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Socially responsible investing and the performance of Eurozone corporate bond portfolios

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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) and on specific dimensions of CSR, namely, Environment, Social and Governance dimensions. Our results show that the performance of highly socially rated bonds is not significantly different from that of low-rated bonds. We also observe 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 and shunned-security hypotheses are not only useful in explaining the performance of socially responsible equity portfolios but that they are also useful in explaining the performance of socially screened bond portfolios over time. Overall, our results indicate that investors can form bond portfolios based on sustainability criteria without compromising financial performance.

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

JEL Classification Codes: G11, M14

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1. Introduction

The growth of socially responsible investing in recent decades has been a major trend in financial markets worldwide, motivating 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, the rise of socially responsible investing in the fallout of the international financial crisis reflects a growing public awareness that socially irresponsible behavior is detrimental not only to a company itself but also to society in general. Increased interest in responsible investment strategies has been further stimulated by several international institutions that have played an important role in bringing sustainability issues to the forefront of investors’ agendas. For instance, the United Nations Principles for Responsible Investment (PRI) established in 2006 encourages mainstream investors to integrate ESG issues into their investment decisions. Currently, more than 2200 institutional investors worldwide are signatories of the United Nations-backed PRI.¹ Another sign of this trend relates to European Union’s commitment to sustainable finance. Within its efforts to combine finance with sustainability, the EU has recently established a technical expert group bringing together academics, practitioners and representatives of public agencies and calling for academic research in the field.²

Regarding socially responsible investment (SRI) asset allocation in Europe, there has been a significant increase in bond investing from roughly 64% of SRI in December 2015 to roughly 40% registered in December 2013. By 2015 the equity segment of the European SRI market accounted for roughly 30% of SRI assets under management, reflecting 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. Compared to equities, returns of bonds are affected by a smaller number of nondiversifiable risk factors. This suggests that there may be a more limited scope for managers to engage in management strategies that exploit ESG firm characteristics. Yet we can argue that a portion of the risk of corporate bonds is firm-specific and can be exploited through active management or eliminated by means of diversification (Derwall and Koedijk, 2009). Furthermore, SRI might even have a

¹ www.unpri.org

² https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance_en#teg

stronger impact on bond performance than on equities given that bond investment based on ESG criteria focuses more on risk reduction by avoiding the most unsustainable or irresponsible companies, particularly in relation to reputational, environmental and supply chain risks and scandals (Henke, 2016; Hoepner and Nilsson, 2017). The financial crisis that hit the European sovereign debt markets in 2010 and its negative effects on the European economies further make a case for investigating the financial performance of portfolios of socially responsible bonds. Nevertheless, the majority of empirical evidence on SRI is concentrated on the equity segment of the market while the performance of SRI bond portfolios has been far less explored. Moreover, the few studies on the financial performance of SRI bond portfolios focus on the performance of actively managed mutual funds. However, analyzing the financial effects of social criteria by evaluating the performance of SRI mutual funds has some limitations. First, it is difficult to disentangle performance attributable to the skills of the fund manager from the performance that is associated with the socially responsible characteristics of companies held by funds (Kempf and Osthoff, 2007; Chen and Scholtens, 2018). Second, fund returns also reflect management fees (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 complies with ethical or social criteria (Auer, 2016). To avoid these problems, an alternative way to evaluate the performance of socially responsible investments involves analyzing synthetic portfolios formed on the basis of companies' social characteristics.

The main objective of this paper is to investigate the financial effects of integrating corporate social responsibility (CSR) criteria in bond portfolios of Eurozone companies. We analyze whether there are financial benefits or costs of investing in Eurozone corporate bonds by forming mutually exclusive bond portfolios with high and low social ratings and by investigating the impact of screening for different social criteria on the financial performance of such portfolios. In addition to examining an aggregate measure of CSR, we also consider three of its individual dimensions, namely Environmental, Social and Corporate Governance dimensions. The analysis of these specific dimensions is important because some social characteristics of companies may 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 for 2003 to 2016 and their performance is evaluated using a conditional multifactor model with time-varying performance and risk.

This paper makes several contributions to the literature. To the best of our knowledge, this is the first investigation of the risk-adjusted performance of synthetic European SRI bond portfolios formed on the basis of ESG criteria. In addition, portfolio performance is evaluated with a conditional multifactor model that allows performance and risk exposure to vary over time according to public

information variables that reflect economic conditions. Furthermore, motivated by previous studies on socially responsible equities that claim that CSR activities take time to be understood by investors and to be incorporated into market prices, we present relevant empirical evidence on time-related issues in socially responsible bond investing. In terms of socially responsible bond investing, to the best of our knowledge this is the first study providing evidence consistent with the errors-in-expectations and shunned-bond hypotheses.

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 employed. Section 5 presents and analyzes the empirical results. Finally, section 6 presents and discusses the main conclusions drawn.

2. Prior research

One of the most issues most highly debated in the finance literature concerns the financial effects of socially responsible investing. Two contrasting hypotheses compete to explain the performance of socially screened portfolios. The hypothesis of the underperformance of SRI portfolios derives directly from modern portfolio theory, according to which the imposition of any social screening restricts the investor's investment universe and reduces risk-adjusted portfolio performance (Rudd, 1981). The additional monitoring and information costs associated with screening strategies also contribute to the underperformance of SRI portfolios (Cortez *et al.*, 2009). The underperformance hypothesis of SRI portfolios is further supported by the argument that investing in controversial activities such as tobacco, alcohol and weapons, which are typically avoided by values-driven investors, is more lucrative (e.g., Hong and Kacperzyck, 2009; Statman and Glushkov, 2009; Derwall *et al.*, 2011). By excluding these stocks, socially responsible investors are not able to benefit from these abnormal returns, whereas other investors might do so. An opposing view based on stakeholder theory (Freeman, 1984) argues that companies that integrate all stakeholders' interests may benefit from higher shareholder value in the long term (Jensen, 2001). Engagement in CSR presents an opportunity for companies to gain competitive advantages (Porter and Kramer, 2006) and signals information regarding 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 less default risk (Hoepner *et al.*, 2016), enabling them to benefit from improved performance relative to the portfolios of less socially responsible companies.

There is extensive empirical evidence on the financial impact of including social criteria in equity portfolios.³ Such studies fall into the category of ‘portfolio studies’ (Wagner, 2001) and the methodology used involves comparing the financial performance of portfolios of companies that score high on one or more indicators of sustainability to those of companies with lower sustainability scores. Typically, financial performance is assessed with well-known risk-adjusted measures such as alphas derived from Fama and French’s (1993) three-factor and Carhart’s (1997) four-factor models. Furthermore, most of these studies analyze the US market, and results range from those that find a positive link between social and financial performance to those that find neutral performance from social screened portfolios. For example, Kempf and Osthoff (2007) evaluate portfolios of US companies for 1991 to 2004 and find that investors can earn high abnormal returns from a strategy that involves assuming a long position in the high-rated social portfolio and a short position in the low-rated social portfolio. Statman and Glushkov (2009), using a dataset of US companies for 1992 to 2007, also find that stocks of 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 no significant return differences between portfolios of US companies with high and low Environment, Social and Governance rating levels for 2002 to 2011. In addition to the US, Mollet and Ziegler (2014) also analyze European SRI stocks for 1998 to 2009 and do not find evidence of significant abnormal returns from SRI portfolios. Outside of the US, Van de Velde *et al.* (2005) analyze portfolios of European companies for 2000 to 2003 and find that portfolios of high-rated European companies do not perform significantly different from low-rated ones. Brammer *et al.* (2006) find similar results for the UK for 2002 to 2005. In turn, Auer and Schuhmacher (2016) document that over the period of 2004-2012, investors in the US and Asia-Pacific markets tend to gain 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.

Additionally, some studies on SRI equity portfolios analyze the evolution of performance over time. The resultant findings support two hypotheses on the performance of SRI portfolios, namely, the shunned-stock and errors-in-expectations hypotheses (Derwall *et al.*, 2011). The underlying argument is that the SRI movement can be divided into a values-driven approach, through which social and personal values are sources for integrating CSR criteria and a profit-seeking approach focusing on traditional financial goals. The shunned-stock hypothesis claims that values-driven investors shun

³ The stream of the literature that evaluates the performance of socially responsible portfolios either considers existing mutual funds or synthetic portfolios formed by the researcher. We restrict our discussion to studies that evaluate the performance of synthetic SRI equity portfolios and not to those addressing the performance of actively managed SRI equity funds. For a detailed discussion of the performance of SRI equity 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.

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 achieve 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 from shunned-stocks over time due to the universal nature of certain social values. In contrast, any abnormal returns associated with errors-in-expectations are expected to be temporary, as over the long run, it is expected that investors will recognize the economic value of CSR practices. In evaluating the performance of a portfolio of shunned stocks and a portfolio of stocks of firms scoring high in employee relations from 1992 to 2008, Derwall *et al.* (2011) confirm these claims. Borghers *et al.* (2013) also show that stakeholder information is mispriced due to errors in investors' expectations. Consistent with the temporary nature of returns associated with this hypothesis, risk-adjusted returns decline as investor attention to stakeholder information increases over time. For a dataset of US firms for 1992 to 2009 and in analyzing different subperiods, the authors find that prior to each breaking date, the average risk-adjusted return differences between top- and bottom-ranked portfolios are positive, whereas postbreak performance is neutral in most cases. The mispricing of SRI assets is further reinforced by Edmans (2011), who finds that from 1984 to 2009, portfolios of firms with high levels of employee satisfaction generate abnormal returns. However, these abnormal returns decrease over time. According to Edmans (2011), mispricing is consistent with the stock market exhibiting difficulties in fully valuing intangibles. The declining performance observed over time is attributed to the possibility that mispricing may be corrected as the market slowly learns about this value-relevant information. Errors-in-expectations in the market are also cited by Mollet *et al.* (2013) to explain the outperformance of portfolios of small and innovative European firms engaged in strategic CSR implementation from 2002-2009. The results of Halbritter and Dorfleitner (2015) for 1991-2012 are also consistent with investors' errors-in-expectations, as in earlier years, companies featuring high ESG scores outperformed their lower-rated counterparts while as of 2012 this outperformance disappears.

There are fewer studies that analyze the extent to which screening on sustainability criteria affects the financial performance of bond portfolios⁴, and most of such studies address the performance of bond or balanced actively managed mutual funds. For instance, Derwall and Koedijk (2009) evaluate the performance of SRI fixed income funds in the US for 1987 to 2003 by using a four-factor model that includes a bond market factor, a default spread factor, an option factor and a stock market factor. Their results show that the average SRI bond fund performs similarly to conventional funds, whereas the

⁴ Although a stream of the bond literature investigates the relationship between corporate social responsibility and the cost of debt (e.g., Menz, 2010; Stellner *et al.*, 2015; Hoepner *et al.*, 2016; Zerbib, 2019), these studies assume the company's perspective, which is outside of the scope of our paper. Our focus is a different one, as we address the issue of SRI from the investor's perspective by analyzing whether there are opportunities for investors to obtain abnormal returns by investing in socially responsible bonds.

average SRI balanced fund outperforms its conventional counterparts. More recently, Henke (2016), using a five-factor model including an additional term factor, finds that from 2001 to 2014, SRI bond funds in the US and Eurozone outperform not only the market but also conventional funds. Based on a conditional six-factor model that also controls for different segments of the bond market and for differences in the sovereign bond returns from GIIPS and other Euro-area countries, Leite and Cortez (2018) investigate the performance of SRI bond and balanced funds domiciled in France and Germany from 2002 to 2014. Their results show no differences in the performance of SRI and conventional balanced funds. However, SRI bond funds significantly outperform their conventional counterparts, in line with Henke (2016). This outperformance appears to be more closely related to the government and not to the corporate bonds that funds hold. Furthermore, both SRI and conventional balanced funds as well as conventional bond funds underperform the market. These results stand in contrast to those of Derwall and Koedijk (2009) who find the performance of SRI balanced funds neutral

Regarding synthetic bond portfolios, Hoepner and Nilsson (2017) is, to the best of our knowledge, the only study that explores whether an investment strategy on bonds based on ESG ratings leads to abnormal returns. The authors use a dataset of US companies for 2001 to 2014 and apply a multifactor performance evaluation model that includes nine factors (the bond market, the default spread, an option factor, a term factor, an equity factor, a global factor and three exchange rate factors). Hoepner and Nilsson (2017) do not find that bonds of companies with high ESG ratings outperform those of less socially responsible companies, in contrast to what Kempf and Osthoff (2007) find for equity portfolios. In fact, the authors suggest that *no news is good news* for ESG bonds, since bonds issued by companies with no strengths, concerns or controversies regarding social issues outperform bonds issued by companies with strengths and concerns. This result is robust when controlling for industry differences and for differences in remaining maturity, and when analyzing value- and equally-weighted portfolios.

As discussed above, there are two conflicting arguments on the effects of integrating social criteria into the portfolio selection process. The main motivation of this paper is rooted in the fact that there are no studies in the literature that analyze the financial effects of integrating ESG screens on the performance of European bond portfolios. Our study fills this gap in the literature by testing the hypothesis that social screening affects the financial performance of Eurozone corporate bond portfolios formed on the basis of Environmental, Social and Governance criteria, and on a combined ESG measure. Furthermore, as there are no studies addressing the evolution of the performance of socially responsible bond portfolios over time, we explore whether the errors-in-expectations and shunned-stock hypotheses can be useful in explaining the performance of bonds over time. To test these

hypotheses, we form portfolios of different social levels based on social scores provided by the ASSET4 ESG database. We evaluate the performance of these portfolios with a conditional multifactor model that allows for time varying risk and performance, thereby overcoming a weakness of most studies that use unconditional models of performance evaluation. In fact, with the exception of Leite and Cortez (2018), all studies mentioned so far use multifactor models of portfolio performance evaluation that do not allow for time-varying risk and performance. These unconditional models can generate biased estimates of performance in contexts of time-varying risk exposure (Ferson and Schadt, 1996; Christopherson et al., 1998) and thus conditional models are considered to be more robust.

3. Methods

We investigate the financial effects of social screening by forming synthetic bond portfolios based on ESG ratings. At the beginning of period t , two value-weighted portfolios are formed based on companies' CSR scores at the end of period $t - 1$. Portfolios are formed with respect to individual Environmental, Social and Corporate Governance dimensions and on an aggregate measure of ESG. For each individual dimension and the aggregate measure, high- and low-rated portfolios include the highest (above the median score) and lowest (below the median score) ranked firms with bonds in each period. These portfolios are rebalanced monthly to account for changes in social rankings occurring throughout the year and for any new security issues or redemptions.

The performance of bond portfolios is evaluated using a multifactor model that accounts for four factors, namely, a bond market factor, a default spread factor, an option factor and a stock market factor. The excess return on the bond market index aims to capture exposure to the specific investment market. The default factor captures the credit risk of corporate bonds. The option factor is included to account for any option effects. Finally, the equity factor proxies for expectations regarding overall economic conditions. These factors have been shown to explain most of the variation in bond portfolio returns (Elton *et al.*, 1995) and have been widely used in studies analyzing bond portfolio performance (e.g., Derwall and Koedjik, 2009; Henke, 2016; Hoepner and Nilsson, 2017).⁵ To avoid biases that may arise from using unconditional models (that do not take into account information on the state 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 represents the public information available at time

⁵ Some studies include a larger number of factors to account for additional sources of risk such as exchange rate, term or specific market risks (Hoepner and Nilsson, 2017). Given that our objective is to use a conditional model, we restrict the number of factors to those that previous studies have found to be more relevant to keep the model parsimonious.

$t-1$ relevant for predicting returns at time t . Therefore, the conditional multifactor model can be expressed as follows:

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

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 $Equity_t$ represents the excess returns of the equity market index. $z_{t-1} = Z_{t-1} - E(Z)$ corresponds to deviations of Z_{t-1} from their average values, $\beta_{1p}, \beta_{2p}, \beta_{3p}, \beta_{4p}$ are the average betas, and $\beta'_{1p}, \beta'_{2p}, \beta'_{3p}, \beta'_{4p}$ are vectors that measure the sensitivity of conditional betas to deviations of the Z_{t-1} from their means. A'_p is a 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.

4. Data

Data on the social scores of Eurozone companies were collected from ASSET4 ESG between 2003 and 2016.⁶ The database provides information on the social responsibility ratings of companies. ASSET4 ESG is one of the world's major suppliers of ESG data and started rating firms on ESG dimensions in 2002. Ioannou and Serafeim (2012) estimate that investors representing more than €2.5 trillion in assets under management use ASSET4 data to integrate ESG data in the portfolio selection process. Furthermore, the database has been used in several recent studies conducted on SRI portfolio performance. Stellner *et al.* (2015), Gonenc and Scholtens (2017) and Eding and Scholtens (2017) note some of the advantages of this source of social data, namely, those related to its international coverage, trustworthiness and consistency of reporting. However, due to the rewriting history of the database, scores collected can vary depending on the date on which they are downloaded.⁷ Although this may be a limitation of our analysis, shifts in the portfolios that may arise from collecting series on different dates are expected to be minor. Additionally, as our main analysis is based on portfolios formed at the 50%

⁶ The ESG scores were collected in August 2017.

⁷ We thank the members of the European Commission Technical Expert Group for this insight.

cut-off, significant shifts in the portfolios are even less likely. Thus, we are confident that our results are not significantly affected by this history rewriting issue. Our choice of the evaluation period is motivated by ASSET4 data availability, as it started rating firms on ESG dimensions from 2002. ASSET4 ESG provides an overall ESG score that results of an equally-weighted rating of 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”. This covers several categories, including *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 covers *product responsibility, community, human rights, diversity, employment quality, health and safety, and training and development*. 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 covers *board functions, board structure, compensation policy, shareholder rights, and vision and strategy*. The Environmental, Social and Corporate Governance pillars represent a company’s extrafinancial health. Considering that the purpose of this paper is to form portfolios based on companies’ extrafinancial health, we do not use the Economic pillar or the overall ESG pillar provided by ASSET4 ESG (as it includes the Economic pillar). Instead, we compute a combined ESG score as an equally-weighted average of these three individual scores.

Considering the Eurozone constituents identified from the ASSET4 database, Thomson Reuters Datastream was used to collect financial information on bonds issued by these companies. For each company, we searched for related securities listed on 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 manner. We include nonsurviving firms and firms that are no longer public companies to avoid survivorship bias. After collecting this information, we checked whether the ASSET4 database covers these companies. We then excluded financial institutions and banks because their inclusion could bias the results. On one hand, the large number of bonds issued by financial companies relative to other sectors would reduce cross-industrial variability (Hoepner and Nilsson, 2017; Oikonomou *et al.*, 2014). On the other hand, the period analyzed 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 excluded bonds with nonstandard features, such as 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 characteristics (Oikonomou *et al.*, 2014). Furthermore, we did not consider issues from subsidiaries (including special purpose vehicles) when a company is a parent company. Finally, we included bond issued in the respective market and in international markets as long as the bond is Euro-denominated. A company was eliminated from the dataset when no data were displayed for related securities in Thomson Reuters Datastream.

The final dataset includes of 935 Euro-denominated bonds issued by 189 Eurozone companies. The number of bonds and companies by country and industry is presented in Table 1. The majority of bonds and companies are from Germany and France. The dataset includes a diversified set of companies of different industries. Table 2 provides descriptive statistics of individual and combined ESG scores for the 189 Eurozone companies for 2003 to 2016. Mean ESG scores of the entire rating universe of ASSET4 are supposed to fall within a range of 50 due to the scoring approach used (Halbritter and Dorfleitner, 2015). On average, the companies included in our dataset have mean Environmental and Social scores of 81.15 and 82.12, respectively. Therefore, it is possible to conclude that Eurozone companies are above average in these two pillars. Furthermore, the distributions of these scores are negatively skewed. This means that there are more high-rated companies than low-rated companies. Regarding the Corporate Governance score, Eurozone companies are in line with the average with a the mean of 56.23. This also implies that Eurozone companies present worse scores in the Corporate Governance pillar than they do in the Environmental and Social pillars. The analysis conducted by industry shows a similar picture.⁸

[Insert Tables 1 and 2 here]

Table 3 presents descriptive statistics for the high- and low-rated portfolios with a 50% cut-off and those for long-short portfolio, which simulates a trading strategy of 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 are rebalanced monthly. The high- and low-rated portfolios, formed on the basis of alternative CSR metrics present positive and statistically significant monthly returns. Although the high-rated portfolios show higher monthly returns than the low-rated portfolios, the differences are not statistically significant. The hypothesis that the portfolio returns are normally distributed is rejected only for the long-short portfolios.

⁸ Although we do not report mean scores by industry, it is worth mentioning that the Healthcare sector presents lower average Environment, Social and ESG scores. For the Corporate Governance scores, the worst performing sector is the Oil & Gas Sector.

[Insert Table 3 here]

Regarding risk factors, the BofA Merrill Lynch Euro Non-Financial Corp Euro Domicile index is used as the bond market benchmark. 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 factor is computed as the difference in returns between the BofA Merrill Lynch € Asset-Backed and Mortgage-Backed Securities TR index and the iBoxx € Sovereign TR index. Finally, the stock market factor 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 were retrieved from Thomson Reuters Datastream.⁹

As lagged public information variables, we use the term spread, the inverse relative wealth (IRW) and a January dummy.¹⁰ The term spread is a proxy for the expected bond risk premium and 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.¹¹ 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 deflated by the Euro-Area Harmonised Index of Consumer Prices. Data on these public information variables are also collected from Thomson Reuters Datastream.¹² Finally, the January dummy variable captures January seasonality and takes a value of 1 when the next month is the month of January and a value of 0 otherwise.

⁹ The exception is the BofA Merrill Lynch Euro Non-Financial Corp Euro Domicile, as data on this index is retrieved from <https://markets.ml.com>.

¹⁰ Silva *et al.* (2003) find that these variables are useful predictors of European bond excess returns.

¹¹ Following Ilmanen (1995) and Silva *et al.* (2003), the IRW variable is defined as follows:

$$IRW = \frac{ewa W_{t-1}}{W_t} = \frac{(W_{t-1} + coef * W_{t-2} + coef^2 * W_{t-3} + \dots) * (1 - coef)}{W_t}$$

where *coef* is the smoothing coefficient, W_t is the real level of the stock market at time t , and $ewa W_{t-1}$ is the exponentially weighted average of real stock market levels up to $t - 1$. A smoothing coefficient of 0.9 and a 36-month window are used to compute this variable.

¹² When the information variables present large autocorrelations, this may lead to spurious regressions. To limit this possibility, Ferson *et al.* (2003) propose a simple form of stochastic detrending that lowers the persistence of predictor variables. Hence, the lagged variables are detrended by subtracting a 12-month moving average. In addition, mean-zero variables are used to minimize possible scale effects on the results.

5. Empirical results

5.1. Performance of SRI bond portfolios

Table 4 presents regression estimates of the conditional multifactor model of high- and low-rated portfolios formed on the basis of individual and combined ESG scores and considering a 50% cut-off. We also present estimates of a portfolio representing differences in returns between the high- and low-rated portfolios, thereby representing the performance of a strategy of going long in the high-rated portfolio and short in the low-rated portfolio. The results show that high-rated portfolios formed on the basis of Social and ESG scores yield positive and statistically significant abnormal returns (at the 5% level). Low-rated portfolios show neutral performance. All high-rated portfolios show higher alphas than low-rated portfolios. Yet the differences between both are not statistically significant. These 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 conducted on equity portfolios (Kempf and Osthoff, 2007; Halbritter and Dorfleitner, 2015).

[Insert Table 4 here]

As expected, the bond market is the main factor that shapes 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 for this factor (except for that formed on the basis of the Social score). The results also show statistically significant differences in investment styles between high- and low-rated portfolios. Although high- and low-rated portfolios present similar levels of exposure to the bond market, 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 engagement in CSR practices (Oikonomou *et al.*, 2014, Stellner *et al.*, 2015).

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 further test the sensitivity of the results to alternative cut-off portfolios and an alternative portfolio weighting scheme. Extant empirical evidence shows that the profitability of a long-short strategy can depend on the cut-off used 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 consider not only the few companies with a very good CSR rating but also a large number of companies with lower ratings. Furthermore, Kempf and Osthoff (2007) only find outperformance for portfolios formed on the basis of extreme social ratings (the 10% of companies with the best ratings). Hence, we also estimate the performance obtained from portfolios formed on the basis of alternative 25% and 10% cut-offs.

Table 5 summarizes comparisons of alphas of portfolios formed on the basis of alternative cut-offs. The results show that forming portfolios that are more strict regarding ESG ratings does not change conclusions drawn previously, thereby showing that there are no significant differences between the financial performance of the best and worst rated portfolios, regardless of the cut-offs considered.¹³ These results contrast with those of Kempf and Osthoff (2007), who find a positive alpha for long-short portfolios 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 5 here]

We additionally analyze portfolio performance using equally-weighted portfolios. Table 6 provides regression estimates of the conditional multifactor model for equally-weighted portfolios formed on the basis of individual and combined ESG scores (high- and low-rated portfolios and the long-short portfolio) with a 50% cut-off. In general, the results show that high- and low-rated portfolios perform better than value-weighted portfolios. The higher alphas obtained when considering equally-weighted portfolios suggest that bonds issued by smaller companies tend to perform better. However, the results continue to show that alphas of the long-short portfolios are not statistically significant. Halbritter and Dorfleitner (2015) also find statistically insignificant differences between high- and low-rated equity portfolios regardless of which portfolio weighting procedure is used. It is also worth mentioning that our results are consistent with those of 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 long-short portfolios are sensitive to the weighting scheme used to form portfolios.

¹³ For low-rated portfolios with a 10% cut-off, the adjusted R-squareds values are rather low, possibly reflecting the limited number of bonds representing the 10% worst portfolios for certain months.

[Insert Table 6 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 portfolios evolve over time. Motivated by empirical evidence that seems to suggest the time-dependency of SRI equity portfolio performance, we further analyze bond portfolio performance for different subperiods.

Figure 1 illustrates the evolution of the mean ESG ratings of the socially screened portfolios between 2003 and 2016. We observe that the high CSR scores of top-rated portfolios show some consistency over time. It is important to keep in mind that the rebalancing of these portfolios strictly reflects the social ratings of their holdings. This procedure contrasts with the rebalancing strategies of most actively managed SRI mutual funds, which rely on fund managers' skills to shift portfolio compositions in response to changing market conditions (Auer, 2016; Auer and Schuhmacher, 2016). Hence, there maybe a trade-off between keeping the social level of a fund high and taking advantage of market timing and selectivity opportunities.¹⁴

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

[Insert Figure 1 here]

Previous empirical evidence shows a link between ESG scores and equity portfolio returns for earlier years (Halbritter and Dorfleitner, 2015). However, over the long run investors should not expect persistent abnormal returns by investing according to ESG aspects, as SRI value-relevant information is 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

¹⁴ Wimmer (2013) concludes that the lack of long-term persistence in mutual funds ESG scores is mainly driven by changes in the holdings of the SRI funds and not by changes in the underlying companies' ESG ratings. This conclusion is relevant for values-driven investors since their main concern is to hold portfolios with high ethical standards.

portfolio performance over time, we expand the regression window by 1 year, starting with the period of 2003-2007 and ending with the period 2003-2016.¹⁵

Table 7 presents the alpha estimates of portfolios formed on the basis of individual and combined ESG scores with a 50% cut-off for subperiods 2003-2007 to 2003-2016. With the exception of portfolios formed on the Corporate Governance score, all long-short portfolios present statistically significant alphas (at the 1% level) for the first period (2003 to 2007), indicating an outperformance of highly socially rated portfolios compared to those that are less socially responsible. These results show that until 2007, 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, 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 exhibit a performance that is not significantly different. In addition, the positive alphas of high-rated portfolios seem to decrease over time, especially 2003-2010.¹⁶ These results are in line with those of Derwall *et al.* (2011) and Edmans (2011) on equity portfolios and suggest that for a period of time financial markets may not have fully reflected all value-relevant information related to CSR, enabling socially responsible investors to obtain abnormal returns associated with mispriced securities. According to Derwall *et al.* (2011), mispricing may arise because CSR is a complex and subjective concept, making it difficult for investors to assess its multidimensional nature and its effects on the fundamental value of a company. Therefore, it may take time for financial markets to recognize the positive impact of corporate social responsibility practices on company valuation. Over time, investors eventually improve their understanding of the impacts of CSR on company value and thus any abnormal returns associated with errors-in-expectations should disappear over time. This learning process apparently coincided with the beginning of the international financial crisis. This is consistent with the growing acceptance of socially responsible investing practices observed in the aftermath of the international financial crisis. The fact that our results do not show any statistically significant alphas on portfolios formed on the Corporate Governance score is in line with Bebchuk *et al.* (2013), who find evidence of abnormal returns on this dimension only prior to 1999.¹⁷ After 2000, any abnormal returns associated with good corporate governance practices seem to disappear, which is consistent with investors acknowledging the positive effects of good government practices. This result is not surprising given that corporate governance issues attracted considerable attention by academics,

¹⁵ This approach is similar to that used by Derwall *et al.* (2011).

¹⁶ Although not reported we also analyzed the evolution of SRI bond portfolio performance based on the 25% cut-off and the results are similar.

¹⁷ These findings are consistent with Gompers *et al.* (2003), who also find significant abnormal performance of portfolios of good-governed firms for the 1990s.

the financial media and market participants by the turn of the millennium. Our results suggest that investors' awareness and understanding of the relevance of other dimensions of corporate social responsibility, namely, that of the Environment and the Social dimensions, has been slower to develop over time, and thus opportunities for abnormal returns on portfolios based on these dimensions persisted until later on.

[Insert Table 7 here]

As expanding windows overlap, we complement the analysis by performing regressions on subperiods of five years with rolling windows. Table 8 presents the results. In general, the results reinforce our hypothesis that until 2007, 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, after this point, alphas of long-short portfolios decrease and lose statistical significance. The alphas of low-rated portfolios appear to increase over time. They are mostly negative and statistically significant from 2003-2007, but they become positive and statistically significant in rolling windows following 2010. We also observe that some high-rated portfolios and, particularly, low-rated portfolios, show a peak in performance over the 2010-2014 and 2011-2015 periods, which might reflect the cumulative effects of our hypotheses along with effects of the European sovereign debt crisis.

[Insert Table 8 here]

According to Derwall *et al.* (2011)'s errors-in-expectations hypothesis, socially responsible stocks may generate higher risk-adjusted returns when the market is slow to recognize the positive impacts of CSR on expected cash flows. However, any abnormal returns associated with errors-in-expectations should be temporary, as over the long run investors are expected to 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 in explaining the performance of equity portfolios but is also useful in explaining the performance of bonds over time. In addition, the results for the high-rated portfolios seem to suggest that the price of bonds of high-rated companies tends to increase over time with increased demand from values-driven investors. It is also worth noting that the alphas of low-rated portfolios appear to increase over time. The alphas of low-rated portfolios are negative and statistically significant from 2003-2007 (except for the Corporate Governance score), but they increase over time. Consistent with the shunned-security hypothesis, results for the low-rated portfolios seem to suggest

that an increasing number of values-driven investors shun bonds of low-rated companies and hence that these portfolios generate higher returns over time.¹⁸

6. Conclusions

This paper investigates the performance of socially screened bond portfolios of 189 Eurozone companies for 2003 to 2016. As far as we are aware, 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 companies' social scores provided through the ASSET4 ESG database. Portfolios are formed with respect to individual dimensions of ESG (Environment, Social and Governance dimensions) and to an aggregate measure combining these dimensions. High- and low-rated portfolios are formed on the basis of the highest (above the median) and lowest (below the median) social scores of all firms with bonds for each period, respectively. Long-short portfolios (long in high-rated and short in low-rated portfolios) are also formed to better assess differences in abnormal returns resulting from investing in high- and low-rated portfolios. Portfolio performance is evaluated 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. However, the performance of high-rated bond portfolios is significantly 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 the evolution of SRI bond portfolio performance over time. With the exception of bond portfolios based on the Corporate Governance score, the results indicate that in an earlier stage (until the beginning of the international financial crisis) 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 increase. The distinct patterns observed in the performance of high- and low-rated bond portfolios are consistent with the errors-in-expectations and shunned-stock hypotheses proposed by Derwall *et al.* (2011). The results of the low-

¹⁸ 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. Over the 2008-2016 subperiod there are no statistically significant differences in the performance of high- and low-rated portfolios.

rated portfolios seem to suggest that an increasing number of values-driven investors have shunned bonds of low-rated companies. The results found for high-rated portfolios are consistent with the mispricing argument and with the claim that the price of bonds of high-rated companies tends to rise over time following increased demand from values-driven investors. The results of this study seem to suggest that the errors-in-expectations and shunned-bond hypotheses are useful in explaining the performance of SRI bond portfolios over time.

Overall, our results suggest that investors can integrate ESG criteria into the bond portfolio selection process without sacrificing financial performance. Furthermore, we even find evidence that in an earlier stage investors were able to obtain financial benefits from investing in bonds of socially responsible companies in the Eurozone. However, they should no longer expect any outperformance, as it seems that the market has come to recognize the value of CSR practices, or at least for 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 with finer dimensions of CSR still not fully recognized by the market. This would be an interesting focus of further research. Another important area for future research concerns the quality of ESG scores. Although there are some recent studies that compare the social scores provided by different data sources, the impact of the rewriting history limitation of ASSET4 ESG has not yet been explored and is clearly in need of investigation.

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Figure 1. Portfolios' 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 by country and industry

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

Country	Bonds	Companies	Industry	Bonds	Companies
France	396	61	Basic Materials	94	24
Germany	144	37	Consumer Goods	154	26
Italy	123	22	Consumer Services	108	27
Netherlands	76	13	Health Care	37	12
Finland	58	19	Industrials	217	48
Belgium	52	9	Oil & Gas	46	9
Spain	40	15	Technology	20	10
Austria	36	6	Telecommunications	94	11
Portugal	9	6	Utilities	165	22
Greece	1	1			
Total	935	189	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 bond portfolios formed on individual and combined ESG scores

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), average factor loadings, and the adjusted R^2 obtained from the conditional multi-factor model regressions over the period 2003-2016. Portfolios are formed with a 50% cut-off. ***, ** 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.

	α	α_{TS}	α_{IRW}	α_{JD}	β_{Bond}	$\beta_{Default}$	β_{Option}	β_{Equity}	$Adj. R^2$
Env. Score									
High-rated	0.054* (1.97)	0.002** (2.18)	0.009** (2.51)	0.001 (1.40)	0.869*** (26.59)	0.009 (0.79)	0.045 (1.50)	0.004 (0.64)	0.907
Low-rated	0.027 (0.89)	0.000 (0.52)	0.004 (1.27)	0.000 (-0.06)	0.903*** (28.72)	-0.044*** (-2.63)	0.072* (1.66)	0.021** (2.37)	0.871
Long-short	0.027 (0.87)	0.001 (1.56)	0.005* (1.71)	0.001 (1.10)	-0.034 (-1.06)	0.053*** (3.11)	-0.027 (-0.60)	-0.017* (-1.87)	0.183
Soc. Score									
High-rated	0.074** (2.47)	0.002** (2.51)	0.011*** (3.21)	0.000 (0.25)	0.877*** (29.63)	-0.001 (-0.07)	0.043 (1.61)	0.005 (0.82)	0.898
Low-rated	0.027 (0.87)	0.000 (-0.14)	0.002 (0.62)	0.001 (0.99)	0.861*** (26.57)	-0.013 (-0.75)	0.071 (1.59)	0.017* (1.89)	0.858
Long-short	0.047 (1.36)	0.002** (2.12)	0.009*** (2.89)	-0.001 (-0.67)	0.017 (0.47)	0.012 (0.64)	-0.028 (-0.58)	-0.013 (-1.27)	0.113
Gov. Score									
High-rated	0.047 (1.57)	0.002** (2.38)	0.007* (1.71)	0.000 (-0.35)	0.891*** (28.79)	0.005 (0.28)	0.026 (0.68)	0.011 (1.16)	0.886
Low-rated	0.032 (1.42)	0.000 (0.59)	0.005* (1.81)	0.002** (2.55)	0.874*** (37.21)	-0.036** (-2.37)	0.094*** (2.89)	0.009 (1.17)	0.925
Long-short	0.015 (0.57)	0.001* (1.76)	0.002 (0.74)	-0.003** (-2.02)	0.017 (0.63)	0.041* (1.84)	-0.067 (-1.37)	0.002 (0.17)	0.217
ESG Score									
High-rated	0.059** (2.08)	0.002** (2.49)	0.009** (2.22)	0.000 (-0.23)	0.885*** (28.97)	0.012 (0.75)	0.043 (1.09)	0.003 (0.42)	0.907
Low-rated	0.018 (0.58)	0.000 (0.37)	0.003 (0.96)	0.002** (2.03)	0.872*** (26.47)	-0.056*** (-3.21)	0.081* (1.77)	0.026*** (2.74)	0.853
Long-short	0.040 (1.23)	0.001 (1.62)	0.006* (1.88)	-0.003** (-2.20)	0.013 (0.39)	0.068*** (3.79)	-0.037 (-0.80)	-0.022** (-2.31)	0.191

Table 5. Comparison of alphas of alternative cut-offs portfolios

This table summarizes the comparison of average conditional alphas (expressed in percentage) obtained from alternative cut-offs: 50%, 25% and 10%. ***, ** and * indicate significance at the 1%, 5%, and 10% level, respectively.

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

Table 6. The performance of portfolios formed on individual and combined ESG scores - equally-weighted portfolios

This table presents estimates of monthly abnormal returns (average conditional alphas expressed in percentage), average factor loadings, and the adjusted R^2 obtained from the conditional multi-factor model regressions over the period 2003-2016. Portfolios are formed with a 50% cut-off. ***, ** 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.

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

Table 7. The performance of portfolios formed on individual and combined ESG scores - analysis for expanding windows

This table presents estimates of monthly abnormal returns (average conditional alphas expressed in percentage) obtained from the conditional multi-factor model regressions considering the overall period (2003-2016) and different subperiods. Value-weighted portfolios are formed with a 50% cut-off.. ***, ** 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 (1.62)	0.056* (1.69)	0.103*** (2.70)	0.101*** (2.72)	0.076* (1.96)	0.069** (2.04)	0.069** (2.28)	0.061** (2.04)	0.063** (2.26)	0.054* (1.97)
Low-rated	-0.139** (-2.26)	-0.047 (-0.80)	0.009 (0.15)	0.004 (0.08)	0.016 (0.35)	0.021 (0.51)	0.024 (0.63)	0.027 (0.74)	0.031 (0.93)	0.027 (0.89)
Long-short	0.235*** (3.73)	0.103* (1.77)	0.094* (1.87)	0.097** (2.04)	0.060 (1.10)	0.048 (0.95)	0.045 (1.00)	0.034 (0.78)	0.032 (0.78)	0.027 (0.87)
Soc. Score										
High-rated	0.114*** (3.24)	0.086 (1.54)	0.127*** (2.86)	0.135*** (3.19)	0.102*** (2.68)	0.091*** (2.65)	0.089*** (2.90)	0.084** (2.28)	0.086** (2.57)	0.074** (2.47)
Low-rated	-0.143** (-2.25)	-0.021 (-0.34)	0.025 (0.42)	0.009 (0.17)	0.024 (0.50)	0.030 (0.69)	0.033 (0.86)	0.033 (0.92)	0.031 (0.92)	0.027 (0.87)
Long-short	0.257*** (3.56)	0.108 (1.53)	0.103 (1.64)	0.126** (2.09)	0.078 (1.50)	0.061 (1.30)	0.057 (1.18)	0.051 (0.98)	0.055 (1.30)	0.047 (1.36)
Gov. Score										
High-rated	0.032 (0.60)	0.030 (0.63)	0.079 (1.51)	0.077 (1.61)	0.064 (1.49)	0.060 (1.53)	0.059 (1.59)	0.051 (1.45)	0.055* (1.68)	0.047 (1.57)
Low-rated	-0.032 (-0.94)	-0.014 (-0.43)	0.033 (0.99)	0.029 (0.88)	0.028 (0.95)	0.028 (1.02)	0.033 (1.33)	0.037 (1.43)	0.038 (1.63)	0.032 (1.42)
Long-short	0.064 (0.89)	0.044 (0.81)	0.045 (0.66)	0.048 (0.78)	0.036 (0.80)	0.031 (0.77)	0.026 (0.72)	0.014 (0.44)	0.017 (0.58)	0.015 (0.57)
ESG Score										
High-rated	0.090*** (2.85)	0.046 (1.32)	0.100** (2.48)	0.099** (2.60)	0.075** (2.14)	0.067** (2.09)	0.066** (2.01)	0.059* (1.89)	0.067** (2.25)	0.059** (2.08)
Low-rated	-0.157** (-2.23)	-0.035 (-0.53)	0.003 (0.06)	-0.003 (-0.05)	0.012 (0.25)	0.020 (0.44)	0.023 (0.59)	0.027 (0.73)	0.023 (0.66)	0.018 (0.58)
Long-short	0.247*** (3.48)	0.081 (1.19)	0.097 (1.66)	0.102* (1.88)	0.062 (1.30)	0.047 (1.07)	0.043 (1.09)	0.032 (0.85)	0.044 (1.18)	0.040 (1.23)

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

This table presents estimates of monthly abnormal returns (average conditional alphas expressed in percentage) obtained from the conditional multi-factor model regressions considering different subperiods. Value-weighted portfolios are formed with a 50% cut-off. ***, ** 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	2004-2008	2005-2009	2006-2010	2007-2011	2008-2012	2009-2013	2010-2014	2011-2015	2012-2016
Env. Score										
High-rated	0.097 (1.62)	0.001 (0.04)	-0.087 (-1.66)	-0.062 (-1.16)	-0.023 (-0.39)	0.023 (0.38)	0.002 (0.06)	0.028 (1.05)	0.032 (1.51)	0.048* (1.95)
Low-rated	-0.139** (-2.26)	-0.023 (-0.74)	-0.071 (-1.27)	-0.047 (-1.03)	-0.031 (-0.63)	0.012 (0.23)	0.054 (1.52)	0.133*** (4.33)	0.089*** (3.32)	0.086*** (2.94)
Long-short	0.235*** (3.73)	0.024 (0.97)	-0.016 (-0.42)	-0.015 (-0.54)	0.007 (0.17)	0.011 (0.23)	-0.051 (-1.45)	-0.105*** (-3.33)	-0.057* (-1.93)	-0.038 (-1.06)
Soc. Score										
High-rated	0.114*** (3.24)	0.016 (0.34)	-0.086 (-1.17)	-0.029 (-0.49)	0.004 (0.06)	0.041 (0.61)	0.021 (0.72)	0.052** (2.37)	0.051** (2.57)	0.066** (2.67)
Low-rated	-0.143** (-2.25)	0.005 (0.11)	-0.042 (-0.8)	-0.050 (-1.27)	-0.009 (-0.18)	0.051 (0.92)	0.036 (1.04)	0.115*** (4.21)	0.065** (2.40)	0.055** (2.03)
Long-short	0.257*** (3.56)	0.011 (0.22)	-0.044 (-0.77)	0.021 (0.39)	0.013 (0.22)	-0.010 (-0.17)	-0.015 (-0.51)	-0.063* (-1.96)	-0.014 (-0.44)	0.011 (0.30)
Gov. Score										
High-rated	0.032 (0.60)	-0.022 (-0.50)	-0.112* (-1.86)	-0.060 (-1.02)	-0.018 (-0.29)	0.026 (0.40)	0.014 (0.44)	0.032 (1.22)	0.044** (2.17)	0.041* (1.73)
Low-rated	-0.032 (-0.94)	0.020 (0.60)	-0.029 (-0.65)	-0.053* (-1.76)	-0.037 (-1.05)	0.008 (0.19)	0.030 (0.88)	0.117*** (3.81)	0.066** (2.44)	0.087*** (2.98)
Long-short	0.064 (0.89)	-0.042 (-1.28)	-0.083 (-1.66)	-0.007 (-0.14)	0.019 (0.41)	0.018 (0.34)	-0.016 (-0.38)	-0.085** (-2.10)	-0.023 (-0.67)	-0.046 (-1.42)
ESG Score										
High-rated	0.090*** (2.85)	-0.009 (-0.20)	-0.099 (-1.66)	-0.055 (-0.95)	-0.028 (-0.45)	0.014 (0.23)	0.012 (0.41)	0.029 (1.24)	0.051** (2.36)	0.060** (2.21)
Low-rated	-0.002** (-2.23)	-0.004 (-0.11)	-0.043 (-1.02)	-0.060* (-1.99)	-0.025 (-0.79)	0.025 (0.51)	0.041 (1.15)	0.146*** (4.66)	0.064** (2.19)	0.072** (2.44)
Long-short	0.247*** (3.48)	-0.005 (-0.15)	-0.056 (-1.13)	0.005 (0.10)	-0.003 (-0.06)	-0.010 (-0.22)	-0.029 (-0.83)	-0.117*** (-3.64)	-0.013 (-0.39)	-0.012 (-0.33)