BlueBay Asset Management | Verisk Maplecroft

The role of ESG factors
in sovereign debt investing

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About BlueBay Asset Management

BlueBay Asset Management is one of Europe's largest specialist active managers of fixed income, entrusted by clients with over US$61bn in assets under management (as of 31st December 2018) in corporate and sovereign debt, rates and FX. Its investment philosophy and approach focuses on delivering absolute-style returns, with an emphasis on capital preservation. It has an established track record of innovation and performance, providing a broad range of relative return, total return and alternative investment portfolios in both public and private debt markets. BlueBay is a wholly-owned subsidiary of Royal Bank of Canada with full investment autonomy and substantial operational independence. BlueBay is a client of Verisk Maplecroft. For more information visit www.BlueBay.com

About Verisk Maplecroft

Verisk Maplecroft is a global risk analytics company specialising in ESG, climate, and political risk data for the world's leading institutional investors and corporations. The company combines a unique portfolio of global risk indices and data sets with expert research on countries, industries and issues to provide a holistic approach to risk analysis that enables its clients to make better, risk-adjusted decisions. Among asset owners and managers, the company is a trusted source of data and insights for the integration of ESG, climate and political risk factors in multiple asset classes, notably sovereign debt. For more information visit www.maplecroft.com.

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1 Executive summary

ESG investing in sovereigns is less developed than it is in equities and corporate debt. Incorporating environmental, social and governance (ESG) factors into investment processes, now near-mainstream in equities, remains at an early stage in sovereign debt investing despite the volume of country bonds as a share of global assets under management. This is partly because of the more limited investment universe, the capped upside, and fewer opportunities for engagement and thematic investing. However, investors have also been constrained by a lack of robust data and the difficulty of using that data for investment purposes, be those purposes ethical or aimed at enhancing or protecting returns.

This research aims to move sovereign ESG investing forward. Verisk Maplecroft and BlueBay, respectively leading data providers and asset managers in the sovereign space, have been working together to address these challenges and contribute to best practice. This paper represents our first step in this direction.

Our approach to measuring country ESG represents a break with the past. We introduce a completely new way of measuring country ESG – a nine-dimensional typology that shows how countries differ from each other, and how each country's ESG performance changes over time, in the ways that are likely to be most material for investors. We believe that this approach does a better job than traditional aggregate scores of accounting for the complexity and multidimensional character of ESG. Integrating ESG means accounting for dozens of different factors at the same time; and global risk distributions on any individual ESG factor are often characterised by irregular clustering and extreme differences between countries. So, we group over 80 global ESG risk factors from the Verisk Maplecroft dataset into nine dimensions using a typology that accounts for whether factors are relevant in the short term, in the long term, or to country resilience; and we use cluster analysis to categorize country performance in each of those dimensions across 198 countries and five years. Because we are focusing on sovereigns, we include political risk within our governance-related dimensions.

All else being equal, investors significantly reward better ESG performance. We systematically explore how sovereign debt markets have actually priced ESG factors in the recent past. Using the country ESG classifications developed through the process above, we conduct regression analyses at different levels of granularity on the hard currency spreads of 97 developed, emerging and frontier markets against their respective benchmarks between January 2013 and May 2018, controlling for eight country-level macroeconomic variables and two global macro variables. At a high level, the result is clear: once all economic differences are factored out, the spreads of the best ESG performers are approximately 70% lower than those of the worst. And disaggregated analysis shows that governance performance is most important for markets, though investors price institutional development in a non-linear way that appears to reflect concern with the political risks associated with democracies.

Markets are apparently not yet pricing in environmental or climate risks. Markets either ignore or actively penalise better environmental performance – especially when it comes to potentially expensive energy transition and environmental regulation. And while investors do in theory account for physical climate change risks when these are viewed in isolation, in practice the most climate-exposed countries are also in general the most biodiverse – and markets reward countries for having significant biodiversity left to exploit, more than cancelling out any price impact of physical climate change. In a world characterised by the collapse of multiple ecosystems under the pressure of human activities, markets' attitude towards biodiversity could also be problematic depending on its practical impact on incentives for biodiverse countries. Such patterns have the potential to set markets up for an eventual abrupt repricing of environmental risks, especially in relation to climate change.

Country ESG performance relates to how investors price global macro factors. Our regression models include interaction terms that identify whether investors price in economic variables differently in countries with different ESG profiles – and we see significant variations in global macro pricing in this respect. For example, in tighter global credit conditions, as measured by US Federal Reserve interest rates, investors disproportionately favour countries which perform poorly on specific aspects of governance, perhaps reflecting the same ambivalence about political institutions noted above.

ESG factors should be taken into account by debt investors - and not just for downside risk management. Our work strengthens the case for routinely including ESG as an element of sovereign credit risk analysis. The combination of market inefficiency and eventual materiality we find also suggests that taking ESG factors into account has the potential to open up new opportunities for alpha, particularly in an active management context. And our outputs can also be used to inform portfolio construction and sovereign engagement.

Next steps. Our work so far focuses entirely on how ESG is priced under normal circumstances, based on a snapshot of a few years of data – not how it should be priced or will be priced in the future. Sovereign ESG investing will benefit from further work to understand the extent of causal connections, likely of a non-linear nature, between ESG and credit risk. BlueBay and Verisk Maplecroft will continue seeking to move forward in this regard.

2 ESG considerations in sovereign debt investing

Figure 1: Overview of ESG investment strategies available

A variety of ESG investment strategies exist:

- Based on either taking a **negative or positive** filter/screening approach
- Consider securities on two dimensions:
  - WHAT an investable entity does: **product-based**
  - HOW an investable entity operates: **conduct-based**
- Multiple ESG strategies can be used in combination within a single fund – although one or two will predominate

Ethical (negative/ exclusions) screening	Norms-based screening	ESG tilting	ESG integration	ESG engagement/ activism	ESG best in class	Sustainability (positive/ thematic) screening
[product-based]	[conduct-based]	[conduct-based]	[conduct-based]	[conduct-based]	[conduct-based]	[product-based]

Source: BlueBay Asset Management

ESG investing – also referred to as sustainable or responsible investing – means the intentional, systematic incorporation of environmental, social and governance (ESG) factors into one or more elements of the investment process. Motives for ESG investing have historically been *values*-based, i.e. driven by ethical or moral commitments, but in recent years *value* considerations have also become important: many investors view accounting for ESG as additive to investment returns, and in line with fiduciary obligations. ESG strategies were first applied in equities, but in recent years investors have begun seeking to apply them in debt markets as well.

At a high level, debt investors draw on a repertoire of ESG investment strategies similar to those used in equities-focused ESG investing – though because of the capped upside, typically with more of an emphasis on downside risk management than generating alpha. As shown in Figure 1, these range from long-standing product-based negative screening to, more recently, product-based positive screening or investing in themes such as clean tech; through a series of conduct-based negative or positive approaches such as best-in-class (e.g. inclusion of the best ESG performers among the issuers in any given sector); to ESG integration (factoring ESG into fundamental credit analysis).

However, the lessons learned in the stock market have been more readily transferable to corporate debt, where companies remain the unit of analysis, than in sovereign debt, which as a sub-asset class uniquely allows investment directly in sovereigns. There is less consensus on appropriate ESG investment strategies in sovereign debt, with several factors presenting particular challenges to greater adoption of ESG in this area:

1. The investment universe is more limited. In contrast to the many thousands of issuers in the corporate universe, there are less than 200 sovereign issuers – and in practice many fewer are available to most investors because of segmentation into either developed or emerging market strategies and technical barriers to investability. This means that traditional exclusionary screening based on conduct in areas such as human rights – for example restrictions on press freedom or the use of torture – can lead to unacceptable tracking error and significantly undermine risk-return diversification. On a related note, the capped upside means that best-in-class positive screening is also potentially damaging to returns - except insofar as countries actually default, weaker ESG performers may generate more yield as compensation for the greater risk – though this is also partly the case with corporate debt investing.

Figure 2: ESG factors taken into account in BlueBay's sovereign issuer ESG evaluation framework

Environmental	Social	Governance/Political
Climate change – vulnerability, and policy response	Freedom of opinion & expression	Corruption
Environmental regulatory framework	Income inequalities	Efficacy of the regulatory system
Water stress	Right to privacy	Government stability
	Women's and girls' rights	Respect for property rights

Source: BlueBay Asset Management

2. Engagement is potentially more challenging. Creditors per se have much less leverage than shareholders. Those holding sovereign debt, in turn, have even less leverage than those holding corporate debt because governments are primarily focused on satisfying their electorates or other stakeholders. Investors can have some influence insofar as governments need to return repeatedly to the market for additional capital but must use alternative approaches and work harder to achieve it.

3. Thematic investment has rarely been an option to date. Investors have historically not been able to invest thematically in sovereigns. However, the emergence of sovereign green bonds and UN Sustainable Development Goal (SDG) bonds, enabling the ring-fencing of proceeds for specific purposes, could materially change this.

4. Sovereign ESG data is harder to come by. There are few sources of holistic ESG data on sovereign issuers, and even fewer that have country-specific knowledge and expertise in-house. This is exacerbated by a lack of consistent and high-quality data from the sovereigns themselves. The situation is improving, with organizations like Verisk Maplecroft working over the last decade to create country ESG and political datasets, but more remains to be done.

5. ESG impacts on sovereign credit risk are more complex and multi-dimensional. Determining which ESG factors will impact the credit risk of a sovereign issuer, and to what extent, is an order of magnitude more difficult than it is for corporates because countries are more complex: credit risk is driven by the combined interactions of national economies, political systems, and ecosystems with each other and the global economy. The multidimensionality of ESG – a basket of factors which might affect each other but are fundamentally different – exacerbates the challenges here, especially when it comes to making sense of aggregate ESG scores.

Notwithstanding the aforementioned, both the investment opportunity and the need to advance thinking and practice in this area are clear. Both BlueBay and Verisk Maplecroft believe that a country sustainability does not just matter ethically, but for achieving better risk-adjusted returns too. Research has shown how various ESG factors are relevant to economic outcomes. So sovereign debt markets, which constantly signal investors' views on countries' ability to pay their debts, should be fertile ground for ESG investment strategies. Indeed, BlueBay has been taking account of ESG factors in its sovereign debt investing strategies since it began to manage sovereign debt in 2002. Having taken a more strategic approach to ESG investment risk management since 2013, in 2018 it enhanced its approach by rolling out a framework to systematically evaluate material ESG risk factors in fundamental credit research across sovereigns and corporates. This is now used by BlueBay's portfolio managers to better account for investment-material ESG and political factors (Figure 2) in their investment decision-making.

Understanding sovereign ESG better is also increasingly important from the point of view of society and global financial market stability. Evidence is mounting of rapid climate change, almost four years since Bank of England governor and Financial Stability Board Chairman Mark Carney identified it as a systemic financial risk.[1] In addition, while global poverty is decreasing, good governance and human rights are on the back foot in many regions of the world.

1 'Breaking the tragedy of the horizon – climate change and financial stability,' Mark Carney, 29 September 2015. Source: https://www.bis.org/review/r151009a.pdf [accessed 17 March 2019].

3 Our research and approach

Given the above, BlueBay and Verisk Maplecroft have been working together to advance best practice in the use of ESG data and qualitative insights to add value to sovereign debt investing. How, why, and when do ESG factors affect sovereign debt markets? And even as investors work within the structural constraints imposed on them by the asset class, how can they take these factors into account more effectively in portfolio management?

This paper summarizes the first step we have taken towards answering these questions. We use an innovative approach to measuring country ESG that better accounts for its complexity and multidimensional character; and explore how debt markets actually price ESG factors in.

The model we have developed controls for economic variations between 97 countries, and within those countries, between 2013 and 2018 (see Focus box: how our model measures market pricing and accounts for economic variables), to test the power of ESG to explain market risk pricing – both directly as an independent variable, and indirectly as an intervening variable. Testing ESG as an intervening variable means testing the extent to which country ESG performance changes how investors price in standard macroeconomic variables such as, for example, inflation.

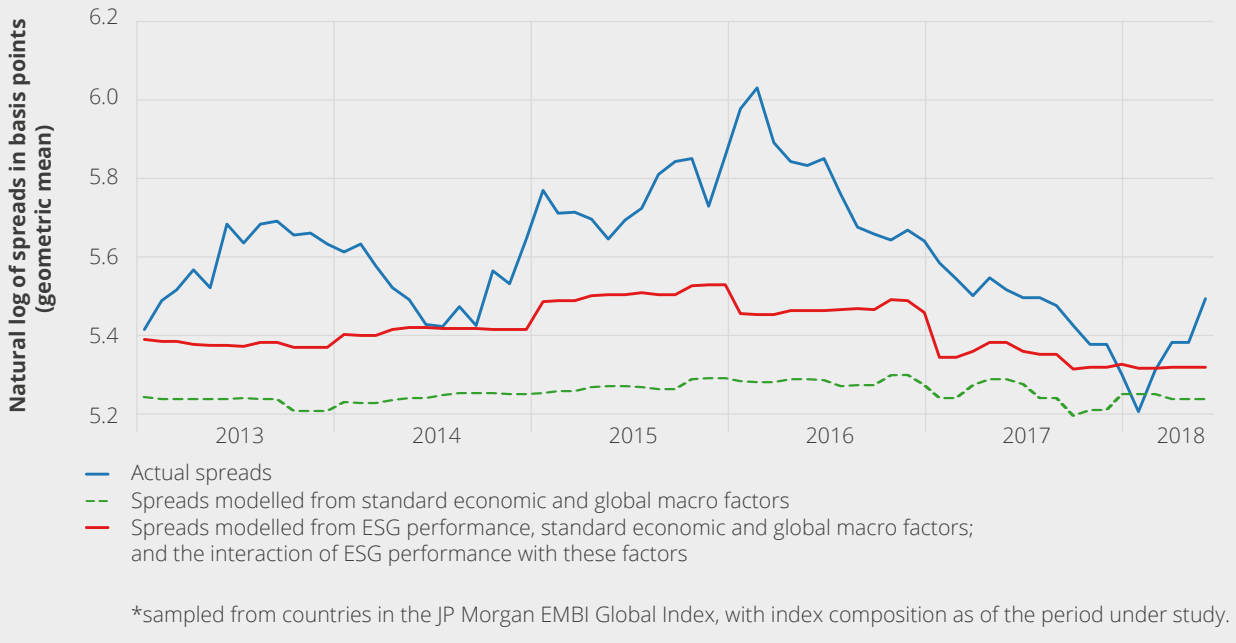
Focus box

How our model measures market pricing and accounts for economic variables

- We worked with monthly spread data between January 2013 and May 2018 across 97 countries including the main developed, emerging and frontier markets.
- For countries for which yield data are consistently available, we use spreads of yields on the relevant safe asset (German bunds for European markets, and US Treasuries for everyone else). For practical purposes, in the case of emerging and frontier markets we measure these using J.P. Morgan EMBI Global country-level index spreads and hence disregard slight differences in duration and changes over time in the selection of the instruments underlying the index.
- For other countries, we use credit default swap spreads on the same safe assets. In pursuit of maximum coverage, we use 5-year swap rates despite the longer duration of most EMBIG instruments.
- For practical purposes the advantages of the increased sample size weighed more in the balance than the resulting differences in duration and instrument type.
- We use the natural logarithm of spread data because the relationship between spreads and ESG performance is exponential.
- We model and control for the effect of eight country-level economic variables: real GDP (% change), GDP per capita, consumer price inflation, dollar exchange rate (% change), current account balance (% of GDP), total foreign reserves (% of GDP), fiscal balance (% of GDP) and external debt (% of GDP).
- We also model and control for two global economic variables: the CFE-Vix Volatility Index as a simple proxy for global risk appetite, and the US Federal Reserve effective federal funds rate as a simple proxy for global credit conditions.[2] Missing data points were generated using multiple imputation by chained equations, a standard approach in the social sciences that produces estimates for observations with missing values using information from similar observations where data is present.

2 Sources for the ten macroeconomic variables are Factset, the International Monetary Fund, the World Bank, and the St. Louis Federal Reserve.

Figure 3: How our model adds value



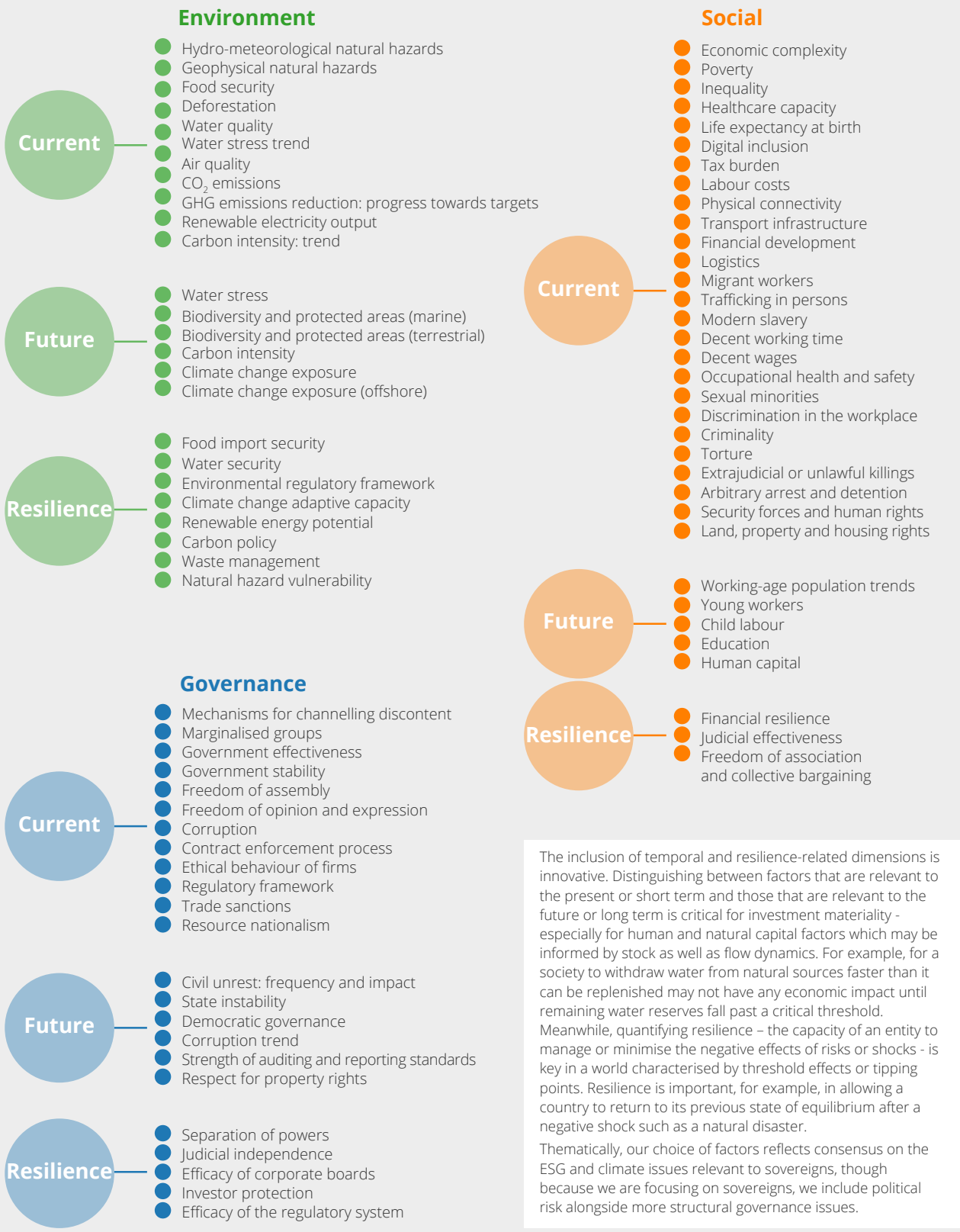
Sources: Verisk Maplecroft 2019; J.P. Morgan, 2019; Bloomberg, 2018; macroeconomic data from various sources

The results are compelling: ESG considerations should be central to investment decision-making. We find support for the widespread belief among practitioners that, all else equal, better ESG performance is associated with lower spreads – with, however, some counter-intuitive and troubling exceptions. Figure 3 shows for J.P. Morgan EMBI Global constituents how the model we have developed as a result - which accounts for economic variables, ESG performance and how ESG performance changes the impact of economic variables on risk premia – is better at predicting actual spreads than a model which is based only on economic variables.

The key to our approach is a new way of measuring sovereign ESG to better reflect its complexity and multidimensionality. We have not aggregated a series of factor scores in the usual way but have instead used a nine-dimensional typology – a system for classifying countries into different types. We assigned over 80 ESG factors from the Verisk Maplecroft country ESG dataset to the nine dimensions (see Figure 4), and then used cluster analysis on 198 countries to place countries into one of three clusters (low, medium and high performance) in each dimension (see Focus box: what is cluster analysis?).[3] In any given year, each country is thus assigned one type out of almost 20,000 possible permutations.

3 Missing data points were generated using multiple imputation by chained equations, the same method used to impute missing macro-economic data points (see previous page).

Figure 4: the conceptual framework for our country ESG performance typology



Source: Verisk Maplecroft, 2019

Focus box

What is cluster analysis?

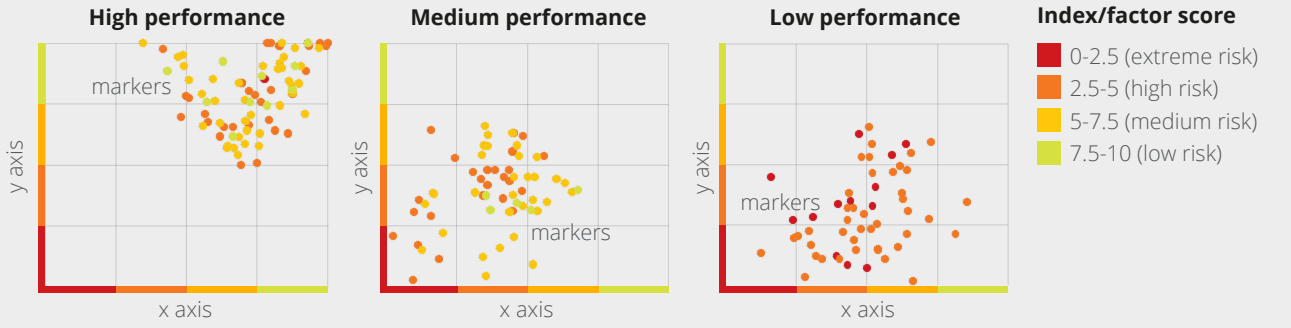
Cluster analysis is the use of an algorithm to segment entities in a dataset - in this case countries - into groups of entities that are similar to each other. It can be carried out across two or more variables simultaneously. It addresses the challenge that ESG analysis involves so many loosely-connected dimensions by letting us group all of the variables into a smaller number of dimensions – in this case nine - and analyse them on that basis.

The specific method we have used is known as two-step clustering, analysing the country data across all of the variables in each dimension of the typology to place countries into one of three clusters for that dimension. For example, Figure 5 shows the cluster affiliations of all countries in 2017 in one dimension – social resilience – and their scores or risk categories for the three variables included in that dimension. The individual variables in any given dimension can also be ranked by their importance as predictors for the eventual cluster assignations on the basis of their strength of fit.

Compared to other clustering methods (e.g. k-means and hierarchical), two-step clustering is more efficient in segmenting and classifying large datasets, has the ability to create groups using categorical or continuous variables alike, and can find the best natural fit to select the number of clusters – though in this instance the clustering yielded either two or three clusters in all dimensions, and so we decided to use three clusters for the sake of consistency.

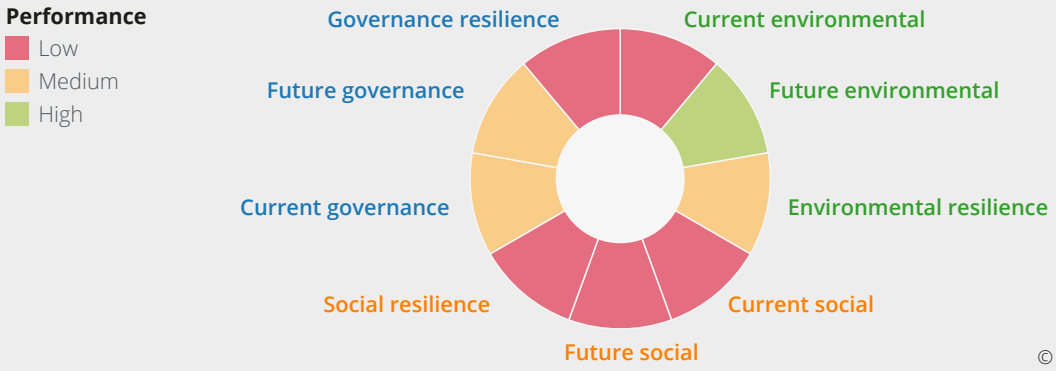
Cluster analysis generates cluster affiliations that are not scores, but categories that shouldn't necessarily be interpreted as being worse or better than each other. However, in the case of our country ESG dataset, the correlations between the numerous variables in each dimension mean that in almost all cases the resulting cluster affiliations can indeed be interpreted in this way. This is with the important exception, however, of the future environmental dimension, where the data unambiguously indicate that those countries with the highest stocks of terrestrial biodiversity (a positive attribute) are also those that are most exposed to physical climate change risks (a negative attribute). In our typology, this is identified as the low ESG performance cluster for this dimension.

Figure 5: Social resilience clusters in 2017



Verisk Maplecroft risk indices
x axis = Freedom of Association and Collective Bargaining
y axis = Judicial Effectiveness
Colour of marker = Financial Resilience.

Figure 6: An example of a specific country ESG performance type in 2018



Source: Verisk Maplecroft, 2019

Beyond the typology itself, below we summarise our findings in two areas:

- To assess the direct explanatory power of ESG factors in relation to risk premia we carried out panel regressions with fixed effects on a dataset of 97 countries, controlling for standard country-level and global macro-economic variables, and operationalising different aspects of ESG performance, using the ESG classifications above, as independent variables. To provide some basic insights into how levels of economic performance affect the pricing of ESG, we also segmented countries into strong, medium and weak performers.[4] As an additional test, we also carried out conventional panel regressions using individual ESG factors as independent variables.
- To better understand how ESG factors help to explain how investors price macroeconomic variables we added interaction terms to our panel regressions with ESG factors as intervening variables, again using our ESG classifications, and the various macroeconomic factors as independent variables.

4 To do this, we used cluster analysis on three standard macroeconomic variables in the Verisk Maplecroft dataset: Macroeconomic Environment, which provides a composite assessment of several key economic indicators; Public Sector Indebtedness, which examines debt levels; and Trade Exposure, which assesses vulnerability to external trade shocks.

4 Key findings

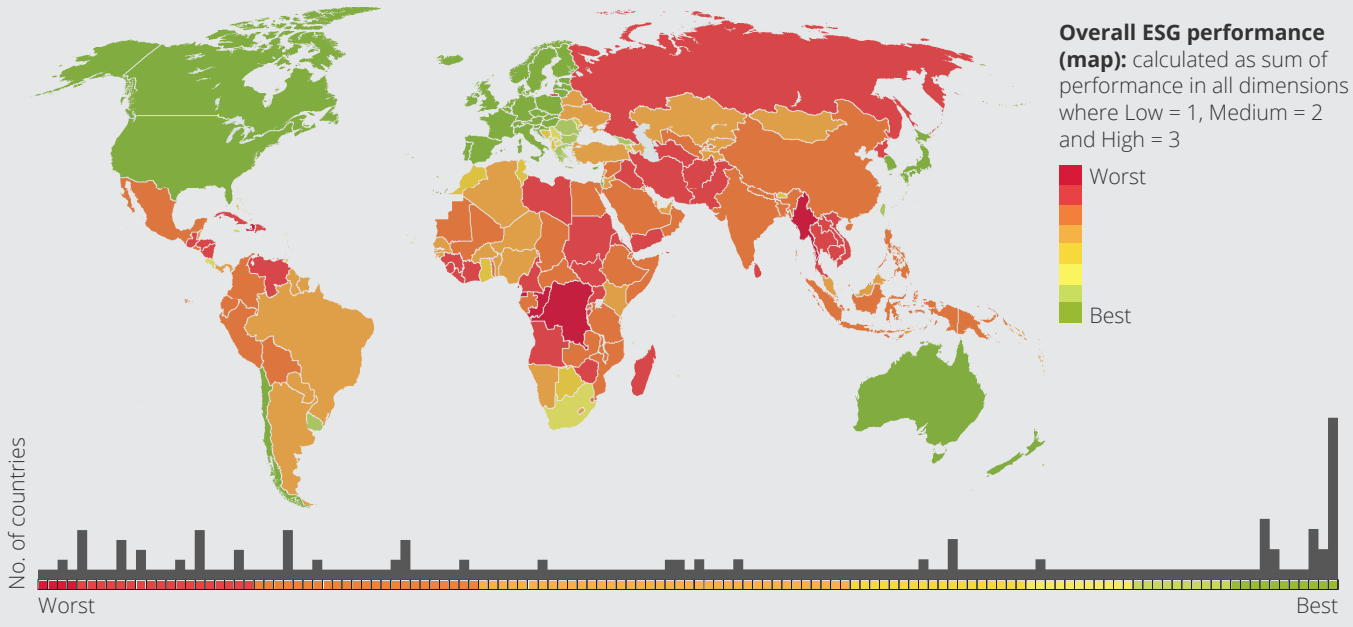
1. Our country ESG performance typology effectively identifies investment-relevant differences between countries and momentum within countries

We believe our ESG typology makes a valuable and innovative contribution to ESG sovereign debt investing. Figure 7, for example, shows the types of all countries in the 2018 clustering ordered from worst to best ESG performance, as well as a map with a high-level summary of their ESG performance in the form of the sum of all of the clusters across the nine dimensions of the country typology.[5] Differences between countries and changes in a country's nine-dimensional ESG type over time are likely to be investment-material because they represent major differences or changes in underlying ESG fundamentals – a difference or change in cluster affiliation in at least one dimension.

Such changes are also likely material because of the way that ESG performance is distributed in each dimension. Because global political, economic and environmental systems are complex, not simple, countries typically cluster together. In particular, distributions of countries on many individual ESG factors are not 'normal' bell curves but instead both multimodal (many-peaked) and characterised by extreme differences between countries. Some countries cluster together around points of temporary equilibrium in clusters, but can also be subject to positive feedback loops that take hold when they cross tipping points. Albeit with some simplification, our cluster analysis captures this in each dimension across all of the factors. Furthermore, as in one dimension, so in many: as shown in Figure 7, the distribution of country types across all nine dimensions also shows similar clustering.

We expect these dynamics to inform market risk pricing such that differences between nine-dimensional types, or by extension movements between types by a single country, will be much more material than differences or movements which do not translate into a change in nine-dimensional type: ESG dynamics will be secondary to investors' decision-making, except when they imply a departure from equilibrium, thus becoming a primary concern.

Figure 7: Global ESG types and overall performance in 2018



5 Where 'low' performance = 1, 'medium' performance = 2 and 'high' performance = 3.

Figure 7 continued: Global ESG types and overall performance in 2018

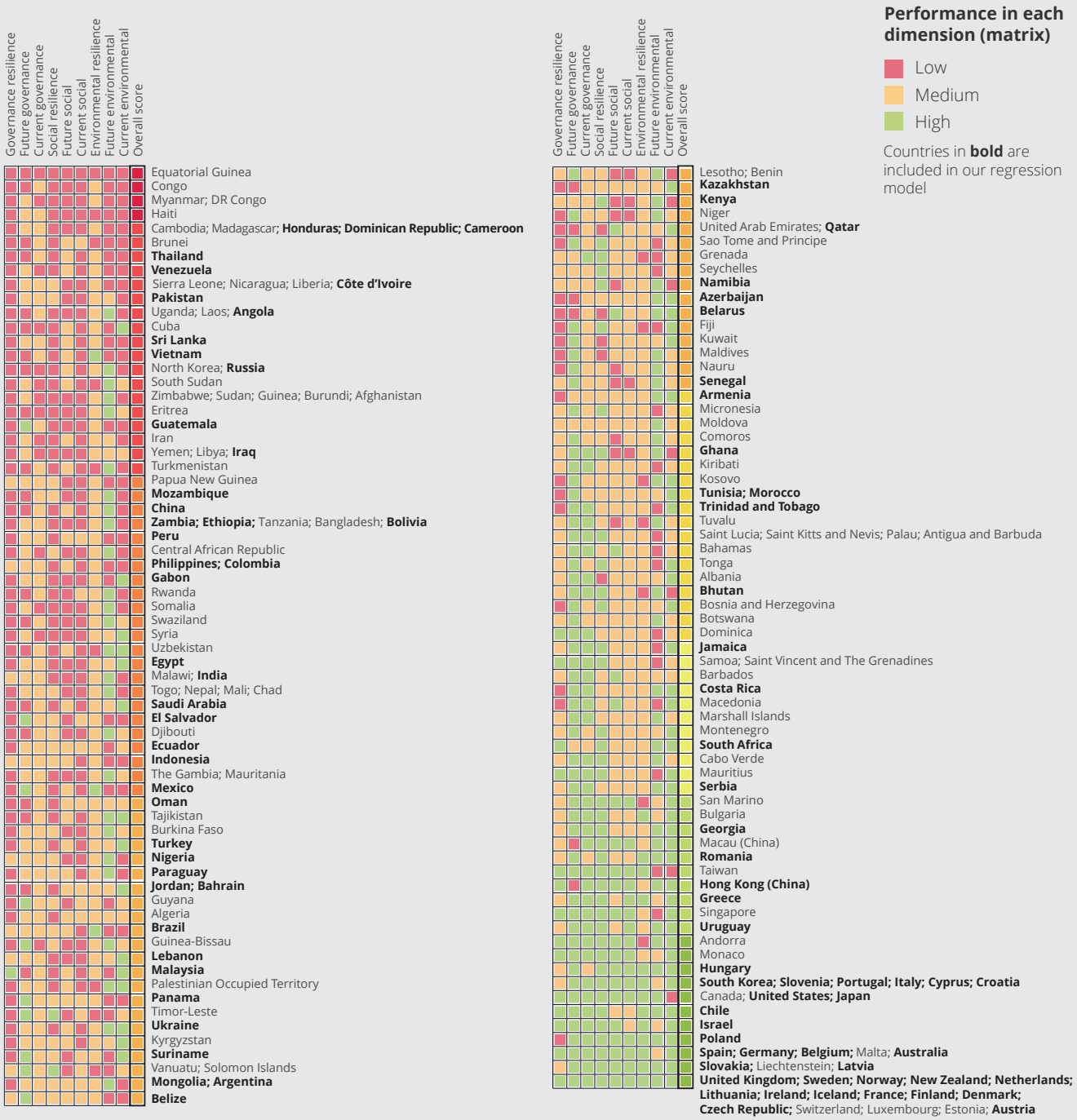
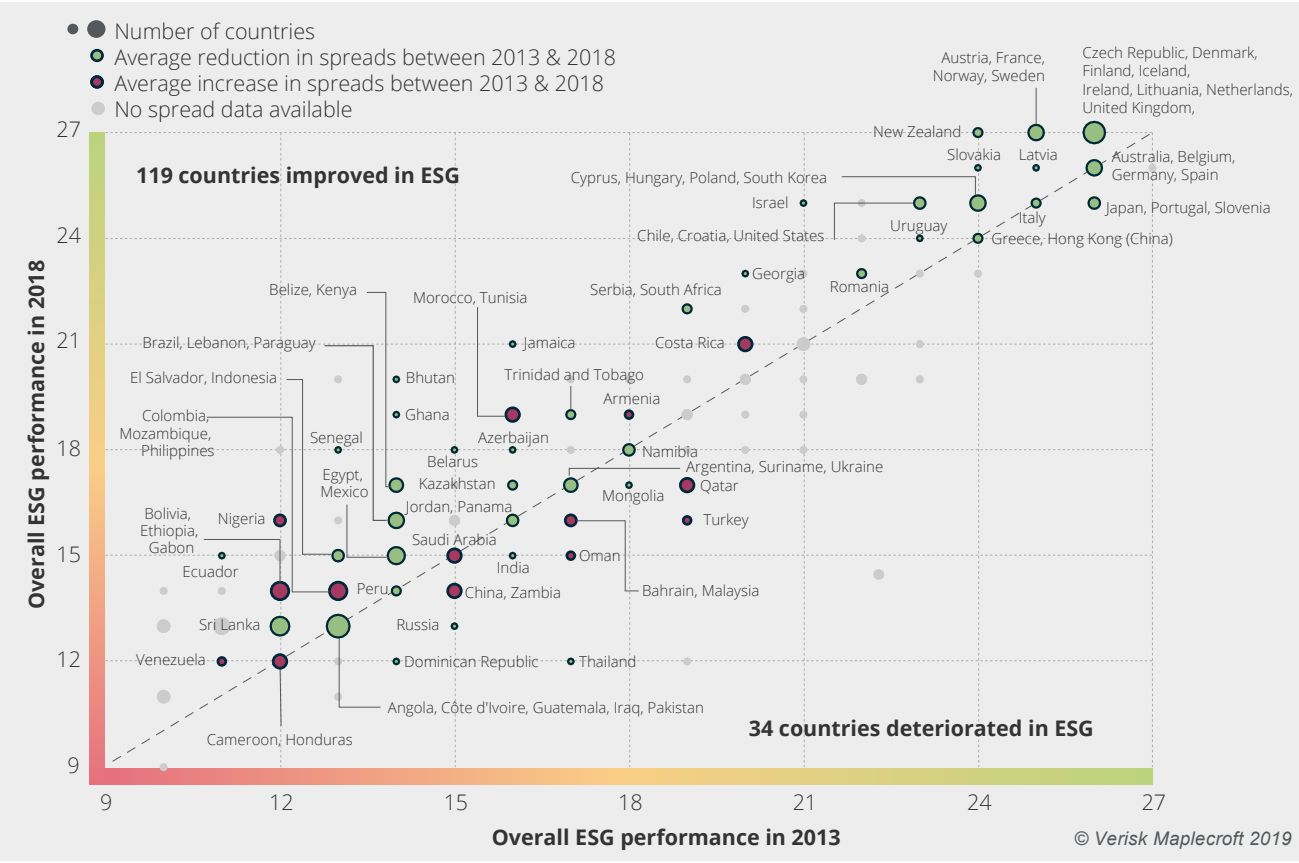
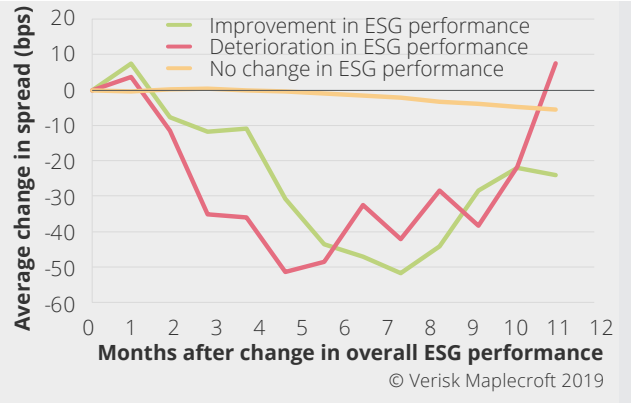


Figure 8: The 2013-2018 period saw ESG improvements and narrowing spreads in multiple countries



Sources: Verisk Maplecroft, 2019; Bloomberg, 2018

Figure 9: Markets may price positive ESG changes in faster than negative ESG changes



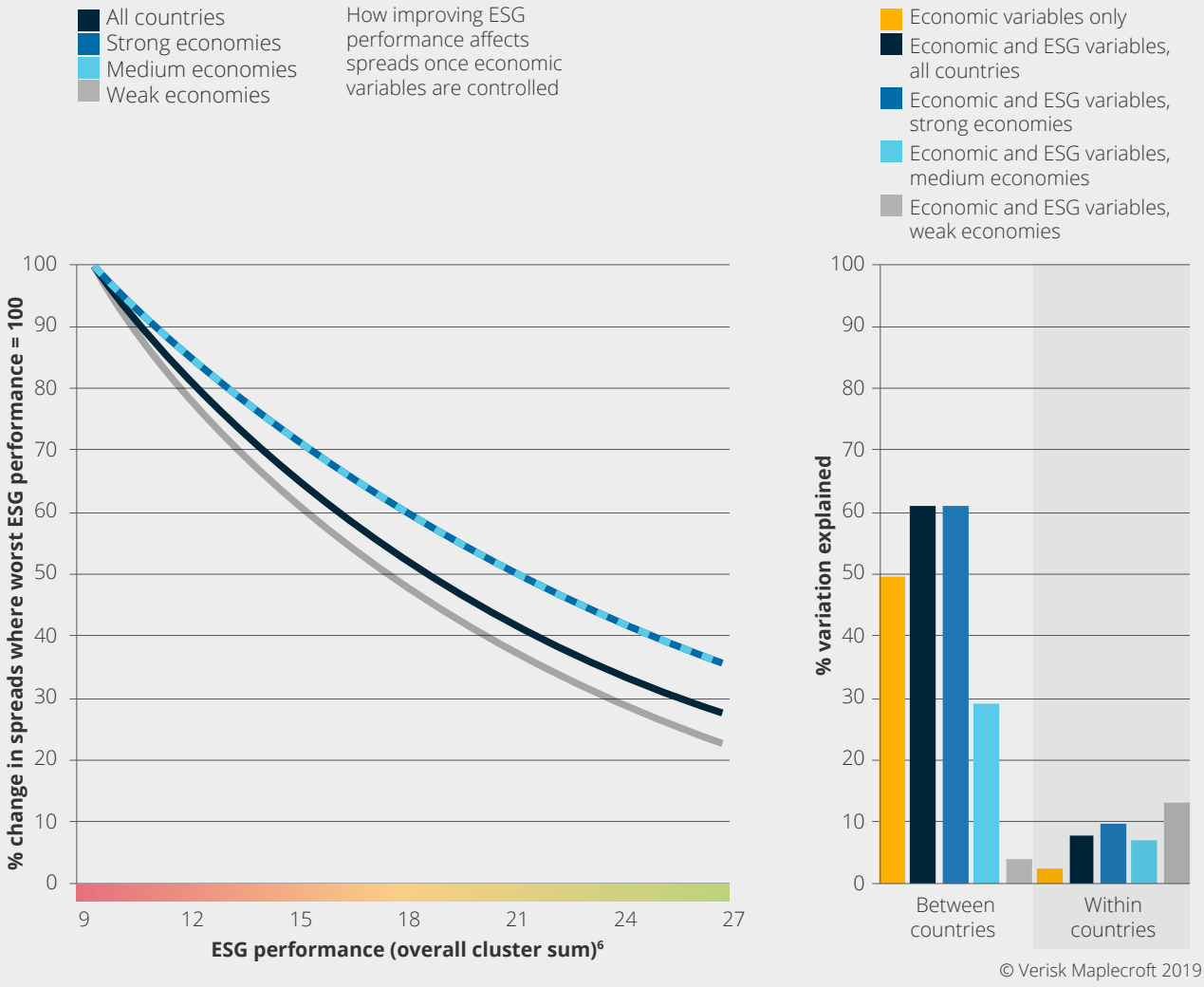
Sources: Verisk Maplecroft, 2019; Bloomberg, 2018

Our research to date takes the first step towards testing this by demonstrating that differences between types are indeed highly material. It is also possible that changes in a country's nine-dimensional type could also be investment-relevant in terms of perception - not just ESG fundamentals - insofar as investors working in low-information contexts use similarity between countries as a shortcut for pricing risk, though we do not investigate this further here.

Simple two-dimensional analysis of the relationship between ESG performance changes and spread changes strongly suggests that our typology captures investment-material momentum. For example, Figure 8, which compares countries' ESG performance in 2013 and 2018, confirms that most countries that improved on ESG also saw their spreads narrow, although the relationship with negative ESG momentum was less clear (perhaps because of overall market dynamics during the sample period).

The same tendency can be seen in Figure 9, which shows average spread behaviour over the 12 months following a change in ESG performance. The apparently more ambivalent relationship between deteriorating ESG performance and spreads is particularly interesting in highlighting inefficiencies that could in theory be exploited for generating alpha. Markets react, but with a substantial time lag, and may even initially interpret negative ESG momentum as positive.

Figure 10: Analysis of overall ESG performance shows that all else equal, better ESG performance means lower spreads



Source: Verisk Maplecroft, 2019

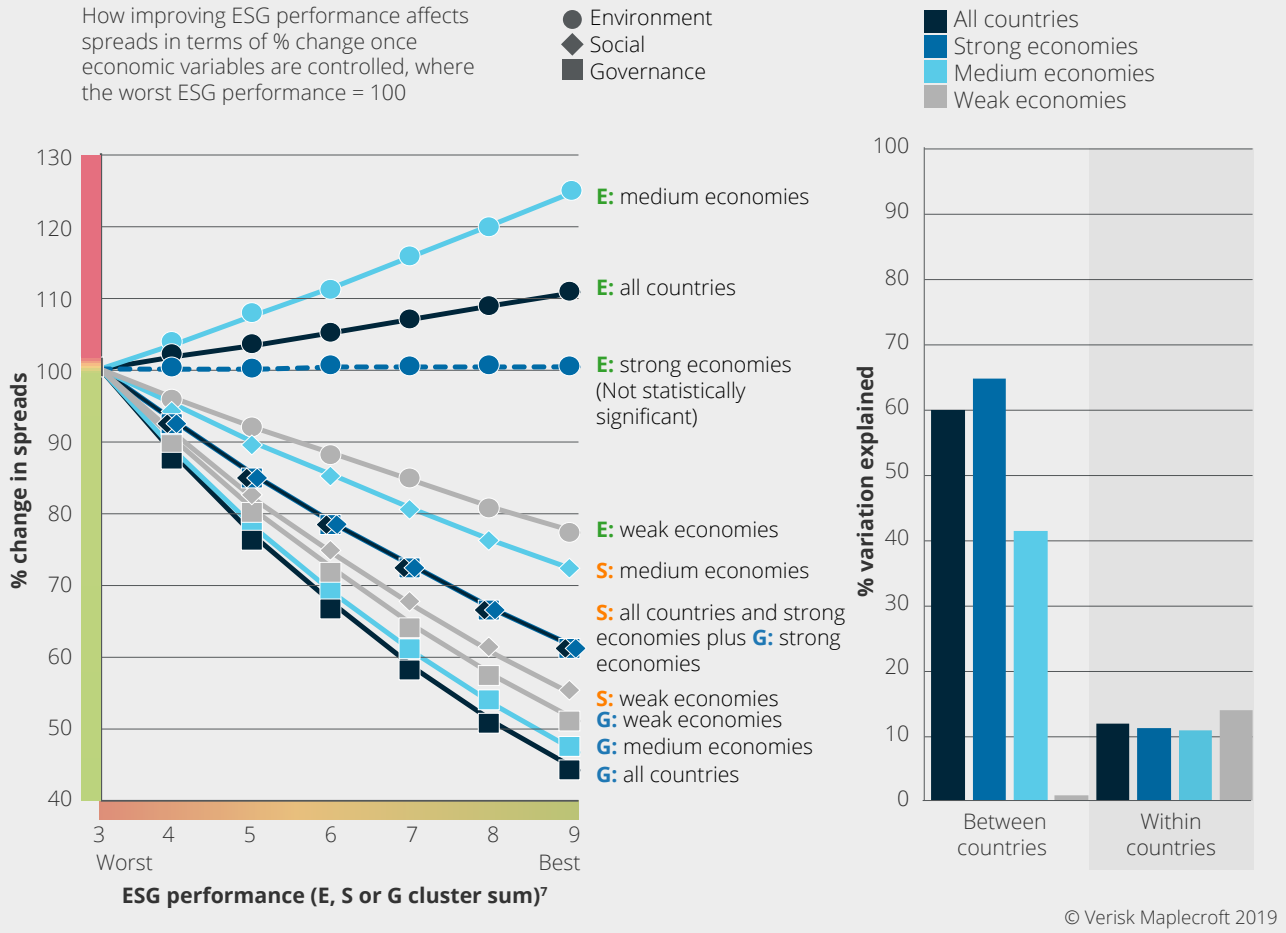
2. ESG factors matter for sovereign debt markets, with better ESG performance associated with lower risk premia

The results of our work show that ESG characteristics appear to significantly influence market pricing of sovereign debt, presumably because of their perceived impact on economic outcomes and ultimately credit risk, and thus should not be disregarded in conventional sovereign analysis. Figure 10 summarises the simplest of our regression results – a test of the independent explanatory power of the sum of the clusters in a given ESG type, which increases in line with the overall level of ESG performance and varies between 9 and 27.[6]

As the figure shows, a 1-unit increase in ESG performance relates to a 6.95% reduction in spread levels – which across the full range of ESG performance, indicates that the spreads of the best ESG performers are 70% lower than those of the worst. Relative to economic variables alone, including ESG performance in the model adds 11.5% more explanatory power to differences in spread levels between countries – a meaningful boost. However, when we segment countries by economic performance we see that this version of the model becomes progressively weaker for medium and weak economies. This likely indicates that ESG stops being as directly relevant for investors once credit risk breaches a given threshold as countries fall below a certain level of economic performance. This version of the model also does not explain variation within countries effectively, likely because within the constrained time horizon of our study, changing macroeconomic factors are overwhelmingly the dominant driver of short-term spread changes.

6 The cluster sums here use the same approach as in Figure 7: 'low' performance equals 1, 'medium' performance equals 2, 'high' performance equals 3, and the nine cluster values are added together.

Figure 11: Separate analysis of overall E, S and G performance shows major differences in impact



Source: Verisk Maplecroft, 2019

3. Governance and social factors are the most material for investors

Our analysis also provides valuable insights into the investment materiality of different ESG factors. Figure 11 shows the results of regressing spreads on overall performance in each of the E, S and G categories separately – again captured as the sum of cluster values.[7] As above, ESG performance directly explains more of the differences between countries than within countries over time. Also, as above, ESG appears to be much less relevant for weak economies: the explanatory power of the model for these is much lower.

But the roles of E, S and G vary. Both S and G factors behave as expected, with better performance being associated with lower spreads. Governance performance is particularly important, with a 1-unit improvement being associated with a 12.72% reduction in spreads.

4. Markets may not yet be pricing in environmental risks adequately

Our focus in this research is on how markets actually price ESG risks in, not how they should price them in. Even so, our results point to what looks like a key blind spot – environmental risk. Figure 11 shows at a high level that investors essentially ignore countries' environmental performance – or even actively penalise better performance.

Analysing the three environmental dimensions in our typology separately, as shown in Figure 12, which compares the difference in spreads associated with a country being a low or medium performer rather than a high performer in each dimension, provides more clarity.

7 In this case possible outcomes range between 3 and 9, because E, S and G have three dimensions each.

Disaggregating ESG factors in this way – and hence differentiating between current and future risk - is particularly important in relation to the environment because of the likely mismatch between the time horizons of most investors and the timeframe in which a given environmental risk might materialise.

That mismatch of time horizons is implied in the way that markets ignore current environmental performance, encompassing factors such as water quality and air quality (see Figure 4). However, our results also show that investors actively penalise better performance in the future environmental dimension with higher spreads.

As for what could be driving these surprising results, the future environmental performance clustering is largely driven by two predictor variables - exposure to physical climate change risk, and levels of terrestrial biodiversity. As already noted, those countries with most exposure to physical climate change risk – categorised as low performers here - also have the highest levels of biodiversity. Regression analysis we conducted on climate change exposure and biodiversity individually shows that all else equal, investors do price the debt of more climate change-exposed countries more cheaply; and that when countries have similar climate change exposure, investors prefer those with higher biodiversity.

In this context, the results in Figure 12 suggest that biodiversity weighs much more in the balance for markets than climate change exposure. Investors are unlikely to be focused on biodiversity in literal terms, but – in a world experiencing the degradation and collapse of multiple environmental systems in response to unsustainable economic pressures - as a broad proxy for a country still having significant natural resources available for exploitation.

The data in Figure 12 also show something else of potential concern: they appear to suggest that markets penalise better performance in the environmental resilience dimension, which includes environmental regulation and carbon policy, in all except the strongest economies. Investors still prefer countries that have ineffective environmental regulations, manage water and waste poorly, and are not making an effort to decarbonise – except when their economies are robust enough to absorb the cost of high performance in these areas, which is expensive and only designed to pay off in the long term, outside market time horizons.

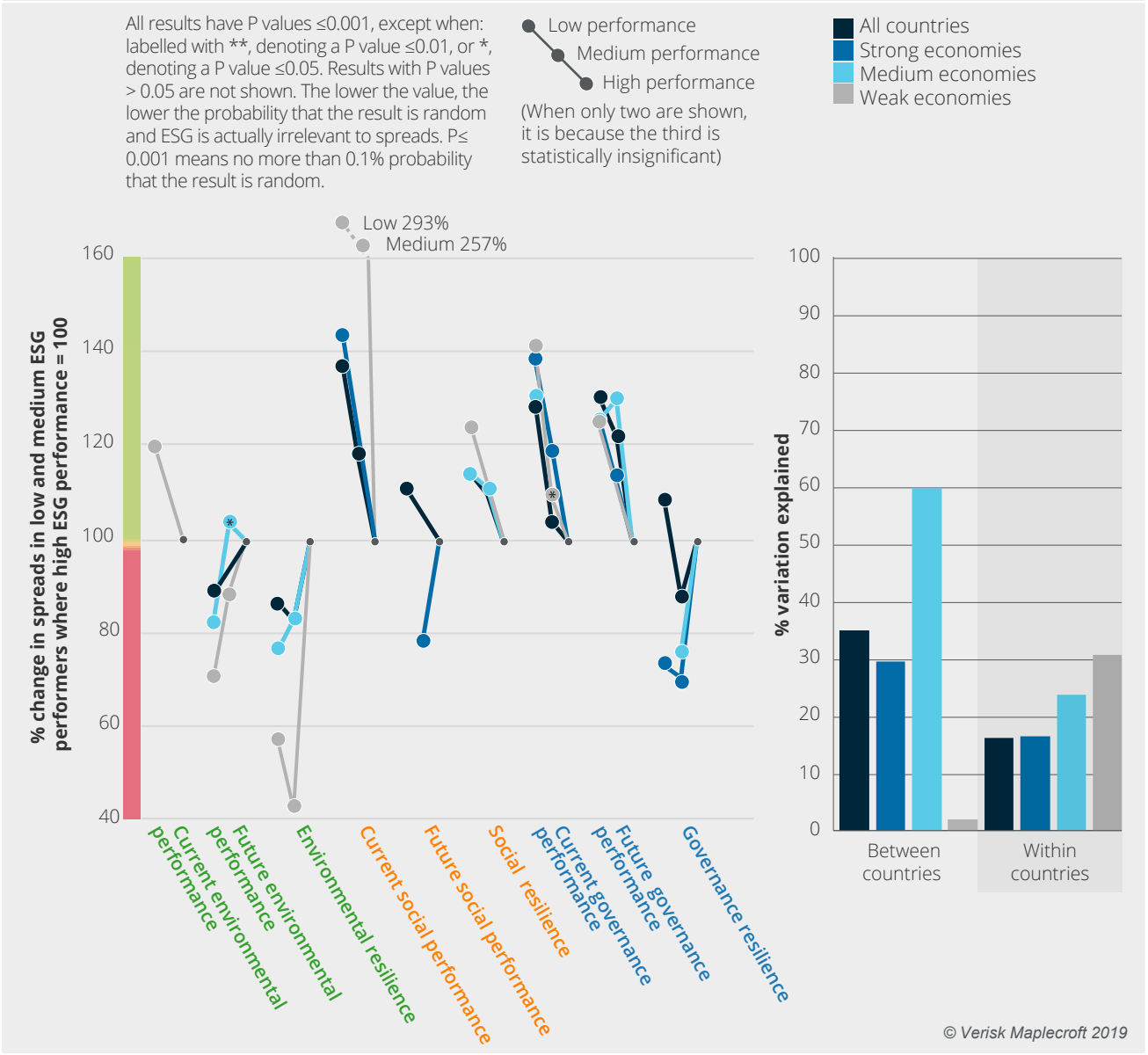
This suggests that the growing strategic focus of the world's largest institutional investors on environmental and climate risk has yet to translate into meaningful changes in market behaviour, at least in sovereign debt. Our research only represents a snapshot of a few years, and the situation may alter gradually. However, it is also plausible that investors will eventually face an abrupt repricing of some environmental risks, especially those related to climate change, when either the risks themselves or market perceptions of their materiality cross a tipping point.

5. ESG risk factors are non-linear in their credit risk impacts – governance being a case in point

Examining the nine ESG dimensions individually also shows us that good governance is not always associated with lower spreads. In particular, the way markets price performance in the governance resilience dimension - which includes the separation of powers, judicial independence, the efficacy of the regulatory system, and levels of investor protection – is non-linear. In general, markets prefer medium governance performance in this area of ESG to low performance – but they also prefer medium to high performance.

When countries have no institutions capable of checking the power of the head of state, policymaking may be arbitrary and political uncertainty high, potentially affecting credit risk. In this context, the introduction of basic institutions represents an improvement, rewarded by markets with lower spreads. At the other extreme, however, countries with more developed political institutions that are independent from and can control the executive face another risk – that of political gridlock preventing the government from being able to pass reforms to meet changing macroeconomic circumstances. Even if authoritarian countries are in the long term arguably more prone to disorderly political change, investors may judge that such change is relatively unlikely to occur within an investment-relevant time horizon.

Figure 12: Analysis of each of the nine ESG dimensions highlights key market blind spots



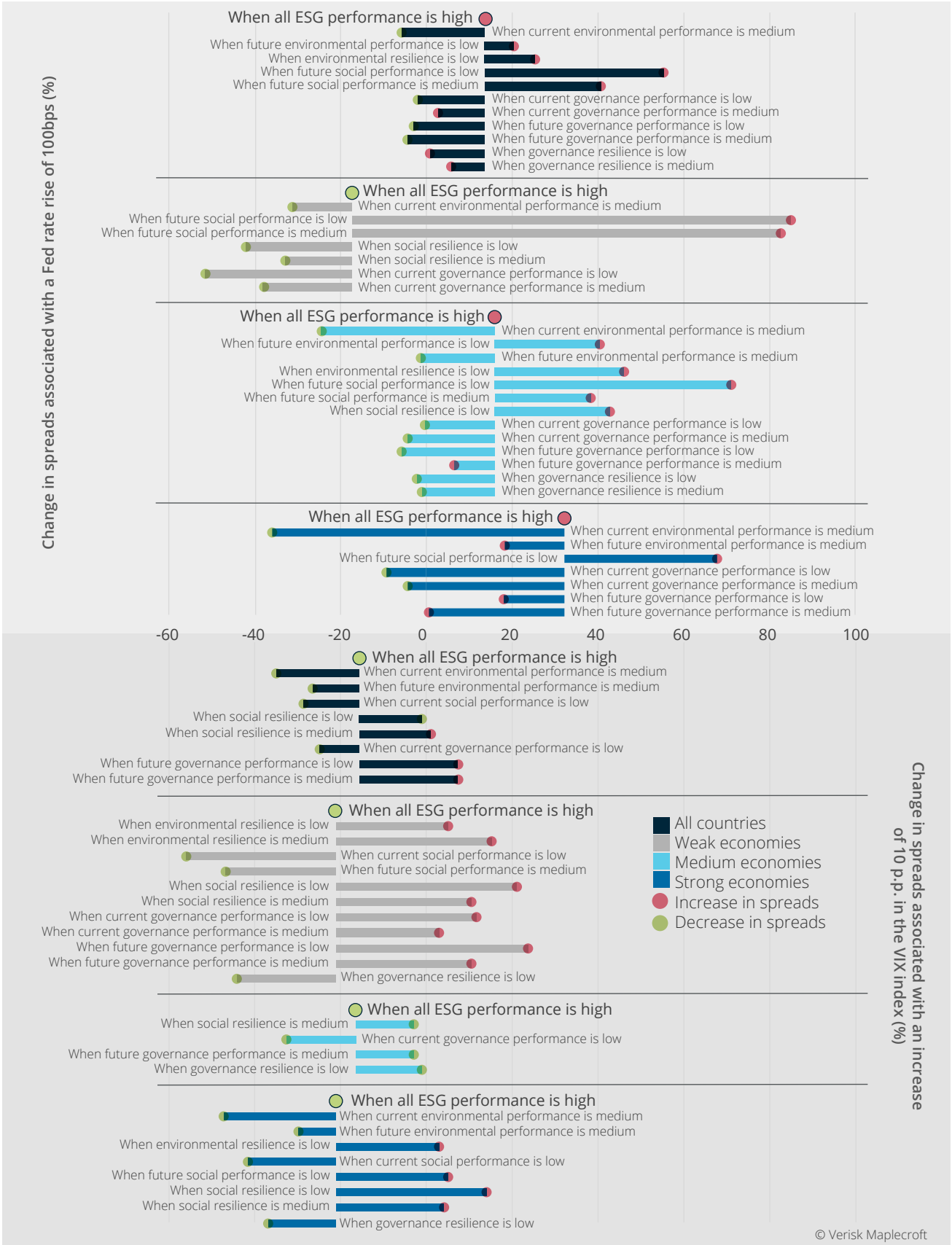
Sources: Verisk Maplecroft, 2019, Bloomberg, 2018; macroeconomic data from various sources

6. ESG performance changes how markets price global macro factors

By adding interaction terms to our model, we find that ESG also appears to be relevant indirectly: it helps to explain differences in how debt markets price other factors. We did discover some interesting relationships with some country-level macroeconomic variables: for example, inflation is in general not a significant driver of spread behaviour but becomes one in certain types of economies that are laggards in specific areas of environmental or social performance.

However, by far the largest interactions occur in relation to the two global macro factors in our model. As shown in Figure 13, which captures how differences in ESG performance affect the impact on spreads of a given global macro change, these are US monetary policy as a proxy for global credit conditions, and the Vix index as a proxy for global risk sentiment.

Figure 13: Differences in ESG may affect how markets respond to global macro factors



Sources: Verisk Maplecroft, 2019, Bloomberg, 2018; macroeconomic data from various sources

Without accounting for ESG, higher Fed rates mean higher spreads, as expected. However, countries that underperform on governance see their spreads widen less or even narrow slightly. While this requires further investigation, it likely represents the same ambivalence towards the political risks associated with democracies already noted above. Far from being more reliable borrowers, when push comes to shove – when debt servicing becomes more expensive – democracies may be seen by markets as less reliable. This could be, for example, because political leaders are more beholden to demands for alternative policies that conflict with debt repayment obligations.

Counterintuitively, increases in the Vix index imply lower spreads in general, suggesting a role for the Vix – at least under recent market conditions - less as the traditional barometer of global risk sentiment than as a red flag for US equities prompting investors to look for uncorrelated assets elsewhere. However, our model highlights an important exception to this rule – countries exhibiting ESG underperformance, especially in relation to governance and in relation to weaker economies, where concerns over credit quality prevail.

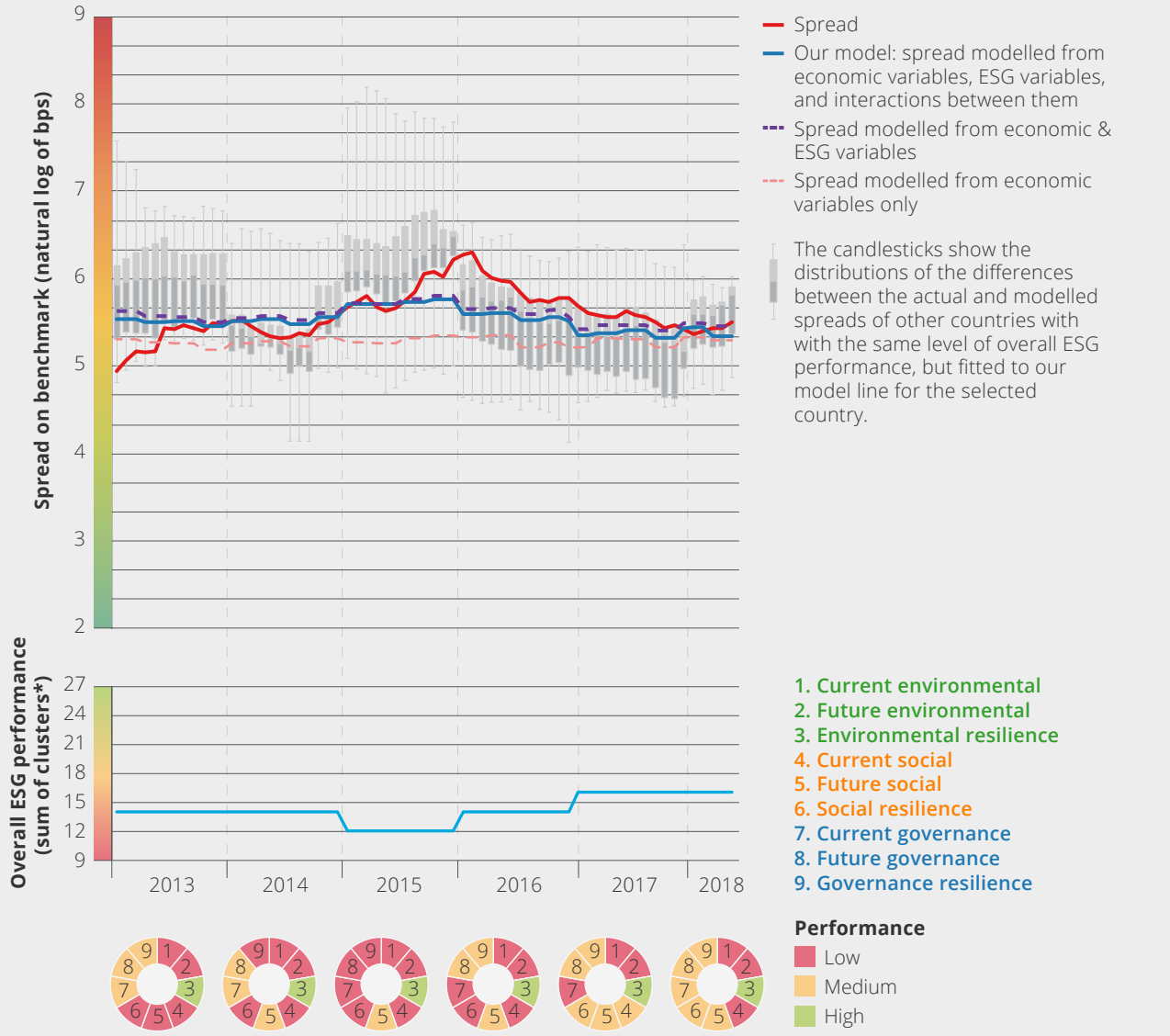
Case studies

The outcomes of our research can support decision-making in relation to individual countries by allowing investors to assess how a given country is trading relative to its economic and ESG fundamentals, not just its economic fundamentals alone. In particular, the actual spreads of a country can be assessed relative to the fitted spreads indicated by our model, which account for both ESG performance and its interaction with economic variables.

Furthermore, our outputs also allow investors to compare the difference between a country's fitted and model spreads to the difference between the fitted and model spreads of its ESG peers. This is because we believe that where our model falls short, it is likely to fall short in similar ways for countries with similar levels of ESG performance,

We share some examples of prominent members of the emerging market hard currency universe, along with brief summaries of how the data can be interpreted.

Figure 14: Brazil



*Sum of clusters calculated across all nine dimensions where low performance equals 1, medium performance equals 2, and high performance equals 3.

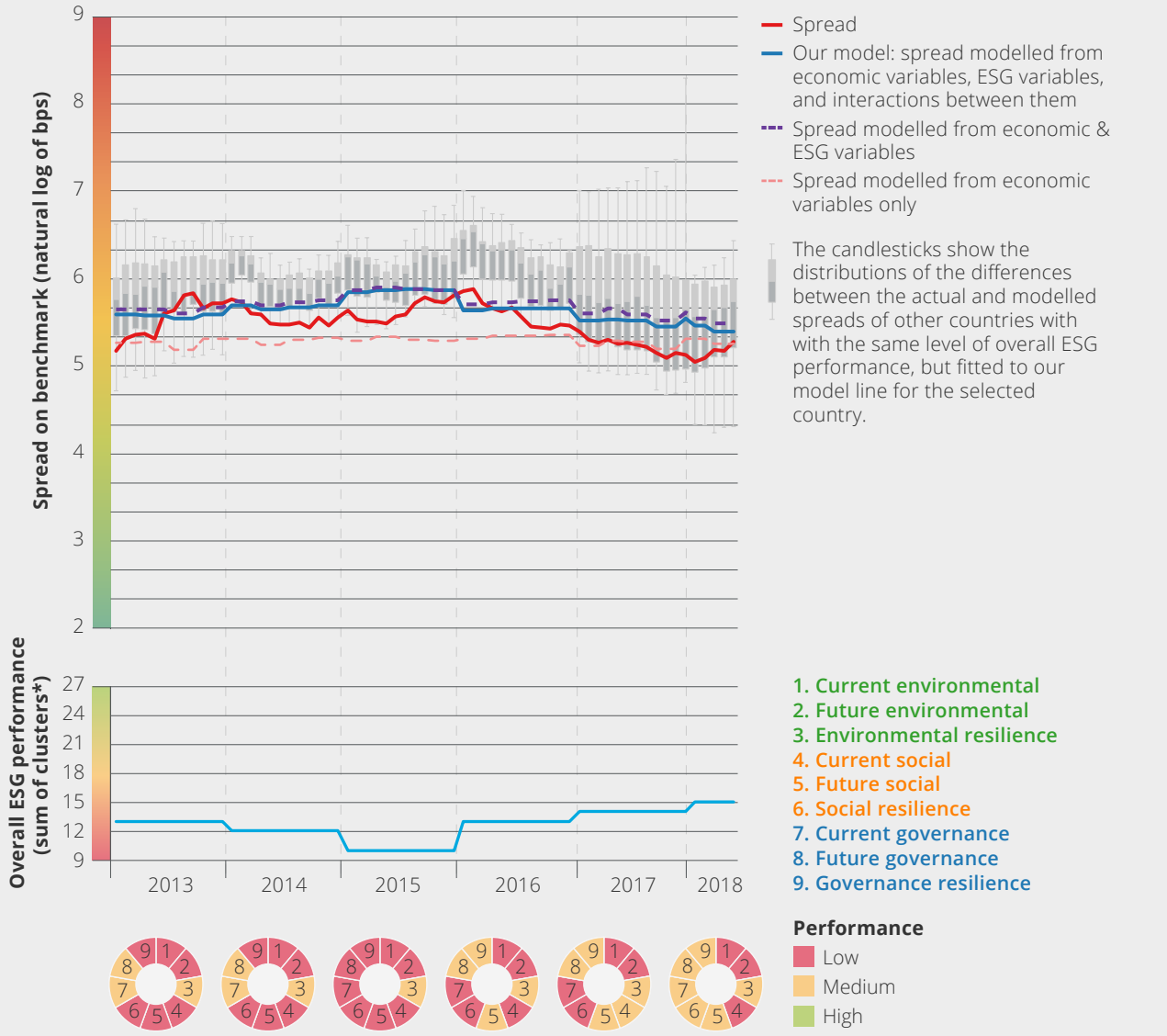
Sources: Verisk Maplecroft, 2019, Bloomberg, 2018; macroeconomic data from various sources

Brazil

Brazil has been a prominent example of the significant role that ESG dynamics can play in markets. The corruption investigations associated with the 'Lava Jato' scandal had immediate political consequences, aggravating an economic recession by paralysing policymaking and damaging business confidence, and eventually resulting in the impeachment of President Dilma Rousseff in 2016.

Our model shows Brazil trading expensively relative to its economic and ESG fundamentals and its peers in 2013, poor ESG performance driving a sizeable proportion of the country spread, and a steady deterioration in ESG performance through to 2015 presaging an increase in spreads. It also indicates that the turning point came in 2015, when lagging market concerns peaked, ESG momentum changed direction, and the debt entered cheap territory. Through to 2018 it slowly moved back towards valuations in line with its economic and ESG fundamentals.

Figure 15: Indonesia



*Sum of clusters calculated across all nine dimensions where low performance equals 1, medium performance equals 2, and high performance equals 3.

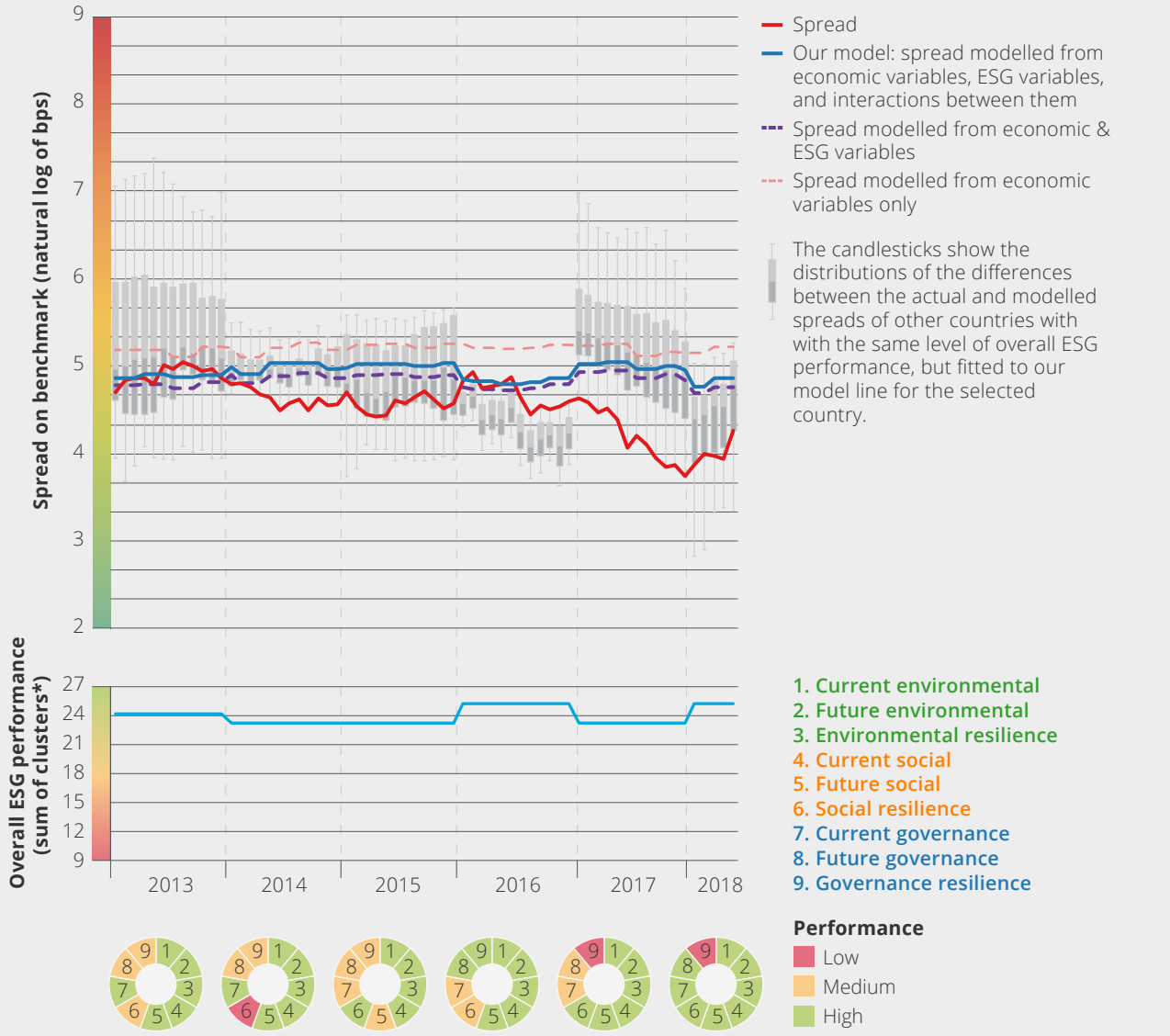
Sources: Verisk Maplecroft, 2019, Bloomberg, 2018; macroeconomic data from various sources

Indonesia

Indonesia stands out as one of south-east Asia's most attractive economic prospects in terms of demographics, growth trends and prudent fiscal and monetary policy management. However, as our model shows, the country remains a poor or average performer in all areas of ESG, and this appears to explain spreads much better than outputs based on economic fundamentals alone.

That said, our model indicates that the country turned a corner in 2016, one year after the election of current president Joko Widodo, and has been characterised by positive ESG momentum since then – but that markets may have overreacted to this by rewarding the country with excessively low risk premia.

Figure 16: Poland



*Sum of clusters calculated across all nine dimensions where low performance equals 1, medium performance equals 2, and high performance equals 3.

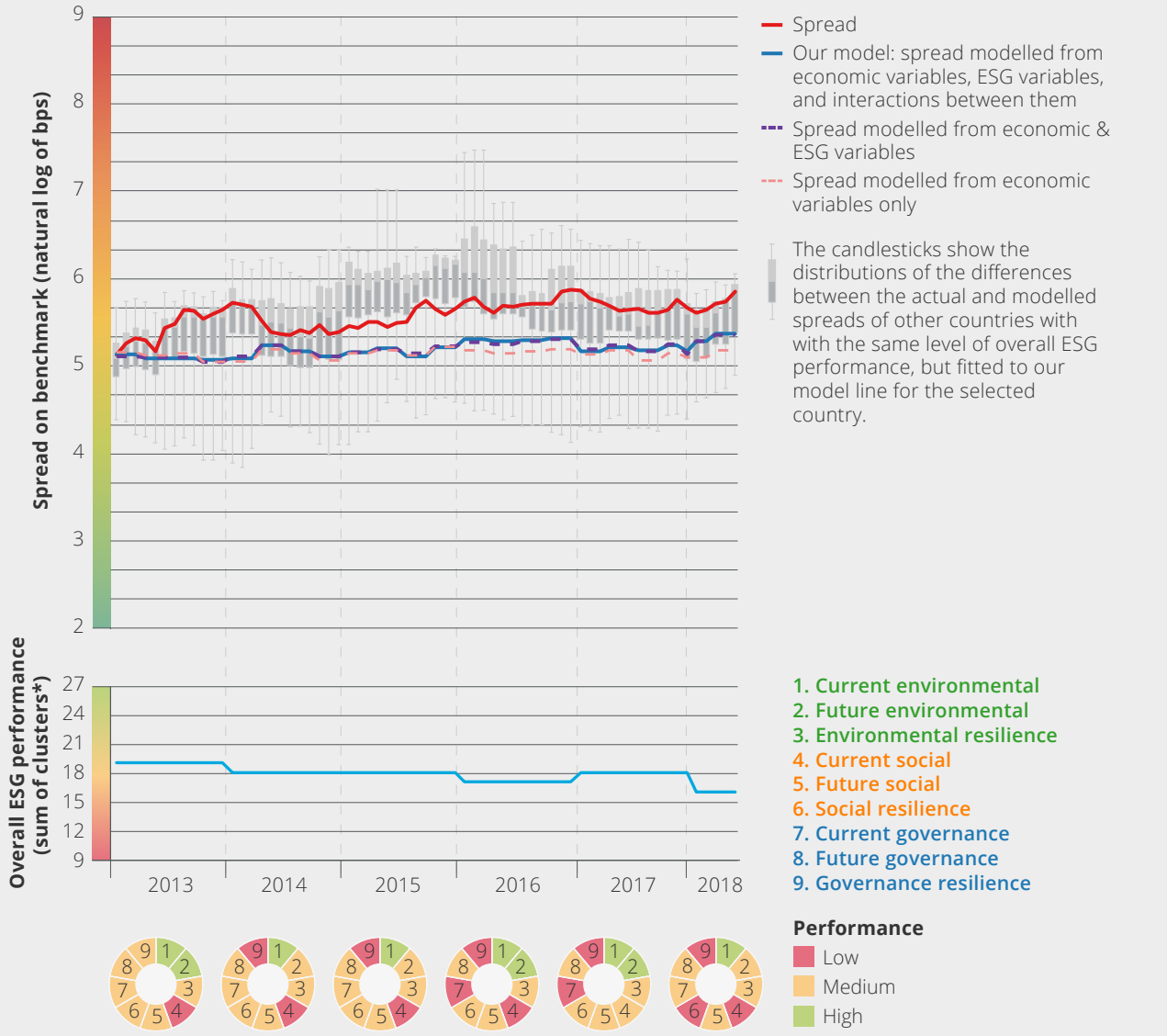
Sources: Verisk Maplecroft, 2019, Bloomberg, 2018; macroeconomic data from various sources

Poland

During the period Poland achieved increasing recognition as a high-quality emerging market, with our model showing the country trading increasingly expensively relative to its economic and ESG fundamentals. Indeed, it appears likely that positives on the ESG front – particularly in relation to environmental and social factors – as well as strong market technicals for Polish USD-denominated bonds due to lack of issuance, have encouraged investors to accept lower risk premia, seeing the country as well-placed to manage some weaknesses on the economic front, notably high levels of external debt.

While the country's ESG behaviour during the period was overall characterised by ups and downs rather than steady momentum in either direction, our model suggests significant room for future spread widening driven or triggered by ESG concerns in the governance resilience dimension, where the country's performance has weakened significantly. While our research suggests that poor performance in this area of ESG can be associated with lower rather than higher spreads, this ceases to be true when countries' economic performance falters.

Figure 17: Turkey



*Sum of clusters calculated across all nine dimensions where low performance equals 1, medium performance equals 2, and high performance equals 3.

Sources: Verisk Maplecroft, 2019, Bloomberg, 2018; macroeconomic data from various sources

Turkey

Turkey is notable for a steady erosion of both ESG and economic fundamentals between 2013 and 2018, one that saw a downgrade to high-yield territory in 2017. Following deterioration in both the social domain – specifically human and civil rights – and the effectiveness of political institutions, 2017 and 2018 saw a series of economic policy missteps.

In contrast to Brazil, however, our model suggests that these trends have largely been priced in via gradual spread widening. Indeed, the country traded cheaply towards the end of the period.

5 Implications for sovereign debt investing

We believe our research into the role of ESG factors in sovereign debt investing is important and innovative in its fresh look at how to model ESG in a way that partly accounts for its non-linear and multidimensional character, as well as in its insights into how ESG directly and indirectly helps to explain risk premia. Our findings can inform fundamental credit analysis, investment decision-making, portfolio construction and product development.

ESG integration can be a tool to enhance investment risk management, particularly given the non-linear impact of ESG on risk premia

The empirical evidence clearly supports the argument that sovereign debt analysis which includes ESG considerations alongside the standard macroeconomic variables is more robust than analysis based on those macroeconomic variables alone. Good ESG performance by sovereigns is generally rewarded by lower credit risk as measured by spreads. Our work reaffirms the importance of governance and social factors for credit risks, as well as revealing some interesting insights into contrarian market preferences in some dimensions (e.g. governance) as well as potential blind spots in the pricing of ESG risks (e.g. environment). We have also shown that ESG is an implicit consideration for markets – even if only as a litmus test for various aspects of credit quality – when it comes to pricing in Fed rate rises or Vix volatility.

Our work also reveals that differentiating between countries using ESG characteristics can help investors prioritize their time and effort for maximal benefit. We have shown that whilst ESG factors are multi-dimensional in their interactions and impacts, it is both possible and helpful to generalise and group countries into clusters sharing similar ESG characteristics for the purposes of fundamental credit analysis. Given that our findings suggest that the sensitivity of risk premia to ESG is non-linear, and that where a country is in terms of its cluster grouping and the direction of its ESG profile trend is important, analysts and portfolio managers can also use our data to prioritise what issues and developments to monitor as potentially most investment-material.

Taking account of ESG factors translates into potential alpha opportunities

ESG integration is not just about risk management. Our work also underscores how inefficient markets still are in relation to ESG. In general, when the ESG characteristics of a country change, spreads are only slow to adjust, and countries can remain persistently overpriced or undervalued for many months afterwards. Our findings also suggest persistent mispricing of environmental performance in particular, indicating a potential long-term alpha opportunity for managers. In these respects, our model allows investors to systematically assess current value, identifying those ESG factors which are likely to be most investment-material in the near term, and identify other areas of ESG which markets are currently disregarding or actively mispricing.

Active management can add value in ESG sovereign investing

Whilst applying quantitative techniques and models can provide insights, both individual countries and the global economy are complex systems, not machines with simple input-output relationships. As such, deterministic solutions are unlikely to ever fully suffice. Instead, both BlueBay and Verisk Maplecroft see an enduring role for analyst and portfolio manager judgement in the near-term grey zone between the inevitable and the unpredictable – as well as humility in recognising that judgement calls under these conditions will often be wrong, and hence a strategic focus on optionality and preparedness in investment strategies. Even if a rules-based quantitative application of our model can generate some alpha under certain market conditions, there will always be a role for active management.

Alternative ESG sovereign investment strategies can be developed using our outputs

For managers with the freedom to construct alternative ESG portfolios rather than track specific benchmarks based on traditional developed, emerging and frontier market designations overlaid with ESG screens, our approach also provides an alternative frame of reference. Beyond basic measures of wealth, some of the criteria underpinning these traditional designations are arguably downstream manifestations of various factors captured in our country ESG performance typology.

Whilst our country ESG performance typology does not control for economic variables or other key considerations, for example liquidity or technical considerations, it can easily be screened with these for the purposes of portfolio construction.

Our data can be used to inform ESG sovereign engagement efforts

The insights resulting from our work can potentially be used to inform and enhance ESG engagement efforts by helping investors to identify the ESG factors to explore in greater detail with sovereign issuers and other key stakeholders which may be most relevant and potentially investment-material across different sub-themes and temporal dimensions.

Next steps

This document summarises at a high level the research project and findings undertaken so far by BlueBay and Verisk Maplecroft.

Reflecting on the work carried out to date, a key lesson of our research is that there are no easy answers to understanding how sovereigns, the global economy and ESG factors interact. Our work focuses entirely on how ESG is priced under normal circumstances, based on just a few years of data. That does not translate into findings on how it should be priced and will be priced in the future – whether markets are sufficiently accounting for major risks such as, for example, climate change.

More generally, there is benefit from more quantitative work to be done to better capture non-linear country, macroeconomic and ESG dynamics. Our approach only takes an initial step towards accounting for this in the way we have built the typology and used it in the regression analysis. Significant further work to understand the extent of causal connections between ESG and credit risk, and as part of that the ways in which threshold effects or tipping points actually work, will help. BlueBay and Verisk Maplecroft will continue to explore ways to move forward in these areas.

6 Appendix

The following tables summarise the results obtained from the regression analysis. The ten macroeconomic variables mentioned above are included in all models though we do not report coefficients or the statistical significance of these variables here. In all cases, the dependent variable is the natural log of sovereign bond spreads.

While Tables I and II show results generated using the sums of cluster values as proxies for ESG performance, Tables III-VII summarise models which operationalise the ESG performance classifications in each dimension directly as dummy variables, with 'high' ESG performance always constituting the point of reference.

Tables I-VII summarise panel regressions with fixed effects. The choice of this method allowed us to account for unobserved differences between countries and to distinguish between differences between and within countries in terms of the explanatory power of our models. The Hausman test suggested that the use of fixed rather than random effects was most appropriate for our data.

Tables IV-VII show the results of regressions with interaction terms. In these, the beta coefficient for each of the independent variables that does not include the interaction terms is called the simple effect.

Lastly, P values are indicated below according to standard notation whereby P≤0.001 is indicated with three asterisks, P≤0.01 is indicated with two asterisks, and P≤0.05 is indicated with one asterisk. Results with P values larger than 0.05 are shown, but greyed out to indicate a lack of statistical significance.

	I: Overall ESG performance as sum of cluster values between 9 and 27*				
	Economic variables only, all countries	All countries	Weak economies	Medium economies	Strong economies
ESG performance		-0.072***	-.082***	-.057***	-.057***
Between	.497	.612	.039	.289	.609
Within R^2	.026	.079	.131	.069	.098
No. of observations	6,290	6,290	1,304	2,620	2,366
No. of groups	97	97	44	74	60

	II: E, S and G performance as sum of cluster values between 3 and 9*			
	All countries	Weak economies	Medium economies	Strong economies
Environmental performance	.017*	-.043***	.037***	.0005
Social performance	-.082***	-.102***	-.055***	-.081***
Governance performance	-.136***	-.112***	-.127***	-.082***
Between R^2	.599	.008	.414	.645
Within R^2	.118	.139	.108	.112
No. of observations	6,290	1,304	2,620	2,366
No. of groups	97	44	74	60

* In the models summarised in Table I and II, cluster sums are calculated whereby in any of the nine ESG dimensions low performance equals one, medium performance equals two and high performance equals three.

	III: The nine dimensions of ESG, with dummy variables for low and medium performance compared to high performance			
	All countries	Weak economies	Medium economies	Strong economies
Current environmental: low	.0002	.181***	-.069	-.059
Current environmental: medium	.0003	.005	-.057	-.062
Future environmental: low	-.119***	-.357***	-.198***	-.029
Future environmental: medium	-.005	-.119***	.036*	.011
Environmental resilience: low	-.146***	-.567***	-.269***	.069
Environmental resilience: medium	-.190***	-.866***	-.187***	Omitted due to collinearity
Current social: low	.319***	1.075***	.121	.362***
Current social: medium	.163***	.943***	.025	.139
Future social: low	.106**	.146	.063	-.181*
Future social: medium	.043	.019	.034	-.243***
Social resilience: low	.134***	.209***	.133***	-.017
Social resilience: medium	.095***	.044	.107***	-.041
Current governance: low	.257***	.344***	.269***	.326***
Current governance: medium	.039*	.087*	.024	.179***
Future governance: low	.265***	.226***	.232***	.229***
Future governance: medium	.203***	.072	.264***	.117***
Governance resilience: low	.079**	.047	.009	-.314***
Governance resilience: medium	-.132***	.001	-.277***	-.352***
Between R^2	.352	.019	.602	.295
Within R^2	.163	.309	.239	.164
No. of observations	6,290	1,304	2,620	2,366
No. of groups	97	44	74	60

	IV: Dummy variables for low and medium ESG performance compared to high ESG performance, interacted with selected economic variables (all countries)							
	Consumer price inflation (% change)	Dollar exchange rate (% change)	Current account balance (% of GDP)	Foreign reserves (% of GDP)	Fiscal balance (% of GDP)	External debt (% of GDP)	Vix Volatility Index (%)	US Federal Reserve rate (%)
Simple effect	-.018*	-.003***	.011*	-.005*	-.004	-.000	-.017***	.128***
Current environmental: low	.013***	.004***	.014**	-.002	-.004	-.000	-.001	-.036
Current environmental: medium	.011*	.001	.033***	-.004***	.000	-.000	-.027***	-.186***
Future environmental: low	-.006**	-.004***	-.001	-.003**	-.007	-.000	-.005	.059*
Future environmental: medium	.009***	-.0009	-.013***	-.001*	-.000	-.000	-.014***	.017
Environmental resilience: low	.037***	-.001	.025*	.007*	.010	-.000	.010	.099*
Environmental resilience: medium	.029***	-.002	.046***	.007*	.013*	-.000	-.003	-.041
Current social: low	-.017	-.005*	-.029*	-.005	-.003	.000	-.017*	.042
Current social: medium	-.024*	-.005*	-.049***	-.005	-.006	-.000*	-.010	-.041
Future social: low	.018**	.004*	-.011	.005*	.001	.000	.017*	.313***
Future social: medium	.028***	.004**	-.007	.003	-.010*	-.000	-.003	.213***
Social resilience: low	-.023***	-.001	.003	-.003**	.002	.000	.016**	.062
Social resilience: medium	-.015***	.000	.014***	-.004***	.004	-.000	.018***	-.046
Current governance: low	.015***	.002*	-.025***	.005***	.002	-.000*	-.012*	-.148**
Current governance: medium	.012***	.002	-.026***	.005***	.006*	.000*	.001	-.101**
Future governance: low	-.029***	.003**	.004	-.005***	-.008*	-.000	.024***	-.158***
Future governance: medium	-.024***	.001	.018***	-.004***	.008***	.000	.024***	-.172***
Governance resilience: low	.002	.0007	-.001	.005**	.004	-.000	-.007	-.120***
Governance resilience: medium	-.001	-.001	-.000	.007***	-.006	.000	-.008	-.072*
Between R^2	.228	.336	.127	.285	.417	.201	.357	.426
Within R^2	.212	.177	.186	.184	.176	.175	.180	.189
No. of observations	6,290	6,290	6,290	6,290	6,290	6,290	6,290	6,290
No. of groups	97	97	97	97	97	97	97	97

	V: Dummy variables for low and medium ESG performance compared to high ESG performance, interacted with selected economic variables (weak economies)							
	Consumer price inflation (% change)	Dollar exchange rate (% change)	Current account balance (% of GDP)	Foreign reserves (% of GDP)	Fiscal balance (% of GDP)	External debt (% of GDP)	Vix Volatility Index (%)	US Federal Reserve rate (%)
Simple effect	-.056**	-.001	.016	-.021	.036*	.001	-.024*	-.190*
Current environmental: low	.001	-.003*	-.052***	-.010**	.007	-.000	-.009	.030
Current environmental: medium	.000	-.003	.018	-.000	-.040***	.000	.007	-.184*
Future environmental: low	.005	.005***	.049**	-.002	.006	-.000	-.002	.165
Future environmental: medium	.001	.004**	.034***	.006*	-.005	.000	-.011	.053
Environmental resilience: low	.011	.007*	.169***	.041	-.012	.000	.029*	.016
Environmental resilience: medium	.005	.003	.156***	.045	-.019	-.000	.038**	-.050
Current social: low	-.203***	.018***	-.142***	-.089	-.027	-.001	-.061***	.090
Current social: medium	-.207***	.010*	-.168***	-.087	-.033	-.002***	-.029	-.135
Future social: low	.192***	-.015**	.036	.058	.054**	.003***	-.015	.805***
Future social: medium	.186***	-.016**	.002	.058	.061***	.002***	-.041***	.792***
Social resilience: low	-.004	-.001	-.043**	-.014**	-.010	-.000	.043***	-.356***
Social resilience: medium	.000	.005**	-.013	-.009**	-.002	-.000	.034***	-.209***
Current governance: low	.034***	-.005*	-.056***	.010**	-.006	-.002***	.035**	-.534***
Current governance: medium	.030***	-.008**	-.057***	.008**	.000	-.001**	.027**	-.287*
Future governance: low	-.007	-.005*	.041**	.006	-.018	.000	.045***	-.042
Future governance: medium	-.001	-.001	-.001	.008**	-.031***	-.001**	.034***	.005
Governance resilience: low	.032	.002	.015	-.002	-.015	-.001	-.036***	.033
Governance resilience: medium	.013	.004	.049**	.004	-.018	-.000	-.017	.026
Between R^2	.128	.034	.075	.022	.005	.033	.043	.063
Within R^2	.382	.340	.356	.373	.343	.359	.358	.378
No. of observations	1,304	1,304	1,304	1,304	1,304	1,304	1,304	1,304
No. of groups	44	44	44	44	44	44	44	44

	VI: Dummy variables for low and medium ESG performance compared to high ESG performance, interacted with selected economic variables (medium economies)							
	Consumer price inflation (% change)	Dollar exchange rate (% change)	Current account balance (% of GDP)	Foreign reserves (% of GDP)	Fiscal balance (% of GDP)	External debt (% of GDP)	Vix Volatility Index (%)	US Federal Reserve rate (%)
Simple effect	-.024	-.005***	.033***	-.006	.001	.000	-.018***	.148***
Current environmental: low	-.007	.003*	-.008	-.005	-.006	.000	.018**	-.049
Current environmental: medium	-.023	.014***	.024***	-.001	-.006	-.000	.013	-.429***
Future environmental: low	.003	-.001	.007	-.018***	-.006	-.000	.008	.192***
Future environmental: medium	.008**	-.001	-.005	-.004*	-.003	-.000**	.002	-.161***
Environmental resilience: low	-.016	-.006*	.056**	-.014*	.004	.000	.013	.232**
Environmental resilience: medium	.001	.000	.051**	-.006	.017	.000	.005	.023
Current social: low	.003	-.007*	-.015	-.001	.029*	.001	-.013	-.182
Current social: medium	-.001	-.007*	-.043**	.010	.021*	-.000	-.019	-.203
Future social: low	.038***	.003	-.013	.006	.011	.000	-.014	.389***
Future social: medium	.043***	.002	-.028	-.001	-.004	-.000	-.012	.177*
Social resilience: low	-.029***	.000	-.025**	.004	-.015*	-.001***	.006	.208**
Social resilience: medium	-.001	.005***	-.009	-.002	-.018***	-.000	.015*	-.034
Current governance: low	.036***	.004	-.035***	.005	-.003	-.000	-.022*	-.152*
Current governance: medium	.027***	.002	-.041***	.010***	-.012**	.000	-.000	-.192***
Future governance: low	-.038***	.003	.013	.000	-.009	.001	.015	-.207***
Future governance: medium	-.043***	.002	.032***	-.004*	.009*	.001***	.015**	-.084*
Governance resilience: low	.014	.001	-.014	.019***	-.009	-.000	.017*	-.171**
Governance resilience: medium	.021*	-.001	-.011	.012***	-.023***	-.000	.003	-.159**
Between R^2	.578	.592	.578	.613	.600	.606	.608	.598
Within R^2	.292	.261	.283	.294	.261	.261	.255	.279
No. of observations	2,620	2,620	2,620	2,620	2,620	2,620	2,620	2,620
No. of groups	74	74	74	74	74	74	74	74

	VII: Dummy variables for low and medium ESG performance compared to high ESG performance, interacted with selected economic variables (strong economies)							
	Consumer price inflation (% change)	Dollar exchange rate (% change)	Current account balance (% of GDP)	Foreign reserves (% of GDP)	Fiscal balance (% of GDP)	External debt (% of GDP)	Vix Volatility Index (%)	US Federal Reserve rate (%)
Simple effect	.055***	-.005***	-.008	-.003	-.030***	-.000***	-.024***	.279***
Current environmental: low	.017	.004	.037***	.004	.011	-.000	-.001	.013
Current environmental: medium	.135***	-.002	.160***	-.007***	.046***	.001***	-.042**	-.723**
Future environmental: low	-.010	-.000	-.016	-.006**	-.042***	.000	-.007	-.022
Future environmental: medium	-.009	-.001	-.019**	-.001	.013*	.000	-.012*	-.110**
Environmental resilience: low	.046*	-.006	-.060*	-.018	.011	.000	.027**	.017
Environmental resilience: medium	.071***	-.004	-.025	-.017	.024	.001	.005	-.060
Current social: low	.032	-.016***	.073**	.036**	.074**	.000	-.031*	.217
Current social: medium	.013	-.015***	.050*	.023*	.058**	-.000	-.019	.099
Future social: low	-.091***	.002	-.057*	-.003	-.031*	-.000	.029**	.239*
Future social: medium	-.031	.007*	-.075***	-.011	-.065***	.000	.012	.129
Social resilience: low	-.027	-.002	.033	-.008***	-.003	-.000	.037***	.068
Social resilience: medium	-.021	-.002	.041*	-.000	-.008	-.000	.028**	-.062
Current governance: low	-.054*	.009**	-.016	-.004	-.098***	.000	.005	-.376***
Current governance: medium	-.042	.009***	-.023	-.007	-.111***	-.000	.005	-.323***
Future governance: low	-.038**	.011***	.030**	-.004	-.016*	-.000	.003	-.113*
Future governance: medium	-.017	.011***	.010	.000	.011	.000	.008	-.272***
Governance resilience: low	-.000	-.000	.019	.012*	.119***	-.000	-.023*	.060
Governance resilience: medium	-.041*	-.004	.040**	.007	.060**	-.000	-.008	.080
Between R^2	.406	.231	.353	.100	.248	.318	.389	.323
Within R^2	.205	.195	.219	.207	.236	.184	.186	.213
No. of observations	2,366	2,366	2,366	2,366	2,366	2,366	2,366	2,366
No. of groups	60	60	60	60	60	60	60	60

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