How ESG Can Improve Sovereign Yield Performance Analysis

Author: Thomas Lorans ▪ thomas.lorans@beyond-ratings.com
Economist

Abstract

- This study analyses the ability of the Beyond Ratings ESG score to explain sovereign spreads;
- We show that the ESG Factor-In model performs as well as traditional credit ratings in assessing yield performance, as ESG-adjusted GDP per capita has a slightly better explanatory power of sovereign yields than Credit Rating Agencies' ratings;
- We also prove that an ESG approach provides additional and powerful information in the analysis of sovereign spread, as ESG factors remain statistically significant with traditional macro-financial indicators used as control variables.
- Combining the Beyond Ratings ESG score and augmented credit score should improve these results. This approach should be documented in a further study.

The rationale for Beyond Ratings ESG Factor-In

Traditional GDP statistics and macro-financial indicators do not account for the whole performance of an economy. While complementary metrics have been developed over the years (e.g. UNDP Human Development Index, OECD Better Life Index, etc.) and increasing peer pressure has led to new initiatives (e.g. UNPRI ESG in credit ratings), ESG integration in Sovereign asset management has been hindered by lack of associated financial materiality. **There is a need to adjust country financial wealth by its ESG performance.**

Beyond Ratings' ESG Factor-IN has been built in order to overcome such limitations in the integration of ESG in Sovereign asset management. Indeed, past ESG indicators for Sovereigns used to aggregate numerous non-discriminated indicators leading to redundancy, aggregation issues, with an "one size fits all" approach for all countries. As a result, no assessment of associated financial materiality currently exists. With ESG Factor-IN, **Beyond Ratings has built a statistical identification of the most relevant ESG factors with regards to GDP growth** through the creation of a specific model for five country groups based on income levels. The main themes covered by the ESG Factor-IN model are available in the appendices.

Final indicators are a computation of a Sustainable GDP per country and sensitivity analysis of financial ratings as key financial metrics. This approach provides an **ESG-adjusted GDP per capita** (appreciated or depreciated GDP per capita according to ESG factors) and an **ESG performance score** (appreciation or depreciation of GDP per capita according to ESG factors, in percent of GDP per capita). For example, in 2015, Russia's ESG-adjusted GDP per capita stood at USD 20,362 vs. USD 23,895 for traditional GDP per capita, a depreciation (or ESG score) of -14.8%.

This study seeks to identify the contributions of the Beyond Ratings ESG Factor-IN model when assessing Sovereign Yield Performance. We will first compare the respective explanatory power of the ESG model

and Credit Rating Agencies' (CRA) ratings. Then, we will study the informational contribution of the ESG scores via a panel analysis.

The Beyond Ratings ESG Factor-In model performs as well as Credit Ratings assessing yield performance

ESG integration into mainstream finance depends on the ability to establish its financial materiality. The main hypothesis is the following: an ESG approach to assessing Sovereign yield could provide an additional, useful information in explaining Sovereign spread.

Not only does the Beyond Ratings ESG Factor-IN model provide an aggregated metric comparable to macro-economic indicators, i.e. a sustainable adjusted GDP, this metric also proves to perform as well as financial ratings to assess country yield performance.

Fig.1 10y bond spread vs ESG-adjusted GDP per capita, 2015

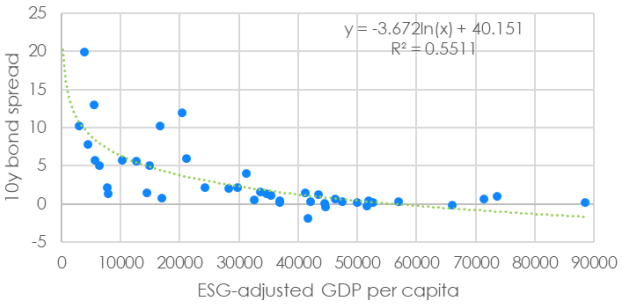
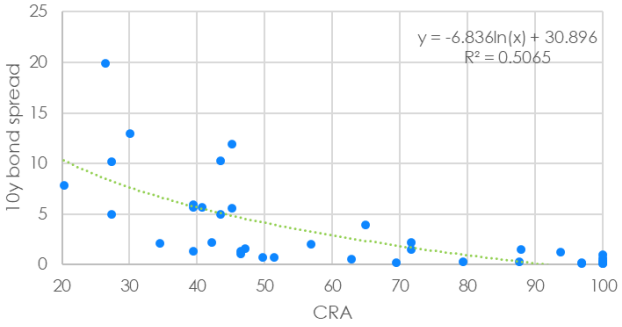


Fig.2 10y bond spread vs CRA, 2015



Indeed, as the simple regression above (Figures 1 and 2) demonstrates, ESG-adjusted GDP per capita has a slightly better explanatory power of Sovereign yields compared to CRA ratings (R^2 equal to around 0.55 vs. 0.50 with CRA's ratings).

In the following part, we seek to identify the additional information contained by ESG scores through econometric analysis. Indeed, we assume that the additional information provided by the ESG Factor-IN approach lies in the ESG scores, i.e. the appreciation or depreciation of GDP per capita, as a percentage of GDP per capita, considering the ESG performance of the country concerned.

We run a panel fixed effect model that tries to explain Sovereign bond spread using ESG scores and traditional macro-financial data as control variables, thus following in part the modelling carried out by Crifo, Diaye and Oueghlissi (2015)[1]. Limited by the availability of Sovereign spread data, the study covers 43 countries, between 2000 and 2015. In order to reduce the potential heterogeneity of our panel, we subdivide our sample into two groups: OECD[2] and non-OECD[3] countries. The individual fixed effects (country fixed effects) will capture the remaining intra-group heterogeneity.

[1] CRIFO, Patricia, DIAYE, Marc-Arthur, et OUEGHLISSI, Rim. Measuring the effect of government ESG performance on Sovereign borrowing cost. 2015.
[2] Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Finland, France, Hong Kong, Ireland, Israel, Italy, Japan, Korea (South), Netherlands, New Zealand, Norway, Poland, Portugal, Singapore, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.
[3] Brazil, China, Colombia, India, Indonesia, Kenya, Morocco, Nigeria, Pakistan, Philippines, Russia, South Africa, Thailand, Vietnam and Zambia.

Dependent variable:	2Y bonds spread, 10Y bonds spread
Control variables:	Reserves of US dollars, gross debt-to-GDP ratio, real GDP growth rate, inflation CPI, average credit rating agencies' ratings
Main independent variable:	ESG scores

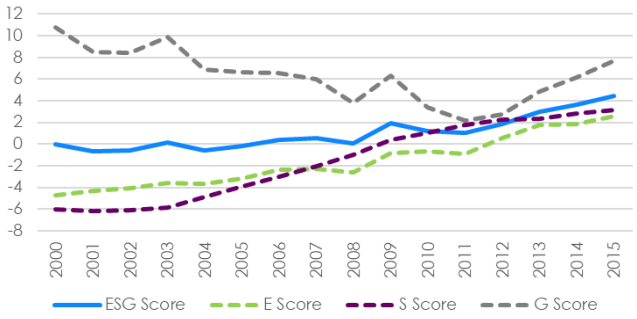
The Beyond Ratings ESG scores: what do they explain in Sovereign spreads?

The main independent variable: Beyond Ratings ESG scores

ESG scores from the Beyond Ratings ESG Factors-In model can be subdivided into sub-scores, depending on the ESG risks assessed. The **sub-score "S"** measures a country's performance on **social factors**, the **sub-score "E"** measures a country's performance on **environmental factors**, and the **sub-score "G"** measure's a country's performance in terms of **governance factors**. We assume a negative relationship between ESG scores and Sovereign spread[4].

Fig.3 Average ESG Scores OECD

Fig.4 Average ESG Scores non-OECD



As Figure 3 demonstrates, the average ESG scores of the OECD countries in our sample[5] are positive and trend up between 2000 and 2015, with the exception of the "Governance" average score, which decreased in 2004 and has stabilized since. For the non-OECD group (Figure 4), ESG performance has improved significantly since 2011. The improvement is particularly significant regarding social and environmental factors (S and E scores).

Fig.5 China ESG Scores

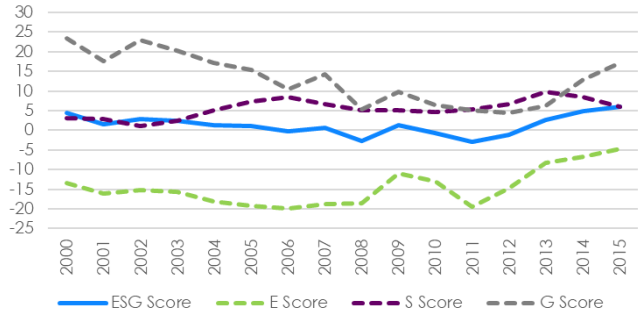


Fig.6 South Africa ESG Scores

[4] ESG scores, when positive, indicate that a country national economy efficiency to reach ESG performance outperforms that of its peers. It should therefore lead to reduce risks and lower yields.
[5] In appendices is the distribution by income group of the ESG scores: among the high-income group countries with a negative ESG score, only Hong Kong is in our sample due to a lack of data on sovereign yields.

Taking China as an example, if we analyse the evolution of its ESG scores, we observe a negative E score until 2014, highlighting potential recent progress on environmental risks. There is also a slight improvement regarding governance performance of the country. For South Africa (Figure 6), while we observe a slight overall improvement in the country's ESG performance, we note an underperformance on the environmental and social pillars, compensated at the aggregate level by a relatively good performance on the governance sub-pillar.

The control variables: traditional macro-financial variables and Credit Rating Agencies' ratings

We include five variables to control for countries' economic characteristics. These control variables are:

Fig.7 Average Reserves

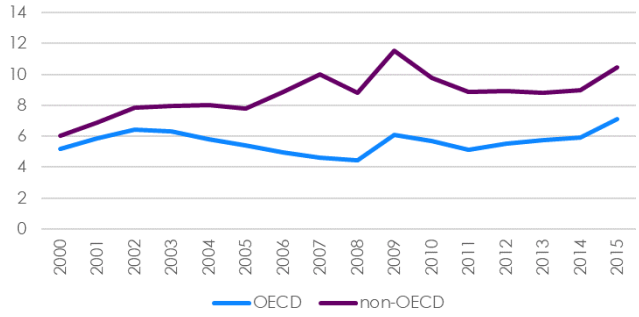
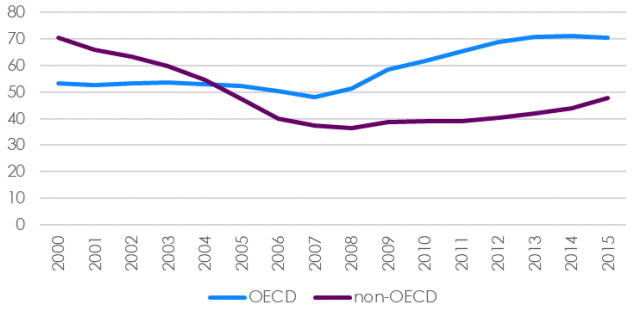


Fig.8 Average Debt-to-GDP ratio



- **US dollar reserves** (in months of imports, Figure 7): according to the literature[6], this is a good indicator for the capacity of economies and central banks to face speculative attacks. We expect a negative link between Reserves and Sovereign bond spread;
- **Gross debt-to-GDP ratio** (Figure 8): Higher levels of debt should increase the default risk[7]. We expect a positive link between Gross debt-to-GDP ratio and spread;

Fig.9 Average Real GDP Growth

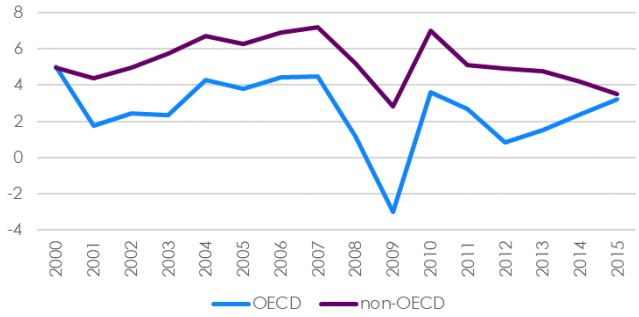
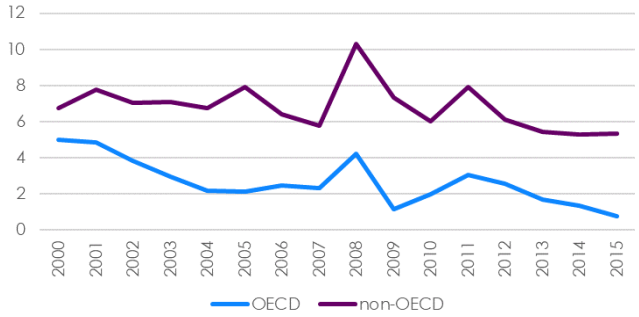


Fig.10 Average Inflation CPI

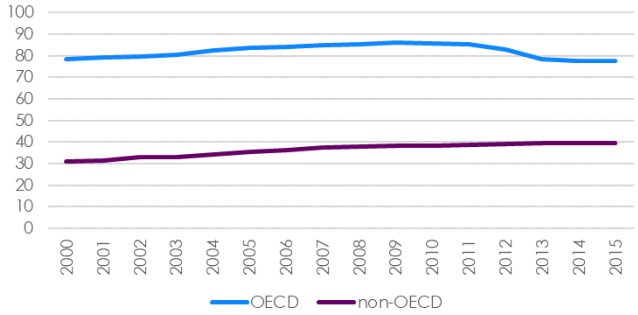


- **Real GDP growth rate** (Figure 9): growing economies should theoretically[8] be able to better fulfil their financial obligations compared to stagnating or recessing countries. We expect a negative link between the real GDP growth rate and the spread of sovereign bonds;

[6] CARTAPANIS, Andre. Le déclenchement des crises de change : qu'avons-nous appris depuis dix ans?. Economie internationale, 2004, no 1, p. 5-48.
[7] SCHUKNECHT, Ludger, VON HAGEN, Jürgen, et WOLSWIJK, Guido. Government risk premiums in the bond market: EMU and Canada. European Journal of Political Economy, 2009, vol. 25, no 3, p. 371-384.
[8] BERNOTH, Kerstin, VON HAGEN, Jürgen, et SCHUKNECHT, Ludger. Sovereign risk premiums in the European government bond market. Journal of International Money and Finance, 2012, vol. 31, no 5, p. 975-995.

- **Inflation CPI** (Figure 10): according to the literature[9], a higher inflation rate could reveal structural problems in a government finances (inflationary money finance). We expect a positive link between the inflation rate and sovereign bonds spread;

Fig.11 Average CRA rating



- **Average CRA ratings** (Figure 11): we transformed Credit Rating Agencies (*Standard & Poor's*, *Fitch* and *Moody's*) to a numeric score (between 0 and 100). The average of these scores are used as measurement of government ability to meets its financial commitments[10]. We expect a negative link between this average CRA ratings and sovereign spread.

The dependent variable: explaining Sovereign spread

We used **2Y bond spread and 10Y bond spread** as the dependent variable. Spreads are calculated as the difference between the sovereign interest rate and a "risk-free" interest rate (i.e. the German government's interest rate on the equivalent maturity for European countries and the United States government bond's interest rate for the rest of the world).

Fig.12 Average 2Y bonds spread

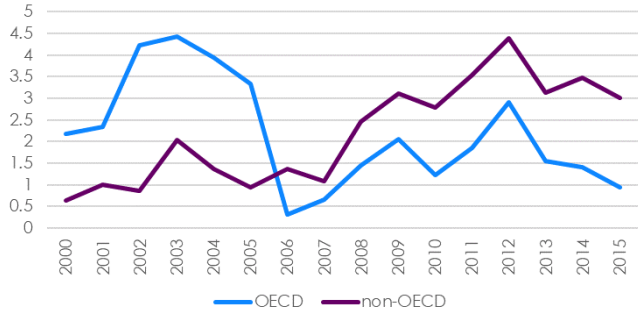
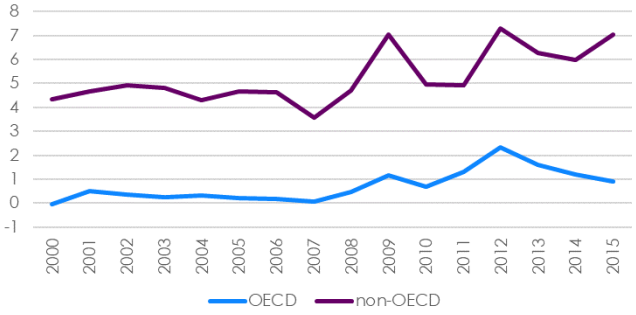


Fig.13 Average 10Y bonds spread



As the charts above (Figures 12 and 13) demonstrate, there was a general increase in spreads following the international financial crisis of 2007. This increase was followed by a drop in short-term spreads in both OECD and non-OECD countries following the intervention of central banks. However, the decline in long-term spreads in OECD countries was accompanied by a rise in spreads for non-OECD countries.

Sovereign Yields assessment through ESG scores: a relevant approach

[9] CANTOR, Richard et PACKER, Frank. Determinants and impact of sovereign credit ratings. The Journal of Fixed Income, 1996, vol. 6, no 3, p. 76-91.
[10] AFONSO, António, ARGHYROU, Michael, et KONTONIKAS, Alexandros. The determinants of sovereign bond yield spreads in the EMU. 2012.

We estimate a fixed effect panel model for 2Y spreads and 10Y spreads for OECD and non-OECD countries, testing the statistical significance of our dependent variables. Finally, 4 models are selected (Tables 1, 2, 3 and 4). A variable is significant at the 90% threshold when the associated probability (Prob. Column) is less than 0.1. C is the intercept (excluding individual fixed effects).

Table 1: OECD countries' 2Y bonds spread

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DEBT	0.101809	0.020308	5.013159	0
INFLATION	0.581429	0.078272	7.428281	0
E SCORE	-0.202908	0.095036	-2.135059	0.0334
C	-4.651202	1.134673	-4.099157	0.0001

R-squared	Adjusted R-squared
0.609763	0.57871

Regarding **2Y rate bonds spread within the OECD group** (Table 1), it is noteworthy that the **CRA average rating was statistically insignificant**, as were reserves and the real GDP growth rate, and thus were not selected as control variables in our estimates. The non-significance of CRA ratings can be explained by their relative inertia during the period. However, inflation, debt and the ESG sub-score regarding environmental factors are significant. Inflation and debt are, as expected, positively linked with 2Y Sovereign spread. The Beyond Ratings **E score is negatively linked with Sovereign spread**.

Table 2: OECD countries' 10Y bonds spread,

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CRA	-0.033559	0.006395	-5.24762	0
DEBT	0.02434	0.003744	6.501282	0
GROWTH	-0.136727	0.016818	-8.129598	0
INFLATION	0.073761	0.030063	2.453581	0.0146
S SCORE	-0.034011	0.017355	-1.959768	0.0508
C	2.445463	0.722756	3.383526	0.0008

R-squared	Adjusted R-squared
0.806772	0.790271

Regarding the 10Y rate spread, the model (Table 2) highlighted the significance of the ESG sub-score regarding **social factors** for OECD countries. Indeed, as expected, it appears to be negatively linked with 10Y sovereign spread. Debt-to-GDP ratio, growth rate and inflation are significant, and coefficient signs confirm our assumptions. The simultaneous significance of both CRA scores and the Beyond Ratings S Score provides an important insight, as it proves the **additional information content of an ESG approach towards Sovereign Yield**. R-squared of this model is much higher than R-squared associated with 2Y

bonds spread estimates. This can be explained by the fact that ESG scores and CRA ratings are indicative of long-term risk.

Fig.14 Estimated vs. current 10Y spread, Ireland

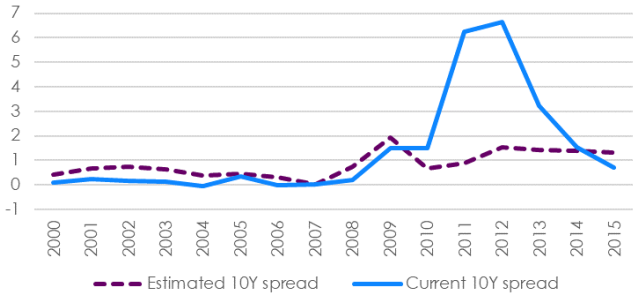
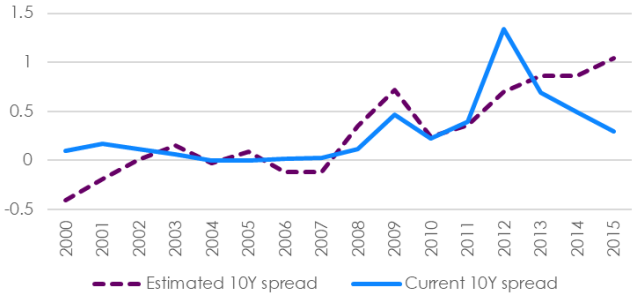


Fig.15 Estimated vs. current 10Y spread, France



The charts above (Figures 14 and 15) show a potential output thanks to the use of the additional information provided by ESG Scores. Indeed, these charts highlight the **similarity between estimated[11] 10Y spread with some control variables and the S score and the current 10Y spread**. The deviation between estimated and current Irish 10Y spreads between 2010 and 2014 can be explained by the European Sovereign Debt Crisis. The recent increasing gap between estimated and current 10Y French spreads can be explained by ECB monetary policy through quantitative easing. The interventions of central banks could be included as control variables in a future study.

Table 3: Non-OECD countries' 2Y bonds spread

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DEBT	0.097894	0.033447	2.92681	0.004
GROWTH	-0.584692	0.094923	-6.159642	0
RESERVES	-0.194854	0.07846	-2.483463	0.0142
G SCORE	-0.075316	0.047827	-1.574759	0.1176
C	6.941956	1.936609	3.584593	0.0005

R-squared	Adjusted R-squared
0.703667	0.665015

Regarding **2Y rate bonds spread within the non-OECD group** (Table 3), **CRA average ratings are still statistically insignificant**, as are reserves and inflation. Real GDP growth rate and debt are significant. The ESG sub-score on governance factors is slightly insignificant. The result is surprising, given the key finding (a high relationship between Transparency International's Corruption Perception Index and foreign credit rating within Eurozone countries) of the PRI's 2013 report[12] on the subject. However, our result could be significant with a more homogeneous group, as governance issues in sovereign risk are certainly very different depending on the region (in this case between Asia, Africa or South America). It

[11] We estimate 10Y bonds spread through coefficients, intercept and fixed effects determined with our selected model
[12] Principles for Responsible Investment, Sovereign Bonds: Spotlight on ESG Risks, 2013

should be further noted that the G score covers a broader thematic range than traditional indicators such as World Bank governance scores: a special effort has been made, for example, on security issues and rent dependency, revealing underlying risks potentially not taken into account in current spreads. Debt, is, as expected, positively linked with the 2Y sovereign spread. The **G score is negatively linked with sovereign spread**.

Table 4: Non-OECD countries' 10Y bonds spread

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DEBT	0.092568	0.022342	4.143124	0.0001
GROWTH	-0.431587	0.065257	-6.613647	0
E SCORE	-0.129898	0.047779	-2.718727	0.0073
C	3.433003	1.075794	3.191134	0.0017

R-squared	Adjusted R-squared
0.793206	0.769612

Regarding the 10Y rate spread, the model (Table 4) highlights the significance of the ESG sub-score regarding **environmental factors** for non-OECD countries. Indeed, it appears to be, as expected, negatively linked with the 10Y sovereign spread.

Fig.16 Estimated vs. current 10Y spread, Brazil

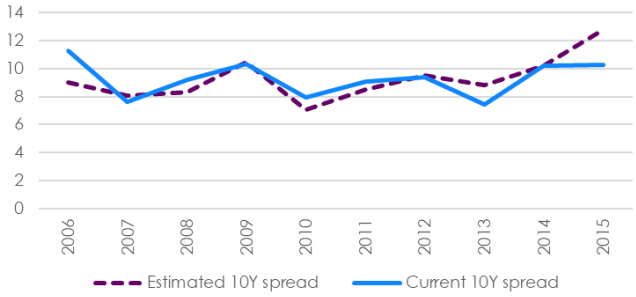
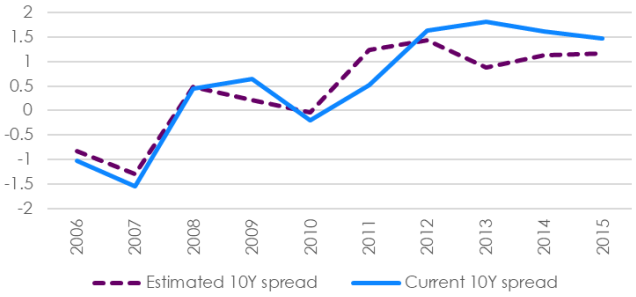


Fig.17 Estimated vs. current 10Y spread, China

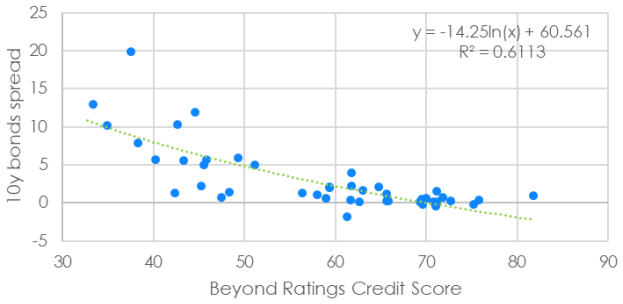


Estimated and current spreads for Brazil (Figure 16) and China (Figure 17) seem to have a **relatively similar behaviour**. This highlight the accurate of the additional information provided by ESG scores.

Conclusion

There are a few potential caveats in this study, which deserve deeper analysis in order to be addressed. Indeed, there is potential endogeneity within our control variables, and our numerical transformation of CRA ratings could be slightly biased. However, this first approach has the quality of demonstrating the value of an ESG approach when analysing sovereign yields. A deeper analysis should also be considered with Beyond Ratings Credit Scores as control variables, as they appear to contain more information than CRA ratings when analysing sovereign yields (see Figure 18).

Fig.18 10y bonds spread vs Beyond Ratings Credit Scores, 2015



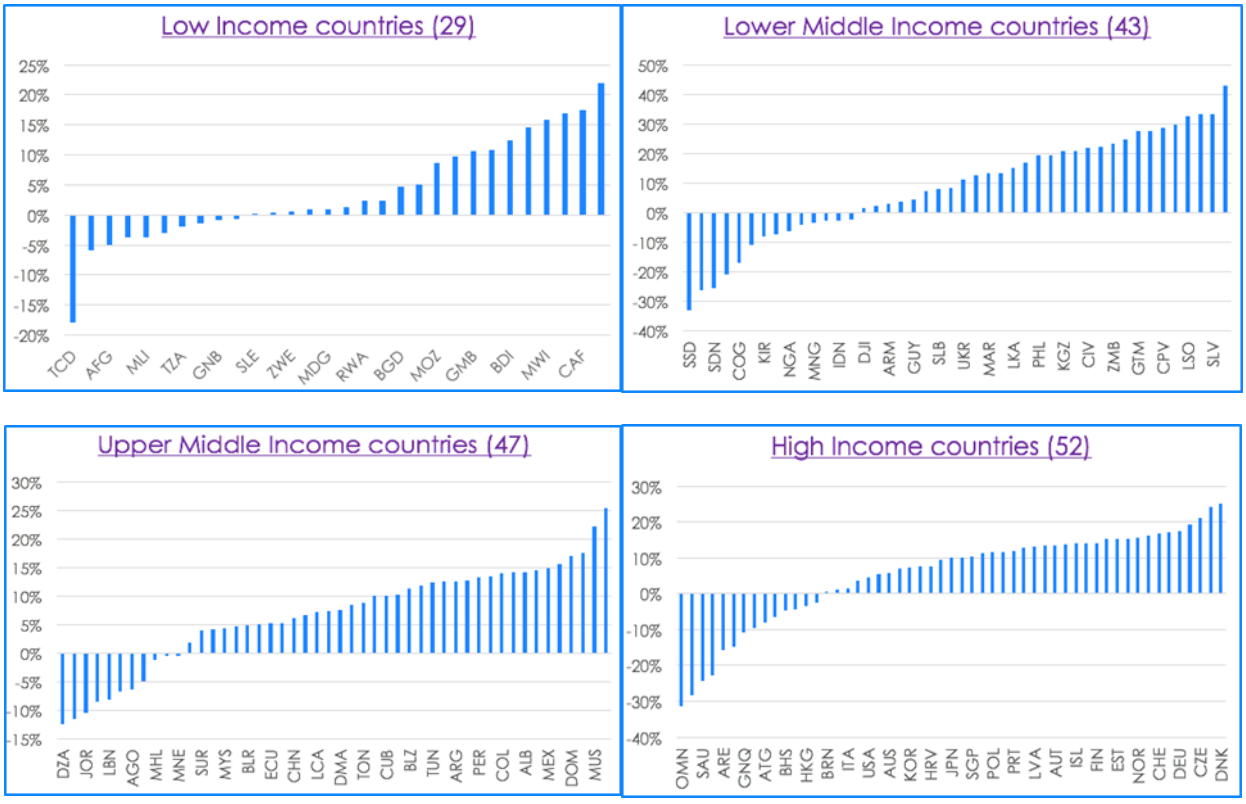
Last but not least, as we proved that ESG integration through Beyond Ratings ESG score can provide relevant information to risk assessment and investment strategy, it should also be stressed out that powerful insights can be found in the more granular analysis of KPIs contributing to each of the E, S and G pillar scores. Trends and performance analysis of these indicators are available in our ESG country scorecards.

Appendices

E, S, G Pillars and sub-pillars (Themes)

Environment	Social	Governance
Climate Change	Demographics – Life conditions	Democratic Life
Energy Efficiency	Demographics – Dynamic	Political Stability
Energy Security	Economic Inequality	Corruption
Energy Infrastructures	Gender Inequality	Political Effectiveness
Pollution	Employment	Security
Biodiversity	Labour & Social Protection	Rent Dependency
Resource & Depletion	Education	Business rights
Water Scarcity	Innovation & Human Capital	
Water Infrastructures	Health Issues	
Land Resources	Health Infrastructure	
Agriculture & Food	Vulnerability	
Transport Infrastructures	Lifestyle Risks	

Overview of sustainable GDP dispersion per country group (nominal GDP adjustment %)



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- **Energy-Climate Sovereign Risk**: Assess the financial impacts & creditworthiness of energy and climate risks
- **Sovereign Carbon Footprints**: Measuring the carbon footprint of your sovereign bonds and portfolios
- **ESG Sovereign Factor-IN**: ESG adjusted financial ratings for 160 countries
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BEYOND RATINGS

T: +33 (0)9 86 27 57 57
E: contact@beyond-ratings.com

Author: Thomas Lorans
E: thomas.lorans@beyond-ratings.com