The impact of social screening on European bond portfolio performance

Patrícia Pereira [a], Maria Céu Cortez [b], Florinda Silva [c]

Abstract

This paper investigates the performance of socially screened bond portfolios of 189 Eurozone companies between 2003 and 2016. Bond portfolios are formed on the basis of an aggregate measure of corporate social responsibility (CSR) as well as on specific dimensions of CSR: environment, social and governance dimensions. Our results suggest that the performance of high-socially rated bonds is not statistically different from that of low-rated bonds Regarding the evolution of bond portfolio performance over time, the results indicate that in an earlier stage portfolios of high-rated bonds outperformed portfolios of low-rated bonds. Yet, over time this outperformance disappears. These results suggest that the errors-in-expectations hypothesis and the shunned-security hypothesis are not only useful to explain the performance of socially responsible equity portfolios but they are also useful in explaining the performance of socially screened bond portfolios over time. When analyzing the performance of socially responsible bond portfolios in different market states, the results show no performance differences in periods of recessions compared to expansions.

Keywords: Socially responsible investments, social screening, risk-adjusted performance, bond portfolios

JEL Classification Codes: G11, M14

[a] School of Economics and Management, University of Minho, Gualtar, 4710-057 Braga, Portugal. Email: pg31723@alunos.uminho.pt

[b] NIPE – School of Economics and Management, University of Minho, Gualtar, 4710-057 Braga, Portugal. Email: mccortez@eeg.uminho.pt

[c] NIPE – School of Economics and Management, University of Minho, Gualtar, 4710-057 Braga, Portugal. Email: fsilva@eeg.uminho.pt

1. Introduction

The growth of socially responsible investing in the recent decades is one of the major trends in financial markets worldwide, having motivated the debate on the financial impact of considering social criteria in the portfolio selection process. According to the European Sustainable Investment Forum (EUROSIF, 2016, p. 9), "Sustainable and Responsible Investment is a long-term oriented investment approach, which integrates ESG (Environmental, Social and Governance) factors in the research, analysis and selection process of securities within an investment portfolio. It combines fundamental analysis and engagement with an evaluation of ESG factors in order to better capture long term returns for investors, and to benefit society by influencing the behaviour of companies." Furthermore, a growing number of investors apply extra-financial criteria when investing in bonds. In fact, regarding socially responsible investment (SRI) asset allocation in Europe, there has been a significant increase in bond investing, which represented by December 2015 around 64% of the SRI market compared to 40% registered in December 2013. By 2015, the equity segment of the SRI market accounted for around 30% of SRI assets under management, indicating a significant decrease from the previous year's 50%. (EUROSIF, 2016). As a consequence, the financial impact of considering social criteria in bond investing is a relevant issue. Considering that a portion of the risk of corporate bonds is firm-specific and can either be exploited by active management or be eliminated by means of diversification, SRI might have an impact on bond investment performance (Derwall and Koedijk, 2009).

Nevertheless, the majority of the empirical evidence on SRI is concentrated on the equity segment of the market and the performance of SRI bond portfolios is far less explored. Furthermore, the few studies on the SRI bond area focus on the performance of actively managed mutual funds. However, analyzing the effects of socially responsible investments by evaluating the performance of SRI mutual funds has some limitations. First, it is difficult to disentangle the performance that is due to the skills of the manager from the performance that is associated to the socially responsible characteristics of the companies held by the funds (Kempf and Osthoff, 2007). Second, fund returns can reflect management fees, as also pointed out by Kempf and Osthoff (2007). Third, there is evidence suggesting that the fact that a fund is classified as socially responsible does not ensure that it is complying with ethical or social criteria (Auer, 2016). To avoid these problems, an alternative way to evaluate the performance of socially responsible investments consists in analyzing the performance of synthetic portfolios formed on the basis of companies' social characteristics.

Thus, the main objective of this paper is to investigate the effects of considering corporate social responsibility (CSR) criteria in European bond portfolios. In particular, we form mutually exclusive bond

portfolios with high and low social ratings and investigate the impact of several social screens on the performance of such portfolios. Besides an aggregate measure of CSR, we also consider three of its individual dimensions: Environmental, Social and Corporate Governance dimensions.[1] The analysis of these specific dimensions is important because there might be important ESG characteristics of companies that might end up hidden when using a broad indicator of CSR, as argued by Hoepner *et al.* (2016). Portfolios are formed from a dataset of Eurozone companies covered by ASSET4 ESG between 2003 and 2016 and their performance is evaluated using a conditional multi-factor model with both time-varying performance and risk.

This paper makes several contributions to the literature. To the best of our knowledge, this is the first investigation on the performance of synthetic European SRI bond portfolios formed on the basis of social criteria. In addition, we present relevant empirical evidence on time-related issues.This analysis represents an additional contribution to the literature. In terms of SRI bond investing, to the best of our knowledge this is the first study providing evidence consistent with the errors-in-expectations hypothesis and the shunned-bond hypothesis.

The remainder of this paper is organized as follows. Section 2 reviews the literature on the performance of SRI funds and portfolios. Section 3 presents the methodology used to assess portfolio performance. Section 4 describes the data. Section 5 presents and analyzes the empirical results. Finally, section 6 presents and discusses the main conclusions.

2. Prior research

The most debated issue in the SRI literature concerns the financial effects of socially responsible investing. Two contrasting hypotheses compete to explain the performance of socially screened portfolios. The hypothesis of underperformance of SRI portfolios derives directly from modern portfolio theory, according to which the imposition of any social screens restricts the investor's investment universe and reduces risk-adjusted portfolio performance (Rudd, 1981). The additional monitoring and information costs associated to screening strategies also contribute to the underperformance of SRI portfolios (Cortez *et al*., 2009). The underperformance hypothesis of SRI portfolios is further supported

[1] The expression "social" can be interpreted in a more broad or restricted sense. In a broad sense, it refers to an umbrella of several dimensions of CSR, while in a more restricted sense it is explicitly associated to the social aspects of ESG - the 'S' in the middle - such as issues related to employee relations, community relations, product responsibility and human rights. Hereafter, to avoid misinterpretations, we refer to this more restricted sense of the expression by capitalizing its first letter – 'Social'. Likewise, the other individual dimensions of ESG will also have the first letter capitalized.

by several studies (e.g., Hong and Kacperzyck, 2009; Statman and Glushkov, 2009; Derwall *et al.*, 2011) that find that stocks in controversial activities such as tobacco, alcohol and weapons, which are typically avoided by values-driven investors, yield abnormal returns. By excluding these stocks, socially responsible investors will not be able to benefit from these abnormal returns, whereas other investors might do so. An opposing view is in line with stakeholder theory (Freeman, 1984) and the concept of CSR. It follows from this perspective that companies that integrate all stakeholders' interests might benefit from long term higher shareholder value (Jensen, 2001). Engaging in CSR represents an opportunity for companies to gain competitive advantages (Porter and Kramer, 2006), and signals information on management quality (Waddock and Graves, 1997). Therefore, social screens can be viewed as tools that portfolio managers can use to identify companies with better management skills (Bollen, 2007) and lower default risk (Hoepner *et al.*, 2016), enabling them to benefit from an improved performance compared to portfolios of less socially responsible companies.

There is extensive empirical evidence on the impact of including social criteria in the performance of equity portfolios.[2] Most of these studies analyze the US market and the results range from those that find a positive link between social and financial performance to those that find a neutral performance of social screened portfolios. For example, Kempf and Osthoff (2007) investigate US companies over the period 1991 to 2004 and find that investors can earn high abnormal returns from a strategy involving a long position in the high-rated social portfolio and a short position in the low-rated social portfolio. The outperformance is stronger when considering best-in-class screening strategies, and when forming portfolios with extreme social ratings. Statman and Glushkov (2009) also find evidence that stocks of US socially responsible companies yield higher returns than those of conventional companies. However, this advantage is offset by the exclusion of shunned companies. Halbritter and Dorfleitner (2015) show that over the period 1991 to 2012 there are no significant return differences between portfolios of US companies with high and low Environment, Social and Governance rating levels. This finding is robust to different portfolio cut-offs, weighting schemes and also when considering industry-balanced investment portfolios. Besides the US, Mollet and Ziegler (2014) also analyze European SRI stocks over 1998 to 2009 and do not find evidence of significant abnormal returns of SRI portfolios. Outside the US, Van de Velde *et al.* (2005) show that portfolios of high-rated European companies perform better than low-rated ones, although not to a significant extent. Brammer *et al.* (2006) and Brzeszczyñski and McIntosh (2014) find no statistically differences in the performance of portfolios with high and low ESG ratings in the UK. In turn, Auer and Schuhmacher (2016) document

[2]Regarding the literature on SRI equity portfolios, we restrict our discussion to studies that evaluate the performance of synthetic SRI portfolios and not to those addressing the performance of actively managed SRI mutual funds. For a detailed discussion on the performance of SRI funds see, for instance, the review studies of Capelle-Blancard and Monjon (2012) and Revelli and Viviani (2015). In general, most studies conclude that SRI equity funds perform similarly to conventional equity funds.

that investors in the US and Asia-Pacific market tend to have no significant financial advantages or disadvantages from investing in an (un)ethical portfolio with high- or low-rated stocks, whereas in Europe, investors in certain industries may pay a price for being socially responsible in their stock selection.

There are fewer studies on socially responsible investing in bonds, and most of them address the performance of bond or balanced actively managed mutual funds. For instance, Goldreyer and Diltz (1999) find that SRI bond funds perform worse than conventional funds. Derwall and Koedijk (2009) evaluate the performance of SRI fixed income mutual funds in the US from 1987 to 2003 and show that the average SRI bond fund performs similarly to conventional funds, whereas the average SRI balanced fund outperforms its conventional peers. More recently, Henke (2016) shows that over the period 2001 to 2014 SRI bond funds in the US and the Eurozone outperform not only the market but also conventional funds. . Furthermore, Henke (2016) shows that the outperformance of SRI bond funds is more evident during crisis periods and suggests that the results are associated to the use of worst-in-class exclusion strategies. Leite and Cortez (2018) investigate the performance of SRI bond and balanced funds domiciled in the leading Euro-area markets (France and Germany) from 2002 to 2014 and find no differences in the performance of SRI and conventional balanced funds. However, SRI bond funds significantly outperform their conventional peers, in line with Henke (2016). This outperformance seems more related to the government and not the corporate bonds that the funds hold. Also, both SRI and conventional balanced funds, as well as conventional bond funds underperform the market. These results are in constrast with those of Derwall and Koedijk (2009), who find that the performance of SRI balanced funds is neutral.

Regarding synthetic bond portfolios, Hoepner and Nilsson (2017) is, to the best of our knowledge, the only study that explores if a trading strategy in bonds, based on their ESG ratings, leads to abnormal returns. Using a dataset of US companies over the period from 2001 to 2014, Hoepner and Nilsson (2017) do not find evidence that bonds of companies with high ESG ratings outperform those of less socially responsible companies, in contrast with Kempf and Osthoff (2007) for equity portfolios. In fact, the authors suggest *no news is good news* in ESG bonds since bonds issued by companies with no strengths, concerns or controversies in social issues outperform bonds issued by companies with strengths and concerns. This result is robust when controlling for industry differences, differences in remaining maturity, and when analyzing value- and equally-weighted portfolios.

The issue of whether SRI portfolios perform differently according to the state of the market has been addressed in the bond literature only at the mutual fund level. Assuming that companies with high levels of CSR will be exposed to less risks and that investors pay greater attention to risk in turbulent

times, one would expect that any positive effect of social screening on bond portfolio performance would occur specially during crisis periods (Henke, 2016). Henke (2016) analyzes the performance of SRI bond funds considering recession and expansion periods according to the National Bureau of Economic Research (NBER) business cycles. Alternatively, the author identifies bull and bear markets as proxies for periods of non-crisis and crisis, respectively. The results show that US and Eurozone SRI bond funds present a significant outperformance compared to conventional funds during recessions and bear markets. Therefore, Henke (2016) concludes that the outperformance of SRI bond funds is especially driven by the performance in crisis periods. During non-recession periods, only US SRI bond funds show a significant outperformance compared to their conventional peers. In bull market periods, there are no statistically significant results.

Besides analyzing overall performance, some studies on SRI equity portfolios analyze the evolution of performance over time, having documented some time effects. These effects have come to support two hypotheses in relation to the performance of SRI portfolios. According to Derwall *et al.* (2011), the SRI movement can be divided into a values-driven approach, in which social and personal values are the sources to integrate CSR criteria; and into a profit-seeking approach, with traditional financial goals. From this segmentation, the authors develop two hypotheses. The shunned-stock hypothesis claims that values-driven investors shun socially controversial stocks, which results in these stocks having a smaller investor base and higher returns. In turn, according to the errors-in-expectations hypothesis, socially responsible stocks can have higher risk-adjusted returns because the market is slow to recognize the positive impact of CSR on expected cash flows. As a consequence, one can expect persistent positive abnormal returns of shunned-stocks over time due to the universal nature of certain social values. In contrast, any abnormal returns associated to errors-in-expectations are expected to be temporary, since in the long run it is expected that investors recognize the economic value of CSR practices. As pointed out by Derwall et al (2011, p. 2139), "superior profits that firms generate through CSR can only be a source of abnormal stock returns to the extent that the investors do not expect them." By forming a portfolio of shunned stocks and a portfolio comprising stocks of firms that score high on employee relations over the period from 1992 to 2008, the authors confirm these claims. The annualized abnormal return on the former ranges from 2.58% to 2.86% and is always statistically significant, while the annualized abnormal return of the latter decreases from 5.62% to 2.81% over time. Borgers *et al.* (2013) also provide evidence that stakeholder information is mispriced due to errors in investors' expectations. Consistent with the temporary nature of returns associated to this hypothesis, the risk-adjusted returns decline as investors' attention to stakeholder information increases over time. Considering a dataset of US firms over the period 1992 to 2009, the authors analyze performance in different subperiods. Prior to each breaking date, the average risk-adjusted return differences between

top- and bottom-ranked portfolios are positive and statistically significant. In contrast, the post-break risk-adjusted returns are not significantly different from zero in most cases. The mispricing of SRI assets is further reinforced by Edmans (2011), who finds that abnormal returns of firms with high levels of employee satisfaction decrease over time. According to Edmans (2011), the mispricing is consistent with the stock market having difficulties in fully valuing intangibles. The declining abnormal returns over time is explained by the possibility that mispricing may be corrected over time as the market slowly learns about this value-relevant information. Errors-in-expectations in the market are also pointed out by Mollet *et al.* (2013) to explain the positive abnormal returns of portfolios of small and innovative European firms with strategic CSR implementation. The results of Halbritter and Dorfleitner (2015) on the performance of ESG portfolios between 1991 and 2012 are also consistent with investors' errors-in-expectations, as in earlier years companies featuring high ESG scores significantly outperformed their lower rated counterparts while as of 2012 this outperformance disappears.

3. Methods

This investigation uses the calendar-time portfolio method. At the beginning of period *t* two value-weighted portfolios are formed based on the companies' CSR scores at the end of period *t* – 1. Portfolios are formed with respect to individual dimensions of CSR (Environment, Social and Corporate Governance dimensions) as well as to an aggregate (combined) measure of CSR. For each individual dimension and the aggregate measure, the high- and low-rated portfolios consist of the top (above the median score) and bottom (below the median score) of all firms with bonds in each period, respectively. These portfolios are rebalanced monthly to account for changes in social rankings throughout the year and for any new security issues or redemptions.

Following Derwall and Koedjik (2009) we evaluate bond portfolio performance using a multi-factor model which incorporates four factors: a bond market factor, a default spread factor, an option factor and a stock market factor. To avoid biases thay may arise from using unconditional models - that do not take into account information about the changing nature of the economy - we use a conditional specification of the model following Christopherson *et al.* (1998). This model allows performance (alpha) and risk (betas) to vary over time as linear functions of a vector of predetermined information variables, Z_{t-1}, which comprises the public information available at time *t-1* relevant for predicting returns at time *t*. Therefore, the conditional multi-factor model can be expressed as:

$$r_{p,t} = \alpha_{0p} + A'_p\, z_{t-1} + \beta_{1p} Bond_t + \beta'_{1p}(z_{t-1} Bond_t) + \beta_{2p} Default_t + \beta'_{2p}(z_{t-1} Default_t) + \beta_{3p} Option_t + \beta'_{3p}(z_{t-1} Option_t) + \beta_{4p} Equity_t + \beta'_{4p}(z_{t-1} Equity_t) + \varepsilon_{p,t} \quad (1)$$

where $r_{p,t}$ represents the excess returns of portfolio p in month t, $Bond_t$ represents the excess returns of the bond market index, $Default_t$ is the return spread between a high-yield bond index and a government bond index, $Option_t$ is the return difference between a mortgage-backed securities index and a government bond index and $Equity_t$ represent the excess returns of the equity market index. $z_{t-1} = Z_{t-1} - E(Z)$ corresponds to the deviations of Z_{t-1} from their average values, $\beta_{1p}, \beta_{2p}, \beta_{3p}, \beta_{4p}$ are the unconditional average betas, and $\beta'_{1p}, \beta'_{2p}, \beta'_{3p}, \beta'_{4p}$ are vectors that measure the sensitivity of the conditional betas to the deviations of the Z_{t-1} from their means. A'_p is the vector that measures the response of the conditional alpha to the information variables, α_{0p} is the average conditional alpha, and $\varepsilon_{p,t}$ is the error term.

An alternative approach to condition fund performance to the economy involves defining discrete states of the economy and using dummy variables to distinguish these different market states, as in Moskowitz (2000), Kosowski (2006) and Areal *et al.* (2013). Whereas the conditional model of Christopherson *et al.* (1998) conditions performance and risk to the state of the economy proxied by continuous public information variables, the dummy variable model conditions performance and risk to different market states, such as bull and bear markets or expansion and recession periods. Hence, the latter model allows to investigate if there are statistically differences in the performance and risk of socially responsible portfolios across different market regimes ("good times" and "bad times").

The incorporation of dummy variables into the multi-factor model mentioned above leads to the following regression:

$$r_{p,t} = \alpha_p + \alpha_{rec,p} D_t + \beta_{1p} Bond_t + \beta_{1rec,p} Bond_t D_t + \beta_{2p} Default_t + \beta_{2rec,p} Default_t D_t + \beta_{3p} Option_t + \beta_{3rec,p} Option_t D_t + \beta_{4p} Equity_t + \beta_{4rec,p} Equity_t D_t + \varepsilon_{p,t} \quad (2)$$

where D_t is a dummy variable that assumes the value of 1 in recession periods and 0 in expansion periods.

4. Data

This study focuses on Euro-denominated bonds issued by Eurozone companies covered by ASSET4 ESG between 2003 and 2016. The ASSET4 ESG database of Thomson Reuters provides information on the social responsibility ratings of companies. The choice of the evaluation period is motivated by ASSET4 data availability.[3] The equal-weighted rating of Asset4 ESG reflects a balanced view of a company's performance in four pillars: Economic, Environmental, Social and Corporate Governance pillars. According to ASSET4, the Economic pillar "represents a company's financial health and measures the sustainable growth and the return on investment". The Environmental pillar "reflects how well a company uses best management practices to avoid environmental risks and capitalize on environmental issues. It includes several categories: *emission reduction, product innovation and resource reduction.* The Social pillar "measures a company's capacity to generate trust and loyalty with its workforce, customers and society, and it is a reflection of the company's reputation". It includes *product responsibility, community, human rights, diversity, employment quality, health and safety, training and development* categories*.* The Corporate Governance pillar "measures a company's systems and processes, which ensures that its board members and executives act in the best interests of its long-term shareholders". It includes *board functions, board structure, compensation policy, shareholder rights, vision and strategy.*[4] The Environmental, Social and Corporate Governance pillars represent the companies' extra-financial health. Considering that the purpose of this paper is to form portfolios based on companies' extra-financial health, we compute a combined ESG score as an equally-weighted average of these three individual scores, as in Auer (2016).

Considering the Eurozone constituents identified from the ASSET4 database, Thomson Reuters Datastream was used to collect the financial information on corporate bonds issued by these companies. For each company, we manually searched for related securities in Thomson Reuters Datastream. The end of month total return index series of bonds were collected from this database. Bond returns were calculated in a discrete way. We include non-surviving firms and firms that are no longer public companies in order to avoid *survivorship bias*. After collecting this information, we checked if the ASSET4 database covers these companies. Then, we excluded financial institutions or banks because their inclusion would potentially induce biases in the results. On the one hand, the large number of bonds issued by financial companies compared to other sectors would reduce cross-

[3] This database is the choice of several recent studies on SRI portfolio performance. Gonenc and Scholtens (2017) point out some of the advantages of this source of social data: besides the consistency in the reporting (since, for example, MSCI is faced with a structural break in the series in 2009), it is likely that fewer cases of matching error occur, since Thomson Reuters also provides financial information about the companies.

[4] Description of Thomson Reuters ASSET4 database.

industrial variability (Hoepner and Nilsson, 2017; Oikonomou *et al*., 2014). On the other hand, the period under analysis includes the international financial crisis that led to a severe systemic banking crisis followed by the bankruptcy of several financial institutions and several bank bailouts worldwide. As in previous studies (e. g., Elton *et al.*, 2001; Hoepner and Nilsson, 2017), we also excluded bonds with nonstandard characteristics. These include floating rate notes, index-linked bonds, convertible bonds, exchangeable bonds, hybrids, preferred bonds, perpetual bonds, private placements, sinking fund provisions, bonds with embedded options or warrants, and bonds with any other nonstandard characteristic (Oikonomou *et al.*, 2014). Additionally, we exclude issues with asset-backed features because they represent the creditworthiness of the collateral rather than the creditworthiness of the issuer (Campbell and Taksler, 2003). Zero-coupon bonds were also excluded, as they tend to behave more like stocks (Bessembinder *et al.*, 2009). Furthermore, we did not consider issues from subsidiaries (including special purpose vehicles) when the company is the parent company. Finally, we included issues from the respective market as well as from international markets as long as the bond is Euro-denominated. A company was eliminated from the dataset if nothing is displayed under related securities from Thomson Reuters DataStream, either because the non-financial company did not issue any fixed-income securities without nonstandard characteristics, or because the bonds are not covered by the database.

The final dataset is composed of 935 bonds issued by 189 companies. The number of bonds and companies in each country is presented in table 1. This table shows that the majority of the bonds and companies are from Germany and France. Table 2 provides some basic descriptive statistics of the individual ESG scores as well as of the combined ESG scores for the 189 Eurozone companies between 2003 and 2016. The mean ESG scores of the entire rating universe of ASSET4 are supposed to be in a range of 50 due to their scoring approach (Halbritter and Dorfleitner, 2015). On average, the companies in our dataset exhibit mean Environmental and Social scores of 81.15 and 82.12, respectively. Therefore, it is possible to conclude that Eurozone companies are above average regarding these two pillars. From table 2, it is also possible to observe that these distributions are negatively skewed. This means that there are more high-rated companies than low-rated companies. Turning to the characteristics of the Corporate Governance score, Eurozone companies are in line with the average since the mean is 56.23. This also implies that Eurozone companies show worse scores in the Corporate Governance pillar than they do in Environmental and Social pillars.

[Insert Tables 1 and 2 here]

Table 3 presents some basic descriptive statistics of the high- and low-rated portfolios, comprising 50% of bonds with the highest and lowest ratings, respectively, as well as of the long-short

portfolio, which simulates a trading strategy going long in the high-rated portfolio and short in the low-rated portfolio. The portfolios are value-weighted, as in Kempf and Osthoff (2007) and Hoepner and Nilsson (2017), and rebalanced monthly. The results support the hypothesis that the 50% cut-off portfolio returns are normally distributed.

[Insert Table 3 here]

Regarding the risk factors, the BofA Merrill Lynch Euro Non-Financial Corp Euro Domicile index is used as the bond index. The default spread is computed as the difference in returns between the BofA Merrill Lynch € High-Yield Total Return (TR) index and the iBoxx € Sovereign TR index. The option variable is computed as the difference in return between the BofA Merrill Lynch € Asset-Backed and Mortgage-Backed Securities TR index and the iBoxx € Sovereign TR index. Finally, the stock market variable is measured by the excess returns of the FTSE AW Eurozone TR index. Excess returns for funds and benchmarks were computed using the 1-month Euribor. Data on indices was retrieved from Thomson Reuters Datastream.[5]

As lagged public information variables, we use the term spread, the inverse relative wealth (IRW) and a January dummy.[6] The term spread is the difference between the yield of a long-term bond and the yield of a short-term bond and is a proxy for the expected bond risk premium. Fama and French (1989) argue that the variation of the term spread is closely related to measured business cycles since it tends to be low near business-cycle peaks and high near troughs. The term spread variable is measured by the annualized yield spread between the European Monetary Union Benchmark 10 Years Datastream Government (iBoxx) and the annualized 3-month Euribor rate. The IRW is used as a proxy for time-varying risk aversion. According to Ilmanen (1995), investors are more risk averse when their wealth is low relative to their past wealth.[7] To calculate the IRW variable, the past real wealth for the Euro-Area is estimated by an exponentially weighted average of past levels of the FTSE AW Eurozone index in EUR deflated by the Euro-Area Harmonised Index of Consumer Prices (HICP). Data on these public information variables are also collected from Thomson Reuters Datastream.[8] Finally, the January

[5] The exception is the BofA Merrill Lynch Euro Non-Financial Corp Euro Domicile, since data on this index is retrieved from https://markets.ml.com.

[6] Silva *et al.* (2003) find evidence that these variables are useful predictors of European bond excess returns.

[7] Following Ilmanen (1995) and Silva *et al.* (2003), the IRW variable is defined as:

$$IRW = \frac{ewa\, W_{t-1}}{W_t} = \frac{(W_{t-1} + 0.9 * W_{t-2} + 0.9^2 * W_{t-3} + \cdots) * 0.1}{W_t}$$

where W_t is the real level of stock market at time t, and $ewa\, W_{t-1}$ is the exponentially weighted average of real stock market levels up to $t-1$. The proxy for aggregate wealth is the real stock market index. Altough stock markets represent only a small part of the world wealth, they represent the most volatile segment and are positively correlated with other segments of wealth (Ilmanen, 1995; Silva *et al.,* 2003).

[8] If the information variables have large autocorrelations, this might lead to spurious regressions. To reduce this possibility, Ferson *et al.* (2003) propose a simple form of stochastic detrending that lowers the persistence of lagged predictor variables. Hence, the lagged variable is

dummy variable captures the January seasonality and takes a value of 1 if the next month is the month of January and 0 otherwise.

Regarding the discrete states of the economy, as mentioned before, we use the Business Cycle Dating Committee for the Euro Area of the Centre for Economic Policy Research (CEPR) to define economic recessions, as in Henke (2016). For the sample period, CEPR identifies 33 months of economic recessions: from January 2008 until April 2009 and from July 2011 until January 2013 (The Business Cycle Dating Committee for the Euro Area of the Centre for Economic Policy Research, 2017).

5. Empirical results

5.1. Performance of SRI bond portfolios

Table 4 presents the regression estimates of the conditional multi-factor model of high- and low-rated portfolios formed on the basis of individual and combined ESG scores. We also present the estimates of a portfolio that represents the differences in returns between a high- and low-rated portfolio, thereby representing the performance of a strategy of going long in a high-rated portfolio and short in a low-rated portfolio. The results show that high-rated portfolios formed on the basis of the Social and ESG scores yield positive and statistically significant abnormal returns (at the 5% level). The low-rated portfolios exhibit neutral performance. All high-rated portfolios show higher alphas than low-rated portfolios. Yet, the differences between both are not statistically significant. Hence, the results suggest that investors cannot obtain abnormal returns by going long in high-rated bonds and short in low-rated bonds. These results are consistent with Hoepner and Nilsson (2017), who find similar evidence for US bond portfolios. These findings are also in line with some studies on equity portfolios. For instance, Kempf and Osthoff (2007) also do not find an outperformance of the long-short strategy by forming portfolios on the basis of a 50% cut-off. Halbritter and Dorfleitner (2015), also using ESG data of ASSET4, do not find evidence of abnormal returns of high- and low-rated as well as of the long-short equity porfolios for each individual and combined ESG scores.

[Insert Table 4 here]

transformed by subtracting off a 12-month moving average of its own monthly observations. In addition, mean-zero variables are used in order to minimize possible scale effects on the results.

As expected, the bond market is the main factor in explaining bond portfolio returns. Furthermore, high-rated portfolios are not significantly exposed to the default factor, whereas low-rated portfolios show a negative and statistically significant coefficient on this factor (except for the one formed on the basis of the Social score). The results also show that there are statistically significant differences in investment styles between high- and low-rated portfolios. Although high- and low-rated portfolios present similar exposures to the bond market, the results show that high-rated portfolios formed on the basis of Environmental and ESG scores are significantly more exposed to the default factor. Since low credit rated bonds present high yields, issuers of speculative grade bonds can benefit the most in absolute terms from reductions in the cost of debt that may result from CSR practices (Oikonomou *et al.*, 2014). In addition, Stellner *et al.* (2015), based on a sample of Eurozone corporate bonds, find that companies more commited to CSR benefit from better credit ratings and lower spreads in countries with above average ESG performance. It does sound like these issuers have a financial incentive to improve on CSR practices.

In general, the results of the Wald tests support the existence of time-varying alphas and betas, at least for several bond portfolios, thereby reinforcing the usefulness of conditional models. Regarding time-varying alphas, the coefficients of the term spread and the IRW are positive and statistically significant for the high-rated portfolios, suggesting that portfolio performance is higher when these two variables are high, which usually occurs in recession periods. The coefficients of the January dummy variable are positive and statistically significant (at the 5% level) for low-rated portfolios formed on the Corporate Governance and ESG scores.

We futher test the sensitivity of the results to alternative cut-off portfolios and an alternative portfolio weighting scheme. Extant empirical evidence shows that the the profitability of a long-short strategy can depend on the cut-off chosen to form portfolios. For instance, Schröder (2014) points out that studies on SRI funds and indices do not find an outperformance of SRI strategies in most cases because they include not only the few companies with a very good CSR rating but also a high number of companies with lower ratings. Furthermore, Kempf and Osthoff (2007) only find a significant outperformance for portfolios formed on the basis of extreme social ratings (the 10% companies with the best rating). Hence, we also estimate the results obtained from portfolios formed on the basis of alternative 25% and 10% cut-offs.

Table 5 presents the regression estimates of the conditional multi-factor model for portfolios formed on the basis of individual and combined ESG scores (high- and low-rated portfolios, as well as the long-short portfolio) with a 25% (Panel A) and a 10% (Panel B) cut-off, respectively. The results show that forming portfolios that are more strict towards ESG ratings does not change the conclusions

obtained previously that there are no statistical differences between the financial performance of the best and worst rated portfolios whatever the cut-off considered.[9]

[Insert Table 5 here]

Table 6 summarizes the comparison of alphas between portfolios formed on the basis of alternative cut-offs. These results contrast with those of Kempf and Osthoff (2007), who find a positive alpha of the long-short portfolio when using a 10% cut-off, but they are in line with those of Halbritter and Dorfleitner (2015), who find no statistically significant alphas when considering alternative cut-offs.

[Insert Table 6 here]

We additionally analyze portfolio performance using equally-weighted portfolios. Table 7 provides the regression estimates of the conditional multi-factor model for equally-weighted portfolios formed on the basis of individual and combined ESG scores (high- and low-rated portfolios, as well as the long-short portfolio) with a 50% cut-off. In general, the results show that high-rated and low-rated portfolios perform better compared to value-weighted portfolios. The higher alphas obtained when considering equally-weighted portfolios suggest that higher performance is mainly concentrated in smaller companies. Yet, the results continue to show that the alphas of the long-short portfolios are not statistically significant. Halbritter and Dorfleitner (2015) also find statistically insignificant differences of high- and low-rated equity portfolios, whatever portfolio weighting procedure is used. It is also worth mentioning that our results are consistent with Kempf and Osthoff (2007), who find similar performance results for value- and equally-weighted long-short portfolios. In contrast, Statman and Glushkov (2009) find that the results of the long-short portfolios are sensitive to the weighting scheme used to form the portfolios.

[Insert Table 7 here]

5.2. Evolution of social and financial performance over time

This section addresses the evolution of social and financial performance over time. We start by analyzing how the social ratings of the portfolios evolve over time. Motivated by empirical evidence that seems to suggest time-dependency of SRI equity portfolio performance, we further analyze the portfolio performance results obtained considering different subperiods and periods of crisis.

[9] In the case of the low-rated portfolios with a 10% cut-off, the adjusted R-squareds are rather low, possibly reflecting the low number of bonds comprising the 10% worst portfolios in some months.

Figure 1 shows the evolution of the mean ESG ratings of the socially screened portfolios between 2003 and 2016. We observe that the portfolios formed by bonds with high CSR scores show some consistency in their ESG levels over time. It is important to keep in mind that the rebalancing of these portfolios reflects solely the social ratings of their holdings. This constrasts with the rebalancing strategy of most actively managed SRI mutual funds, that rely on fund managers' skills to shift the portfolios' composition in response to changing market conditions (Auer, 2016; Auer and Schuhmacher, 2016). Hence, there might be a trade-off between keeping the social level of the fund high or taking advantage of market timing and selectivity opportunities. In fact, as Wimmer (2013) points out, the lack of long-term ESG persistence of actively managed mutual funds can be attributed to two reasons. First, an SRI mutual fund manager can change the portfolio's composition according to his investment strategy. Second, each company's ESG score can change depending on its efforts with respect to Environmental, Social, and Governance issues. Wimmer (2013) concludes that the lack of long-term persistence in mutual funds ESG scores is driven mainly by changes in the holdings of the SRI mutual funds and not by changes in the underlying companies' ESG ratings. This conclusion is relevant for value-driven investors since their main concern is to hold portfolios with high ethical standards.

Figure 1 also shows that the low-rated portfolios formed on the basis of the Environmental and Social scores appear to present a downward trend after the financial crisis of 2007-2008. Even so, after 2014 these ethical ratings of these companies appear to show a recovery. The low-rated portfolios formed on the Corporate Governance dimension tend to improve their scores over time. This is consistent with the argument of Lucey and Zhang (2010) that the increasing financial integration over time has allowed firms to borrow funds in countries with more efficient legal systems. In particular, low-rated companies have a financial incentive to improve on Corporate Governance issues.

[Insert Figure 1 here]

Previous empirical evidence shows a link between ESG scores and equity portfolio returns in earlier years (Halbritter and Dorfleitner, 2015). However, over the long run investors should not expect persistent abnormal returns by trading a portfolio with regard to ESG aspects, as SRI value-relevant information becomes recognized by investors over time (e.g., Derwall *et al.*, 2011; Edmans, 2011; Halbritter and Dorfleitner, 2015). We extend the investigation of this issue to bond portfolios. To analyze

the evolution of SRI bond portfolio performance over time, we expand the regression window by 1 year starting with the period 2003-2007 and finishing with the period 2003-2016.[10]

Table 8 presents the alphas estimates of portfolios formed on the basis of individual and combined ESG scores with a 50% cut-off, over the subperiods starting with 2003-2007 until 2003-2016. Except for portfolios formed on the Corporate Governance score, all long-short portfolios present statistically significant alphas (at the 1% level) during the first period (2003 to 2007), indicating an outperformance of high socially rated portfolios compared to those that are less socially responsible. These results indicate that during this period it was possible for investors to obtain abnormal returns by going long in bonds of high-rated companies and short in bonds of low-rated companies. Yet, over time the positive alphas of the long-short portfolios decrease and lose statistical significance. From 2003 to 2010 the long-short alphas are still positive and statistically significant at the 5% level for portfolios based on Environmental and Social scores and only at the 10% level for the portfolio based on the ESG score. After this period, high- and low-rated portfolios start to show a performance that is not statistically different. In addition, the positive alphas of high-rated portfolios seem to decrease over time, especially after the period 2003-2010. These results are in line with the findings of Derwall *et al.* (2011) and Edmans (2011) on equity portfolios. Although our evidence does not show statistically significant alphas on portfolios formed on the Corporate Governance score, it is worth pointing out that Bebchuk *et al.* (2013) find evidence of abnormal returns on this dimension only prior to 1999.[11] After 2000, any abnormal returns associated to good corporate governance practices seem to have disappeared.[12]

[Insert Table 8 here]

According to the errors-in-expectations hypothesis of Derwall *et al.* (2011), socially responsible stocks may generate higher risk-adjusted returns when the market is slow to recognize the positive impact of CSR on expected cash flows. However, any abnormal returns associated to errors-in-expectations should be temporary, since in the long run it is expected that investors recognize the economic value of CSR practices. The results of this study seem to confirm that the errors-in-expectations hypothesis is not only useful to explain the performance of equity portfolios but it is also useful to explain the performance of bonds over time. In addition, the results of the high-rated portfolios

[10] This approach is similar to the one used by Derwall *et al.* (2011).
[11] These results are consistent with Gompers *et al.* (2003), who also find statistically significant abnormal performance of portfolios of good-governed firms during the 1990s.
[12] Although not reported, we also analyzed the evolution of SRI bond portfolio performance considering the 25% cut-off and, in general, the results are similar.

seem to suggest that the price of bonds of high-rated companies tends to increase over time following increased demand by values-driven investors.

It is also worth pointing out that the alphas of low-rated portfolios appear to increase over time. The alphas of the low-rated portfolios are negative and statistically significant during the period 2003-2007 (except for the Corporate Governance score), but they turn out to be insignificant over time. Consistent with the shunned-security hypothesis, the results of the low-rated portfolios seem to suggest that an increasing number of values-driven investors shun bonds of low-rated companies and, hence, these portfolios generate higher returns over time.[13]

5.2.1 SRI bond portfolio performance in times of crisis

An alternative approach to condition fund performance to the economy involves using dummy variables to distinguish different market states, as in Moskowitz (2000), Kosowski (2006) and Areal *et al.* (2013). We use a model that includes a dummy variable which assumes the value of 0 in expansion periods and 1 in recession periods (equation 2), as identified by CEPR. This model enables us to investigate if there are statistically differences on the performance and risk of SRI portfolios during "good times" and "bad times". Table 9 presents the regression results of the dummy variable model for portfolios formed on the basis of individual and combined ESG scores (high- and low-rated portfolios, as well as the long-short portfolio) with a 50% cut-off.

During expansion periods, the alphas of high- and low-rated portfolios are not statistically different from zero. During recession periods, none of the portfolios changes its performance in a statistically significant way. Furthermore, high- and low-rated portfolios perform similar in expansion periods, regardless of the score used, and this does not change in recession periods. As expected, bond market risk has a significant impact on the abnormal returns of the high- and low-rated portfolios, regardless of the score used. It is also worth mentioning that with the exception of the Social score, all high rated portfolios are more exposed to the default factor in expansions than low rated portfolios. The exposure of the portfolios formed on the Environmental and Social scores to this factor is even reinforced in periods of recession compared to low-rated portfolios.

[13] To further explore the differences between the period in which high-rated portfolios outperform and the period where outperformance disappears, we also compare portfolios' performance in two mutually exclusive subperiods: 2003-2007 and 2008-2016. As in table 8, all long-short portfolios (except for the one formed on the basis of the Corporate Governance score) present statistically significant alphas (at the 1% level) during the first subperiod (2003 to 2007). However, over the 2008-2016 subperiod, there are no statistically significant differences in the performance of high- and low-rated portfolios.

As mentioned previously in the literature review, there are theoretical arguments in favour a higher performance of SRI firms in times of turmoil. As Hoepner *et al.* (2016) argue, companies that are highly committed to CSR practices can generate reputational wealth and relational capital that prevents them from declines in value during market crises. Several studies on SRI equity funds (e.g., Nofsinger and Varma, 2014; and Leite and Cortez, 2015), on SRI bond funds (e. g., Henke, 2016) and on equity portfolios (e.g., Carvalho and Areal, 2016) find that SRI funds and portfolios provide additional protection during periods of market crisis. Overall, our results do not show evidence that high-rated portfolios provide significant additional protection to investors during recession periods. Even so, it seems that it is possible to invest in portfolios of bonds issued by companies with high ESG ratings without sacrificing the financial performance of investors.

[Insert Table 10 here]

6. Discussion and conclusions

This paper investigates the performance of socially screened bond portfolios of 189 Eurozone companies between 2003 and 2016. As far as we are aware of, this is the first paper to evaluate the performance of synthetic bond portfolios formed on the basis of CSR ratings of European companies.

We form value-weighted portfolios of bonds based on the companies' social scores provided by ASSET4 ESG database. Portfolios are formed with respect to individual dimensions of ESG (Environment, Social and Governance dimensions) as well as to an aggregate measure combining these dimensions. The high- and low-rated portfolios are formed on the basis of the top (above the median) and bottom (below the median) social scores of all firms with bonds in each period, respectively. In addition, long-short portfolios (long in the high-rated and short in the low-rated portfolio) are also formed, to better assess the differences in abnormal returns from investing in high- and low-rated portfolios. Portfolio performance is evaluated by using a conditional model that accounts for four risk factors.

Our findings suggest that with the exception of portfolios formed on the Corporate Governance dimension, high-rated bond portfolios present abnormal returns. Yet, the performance of high-rated bond portfolios are not not statistically different from that of low-rated bond portfolios. This result is robust to a different portfolio weighting scheme (equally-weighted portfolios) and to alternative portfolio cut-offs.

We also analyze time effects of SRI bond investing. The results do not show differences in the performance of high- or low-rated portfolios in periods of expansions compared to recessions. We also analyze the evolution of SRI bond portfolio performance over time. With exception of bond portfolios formed on the Corporate Governance score, the results indicate that in an earlier stage it was possible for investors to obtain abnormal returns by going long in bonds of high-rated companies and short in those of low-rated companies. However, this outperformance disappears over time. In fact, while the positive alphas of high-rated portfolios decrease over time, the alphas of low-rated portfolios exhibit an increasing pattern. The distinct patterns of performance of high- and low-rated bond portfolios are consistent with the errors-in-expectations and the shunned-stock hypotheses of Derwall *et al.* (2011). These hypotheses are explained by a breakdown of the SRI movement into a profit-seeking approach and a values-driven investment approach. While profit-seeking investors have traditional financial goals, values-driven investors are mainly concerned with their social and personal values, being willing to accept a loss in financial performance in exchange for non-financial utility. According to the errors-in-expectations hypothesis, SRI can deliver superior performance if the market is slow to recognize the positive impact of CSR on the fundamental value of the firm. However, in the long run it is expected that investors recognize the importance of CSR practices and that any evidence of mispricing disappears. Furthermore, the shunned-stock hypothesis claims that values-driven investors shun socially controversial stocks and hence these stocks will generate higher returns. The results of the low-rated portfolios seem to suggest that there has been an increasing number of values-driven investors that shun bonds of low-rated companies. The results of the high-rated portfolios are consistent with both the mispricing argument and the claim that the price of bonds of high-rated companies tends to rise over time following increased demand by values-driven investors. The results of this study seem to suggest that the errors-in-expectations and the shunned-bond hypotheses are useful in explaining the performance of SRI bond portfolios over time.

How do our results compare to most of the empirical evidence on actively managed SRI bond funds? It is important to mention that there is evidence suggesting that the fact that a fund is classified as socially responsible does not ensure that their portfolios have average ESG ratings above those of conventional funds. For instance, Wimmer (2013) finds that funds classified as socially responsible considerably change their social standards over time and, so, their levels of ESG are not persistent. This lack of ESG persistence may arise because fund managers might face a trade-off between keeping the social level of the fund high or trying to taking advantage of market and selectivity opportunities. Therefore, the positive effect of social screening on financial returns is not reflected in these funds. This contrasts with the results obtained in this study, since portfolios formed by bonds of companies with high social scores show consistency in their ESG levels over time.

In conclusion, this paper shows that for the overall period under analysis, a strategy of investing in high social rated bonds does not perform differently from investing in low social rated bonds. Yet, we find evidence that in an earlier stage it was possible for investors to obtain abnormal returns by going long in bonds of high-rated companies and short in bonds of low-rated companies. However, investors should no longer expect abnormal returns from this investment strategy, as it seems that the market has come to recognize the value of CSR practices, at least at the broad Environmental, Social and Corporate Governance dimensions. In spite of this, our evidence does not preclude the possibility of investors still benefiting from abnormal returns from value-relevant information associated to finer dimensions of CSR, still not recognized by the market. This would be an interesting area for further research.

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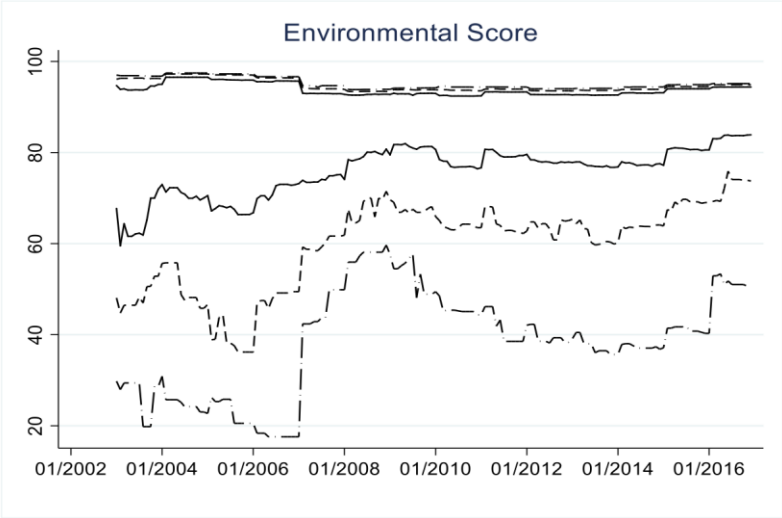
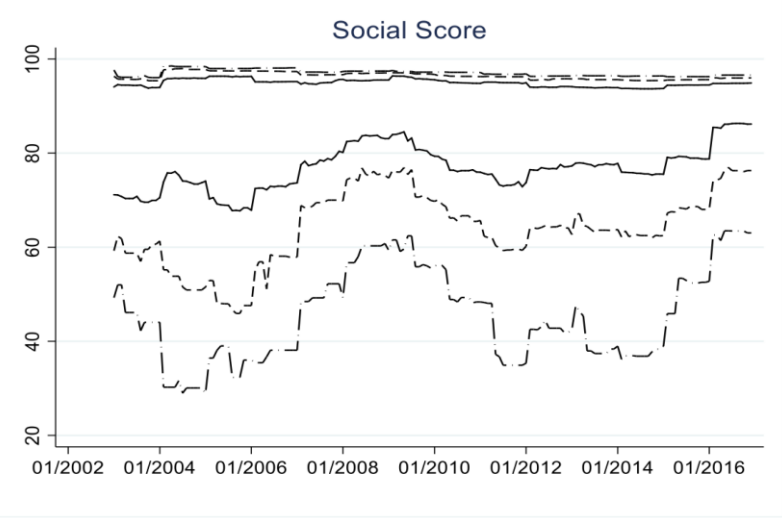
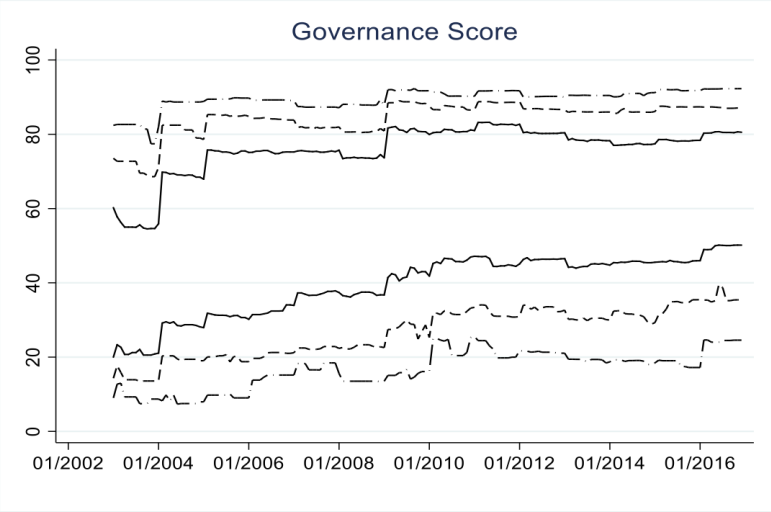
Figure 1. Portfolio ESG ratings over time

For each month between 2003 and 2016, the upper (lower) half of each graph in this figure shows the mean Environmental, Social, Governance and combined ESG scores of portfolios containing the high-rated (low-rated) firms. Portfolios with 50%, 25% and 10% cut-off rates are represented by solid, dashed and dashed-dotted lines, respectively.







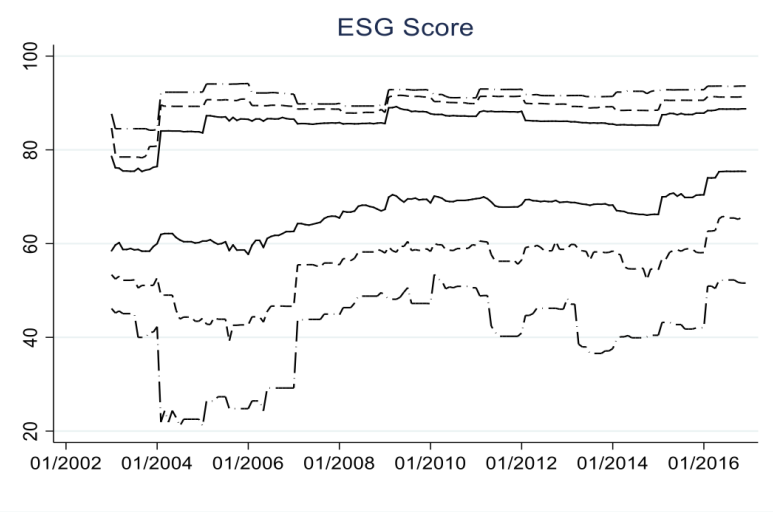


Table 1. Number of bonds and companies for each country

This table presents the number of bonds and companies in the dataset, by country, considering the period 2003 to 2016.

	Bonds	Companies
France	396	61
Germany	144	37
Italy	123	22
Netherlands	76	13
Finland	58	19
Belgium	52	9
Spain	40	15
Austria	36	6
Portugal	9	6
Greece	1	1
Total	935	189

Table 2. Descriptive statistics of ESG scores

This table reports descriptive statistics of Environmental, Social and Governance scores as well as of a combined ESG score (equally-weighted average of the three individual scores) of the companies in the Dataset: 189 Eurozone companies over the period 2003 and 2016.

	Environmental Score	Social Score	Governance Score	Combined ESG Score
Mean	81.149	82.119	56.259	73.176
Std. Dev.	19.117	17.772	21.752	16.427
Median	89.434	88.375	60.075	77.836
Minimum	11.275	8.790	7.558	13.308
Maximum	96.423	96.910	94.878	94.631
Skewness	-2.097	-2.160	-0.356	-1.626
Kurtosis	6.783	7.704	2.145	5.553
Obs	189	189	189	189

Table 3. Descriptive statistics of portfolios

This table reports descriptive statistics on the monthly returns of the high- and low-rated portfolios (50% cut-off) as well as the long-short portfolios for each individual and combined ESG score between 2003 and 2016. The high-rated (low-rated) portfolios consists of bonds from the 50% of all companies with the highest (lowest) rating and the long-short portfolio is a trading strategy going long in the high-rated and short in the low-rated portfolio. The portfolios are value-weighted and rebalanced monthly. p-value is the probability of the Jarque Bera normality test. ***, ** and * indicate significance at the 1%, 5%, and 10% level, respectively.

	Mean	Std. Dev.	Median	Minimum	Maximum	Skewness	Kurtosis	*p*-value
Environmental Score								
High-rated	0.438%***	0.898%	0.517%	-2.356%	2.508%	-0.165	2.887	0.660
Low-rated	0.428%***	0.883%	0.517%	-1.813%	2.394%	-0.202	2.598	0.289
Long-short	0.010%	0.358%	-0.019%	-1.041%	2.779%	2.699	24.053	0.000
Social Score								
High-rated	0.445%***	0.892%	0.528%	-2.203%	2.470%	-0.155	2.845	0.681
Low-rated	0.444%***	0.872%	0.547%	-1.894%	2.313%	-0.199	2.631	0.339
Long-short	0.001%	0.378%	-0.010%	-1.034%	3.158%	3.692	32.168	0.000
Governance Score								
High-rated	0.443%***	0.923%	0.538%	-2.400%	2.776%	-0.070	2.920	0.929
Low-rated	0.417%***	0.830%	0.554%	-1.765%	2.390%	-0.194	2.550	0.234
Long-short	0.026%	0.356%	0.018%	-1.532%	1.916%	0.571	9.777	0.000
Combined ESG Score								
High-rated	0.448%***	0.904%	0.559%	-2.270%	2.579%	-0.118	2.841	0.789
Low-rated	0.412%***	0.867%	0.547%	-2.228%	2.224%	-0.336	2.839	0.187
Long-short	0.036%	0.378%	0.011%	-1.027%	3.188%	3.428	31.018	0.000

Table 4. The performance of portfolios formed on individual and combined ESG scores

This table presents estimates of alphas (expressed in percentage), factor loadings, and the adjusted R^2 obtained from the conditional multi-factor model regressions over the period 2003-2016. *Bond* corresponds to the monthly excess returns of the iBoxx Euro Non-Financial All Maturities index. *Default* is the difference in returns between the BofA Merrill Lynch € High-Yield TR index and the iBoxx € Sovereign TR index. *Option* is the difference in return between the BofA Merrill Lynch € Asset-Backed and Mortgage-Backed Securities TR index and the iBoxx € Sovereign TR index. *Equity* corresponds to the monthly excess returns of the FTSE AW Eurozone TR index. Excess returns were computed using the 1-month Euribor. The public information variables are the term spread (TS), the Inverse Relative Wealth (IRW) and a January dummy (JD) The high-rated (low-rated) portfolios include bonds from the 50% of all companies with the highest (lowest) rating for each individual and combined ESG score. The long-short portfolio is a trading strategy going long in the high-rated and short in the low-rated portfolio. ***, ** and * indicate significance at the 1%, 5%, and 10% level, respectively. t-statistics are presented in parenthesis. Standard errors are computed using the Newey-West (1987) or the White (1980) variance–covariance matrix, whenever necessary. W_1, W_2 and W_3 correspond to the probability values of the $\mathcal{X}^2$ statistic of the Wald test on the hypothesis that the coefficients of the conditional alphas, conditional betas and conditional alphas and betas, respectively, are jointly equal to zero.

	α	α_{TS}	α_{IRW}	α_{JD}	β_{Bond}	$\beta_{Default}$	β_{Option}	β_{Equity}	$\beta_{Bond*TS}$	β_{Def*TS}	β_{Opt*TS}	β_{Eq*TS}
Env. Score												
High-rated	0.054*	0.002**	0.009**	0.001	0.869***	0.009	0.045	0.004	-0.132**	-0.020	0.055	-0.001
	(1.97)	(2.18)	(2.51)	(1.40)	(26.59)	(0.79)	(1.50)	(0.64)	(-2.17)	(-1.00)	(0.75)	(-0.05)
Low-rated	0.027	0.000	0.004	0.000	0.903***	-0.044***	0.072*	0.021**	-0.080	0.019	-0.053	-0.019
	(0.89)	(0.52)	(1.27)	(-0.06)	(28.72)	(-2.63)	(1.66)	(2.37)	(-1.17)	(0.92)	(-0.69)	(-1.39)
Long-short	0.027	0.001	0.005*	0.001	-0.034	0.053***	-0.027	-0.017*	-0.052	-0.038*	0.107	0.019
	(0.87)	(1.56)	(1.71)	(1.10)	(-1.06)	(3.11)	(-0.60)	(-1.87)	(-0.74)	(-1.83)	(1.38)	(1.32)
Soc. Score												
High-rated	0.074**	0.002**	0.011***	0.000	0.877***	-0.001	0.043	0.005	-0.162***	-0.031	0.070	0.002
	(2.47)	(2.51)	(3.21)	(0.25)	(29.63)	(-0.07)	(1.61)	(0.82)	(-2.75)	(-1.62)	(0.93)	(0.14)
Low-rated	0.027	0.000	0.002	0.001	0.861***	-0.013	0.071	0.017*	0.034	0.022	-0.047	-0.014
	(0.87)	(-0.14)	(0.62)	(0.99)	(26.57)	(-0.75)	(1.59)	(1.89)	(0.48)	(1.03)	(-0.61)	(-1.01)
Long-short	0.047	0.002**	0.009***	-0.001	0.017	0.012	-0.028	-0.013	-0.196**	-0.053**	0.117	0.016
	(1.36)	(2.12)	(2.89)	(-0.67)	(0.47)	(0.64)	(-0.58)	(-1.27)	(-2.54)	(-2.29)	(1.37)	(1.02)
Gov. Score												
High-rated	0.047	0.002**	0.007*	0.000	0.891***	0.005	0.026	0.011	-0.087	-0.020	0.027	-0.001
	(1.57)	(2.38)	(1.71)	(-0.35)	(28.79)	(0.28)	(0.68)	(1.16)	(-1.44)	(-0.96)	(0.31)	(-0.08)
Low-rated	0.032	0.000	0.005*	0.002**	0.874***	-0.036**	0.094***	0.009	-0.174***	0.021	-0.044	-0.019*
	(1.42)	(0.59)	(1.81)	(2.55)	(37.21)	(-2.37)	(2.89)	(1.17)	(-3.28)	(1.65)	(-0.85)	(-1.73)
Long-short	0.015	0.001*	0.002	-0.003**	0.017	0.041*	-0.067	0.002	0.087**	-0.041**	0.071	0.017
	(0.57)	(1.76)	(0.74)	(-2.02)	(0.63)	(1.84)	(-1.37)	(0.17)	(1.99)	(-2.18)	(0.78)	(1.39)
ESG Score												
High-rated	0.059**	0.002**	0.009**	0.000	0.885***	0.012	0.043	0.003	-0.100*	-0.025	0.035	0.004
	(2.08)	(2.49)	(2.22)	(-0.23)	(28.97)	(0.75)	(1.09)	(0.42)	(-1.73)	(-1.43)	(0.45)	(0.32)
Low-rated	0.018	0.000	0.003	0.002**	0.872***	-0.056***	0.081*	0.026***	-0.133*	0.033	-0.042	-0.029**
	(0.58)	(0.37)	(0.96)	(2.03)	(26.47)	(-3.21)	(1.77)	(2.74)	(-1.86)	(1.55)	(-0.52)	(-2.04)
Long-short	0.040	0.001	0.006*	-0.003**	0.013	0.068***	-0.037	-0.022**	0.033	-0.058***	0.076	0.033**
	(1.23)	(1.62)	(1.88)	(-2.20)	(0.39)	(3.79)	(-0.80)	(-2.31)	(0.45)	(-2.64)	(0.94)	(2.24)

Table 4. Continued

	$\beta_{Bond*IRW}$	$\beta_{Def*IRW}$	$\beta_{Opt*IRW}$	β_{Eq*IRW}	$\beta_{Bond*JD}$	β_{Def*JD}	β_{Opt*JD}	β_{Eq*JD}	$Adj.R^2$	W_1	W_2	W_3
Env. Score												
High-rated	-0.413	-0.103	0.142	0.039	0.035	-0.121	0.029	0.050	0.907	0.026	0.465	0.007
	(-1.59)	(-1.12)	(0.50)	(0.80)	(0.30)	(-0.79)	(0.25)	(0.82)				
Low-rated	-0.709***	-0.092	-0.120	-0.004	-0.141	-0.157	-0.100	0.072*	0.871	0.648	0.090	0.175
	(-2.86)	(-1.05)	(-0.35)	(-0.07)	(-0.68)	(-1.48)	(-0.56)	(1.67)				
Long-short	0.296	-0.011	0.263	0.043	0.176	0.036	0.129	-0.022	0.183	0.199	0.254	0.137
	(1.16)	(-0.12)	(0.73)	(0.74)	(0.83)	(0.33)	(0.70)	(-0.49)				
Soc. Score												
High-rated	-0.810***	-0.113	0.148	0.008	-0.052	-0.129	-0.062	0.065	0.898	0.004	0.051	0.023
	(-3.46)	(-1.28)	(0.56)	(0.15)	(-0.43)	(-0.80)	(-0.48)	(1.07)				
Low-rated	-0.277	-0.103	-0.127	0.061	0.075	-0.172	0.155	0.062	0.858	0.672	0.245	0.253
	(-1.08)	(-1.15)	(-0.35)	(1.04)	(0.35)	(-1.57)	(0.84)	(1.39)				
Long-short	-0.533*	-0.009	0.275	-0.054	-0.127	0.042	-0.217	0.003	0.113	0.026	0.037	0.030
	(-1.91)	(-0.09)	(0.70)	(-0.84)	(-0.55)	(0.35)	(-1.07)	(0.06)				
Gov. Score												
High-rated	-0.345	-0.153	0.149	0.027	-0.212	-0.125	-0.171	0.073	0.886	0.115	0.512	0.225
	(-0.95)	(-1.41)	(0.40)	(0.39)	(-1.29)	(-0.69)	(-0.96)	(1.07)				
Low-rated	-0.860***	-0.022	-0.121	-0.010	0.170	-0.166	0.156	0.049	0.925	0.021	0.004	0.000
	(-3.49)	(-0.35)	(-0.47)	(-0.25)	(0.97)	(-1.22)	(1.04)	(0.85)				
Long-short	0.516**	-0.131*	0.271	0.038	-0.382	0.040	-0.327	0.024	0.217	0.076	0.001	0.000
	(2.50)	(-1.74)	(0.96)	(0.51)	(-1.51)	(0.52)	(-1.63)	(0.62)				
ESG Score												
High-rated	-0.404	-0.131	0.173	0.017	-0.135	-0.138	-0.132	0.080	0.907	0.068	0.303	0.108
	(-1.16)	(-1.36)	(0.53)	(0.28)	(-0.98)	(-0.88)	(-0.88)	(1.35)				
Low-rated	-0.812***	-0.042	-0.201	0.021	0.115	-0.162	0.152	0.036	0.853	0.186	0.051	0.055
	(-3.13)	(-0.46)	(-0.55)	(0.35)	(0.54)	(-1.45)	(0.81)	(0.78)				
Long-short	0.41	-0.089	0.374	-0.004	-0.250	0.024	-0.284	0.044	0.191	0.029	0.186	0.051
	(1.53)	(-0.94)	(1.00)	(-0.07)	(-1.13)	(0.21)	(-1.47)	(0.95)				

Table 5. The performance of portfolios formed on individual and combined ESG scores - 25% and 10% cut-offs

This table presents estimates of monthly abnormal returns (alphas expressed in percentage), factor loadings, and the adjusted R^2 obtained from the conditional multi-factor model regressions over the period 2003-2016. *Bond* corresponds to the monthly excess returns of the iBoxx Euro Non-Financial All Maturities index. *Default* is the difference in returns between the BofA Merrill Lynch € High-Yield TR index and the iBoxx € Sovereign TR index. *Option* is the difference in return between the BofA Merrill Lynch € Asset-Backed and Mortgage-Backed Securities TR index and the iBoxx € Sovereign TR index. *Equity* corresponds to the monthly excess returns of the FTSE AW Eurozone TR index. Excess returns were computed using the 1-month Euribor. The high-rated (low-rated) portfolios include bonds from the 25% and 10% (panel A and B, respectively) of all companies with the highest (lowest) rating for each individual and combined ESG score. The long-short portfolio is a trading strategy going long in the high-rated and short in the low-rated portfolio. The portfolios are value-weighted and rebalanced monthly. ***, ** and * indicate significance at the 1%, 5%, and 10% level, respectively. The values of the t-statistic are presented in parenthesis. Standard errors are computed using the Newey-West (1987) method or the White (1980) variance–covariance matrix, whenever necessary. W_1, W_2 and W_3 correspond to the probability values of the $\mathcal{X}^2$ statistic of the Wald test on the hypothesis that the coefficients of the conditional alphas, conditional betas and conditional alphas and betas, respectively, are jointly equal to zero.

PANEL A	α	β_{Bond}	$\beta_{Default}$	β_{Option}	β_{Equity}	$Adj.R^2$	W_1	W_2	W_3
Env. Score									
High-rated	0.030	0.839***	0.000	0.086**	0.007	0.898	0.144	0.000	0.000
	(1.12)	(26.34)	(0.03)	(2.18)	(1.05)				
Low-rated	0.013	0.869***	-0.048*	0.039	0.027*	0.679	0.572	0.762	0.800
	(0.25)	(16.02)	(-1.68)	(0.52)	(1.77)				
Long-short	0.017	-0.030	0.049*	0.047	-0.020	0.034	0.080	0.475	0.326
	(0.33)	(-0.56)	(1.70)	(0.63)	(-1.28)				
Soc. Score									
High-rated	0.077*	0.900***	-0.017	0.048	0.008	0.874	0.012	0.137	0.051
	(1.82)	(27.74)	(-1.18)	(1.27)	(1.07)				
Low-rated	0.037	0.792***	-0.022	0.033	0.027*	0.706	0.781	0.696	0.774
	(0.76)	(15.83)	(-0.84)	(0.48)	(1.94)				
Long-short	0.041	0.107*	0.005	0.015	-0.019	0.151	0.041	0.000	0.000
	(0.58)	(1.93)	(0.19)	(0.25)	(-1.09)				
Gov. Score									
High-rated	0.009	0.888***	0.019	-0.021	0.007	0.858	0.588	0.808	0.448
	(0.27)	(26.05)	(0.97)	(-0.42)	(0.64)				
Low-rated	0.056*	0.846***	-0.055**	0.138***	0.015	0.852	0.202	0.302	0.130
	(1.73)	(23.74)	(-2.54)	(2.80)	(1.40)				
Long-short	-0.047	0.042	0.074***	-0.159***	-0.009	0.369	0.112	0.001	0.001
	(-1.25)	(1.08)	(3.54)	(-2.93)	(-0.79)				
ESG Score									
High-rated	0.058*	0.910***	0.022	0.002	0.003	0.870	0.137	0.431	0.144
	(1.70)	(26.08)	(1.07)	(0.04)	(0.30)				
Low-rated	0.049	0.725***	-0.058*	0.093	0.039**	0.497	0.720	0.734	0.834
	(0.77)	(11.04)	(-1.67)	(1.03)	(2.11)				
Long-short	0.009	0.185***	0.080**	-0.091	-0.036*	0.132	0.217	0.496	0.430
	(0.14)	(2.84)	(2.32)	(-1.01)	(-1.94)				

Table 5. Continued

PANEL B	α	β_{Bond}	$\beta_{Default}$	β_{Option}	β_{Equity}	$Adj.R^2$	W_1	W_2	W_3
Env. Score									
High-rated	0.041	0.783***	0.003	0.117**	0.009	0.816	0.139	0.000	0.000
	(1.35)	(18.77)	(0.12)	(2.15)	(0.96)				
Low-rated	0.011	0.765***	-0.088	0.013	0.059*	0.302	0.312	0.856	0.869
	(0.11)	(7.03)	(-1.53)	(0.09)	(1.91)				
Long-short	0.029	0.018	0.091	0.104	-0.049*	-0.004	0.084	0.485	0.415
	(0.29)	(0.17)	(1.64)	(0.72)	(-1.67)				
Soc. Score									
High-rated	0.088*	0.932***	-0.005	0.051	0.009	0.820	0.045	0.156	0.093
	(1.69)	(23.04)	(-0.27)	(1.09)	(0.86)				
Low-rated	0.065*	0.784***	-0.033	0.126**	0.013	0.686	0.116	0.284	0.022
	(1.76)	(13.06)	(-1.12)	(2.29)	(0.92)				
Long-short	0.024	0.148***	0.027	-0.075	-0.004	0.188	0.029	0.023	0.001
	(0.42)	(2.61)	(0.88)	(-1.03)	(-0.26)				
Gov. Score									
High-rated	-0.024	0.901***	0.015	-0.030	0.000	0.815	0.596	0.388	0.317
	(-0.52)	(19.94)	(0.61)	(-0.58)	(-0.02)				
Low-rated	0.051	0.674***	-0.002	0.168**	0.025	0.494	0.175	0.591	0.357
	(0.89)	(11.44)	(-0.08)	(2.06)	(1.50)				
Long-short	-0.074	0.227***	0.018	-0.198**	-0.025	0.151	0.437	0.264	0.252
	(-1.12)	(3.30)	(0.49)	(-2.08)	(-1.29)				
ESG Score									
High-rated	-0.009	0.915***	0.012	-0.062	0.006	0.845	0.509	0.227	0.156
	(-0.24)	(22.40)	(0.52)	(-1.03)	(0.55)				
Low-rated	0.017	0.712***	-0.142*	0.096	0.079**	0.141	0.579	0.980	0.982
	(0.12)	(5.07)	(-1.91)	(0.49)	(1.99)				
Long-short	-0.026	0.203	0.154**	-0.158	-0.073*	0.000	0.380	0.938	0.901
	(-0.21)	(1.54)	(2.21)	(-0.87)	(-1.96)				

Table 6. Comparison of alphas between alternative cut-offs

This table summarizes the comparison of alphas (expressed in percentage) between alternative cut-offs. ***, ** and * indicate significance at the 1%, 5%, and 10% level, respectively.

		Env. Score	Soc. Score	Gov. Score	ESG Score
	High-rated	0.054*	0.074**	0.047	0.059**
50%	Low-rated	0.027	0.027	0.032	0.018
	Long-short	0.027	0.047	0.015	0.040
	High-rated	0.030	0.077*	0.009	0.058*
25%	Low-rated	0.013	0.037	0.056*	0.049
	Long-short	0.017	0.041	-0.047	0.009
	High-rated	0.041	0.088*	-0.024	-0.009
10%	Low-rated	0.011	0.065*	0.051	0.017
	Long-short	0.029	0.024	-0.074	-0.026

Table 7. The performance of portfolios formed on individual and combined ESG scores - equally-weighted portfolios

This table presents estimates of monthly abnormal returns (alphas expressed in percentage), factor loadings, and the adjusted R^2 obtained from the conditional multi-factor model regressions over the period 2003-2016. *Bond* corresponds to the monthly excess returns of the iBoxx Euro Non-Financial All Maturities index. *Default* is the difference in returns between the BofA Merrill Lynch € High-Yield TR index and the iBoxx € Sovereign TR index. *Option* is the difference in return between the BofA Merrill Lynch € Asset-Backed and Mortgage-Backed Securities TR index and the iBoxx € Sovereign TR index. *Equity* corresponds to the monthly excess returns of the FTSE AW Eurozone TR index. Excess returns were computed using the 1-month Euribor. The high-rated (low-rated) portfolios include bonds from the 50% of all companies with the highest (lowest) rating for each individual and combined ESG score. The long-short portfolio is a trading strategy going long in the high-rated and short in the low-rated portfolio. The portfolios are equally-weighted and rebalanced monthly.. ***, ** and * indicate significance at the 1%, 5%, and 10% level, respectively. The values of the t-statistic are presented in parenthesis. Standard errors are computed using the Newey-West (1987) method or the White (1980) variance–covariance matrix, whenever necessary. W_1, W_2 and W_3 correspond to the probability values of the $\mathcal{X}^2$ statistic of the Wald test on the hypothesis that the coefficients of the conditional alphas, conditional betas and conditional alphas and betas, respectively, are jointly equal to zero.

	α	β_{Bond}	$\beta_{Default}$	β_{Option}	β_{Equity}	$Adj.R^2$	W_1	W_2	W_3
Env. Score									
High-rated	0.075***	0.807***	0.027**	-0.007	0.001	0.922	0.074	0.071	0.055
	(3.26)	(31.79)	(2.17)	(-0.20)	(0.16)				
Low-rated	0.071**	0.791***	-0.037**	0.047	0.023**	0.817	0.963	0.495	0.634
	(2.13)	(23.03)	(-2.03)	(0.99)	(2.36)				
Long-short	0.004	0.016	0.064***	-0.054	-0.022**	0.184	0.420	0.271	0.367
	(0.12)	(0.46)	(3.42)	(-1.10)	(-2.19)				
Soc. Score									
High-rated	0.074***	0.822***	0.014	0.000	0.002	0.921	0.024	0.015	0.025
	(3.01)	(32.66)	(1.09)	(-0.01)	(0.28)				
Low-rated	0.074**	0.768***	-0.021	0.043	0.019**	0.827	0.748	0.508	0.460
	(2.29)	(23.20)	(-1.20)	(0.95)	(2.07)				
Long-short	0.001	0.053	0.035*	-0.044	-0.018*	0.177	0.032	0.003	0.004
	(0.01)	(1.49)	(1.85)	(-0.89)	(-1.73)				
Gov. Score									
High-rated	0.071***	0.819***	0.009	0.003	0.016	0.854	0.064	0.319	0.000
	(3.04)	(26.98)	(0.55)	(0.08)	(1.42)				
Low-rated	0.068***	0.762***	-0.018	0.032	0.007	0.895	0.217	0.108	0.088
	(3.06)	(32.56)	(-1.24)	(0.97)	(0.87)				
Long-short	0.003	0.057*	0.027	-0.029	0.009	0.170	0.090	0.002	0.000
	(0.10)	(1.79)	(1.12)	(-0.69)	(0.52)				
ESG Score									
High-rated	0.081***	0.835***	0.019	0.021	0.002	0.917	0.083	0.171	0.072
	(3.09)	(31.75)	(1.29)	(0.56)	(0.37)				
Low-rated	0.080**	0.744***	-0.037**	0.034	0.023**	0.824	0.491	0.280	0.300
	(2.58)	(23.26)	(-2.18)	(0.76)	(2.56)				
Long-short	0.001	0.091***	0.056***	-0.013	-0.021**	0.222	0.111	0.216	0.088
	(0.04)	(2.76)	(3.20)	(-0.27)	(-2.21)				

Table 8. The performance of portfolios formed on individual and combined ESG scores - analysis for expanding windows

This table presents estimates of monthly abnormal returns (alphas expressed in percentage) obtained from the conditional multi-factor model regressions considering the overall period (2003-2016) and different subperiods. The high-rated (low-rated) portfolios include bonds from the 50% of all companies with the highest (lowest) rating for each individual and combined ESG score. The long-short portfolio simulates a trading strategy going long in the high-rated and short in the low-rated portfolio. The portfolios are value-weighted and rebalanced monthly. ***, ** and * indicate significance at the 1%, 5%, and 10% level, respectively. The values of the t-statistic are presented in parenthesis. Standard errors are computed using the Newey-West (1987) method or the White (1980) variance–covariance matrix, whenever necessary.

	2003-2007	2003-2008	2003-2009	2003-2010	2003-2011	2003-2012	2003-2013	2003-2014	2003-2015	2003-2016
Env. Score										
High-rated	0.097	0.056*	0.103***	0.101***	0.076*	0.069**	0.069**	0.061**	0.063**	0.054*
	(1.62)	(1.69)	(2.70)	(2.72)	(1.96)	(2.04)	(2.28)	(2.04)	(2.26)	(1.97)
Low-rated	-0.139**	-0.047	0.009	0.004	0.016	0.021	0.024	0.027	0.031	0.027
	(-2.26)	(-0.80)	(0.15)	(0.08)	(0.35)	(0.51)	(0.63)	(0.74)	(0.93)	(0.89)
Long-short	0.235***	0.103*	0.094*	0.097**	0.060	0.048	0.045	0.034	0.032	0.027
	(3.73)	(1.77)	(1.87)	(2.04)	(1.10)	(0.95)	(1.00)	(0.78)	(0.78)	(0.87)
Soc. Score										
High-rated	0.114***	0.086	0.127***	0.135***	0.102***	0.091***	0.089***	0.084**	0.086**	0.074**
	(3.24)	(1.54)	(2.86)	(3.19)	(2.68)	(2.65)	(2.90)	(2.28)	(2.57)	(2.47)
Low-rated	-0.143**	-0.021	0.025	0.009	0.024	0.030	0.033	0.033	0.031	0.027
	(-2.25)	(-0.34)	(0.42)	(0.17)	(0.50)	(0.69)	(0.86)	(0.92)	(0.92)	(0.87)
Long-short	0.257***	0.108	0.103	0.126**	0.078	0.061	0.057	0.051	0.055	0.047
	(3.56)	(1.53)	(1.64)	(2.09)	(1.50)	(1.30)	(1.18)	(0.98)	(1.30)	(1.36)
Gov. Score										
High-rated	0.032	0.030	0.079	0.077	0.064	0.060	0.059	0.051	0.055*	0.047
	(0.60)	(0.63)	(1.51)	(1.61)	(1.49)	(1.53)	(1.59)	(1.45)	(1.68)	(1.57)
Low-rated	-0.032	-0.014	0.033	0.029	0.028	0.028	0.033	0.037	0.038	0.032
	(-0.94)	(-0.43)	(0.99)	(0.88)	(0.95)	(1.02)	(1.33)	(1.43)	(1.63)	(1.42)
Long-short	0.064	0.044	0.045	0.048	0.036	0.031	0.026	0.014	0.017	0.015
	(0.89)	(0.81)	(0.66)	(0.78)	(0.80)	(0.77)	(0.72)	(0.44)	(0.58)	(0.57)
ESG Score										
High-rated	0.090***	0.046	0.100**	0.099**	0.075**	0.067**	0.066**	0.059*	0.067**	0.059**
	(2.85)	(1.32)	(2.48)	(2.60)	(2.14)	(2.09)	(2.01)	(1.89)	(2.25)	(2.08)
Low-rated	-0.157**	-0.035	0.003	-0.003	0.012	0.020	0.023	0.027	0.023	0.018
	(-2.23)	(-0.53)	(0.06)	-0.05	(0.25)	(0.44)	(0.59)	(0.73)	(0.66)	(0.58)
Long-short	0.247***	0.081	0.097	0.102*	0.062	0.047	0.043	0.032	0.044	0.040
	(3.48)	(1.19)	(1.66)	(1.88)	(1.30)	(1.07)	(1.09)	(0.85)	(1.18)	(1.23)

Table 9. The performance of portfolios formed on individual and combined ESG scores - dummy variable model

This table presents estimates of monthly abnormal returns (alphas expressed in percentage), factor loadings, and the adjusted R^2 obtained from the dummy variable model regressions (equation 2). D_t is a dummy variable which assumes the value of 0 in expansion periods and 1 in recession periods. The high-rated (low-rated) portfolios include bonds from the 50% of all companies with the highest (lowest) rating for each individual and combined ESG score. The long-short portfolio is a trading strategy going long in the high-rated and short in the low-rated portfolio. The portfolios are value-weighted and rebalanced monthly. The observation period spans the period from 2003 to 2016. ***, ** and * indicate significance at the 1%, 5%, and 10% level, respectively. The values of the t-statistic are presented in parenthesis. Standard errors are computed using the Newey-West (1987) method or the White (1980) variance–covariance matrix, whenever necessary. W_1, W_2 and W_3 correspond to the probability values of the $\mathcal{X}^2$ statistic of the Wald test on the hypothesis that the coefficients of the conditional alphas, conditional betas and conditional alphas and betas, respectively, are jointly equal to zero.

	α	α_{D_t}	β_{Bond}	$\beta_{Default}$	β_{Option}	β_{Equity}	β_{Bond*D_t}
Env. Score							
High-rated	0.033	0.040	0.877***	-0.002	0.051	0.004	0.022
	(1.52)	(0.47)	(27.53)	(-0.14)	(1.32)	(0.48)	(0.28)
Low-rated	0.006	0.109	0.909***	-0.029*	0.049	0.016*	-0.034
	(0.21)	(1.57)	(25.83)	(-1.79)	(0.96)	(1.90)	(-0.55)
Long-short	0.027	-0.069	-0.032	0.027**	0.001	-0.012	0.056
	(0.83)	(-1.39)	(-0.75)	(2.02)	(0.04)	(-1.10)	(0.89)
Soc. Score							
High-rated	0.035	0.130	0.890***	-0.022	0.046	0.004	-0.036
	(1.39)	(1.42)	(20.89)	(-1.34)	(1.27)	(0.62)	(-0.49)
Low-rated	0.014	0.099	0.894***	0.008	0.067	0.017**	-0.075
	(0.47)	(1.40)	(25.00)	(0.47)	(1.28)	(1.96)	(-1.20)
Long-short	0.021	0.031	-0.004	-0.030	-0.021	-0.013	0.039
	(0.50)	(0.37)	(-0.08)	(-1.32)	(-0.40)	(-0.91)	(0.57)
Gov. Score							
High-rated	0.011	0.070	0.900***	0.000	0.058	0.015	0.019
	(0.41)	(0.75)	(30.59)	(0.00)	(1.50)	(1.47)	(0.22)
Low-rated	0.040*	0.001	0.875***	-0.035**	0.042	-0.002	-0.042
	(1.95)	(0.96)	(33.17)	(-2.42)	(1.16)	(-0.24)	(-0.68)
Long-short	-0.030	0.004	0.024	0.035**	0.016	0.017	0.061
	(-1.19)	(0.09)	(0.75)	(2.45)	(0.35)	(1.23)	(0.83)
ESG Score							
High-rated	0.028	0.054	0.889***	0.004	0.055	0.006	0.032
	(1.22)	(0.61)	(29.35)	(0.32)	(1.24)	(0.64)	(0.41)
Low-rated	0.014	0.094	0.885***	-0.043**	0.042	0.017*	-0.064
	(0.43)	(1.25)	(23.20)	(-2.47)	(0.75)	(1.81)	(-0.95)
Long-short	0.014	-0.041	0.004	0.047***	0.013	-0.011	0.096
	(0.43)	(-0.53)	(0.11)	(2.68)	(0.22)	(-1.18)	(1.40)

Table 10. Continued

	β_{Def*D_t}	β_{Opt*D_t}	β_{Eq*D_t}	$Adj.R^2$	W_1	W_2	W_3
Env. Score							
High-rated	-0.001 (-0.04)	-0.086 (-1.01)	0.001 (0.07)	0.901	0.639	0.580	0.462
Low-rated	-0.054** (-2.23)	0.055 (0.70)	0.012 (0.70)	0.871	0.119	0.065	0.058
Long-short	0.053*** (2.87)	-0.141** (-2.48)	-0.010 (-0.64)	0.185	0.167	0.000	0.000
Soc. Score							
High-rated	0.004 (0.13)	-0.076 (-0.86)	0.005 (0.35)	0.887	0.158	0.727	0.483
Low-rated	-0.055** (-2.24)	0.033 (0.41)	0.009 (0.56)	0.862	0.163	0.016	0.022
Long-short	0.060** (2.19)	-0.109 (-1.55)	-0.004 (-0.25)	0.076	0.709	0.083	0.133
Gov. Score							
High-rated	-0.017 (-0.50)	-0.117 (-1.33)	-0.008 (-0.38)	0.889	0.456	0.224	0.152
Low-rated	-0.029 (-1.05)	0.090 (1.26)	0.030* (1.96)	0.909	0.339	0.353	0.470
Long-short	0.012 (0.51)	-0.208*** (-3.03)	-0.037** (-2.03)	0.224	0.925	0.000	0.001
ESG Score							
High-rated	-0.019 (-0.57)	-0.083 (-0.97)	0.000 (-0.01)	0.905	0.544	0.365	0.282
Low-rated	-0.032 (-1.23)	0.072 (0.84)	0.015 (0.84)	0.844	0.213	0.409	0.464
Long-short	0.013 (0.48)	-0.154* (-1.79)	-0.015 (-0.83)	0.156	0.597	0.073	0.123