

# White Paper

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## The impact of ESG investing in corporate bonds

We investigate the relationship between ESG (Environmental, Social and Governance) scores and characteristics of corporate bonds issuers.

After a brief overview of, and rationale for, ESG investing, we examine the main investment implications in fixed income, focusing on corporate bond issuers, and investigate the impact of ESG factors on fixed income portfolios.

The paper then aims to establish empirically whether ESG characteristics can be considered an additional, independent risk factor with respect to traditional fixed income factors. To this end, we take ESG scores in combination with traditional investment metrics such as issuer financials, default probability, liquidity measures and spread performance.

Our findings show that integrating ESG characteristics beyond pure financial data in corporate bond portfolio can add value by both improving performance and reducing returns volatility.

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# The rationale for ESG

Environmental, Social and Governance (ESG) issues are becoming a focus area in the investment community. The idea that capital should be deployed not only based on financial considerations but also with a bias towards companies that take sustainability considerations into account is no longer an abstract concept.

Early steps into these ideas go back to 2006, when the United Nations-sponsored Principles for Responsible Investment (PRI) was launched. The six principles have since become the standard for sustainable investments, and the PRI now has over 1,100 signatories, representing over 70 trillion USD of assets under management.

Motivations to embrace ESG include:

- An alignment of interests between stakeholders, avoiding short-termism in favour of long term incentives.
- Mitigating risks associated with poor social and environmental practices that could have the potential of permanent loss in capital. The main examples are fines, loss of current license and potentially future contracts from pollution, loss in working hours due to poor working conditions, not having the right skillset due to lack of employee, senior management and board diversity, fines and loss of license to operate due to corruption and bad governance practices leading to poor decisions made for the company.
- Increasing the transparency of how money is invested both in the interest of the beneficiaries and the whole financial eco-system.
- Aligning investment practice with social responsibilities and principles, which is increasingly important with the growth of younger generations of capital owner.

Financial data such as accounting statements often do not provide the level or type of information needed to make sure the above objectives are appropriately considered. However, as ESG has become more mainstream a set of alternative measures are increasingly becoming available to assess the ESG profile of the issuers, complementing more traditional financial metrics. These ESG measures can help highlight risks that could materially impact investment performance.

In Table 1 we list some of the most popular ESG factors as [listed by the PRI](#). This is far from an exhaustive list in a rapidly evolving investment landscape.



Table 1: Commonly recognised ESG factors

<b>Environmental</b>	Climate change Carbon emissions Resource depletion, including water or deforestation Waste production and pollution
<b>Social</b>	Working conditions, including slavery and child labour Local communities, including indigenous communities conflict Health and safety Employee relations and diversity
<b>Governance</b>	Executive pay Bribery and corruption Political lobbying and donations Board diversity and structure Tax strategy

The first iterations of ESG investment strategies took a rather blunt approach to sustainable investing, by excluding 'controversial' sectors such as tobacco and gambling, or by aiming to deliver a particular benefit or impact<sup>1</sup>. Further iterations have become more sophisticated and often make quantitative assessments of the main ESG metrics. It is now possible to apply ESG considerations across a much broader set of investments and portfolios; ESG has become part of the toolkit available to the capital allocator.

In a nutshell we think the ultimate objective of ESG is to measure and control the risk of what economists call 'negative externalities' or even, in some cases, create positive externalities, using capital markets to incentivise companies to change their modus operandi<sup>2</sup>. An example of such positive incentives and externalities are green bonds, which are issued specifically to finance sustainable projects (e.g. renewable sources, improving waste recycling). Issuers, on their part, benefit from a more diverse investor base, and, at times, from cheaper borrowing costs amid increasing demand from dedicated investors.

1. Controversial industries are usually excluded in the so called Socially Responsible Investing (SRI).

2. In economics a negative (positive) externality is the cost (benefit) that affects a party who did not choose to incur that cost (benefit). For example manufacturing activities that cause any form of pollution impose costs on the whole society that may not be immediately recognised.

# ESG investing in Fixed Income

We consider ESG investing in corporate bonds in the context of factor investing. Factor-based equity investing (sometimes referred to as Smart Beta) is a well-established area of interest in the equities world, but has recently gained traction in fixed income. Market factors such as value, quality, low volatility, momentum and size are well studied by both academics and practitioners. They cannot simply be assumed to represent the factor structure of the fixed income market.

Early attempts to identify relevant fixed income factors were made by Fama and French<sup>3</sup>, who found default and term premia to be the two main drivers for/of fixed income. Today, practitioners attribute fixed income performance to two broad sets of factors, labelled more generally as interest rate and credit risk. The interest rate factor is dominated by the level of the interest rate curve and to a lesser extent from how the shape of the curve changes<sup>4</sup>. The credit factor is typically associated with default and liquidity risks, which explain a large part of corporate bond excess returns over government bonds<sup>5</sup>. The corporate bond default factor can be considered as similar to the quality factor in equities. It can be measured leveraging the long-term data time series on creditworthiness and default risk provided by credit rating agencies such as Moody's and S&P.

ESG incorporation in a traditional investment process can be a powerful tool when it comes to evaluating creditworthiness of corporate issuers and to improve the value vs. quality trade-off between issuers. Traditionally, practitioners refer to valuation indicators when assessing the price versus quality, to identify mispriced securities. Such indicators are usually obtained by regressing corporate bond spreads against the sector, rating and seniority of an issuer for a given maturity. Cheap bonds should exhibit a higher spread compared to peers once adjusted for quality. We will investigate whether we can consider these measures to be complementary or alternative to ESG in the third part of this paper.

Furthermore, at the time of writing there is already evidence that ESG is becoming directly or indirectly associated with the quality of issuers. It is not surprising to see the cost of capital being more directly tied to ESG performance<sup>6</sup>. Goldman Sachs recently reported that there are four publicly disclosed cases of banks directly linking loan margins to corporate ESG performance, via third-party independent ESG scores. In line with our previous thinking, there is already evidence that ESG is directly impacting credit ratings<sup>7</sup>. S&P Global Ratings recently reported that there were 106 cases between July 2015 and August 2017 where environmental and climate concerns resulted in a rating impact (either positive or negative). S&P Global Ratings highlighted that ESG factors are a complement to traditional forecasts related to the issuer's fundamentals and can be used to assess longer term risk beyond those forecast periods.

The impact of ESG factors on financial performance has been extensively studied in equities<sup>8</sup>; most studies indicate a positive relationship between the two. Literature in fixed income is also growing, in line with data availability, and the impact of ESG on corporate bond portfolios is now becoming a popular theme among practitioners and academics. A full review of the literature is beyond the scope of this paper, but highlighting some of the results already published elsewhere serves to provide a good ground from where to begin our analysis.

The latest evidence suggests that accounting for ESG characteristics can improve bond performance<sup>9</sup>. Barclays analysed the performance of ESG scores from two major independent providers – MSCI and Sustainalytics. They found that bond portfolios constructed with an ESG tilt outperform the market, generating positive excess returns. Overweight high ESG versus low ESG issuers during the sample period (August 2009 – April 2016) also delivered superior risk adjusted returns according to this study. The improvement in the information ratio was mostly due to the 'Governance' ('G') factor, which was by far the most statistically relevant when compared to the 'E' and 'S'.

3. Fama, E., and K. French, 1992. The cross-section of expected stock returns, *Journal of Finance* 47 (2): 427-65.

4. Litterman, R. and J. Scheinkman (1991). Common factors affecting bond returns, *Journal of Fixed Income*, vol. 1, No. 1, Pp. 54-61.

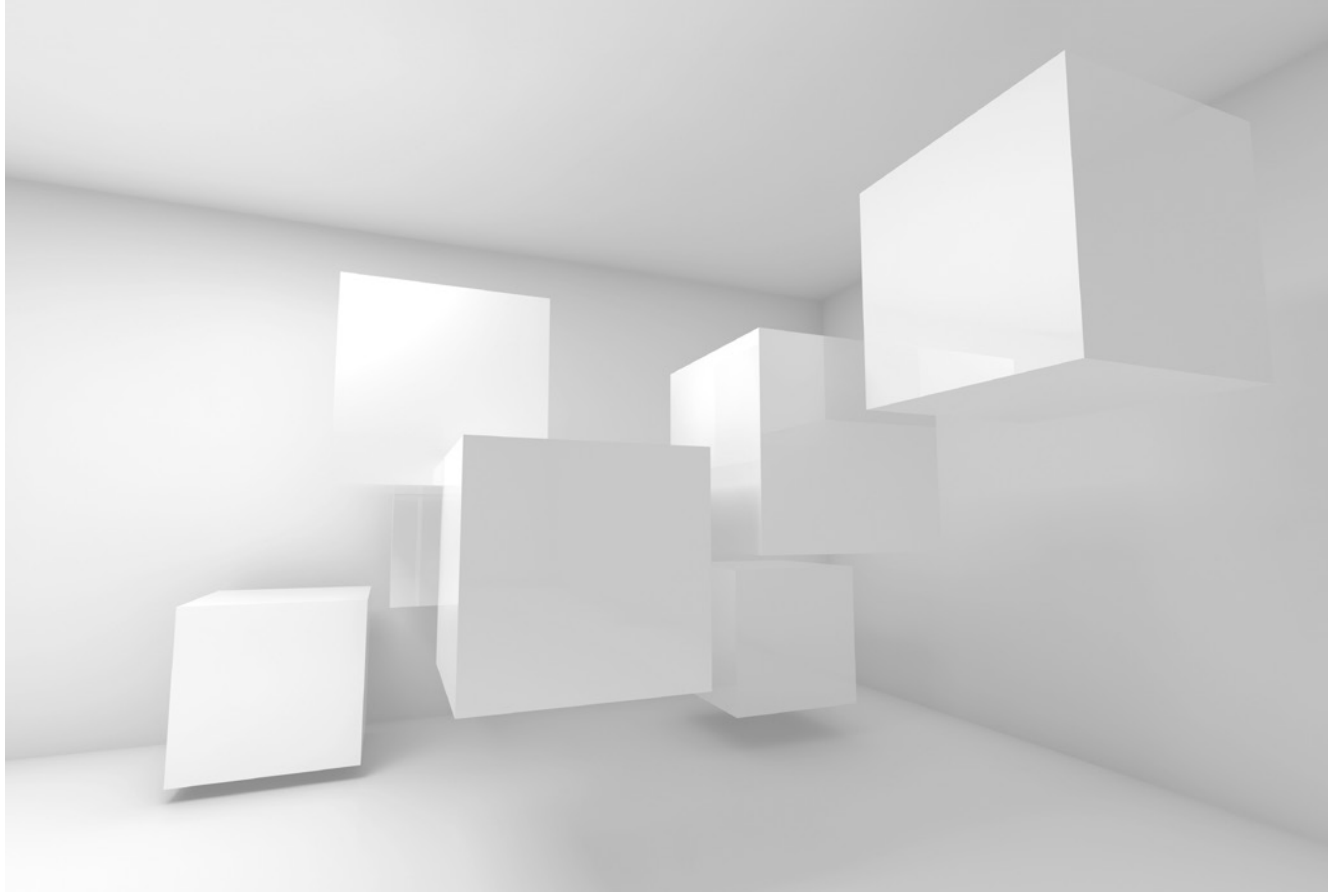
5. Elton E., Gruber M., Agrawal D., and Mann M. Explaining the rate spread on corporate bonds. *The Journal of Finance*, Vol. LVI, No. 1, February 2001.

6. GS Sustain ESG Series. A Revolution Rising – From low chatter to loud roar

7. S&P Global Ratings, How Does S&P Global Ratings Incorporate Environmental, Social, And Governance Risks Into Its Ratings Analysis, Nov, 2017

8. Friede, Busch, & Bassen. (2015). ESG and financial performance: aggregated evidence from more than 2000 empirical studies. *Journal of Sustainable Finance & Investment*.

9. Dynkin, Desclée, Hyman, Polbennikov. (2016). ESG Investing in Credit Markets. Barclays.



While ESG is becoming a recognised and topical framework, active bond managers have for a long time considered sustainability factors in their investment decisions, even if they weren't labelled that way. Credit analysts have always focused on what we would today call ESG data when evaluating a company's credit worthiness. For example, corruption risks, governance structure and the potential for negative externalities stemming from poor environmental policies or bad social practices have been at the core of credit research for many years. This should not be surprising when considering the basic principles of fixed income investing. A corporate bond investor is subject to an asymmetric return profile where the tail risks associated with a falling bond price for distress or default is larger than the upside coming from the income generated by the coupon<sup>10</sup>.

To mitigate risks that come from negative externalities, it is therefore natural for a bond investor to emphasise – directly or indirectly – ESG factors when deciding where their capital is allocated. As a subordinated lender, fixed income investors have a unique exposure to the bad behaviour of a company. A fixed income investor will be exposed to downside risks related to legal and reputational events, but will only have a marginal exposure to any upside resulting from the unethical behaviour of the issuer. This asymmetry can result in a lower rating by rating agencies at an individual security level. Evidence from Barclays shows that companies with a lower ESG scores have a higher likelihood of a rating downgrade than companies with a higher ESG scores<sup>11</sup>. This asymmetric risk is also seen in our results and we highlight several metrics where the relationship is evident but non-linear, i.e. it is mainly the companies with the very worst ESG profile that should be avoided. This result has interesting implications on how ESG is implemented in portfolios. Removing just a small portion of the worst offenders may deliver most of the ESG benefits without impacting alpha generation or diversification.

When initially assessing ESG's relevance for fixed income, a common question is whether we can consider ESG as a separate factor. For this to be the case, in our opinion, it would need to satisfy two conditions, orthogonality to other fixed income factors and additional performance.

A more detailed analysis follows in the rest of the paper. Whilst there is some evidence of both performance and low correlation, we expect this to be an area of increased interest in the near future, with more studies and statements becoming available as data availability improves. We intend to follow this paper with a more detailed investigation into orthogonality of an ESG factor and how these relationships have changed over time given the increased prominence of ESG investing.

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10. There are some exceptions, of course, when we look at distress bonds investing where the distribution of returns is more symmetric.

11. Dynkin, Desclee, Hyman, Polbennikov (2016). ESG Investing in Credit Markets. Barclays.

# An empirical study of ESG scores

## 3.1 Initial considerations and scope of the analysis

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In this paper, we will assess whether ESG scores can complement existing factors such as spread levels and performance, corporate fundamentals, default probability, corporate bond liquidity and volatility.

## 3.2 Empirical study setup

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The empirical analysis that follows is based on a cross sectional comparison of ESG data versus a range of relevant company statistics such as fundamentals, liquidity, valuations and volatility. The study uses a cross section of data from year end 2017. We intend to expand this study to include a longer time series of data in the near future.

The ESG data we use is sourced from Sustainalytics<sup>12</sup>. The results are broken down in four scores

- ESG: This is the overall ESG score provided by Sustainalytics.
- E: Environmental score.
- S: Social score.
- G: Governance score.

Sustainalytics' overall ESG Score is a quantitative score on a scale of 1-100. The Overall ESG Score is derived from the sum of the weighted average of underlying indicator scores.

We split the global credit universe (defined by ICE BofAML Indices) into quintiles for each of these four scores and then calculate the median of a chosen metric for each score in each quintile to assess the relationship between ESG scores and a given metric.

## 3.3 Overview of data sources

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In our study, we will use of the following data of corporate debt issuers: spreads, corporate financials, equity implied volatility, transaction costs, trading volume, ESG scores and corporate ratings.

We measure spread as the 5-year senior cash bond spread over a cash government benchmark. The 5-year cash bond spread is calculated by interpolating the 5-year point on the cash OAS (option adjusted spread) curve for each issuer. The OAS curve for each issuer is created using ICE BofAML index data and is fitted using a Nelson-Siegel parameterisation. We use a 5-year cash bond spread to enable spread comparison across issuers.

We use a time series of this spread to calculate performance and volatility metrics used in the analysis. (source: ICE BofAML Indices, Fidelity International).

The fundamental financial metrics are derived from Factset Fundamental Dataset using our own calculations. We use an adjusted net debt calculation that considers the funded status of the pension fund as well as adjusting for operating leases using an average multiple of eight. Leverage is calculated as

$(\text{Debt-Cash-Pension Funded Status}-8*\text{Operating Lease Expense})/(\text{EBITDA from Operations})$

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<sup>12</sup> Sustainalytics is an independent ESG and corporate governance research, ratings and analytics firm. For more information about the ratings methodology visit [www.sustainalytics.com](http://www.sustainalytics.com).

Dividend Yield and Sales are used as given by Factset and EBITDA (Earnings before Interest, Tax, Depreciation and Amortisation) margin is calculated as EBITDA from operations over Sales (source: Factset, Fidelity International).

Implied equity volatility is the 3-month at-the-money implied volatility on the listed equity issuer (source: Fidelity International, Bloomberg).

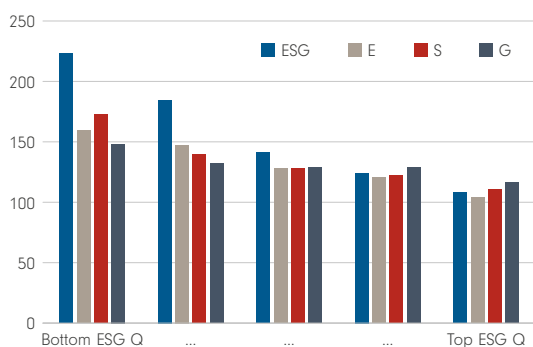
The Bid-Ask metrics are calculated by averaging daily quotes provided by brokers. (source: Fidelity International, Bloomberg).

The volume metrics are calculated using data provided by TRAX and TRACE. We combine different providers to get as much coverage as possible across our investment universe (source: TRAX, TRACE).

## 3.4 Empirical study results

### 3.4.1 Spreads

#### 5 year cash spread (BPS)



We find a monotonic relationship between the ESG score of a company and the 5-year cash bond spread. Companies with a higher ESG score are associated with a lower credit spread. The result shows that on average the market requires less compensation for risk in companies that have better ESG credentials, with investors already pricing ESG related risks.

As discussed in section 2 we believe that ESG factors have long been a consideration of fixed income investors, who charge companies a higher interest on debt if they have poor ESG credentials.

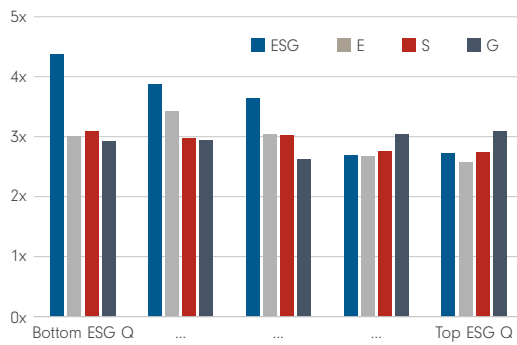
This shows that companies with a lower ESG score could lower their cost of debt financing and WACC (weighted average cost of capital) if they were to improve their ESG credentials.

### 3.4.2 Financial metrics

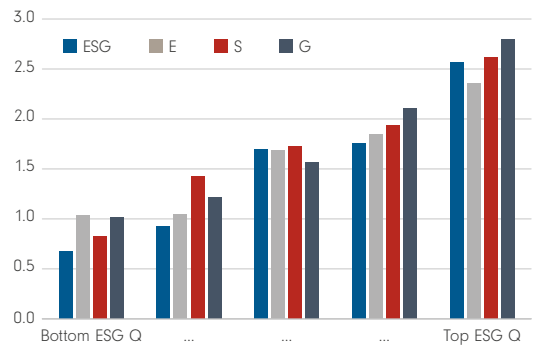
We find a relationship between company financials and their ESG scores. We see that companies with higher ESG scores tend to have:

- Lower Leverage
- Higher Sales (as they are generally larger companies)
- Higher Dividend Yields
- Similar Margins

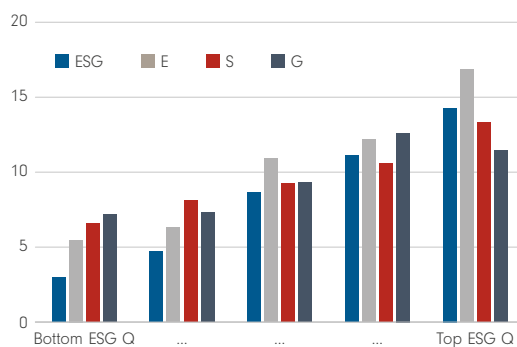
### Leverage (Net Debt to EBITDA)



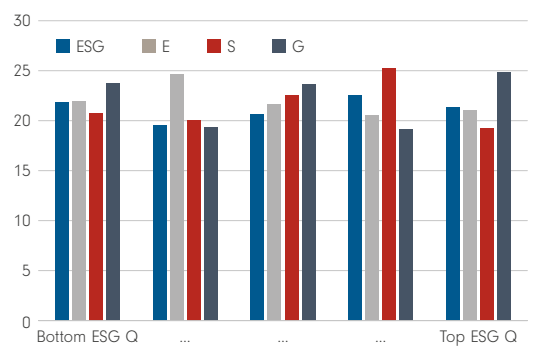
### Dividend yield (%)



### Sales (USD, Billions)



### EBITDA margin (%)



To explore these findings further: companies with higher ESG scores tend to have a lower leverage (measured as Net Debt to EBITDA, adjusted for pension deficits and operational leases). This can be linked to the default factor in fixed income. Leverage is an important measure when evaluating the default risk of a fixed income issuer, it is strongly related to the ability of an issuer to repay its obligations, with a higher leverage associated with a higher risk of default. The link between ESG and leverage therefore shows that ESG can be used as an additional factor when considering a company's ability to repay its obligations.

We find a strong relationship between the sales generated by a company and its ESG rating. This can be explained by considering sales as a proxy for company size. Larger companies generally have higher ESG scores. We attribute this to both the capacity and willingness of a company to improve its ESG profile. Firstly, smaller companies may not have the resources to produce policies and documentation related to ESG themes. Documentation is an important aspect in terms of evidencing a company's ESG credentials, and smaller companies therefore tend to score worse than larger peers on average. Secondly, the increased public profile that comes with being a large global corporation increases the pressure on a company to improve its social and environmental impact and governance credentials. We use sales as our primary measure of size but a similar relationship holds when using alternative measures such as the number of bonds issued, the amount of bonds outstanding or market weight in an index. In every instance, larger fixed income issuers tend to have higher ESG ratings.

The dividend yield is also strongly related to the ESG score of a company<sup>13</sup>. We find that a better ESG score is correlated with a higher dividend yield. The result is similar to the relationship with a company's size, as larger, more mature companies are more likely to be paying higher dividends. At the same time, it also shows a link between company returns, or cashflow generation, and its ESG profile.

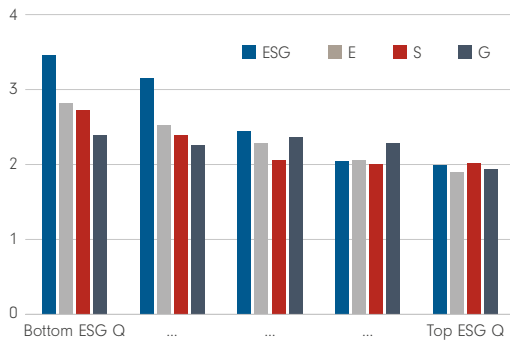
We also looked at EBITDA margin as a measure of the profitability of our fixed income issuers. On this metric, we see very little relationship between ESG score and profitability.

13. In our analysis, we have used the dividend yield of the equity issuer from Factset linked to the bond issuer using proprietary in-house fixed income to equity mapping.



### 3.4.3 Default probability

#### Default probability (%)



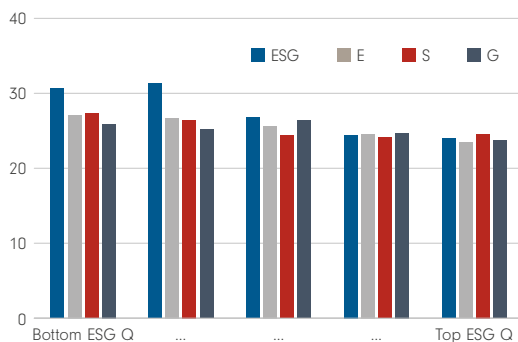
Empirical results show that companies with lower ESG scores tend to have a higher probability of default<sup>14</sup>.

Even more significantly, the lowest quintile of ESG companies have a default probability 1.5 times that of companies with the highest ESG scores. The relationship is also non-linear, with the companies in the worst quintile having a significantly higher probability than those in the 4th quintile.

This result has immediate implications in portfolio construction, and highlights the benefit of incorporating ESG in credit portfolios. A portfolio with a positive ESG bias will expose investors to a lower probability of default. Moreover, as it is the very worst ESG companies that have the highest likelihood of default, only these need to be avoided to mitigate downside risks. Excluding the worst ESG companies would achieve most of the improvement in lowering defaults risk whilst maintaining diversification and ability to add alpha, if in an active portfolio context.

### 3.4.4 Volatility

#### Equity implied volatility – 3 month 90% moneyness (%)



We find that higher ESG scores tend to have lower equity implied volatility, which is a measure of riskiness implied from equity options.

The result further supports the previous finding that better ESG-rated companies are, on average, perceived to be safer and less likely to default.

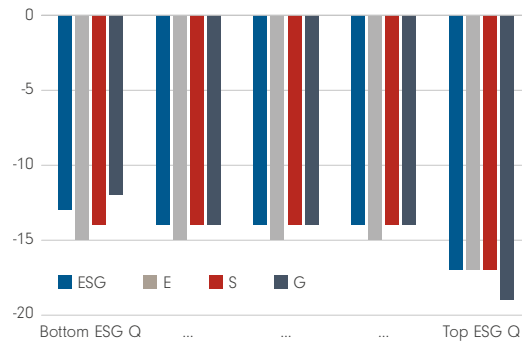
Both equity and fixed income markets are pricing better-rated ESG companies as lower risk companies with a lower discount rate.

14. How is the implied default probability calculated?

- We create a simple model based on implied equity volatility, leverage and profitability to estimate a market spread for each company.
- We use two regressions (one logarithmic and one linear) to achieve a superior fit and provide an estimated fair value spread per company. For low spreads, we use log and for high spreads we use linear, and we scale between the two for intermediate spreads. This methodology can be shown to fit the market pricing better than either a linear or log model alone due to the nature of spreads (been floored at zero and having higher sensitivity to changes in fundamentals when they are weak than when they are strong).
- This results in a R-squared of 78% between the market spread and our estimated fair spread.
- We then use this fair value spread to calculate an estimated default probability assuming a standard recovery rate of 40%.

### 3.4.5 Spread performance

#### Spread change (%)



We find that higher ESG-rated companies perform better on an excess return basis.

Our results show that over the last 12 months credit spreads of the best ESG-rated companies have tightened on average by ~20%, compared to around 12% for the worst ESG companies.

We use percentage spread change based on the DTS paradigm that implies percentage changes in spread should be similar across the risk spectrum and is therefore a fairer way to compare spread changes than using absolute change<sup>15</sup>.

Our result is static and refers only to the last 12 months. However, we also know from other studies such as Barclays that this outperformance has been reasonably persistent since 2009 (which is as far back as most studies go due to data limitations)<sup>16</sup>.

Our result also backs up Barclays' claim that governance is the most important ESG criteria for fixed income. As shown in the chart, 'Governance' has the best outperformance score in the top quintile and the worst score in the bottom quintile. This reinforces the importance of governance in fixed income. From our company engagement findings, companies with strong governance tend to have robust environmental and social policy. A company with strong environmental and social policy but a weak governance structure is questionable as in how the other 2 factors are managed.

### 3.4.6 Liquidity

Analysis of market liquidity in fixed income must account for two distinct aspects. Firstly, the cost of trading the instrument and secondly, the impact that a transaction may have on the market. The cost of trading is measured by the bid-ask spread. In our analysis, we take the bid-ask spreads of each bond as measured by the difference between the bid price and the ask price available from multiple trading venues. We then calculate an average bid-ask spread for each company by taking a simple average of the company's index-eligible bonds.

We find that better ESG-rated companies tend to have lower bid-ask spreads and are therefore cheaper to trade, a result that would benefit active ESG portfolios where turnover is higher and transaction costs can have a meaningful impact on performance.

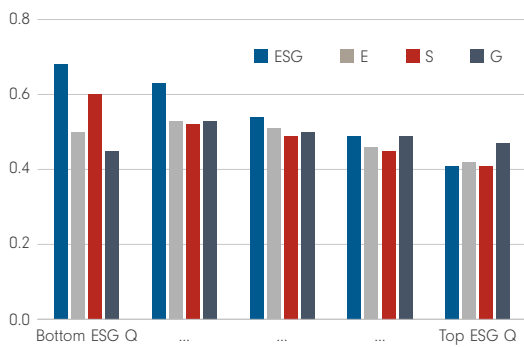
When looking at liquidity, volumes and market impact cannot be ignored. To assess the expected market impact, we measure the average daily trading volume for all index-eligible bonds in our analysis. The daily trading volume data is far from being a full dataset but it still provides a representative sample to assess market liquidity.

The results show that the volume traded in bonds issued by better ESG-rated companies is lower than for worse-rated names. This contrasts in part with the previous result on liquidity using bid-ask spreads, as although outright transaction costs are lower, the amount it is possible to trade without affecting the market is lower. We find evidence of statistical significance on both findings, as discussed at the end of the empirical results.

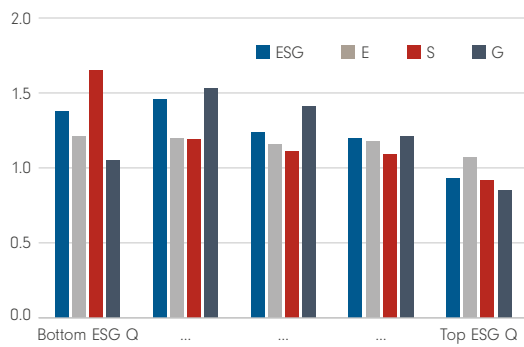
15. A widely adopted risk measure in fixed income corporate bonds, originally proposed in 'DTS (Duration Times Spread)' Dor, Dynkin, Hyman, Houweling, Leeuwen & Penninga 2007.

16. Dynkin, Desclee, Hyman, Polbennikov (2016). ESG Investing in Credit Markets. Barclays.

**Bid-ask spread (%)**



**Average daily volume (MM USD)**



Overall, we think that these relationships make sense on two counts. Firstly, the larger, less volatile companies with higher ESG ratings are bigger issuers in the bond market, and trade with lower transaction costs as it is easier for market makers to transfer the risk and there is less chance of large moves in these names.

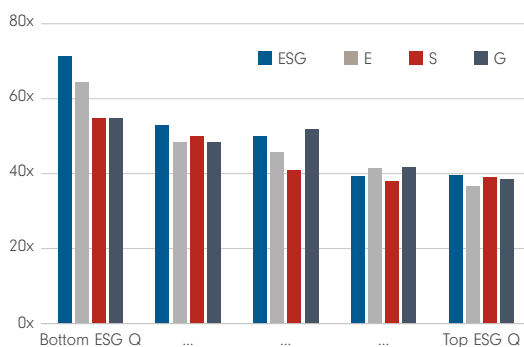
Secondly, the worst ESG-rated companies have a higher risk of downside price moves and event risk due to a higher news flow. These two elements drive market volumes due to market participants trading around corporate events or having to sell after downgrades, partially explaining the inverse relationship between volumes and ESG ratings.

**3.4.7 Orthogonality vs classic relative value measures**

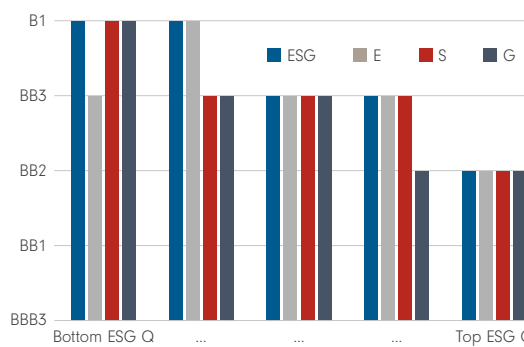
The debate over whether ESG is a ‘factor’ is becoming more prominent given the growing interest in the topic and the proliferation of fixed income ESG portfolios. We contribute to the debate by analysing whether the addition of a specific ESG element in a fixed income portfolio can offer an exposure which has a low correlation to (and is therefore complementary to) that of traditional fixed income factors.

Firstly, we look at spread per unit of leverage (SPL). This is a simple valuation measure, widely used among fixed income practitioners, which assesses the amount of spread investors receive as compensation for each turn of leverage. We use the 5-year cash spread and Adjusted Net Debt to EBITDA to make comparisons.

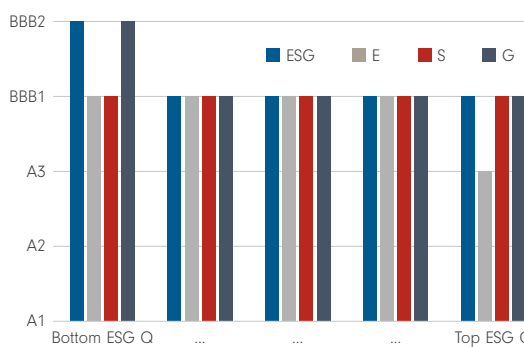
**Spread per leverage**



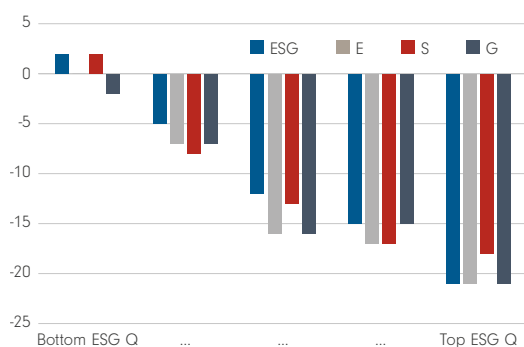
**Credit rating (high yield only)**

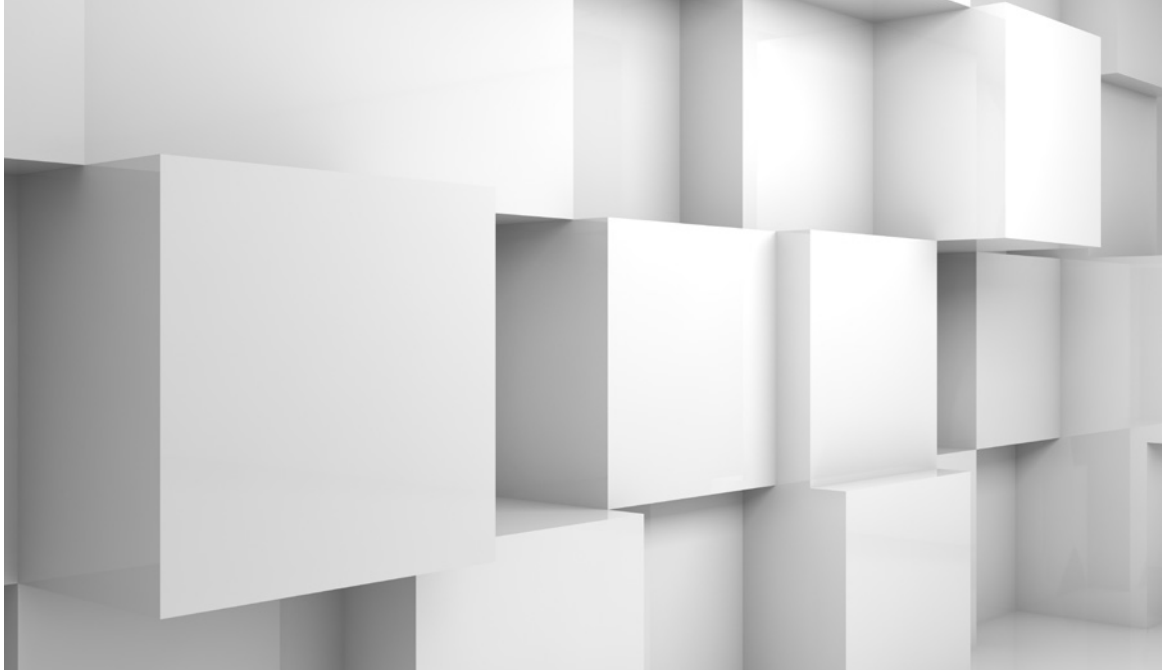


**Credit rating (investment grade only)**



**Valuation score – industry and rating (%)**





Our results show that ESG ratings are inversely proportional to an SPL valuation score which suggests that ESG is uncorrelated to a common relative value metric.

Secondly, we look at a default factor and take an external credit rating as our measure of default risk, using the average rating from the three main rating agencies Moodys, S&P and Fitch. We also choose to split the results between investment grade and high yield.

In High Yield, results show a bias, where the top ESG quintile has a better average default risk rating than the bottom. In Investment Grade, we see a lower correlation between default risk and ESG when we look at the quintiles analysis, but it is still statistically significant when we look at the full distribution, as discussed later in the paper.

Finally, we look at the relationship to a simple valuation score. We create a valuation score using a combination of rating and industry.

This score describes whether the spread is cheap given its rating and industry. A positive score means it is cheap for its rating. Negative scores mean they are expensive.

We find that better ESG scores are correlated with lower valuation scores, adding further evidence that ESG is uncorrelated to traditional fixed income factors.

### **3.4.8 Summary statistics**

In this section we discuss the significance of the relationships examined in the empirical study, both outright and in relation to one another. We run a linear regression for each of our variables against ESG scores as well as E, S and G scores separately. Table 2 shows the R squared (which defines how good the fit is) and the t-statistics (which defines the significance of the relationship) for each of our variables.

All the variables we examine are significant on at least one ESG parameter. The only exception is EBITDA Margin which we highlight above as having no relationship with ESG scores. This is backed up by the statistics in Table 2.

Cash spread is very significant and has one of the highest R squared measures. Along with default probability and volatility, it is one most consistently significant metrics across all four ESG categories (ESG, E, S and G). These are all market-related variables, which shows that the market-related metrics are more strongly correlated to ESG scores than fundamental metrics. Or that the market is already considering the ESG profile of a company when considering what to charge for capital (both equity and debt).

Net Debt to EBITDA is only significant when compared with governance scores and has a low R squared overall. In the financial metrics section (3.4.2) we highlight the change between the 4th and 5th quintile of ESG scores and leverage, this flat relationship for most quintiles and strong relationship for just the lowest quintile would not be captured in our linear regression here so it is not surprising that the significance is weak.

These results broadly confirm the findings of the quintile study, showing that several metrics are indeed related in a statistically significant way with ESG scores. We find that the relation is showing a link with a quality assessment of the credit issuer. We also find an inverse relationship, albeit statistically weak, with SPL and valuation scores, highlighting the potentially good diversification properties of ESG scores.

Table 2: Summary statistics of linear regressions

	R Squared				T Statistic			
	ESG	E	S	G	ESG	E	S	G
<b>5 Year Cash Spread</b>	8.51%	6.86%	7.81%	2.41%	-9.09	-8.09	-8.67	-4.68
<b>Net Debt to EBITDA</b>	0.38%	0.42%	0.01%	0.93%	-1.84	-1.93	-0.28	-2.86
<b>Dividend Yield</b>	3.43%	1.78%	2.74%	3.46%	6.11	4.37	5.45	6.14
<b>Sales</b>	0.90%	3.19%	0.19%	0.16%	3.14	5.97	1.44	-1.30
<b>EBITDA Margin</b>	0.15%	0.81%	0.03%	0.01%	-1.13	-2.68	0.54	0.32
<b>Default Probability</b>	7.38%	6.39%	5.29%	3.75%	-6.48	-6.00	-5.42	-4.53
<b>Equity Volatility</b>	4.53%	3.73%	3.26%	2.11%	-5.73	-5.17	-4.82	-3.86
<b>Spread Change % 12 Months</b>	1.13%	0.23%	2.18%	0.32%	-4.32	-1.92	-6.03	-2.28
<b>Bid Ask</b>	0.75%	1.01%	0.85%	0.00%	-3.01	-3.51	-3.21	0.12
<b>Volume</b>	0.75%	0.05%	1.87%	0.29%	-3.59	-0.91	-5.67	-2.23
<b>SPL</b>	0.43%	0.00%	0.98%	0.28%	-1.92	-0.20	-2.92	-1.56
<b>Rating HY</b>	6.77%	2.59%	8.93%	3.79%	-5.47	-3.31	-6.22	-4.03
<b>Rating IG</b>	2.70%	3.01%	4.54%	0.01%	-6.10	-6.50	-7.99	0.37
<b>Valuation Score</b>	1.27%	1.56%	0.31%	0.57%	-4.72	-5.23	-2.30	-3.16

## Conclusions

Evidence from our studies in corporate bonds across investment grade and high yield suggests that ESG leaders tend to have lower spreads, stronger financial metrics and a lower implied probability of default; furthermore, they exhibit lower volatility and better performance in our sample versus ESG laggards. We have also highlighted that lower trading costs seems to apply to those issuers with stronger ESG profiles despite, on average, a lower volume being traded in the market, probably driven by lower probability of the companies being in the news for the wrong reasons.

There is insufficient data to conclude whether ESG is an independent factor or not and further work is needed to make stronger statements. At the time of writing there are a variety of ways to measure ESG scores amongst providers and practitioners, so not all approaches will necessarily produce the same results. We aim to produce additional research in this field and revisit some of these questions with a follow-up paper, once a larger dataset becomes available.

We conclude, for now, that ESG can be a good complement to traditional factors used in fixed income. We find evidence of weak relationships, or sometimes moderate correlations, with other characteristics like a company's credit rating, spread per leverage and valuation. Our conclusion is that including an ESG tilt can improve classic measures of default risk in a portfolio and reduce default risk ex-post. We find this both consistent from a theoretical point of view and with our empirical study.

Our study supports the idea that the integration of ESG consideration into credit investing can offer some diversification versus other traditional factors and that ESG can be a useful extension in fixed income investing where tail risk control can be an important part of the investment objective.

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