Are ESG Alpha and Beta Benefits in Corporate Bonds a Mirage?

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Abstract

Employing linear and non-linear techniques for assessing the relationship between ESG factors and future returns and risks on an out-of-sample basis, we find that the best and worst quintile portfolios ranked on their ESG scores were statistically significant in generating alpha and reducing beta for equities in Australia and the US, but not for those located in Europe and Japan. In the US corporate bond market, which has the largest available data-set, we can identify no statistically significant effects on alpha (in the CAPM sense), but ostensibly significant beta reduction benefits. Importantly, however, we demonstrate that better (worse) ESG scores are associated with superior (inferior) credit ratings, which is known to decrease (increase) beta. In order to investigate the marginal effect of ESG scores, we construct quintile-based portfolios with similar characteristics along the three major dimensions that affect a bond's risk and return profile, namely its credit rating, the issuer's industry and the time to maturity (or call). After equalising the industry, tenor and rating composition of the five portfolios, we find that ESG factors do not significantly contribute to positive alpha in the bond market. In fact, the best social quintile portfolio has statistically significant negative alpha; though given the non-monotonicity of the results and the multiple applications of confidence interval tests without multiplicity adjustments, we cannot conclude in favour or detriment to ESG effects on alpha. More importantly, however, once we adjust for credit rating and industry factors, we find that the previously observed beta-reduction benefits of ESG factors are no longer significant. In fact, the best environment and social quintiles have significantly higher beta, which is undesirable. In addition, better total ESG quintiles have betas that are nearly monotonically increasing and almost significant, which is again, undesirable. While ESG factor analysis is an important part of any investment process, participants need to understand the strengths and weaknesses of ESG scores. Future research should continue to explore these relationships as ESG measurement techniques improve.

Keywords: ESG; Equities; Bonds; Factor; Alpha; Beta

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1. Executive Summary

A recent trend amongst retail and institutional investors has been the desire to construct portfolios that are compliant on an environmental, social and governance (ESG) basis. But this begs the question as to whether ESG factors have any relationship with future risk and return. Put differently, can ESG drive alpha and/or reduce beta? While there is a growing literature on the value of ESG factors (see Bektic (2017)), this paper presents alternative out-of-sample methods for isolating these relationships and considers both equities and corporate bonds in a global context.

Leveraging off one of the world's leading ESG score providers available via Bloomberg, we initially find that ESG factors are not statistically significant in linearly predicting future equity alpha after controlling for market and industry betas on an out-of-sample basis for companies based in Australia, the US, Europe and Japan.

Our research is subsequently expanded to investigate non-linear relationships between ESG factors and future performance by examining quintile-based portfolios using the Capital Asset Pricing Model (CAPM) framework. Adopting this approach, we find that the best and worst ranked quintile portfolios on their ESG scores were statistically significant in generating alpha and reducing beta, out-of-sample, for companies in Australia and the US, but not for those located in Europe and Japan. Within the ESG scores, we found that the "governance" factor is by far the best predictor of future returns and risk, in Australia, the US and Europe.

In Section 3 we study the relationship between ESG factors and future corporate bond performance, focussing on the US market where the best available TRACE data exists. Employing a similar quintile-based portfolio and CAPM method, we find no statistically significant effects on alpha (in the CAPM sense), but ostensibly statistically significant beta reduction benefits.

Importantly, however, we demonstrate that better (worse) ESG scores are associated with superior (inferior) credit ratings, which is known to decrease (increase) beta.

In order to investigate the marginal effect of ESG scores, we construct quintile-based portfolios with similar characteristics along the three major dimensions that affect a bond's risk and return profile, namely its credit rating, the issuer's industry and the time to maturity (or call). After equalising the industry, tenor and rating composition of the five portfolios, we find that ESG factors do not significantly contribute to positive alpha in the bond market. In fact, the best social quintile portfolio has statistically significant negative alpha; though given the non-monotonicity of the results and the multiple applications of confidence interval tests without multiplicity adjustments, we cannot conclude in favour or detriment to ESG effects on alpha.

More importantly, however, once we adjust for credit rating and industry factors, we find that the previously observed beta-reduction benefits of ESG factors are no longer significant. In fact, the best environment and social quintiles have significantly higher beta, which is undesirable. In addition, better total ESG quintiles have betas that are nearly monotonically increasing and almost significant, which is again, undesirable.

We conclude that there is value in analysing ESG factors when considering individual investments in equities but less so in corporate bonds. There is a case for ESG alpha and beta benefits in the equity markets in Australia and the US, with governance by far the most important factor. We could not identify any objective ESG alpha or beta benefits in the corporate bond market, with ESG insights apparently already captured in companies' individual credit ratings.

While ESG factor analysis is an important part of any investment process, participants need to understand the strengths and weaknesses of ESG scores.

2. ESG Alpha in Equities

Our research question is whether there are any ESG indicators that can predict a company's future equity out-performance on an out-of-sample basis after controlling for various betas. We use one of the world's leading providers of ESG rankings sourced via Bloomberg. The ESG scores tested include environmental, social and governance factors, each of which is a rated out of 100 on a relative percentile distribution basis. The total ESG score is the aggregation of the three individual components. We also test an industry-adjusted ESG score, where the total ESG score is normalised against the industry, hence removing industry bias.

2.1 Method

Two different methods are adopted. The first involves cross-sectional regression analysis on a time-series basis. At monthly intervals, we take the cross-section of all equity tickers with ESG scores estimated by the third-party provider. We construct a linear regression model and use these ESG factors as independent variables in the regression to predict the future total equity returns over the subsequent 6, 12 and 18 months on an out-of-sample basis over the period 2010 to 2018. To control for other confounding beta variables, industry dummy variables were also included in the models, and the regressions were conducted independently in each geographic region. We test for regression coefficient sign and statistical significance. The regression form is given in Equation 1.

$$R_{im} = \beta + \beta_E E_i + \beta_S S_i + \beta_G G_i + \sum_{j=1}^{J} \beta_j I_{ji} + \varepsilon_i \quad (1)$$

Where

R_{im}	=	return of equity i in m months (out of sample)
β	=	market wide return (plus a constant regression offset)
$\beta_E, \beta_S, \beta_G$	=	Environment, Social and Governance regression coefficients
E_i, S_i, G_i	=	Environment, Social and Governance scores of equity i
I_{ji}	=	industry dummy variables
ε_i	=	residual which is assumed to be normally distributed

Our second method accommodates non-linearities using quintile-based (or five equally sized) portfolios of companies based on their ESG scores within the Australian, US, European and Japanese markets. We observe the monthly returns of these quintile-based portfolios and compare them against the returns of the relevant market benchmark.[1] We test whether the returns from the quintile-based portfolios are statistically significantly different to that of the benchmark, using both a bootstrap standard error estimation approach and the CAPM method (see Equation 2).

$$P_i - r_i = \alpha + \beta(M_i - r_i) + \varepsilon_i \quad (2)$$

Where

[1] The chosen equity benchmarks are the ASX 200, S&P 500, Nikkei 225 and the STOXX Europe 600

P_i = portfolio return in month i

M_i = market or benchmark index return in month i

r_i = risk free return in month i, taken from the 10-year government bond yield

α = Alpha coefficient in CAPM

β = Beta coefficient in CAPM

ε_i = residual for month i which is assumed to be normally distributed

2.2 Results

2.2.1 Rolling Cross-Sectional Regressions of ESG Scores on Future Equity Returns Over Time

The cross-sectional regression coefficients are shown below. There is no strong consistent pattern in the ESG regression coefficients, which implies that ESG factors are not reliable linear predictors of future equity returns. The percentage of months where the ESG coefficients are of the correct sign (ie, superior ESG scores correlating with higher returns) and of statistical significance are also tabulated below.

Figure 1

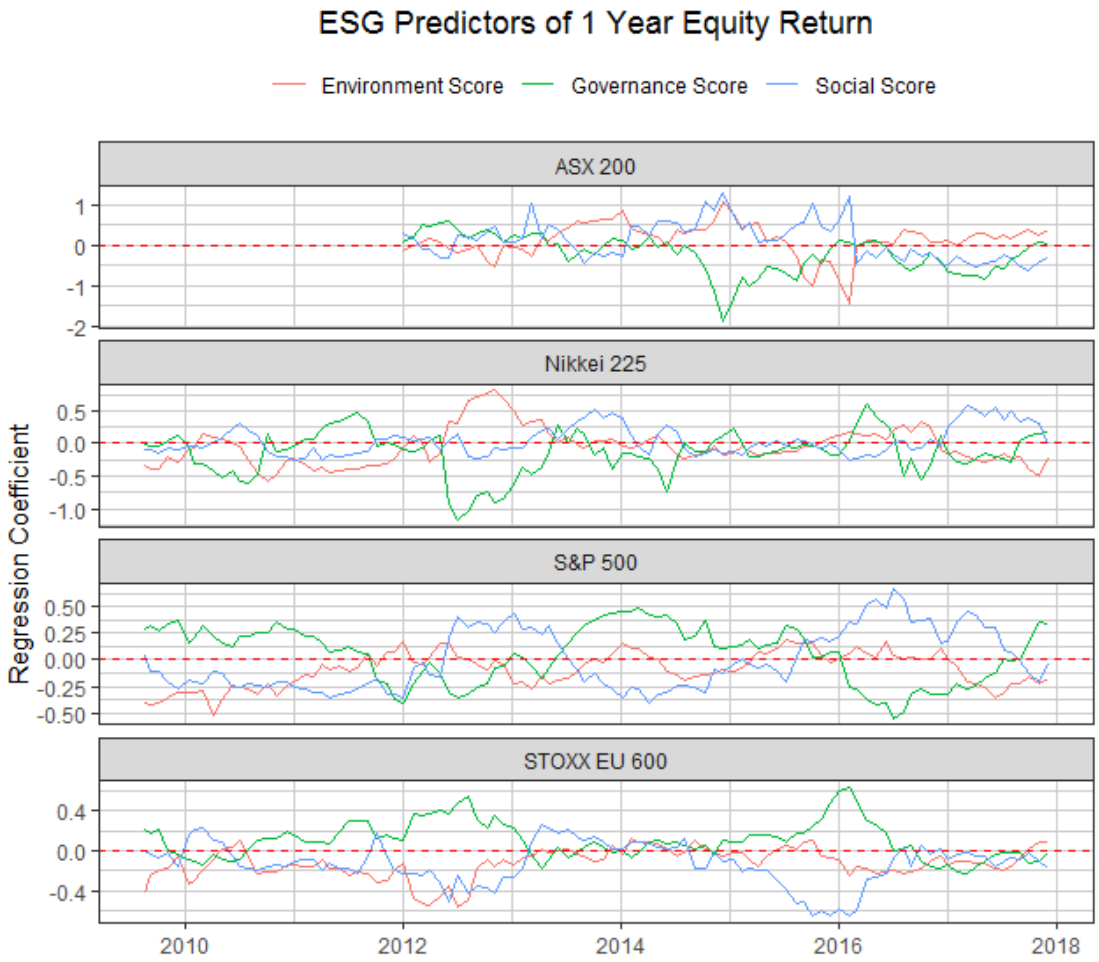


Table 1

Percentage of Months where ESG Factors are Statistically Significant Predictors (with the expected direction) of Future 6, 12 and 18 Month Equity Returns After Controlling for Industry and Geographic Betas				
Index	Testing Future Return Period (Months)	Environment - Percentage Significant	Governance - Percentage Significant	Social - Percentage Significant
ASX 200	6	5.6%	0.0%	1.4%
ASX 200	12	2.8%	0.0%	0.0%
ASX 200	18	4.3%	0.0%	0.0%
Nikkei 225	6	1.0%	0.0%	3.0%
Nikkei 225	12	1.0%	0.0%	4.0%
Nikkei 225	18	1.0%	0.0%	4.1%
S&P 500	6	3.0%	10.9%	12.9%
S&P 500	12	0.0%	17.8%	13.9%
S&P 500	18	0.0%	17.3%	13.3%
STOXX EU 600	6	0.0%	8.9%	1.0%
STOXX EU 600	12	0.0%	5.0%	0.0%
STOXX EU 600	18	0.0%	4.1%	0.0%

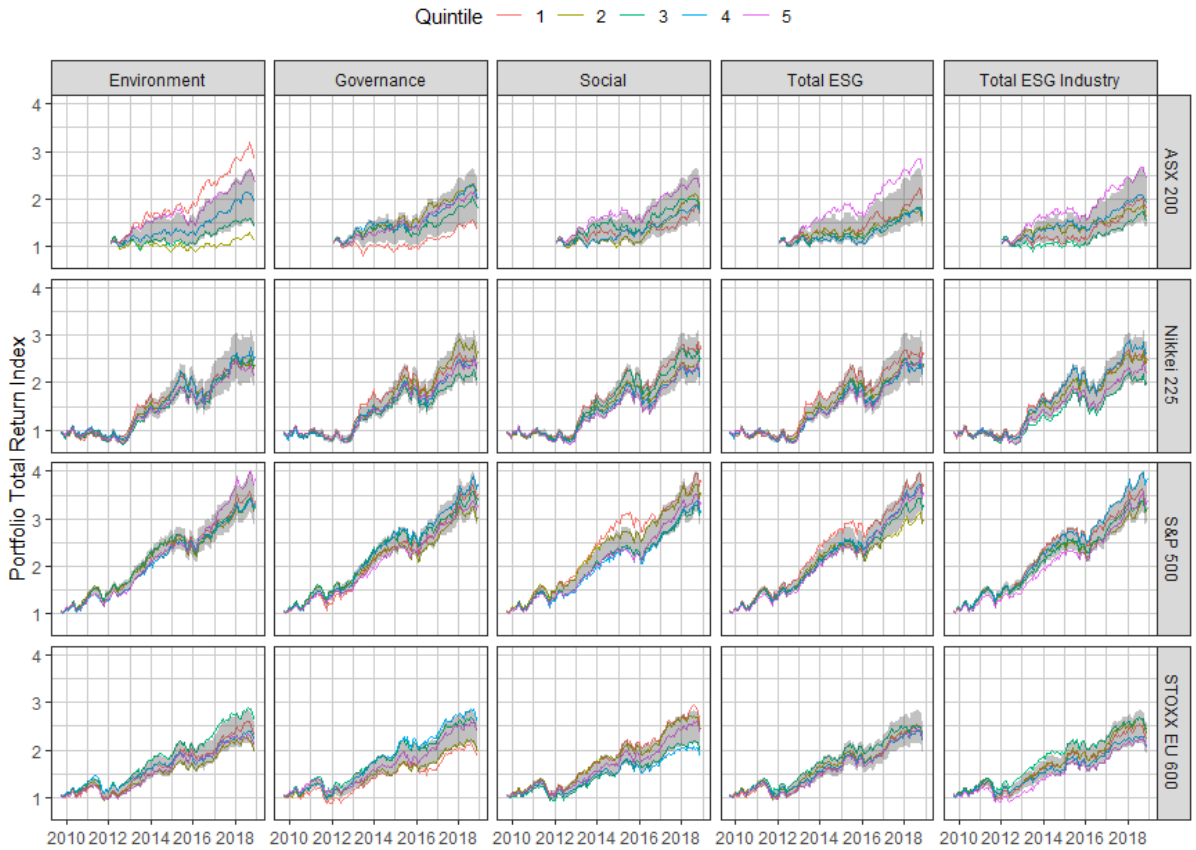
2.2.2 Performance of Quintile Based Rankings of Companies on ESG Scores vis-à-vis Indices

Figure 2 shows the total equity return indices that we constructed for each of the five ESG quintile-based portfolios (ranked from low-to-high in terms of ESG scores). The shaded area signifies the 95% confidence interval around the benchmark index return for Australia, Japan, the US and Europe. These confidence intervals were estimated using the bootstrap sampling approach, where many simulations of quintile portfolios were chosen randomly, allowing the 95% confidence intervals to be determined from their distribution. Key observations include:

- For companies in the US, Japan and Europe, it was difficult to find any evidence of ESG alpha, with most quintiles falling within the 95% confidence band around the index performance; and
- There was some evidence of ESG explanatory power for Australian companies. For example, the worst (first) quintile portfolio ranked on “governance” scores performed statistical-significantly worse than the benchmark, suggesting that poor governance is correlated with inferior equity returns. Similarly, the best (fifth) quintile portfolios ranked by their Total ESG score and Industry-adjusted Total ESG score performed significantly better than the benchmark index, implying that strong overall ESG results can contribute to alpha. Having said that, the results for the “environmental” factor are confounding, with the worst quintile out-performing benchmark, perhaps because of the dominance of the mining industry in Australia.

Figure 2

Total Return Index of ESG Signal Quintile-Based Portfolios



2.2.3 Capital Asset Pricing Model (CAPM) Analysis

The generalised CAPM model assumes that a portfolio return is a function of the individual company betas multiplied by the market return less the risk-free rate with the intercept capturing any unexplained alpha. This alpha is independent of the market beta and desirable (if positive). A beta less than one can be appealing insofar as it contributes to lower portfolio volatility. If ESG scores are alpha enhancing and/or beta reducing, one would expect to observe a monotonic relationship across the five quintiles ranked on ESG outcomes on a beta and/or alpha basis. The estimated alpha and beta coefficients using the CAPM and quintile-based framework are shown in Figures 3 and 4. Our key findings are as follows:

- **Environment Scores:** In all the indices, the "environment" factor gave either non-monotonic alpha or non-significant alpha. There is some weak evidence for superior "environment" scores having lower beta, but again the relationship is non-monotonic and statistically insignificant.
- **Governance Scores**: For the Australian, US and European markets, the "governance" factor gave nearly-monotonically increasing alpha that are also close to being statistically significant. In addition, the governance factor is statistically significant and mostly monotonically decreasing for beta (volatility). This suggests that the governance factor can be useful for equity investors in driving alpha and reducing beta.
- **Social Scores:** The case for "social" alpha is weak in all equity indices, though in Australia the alpha for the best social quintile is close to being statistically significant. On beta, the best social quintile had statistically significant lower beta in Australia and the US.

- **Total ESG:** The best total ESG quintile in Australia and the US had statistically significant alpha and beta, suggesting superior ESG firms performed better in return and risk terms. Similar results applied for the industry-adjusted total ESG score. These results were not, however, significant for the Japanese and European markets.

Figure 3

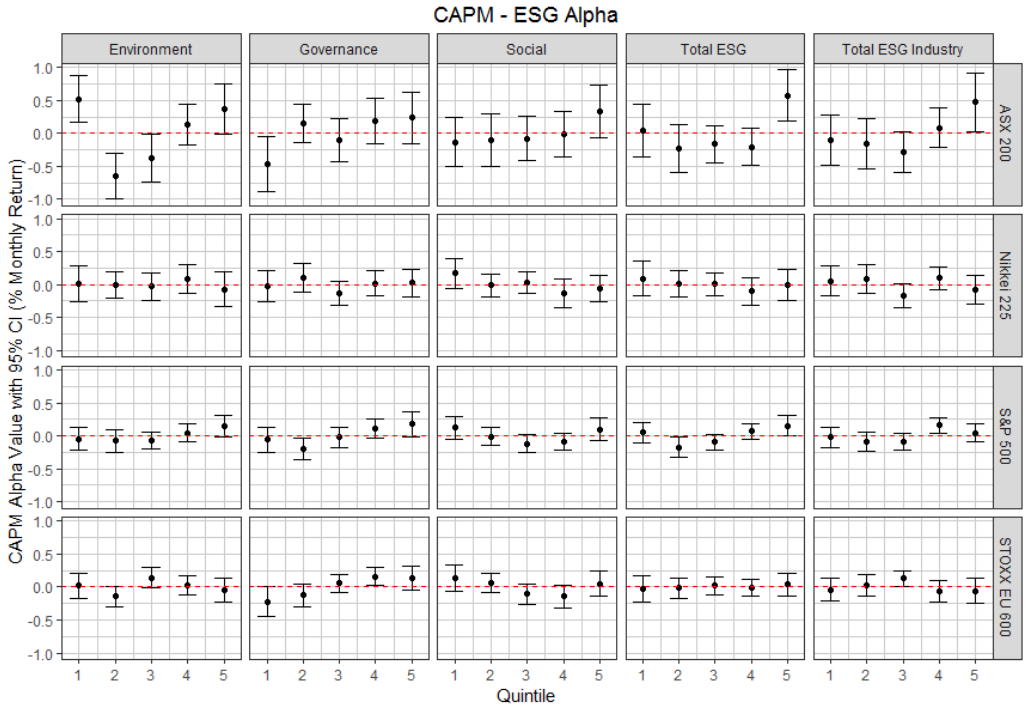
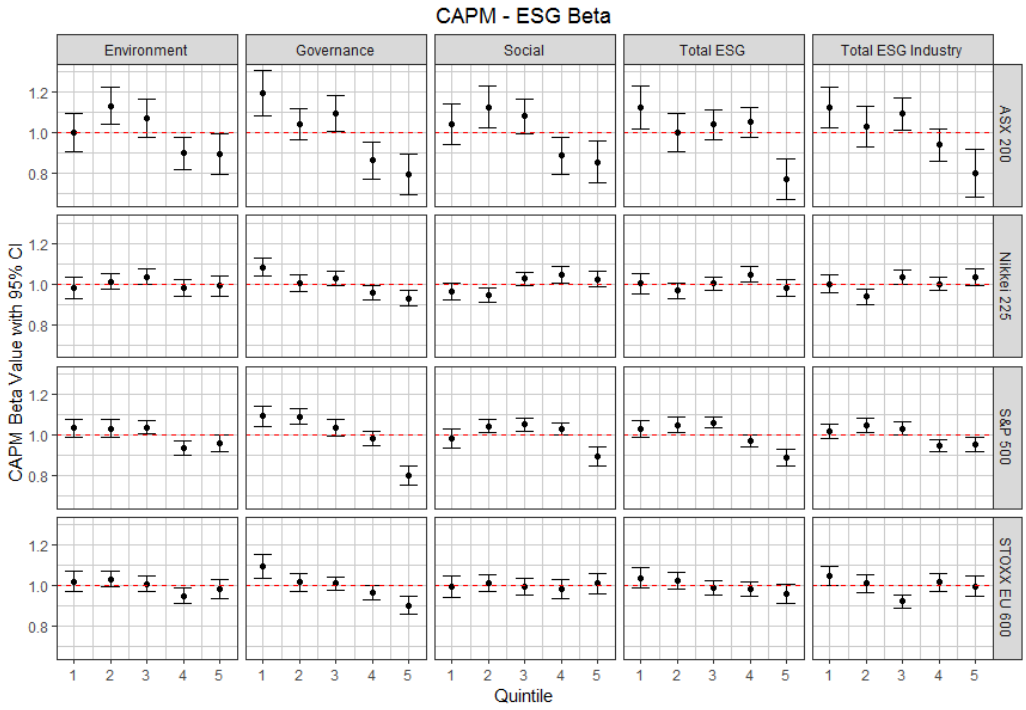


Figure 4



3. ESG Alpha in Bonds

In this section we evaluate whether there are ESG indicators that can predict a corporate bond's future performance after controlling for various betas. The same ESG data is used as in the equity alpha and beta analysis above. For bond prices, we use the US TRACE dataset containing 4,100 USD corporate bonds of all industries, with minimum $500 million issue sizes.

3.1 Method

As with the equity analysis, we examine quintile-based ESG portfolios to accommodate non-linearities. As there are known factors, such as credit rating, that strongly affect a bond's risk and return profile, we construct two sets of quintile-based portfolios. In the first *unadjusted* case, we consider the ESG scores in isolation while in the second *adjusted* case, we also maintain the composition of the quintile portfolios along certain bond factor dimensions such as credit rating.

At the beginning of each month, in the unadjusted case, we construct five bond portfolios based on the individual firms' ESG scores without considering other bond factors such as credit rating. We observe the monthly returns of these quintile-based portfolios and compare them against the returns of the entire available bond universe used in this experiment. We test whether the returns from the quintile-based portfolios are statistically different to that of the overall universe, using the CAPM approach.

In the adjusted case, we construct an additional five ESG quintile-based portfolios that also have very similar compositions along the three dimensions of credit rating, issuer's industry, and tenor (time to maturity or call). This is done by first splitting credit ratings into groups, such as AAA to AA-, A+ to A-, BBB+ to BBB- and sub-investment grade. Together with industry groups, these split our bond universe into a two-dimensional array of groups. The top quintile portfolio is then constructed by combining the top quintiles of each of these groups. The other quintile portfolios are similarly constructed. We did not observe any significant difference in the average tenor between the quintile portfolios constructed this way, hence we did not conduct any further adjustments along this dimension.

3.2 Results

The CAPM results are shown in Figure 5 for the unadjusted case, and in Figure 6 for the adjusted case. In the unadjusted case, we find that ESG factors do not significantly contribute to bond market alpha. However, portfolios with high ESG scores generally have lower beta, often to a statistically significant degree. Nonetheless, it is difficult to attribute this to ESG factors because we observed that portfolios with high ESG scores have better credit ratings, and it is quite likely that the reduced beta is caused by superior ratings. Specifically, Figure 7 shows that the worst (best) quintiles have the worst (best) credit ratings.

The limitations above are appropriately handled by the adjusted case. Here, after equalising the industry, tenor and rating composition of the five portfolios, we also find that ESG factors do not significantly contribute to positive alpha in the bond market. In fact, the best social quintile portfolio has statistically significant negative alpha; though given the non-monotonicity of the results and the multiple applications of confidence interval tests without *multiplicity adjustments*, we cannot conclude in favour or detriment to ESG effects on alpha.

More importantly however, regarding beta, once we adjust for credit rating and industry factors, we find that the previously observed beta-reduction benefits of ESG factors are no longer significant. In

fact, the best environment and social quintiles have significantly higher beta which is undesirable. In addition, better total ESG quintiles have betas that are nearly monotonically *increasing* and almost significant, which is again, undesirable.

Figure 5

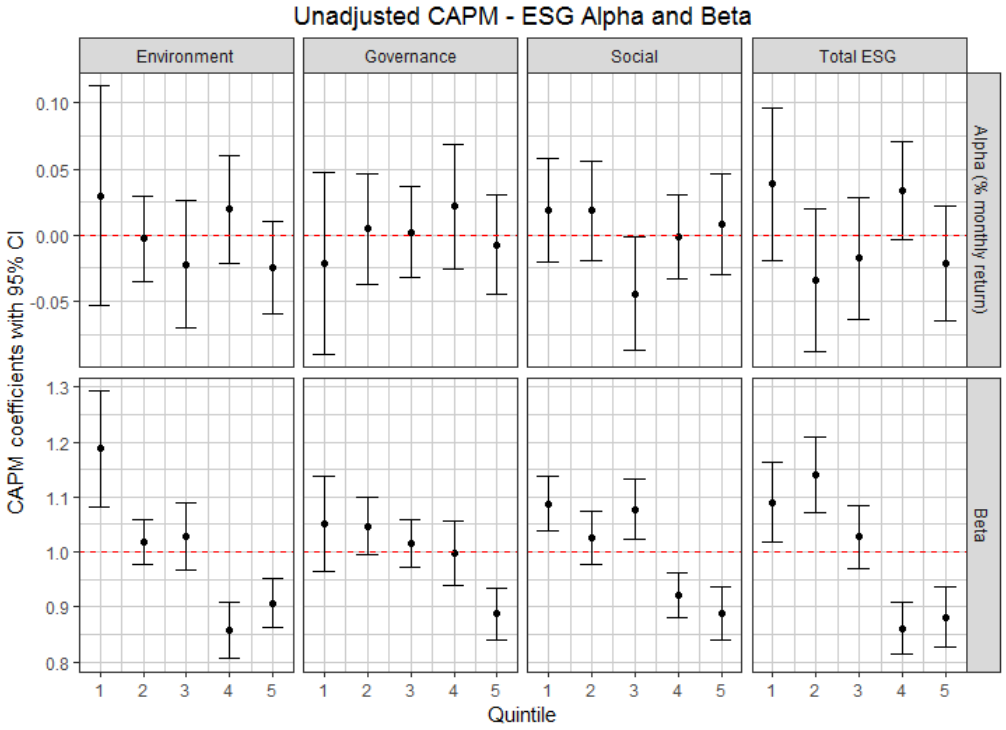


Figure 6

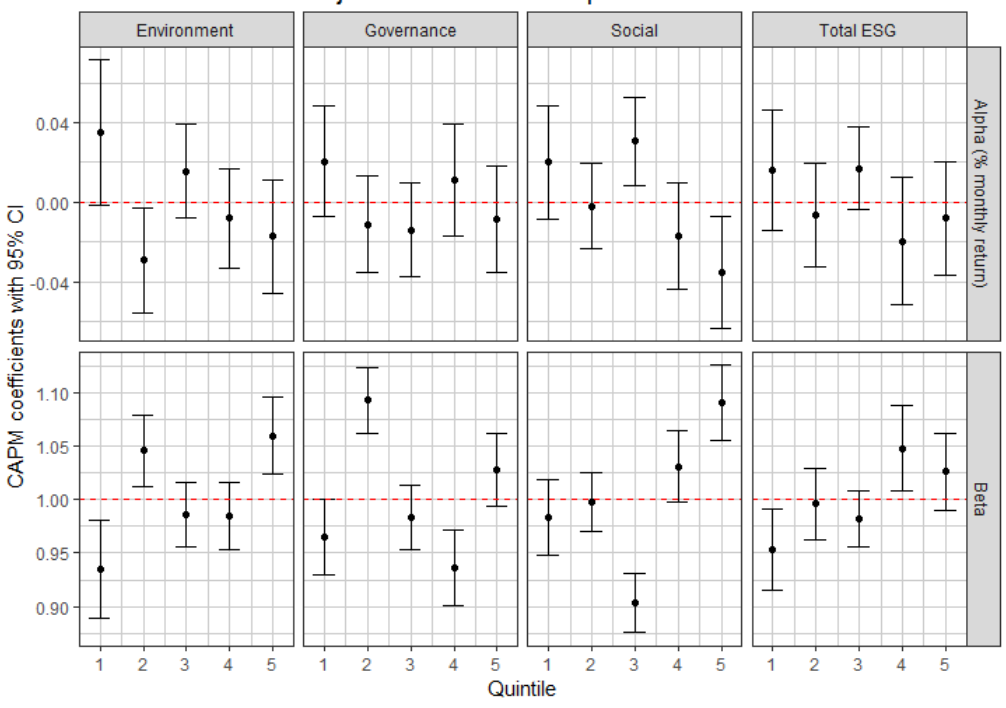
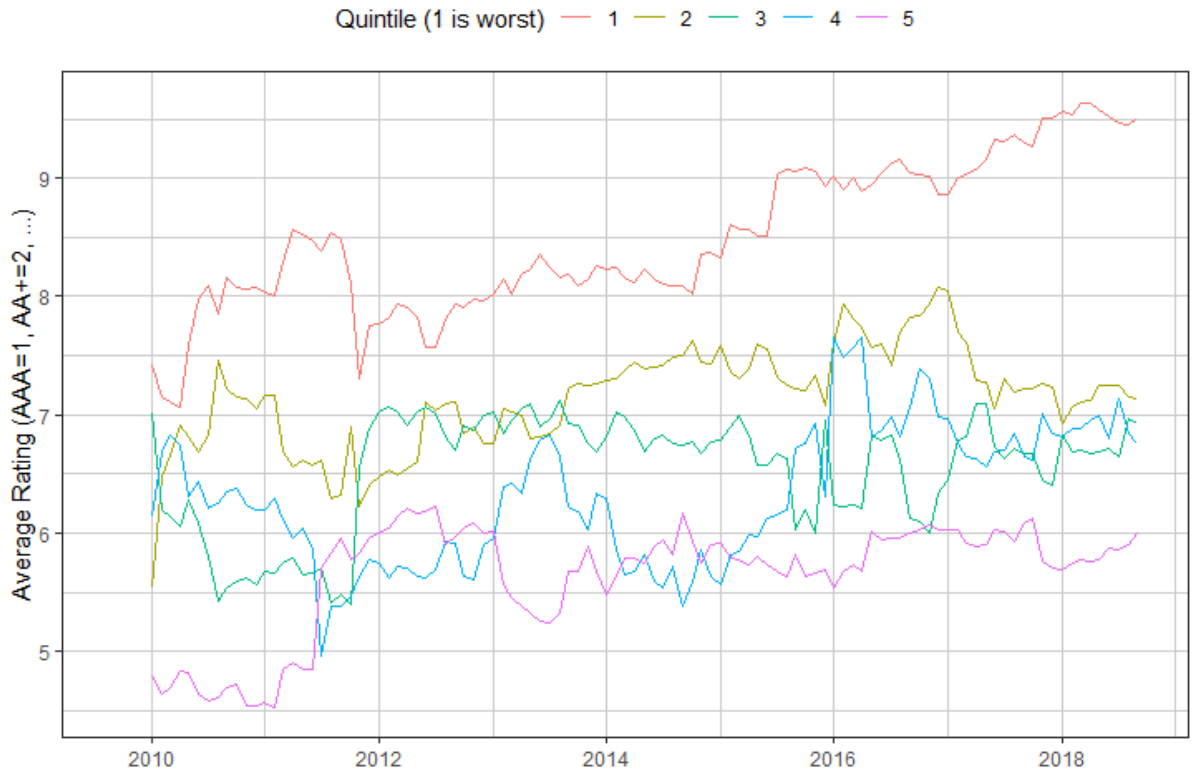


Figure 7

Rating Characteristics of Unadjusted Quintile Portfolios based on Total ESG Score



4. Conclusion

We conclude that there is value in analysing ESG factors when considering individual equity investments, but less so in corporate bonds. There is a case for ESG alpha and beta benefits in the equity markets in Australia and the US, with governance by far the most important factor. The evidence is less conclusive in Europe and Japan. We could not identify any objective ESG alpha in the bond market. There are beta benefits albeit that these appear to be embedded in companies' credit ratings, and are rendered insignificant once we equalise the industry and credit rating compositions of our ESG portfolios. Future research should continue to explore these relationships as ESG measurement techniques improve.

5. Bibliography

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