

Active is: Investing responsibly

ESG in Sovereign Bonds

This whitepaper is aimed for external use and geared to demonstrate Allianz Global Investors' ESG Thought Leadership.

This paper aims at analyzing the empirical evidence on the materiality of ESG factors with regard to financial performance and risk of sovereign bonds in developed and emerging markets.

In line with our whitepapers on ESG across different asset classes, e.g. '[ESG in Equities](#)', and '[ESG in Investment Grade Corporate Bonds](#)', we review and analyze high-quality academic and industrial research. We thereby capture diverse approaches and provide clear insights into the field and

Please note: the conclusions from the research studies analyzed and summarized in this report do not necessarily reflect Allianz Global Investors' investment opinion. The research does not imply investment advice or investment performance related forecasts.

We suggest readers interested in a concise overview on our findings to take a look at the executive summary. We recommend the latter sections (including the appendices) to readers who want to gain a deeper insight into ESG in sovereign bonds. By clicking on the headline you are interested in, you will be redirected to the corresponding section.

Key contact

Dr. Steffen Hörter

Global Head of ESG

Allianz Global Investors GmbH
Bockenheimer Landstrasse 42
D-60323 Frankfurt am Main

Phone: +49 - (0) 69 - 24431 – 7704

Mobile: +49-(0) 160 - 586 - 3302

Email: steffen.hoerter@allianzgi.com

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ESG in Sovereign Bonds

Sovereign bonds account for a large share of global financial assets. With an estimated volume of approximately USD 50 trillion, many asset owners consider them as an integral part of the fixed income (FI) portfolio. Investors typically consider allocations into the sovereign bond market of developed countries as safety assets with no credit risk to preserve capital in extreme market situations. Investments into the sovereign bond market of emerging countries often aim at earning attractive returns at comparatively smaller levels of credit risk and volatility.

To achieve these investment objectives all risks that drive the financial performance of sovereign bonds need to be well understood. Several research studies including Allianz Global Investors' proprietary analysis provide empirical evidence that ESG factors may have a considerable impact on the financial performance of sovereign bonds. ESG factors are relevant for both the credit risk of emerging and developed sovereign bond issuers. Thus, it is important to understand how ESG can be integrated into sovereign bond portfolios to optimize risk and return opportunities.

Executive summary

Objective

As an asset class, sovereign bonds are globally dominant in asset allocation. This study examines selected academic and industry research and includes considerable proprietary research on the relevance of ESG factors for the financial performance of sovereign bond portfolios.

From an investment and ESG risk perspective, we distinguish between developed and emerging market sovereigns. Many investors consider bonds issued by developed countries as safety assets with no or little credit risk. On the one hand, zero or negative interest rates seem to have little impact on the attractiveness of sovereigns for investors who seek capital preservation.

On the other hand, due to financial repression and ultra-low interest rates, asset owners have increasingly shown greater interest in riskier bonds including emerging market sovereign bonds. The investment objective is often focused on earning a credit risk premium at reasonable levels of risk.

In the context of these typical investment objectives it is important to understand all material sovereign issuer ESG risks. From a sovereign bond portfolio ESG integration perspective, it needs to be analyzed how ESG risk factors can contribute to better issuer credit risk analysis and portfolio based country credit risk budgeting and country allocation.

In the following sovereign bonds may be abbreviated as 'sovereigns'.

Results

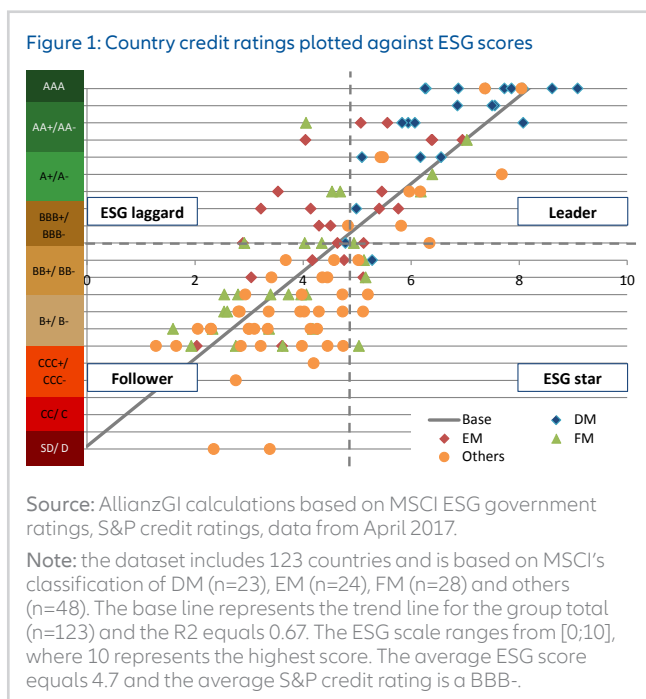
The empirical findings suggest that specific ESG factors are important determinants of the financial performance of sovereign bonds.

Finding 1.

Country credit ratings do not fully incorporate sovereign issuers' ESG risk factors.

Interestingly, our proprietary empirical analysis shows country credit ratings appear not to fully account for ESG risks. The ESG scores of countries are highly scattered along each credit rating band. In particular, low credit rated sovereigns with the same credit rating show a high dispersion of ESG scores. Thus, ESG country scores could help to provide a more holistic sovereign issuer risk view and identify countries which exhibit large ESG (tail) risks relative to their credit ratings.

Continue reading on page 10.



Finding 2.

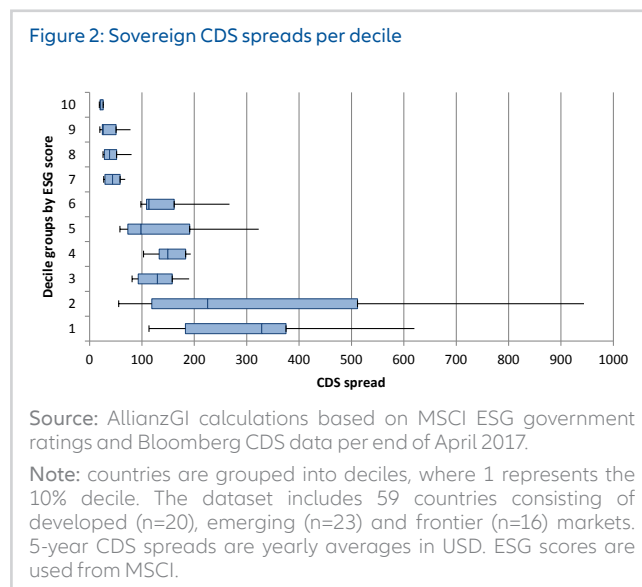
ESG risk is priced into sovereign credit risk: better ESG scores are reflected in lower sovereign CDS spreads.

Our research findings suggest that ESG risk factors have become more significant in explaining sovereign bond spreads, especially after the financial crisis in 2007.

Our empirical findings further show that there exists an inverse relationship between countries' ESG scores and their credit default swap (CDS)/ bond spreads. This relationship seems to be of non-linear nature. In particular, markets seems to penalize countries in the lowest ESG scoring quartile. In our analysis, the median and the dispersion of CDS spreads increases in the lower ESG scoring deciles.

We also find that developed and emerging country issuers with better ESG scores benefit from lower borrowing cost. This implies that capital markets are already pricing ESG performance to some degree. ESG performance therefore matters for emerging and developed countries and may be used for credit risk pricing models.

Continue reading on page 13.



Finding 3.

Bad sovereign governance is a key risk followed by social risks; ESG risk is long-term in nature.

The empirical evidence implies that the financial materiality of ESG factors for sovereigns varies. The individual ESG factors seem to have different degrees of materiality. In general, governance risk factors appear to be the most material ESG risk domain followed by the social risk domain.

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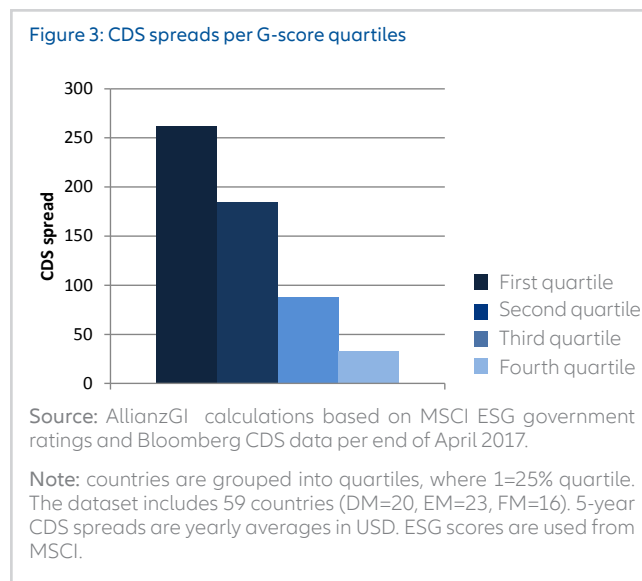
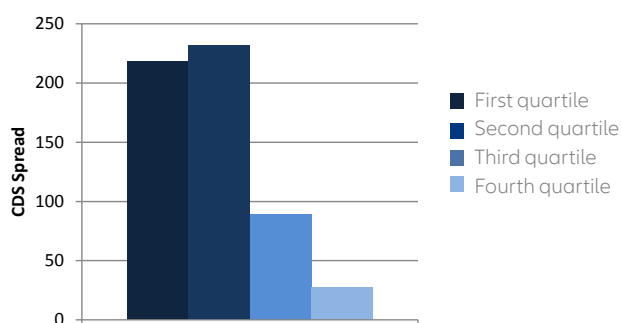


Figure 4: CDS spreads per S-score quartiles



Source: AllianzGI calculations based on MSCI ESG government ratings and Bloomberg CDS data per end of April 2017.

Note: countries are grouped into quartiles, where 1=25% quartile. The dataset includes 59 countries (DM=20, EM=23, FM=16). 5-year CDS spreads are yearly averages in USD. ESG scores are used from MSCI.

Empirical research findings also suggest that ESG risk factors become increasingly material over time and can therefore be regarded as long-term in nature. In portfolio practice, this means that sovereign ESG risk factors may remain silent for a significant time during a holding period. They may then suddenly be triggered through a toxic mix which can lead to a fundamental change of the credit risk strength of a sovereign issuer. Hence, ESG tail risks should be anticipated as good as possible through evaluating early warning signals.

Our proprietary case study on Greece and Turkey reflects on how ESG risk factors may serve as an early warning system to investors to mitigate ESG (tail) risk exposure.

Finding 4.

Materiality of ESG risk varies across countries and economic environments

The empirical results are less conclusive of whether or not ESG factors are more material for developed than for emerging markets sovereign bond portfolios.

It seems that emerging countries are more vulnerable and ESG risks more likely to materialize because governments have less resources available to manage them. In principle, it is most important for investors to first understand the impact chain of individual ESG risk factors to manage them properly. For example, the impact of climate change on an emerging country may become material due to a lack of financial resources that inhibit investments in infrastructure to overcome water shortage. Water shortage may trigger social unrest, leading to an economic downturn and a substantial increase in a country's probability of default.

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Finding 5.

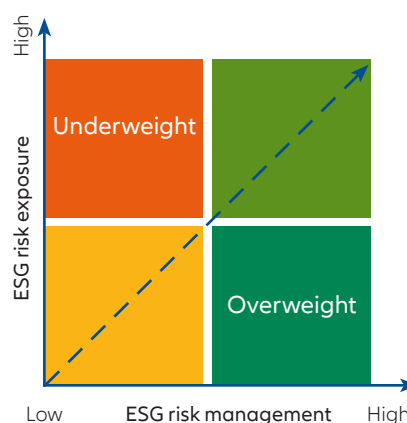
ESG integration into portfolio strategies may enhance performance

Our research findings show that investors can use ESG investment signals in various ways. Any sovereign bond portfolio strategy may generally benefit from optimized country asset allocation and bond selection. As a first step, countries may be analyzed with regard to their ESG (tail) risk exposure and their readiness to manage these ESG risks. Country allocation in sovereign bond portfolios may be optimized through this ESG integration whereby sovereign issuers with better ESG risk management are selected with preference. This may mitigate a portfolio's overall credit (tail) risk exposure.

In particular, the exclusion of sovereigns with extremely low ESG rating may be considered too. There is empirical evidence that excluding the worst ESG performing countries does not alter the main characteristics of a portfolio. Finally, several studies show that portfolio performance measured by their risk-adjusted return may be improved through an overweighting of sovereigns with high ESG ratings and low ESG risk.

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Figure 5. ESG risk exposure and management



Source: AllianzGI illustration.

One step deeper

1. How do ESG factors influence sovereigns' creditworthiness?
2. How are sovereigns' ESG performance and credit risks related?
3. What are the most material ESG factors for sovereigns?
4. How can ESG integration into sovereign bond portfolios help to manage tail risks?
5. Best practice: what are feasible ESG portfolio strategies?

1. How do ESG factors influence sovereigns' creditworthiness?

Developed market sovereign bonds are traditionally considered important for institutional and large private investors as a safety asset. Sovereign bonds make up a large share in many investment portfolios. Investors often aim for capital preservation and capital stability when investing in sovereign bonds. Within a country, sovereign bonds usually are considered one of the safest asset in the entire economy.

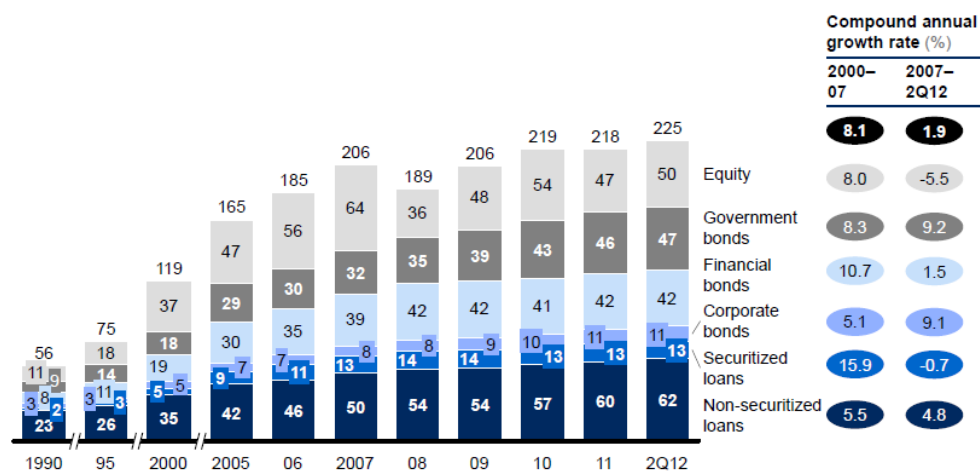
For more than two decades, the market for sovereign bonds has roughly accounted for one-fifth of the global stock of financial assets. McKinsey Global Institute (2013) estimates that the size of the total sovereign bond market is equal to US\$ 47 trillion in 2012 (see figure 1)¹. From 2000 until 2012, the sovereign bond market grew at an average rate of approximately 13.4% per year.

Except for times of general capital market distress, e.g. the periods following the default of Lehman Brothers in 2008 or the EMU crisis in 2012, sovereign bonds and the fixed income universe as a whole have historically shown a low or negative correlation with the stock market.

As a result, sovereign bonds provide investors who are looking for multi-asset portfolio strategies with an additional incentive to invest and to achieve a balanced, risk diversified portfolio mix.

Compared to, for example, equity as an asset class, sovereign bonds have fundamentally different characteristics. This is also important to better understand the role of ESG factors. Firstly, unlike with corporate investors, sovereign bond investors usually have comparatively much less opportunities to engage with sovereign bond issuers. Like with all fixed income instruments, proxy voting as an instrument to influence the issuer is not at investors' disposal. Taking an active stewardship role through engagement seems also less plausible. Further, unlike with corporate bonds there are no covenants for sovereign bonds. The creditworthiness is driven by the strength of the government and the economy. Moreover, sovereign bonds usually have an asymmetric downside risk profile. As a result, the analysis of sovereign issuer downside risk factors often stand higher on the agenda than alpha generation. Hence, ESG integration into long-term sovereign credit risk analysis becomes key for credit risk management.

Figure 6: Total stock of global financial assets¹



Source: McKinsey Global Institute (2013).

Note: numbers in USD trillions.

Large diversity within the sovereign bond market

The sovereign bonds market, however, is not a homogenous one. The level of risk and the investment purpose often varies across countries. For instance, high credit quality mostly correlates with sovereign bonds of developed countries. Contrary, sovereign bonds in emerging markets are more volatile and often have greater default risks. In general, the sovereign bond market may be classified into three major groups: developed markets, emerging markets and frontier markets.

Developed markets usually represent the most industrialized and largest economies around the globe. Institutions, the rule of law and the entire economic system are usually considered to be of high quality and stable. In the last decade, economic growth rates have remained at modest levels and investment analysis has largely focused on market and electoral cycles. Examples include the USA, Japan or Germany. Sovereign bonds in developed economies are often treated as risk free assets because investors consider the sovereign's default as very unlikely. This may be a general misconception in the market. The more recent European debt crisis highlights the tendency of major economies having difficulties in coping with their debt obligations.

Emerging markets are often at the edge of industrialization and undergo fast economic transformation as the countries try to catch up with the developed world. Fast economic growth often leads to excess returns and are therefore attracting many investors. Nevertheless, these excess returns do not come as a free lunch to investors because emerging countries usually have higher risks of default. This is due to their more volatile economic system and higher vulnerability to internal and external shocks. Examples include some of today's fastest growing economies such as China and India but also more volatile economies such as Brazil and Russia (BRIC countries). The example of the Russian default in 1998 shows that the downside risk of bonds in emerging markets should be managed by any prudent investor to circumvent large losses.

Frontier markets are often smaller than emerging countries in terms of total economic output. However, they offer many attractive opportunities which may attract capital in the future. Despite lower liquidity and sometimes higher risk profiles, frontier markets provide investors with lucrative returns and new sources of diversification as they are generally less correlated with major investment destinations. Such markets may include Argentina, Nigeria or Vietnam. In these markets, investors may also be well advised to consider a broader set of factors next to financial indicators.

But how can investors distinguish between attractive investment within each country group? Do ESG factors help to enrich the traditional view of investors? What ESG factors are financially material in sovereign bonds of developed and emerging countries?

The traditional approach to country analysis

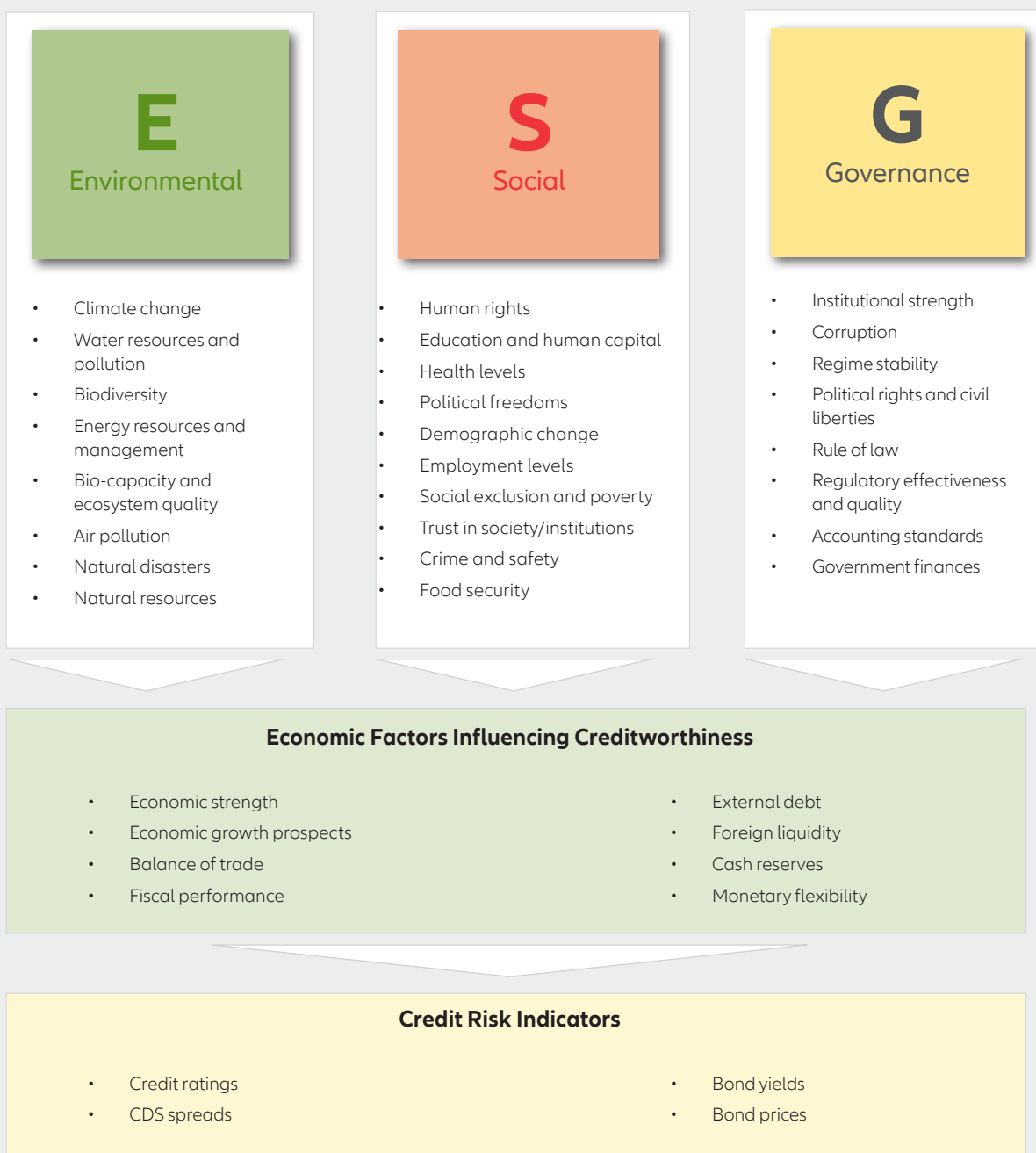
Similar to corporate bonds, the performance of sovereign bonds is influenced by numerous factors. In the analysis of the credit quality of sovereign bonds, important factors have traditionally been the country's government debt-to-GDP ratio and cash reserves among others. In addition to financial indicators, exchange rate risk as well as macroeconomic factors such as macroeconomic growth prospects are being taken into consideration by investors when evaluating the creditworthiness of a sovereign (see figure 7).

Financial and macroeconomic factors are usually accessible and quantifiable. Hence, investors and credit rating agencies prefer these indicators to calculate the sovereign's credit risk and to price its securities. Similarly, many economic growth models, e.g. the Solow model, also try to explain the total output of an economy by analyzing the total capital and labor stock as well as the investment rates of country. Academics have recognized that these factors fail to explain the fundamental determinants of growth into account.

Figure 7 visualizes that these economic and financial factors which are popular in traditional analyses only represent the second layer. For example, they fail to explain the investment rate or the total factor productivity in a country. They often represent the creditworthiness of a sovereign well during the short term but do not account for ESG tail risks and long-term drivers of economic development. For example, it needs to be analyzed how low levels of democracy and high degrees of corruption determine the country's risk profile. Another example includes the resulting risks from countries with high climate change risk exposure but low readiness. Both examples make clear that a toxic mix of low ESG scores and high exposure can substantially increase a country's credit risk.

In this context public data such as the ND-Gain Country Index can be used to enhance traditional sovereign credit risk analysis. It scores countries on their vulnerability to climate change risk but also takes account the level of preparedness and willingness to invest into risk mitigation. All in all it is a good instrument to assess a sovereign's climate transition risk.

Figure 7. ESG framework for sovereign credit risk



Source: UNEP The Principles for Responsible Investment (PRI) Initiative (2013), "Sovereign Bonds: Spotlight on ESG Risks".

ESG factors supplement traditional analysis

While mainstream investors have increasingly started to use ESG factors for the fundamental analysis of corporate issuers, the optimization of equity strategies and corporate bonds portfolios, ESG factors have surprisingly been considered on a smaller scale in the investment analysis

and process of sovereign bonds portfolios. This is remarkable as the sheer size of the market, the direct impact of ESG factors on sovereign creditworthiness and the chance for investors to gain an advantageous position through the use of available ESG information can hardly be ignored.

Figure 7 shows that the first layer of analysis represents the fundamental determinants of a country's economic performance. Relevant ESG criteria for sovereigns are centered around broader economic, environmental and social developments of entire economies. For instance, fundamental environmental factors include a country's biodiversity and exposure to climate change whereas governance factors include the strength of institutions, the level of corruption and democracy within a country.

ESG factors supplement the traditional approach to country analysis in several ways. First, they help investors to assess the quality of institutions and effectiveness of a country to build and ensure an investment friendly environment for long-term prosperity. Second, they provide means to assess the productivity of a country's investment, that is, whether or not investment are divergent or multiplicative. Third, the market environment has changed as a result of the global financial crisis. Political polarization and social unrest as well as the impact of climate change increased the need for proper ESG risk assessment. A broader scope of analysis will certainly contribute to a more balanced analysis.

ESG factors can impact both developed and emerging countries

The large majority of sovereign bond investors attaches great importance to the identification of sovereign issuers with (high) investment grade credit quality. Many market participants take a country's credit rating as their main anchor to determine their risk exposure. For example, they aim to invest a large share of their asset allocation into AAA-AA sovereign bonds.

However, investors often appear to disregard ESG factors which may drive the credit risk of their investments unexpectedly because they are fundamentally influencing traditional economic factors in the economy. Thereby, they often unconsciously expose themselves to material ESG (tail) risks.

ESG risks can impact the economic performance of developed and emerging countries. Bonds of developed countries which are considered to be "safety assets" may in fact be exposed to ESG (tail) risks. For instance, from a macro perspective climate change risks are systemic. Global warming may increase the probability of natural disasters, e.g. extreme weather such as draught and heavy rainfall. Thereby existing supply chains and infrastructure can be disrupted within a country. These

shocks may paralyze an entire company and threaten the financial performance of sovereigns. For instance, Israel suffers from water shortages and desertification which may intensify in the future. Water risk poses a substantial risk for many emerging market countries.

Moreover, social factors can be decisive for long-term economic growth prospects. In particular, the total stock of human capital and social stability in emerging countries is seen as one critical component to achieve higher standards of living and economic growth. For instance, the long-lasting social unrest as a result of the Arab spring in many countries in the Middle East and North Africa are a continuous drag on economic performance. A blend of broader dissatisfaction among especially the younger generation mixed with an autocratic regime and speedy distribution of news, opinions and pictures through social media can amplify critical social issues and translate them into risks for investors.

Current ESG developments in the industry

Investors should also take current industry developments into account. First, there are increasingly more regulations on sustainability that make it a logical step to implement a holistic approach towards ESG integration. Second, many institutional investors demand for more transparency on the dealing with ESG risks and ESG integrated solutions. Third, the market has witnessed a "green" wave of new data sources and new products being launched, e.g. green and climate bonds. Fourth, the materiality of ESG factors has become more visible, e.g. the governance failures and corruption in Greece were largely overlooked.

In this context and from the theoretical point of view, ESG integration in sovereign bond seems to be a natural match. Not only do the typical longer holding periods match the perception of ESG factors as being a long-term determinant but the empirical evidence in this study suggests that the selection of issuers may be improved. On the portfolio level, this may help to avoid losses through better ESG risk management and to enhance overall performance.

2. How are sovereigns' ESG performance and credit risks related?

The ESG framework in chapter 1 for the analysis of ESG factors and sovereign bonds shows that ESG factors are critical determinants of sovereign credit risk.

The central role of credit rating agencies

Credit rating agencies play a central role in the financial market because other stakeholders consider them as a source of objective judgment about the issuer's creditworthiness and risk of default to make predictions and calculations. Moreover, the credit rating agency industry is highly concentrated as over 90% of the market share is attributed to three agencies Standard & Poor's Group, Moody's Group and Fitch Group (ESMA, 2015)³. Thus, it is key to any investor who seeks to consider ESG risks in his investment process to better understand the degree to which ESG factors are incorporated in the final sovereign credit rating.

Country credit rating methodologies incorporate only few ESG factors

Conventional factors in the methodology to assess credit risk include fiscal measures such as the level of debt, fiscal accounts, trade balance among others. Furthermore, monetary factors, macroeconomic indicators and policies are measured. According to our benchmark analysis, all big three agencies include a measure of institutional strength to capture possible risks of governance, political and social stability. The institutional dimension has traditionally been regarded as the most material governance factor and thus has been partially

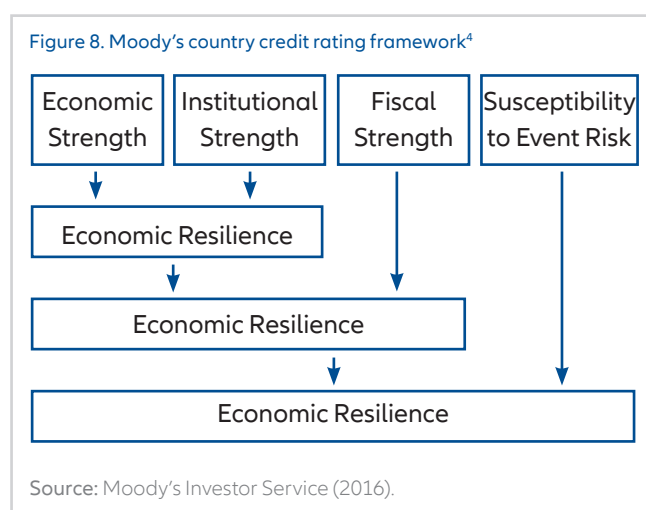
incorporated into the credit rating models.

For example, Moody's captures the institutional strength of a country by using few indicators such as the level of corruption, government effectiveness and the rule of law into (see figure 8)⁴. Yet, the governance dimension is broader and not limited to few factors. The major rating agencies do not seem to consider the social and environmental risk dimensions in detail.

In its fourth model block "susceptibility to event risk", Moody's represents the common practice in the industry to explicitly include political risk, e.g. measured by the Worldwide Voice and Accountability Index, to adjust the credit rating accordingly. There, ESG risks appear not to be treated in a systematic, continuous manner, e.g. Moody's methodology tries to deal with recurring event risks by adjusting their sovereign bond rating on an ad-hoc basis.

Credit rating agencies pledge better ESG consideration

There is a positive development that rating agencies will start to include ESG risks in their ratings. With the support of the UN PRI, leading credit rating agencies signed the "Statement on ESG in Credit Ratings" in 2016 in which they recognize the impact of ESG risks on the borrower's default risk⁵. Yet, it is not conclusive how country-specific ESG risks will be integrated by credit rating agencies in their assessment of credit risk. Hence, a more differentiated view of investors on ESG may pay off.

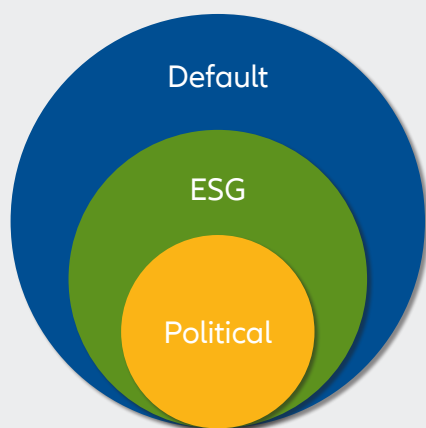


Focus box: default risk, ESG risk and political risk

There is some uncertainty among investors about the different dimensions of risk which should be taken into consideration. Political risk has historically been taken into consideration by rating agencies and investors. It can be defined as the risks investments are exposed to resulting from domestic political and geopolitical changes leading to instability in a country.

However, political risk may be classified as a subcategory of ESG risk which captures elements from the governance and social dimension too (see figure 9). ESG risk includes a broader set of elements. ESG risk can be defined as the risks stemming from environmental, social and governance factors which have material effects on investments. Default risk is the risk that the issuer is unable to honor their financial obligations. ESG risks are therefore an integral piece when evaluating the default risk of a sovereign.

Figure 9. Dimensions of default risk



Source: AllianzGI illustration.

Country credit ratings and ESG scores

The preceding discussion makes clear that ESG factors seem to have not been explicitly incorporated into assessments of country credit ratings. Therefore, it is interesting to examine their relationship in more detail.

For the assessment of a country's ESG score relative to its credit rating, we are analyzing the total ESG score and each ESG dimension individually. S&P's country credit ratings and MSCI's ESG government ratings from April 2017 are used. MSCI's ESG government ratings include 99 data points which are aggregated for each individual ESG pillar score. The environmental, social and governance pillar scores are then weighted with 25%, 25% and 50% respectively to calculate the total final ESG score.⁶ MSCI's ESG scores range from 0 to 10 where 10 represents the highest score. Our dataset includes 123 countries. The dataset consists of 23 developed market (DM), 24 emerging market (EM), 28 frontier markets (FM) and 48 countries which are classified as "others" by MSCI.

All country credit ratings are plotted against their ESG scores to examine their relationship (see figure 10). The analysis shows that credit ratings and ESG scores of countries possess a positive relationship. A country with a higher ESG score has on average a better credit rating. The base line represents this relationship for the entire group. Interestingly, figure 5 also provides insights into the relationship between these two variables across market economies with different levels of development. The upper right quadrant represents the "leader" countries with high ESG scores and high investment grade credit ratings. Contrary, the lower left quadrant represents countries

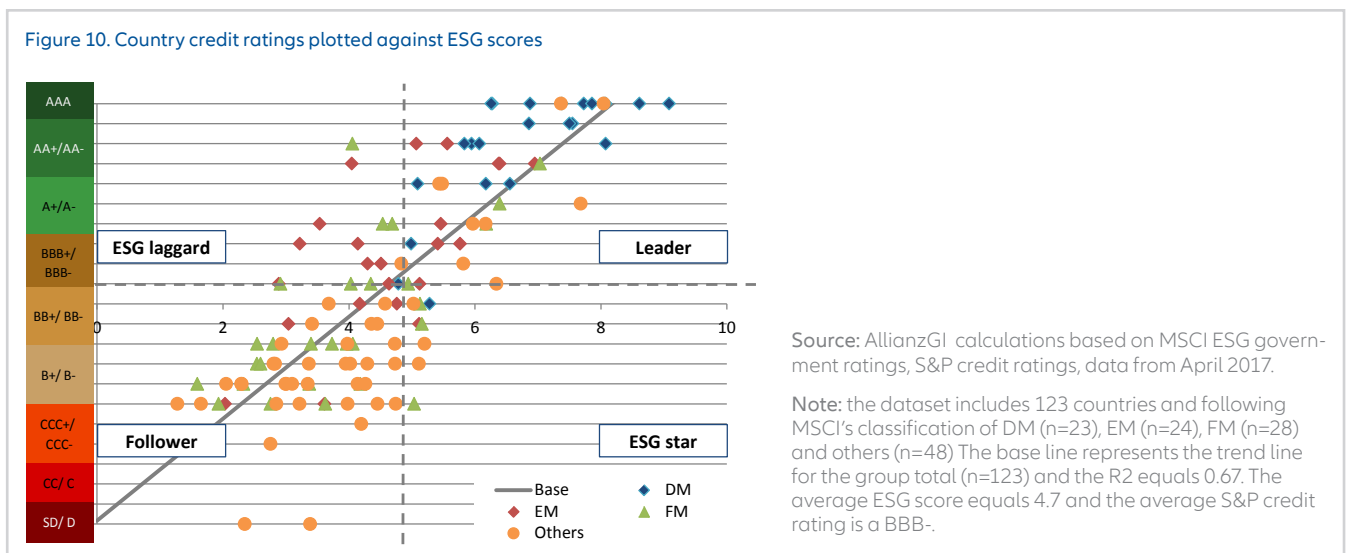
Country credit ratings and idiosyncratic E-, S- and G-scores

In the next step, countries’ relationship of their credit rating with each individual ESG dimension is assessed. Similar to figure 10, the countries’ credit ratings are plotted against their E-,S- and G-scores.

It becomes clear that the distribution of countries across the different ESG dimension differs. On the E-dimension, the scores of countries are highly dispersed (see figure 5.1). Developed countries such as Israel (ISR) and Singapore (SGP) score low relative to their credit rating. On the opposite side, emerging markets such as Russia and Brazil perform better on the E-dimension than many other countries. In the light of accelerated climate change and heavy weather events, low environmental scores may reflect larger tail risks.

On the S-dimension, countries are more closely dispersed around the base line and higher social scores correspond to a higher degree of economic development (see figure 10.2). However, the distribution is fanning out towards countries with non-investment grade credit ratings. For example, FMs with a B- credit rating have S-scores ranging from 2.2 to 6.6.

On the G-dimension, many countries are closely scattered around the base line and fewer major deviations can be observed (see figure 10.3). First, this may partly be due to the fact that the G-dimension is weighted with 50% in the total MSCI ESG score. Second, the previous discussion shows that credit rating agencies have largely focused on governance criteria in their credit analysis which may lead to a higher correlation between them.



ESG risks are not fully captured by credit ratings

The empirical results make clear that investors can benefit from integrating ESG factors into their investment process and asset allocation for several reasons. First, credit ratings do not fully capture the ESG score of countries and omit material ESG (tail) risks. Second, the integration of ESG information may therefore add new financially material insights for investors. In particular, ESG tail risks can be mitigated or avoided if investors overweight or

avoid countries with large ESG risks throughout their asset allocation. For instance, Thailand exhibits larger environmental risks than Peru but possesses the same S&P credit rating BBB+. All other things being equal, an investor may thereby be able to optimize ESG risk exposure. ESG stars, countries with ESG outperformance relative to their credit rating, can be identified which may have the potential to benefit from a higher credit rating in the near future.

Figure 10.1. Credit ratings plotted against E-scores

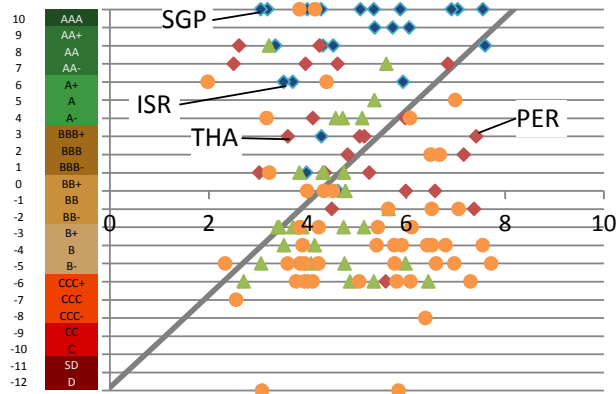


Figure 10.2. Credit ratings plotted against S-scores

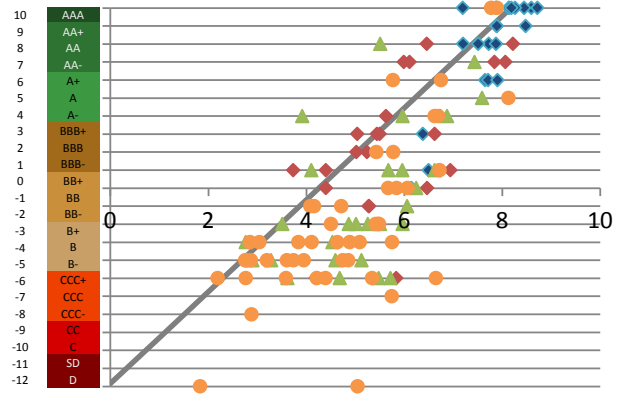
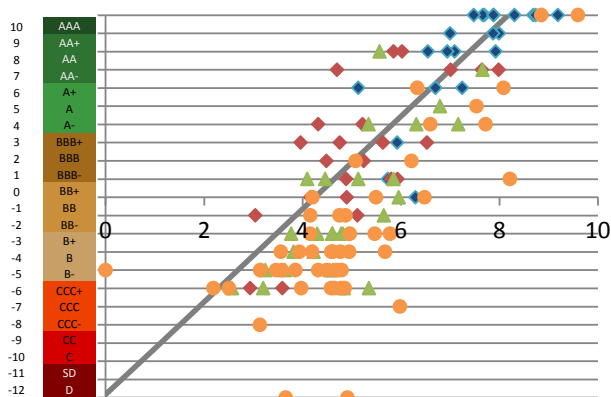


Figure 10.3. Credit ratings plotted against G-scores



— Base ◆ DM ◆ EM ◆ FM ● Others

Source: AllianzGI calculations based on MSCI ESG government ratings, S&P credit ratings, data from April 2017.

Note: the dataset includes 123 countries and following MSCI's classification of DM (n=23), EM (n=24), FM (n=28) and others (n=48) The base line represents the trend line for the group total (n=123). Source: AllianzGI calculations based on data from MSCI ESG government ratings, S&P credit ratings, data from April 2017.

3. What are the most material ESG factors for sovereigns?

Rating agencies determine sovereign credit ratings mainly on the basis of macroeconomic and financial indicators. The financial crisis and volatility of markets in recent years have shown that non-financial indicators are important too. There is broad discussion among investment professionals on which ESG factors are most material for financial performance. Similar to the results of our research “ESG in equities” and “ESG in corporate bonds”, governance is considered to be the most material determinant of sovereign credit risk.

This is partly due to the fact that measures about the level of corruption, quality of institutions and judicial system have been analyzed more frequently in the past. However, the strong historical focus on few governance indicators does not fully capture the full picture and leaves out environmental and social risk in the analysis. From an investor’s perspective, it is desirable to determine which ESG factors are most relevant and if the impact of ESG is of long-term nature. Thus, the following hypothesis are examined:⁷

H1: The higher the ESG score of a country, the lower is its bond/ CDS spread.

H2: The link between ESG score and sovereign bond/ CDS spreads becomes stronger in the long-term.

H3: The link between ESG score and sovereign bond/ CDS spreads is more significant in emerging compared to developed sovereign bond issuers.

H4: The financial materiality of governance factors is greater than for social and environmental factors.

CDS and bond spreads as a measurement of credit quality

Sovereign credit quality can be approximated by comparing CDS or bond spreads between countries. Sovereign credit defaults swaps (CDS) insure the buyer against losses resulting from a default or any other credit event. The price an investor needs to pay for this insurance is determined by the market and subject to the perceived default risk of a sovereign. CDS spreads increase with the sovereign’s default risk since CDS sellers require higher premiums for the additional risk they are insuring. In addition to sovereign risk, CDS prices also depend on other factors such as the systemic financial market stress and market liquidity.

Bond spreads are calculated on the basis of their yields in comparison to a benchmark. Sovereign bond yields are often subject to more factors that determine their price such as bond duration and liquidity considerations among others. The selection of the benchmark matters too. Overall, both measurement of credit quality have its advantages and disadvantages.

Correlation of traditional and ESG factors

In the next step of our analysis, we empirically examine the relationship between traditional financial factors of

Figure 11. Correlation of CDS spreads with financial and ESG factors

		1	2	3	4	5	6	7	8	9	10	11
1	5-year CDS spread	1,00										
2	S&P credit rating	-0,69	1,00									
3	ESG score	-0,57	0,81	1,00								
4	Environmental score	-0,05	0,11	0,47	1,00							
5	Social score	-0,48	0,81	0,86	0,09	1,00						
6	Governance score	-0,64	0,82	0,96	0,29	0,80	1,00					
7	Trade-to-GDP ratio [%]	-0,11	0,22	0,11	-0,32	0,20	0,20	1,00				
8	Current account-to- GDP [%]	-0,26	0,52	0,45	-0,07	0,53	0,46	0,29	1,00			
9	Inflation [%]	0,54	-0,43	-0,24	0,13	-0,28	-0,32	-0,12	-0,13	1,00		
10	GDP growth [%]	-0,50	0,13	-0,05	-0,15	-0,14	0,08	0,09	0,11	-0,54	1,00	
11	GDP per capita	-0,37	0,65	0,55	-0,03	0,65	0,56	0,20	0,48	-0,26	-0,09	1,00

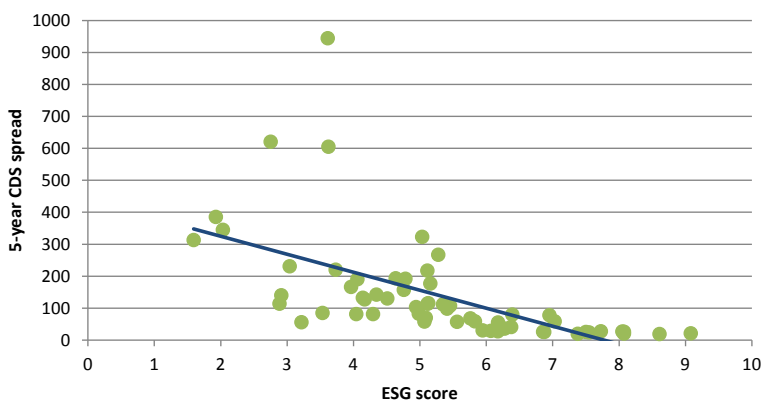
Source: AllianzGI calculations based on data from MSCI ESG government ratings, S&P credit rating, Bloomberg and World Bank, data from 2015.

Note: the dataset includes 59 countries consisting of developed (n=20), emerging (n=23) and frontier (n=16) markets.

credit analysis and ESG factors (see figure 11). In our analysis, we use a country dataset of 59 countries and use 5-year CDS spreads as a measurement of credit quality. The dataset contains 20 developed markets (DM), 23 emerging markets (EM) and 16 frontier markets (FM) issuers according to MSCI's country classification. The ESG scores are underlying MSCI's country ESG ratings. MSCI's ESG scores range from 0 to 10 where 10 represents the best ESG score.

As economic theory would suggest, apart from inflation, all traditional macroeconomic and financial factors are negatively correlated with the sovereigns' CDS spreads. S&P's credit rating has the strongest negative correlation of -0.69. Remarkably, the results show that there is indeed a strong negative relationship between CDS spreads and ESG scores. In particular, the negative correlation stems from the governance and social score. The environmental score, however, is only slightly negatively correlated.

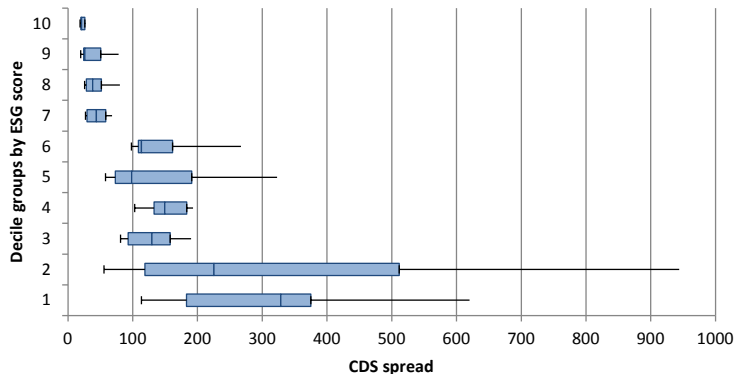
Figure 12. 5-year CDS spreads plotted against country ESG scores



Source: AllianzGI calculations based on data from Bloomberg and MSCI, data YTD April 2017.

Note: the dataset includes 59 countries consisting of developed (n=20), emerging (n=23) and frontier (n=16) markets. 5-year CDS spreads are yearly averages in USD. ESG scores are used from MSCI. The R² is equal to 0,34.

Figure 13. Sovereign CDS spreads per decile



Source: AllianzGI calculations based on data from Bloomberg and MSCI, data from YTD April 2017.

Note: countries are grouped into deciles, where 1 represents the 10% decile. The dataset includes 59 countries consisting of developed (n=20), emerging (n=23) and frontier (n=16) markets. 5-year CDS spreads are yearly averages in USD. ESG scores are used from MSCI.

The relationship between CDS spreads and ESG risks

Based on the correlation analysis and the theoretical framework, a rational investor would therefore assume that ESG scores display a negative relationship with CDS spreads. This in turn would imply that the higher the ESG score of a sovereign, the lower its default risk.

When the CDS spreads are plotted against the countries' ESG scores, there seems to be a clear negative relationship (see figure 12). The higher the ESG score of a country, the lower its CDS spread. The asset manager RobecoSAM (2015) finds similar results when ESG scores of sovereigns are plotted against 5-year CDS spreads based on data from 2015.⁷

CDS spreads are one way in which investors can trade default risk of the issuer and hence provide an approximation to the perception of default risk in the market. This suggests that market participants have already implicitly been taking countries' ESG performance into account by pricing low ESG performance in the CDS market can be gained.

Moreover, it is interesting to analyze this relationship in more detail. We therefore create a boxplot with decile groups of our country dataset. The results indicate that there is an inverse relationship between the level of the CDS spreads, the dispersion of CDS spreads and ESG scores (figure 13). Countries in the tenth decile have the strongest ESG scores and lowest CDS spreads median whereas countries in the first decile have the lowest ESG scores and the highest CDS spreads median. The dispersion of CDS spreads within each decile widens in the lower deciles. This is an interesting finding as it provides empirical evidence that countries with low ESG scores are on average more uncertain and heterogeneous in terms of investment returns and risk. In addition, the boxplot suggests a non-linear relationship between CDS spreads and ESG scores.

CDS spreads per E-,S- and G-dimension

The boxplot analysis on the aggregate ESG score provides meaningful insights into the relationship between CDS spreads and ESG country score. It is of further interest to examine each ESG dimension separately to assess the strength of their relationship. Therefore the country dataset is divided into quartiles according to their individual ESG score. The average CDS spreads are then analyzed across quartiles.

The relationship between the countries’ environmental score and their CDS spreads seems to be less strong and inconclusive (figure 13.1). The first quartile has the lowest average of E-score and a higher average of CDS spreads than the fourth quartile. However, the third quartile has a substantially higher average of CDS spreads than all other three quartiles.

The analysis of countries’ social score yields several valuable insights (figure 13.2). First, the relationship between CDS spreads and S-score seems to hold on average: the lower the ESG score of a sovereign issuer the higher the CDS spread. Second, the magnitude of the relationship is worth noting as the average of CDS spreads more than doubles between the upper half and lower half. The market seems to price in a social risk threshold between both halves.

The empirical results of analyzing the governance score reveal even a stronger link (figure 13.3). The average of CDS spreads across the four quartiles is more gradually distributed as the average decreases step-wise towards the end. Notably, the average of CDS spreads in the first quartile is more than 8 times bigger than in the fourth quartile. This suggests that the market prices the risk and penalizes the countries with low governance score.

In summary, there seems to exist a strong relationship between the CDS spreads and the social and governance scores whereas for the environmental scores the relationship is weak.

ESG tail risk is penalized by the market

The empirical results indicate a negative correlation between CDS spreads and ESG score. These findings are important to investors because they have direct implications for investors’ asset allocation. Countries with low ESG score have a wider dispersion of CDS spreads. In addition, ESG score in the lower half is penalized by the market. Investors should be aware that countries which are at the edge of worsening or improving their ESG score may be subject to extreme pricing adjustments. Investors may want to explore venues to incorporate ESG information into their pricing.

Figure 13.1. CDS spreads per E-scores quartiles

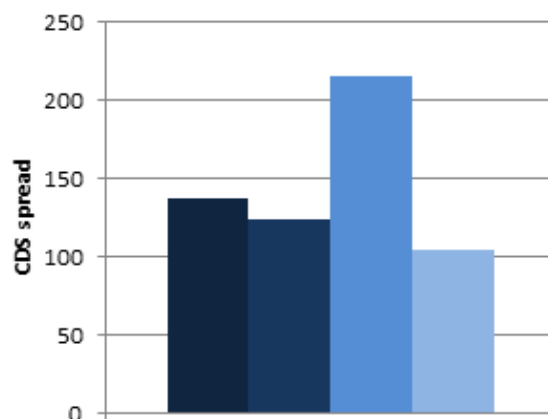


Figure 13.2. CDS spreads per S-scores quartiles

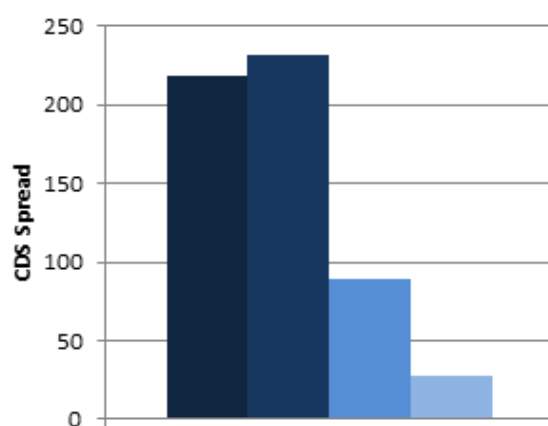
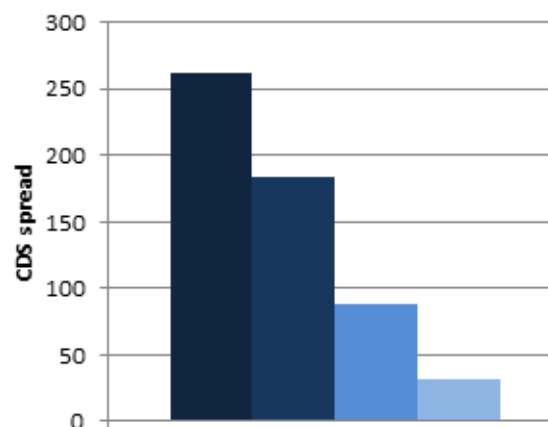


Figure 13.3. CDS spreads per G-scores quartiles



■ First quartile ■ Third quartile
 ■ Second quartile ■ Fourth quartile

Sources: AllianzGI calculations based on data from Bloomberg, MSCI, data as YTD April 2017.

Note: countries are grouped into quartiles, where 1=25% quartile. The dataset includes 59 countries (DM=20, EM=23, FM=16). 5-year CDS spreads are yearly averages in USD. ESG scores are used from MSCI.

ESG integration is significant to explain sovereign bond spreads of developed countries

Next to CDS spreads, we also discuss the relationship between bond spreads and ESG factors. Capelle-Blancard et al. (2015) find that ESG factors are relevant to explain sovereign bond spreads. They examine a panel dataset of 20 OECD countries during the time period from 1996 to 2012 and run a dynamic panel regression for analysis purposes. The dataset includes various financial and macroeconomic indicators, e.g. debt-to-GDP ratio, inflation rate and GDP growth among others, to control for their effects on the sovereign's credit spreads.

ESG scores are based on a self-constructed ESG index which uses numerous data points from the World Bank and other public institutions. In addition, the ESG scores are calculated for each dimension separately and are included in the regression analysis. To make judgments

about short term and long-term effects, the 12 months and 10-year bond spreads are analyzed.

Despite the inclusion of other financial factors, the empirical evidence indicates that there is a statistically significant negative relationship between the aggregated ESG score and bonds spreads (table 1). The relationship becomes stronger for 10-year sovereign bond spreads. The regression coefficient suggest that a 10% increase in the ESG score reduces the sovereign bond spreads by approximately 10.9% in the short-term. Remarkably, the effect increases to 16.3% in the long-run. Regarding the other financial factors, only the country credit rating, GDP growth rate and current account-to-GDP are significant. On an individual ESG score basis, the governance dimension seems to have the greatest magnitude followed by the social dimension. The environmental dimension, however, is not significant in any of these cases.

Table 1. The impact of ESG factors on OECD sovereign credit spreads in the short- and long-run⁸

	Sovereign Bond Spreads			
	12 month	12 month	10 year	10 year
First lag of spreads	1.126***	1.115***	0.937***	0.952***
First lag of ESG score	-0.109***	-	-0.163***	-
First lag of E score	-	0.018	-	0.023
First lag of S score	-	-0.033***	-	-0.080*
First lag of G score	-	-0.096***	-	0.083**
GDP growth rate	-0.089***	-0.082***	-0.162***	-0.152***
Inflation rate	-0.032	-0.032	-0.100	-0.096
Debt-to-GDP ratio	-0.002	-0.000	0.007	0.010
Primary-Fiscal-to-GDP	0.021	0.019	0.038	0.035
Current-Account-to-GDP	-0.28*	-0.034*	-0.045*	-0.041
Trade-Openness-to-GDP	0.005	0.008	0.012	0.010
Reserves-to-Imports	-0.628	-0.443	-0.858	-0.751
S&P credit rating scale	-0.283***	-0.240***	-0.211***	-0.168**

Sources: Capelle-Blancard et al. (2015).

Note: *, **, *** significance at 10%, 5% and 1% respectively. The dataset includes 320 observations from OECD countries. Source: Capelle-Blancard et al. (2015).

Financial materiality of ESG factors in emerging countries

As a larger share of investments is flowing into emerging markets to seek higher returns, the assessment of associated risks and opportunities has become more important. ESG strength is often regarded as particularly important for emerging countries as their markets are perceived to be more volatile and unstable throughout their transition period to developed economies. Strong institutions, energy security and the average level of education are seen as preconditions for subsequent economic development. In this context, ESG strength of sovereigns may function as a signal about the current prospects of future long-term economic development to investors.

Berg et al. (2016) examine the effect of ESG on credit spreads of emerging markets. The dataset consists of 52 emerging economies with information on their credit

rating, ESG score and traditional financial indicators during the time period from 2000 to 2012. The ESG scores are calculated on the basis of the World Bank Governance Indicator, Human Development Index and the Environmental Performance Index from Yale University.

The research finds that ESG factors are a good supplement to credit ratings and traditional indicators to explain credit spreads of sovereigns in emerging markets (see table 2). This may be due to the fact that strong ESG performance reduces risks and investors may perceive it as a credible commitment to deal with long-term problems. However, the empirical findings are more mixed. Surprisingly, governance is not significant to explain sovereign bond spreads in this study. The empirical findings suggest that governance indicators become redundant to explain bond spreads in emerging countries once

Table 2. The impact of ESG factors on sovereign credit spreads in emerging Markets ⁹

	GMM Regression of D(Spread) on differenced ESG indicators		GMM Regression of D(Spread) on differenced ESG indicators and Credit Rating	
	Without time lags	With time lags	Without time lags	With time lags
First lag of spreads	0.522***	0.448***	0.608***	0.581***
Third lag of spreads	-0.222***	-0.196***	-0.263***	-0.2333***
E score	0.332**	-	0.252	-
First lag of E score	-	0.318	-	0.350
Second lag of E score	-	-0.088**	-	-0.119**
S score	99.375**	-	86.335***	-
First lag of S score	-	32.016	-	26.666
Second lag of S score	-	-120.633***	-	-121.162***
G score	0.097	-0.120	0.104	-0.129
First lag of G score	-	0.642	-	0.568
Average Life	1.120***	0.982***	1.026***	0.874***
Average Life squared	-0.052***	-0.051***	-0.048***	-0.044***
Bid Ask spread	170.458***	156.970***	131.658	123.374
GDP growth	-0.340*	-0.232*	-	-
First lag of GDP growth	-	0.142	-	-
Debt-to-GDP ratio	0.090	0.082	-	-
First lag of Debt-to-GDP ratio	-	0.017	-	-
Fitch's credit rating scale	-	-	-0.802**	-0.641*
First lag of Fitch's credit rating scale	-	-	-	0.957***

Sources: Berg et al. (2016).

Note: The environmental score is measured by the Environmental Performance Index (EPI) published by Yale University (scale [0;100]). The Social score is equal to the human development index (scale [0;1]). The Governance score is based on the World Governance Indicators (scale [-10;10]). Average Life measures the duration and convexity of the bonds. *, **, *** significance at 10%, 5% and 1% respectively.

macroeconomic indicators are included. Social and environmental risks, however, seem to have strong explanatory power.

The authors try to strengthen their arguments with the empirical findings from regressing ESG factors on credit ratings. They find that governance is significant to explain credit ratings while it becomes insignificant for explaining credit spreads. These findings are in line with our investigation on credit ratings which shows that governance factors have partly been accounted for by credit rating agencies. The other two E- and S-dimensions, however, are often disregarded. The study indicates that emerging economies seem to be more vulnerable to environmental and social risks. Investors may want to include E- and S-dimensions because their performance seem to have a strong long-term link with the credit spreads in emerging economies.

The bottom line of ESG materiality

At the beginning of this section four investment hypotheses are stated to analyze the financial materiality of ESG factors. Overall, there is empirical evidence to make the case for all four investment assumptions. First, ESG factors have an inverse relationship with a country's credit risk, e.g. CDS spreads and bond spreads. This relationship seems to be of non-linear nature for CDS spreads. Second, the empirical findings suggest that ESG factors are material in the short and long run. However, they become increasingly material over time and can therefore be regarded as a long-term determinants.

Third, empirical results are less conclusive of whether or not ESG factors are more material for developed than for emerging markets. It seems that emerging countries are more vulnerable to environmental and social risks. These risks seem to be more material in emerging countries as governments have less resources available to manage them. Fourth, there is no final answer if governance factors are generally more material than social and environmental factors. While it is true that governance performance has a strong impact on economic performance across most countries, individual countries may show greater risk exposure to the other two factors.

Finally, ESG factors can add new financially material information which is not included in the analysis of traditional financial data. Investors may be better off to include all ESG factors in their analysis by recognizing that their impact may differ across countries.

4. How can ESG integration into sovereign bond portfolios help to manage tail risks?

Today, risk management is an integral part of successful and modern investment strategies. In the daily affairs of any bond investors, the management of portfolio volatility and risk exposure is of great importance. Especially after the MBS bond crisis, the Lehman default in 2008 and the EMU fiscal debt crisis, some rethinking reshaped institutional investors' view on the relevance of sophisticated approaches to manage tail risks in bond portfolios.

In recent discussions, ESG integration is thought to provide investors with an additional lens to evaluate the riskiness of their investments. The explicit treatment of ESG in sovereign bond portfolios may therefore be beneficial as it can serve as an early warning system to investors about their 'true' financial risk exposure.

How could sovereign bond portfolio investors benefit from taking ESG factors into account in their investment process? Does ESG performance reduce volatility and help to anticipate tail risks throughout stress markets? We examine the following investment hypothesis with respect to ESG factors and sovereign bonds:

H5: ESG performance of countries has become more material after the financial crisis in 2007.

H6: The impact of ESG performance on short-term sovereign credit spreads increases during periods of economic distress.

ESG factors are helpful to differentiate between the level of risk of countries within the Eurozone

Prior to the introduction to the Euro, bond yields of EMU sovereigns converged to a common level as investors assumed that they would become equally risky. Before the breakout of the financial crisis, European bonds yields remained at a homogenous level. In the years following the financial crisis and in particular at its peak in 2012, EMU sovereign bond yields started to diverge. Investors realized that the robustness and strength of European economies differed from core to periphery and therefore required different risk premiums. Next to the financial performance of governments, it became clear that

countries with stronger institutions and better governance structures were faster and more effective to implement reforms and to reverse economic downturns.

Capelle-Blancard et al. (2015) analyze a set of 20 OECD during the time period from 1996 to 2012. In their research, they regress the 10-year sovereign bond spreads for Eurozone and non-Eurozone countries on financial and ESG factors (see figure 10). Their findings suggest that the credit rating and ESG score are statistically significant whereas traditional indicators such as the debt-to-GDP ratio are statistically insignificant.

Furthermore, they find empirical evidence that the effect of ESG factors is substantially stronger in the sub-set of countries belonging to the Eurozone. In fact, the effect of ESG factors in the Euro area is statistically highly significant and of a larger magnitude. For instance, a 10% increase in the sovereign's ESG score of the Euro area would decrease the 10-year bond spread by 16.6%. Overall, the empirical findings imply that ESG factors are significant for explaining the credit spreads of both Euro area and non-Euro area countries in the long run. These findings may be explained by the high spread volatility and market overshooting that was witnessed over the last years in the Eurozone.

ESG factors after the financial crisis

Capelle-Blancard et al. (2015) use the same dataset to investigate the impact of ESG on credit spreads during crisis periods in the short and long run (see table 3). In their analysis, the 12-month and 10-year bond spreads serve as a measurement for short and long-term effects. The bonds spreads are regressed on the financial factors, ESG factors and an interaction term between the ESG score and a dummy variables for the years from 2007 to 2012. Their regression output suggests that the ESG score as well as the interaction term are statistically significant at the 10% level. Thus, their empirical results suggest that the impact of ESG performance on the 12-month and 10-year bond spreads increased during the aftermath of the financial crisis.

The bond spread mitigation effect of ESG factors is more pronounced during the short term. In particular, the interaction term, which accounts for the time period after 2007, would imply that a 10% increase in ESG performance leads to 0.9% reduction in credit spreads of 12-month sovereign bonds. These findings indicate that capital markets eventually changed their mind-set and started to take a broader set of risk determinants into account. Furthermore, the empirical evidence suggests that the impact of ESG performance on 12-month is higher than on the 10-year credit spreads. This may indicate that strong ESG performance makes sovereigns more resilient during crisis periods.

Table 3. The impact of ESG factors during crisis periods and on the Eurozone⁶

	Sovereign bond spreads in Euro vs non-Euro area		Long-term vs short-term sovereign bond spreads during crisis periods	
	10-year Euro area	10-year Non-Euro area	12-month Full dataset	10-year Full dataset
First lag of spreads	1.003***	0.747***	1.15***	0.980***
First lag of ESG score	-0.166***	-0.086*	0.038*	-0.054*
First lag of ESG score * 2007	-	-	-0.009***	-0.006***
GDP growth rate	-0.205***	-0.019	-0.109***	-0.131***
Inflation rate	-0.156	-0.052	-0.000	-0.026
Debt-to-GDP ratio	0.007	0.003	-0.001	0.007
Primary-Fiscal-to-GDP	0.037	0.001	0.016	0.038*
Current-Account-to-GDP	-0.020	-0.023*	-0.031*	-0.046***
Trade-Openness-to-GDP	0.004	0.012*	0.003	0.014*
Reserves-to-Imports	-0.531***	-0.297	-1.015***	-0.873*
S&P credit rating scale	-0.204**	-0.068	-0.290***	-0.257***

Sources: Capelle-Blancard et al. (2015).

Note: *, **, *** significance at 10%, 5% and 1% respectively. The Euro area and non-Euro area include 187 and 153 observations respectively. The aggregated dataset captures 320 observations.

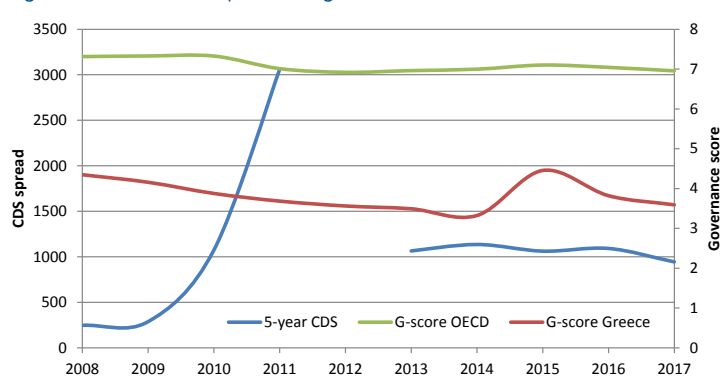
The Greek case: governance score as indicator of tail risk

Since the global economic downturn in 2007, Greece's economic position worsened. As a result, Greece's debt levels skyrocketed. Greece is facing a severe sovereign debt crisis ever since and approximately debt equals 170% of Greek's GDP today. Greece's CDS spread rose substantially to record highs during civil protests, political and financial uncertainty in 2011 (see figure 14). In 2012, Greece found itself unable to meet all its financial obligations and partially defaulted on its debt even though it was technically never considered a credit event. Many investors were caught on the wrong foot and were obliged to write down the value of their investments. Greece experienced several downgrading by all major credit rating agencies during these periods. Given

the large losses, the question may be raised if investors were aware of the full risk of their investments?

Preceding the financial crisis and Greece's partial default in 2012, there were clear indications in the market that Greek bonds bore a higher risk than its European counterparts.

Figure 14. Greece's CDS spread and governance score



Source: AllianzGI calculations based on World Bank and MSCI, data from YTD April 2017.

Note: the CDS spreads are annualized and no CDS spread data is available for 2012 (LH axis) and MSCI's ESG government ratings (RH axis).

First, investors could have recognized that Greece's economic and financial position was weaker than of its European counterparts. Second, Greece had shown signs of major weaknesses in its institutional and governance effectiveness, e.g. large levels of corruption and a weak tax system. The OECD countries' average governance score has been above 7 since 2008 whereas Greece started with a score of 4.3 and which started to diverge even further to 3.5 in 2012.

In fact, Greece's governance performance had been the lowest of all OECD countries between 2008 and 2015.

From an investor's point of view, it is questionable if Greece's governance performance was sufficiently considered throughout the investment process. As poor governance coupled with weak economic performance makes effective crisis management less likely, investors clearly could have benefitted from taking Greece's governance score into account and to reassess the level of risk they attributed to Greek bonds. Even though Greece has high level of development, the Greek case shows that ESG factors, e.g. governance performance, may be of importance to investors to get the full picture of their investments right.

The Turkish case: are investors pricing ESG risk properly?

In recent months, Turkey has made it to the headlines of the media for several reasons related to the Syrian conflict, the refugee crisis, changes to Turkey's political structures and constitution, a military coup and social unrest among others.

In this context it is interesting to analyze how the sovereign bond market reacted to these events related to governance and social (risk) factors. Since the 2000s, Turkey has set out on a path of strong economic development. Until 2015, Turkey's governance score had been below the OECD's average but remained stable.

In 2015, Turkish CDS spreads slowly increased during the first half year and finally peaked in the summer as Turkey announced military strikes against the Islamic State and conflicts with the Kurdish PKK started to intensify again (see figure 18)¹⁰.

At the end of February 2016, investors started to price in a

higher risk. This was due to worsening relations between Russia and Turkey as a result of the Russian military jet crash and new conflicts with the Kurdish PKK and the Turkish government. In July 2016, the Turkish government faced a military coup attempt which led to a sharp spike in the CDS spread.

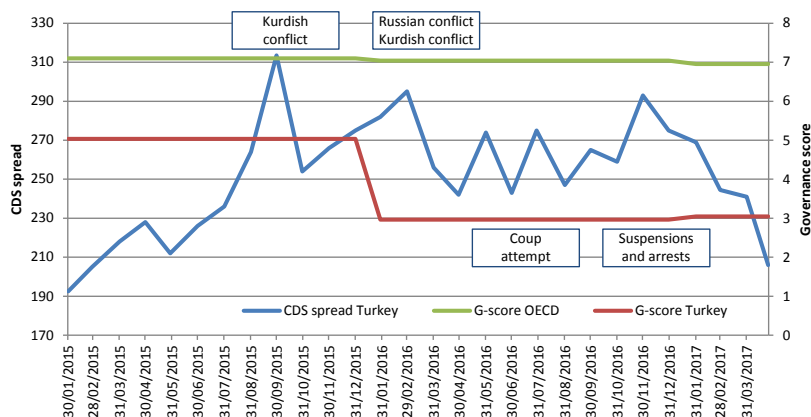
During the aftermath of the military coup, S&P downgraded Turkey's foreign currency rating to BB+, a non-investment grade, citing political uncertainty. The coup was followed by a period of suspensions and arrests of government officials and other people by the Turkish government who were suspected to be involved in the coup. Turkey's currency Lira had also substantially fallen in value against the US dollar by the end of 2016, reflecting political uncertainties and social unrest among others. By the end of January 2017, Turkey was downgraded by all three major credit rating agencies. In April 2017, the Turkish President Recep Tayyip Erdogan won the referendum which gives him the power to transform Turkey from a parliamentary to a presidential republic¹¹.

The analysis shows that the CDS market is volatile and quickly prices in risk related to key events. In particular, the Turkish CDS spreads movement show that major political or social events, e.g. a military coup, can lead to sharp changes in the pricing of risk. However, pricing in the CDS market seems to be short-lived. Turkish CDS spreads have gradually declined since November 2016 and the market started to price the risk of Turkish bonds less fiercely.

Interestingly, Turkey's governance score started to diverge from the OECD average during the same period of analysis and substantially dropped in 2016 (see figure 18). Since 2016, Turkey took over Greece's position of having the lowest governance score among all OECD countries. In the light of the negative trend, the question remains whether or not investors are currently adequately pricing the risk stemming from Turkey's low governance performance.

Contrary to Greece, Turkey's economy faces noticeably lower debt burdens and has positive growth prospects for the next years. Nevertheless, investors should have an awareness that all ESG factors are long-term determinants of a country's economic performance and become more pronounced during periods of economic distress. Investment professionals are therefore well-advised to keep an eye on Turkey's governance performance to manage its portfolio ESG risks appropriately. Whether or not the governance risk in Turkey materializes in the near future remains to be seen.

Figure 15. Timeline of Turkey's CDS spread



Source: AllianzGI calculations based on data from Bloomberg and MSCI, data from January 2015 to April YTD 2017.

Note: the Turkish CDS spreads (LH axis) are monthly averages and MSCI's ESG government ratings (RH axis).

Social and environmental factors can have substantial impact

In the preceding two case studies on Turkey and Greece, the analysis focuses on the governance performance. However, social and environmental factors are also important to mitigate portfolio risk and volatility. For instance, the United Nations Environment Programme (UNEP, 2012) analyzed fluctuations in commodity prices and resource capacity for five countries including France, Japan, Brazil, India and Turkey.¹² They find that even though environmental risks vary across countries, it can substantially increase credit risk. In particular, their empirical findings suggest that keeping consumption levels constant, a 10% degradation of productive capacity of renewable and natural resources could decrease a country's trade balance by 1-4% of its GDP.

Another example of material environmental factors is climate risk. Climate risk is systemic and impacts all countries to a different degree. Physical climate change risk, e.g. extreme weather events, transition risk and the country's policy response towards a low carbon economy may have an impact on a country's creditworthiness. For example, Thailand's economy contracted by 9% three months after the huge flooding started in 2011.¹³

Maplecroft (2013) finds that social unrest is more likely in countries that have high levels of social development but little political freedom¹⁴. For example, Egypt's economy was hit hard by the social protests during the Arab spring and the resulting uncertainty. The Egyptian government estimates that the tourism revenue dropped by 95% from 2010 to 2014¹⁵. These examples of environmental and social risks stress the fact that ESG risk exposures often vary across countries.

ESG factors are an early warning system to investors

The empirical evidence in this section provides support for our hypotheses that ESG factors are particularly material in the long run and became more material after the financial crisis in 2007. ESG factors can help sovereign bond portfolio investors to better assess a sovereign issuers' 'true' risk profile.

Furthermore, investment professionals could use ESG information to mitigate their ESG risk exposures and tail risks of their portfolios. The downside risk management of sovereign bonds may be particularly interesting during economic downturns because there is empirical evidence that strong ESG performing countries are more resilient. This may also help investors to reduce the volatility of their portfolio due to fewer event exposure leading to extreme repricing of risk.

ESG risks and the financial materiality of ESG factors may also vary across countries. In particular, developed market, emerging market and frontier markets have different means and resources to deal with the consequences of environmental and social risks.

We suggest that sovereign bond investors should consider the ESG risk management capabilities and willingness of countries today. Good management may reduce a countries ESG exposure or strengthen its capabilities to cope with the consequences. Hence, an individual assessment of countries may help investors to anticipate a repricing of securities and changes in their portfolio risk exposure.

5. Best practice: what are feasible ESG portfolio strategies?

In the previous sections, this whitepaper provides empirical evidence on the financial materiality of ESG factors in sovereign bonds. In this section, we discuss how financially material ESG information can be translated into successful sovereign bond portfolio strategies. Such investment strategies can aim at worst-in-class exclusion, best-in-class screening, ESG risk tilting and ESG risk momentum driven allocations.

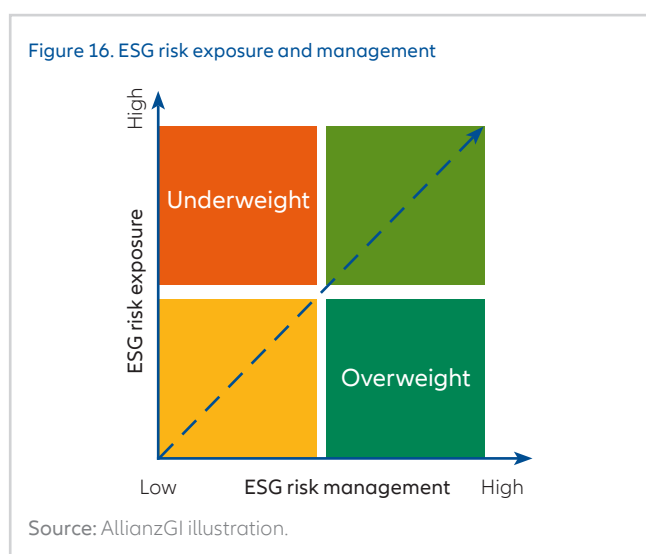
Optimized asset allocation through ESG

Any sovereign bond portfolio strategy may generally benefit from optimized country asset allocation and bond selection. For sovereign bonds, as a first step, countries may be analyzed with regard to their ESG (tail) risk exposure and their readiness to address these ESG risks (see figure 16).

Investors may simply start to identify countries with high ESG (tail) risk exposure and low ESG risk management (upper left quadrant). Given a particular credit rating and return profile, a top-down approach following ESG considerations can help investors to avoid the upper left quadrant and seek countries in the lower right quadrant.

Exclusion strategies do not induce a major loss in diversification

Financial theory predicts that a restriction in the investment universe leads to an inward shift of the efficient frontier. A restriction is thus undesirable due to the loss in diversification opportunities and risk-adjusted returns.



Drut (2009) analyses a dataset of 20 developed countries using data from 1994 to 2008¹⁶. He tries to determine if a minimum ESG performance threshold leads to a loss in diversification. Based on his thresholds, the lowest ESG performing issuers are omitted. Drut uses a minimum variance and tangency portfolio as benchmarks for the efficient frontier. His empirical findings suggest that a ESG worst-in-class exclusion strategy in sovereign bonds of developed countries does not cause a significant loss in diversification (see table 4).

Only the statistics of portfolios for which the mean-variance efficiency hypothesis is rejected at the 10%, 5% and 1% level are shown. The Sharpe ratios remain roughly unchanged across all portfolios. The true tangency portfolio has a sharp ratio of 0.37 and a Vigeo ESG score rating of 72.73 whereas the tangency portfolio with the rejection of the mean-variance efficiency at the 1% level has a Sharpe ratio of 0.34 and a Vigeo ESG score of 80.55. Interestingly, the empirical results show that the volatility of the constructed portfolio increase in comparison to their benchmark while

the skewness and kurtosis decrease. The latter suggests that extreme risks become less likely for high ESG scoring portfolios.

Portfolio managers could therefore increase their ESG sovereign portfolio scores without having to make large sacrifices in terms of diversification and returns. Investors may profit from this insight in various forms. First, investors could reduce their portfolio exposure to ESG tail risks because better ESG performance make sovereign defaults and credit rating downgrades less likely. Second, investors could respond to the demand from institutional investors in the market for responsible investment without the need to compromise on the expected returns.

Table 4. Descriptive statistics of the minimum variance and tangency portfolio¹⁶

	Minimum variance portfolio				Tangency portfolio			
	True frontier	10%	5%	1%	True frontier	10%	5%	1%
Mean (annualized)	7.10%	7.10%	7.10%	7.10%	7.52%	7.52%	7.52%	7.52%
STD (annualized)	2.53%	2.66%	2.69%	2.73%	2.58%	2.72%	2.74%	2.79%
Maximum	2.60%	2.56%	2.53%	2.48%	2.76%	2.76%	2.73%	2.68%
Minimum	-1.86%	-1.85%	-1.85%	-1.85%	-1.85%	-1.88%	-1.87%	-1.87%
Skewness	-0.13	-0.11	-0.11	-0.11	-0.17	-0.12	-0.12	-0.12
Kurtosis	3.57	3.01	2.95	2.87	3.44	3.08	3.03	2.96
Sharpe Ratio	0.33	0.31	0.31	0.31	0.37	0.35	0.35	0.34
Vigeo ESG score	73.33	79.56	80.01	80.73	72.73	79.47	79.86	80.55

Sources: Drut (2009).

Note: 10%, 5% and 1% are probability levels at which the mean-variance efficiency hypothesis of the portfolio is rejected. Vigeo ESG scores range from [0;100], where 100 represents the best grade.

Outperformance through positive ESG screening and overweighting

In a report published by the Principles for Responsible Investment (PRI), Bank J. Safra Sarasin constructs a sovereign bond portfolio of industrialized countries using traditional methods based on issuers who pass a pre-defined sustainability threshold, e.g. natural resource availability-efficiency ratio¹⁷. The sustainable portfolio outperforms the benchmark in the long-run between 2006 and 2012 (see figure 17). Notably, the outperformance of the sustainable portfolio can largely be attributed to the period after the financial crisis.

Instead of focusing on sustainability, Union Investment (2014) provides evidence for ESG portfolio outperformance by concentrating on the governance dimension¹⁸. In particular, they construct a corruption optimized index of Eurozone sovereign bonds and compare it to its benchmark from 2001 to 2013. They find that the corruption optimized portfolio has a lower volatility and outperforms its benchmark by 11 basis points per year. Remarkably, the outperformance is also largely due to the years after the financial crisis.

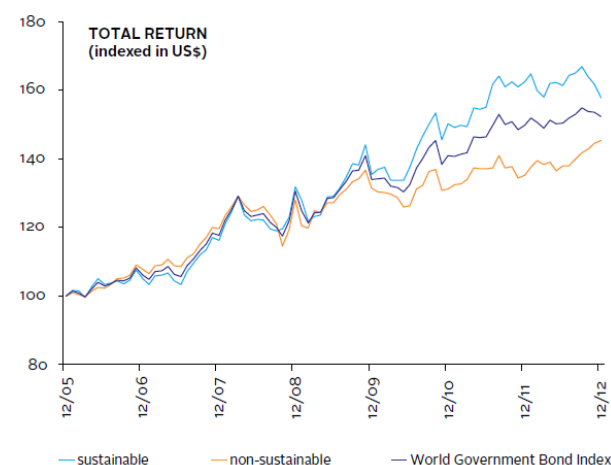
Similarly, AXA Investment Managers (2013) finds empirical evidence for the outperformance of a high scoring ESG portfolio of developed countries against low scoring peers from 2005 to 2012 (figure 18)¹⁹. Furthermore, they construct a portfolio with an overweight of high ESG scoring sovereigns but are limiting the weighting to 0.05%.

Overall, the results suggest that an ESG weighted portfolio can benefit from higher credit quality and better ESG performance while leaving the key portfolio characteristics unchanged. This may be a building block for investors who seek competitive risk-adjusted returns and high ESG portfolio performance.

Exploiting the ESG upside momentum

Investors may also want to consider momentum strategies which seek to capitalize on issuer ESG risk improvements by anticipating improvements. Several studies in this whitepaper show that capital markets partly price these ESG performance of countries. Lower CDS spreads and bond spreads correlate with higher ESG performance. The magnitude of their financial materiality, however, varies with the investment time horizon and level of development. Hence, well informed investors with superior ESG information may be able to exploit the ESG upside in their portfolio.

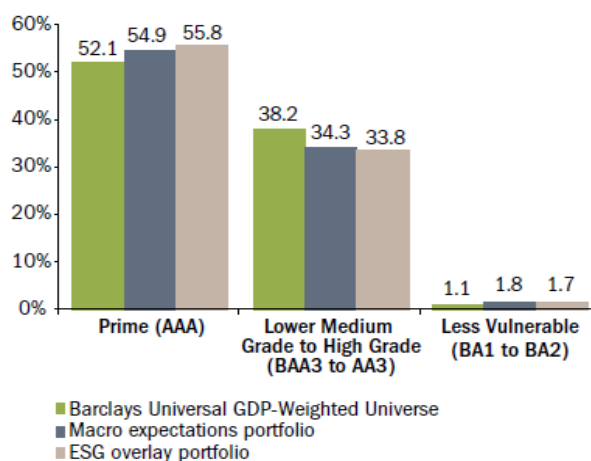
Figure 17. Sustainable sovereign bond market-weighted performance¹⁷



Source: Bank J. Safra Sarasi, Principles for Responsible Investment Initiative (PRI).

Figure 18. Performance and credit quality of ESG overweighted portfolio vs benchmark¹⁹

	Yield to Worst	Option Adjusted Spread	Duration	ESG Score
GDP-weighted universe	2.6	54	6.1	7.85
Macro expectations portfolio	2.5	43	6.2	7.92
ESG overlay portfolio	2.5	47	6.1	7.99



Source: AXA Investment Managers (2013).

Appendix

APPENDIX 1: Summary table of studies examined

	Study	Time period	Data	Methodology	ESG dimension	Level	Result
Summary of empirical findings presented for selected studies							
A	AXA Investment Managers (2013)	2005 – 2012	ECDC	Constructing different portfolios based on ESG performance	ESG	Portfolio	Positive
B	Berg et al. (2016)	2000 – 2012	EC	Regression of sovereign bond spreads on ESG and economic data	ESG	Bond	Mixed
C	Capelle-Blancard et al. (2015)	1996 – 2012	DC	Regression of sovereign bond spreads on ESG and financial data	ESG	Bond	Positive
D	Drut (2009)	1994 – 2008	DC	Analyzing the mean-variance efficient frontier of ESG optimized portfolios	ESG	Portfolio	Positive
Extract of additional studies analyzed (not further discussed in the appendix)							
E	Bank J. Safra Sarasin (2013)	2005 – 2012	DC	Constructing a sustainability optimized portfolio	E	Portfolio	Positive
F	RobecoSAM (2015)	2015	ECDC	Analyzing the relationship between ESG and 5-year CDS spreads	ESG	Bond	Positive
G	Union Investment (2014)	2001 – 2013	Eurozone	Constructing a corruption optimized portfolio	G	Portfolio	Positive
H	Crifo et al. (2015)	2007 - 2012	DC	Regression of bond spreads on ESG score and economic data	ESG	Bond	Positive
I	Hoepner et al. (2013)	2002-2012	ECDC	Regression of bond spreads with various maturities on ESG score and economic control variables	ESG	Bond	Positive
J	UNEP (2016)	2014	ECDC	Modelling the effect of commodity prices and natural resource capacity on GDP	E	Country credit risk	Positive
K	Global Footprint Network (2016)	2012	ECDC	Central focus on transition risk, policy responses, physical climate change risk on creditworthiness	E	Country credit risk	Positive
L	Maplecroft, PRI (2013)	2013	ECDC	Influence of levels of political freedom and social development on social stability	S	Country credit risk	Positive
M	Ciocchini et al. (2003)	1995-1999	ECDC	Regression of log bond spreads on Transparency Int. Corruption Index and control variables	G	Bond	Positive

Note: DC= developed countries; EC= emerging countries; ECDC= emerging and developed countries.

Summary of empirical findings presented for selected studies

A. AXA Investment Managers (2013)

“Sovereign Debt Investing: ESG Framework and Applications”

Time Period	2005 – 2012
Dataset	Different datasets of emerging and developed countries
Main focus	Financial performance of different portfolios using ESG information for construction purposes
Methodology	Comparing the performance of different ESG portfolio construction strategies to its benchmark

Approach:

AXA Investment Managers construct ESG country ratings based on several indicators of each ESG dimension. They then build different sovereign bond portfolios for emerging and developed markets to compare their financial performance:

- Best (first quartile) vs worst (fourth quartile) ESG performing portfolio construction for developed economies
- Portfolio construction based on a negative screening for reputation risks in emerging economies
- Construction of an ESG weighted portfolio of developed and emerging economies with a weight limit of 0.05%

Key findings:

- The best ESG performing portfolio of developed countries substantially outperformed the worst ESG performing portfolio
- Negative screening on low governance performance for emerging countries, e.g. high level of corruption, can improve the portfolio quality without changing the portfolio's yield and duration characteristics
- An ESG weighted portfolio of emerging and developed economies leaves the major portfolio characteristics unchanged while increasing the ESG performance

B. Berg et al. (2016)

“Sovereign Bond Spreads and Extra-Financial Performance: An Empirical Analysis of Emerging Markets”

Time Period	2000 – 2012
Dataset	52 emerging countries
Main focus	Relationship between sovereign bond spreads and ESG performance
Methodology	Regression of sovereign credit spreads on ESG factors and traditional financial factors, e.g. government debt levels, credit ratings, GDP growth etc.

Key findings:

- There is a negative relationship between strong ESG performance and sovereign credit spreads
- There is an inverse relationship between strong ESG performance and sovereign credit ratings
- Governance and environmental factors seem to be important where the former influences the credit rating and credit spread whereas the latter only influences the credit spread

Approach:

Berg et al. (2016) examine the relationship between sovereign credit spreads of emerging countries and their ESG performance. They use the World Bank Governance Indicators, Human Development Index and Environmental Performance Indicator from Yale University as ESG factors. They analyze:

- How and to what degree ESG performance impacts credit spreads
- How and to what degree ESG performance can explain credit ratings
- The financial materiality of ESG factors and information

C. Capelle-Blancard et al. (2015)

“Environmental, Social and Governance (ESG) performance and sovereign spreads: an empirical analysis of OECD economies”

Time Period	1996 – 2012
Dataset	20 OECD countries
Main focus	Relationship between sovereign bond spreads and ESG performance
Methodology	Regression of sovereign credit spreads on ESG factors, e.g. self-constructed index, and traditional financial factors, e.g. credit ratings, GDP growth, government debt levels etc.

Key findings:

- There exists a strong inverse relationship between sovereign bond spreads and ESG performance
- ESG factors become more pronounced during the long-term (long-deterministic concept), during crisis periods (risk mitigation) and Euro area (structural criteria)
- Governance factors have the greatest financial materiality, followed by social factors whereas environmental factors seem to be positively related to sovereign credit spreads

Approach:

Capelle-Blancard et al. (2015) analyze the relationship between sovereign bond spreads and ESG performance by constructing their own ESG index based on numerous World Bank Development and Governance Indicators. They examine:

- How and to what extent ESG performance influences credit spreads
- The financial materiality of ESG factors and each dimension individually
- The effect of ESG factors on different groups of countries, e.g. Euro area and non-Euro area
- The impact of periods of economic distress, e.g. financial crisis, on sovereign credit spreads

D. Drut (2009)**“Sovereign Bonds and Socially Responsible Investment”**

Time Period	1994 – 2008
Dataset	20 developed countries
Main focus	Analyzing the mean-variance frontier of sovereign bond portfolios which have improved ESG scores
Methodology	Constructing ESG optimized portfolio based on a minimum ESG performance threshold to assess the effect of negative screening on diversification and risk and return relationship

Approach:

Drut (2009) studies the risk and return relationship of sovereign bond portfolios which are constructed based on superior ESG performance based on the Sustainability Country Rating (CSR) of Vigeo. In addition, Drut looks at each ESG dimension individually. In the analysis:

- A minimum threshold of a CSR score is imposed and the implications for portfolio diversification and the efficient frontier discussed
- Two benchmark portfolios are used, e.g. a minimum variance portfolio and tangency portfolio, to assess the portfolio characteristics of the ESG optimized portfolio
- The environmental, social and governance performance of countries and the effect of a respective threshold is analyzed

Key findings:

- Investors can construct a portfolio with higher ESG performance without making sacrifices in the risk and return relationship if each ESG dimension is assessed on its own.
- ESG optimized portfolios have a higher volatility but a lower skewness and kurtosis. This implies less exposure to extreme risks
- If preferences for negative screening become too stark or narrow, a loss in diversification and risk and return relationship is likely

Full name of additional studies analyzed and not mentioned in text (see appendix):

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- J UNEP Finance Initiative (2016), ERISC PHASE II: How Food Prices Link Environmental Constraints to Sovereign Credit Risk.
- K Global Footprint Network (2016), Carbon Disclosure and Climate Risk in Sovereign Bonds.
- L UNEP The Principles for Responsible Investment (PRI) Initiative (2013), Sovereign Bonds: Spotlight on ESG Risks
- M Ciocchini, F. Durbin, E. Ng, D. 2003, 'Does corruption increase emerging market bond spreads?' Journal of Economics and Business 55, 2003, 503–528

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Key contact

Dr. Steffen Hörter

Global Head of ESG

Allianz Global Investors GmbH
Bockenheimer Landstrasse 42
D-60323 Frankfurt am Main

Phone: +49 - (0) 69 - 24431 – 7704

Mobile: +49 - (0) 160 - 586 - 3302

Email: steffen.hoerter@allianzgi.com

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