Spread*	Avg Life	Avg Life Sq.	*Bid Ask*	*GDP Growth*	Debt Serv	*Gov Debt*	*WGIT*	*HDI*	*EPI*
Africa										
Egypt	2.38	6.54	53.29	0.01	8.59	9.33	85.60	-3.32	0.64	55.16
	(1.46)	(3.39)	(50.50)	(0.00)	(1.13)	(0.24)	(12.54)	(0.66)	(0.02)	(2.66)
Gabon	4.76	7.39	56.71	0.02	8.38	9.28	19.79	-3.33	0.68	57.03
	(2.24)	(1.58)	(23.47)	(0.01)	(1.00)	(0.26)	(2.76)	(0.39)	(0.01)	(1.39)
Ghana	5.87	7.21	53.95	0.02	9.73	9.8	42.00	0.49	0.54	47.29
	(1.96)	(1.58)	(22.87)	(0.01)	(0.37)	(0.21)	(6.93)	(0.19)	(0.02)	(0.23)
South Africa	2.06	7.92	64.11	0.01	8.02	9.17	35.48	1.97	0.61	34.62
	(0.87)	(1.25)	(20.01)	(0.00)	(1.11)	(0.35)	(4.93)	(0.45)	(0.01)	(0.87)
Europe										
Bulgaria	2.64	7.36	62.32	0.01	8.09	7.98	33.75	1.21	0.76	54.50
	(1.69)	(2.97)	(43.66)	(0.00)	(1.79)	(0.89)	(9.83)	(0.17)	(0.02)	(1.94)
Croatia	2.77	4.83	28.43	0.01	7.31	7.84	38.45	2.09	0.79	61.97
	(1.39)	(2.37)	(29.01)	(0.00)	(2.26)	(1.58)	(6.94)	(0.35)	(0.02))	(1.54)
Hungary	1.85	6.19	47.18	0.01	7.01	8.30	68.00	5.10	0.82	55.63
	(1.65)	(3.10)	(37.34)	(0.01)	(2.36)	(0.49)	(10.68)	(0.76)	(0.01)	(1.63)
Poland	1.50	8.30	75.27	0.01	8.22	8.16	48.08	3.87	0.80	65.88
	(0.71)	(2.63)	(45.99)	(0.00)	(1.24)	(0.80)	(5.56)	(0.76)	(0.01)	(8.16)
Serbia	4.38	8.65	76.55	0.02	7.40	8.92	43.72	-1.27	0.76	46.31
	(1.63)	(1.45)	(26.30)	(0.01)	(2.70)	(1.58)	(9.93)	(0.46)	(0.01)	(0.22)
Turkey	4.11	11.84	141.34	0.01	8.15	6.54	51.84	-0.59	0.69	43.45
	(2.29)	(1.15)	(26.11)	(0.00)	(1.78)	(0.56)	(14.54)	(0.58)	(0.02)	(1.10)

Table B1: Summary Statistics, by Country (cont.).

Country	*Spread*	Avg Life	Avg Life Sq.	*Bid Ask*	*GDP Growth*	Debt Serv	*Gov Debt*	*WGIT*	*HDI*	*EPI*
Asia Pacific										
China	1.20	6.18	38.98	0.01	9.97	9.78	20.90	-3.25	0.65	42.21
	(0.60)	(0.92)	(11.23)	(0.01)	(0.10)	(0.31)	(5.48)	(0.17)	(0.03)	(0.31)
Indonesia	2.95	13.62	190.58	0.01	9.34	7.81	32.25	-3.11	0.60	51.30
	(1.19)	(2.39)	(65.47)	(0.00)	(0.59)	(0.76)	(7.71)	(0.63)	(0.02)	(1.07)
Iraq	5.84	14.24	205.64	0.02	9.28	10	66.54	-8.87	0.58	25.36
	(1.34)	(1.87)	(53.34)	(0.01)	(0.75)	(0)	(30.80)	(0.93)	(0.01)	(0.19)
Kazakhstan	5.07	6.79	210.43	0.01	8.81	5.95	10.06	-3.18	0.74	32.79
	(2.30)	(0.89)	(14.23)	(0.01)	(1.34)	(1.91)	(2.16)	(0.58)	(0.01)	(0.22)
Lebanon	4.73	5.16	27.40	0.01	8.61	9.26	159.39	-3.44	0.73	50.63
	(1.79)	(0.89)	(9.03)	(0.00)	(1.06)	(0.34)	(14.99)	(0.98)	(0.01)	(9.99)
Malaysia	1.57	7.84	62.61	0.01	8.77	9.75	46.50	2.14	0.75	63.04
	(0.57)	(1.08)	(17.28)	(0.00)	(1.13)	(0.27)	(5.77)	(0.50)	(0.02)	(3.76)
Pakistan	7.24	4.98	28.80	0.03	8.98	8.40	61.00	-6.21	0.49	37.73
	(4.05)	(2.10)	(21.23)	(0.01)	(0.92)	(0.92)	(5.93)	(0.62)	(0.02)	(4.91)
Philippines	3.39	12.86	166.95	0.01	8.72	8.78	52.27	-2.75	0.63	54.44
	(1.37)	(1.34)	(37.61)	(0.00)	(0.98)	(0.41)	(10.09)	(0.53)	(0.01)	(2.91)
Russia	3.33	10.54	115.04	0.00	8.67	9.51	18.87	-4.27	0.76	46.31
	(1.79)	(2.09)	(44.37)	(0.00)	(2.09)	(0.44)	(13.46)	(0.25)	(0.02)	(1.24)
Ukraine	6.92	4.65	22.51	0.01	8.48	8.61	28.31	-3.33	0.72	46.49
	(5.13)	(1.00)	(8.36)	(0.01)	(1.97)	(0.99)	(9.88)	(0.61)	(0.02)	(0.75)
Vietnam	3.32	7.45	56.84	0.01	9.15	9.86	45.21	-3.19	0.60	50.38
	(1.33)	(1.25)	(19.17)	(0.01)	(1.19)	(0.23)	(5.59)	(0.11)	(0.01)	(0.34)

Table B1: Summary Statistics, by Country (cont.).

Country	*Spread*	Avg Life	Avg Life Sq.	*Bid Ask*	*GDP Growth*	Debt Serv	*Gov Debt*	*WGIT*	*HDI*	*EPI*
Americas										
Argentina	21.93	18.38	365.34	0.02	7.64	5.21	81.26	-1.88	0.78	54.59
	(21.48)	(5.48)	(194.75)	(0.01)	(2.87)	(2.91)	(40.46)	(0.57)	(0.02)	(1.57)
Brazil	4.77	14.39	207.80	0.01	8.07	5.94	68.73	0.13	0.70	58.39
	(3.90)	(0.88)	(25.58)	(0.00)	(0.86)	(2.11)	(4.62)	(0.53)	(0.03)	(2.12)
Chile	1.46	8.66	77.11	0.01	8.77	7.95	9.22	7.07	0.80	57.71
	(0.54)	(1.54)	(26.54)	(0.00)	(1.04)	(0.80)	(3.89)	(0.25)	(0.02)	(8.44)
Colombia	3.41	11.08	126.27	0.01	8.36	6.97	37.74	-2.87	0.69	61.15
	(1.86)	(1.94)	(42.74)	(0.00)	(0.77)	(1.31)	(4.75)	(0.81)	(0.02)	(1.50)
Dominican Republic	5.79	6.91	49.48	0.01	7.98	9.30	26.56	-2.18	0.68	53.43
	(3.05)	(1.40)	(19.24)	(0.01)	(1.52)	(0.44)	(5.92)	(0.34)	(0.02)	(1.94)
Ecuador	10.84	15.29	282.82	0.01	7.85	7.76	32.47	-4.61	0.69	58.74
	(4.42)	(7.31)	(192.17)	(0.00)	(1.67)	(1.22)	(14.58)	(0.38)	(0.02)	(1.83)
El Salvador	3.34	17.37	302.39	0.01	7.60	8.67	43.68	-0.88	0.67	52.08
	(1.12)	(0.93)	(32.15)	(0.00)	(0.91)	(0.72)	(6.43)	(0.28)	(0.01)	(0.27)
Mexico	2.27	13.71	190.63	0.01	7.49	8.43	41.58	-0.54	0.75	47.09
	(0.75)	(1.72)	(49.56)	(0.00)	(1.87)	(1.36)	(2.41)	(0.56)	(0.02)	(1.74)
Panama	2.80	15.52	244.23	0.01	8.45	7.95	54.80	0.54	0.75	57.02
	(1.06)	(1.90)	(60.49)	(0.00)	(1.33)	(0.91)	(9.97)	(0.27)	(0.02)	(1.17)
Peru	3.16	13.84	207.00	0.01	8.91	7.69	33.20	-1.95	0.71	50.52
	(1.78)	(4.12)	(116.63)	(0.00)	(0.95)	(1.03)	(9.30)	(0.40)	(0.02)	(1.00)
Uruguay	4.38	17.47	329.56	0.01	7.64	6.49	75.40	4.29	0.77	58.01
	(2.93)	(5.19)	(148.90)	(0.01)	(2.48)	(1.33)	(17.29)	(0.48)	(0.02)	(1.27)
Venezuela	8.41	14.12	201.46	0.01	6.73	9.00	40.17	-6.65	0.71	54.91
	(3.57)	(1.49)	(39.74)	(0.00)	(3.50)	(0.82)	(11.31)	(0.91)	(0.03)	(0.94)

Notes. *Spread*: Stripped Spread MidPoint. *Average Life*: Average Life. *Average Life Squared*: Average Life Squared. *Bid Ask*: Bid Ask Spread. VIX: Implied Volatility of S&P500 Index Options. 10y US Treasury: 10 year US Treasury Zero Coupon Yield. *GDP Growth*: GDP Growth. *Gov Debt*: General Government Gross Debt. Debt Serv: Debt Service. *WGIT*: World Governance Indicator Index Total. *HDI*: Human Development Index. *EPI*: Environmental Performance Index.

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