

## Core Matters

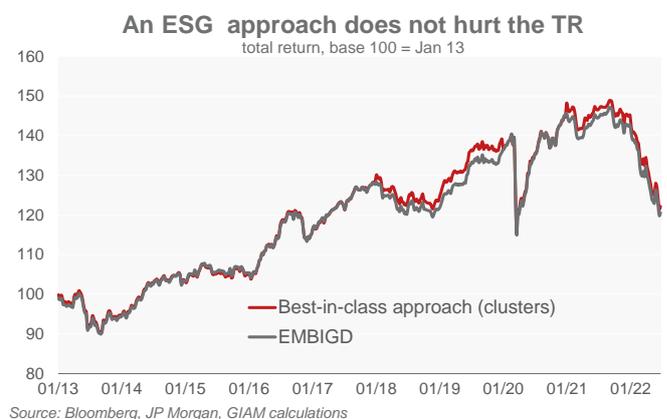
# The challenge of integrating ESG into sovereign fixed income

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### Our Core Matters series provides thematic research on macro, investment and insurance topics

- Sovereign bonds are the largest asset class for life insurers. They are also an essential source of long-term financing for public infrastructure projects. Yet a thorough analysis on how to integrate ESG consideration into investment decisions is lagging relative to equity and corporate credit.
- The current approach, based on excluding/weighting countries into sovereign bond portfolios given ESG scores averaging several metrics, has been shaken by the war in Ukraine. Russia's relatively high pre-war weight in sustainable indexes and its hasty exclusion highlight inherent problems with ESG scoring.
- ESG considerations matter more for Emerging Markets (EMs), where performance in terms of sustainability indicators is much more diverse than in Advanced Economies. Crucially, the most widely used ESG scores strongly correlate with per capita income. Therefore, their use for portfolio construction risks hurting the funding of developing countries, which most need financial resources to improve their environmental and social performance.
- We suggest an innovative approach to address the income bias in ESG scores. We show that a more balanced ESG weighting comes at no cost in terms of performance. We find that the redistribution of investments towards better ESG sovereigns should not penalise total return
- Do financial markets care about sustainability? The evidence of pricing climate risk into sovereign spreads is mixed but slightly stronger for EMs. Moreover, bonds issued to fund environmental and social projects enjoy a small premium relative to standard ones.



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### 1. Introduction

The Ukraine invasion has abruptly shed light on the difficulties and the limits of the current ESG sovereign framework. Indeed, Russia had on average a good ESG score and was even included in certain ESG indexes before the war. Integrating ESG considerations in managing sovereign bond portfolios is an increasingly important topic for life insurers and more broadly, long-term investors. However, the integration has been weak and limited so far. Attention and debates have been essentially focused on the corporate sector, while in the fixed-income space, the sovereign bond market is almost twice as big.

In the first sections, we will sketch some of the issues related to applying ESG criteria to sovereigns and the additional difficulties related to the Russian invasion of Ukraine. Then we deal with the main limitations of the current framework. We present an original quantitative methodology to alleviate the GDP income bias and avoid some of the main pitfalls of incorporating ESG in the sovereign investment process. Finally, we assess how much climate risk is priced in sovereign yields by reviewing the recent academic/policy-oriented literature, and we estimate the sovereign greenium.

### 2. A late and complex integration

The use of ESG criteria has developed fast in investment decisions and financial analysis over the past years. However, it has mainly focused on the corporate sector. The ESG approach in the sovereign space has been lagging as if the ESG criteria did not affect sovereigns or could even be set aside. The EU Taxonomy and, to a lesser extent, the EU Sustainable Finance Disclosure Regulation (SFDR), have

been more focused on the corporate sector than on sovereigns. The Ukraine invasion has been a stress test to the current ESG sovereign framework, highlighting several limitations and the need for a deeper integration.

The lagging ESG fixed-income sovereign focus is all the more surprising given their importance for greenhouse gas emissions and the global size of assets under management. The global sovereign bond market represents USD 76 tr of debt<sup>1</sup>, while the corporate bond market is just over half the size at USD 40 tr. However, corporates have adopted the ESG criteria more rapidly and flexibly by issuing more labelled bonds<sup>2</sup>. Indeed, despite a smaller overall global market size, corporate labelled bonds represent USD 1.1 tr while sovereign/ SSA labelled issuance stands at USD 793 bn only. Likewise, sovereigns, in contrast to corporates, have been slow to issue social bonds: only one country, Chile, issued a Sustainability Linked Bond (SLB) for the first time in 2022.

The ESG focus has been larger for EM countries than DM. The risk of sanctions and weak governance are indeed seen as more relevant in EM countries. The basic ESG sovereign approach resembles a standard country risk analysis used by EM investors. Moreover, EM countries generally exhibit lower ESG scores, as the latter<sup>3</sup> tend to be highly correlated with GDP per capita. The relatively small size of the EM sovereign market partly explains that the ESG sovereign approach is not as developed as for corporates.

ESG criteria at a country level are also particularly complex. First, they cover a vast scope of topics, incl. health, education, governance, freedom of speech or greenhouse gas emissions. The list of ESG demands is long. Second, the transparency, accuracy and accessibility of data are often weak. Country data tend to be backwards-looking and cover a wider universe. Third, corporates face more substantial pressure from shareholders to publish relevant data than governments.

Yet ESG has been considered in the sovereign space for longer. Historically, governance has been a key factor in sovereign credit rating. For instance, poor governance (G) is a clear drag on the country's credit rating in Kazakhstan. Social (S) is also gradually more considered at the sovereign level, especially after the Arab Spring. ESG at the sovereign level has been seen more as a risk-mitigating factor that can affect credit quality and performance than a final purpose (ESG as an output). The environmental (E) component – barely analysed at the country level until recently – will gain importance amid rising pressure from investors.

Beyond the technicalities, the significant implications for investors of integrating ESG sovereign criteria may explain the slow motion. First, it is easier to exclude a single company

<sup>1</sup> Par value, Bloomberg data, as of September 1st

<sup>2</sup> Labelled bonds refer to environmental, social, transition and sustainable bonds

<sup>3</sup> World Bank, Demystifying Sovereign ESG, 2021

from the investable universe because of low ESG scores than a sovereign, given the size of the market and the limited number of countries in fixed-income indices. For instance, Russia's local and external market debt stands at USD 273 bn.

Second, excluding a country like Russia also raises the question of excluding the local corporates. The EMBIGD benchmark only includes 75 countries. The exclusion of a few countries can drastically reduce the investable universe.

Third, engagement to help improve an ESG profile tends to be more complex than at the corporate level. The most critical question is the entry point of discussions, and at which level the interactions must take place. Without a broad consensus across ministries, from Finance to Environment, the engagement reward will be low. It partially explains why sovereigns favour issuing labelled bonds where the use of proceeds is clearly designed over sustainability-linked bonds (SLBs). SLBs have KPIs that require government involvement and global coordination between ministries.

Fourth, governments are accountable to their electors, not investors. As a result, their agenda can be unstable and change when a new government is elected. To this extent, one criticism that has emerged is the risk of colonialism as investors try to push for changes in EM countries.

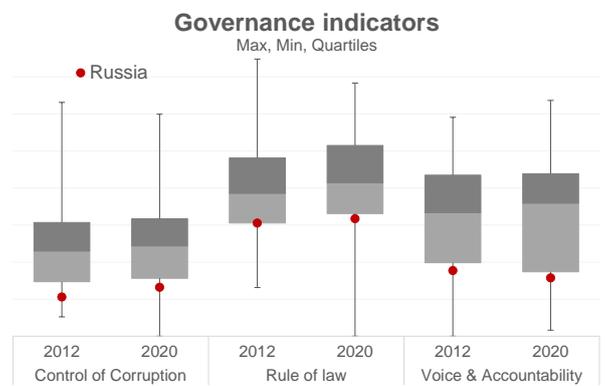
### 3. The Ukraine invasion: an accelerator and stress test for the sovereign ESG framework

The Russian invasion of Ukraine provided a harsh stress test for sovereign ESG scores and, more broadly, credit ratings. Following the invasion of south-eastern Ukraine in 2014, credit rating agencies (CRAs) downgraded Russia by up to three notches in late 2014/early 2015. But this was more because of the drop in global oil prices than due to the relatively mild sanctions imposed by the US and EU. S&P was the first to raise back rates at the beginning of 2018. Only Fitch brought its rating back to the level preceding the invasion of Crimea.

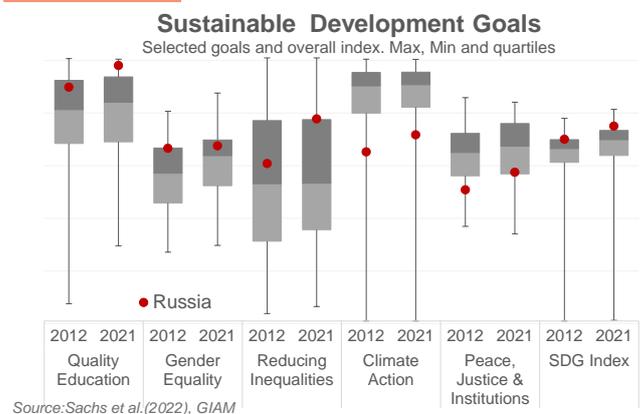
The impact on the ESG assessment varied: MSCI and other providers cut their rating, but a country scoring based on the attainment of the UN sustainable development goals developed by academics<sup>4</sup> improved. The aggressive stance towards Ukraine that started in 2021 and the visible military build-up at the Ukrainian border initially did not alter Russia's sovereign rating or ESG assessment. At the end of 2021, MSCI awarded Russia a BBB ESG rating (at par with Greece, Chile, Hungary, and UAE). In January, it was cut to B (like Angola, Egypt, and Iraq) and to the lowest possible level in

early March. Only after the invasion did CRAs strip Russia of its IG status. They then discontinued the assessment in line with EU sanctions. This raises doubts about the predictive information or early warning nature of credit ratings as far as political risk is concerned.

The sharp fall in the value of Russian assets caused steep losses to investors. It highlighted the fragility of the tools which were supposed to assess the political risk related to the Russian authoritarian and expansionistic attitude. More specifically to ESG, it exposed the pitfalls of an approach based on a (weighted) average of various criteria. This was not common to just private providers of financial information. Academic measures like the SDG index showed that in terms of overall compliance with the UN goals, Russia ranked relatively high among EMs<sup>5</sup>. It has an excellent quality of education and relatively low income and gender gaps that more than offset poor scores on climate action and, above all, governance and political freedom levels that remained in the lowest quartile.



The poor and deteriorating governance and political outlook have been flagged for many years by, among many, the World Bank, but this did not raise much awareness.



<sup>4</sup> See Sachs, J. et al. (2022). From Crisis to Sustainable Development: the SDGs as Roadmap to 2030 and Beyond. Sustainable Development Report 2022. Cambridge: Cambridge University Press. Available [here](#).

<sup>5</sup> We consider a sample of 72 countries included in the JPM EMBI+ bond index.

The underappreciation of the "G" pillar is also reflected in the composition of indexes. For example, the JPM EMBIGD ESG index, one of the largest EM sovereigns ESG benchmarks, continued to include Russia and Belarus until the war broke out, despite the severe deterioration of political freedom, individual rights and minimal efforts to tackle climate change. More strikingly, the two countries had higher weights in the ESG index than in their "brown" counterpart<sup>6</sup>.

The upshot is that ESG measures should not be seen as a mean of criteria but rather as a chain of crucial parts: the breakup of just one link can lead to a collapse of the whole assessment. In this sense, a very critical link can be identified in governance/political assessment, not just in terms of stability and effectiveness but also in terms of the well-functioning of the formal and informal checks and balances to government decisions. The invasion of Ukraine was a deliberate choice of the Russian government, which will ultimately have negative repercussions on global climate goals. This suggests the critical role of political decisions and the context in which they are taken. Therefore, instead of a weighted ESG total score, a "hierarchical" structure of ESG criteria may be more appropriate, where a country's political decision-making is investigated as the first step. To this end, a more reliable assessment should involve complementing slow-moving governance assessments (like those provided by the World Bank's popular governance indicators) with a timely assessment of the political outlook. This is easier said than done, given the subjectivity risk.

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#### 4. A new ESG approach for the sovereign ratings

Integrating sovereign ESG factors into the investment process requires an analysis of the existing sustainability metrics. Then investors need a methodology that makes the use of this index as close as possible to the "spirit" of ESG investing. In what follows, we show how we seek to tackle a critical bias that affects the most available ESG scores, i.e., their tight correlation with a country's per capita income.

##### 4.1. ESG ratings may tilt funding away from poorer countries

The World Bank recently published a thorough analysis of several ESG indicators compiled by private providers<sup>7</sup>. It highlights the problems in using them for investment strategies. We see three main shortcomings: i) poorly defined outcomes of ESG strategies do not allow a precise matching between the criteria used to construct the indexes and long-term goals such as the UN SDG; ii) the tight correlation

between ratings and per capita income; iii) poor data quality, especially on the Environmental pillar.

The World Bank [finds that](#) the lack of precisely identifiable variables may limit the effectiveness of existing ESG scores. There are two types of drawbacks. First, the ill-defined criteria give rise to opaque metrics and risk limiting the role of ESG consideration as an input to investment decisions ("ESG as an input"). Second, ESG scores ("ESG as an output") vary greatly depending on the providers. The problem is particularly stark for the Environmental pillar. The lack of consensus on measuring a country's environmental performance leads to a very low correlation across the "E" pillar between the seven most representative ESG scores. The median correlation is 38% against 88% for the "S" pillar and 55% for "G".

On the issuer's side, what matters for the environment may not be so pertinent (yet) for debt financing, as shown by mixed evidence on the relevance of E variables on sovereign yields (see below). Hence each index provider may take a very different view on what to consider. Crucially, most environmental risks tend to materialise in the long run and have only shown up partially to date. This may confuse investors on how to best select countries to promote sustainable growth. The difficulty in measuring "E" in an uncontroversial way may be one reason behind the pillar's relatively low weight in the aggregate scores. In the seven indices studied by the WB, the median is 29% against 30% for S and 43% for G.

The high correlation among the S and G pillars computed by private providers of ESG scores highlights a relatively strong consensus on the relevant metrics. It underlines that high ESG performance is tightly linked to economic development. High labour force participation and school enrolment, political stability and forest protection policies derive from and support long-term growth. This is reflected in the tight correlation between ESG metrics and per capita income (see chart below) This also applies to the SDG index, which is meant to have a closer relationship with commonly accepted development goals.

This phenomenon, defined by the WB as Ingrained Income Bias (IIB), has inconvenient repercussions for investment. Using ESG scores as they are, not accounting for IIB would result in a tilt towards richer countries. By raising the hurdle for poorer governments to access financial resources needed to improve sustainability metrics, the status quo tends to be perpetuated, which is at odds with the intended ESG objective.

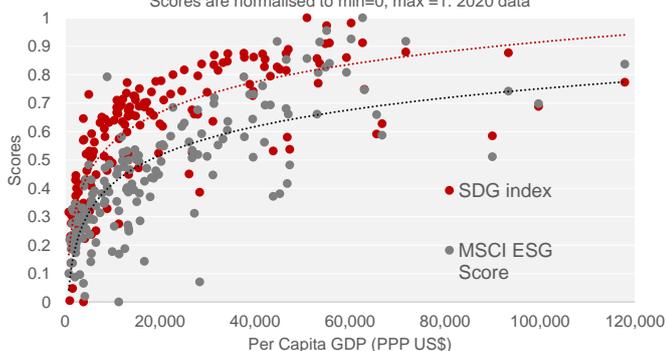
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<sup>6</sup> To build its EMBI sovereign ESG index, J.P. Morgan starts from its EMBI index, whose weights reflect market capitalization. It adds an overlay considering the annual Sustainalytics index and higher frequency information provided by RepRisk and built as follows: Issuers are grouped in bands according to their ESG scores. A Band-dependent multiplier (ranging from 0 to 1) is applied to their market capitalization

weights: countries with the lowest ESG score get a zero weight, i.e. they are excluded from the index, and the weights are recomputed. The exclusion lasts 12 months, whereas the multipliers can be updated daily.  
<sup>7</sup> All publications and data produced by the World Bank plus a wealth of other information can be found in the WB dedicated [portal](#)

## Sustainability and Economic development

Scores are normalised to min=0, max=1. 2020 data



Source: Sachs et al. (2022), MSCI, World Bank, GIAM

### 4.2. A new method to reduce income bias

In what follows, we propose to temper the income bias in the ESG rating. We then run a cost/benefit analysis for popular benchmarks (JPM EMBIGD index and ESG counterpart) by computing standard performance and volatility metrics, such as CAAGR and maximum drawdown.

To do so, we introduce a Best-in-class approach, adapting to sovereigns the methodology presented by the Bank for International Settlements (BIS) for corporate bonds<sup>8</sup>. We basically divide countries into buckets based on per capita income or credit rating and then apply exclusion criteria based on ESG scores, ensuring that developing countries with relatively good ESG performance have a significant overweight in the resulting bond index.

Our starting point is the set of weights of JPM EM bond indexes, which are modified using our exclusion schemes. We proceed as follows: we first apply two independent clustering algorithms to EM countries, one considering countries' GDP per capita level and the other their MSCI ESG score. In both cases, countries are clustered into five groups using a k-means algorithm. Then, for each income cluster, we exclude the countries falling into the lowest ESG group (computed for the whole sample). Finally, we consider the JPM weights based on just market capitalisation and redistribute the excluded countries' weights proportionally within each income cluster. We also check for the robustness of the methodology by testing for two slightly different specifications: we repeat the steps using five credit buckets (from Moody's credit ratings) instead of GDP per capita clusters. In addition, we exclude in each income/credit rating group the 30% worst-ESG performing countries, disregarding the ESG clusters. As a result, we obtain four different weighting schemes (see Appendix for more details).

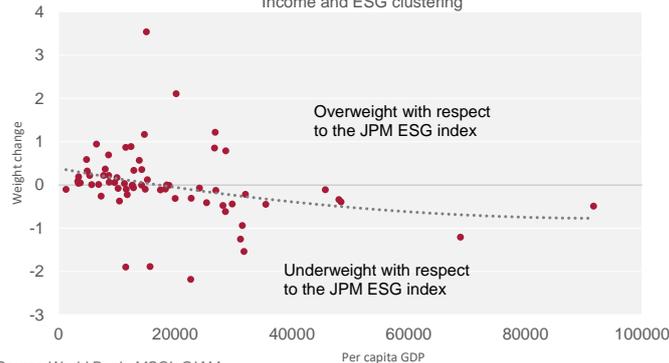
Unlike the JPM methodology that applies ESG-based restrictions and exclusions to the whole group of countries, we do that within each income or credit rating class. This

<sup>8</sup> See Ehlers et al, (2022). Deconstructing ESG: how to invest with your own criteria, BIS Working Paper 1008, March. Available [here](#).

reduces the IIB. Therefore, poorer countries are often overweighted for the JPM ESG index.

## Country weight redistribution

Income and ESG clustering



Source: World Bank, MSCI, GIAM

The table below shows that these adjustments come at no cost in terms of performance or volatility for the JPM indexes; some transformations significantly improve the benchmarks on both metrics.

Period: 01/2013 - 06/2022		Sharpe Ratio (100x)	CAGR*	Max Drawdown
JPM Index		4.3	2.0	-18.5
JPM ESG Index		4.4	2.1	-18.7
Buckets	ESG exclusion			
GDP per capita buckets	Lowest cluster**	4.7	2.2	-18.1
	Worst 30%***	4.8	2.3	-18.3
Credit buckets	Lowest cluster	4.7	2.2	-17.6
	Worst 30%	4.9	2.4	-17.9

\* Compound Annual Growth Rate: average annual growth (%) of the index.

\*\* Countries belonging to the lowest ESG class.

\*\*\* Worst 30% of countries in ESG score terms.

Note that this methodology can be adapted to any ESG measure. For example, given the vital role of political institutions and (lack of) democracy in triggering the Ukraine war, the index could be developed using the World Bank's voice and accountability measures. More details on the methodology are provided in the Appendix.

### 5. A growing impact of ESG on ratings and spreads

Beyond the problem of the ESG ratings, the question is whether ESG criteria impact credit ratings and sovereign spreads. There are now numerous studies on the economic impacts of climate change and ESG factors in general. However, the effect of climate change on the creditworthiness of sovereigns has only recently come into focus.

Several studies show that higher temperatures – as a proxy for climate change – lead to a reduction of growth, reduce human capital accumulation and worsen a country's trade balance. This applies mainly to countries concentrated in geographic areas with high average temperatures. Including

ESG as an input, investors need to consider the impact of climate change on sovereign ratings after controlling for conventional macroeconomic factors as they determine a country's debt sustainability and, ultimately, the risk of default. The effect on a country's creditworthiness varies depending on the extent of climate change. [Cevik and Jalles \(2020\)](#) show in a panel of 67 countries that climate change has a lasting impact on sovereign ratings. However, a country's capacity to adjust to climate change (e.g., a suitable insurance scheme, economic diversification, and efficient policy management) is essential for alleviating the consequences. Countries with greater resilience can even benefit and gain higher credit ratings. It is striking that the impact of climate change on advanced countries' ratings is generally hardly significant, whereas the opposite holds for developing countries.

Moreover, climate change resilience is positive for all countries, but the magnitude of this effect is much more evident for developing countries. Economic diversification and appropriate policy management can help to better cope with climate change's impacts, ultimately reducing the higher interest costs associated with a lower rating.

[Klusak et al. \(2021\)](#) empirically investigate the effect of climate change on sovereign ratings for 108 countries. They conclude that if global warming is limited to below two degrees, the impact on the sovereign rating should be limited, too. Therefore (now focussing on ESG as an output), there is a strong incentive to pursue a sustainable climate policy to mitigate the impact as it is seen to pay off in the foreseeable future (as warming is a global phenomenon leaning against it appears futile anyway). However, if this threshold is breached, many countries will have to face a downgrade by around one notch as soon as 2030, and even eighty countries may suffer a downgrade of almost 2.5 notches by 2100. This would imply a partly significant increase in the cost of public borrowing. The authors stress that the downgrades are not limited to government bonds. The reduced sovereign ratings often represent an upper limit for other issuers, and a general trend toward downgrades is to be expected.

### *Climate change does have an impact on sovereign ratings – but how strong is it?*

A more diversified approach by [Bingler \(2022\)](#) disentangles transition, physical, and innovation aspects of climate risks and climate performance. Climate-related innovation activities are an essential safeguard of future welfare and, ultimately, the ability to service debt. Starting with a large dataset of sovereigns, the analysis is eventually carried out with the help of a few variables to assess the pricing-in of the several dimensions of climate risks and climate performance for a sample of 29 countries for the years 2008-2021. It turns

out that financial markets strongly factor in physical risk exposure. On the contrary, transition and innovation aspects are less priced by financial markets. The effects are particularly pronounced in the case of countries with lower credit ratings and for long-term maturities.

Studies referring to EMs show differing results. [Morgan Stanley](#)<sup>9</sup> (data back to 2003) concludes that a significant proportion (24% for HY countries and 40% for IG countries) of spread movements can be attributed to the changing level of ESG factors. Most of the explanatory variables can be assigned to the S or G factors (e.g., political stability, control of corruption, government effectiveness and legal certainty). Going forward, it is expected that the E factor will exert an increasing influence. Countries particularly subjected to climate change will be exposed to an increased risk of rating downgrades.

In contrast, [Barclays \(2022\)](#)<sup>10</sup> does not discover a relationship between ESG rankings and spreads. To begin with, a linkage between ESG rankings, on the one hand, and wealth and credit ratings, on the other hand, is demonstrated. However, once controlling for credit ratings, the effect of ESG attributes on spreads disappears (see also the approach presented in chapter 4). Accordingly, it is concluded that investors can follow a pro-ESG tilt without giving up return (but at the cost of a worsening mix of financial fundamentals). Like Morgan Stanley, Barclays shows that variables from the G range significantly impact the credit rating, while E variables have hardly any effect. However, the study (in contrast to Morgan Stanley) does not find any impact of S on credit rating.

Overall, it can be concluded that ESG factors already have a particular influence on a country's rating. Given the evolving climate change, it can be safely assumed that this effect will become even stronger in the future. Particularly low-rated countries are exposed to downgrade risks.

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## 6. Is there a sovereign greenium?

Investment in ESG bonds is a part of the integration into sovereign fixed-income markets. The debate is still intense on whether labelled bonds (i.e., bonds which promote sustainability and better ESG performance) issued by a country with a low ESG score are investable. There is no final answer, and it is a subjective decision that partially depends on the ESG approach (ESG as an input or output) and the investment process (exclusion, best-in-class). Apart from the above-discussed conceptual challenges, a key question from a market perspective is whether labelled bonds offer a premium over conventional ones.

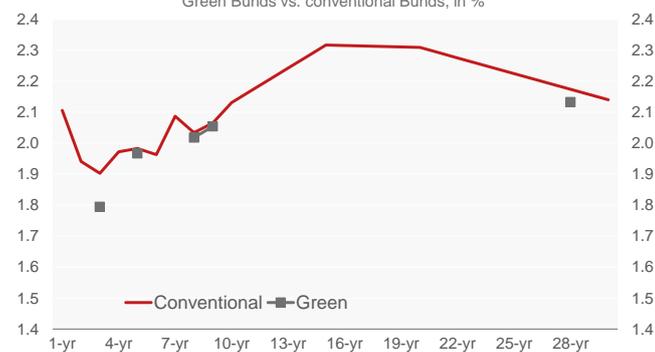
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<sup>9</sup> Morgan Stanley (2021), How Much Does ESG Matter for EM Sovereign Credit?, Global Insight.

<sup>10</sup> Barclays (2022), Performance of ESG-Tilted Portfolios of Sovereign Bonds, FICC Research.

## German sovereign yield curves

Green Bunds vs. conventional Bunds, in %



Source: Bloomberg, GIAM

The greenium is defined as the yield spread between a conventional bond and a green bond with comparable terms.<sup>11</sup> A positive greenium means the yield of a green bond is lower than that of a conventional bond.

At first glance, there is a theoretical case for a positive greenium. Initially, issuers must use the proceeds for ESG-related projects and document this accordingly. According to the asset pricing theory, this can reduce risks compared to conventional bonds. Moreover, the supply of green bonds is linked with additional costs which issuers might be tempted to pass on to investors. Additionally, pro-ESG preferences can lead to higher demand by investors willing to accept lower yields. These investors may be willing to forgo some profits to support activities deemed societally desirable. Further regulatory interventions by the legislators will likely support the demand for green bonds as well.

On the contrary, it can be argued that investors may demand compensation for holding a smaller, less liquid, and more volatile bond. High volatility can be inferred from the smaller size and lower liquidity (however, stronger fluctuations are by no means clearly ascertainable empirically). Furthermore, green bonds are subject to the risk surrounding the development of green technologies (at least in case if it is assumed that these new technologies are more exposed to particularly high risks due to their innovative character leading to a higher probability of default of the respective issuer). Finally, it is argued that arbitrage is opposed to a sustainable positive greenium.

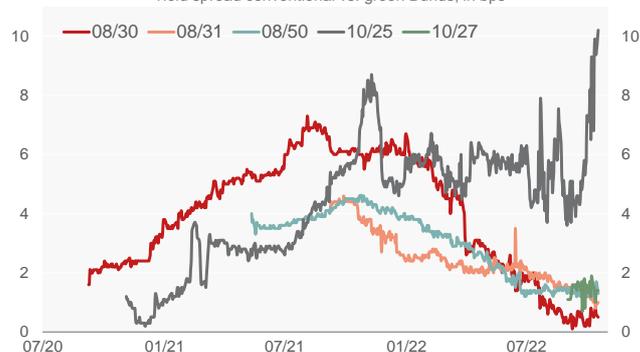
Empirically, most studies over the last years identified a positive greenium – both for developed markets and EMs.<sup>12</sup> This premium is already present in the primary market, and there is evidence that this yield spread persists in the secondary market. This is the case for both developed countries and EMs. While most analyses find a single-digit (bps) positive greenium, others show a greenium well into double digits.

<sup>11</sup> Originally, the term referred to green bonds. However, the spread effect described can also apply to other ESG bonds. The following is an extended definition of the term greenium to include all ESG bond types.

Some studies show that green bonds offer narrower bid/ask spreads than conventional ones. Although controversial, there is some evidence that, in principle, green government bonds are characterised by [higher liquidity compared to plain vanilla bonds](#). Moreover, there are some indications that green bonds [performed better during the Covid-19 outbreak](#). Among others, a more diversified investor base and/or the preference to hold green bonds for longer can be reasons for this.

## German Bunds: Greenium

Yield spread conventional vs. green Bunds, in bps



Source: Bloomberg, GIAM calculations

Additionally, given the shift in the investment community towards ESG, we see issuance activity further on the rise – not least due to diversification for investors and issuers. However, we expect that investor demand is sufficiently high to ensure a premium also in the future.

We take a deeper look at current market pricing and estimate the size of the sovereign greenium. We are considering a few examples: German Bunds and selected EM issuers.

*The twin bond approach increases transparency and provides added value for borrowers and investors*

Bunds are particularly well suited for this purpose. In 2020, Germany issued its first green bond with a total issuance volume of €11.5 bn (meanwhile, five green bonds with a total outstanding volume of €38 bn). Germany has established green Bunds as the benchmark for the euro green finance market with a green yield curve showing the same standard maturities as the conventional one.

Germany follows a unique approach: the so-called [twin bond approach](#). This means that every green Bund is issued alongside an already existing conventional bond. This green Bund has the same characteristics as the conventional one regarding coupon, maturity, and interest payment dates. However, the green bond's volume is much lower than that of the conventional bond.

<sup>12</sup> For simplification we refer to EUR-denominated debt only. The empirics for USD-denominated debt are less clear-cut.

It turns out that there is a positive greenium (also in times of market turbulence), but it has declined in recent months (with the notable exception of Germany 0% 10/2025). While the greenium of Germany 0% 10/2025 had temporarily risen to 11 bps, the greenium of most outstanding bonds is now between 1 and 5 bps.

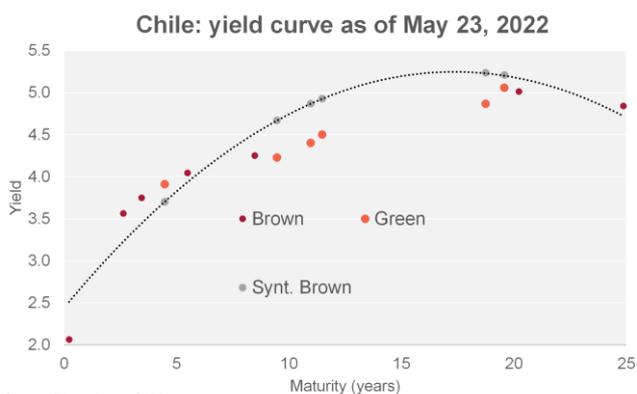
The consistently observable greenium on the primary market implies that investors who hold the green bonds to maturity achieve a slightly lower return than market participants who invest in conventional bonds. Moreover, excess demand is insufficient to sustain a constant (or even increasing) greenium on the secondary market. The fluctuations in the greenium, therefore, do not allow any clear conclusions to be drawn regarding the performance relative to conventional bonds.

greenium.

For most of the EMs countries considered, we found evidence of a greenium. As the charts show, however, it tends to be volatile, especially around periods of large shocks, like the Covid-19 outbreaks or the commodity price spike in early 2022 following the Ukraine war. Liquidity may be the culprit that our simple analysis cannot account for. Yet, in "normal" times, we estimate that the greenium for most countries is in the range of 5 to 10 basis points, not too distant from that of twin Bunds.

Greenium Estimates (bps)

Bond	Mean	Median	Min	Max
POLAND EUR 1% 03/07/29	8.8	9.3	-11.8	77.3
REPHUN 1.75% 06/05/35	16.7	4.7	-12.1	75.7
MEX EUR 1.35% 09/18/27	9.3	8.4	-0.9	22.7
INDONESIA USD 3.9 08/20/24	9.8	6.6	-6.4	60.3
CHILE 2.55 01/27/32	10.0	6.4	-1.5	46.9



## 7. Conclusions

The integration of ESG criteria in managing sovereign bond portfolios will gain momentum. It has been lagging, but the size of the sovereign market is too big to be ignored. Sovereign ESG integration is likely the next relevant step of ESG fixed-income development. The Ukraine invasion has shed light on the current ESG sovereign framework's numerous limitations, which will likely lead to an acceleration of the integration.

For EM countries, the comparison is more difficult, given the lack of issuance and the limited numbers of issuers. There are no two similar green and brown curves for the same country. We thus consider a few EMs with a sizeable issuance activity, build a yield curve using a quadratic interpolation of the "brown" yields and use it to construct the yields of synthetic bonds with the same maturity as the existing green ones. We then compare the yield of the synthetic bond with the equivalent bonds to measure the

One problematic issue with sovereign ESG ratings is their correlation with GDP per head. It must be addressed, or EM sovereigns – often with high climate-related investment needs – will be gradually excluded from indices. At the same time, they often face more significant funding needs to address climate risks and improve their ESG performance. Our proposed (best in class) approach addresses the income bias at no cost in terms of performance or volatility. The way to address the ESG rating issue will heavily depend on the adopted approach: ESG as input or ESG as an output. After the stress test triggered by the Ukraine war, the risk is that a growing focus on ESG as an input would imply more exclusions as a quick fix to the revealed shortcomings.

Sovereigns and investors have overlapping goals: On the one hand, fund managers are seeing a growing ESG pressure. On the other hand, sovereigns, especially EMs, need funding to invest in transition in a rising interest rate environment. In the future, sovereigns and investors will eventually have to partner to tackle the ESG integration via more engagement, better data disclosure and sharing, exactly like corporates have been doing over the past years.



Source: Bloomberg, GIAM

## APPENDIX:

In what follows, we briefly explain the methodology employed to build the alternative ESG bond indexes and compute the Greenium for selected EM issuers. Additional details are available on request.

### Alternative ESG indexes

The methodology employed in section 4 offers a straightforward and flexible way of adjusting for the income bias that characterises ESG scores. Hence, the target is to build a weighting scheme alternative to plain "brown" and "green" indices that do not consider ESG scores' income bias while testing the financial performance implied by the new weights.

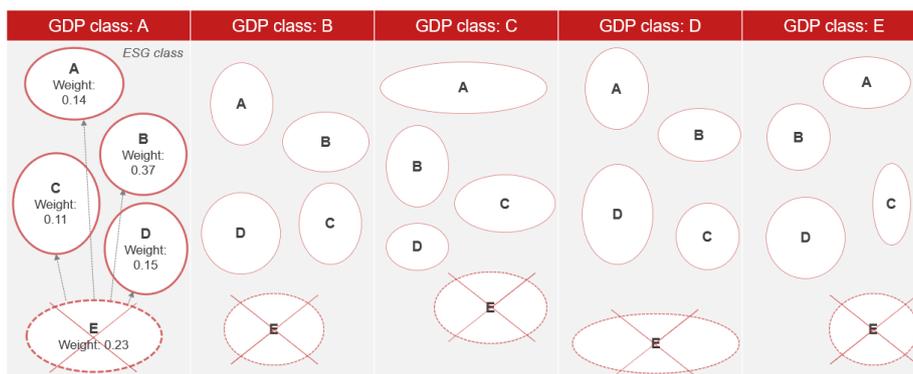
Starting from a baseline index – in our case, the JPM EMBIGD Index, comprising Sovereign and Quasi-Sovereign bonds of 72 countries – the "Best-in-class" approach reweights countries according to their ESG scores and other information, such as their credit rating and level of per capita GDP.

The methodology steps are organised as follows:

- Group countries according to their ESG scores through a time-varying k-means clustering algorithm.
- Two separate approaches. Either:
  - o Create five credit buckets from credit ratings (AAA, AA-A, BBB, BB-B, Lowest).
- or:
  - o Cluster countries according to their GDP per capita level (through k-means, allowing for time variation of clusters).
- At every point in time  $t$ , exclude the worst ESG-performing countries (either the lowest ESG cluster or below an exogenous  $x\%$  threshold) in each GDP/credit bucket.
- Redistribute the weights proportionally to the rest of the bucket.

The key feature of the approach is that GDP and credit dimensions are considered alongside the ESG performance: countries are excluded according to their ESG scores, but the subsequent weight redistribution occurs within each GDP/credit rating bucket, and not on the whole sample as in the JPM ESG index. The approach delivers a rebalancing towards poorer countries. MSCI sovereign ESG scores and GDP per capita levels are provided on a yearly frequency. Exclusions are determined at the beginning of the year according to the set of information from the previous year. Once we observe the EMBIGD weights at time  $t$  (weekly frequency), we perform our weights redistribution and determine the Best-in-class weights for  $t+1$ . The number of exclusions ranges from 5 to 10 countries each year.

Theoretically, a better solution (used by the BIS) should be to apply the clustering algorithm on ESG scores within each income group. However, the limited number of countries makes this approach impractical.

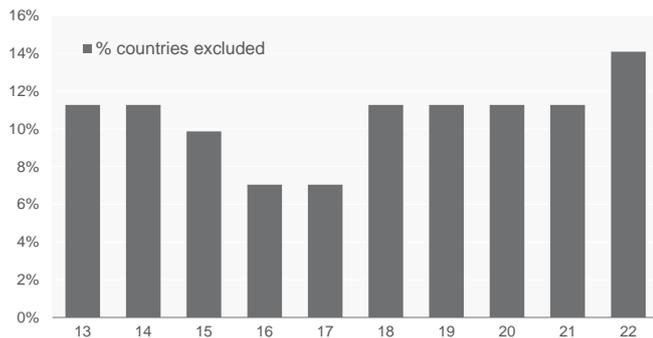


Given that the IMF WEO database does not provide information about Venezuela's level of GDP per capita at constant prices, we decide to take out the country from both the EMBIGD and JPM ESG indices. Weights are then proportionally redistributed so that they sum up to 1. In what follows, we provide the weight changes of countries that – at least once in the period – fall in the lowest ESG class and are taken out from the Best-in-class index.

Dates	Angola	Belarus	Cote d'Ivoire	Egypt	Ethiopia	Iraq	Kenya	Lebanon	Mozambique	Nigeria	Pakistan	Russia	Senegal	Tajikistan	Exclusion
27/12/2013	0,38	0,615	0	0	0	0	0	3,724	0	0,566	0	5,371	0	-	8
26/12/2014	0,357	0,229	0	0	0	0	0	3,492	0	0,546	0	4,13	0	-	8
25/12/2015	0,769	0,237	0	0	0,293	0,526	0	0	0	0	0	4,89	0,326	-	7
30/12/2016	0,558	0,218	1,065	0	0	0	0,683	0	0,126	0,397	0	4,361	0,276	-	5
29/12/2017	0,378	0,329	1,04	0	0	0,782	0,63	0	0,127	0	0	3,701	0,499	0,106	5
28/12/2018	0	0,456	1,08	0	0	0	0,965	0	0	0	0	3,595	0,603	0,117	8
27/12/2019	0	0,459	0,711	0	0	0	1,349	0	0	0	0	3,375	0,556	0,085	8
25/12/2020	0	0,59	0,57	0	0	0	1,078	0	0	1,803	0	3,448	0,453	0	8
31/12/2021	0	0,459	0,5	0	0	0	1,371	0	0	0	0	3,37	0,388	0,081	8
01/07/2022	0	0	0,525	0	0	0	1,285	0	0	0	0	0	0,372	0,076	10

The table shows the closing weights for the 2013-2022 period and the number of countries excluded from the index - following the "lowest ESG cluster" approach - out of 71. Given that JPM weights are disclosed at an aggregate country level, we cannot provide the exact number of bonds excluded but rather the number of countries excluded. Therefore, backtesting is performed at the country level and not by a single instrument.

Fraction of countries excluded



Source: GIAM calculations

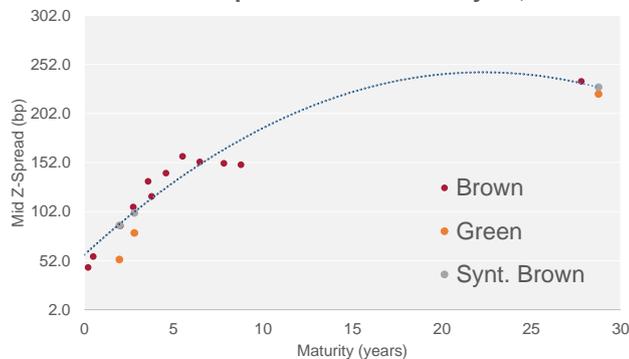
### Greenium computation

Greenium computation in section 6 employs a quadratic interpolation of the selected EM yield curves. Namely, at every point in time  $t$ , a quadratic OLS regression fits both the YTM and the Z-spread curve of the country according to the formula:

$$z\_spread_i = \alpha + \beta_1 \cdot maturity_i + \beta_2 \cdot maturity_i^2 + \varepsilon_i, \quad \forall t = 1, \dots, T$$

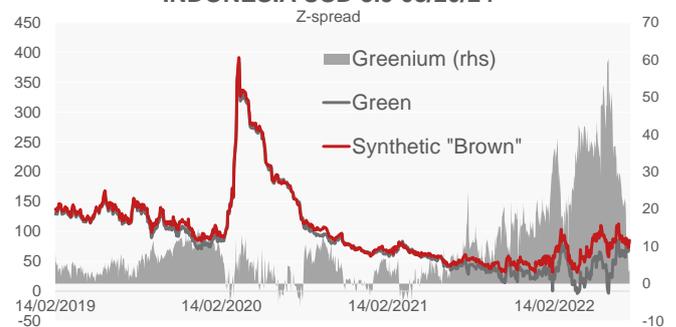
where  $i$  represents the  $i$ -th "brown" bond on a country's yield curve. The set of coefficients is then used to predict a set of fictitious conventional bonds matching the maturities of the existing green bonds. The greenium time series is computed as the difference of z-spreads between the green and the fictitious conventional bond. The graphs below provide additional information on z-spread curves and the greenium of Indonesia (USD bonds). The presence of a greenium is hinted at by the existing green bonds below the quadratic interpolation, as their z-spread will be lower than that of the fictitious brown bond. The denser the z-spread curve is, the more reliable results tend to be.

Indonesia: z-spread curve as of May 23, 2022



Source: Bloomberg, GIAM

INDONESIA USD 3.9 08/20/24



Source: Bloomberg, GIAM

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