Corporate Social Responsibility as a Common Risk Factor

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Abstract. This study challenges factor models that are widely used to explain stock returns in Europe for the particular case of firms involved in corporate social responsibility (CSR) actions. We find a risk premium associated with extra-financial ratings priced by the market. This premium is computed as the excess return of low-rated firms with respect to high-rated firms. Furthermore, we propose a parsimonious two-factor model, which includes both the market factor and the proposed ESG premium that appears suitable for describing CSR-rated firms' returns. Unlike the CAPM, three or five factor models, our model is validated according to the Gibbons, Ross and Shanken (1989) test. Our results lead to many managerial implications related to portfolio management, asset pricing and corporate financial and investing decisions.

Key words and phrases. Asset Pricing, Size effect, Value premium, Momentum, Risk factors, Three-, Four- and Five-factor Models, Extra-financial rating, ESG criteria, Corporate Social Responsibility and Anomalies. JEL classification: G12.

MOTIVATION

How informative are Environmental, Social and Governance (henceforth ESG) ratings for financial markets? Our study investigates this issue and has as a main objective to shed light on the consideration of financial markets for extra-financial or ESG ratings as a proxy of firms'

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Corporate Social Responsibility (henceforth CSR). Developed in Europe in the beginning of the 21st century, the European Commission (2001) defines CSR as "*a concept whereby companies integrate social and environmental concerns in their business operations and in their interaction with stakeholders on a voluntary basis*". A firm's level of CSR is measured according to several dimensions; including treating employees well, reducing the level of negative environmental impact of production and philanthropic activities. Fatemi and Fooladi (2013) suggest even a shift in paradigm from the current approach of shareholder wealth maximization to a sustainable value creation framework, within which all social and environmental costs and benefits are explicitly considered.

While the number of academic studies in this area has increased substantially in recent years, no clear consensus has yet emerged concerning whether investment in socially responsible stocks or funds is favorable or detrimental to stock returns or firm value (for a meta-analysis, see for example : Chatterji, Durand, Levine, and Touboul 2016, Revelli and Viviani 2015, Van Beurden and Gössling 2008, Orlitzky, Schmidt and Rynes 2003). However, the pressure for corporate accountability is increasing through time. Investors nowadays are not only looking at the financial performance of a company but also to the way firms meet their social responsibilities. The development of corporate social responsibility and investor demand for information related to CSR practices has generated, since the 2000s, a demand for extra-financial ratings. Essentially, it involves evaluating the social, environmental and governance policies of companies and then establishing a grade based on a grid of criteria adapted to each sector. The extra-financial rating mainly comes from specialized players that are financial or extra-financial rating agencies as MSCI[1], Refinitiv[2] or Vigeo-Eiris[3]. Their methodologies are usually different and topic of discussion (Chatterji, Levine and Toffel 2009).

Recent studies show how difficult to include qualitative issues in financial decisions (Arjaliès and Bansal 2018; Beunza and Ferraro 2019). van Duuren, Plantinga, and Scholtens (2016) find that many conventional fund managers have already adopted features of

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[1] https://www.msci.com/esg-ratings
[2] https://www.refinitiv.com/en/financial-data/company-data/esg-research-data (Thomson Reuters)
[3] http://www.vigeo-eiris.com

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responsible investing in the investment process and that ESG information is being used for red flagging and to manage risk.

Consequently, can we state that the level of implication in CSR can be seen as a risk indicator? Moreover, can we identify a risk premium related to the ESG score? Can we integrate this premium in a parsimonious asset pricing model to better describe stock returns? If the prices fully reflect all available information (Fama 1970), then the ESG score, a proxy for CSR, should also be integrated.

LITERATURE REVIEW

Our study is related to a large literature about asset pricing models developed over more than fifty years: The Capital Asset Pricing Model (henceforth CAPM) (Sharpe 1964, Lintner 1965, Black 1972), Merton's (1973) ICAPM or Ross's (1976) arbitrage pricing theory (APT), The three factor model of Fama and French (1993, 1996a, 1996b, 1998), the four factor model (Carhart 1997, Fama and French 2012), Fama and French five factor model (2015, 2018a, 2018b, 2018c). After the publication of the CAPM, many anomalies, not explained by this model, have emerged from empirical studies. For example, the expected returns and the price-to-earnings ratio are positively related (Basu, 1977). Banz (1981) show that small capitalizations have higher expected returns than large ones. Bhandari (1988) and Chan and Chen (1991) find a positive relationship between the level of debt and stock returns. Davis (1994), Chan, Hamao and Lakonishok (1991) and Barber and Lyon (1997) shed light on a significant relationship between stock returns and the book-to-market ratio. More recently, Novy-Marx (2012 and 2013) and Fama and French (2015) indicate that stocks with high profitability outperform. The existence of patterns in average returns related to size, B/M, profitability, and investment marks the emergence of multi-factor asset pricing models by considering these patterns as sources of risk that should be priced. The main idea is that a security's risk premium should depend on the security's market beta and/or other measure(s) of systematic risk. Some of these risk premiums are subject of discussion (weak historical record, varying significantly over time, weakening after its discovery, being concentrated among microcap stocks, residing predominantly in January or being weak internationally).

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Most multi-factor models build risk premium based on accounting criteria. Nowadays, investors may be sensitive to other elements. Indeed, the substantial literature on asset pricing and anomalies in financial markets does not investigate the informative content of extra-financial rating. Only the relationship between corporate social performance (CSP) and financial performance has been extensively examined, and research related to this topic yields to mixed findings (for a meta-analysis, see for example: Chatterji et al. 2016, Revelli and Viviani 2015, Van Beurden and Gössling 2008, Orlitzky et al. 2003). Waddock and Graves (1997) document that lower implicit costs due to socially irresponsible actions induce higher explicit costs for the firm. Bénabou and Tirole (2010) attest that CSR policies benefit firms on the long term. Fu, Tang and Yan (2019) suggest that the link between CSP and financial performance have to be interpreted like a long-term insurance. In the same vein, some authors document that CSR actions create goodwill between firms and their stakeholders and validate the stakeholder approach (Freeman, 1984). In line with Godfrey, Merrill and Hansen (2009), Fu et al. (2019) conclude that CSR costs insure the firm to maintain a strong reputation during bad conjunctures. Cox, Brammer and Millington (2004) and Graves and Warddock (1994) show that poor CSR can lead to a decrease in the number of long-term institutional investors holding stock in a firm. Considering only the environmental dimension of the CSR, Feldman, Soyka and Ameer (1997) and Derwall, Gunster, Bauer and Koedijk (2004) find that the portfolios with the highest environmental scores have significantly better return performance than portfolios with lower scores. Oikonomou, Brooks and Pavelin (2012) emphasize the importance of market conditions in determining the nature and the strength of the CSP-risk relationship. They argue that there exist both a negative but weak relationship between CSR and systematic firm risk and a positive and strong relationship between corporate social irresponsibility and financial risk. Jo and Harjoto (2012) show that corporate governance positively influences CSR, and CSR increases firm value. Their results support the conflict-resolution hypothesis, and therefore stakeholder theory, as opposed to the overinvestment hypothesis. Brammer and Pavelin (2005) find that the composite CSR score is significantly and negatively related to stock returns, but the poor financial reward offered by these firms is mainly attributable to their good performance on employment and environmental measures. Brammer and Pavelin (2005) confirm the argument of Vance (1975), who finds evidence that

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firm CSR strategies have a negative effect on stock performance and link this finding to the competitive disadvantage induced by CSR expenses. This position is also confirmed by McWilliams and Siegel (2001). Based on the Carhart (1997) four-factor model, Bauer, Koedijk and Otten (2002) show that both German and U.S. ethical funds underperform their benchmarks in terms of their risk-adjusted returns, although similar UK funds achieve slight outperformance. However, the authors also report a learning effect that is at work thanks to the improvement of ethical fund managers over time.

Thus, while most literature focuses on the relationship between CSP and a firm's financial performance and the links between CSP and firm characteristics, our objective is to assess how investors price the quality of extra-financial information. In this study, we find that ESG extra-financial grade is indeed informative for financial markets and that it should be taken into consideration when building an appropriate asset pricing model for CSR-rated firms. Considering a European database that contains firms from 18 countries with available extra-financial rating, this study brings two main contributions. First, we find a significant risk premium associated with extra-financial ratings that is priced by the market. Second, we propose a parsimonious two-factor model that outperforms existing asset pricing models in describing CSR-rated firms' returns. Adding the ESG premium to the beta is sufficient to explain stocks screened by extra-financial agencies.

This paper proceeds as follows: Section I introduces the constructed database and the methodology. Section II summarizes the results of empirical tests and section III concludes and sheds light on the academic and managerial implications of this study.

DATA

Database

We study monthly returns on the European market in 18 different countries from June 2002 to May 2015 (data are extracted from *Thomson Reuters Datastream*). Financial firms and stocks with negative book-to-market ratios are eliminated from the sample, which comprises *in fine* 12,144 firms listed on the Euronext stock exchange. We include delisted firms when available. Subsequently, we independently sort our sample and assign stocks to three groups

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with respect to their Asset4 extra-financial ratings[4] (good, neutral and bad) and to three book-to-market (Panel A), operating profitability (Panel B), and investment groups (Panel C)[5]. We label these portfolios with two letters. The first letter describes the book-to-market (high [H], neutral [N] and low [L]), operating profitability (robust [R], neutral [N] and weak [W]) and investment (conservative [C], neutral [N] and aggressive [A]). We form our variables at the end of June in year t by using information from fiscal year-end $t-1$ from *Datastream*. The different strategies tested are monthly value-scaled. We consider a holding period return from the beginning of June of year t to July of year $t+1$. The portfolio allocation is updated annually.

In our study, the main question is about the informative content of extra-financial rating considered as a proxy for the firm's CSR. We do not discuss the methodology used by Asset4, which considers several indicators (more than 750 data points in four pillars: economic, environmental, social and corporate governance)[6].

Explanatory variables

Seven independent variables are used in our time series regressions. The Market Premium $[r_M - r_f]$ is the excess return of the European market. The Small Minus Big portfolio [SMB] corresponds to the difference between the average monthly stock returns of the three portfolios with small capitalizations (SL, SM and SH) and the three with large capitalizations (BL, BM

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[4] Asset4 is one of the largest providers of ESG (environmental, social, governance) information.

[5] The book-to-market ratio is obtained by inverting market-to-book [MTBV]. Revenues minus cost of goods sold, minus selling, general, and administrative expenses [EBITDA: WC18198], minus interest expense [WC01251], all divided by book equity [WC05491] yields our operating profitability ratio. Finally, investment is defined as the annual change in gross property, plant, and equipment plus the annual change in inventories [Total Asset: WC02999] between $t-2$ and $t-1$, all divided by the lagged book value of total assets of $t-2$.

[6] Thomson Reuters (August 2013) describes Asset4 rating as follows: "The ratings are designed to provide the most appropriate peer-to-peer comparisons. At the same time, we endeavor to avoid over-fitting so the relationships remain robust over time. To accomplish this, each ASSET4 pillar is handled and modelled differently. Environmental KPIs tend to be very global-industry-specific. Alternatively, corporate governance practices are best benchmarked by region. Our attempts at getting more granular by investigating region-specific models within each industry-specific environmental model led to preliminary results with little stability from year-to-year so this pursuit was abandoned. The same was true in trying to further break down the region-specific governance models to make them more industry specific. The social practices pillar was the most challenging of the three. Product-responsibility and health-and-safety practices were best benchmarked by industry sector but employment quality and community citizenship practices were most differentiated by region, and human rights issues are benchmarked universally. Each KPI is scored within each industrial, regional, or universal model between zero and one."

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and BH). The High Minus Low portfolio [HML] corresponds to the difference between the average monthly stock returns of the two portfolios with the highest book-to-market ratios (SH and BH) and the two with the lowest ratios (SL and BL). The Winners Minus Losers portfolio [WML] is the return of a long strategy on stocks with high past returns (winners) minus the return of a short strategy on firms with low past returns (losers). Every month t, stocks are sorted into 3 groups according to their cumulative returns between month $t - 12$ and $t - 2$. Then, the value-weighted returns of the winner and loser portfolios are computed. The WML factor is thus the spread. The Robust Minus Weak portfolio [RMW] corresponds to the difference between the average monthly stock returns of the two most profitable portfolios (SR and BR) and the two least profitable portfolios (SW and BW). We retain the definition of the operating profitability ratio of Hou, Xue and Zhang (2015, 2017) and Fama and French (2015, 2018a, 2018b, 2018c). The Conservative Minus Aggressive portfolio [CMA] corresponds to the difference between the average monthly returns on portfolios with high asset growth rates, designated aggressive (SA and BA), and portfolios with conservative firms (SC and BC). Like Chen and Zhang (2010), Hou *et al.* (2015, 2017) and Fama and French (2015, 2018a, 2018b, 2018c), the investment proxy is the annual change in gross property, plant, and equipment plus the annual change in inventories between $t - 2$ and $t - 1$, all divided by the lagged book value of total assets of $t - 2$. Finally, The Bad Minus Good portfolio [BMG] corresponds to the difference between the average monthly stock returns of the two portfolios of stocks with the best extra-financial scores (the top 30%) and the worst ratings (the lower 30%). Figure 1 exhibits the compounded returns from investments in portfolios with good versus bad CSR grades. Portfolio allocations in the beginning of $t + 1$ are based on the grades at the end of t. Those strategies are maintained for one year and are then rebalanced[7]. The data for the six portfolios ($r_M - r_f$, SMB, HML, WML, RMW, CMA) are extracted from Kenneth French's website[8]. Only the BMG portfolio returns are the authors' calculation.

Insert Figure 1 about here

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[7] As a robustness check, we construct the BMG portfolio with a breakpoint at 10% as in Kempf and Osthoff (2007). The results are similar.

[8] http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/

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Dependent variables

Three sets of portfolios, named "*panels*", are used as dependent variables. At the end of each year, stocks are classified into three CSR groups with respect to their extra-financial rating (good, neutral and bad). Stocks are subsequently allocated independently to three book-to-market groups (Panel A), three investment groups (Panel B), and three operating profitability groups (Panel C). The intersections of the two sorts produce nine value-weighted portfolios per panel, corresponding to the left-hand-side variables.

Summary statistics

Table 1 indicates that, on average, firms with the highest monthly excess returns have bad CSR grades. We report 1.41% and 1.42% average monthly return for firms with bad score and high and low B/M classification, respectively, compared to 0.65% and 0.94% for firms with a good CSR grade (see Table 1). This category is also the riskiest, as we record 16.69% average monthly standard deviation for firms with bad score and high B/M compared to firms with good rating and high B/M, which have 7.55% average standard deviation. Moreover, firms with bad score and low B/M have an average monthly standard deviation of 7.83%, whereas firms with good rating and low B/M have an average monthly standard deviation of 3.76%. From the descriptive statistics, there is no obvious relationship between average return and B/M classification. However, value stocks seem to be riskier than growth stocks, on average. Furthermore, a higher average number of firms is recorded for companies classified as neutral in terms of score and B/M, whereas the lowest average number of firms is observed for companies with bad rating and high B/M. Moreover, firms with good CSR rating and low B/M seem to have higher average market capitalization.

Insert Table 1 about here

For portfolios sorted by investment and CSR rating, the descriptive statistics in panel B of Table 1 show that firms with the highest average returns have bad ratings. Moreover, firms that are considered to be aggressive always have higher average stock returns than conservative ones. However, aggressive firms are less risky than conservative firms, according to the

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average standard deviation. Firms with bad rating exhibit a higher average monthly standard deviation than firms with good grades. Moreover, on average, a higher number of firms are classified as neutral in terms of notation and investment, whereas the lowest average number of firms is observed for aggressive companies with good rating. Furthermore, aggressive firms with good CSR rating seem to have higher average market capitalization.

Turning to portfolios sorted by profitability and CSR rating, we also record a higher average monthly stock return for firms with bad CSR rating relative to companies with good rating. Indeed, we report 1.28% and 1.23% average monthly return for firms with bad rating that are robust and weak, respectively, in terms of profitability compared with 0.55% and 0.04% average monthly returns for firms with good rating that are robust and weak, respectively. Robust firms seem to have higher average return than weak ones. Moreover, the latter are riskier than robust firms, as we record a higher monthly return standard deviation for weak firms than for robust companies. Firms with bad CSR rating have, on average, a higher standard deviation than companies with good grades. We observe a higher number of firms, on average, of robust companies with neutral notation, whereas the lowest average number of firms is observed for weak companies that have good rating. Additional descriptive statistics are reported in Table 1, panel C.

Table 2 reports the Pearson and Spearman correlation matrixes of variables' monthly excess returns. The strategies considered in Table 2 panel A, are built based on independent classifications of B/M and CSR grade. The correlations appear to be low between the considered portfolios and the following risk factors: market, SMB, HML, WML, RMW, CMA, and BMG. Specifically, BMG appears to be positively correlated with the market factor, SMB and HML, whereas it is negatively linked to RMW, CMA and WML. These correlations are nevertheless low (0.28, 0.21, 0.19, -0.21, -0.05 and -0.14, respectively). We also note that the market factor, HML and BMG have a generally positive correlation with the tested portfolios, whereas the correlation appears to be generally negative between the latter and the SMB, RMW, CMA and WML factors.

Insert Table 2 about here

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The same results are found for portfolios constructed based on investment and CSR score and for strategies built based on profitability and CSR rating classifications. The correlations are reported in Table 2, panels B and C, respectively.

Table 3 reports summary statistics for the factors' monthly returns. For the market factor, SMB and HML, we observe an average monthly return of 0.7%, 0.16% and 0.21%, respectively. Moreover, the RMW, CMA and WML factors have average monthly returns of 0.29%, 0.18% and 0.80%. The BMG factor presents the highest average monthly return (1.19%) but also has the highest standard deviation among the tested risk factors (market, SMB, HML, RMW, CMA and WML).

Insert Table 3 about here

RESULTS

Time series regression results for B/M-CSR portfolios

As presented in Panel A of Table 4, Table 5, Table 6, Table 7 and Table 8, the betas are positive and significant for all portfolios and for all asset pricing models tested. The betas are higher for portfolios with low B/M after adding risk factors to the one-factor model. In Table 5 (Panel A), the SMB factor is negative and significant for firms with good CSR rating, while it is positively and significantly linked to firms with bad rating (except for portfolios with a high B/M ratio).

Insert Table 4 about here

Insert Table 5 about here

Except for firms with bad grades, the HML coefficients in Table 5 are positive and significant for value portfolios and negative and significant for growth portfolios. Moreover, as shown in Table 6 (Panel A), the WML factor is almost always negative. It is significant for portfolios with high B/M and good rating and for portfolios with low B/M and bad CSR grades.

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The same findings for the RMW and CMA factors are the same as those for the WML factor, as shown in Table 7 (Panel A).

Insert Table 6 about here

Insert Table 7 about here

However, in Table 8

Table 8 (Panel A), the coefficient on the BMG factor is positive and significant for portfolios of firms with bad grades, while it is negative and not always significant for portfolios of firms with good grades. This finding reveals that there exists a CSR premium for companies with bad grades on CSR.

Insert Table 8 about here

Table 9 displays the adjusted R-squared for the CAPM, 3FM, 4FM, 5FM and the proposed CSR pricing model. Panel A indicates that the adjusted R-squared values are particularly improved for portfolios of firms with bad grades. For these portfolios, the highest adjusted R-squared values are obtained by the CSR model.

Insert Table 9 about here

Time series regression results for investment-CSR portfolios

From Panel B of Table 4, Table 5, Table 6, Table 7 and Table 8, the betas are positive and significant for all portfolios and for all asset pricing models tested. Table 5 (Panel B) reports negative and significant SMB coefficients for firms with good CSR rating, while SMB is positively and significantly linked to firms with bad grade (except for conservative firms).

Except for firms with bad grades, the HML coefficients in Table 5 (Panel B) are positive and significant for conservative portfolios and negative and not significant for aggressive

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portfolios. Moreover, as shown in Table 6 (Panel B), the WML factor is negative and significant for portfolios that are classified as conservative in their investment. The results for the RMW and CMA factors are similar to those for the WML factor (see Table 7, Panel B).

The coefficient on the BMG factor is positive and significant for portfolios of firms with bad grades, while it is negative and not always significant for portfolios of firms with good grades (Table 8, Panel B). Table 9 (Panel B) reports that the adjusted R-squared values are improved for portfolios of firms with bad grades, especially for aggressive and conservative firms.

Time-series regression results for profitability-CSR portfolios

As reported in Panel C of Table 4, Table 5, Table 6, Table 7 and Table 8, the betas are positive and significant for all portfolios and for all asset pricing models tested. Except for firms with weak profitability, the SMB factor is negative and significant for firms with good CSR rating, while SMB is positively and significantly linked to firms with bad grade. Moreover, the HML coefficients in Table 5 are positive and significant for robust portfolios. However, when introducing WML, CMA and RWM, the HML factor loses its significance (as shown in Table 6 and Table 7). Moreover, as shown in Table 6, the WML factor is negative and significant for all strategies except for the portfolio of robust firms with good grades. The results for the RMW factor reported in Table 7 are similar to those for the WML factor. The CMA factor always has a negative and significant coefficient except for firms with robust profitability and poor CSR grades.

Finally, the coefficient of BMG factor is positive and significant for portfolios of firms with bad grades but negative and significant for portfolios of firms with good grades. Table 9 (panel C) indicates that the adjusted R-squared values are improved for portfolios of firms with bad grades.

Gibbons, Ross and Shanken (1989) statistic results

Table 10 displays values of the GRS statistic for ten different asset pricing models. Each model is a combination of the market premium factor and one or more of the SMB, HML, WML, RMW, CMA and BMG factors.

Insert Table 10 about here

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Panel A, Panel B and Panel C of Table 10 report the GRS statistics for portfolios classified by B/M-CSR rating, investment-CSR rating and operating profitability-CSR rating, respectively. The models with the lowest GSR statistics all contain the BMG factor. Moreover, on average, model 8 presents the lowest GRS statistic when jointly considering the three portfolio classifications. Indeed, the GRS test statistics are below the critical value for Panel A (1.984), Panel B (1.881) and Panel C (1.191). This result confirms that a parsimonious two-factor model including both the market factor and the CRS premia is sufficient to describe the stock returns of firms screened by extra-financial agencies in Europe.

CONCLUSION

This paper sheds light on the negative relationship between returns and corporate social responsibility, proxied by extra-financial rating, in Europe from June 2002 to May 2015 (13 years). Our period of study begins in the early-2000s, when extra-financial rating first emerged in Europe. Since our aim is to identify the appropriate asset pricing model for firms engaging in CSR, we challenge, among others, the widely used one-, three-, four- and five-factor models. By building and testing 27 investment strategies based on CSR grade, book-to-market, investment and operating profitability, we show that the market factor and CSR premium are sufficient to describe and assess portfolios' excess returns over the period considered. Both CSR funds and asset managers can use the proposed CSR factor model for performance measurements and expected return computation. Using this model also makes it possible to include the CSR dimension in corporate valuation. The most responsible firms will have lower discount factors, which will increase their market values.

- **Two contributions to the finance literature**

First, we find a significant risk premium priced by the market that is associated with extra-financial ratings. We measure this premium by computing the excess return of firms with bad ratings with respect to firms with good ratings. By regressing portfolios' excess returns on this premium, we find that it has a positive and significant coefficient for firms with bad ratings and a negative but not always significant coefficient for firms with good ratings.

Second, we propose a parsimonious two-factor model that appears able to describe CSR-rated firms' excess returns. Our model represents a considerable improvement in adjusted R-squared

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for firms with bad ratings. Moreover, for all portfolios combined (firms with good and those with bad ratings), we fail to reject the CSR asset pricing model based on the GRS (Gibbons Ross & Shanken) statistic. Furthermore, our model yields a low GRS statistic relative to the other models that we tested, which corroborates the ability of our model to explain better portfolios' excess returns.

- **Several managerial implications**

This study sheds light on investing in CSR rated firms and demonstrates that choosing to invest in bad rated firms do come with the condition of higher expected returns as a compensation for the higher risk found among this category of stocks. This finding confirms that social norms participate to the shaping of market outcomes since we find that firms with bad (good) extra-financial ratings are riskier (safer). We verify thus the traditional positive relation between risk and reward for CSR rated firms in Europe.

Moreover, the overall performance of a portfolio is traditionally measured against a benchmark market index whether pure or composite. There are different measures of risk-adjusted performance. Traditionally, the CAPM is used to measure the performance since alpha is considered as an abnormal return. Defining the true meaning of abnormal return remains a challenge since the latest comes from returns left unexplained by persistent risk premiums. In order to capture the true abnormal returns, we also need to specify the adequate asset pricing model by integrating the structural risk factors. In our study, we specify the most suitable asset pricing model for the particular case of CSR rated firms in Europe. The latest can thus help better measurement and performance attribution for investors' portfolios.

Furthermore, defining the right asset pricing model is important to estimate the cost of equity which is a major input in computing the weighted average cost of capital. The latest is defined as the average cost of the various sources of financing of the company weighted by their market value in the total pool of financing resources. The WACC enables discounting the future cash flows generated by a project, measuring the value created or evaluating the profitability of potential investment projects.

Finally, while existing asset pricing models are tested on firms without distinguishing between CSR-rated and CSR-unrated firms, our study focuses only on firms engaged in CSR (and for which ESG ratings are available) and proposes a parsimonious model that is suitable for this

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particular segment of the European stock market. Our paper can be extended in various ways: It would be interesting to compare our findings with different ratings from other extra-financial rating agencies. In addition, testing the CSR asset pricing model on other financial markets and comparing the outcomes would be a natural extension of our study.

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TABLES

Table 1
Summary statistics for the returns of 27 portfolios constructed from independent sorts on book-to-market, investment, operating profitability and CSR extra-financial notations from June 2002 to May 2015

Stocks are independently sorted into three Asset4 extra-financial notations (good, neutral and bad) and three book-to- market (Panel A), operating profitability (Panel B), and investment groups (Panel C). The table below statistically describes the monthly excess returns of the 27 value-weighted portfolios.

			Panel A Book-to-Market			Panel B Investment			Panel C Operating profitability		
			Low	Neutral	High	Aggress.	Neutral	Cons.	Weak	Neutral	Robust
Mean	CSR	Good	0,65	0,56	0,94	0,69	0,23	0,64	0,04	0,29	0,55
		Neutral	1,22	0,54	0,07	1,16	0,69	0,6	-0,11	0,63	1,11
		Bad	1,41	1,2	1,42	1,61	1,58	0,64	1,23	1,13	1,28
Standard deviation	CSR	Good	3,76	4,78	7,55	4,92	5,15	6,37	10,54	5,13	3,88
		Neutral	4,61	6,25	8,37	5,81	6,58	7,06	7,36	5,4	6,69
		Bad	7,83	7,96	16,69	7,44	7,17	14,17	15,85	7,78	7,78
Sharpe ratio	CSR	Good	0,17	0,12	0,12	0,14	0,04	0,1	0	0,06	0,14
		Neutral	0,26	0,09	0,01	0,2	0,1	0,09	-0,02	0,12	0,17
		Bad	0,18	0,15	0,08	0,22	0,22	0,05	0,08	0,14	0,16
Average number of firms	CSR	Good	67,8	111,4	34,2	44,5	127,1	44,7	12,3	96,2	103,9
		Neutral	115,9	147,7	52,8	82,7	164,8	74,2	31,4	137,9	145,8
		Bad	78,5	103,5	52,2	74,7	106,3	59	39,3	108	85,7
Average market cap. (€M.)	CSR	Good	698,6	428,9	449,7	829,7	541,3	536,1	1067,4	516,1	642,3
		Neutral	146,6	135,6	145,7	198,7	163,7	110,7	207,6	124,7	175
		Bad	81,9	59	44,9	75,4	45	72,1	82,8	49,8	73,5
Jarque Bera	CSR	Good	36,7	4,7	5	6,1	390	26,3	1235,6	5,3	12
		Neutral	6,2	72	24	52,4	68,8	24,6	72,6	24,1	112,7
		Bad	25,4	326,2	4801,8	104,9	59,7	2428,6	5444,4	335,5	171,1

Table 2
Pearson and Spearman correlation matrix of the monthly returns of panel A, B and C: June 2002 to May 2015

At the end of each year, stocks are classified into three book-to-market groups (low, neutral and high), three investment groups (conservative, neutral and aggressive) and three groups based on the operating profitability ratio (weak, neutral and robust). Stocks are subsequently allocated independently to three CSR groups with respect to the Asset4 extra-financial notation (good, neutral and bad). The intersections of the two sorts produce 9 value-weighted portfolios. The right-hand-side variables are explanatory variables: $(r_M - r_f)$ (the market premium), the size factor (SMB), the value factor (HML), the operating profitability factor (RMW), the investment factor (CMA), the momentum factor (WML) and the CSR risk factor (BMG). We use both the Pearson (black figures) and the Spearman (blue figures) correlations to study the relationships between variables. The first letter corresponds to the book-to-market group (L, N or H). The second corresponds to the CSR grade (G, N or B). For instance, LG is a value-weighted portfolio comprising the stocks of both the lowest 30% of firms in terms of book-to-market and the highest 30% of firms in terms of CSR.

		LG	LN	LB	NG	NN	NB	HG	HN	HB	$r_M - r_f$	SMB	HML	WML	RMW	CMA
											Spearman correlation matrix					
Pearson correlation	LG		0,67	0,47	0,75	0,63	0,41	0,43	0,49	0,45	0,66	-0,30	0,13	-0,20	-0,16	-0,23
	LN	0,70		0,56	0,78	0,77	0,59	0,51	0,53	0,62	0,74	-0,11	0,30	-0,22	-0,30	-0,13
	LB	0,47	0,51		0,62	0,62	0,51	0,44	0,47	0,56	0,60	0,10	0,29	-0,21	-0,40	-0,06
	NG	0,76	0,76	0,57		0,79	0,52	0,61	0,60	0,61	0,79	-0,20	0,44	-0,33	-0,38	-0,09
	NN	0,69	0,73	0,61	0,77		0,61	0,51	0,65	0,69	0,74	0,01	0,43	-0,29	-0,38	-0,08

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NB	0,40	0,58	0,48	0,47	0,62		0,41	0,46	0,58	0,57	0,17	0,30	-0,23	-0,27	-0,12
HG	0,47	0,52	0,50	0,67	0,53	0,43		0,58	0,53	0,58	-0,18	0,45	-0,35	-0,48	0,04
HN	0,54	0,59	0,50	0,63	0,65	0,47	0,65		0,63	0,61	-0,05	0,51	-0,39	-0,48	0,04
HB	0,38	0,44	0,40	0,48	0,49	0,45	0,47	0,47		0,64	0,04	0,43	-0,26	-0,42	0,04
$r_M - r_f$	0,72	0,75	0,61	0,80	0,80	0,59	0,61	0,67	0,53		-0,09	0,49	-0,32	-0,45	-0,02
SMB	-0,28	-0,09	0,09	-0,27	0,03	0,23	-0,17	-0,04	-0,06	-0,10		0,02	0,16	0,02	-0,05
HML	0,14	0,26	0,31	0,41	0,43	0,35	0,54	0,48	0,31	0,50	0,00		-0,29	-0,63	0,32
WML	-0,36	-0,32	-0,46	-0,48	-0,48	-0,39	-0,51	-0,54	-0,36	-0,48	0,12	-0,37		0,33	-0,01
RMW	-0,21	-0,36	-0,46	-0,46	-0,41	-0,37	-0,61	-0,53	-0,30	-0,49	0,06	-0,66	0,50		-0,29
CMA	-0,37	-0,22	-0,23	-0,19	-0,34	-0,18	-0,07	-0,16	-0,15	-0,22	-0,11	0,26	0,21	-0,21	
BMG	0,02	0,22	0,56	0,12	0,23	0,53	0,16	0,21	0,66	0,28	0,21	0,19	-0,14	-0,21	-0,05

	AG	AN	AB	NG	NN	NB	CG	CN	CB	$r_M - r_f$	SMB	HML	WML	RMW	CMA
AG		0,71	0,55	0,76	0,68	0,60	0,56	0,69	0,46	0,69	-0,18	0,34	-0,26	-0,33	-0,11
AN	0,75		0,61	0,71	0,66	0,60	0,52	0,69	0,47	0,68	-0,01	0,32	-0,22	-0,26	-0,17
AB	0,52	0,63		0,52	0,53	0,56	0,39	0,59	0,54	0,58	0,22	0,28	-0,11	-0,32	-0,14
NG	0,79	0,76	0,48		0,72	0,62	0,65	0,69	0,52	0,74	-0,22	0,34	-0,33	-0,34	-0,19
NN	0,69	0,68	0,53	0,75		0,69	0,61	0,73	0,55	0,75	-0,09	0,44	-0,32	-0,44	-0,11
NB	0,63	0,63	0,56	0,70	0,74		0,54	0,71	0,61	0,66	0,07	0,36	-0,37	-0,40	-0,01
CG	0,57	0,43	0,34	0,59	0,59	0,55		0,63	0,51	0,65	-0,19	0,41	-0,34	-0,45	0,06
CN	0,61	0,60	0,51	0,63	0,73	0,65	0,56		0,61	0,74	-0,06	0,45	-0,42	-0,43	0,03
CB	0,45	0,44	0,48	0,51	0,51	0,56	0,47	0,50		0,58	-0,01	0,39	-0,33	-0,47	-0,03
$r_M - r_f$	0,76	0,75	0,60	0,80	0,78	0,71	0,62	0,68	0,55		-0,09	0,49	-0,32	-0,45	-0,02
SMB	-0,18	0,06	0,26	-0,20	-0,06	0,05	-0,19	-0,05	-0,05	-0,10		0,02	0,16	0,02	-0,05
HML	0,37	0,30	0,30	0,33	0,39	0,39	0,49	0,44	0,33	0,50	0,00		-0,29	-0,63	0,32
WML	-0,36	-0,32	-0,27	-0,48	-0,60	-0,57	-0,60	-0,58	-0,48	-0,48	0,12	-0,37		0,33	-0,01
RMW	-0,39	-0,30	-0,38	-0,39	-0,52	-0,50	-0,50	-0,47	-0,41	-0,49	0,06	-0,66	0,50		-0,29
CMA	-0,18	-0,36	-0,17	-0,36	-0,28	-0,17	-0,10	-0,14	-0,19	-0,22	-0,11	0,26	0,21	-0,21	
BMG	0,15	0,23	0,56	0,13	0,21	0,41	0,05	0,25	0,75	0,28	0,21	0,19	-0,14	-0,21	-0,05

	WG	WN	WB	NG	NN	NB	RG	RN	RB	$r_M - r_f$	SMB	HML	WML	RMW	CMA
WG		0,51	0,40	0,55	0,53	0,32	0,50	0,53	0,48	0,57	-0,11	0,36	-0,29	-0,32	0,05
WN	0,55		0,52	0,66	0,65	0,47	0,49	0,54	0,58	0,65	0,03	0,57	-0,45	-0,49	0,02
WB	0,32	0,47		0,57	0,53	0,41	0,48	0,50	0,48	0,57	0,12	0,34	-0,32	-0,42	0,00
NG	0,54	0,72	0,52		0,80	0,57	0,76	0,72	0,61	0,73	-0,19	0,46	-0,36	-0,49	-0,10
NN	0,58	0,66	0,46	0,79		0,53	0,72	0,77	0,65	0,71	-0,13	0,40	-0,33	-0,38	-0,10
NB	0,40	0,55	0,47	0,63	0,63		0,45	0,56	0,60	0,52	0,11	0,32	-0,17	-0,34	-0,10
RG	0,51	0,52	0,45	0,73	0,77	0,50		0,67	0,51	0,73	-0,25	0,20	-0,21	-0,20	-0,20
RN	0,61	0,52	0,41	0,64	0,76	0,58	0,67		0,63	0,72	-0,05	0,32	-0,23	-0,31	-0,16
RB	0,46	0,55	0,28	0,53	0,61	0,59	0,43	0,57		0,65	0,15	0,45	-0,26	-0,42	0,01
$r_M - r_f$	0,65	0,68	0,51	0,73	0,79	0,61	0,76	0,75	0,61		-0,09	0,49	-0,32	-0,45	-0,02
SMB	-0,07	0,01	-0,01	-0,19	-0,10	0,18	-0,26	-0,03	0,17	-0,10		0,02	0,16	0,02	-0,05
HML	0,37	0,61	0,28	0,53	0,36	0,40	0,23	0,28	0,46	0,50	0,00		-0,29	-0,63	0,32
WML	-0,44	-0,54	-0,40	-0,62	-0,55	-0,43	-0,37	-0,47	-0,39	-0,48	0,12	-0,37		0,33	-0,01
RMW	-0,42	-0,52	-0,36	-0,54	-0,41	-0,40	-0,25	-0,45	-0,48	-0,49	0,06	-0,66	0,50		-0,29
CMA	-0,22	-0,11	-0,19	-0,18	-0,29	-0,25	-0,32	-0,29	-0,02	-0,22	-0,11	0,26	0,21	-0,21	
BMG	0,05	0,26	0,70	0,14	0,21	0,54	0,07	0,21	0,46	0,28	0,21	0,19	-0,14	-0,21	-0,05

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Table 3
Summary statistics for monthly factor returns: June 2002 to May 2015

The table below statistically describes our independent variables. $r_M - r_f$ is the European market premium. Stocks are independently classified into three book-to-market, operating profitability, investment, momentum and CSR notation groups, by using their 30th and 70th percentiles as the respective breakpoints. HML, utilizes value-weighted portfolios formed from the intersection of the size and book-to-market sorts (2 × 3 = 6 portfolios). An analogous approach is used for operating profitability, momentum, investment and CSR, yielding RMW, WML, AMC and BMG, respectively.

	$r_M - r_f$	SMB	HML	RMW	CMA	WML	BMG
Mean (%)	0,71	0,16	0,21	0,29	0,18	0,80	1,19
Median (%)	1,00	0,23	0,25	0,37	0,17	1,18	0,40
Variance	0,32	0,04	0,05	0,02	0,02	0,19	0,72
Standard deviation (%)	5,68	1,96	2,16	1,55	1,41	4,32	8,50
Annualized standard deviation (%)	19,66	6,80	7,49	5,38	4,87	14,95	29,45
Minimum (%)	-22,17	-6,85	-4,60	-5,25	-3,66	-26,15	-17,13
25th percentile (%)	-2,31	-1,09	-1,01	-0,50	-0,60	-0,39	-3,44
75th percentile (%)	4,40	1,54	1,42	1,19	0,85	2,52	4,22
Maximum (%)	13,86	4,99	8,31	6,00	5,54	13,70	60,61
Kurtosis	1,60	0,64	0,86	1,81	2,40	10,63	16,36
Skewness	-0,67	-0,34	0,32	-0,28	0,71	-1,79	2,69
Sharpe ratio	0,13	0,08	0,10	0,19	0,13	0,19	0,14

(Descriptive statistics)

Table 4
Time series regressions of monthly excess returns of Panels A, B and C with the Sharpe-Lintner-Black CAPM: June 2002 to May 2015

At the end of each year, stocks are classified into three CSR groups with respect to their extra-financial ratings (good, neutral and bad). Stocks are subsequently allocated independently to three book-to-market groups (low to high), three investment groups (conservative to aggressive), and three operating profitability groups (low to high). The intersections of the two sorts produce 9 value-weighted portfolios corresponding to the LHS (left-hand-side) variables of panels A, B and C. Those dependent variables are then regressed using the Sharpe-Lintner-Black CAPM. The table below presents, for each portfolio, its slope (bold figures) and the corresponding Student t-test results represented by stars ($*p < 0.1; **p < 0.05; ***p < 0.01$).

Sharpe-Lintner-Black CAPM (1964)

Intercepts

CSR Notation	Book-to-market			Investment			Operating profitability		
	Low	Neutral	High	Aggress.	Neutral	Cons.	Weak	Neutral	Robust
Good	**0,00**	**0,00**	**0,00**	**0,00**	**0,00**	**0,00**	**-0,01**	**0,00**	**0,00**
	1,45	0,31	0,75	1,05	-1,06	0,05	-1,25	-0,74	0,88
Neutral	**0,01** ***	**0,00**	**-0,01**	**0,01** **	**0,00**	**0,00**	**-0,01** *	**0,00**	**0,00**
	3,18	-0,28	-1,24	2,00	0,17	-0,11	-1,69	0,35	1,44
Bad	**0,01**	**0,01**	**0,00**	**0,01** **	**0,01** **	**0,00**	**0,00**	**0,01**	**0,01**
	1,31	1,16	0,38	2,20	2,42	-0,41	0,17	1,10	1,27

Market Premium

CSR Notation	Book-to-market			Investment			Operating profitability		
	Low	Neutral	High	Aggress.	Neutral	Cons.	Weak	Neutral	Robust
Good	**0,48** ***	**0,69** ***	**0,81** ***	**0,62** ***	**0,66** ***	**0,87** ***	**1,03** ***	**0,75** ***	**0,52** ***
	12,78	16,37	9,54	14,55	16,83	9,71	10,62	13,18	14,64
Neutral	**0,61** ***	**0,88** ***	**0,99** ***	**0,76** ***	**0,89** ***	**0,92** ***	**0,91** ***	**0,75** ***	**0,86** ***
	13,89	16,61	11,18	13,92	15,29	11,52	11,52	16,02	14,27
Bad	**0,94** ***	**0,83** ***	**1,43** ***	**0,78** ***	**0,87** ***	**1,52** ***	**1,46** ***	**0,82** ***	**0,88** ***
	9,45	9,02	7,74	9,35	12,38	8,08	7,42	9,45	9,67

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Table 5
Time series regressions of monthly excess returns of Panels A, B and C with the Fama-French three-factor model: June 2002 to May 2015

At the end of each year, stocks are classified into three CSR groups with respect to their extra-financial ratings (good, neutral and bad). Stocks are subsequently allocated independently to three book-to-market groups (low to high), three investment groups (conservative to aggressive), and three operating profitability groups (low to high). The intersections of the two sorts produce 9 value-weighted portfolios corresponding to the LHS (left-hand-side) variables of panels A, B and C. Those dependent variables are then regressed using the Fama-French three-factor model. The table below presents, for each portfolio, its slope (bold figures) and the corresponding Student t-test results represented by stars (∗p <0.1;∗∗p <0.05;∗∗∗p <0.01).

Fama-French three-factor model (1993)

Intercepts

CSR Notation	Book-to-market Low		Neutral		High		Investment Aggress.		Neutral		Cons.		Operating profitability Weak		Neutral		Robust	
Good	**0,00**	**	**0,00**		**0,00**		**0,00**		**0,00**		**0,00**		**-0,01**		**0,00**		**0,00**	
	2,18		0,70		0,81		1,23		-0,78		0,11		-1,26		-0,70		1,43	
Neutral	**0,01**	***	**0,00**		**-0,01**		**0,01**	*	**0,00**		**0,00**		**-0,01**	**	**0,00**		**0,00**	
	3,32		-0,54		-1,41		1,85		0,13		-0,21		-2,21		0,40		1,44	
Bad	**0,01**		**0,00**		**0,00**		**0,01**	*	**0,01**	**	**0,00**		**0,00**		**0,00**		**0,00**	
	1,10		0,75		0,36		1,87		2,20		-0,44		0,10		0,72		0,87	

Market Premium

CSR Notation	Book-to-market Low		Neutral		High		Investment Aggress.		Neutral		Cons.		Operating profitability Weak		Neutral		Robust	
Good	**0,56**	***	**0,65**	***	**0,58**	***	**0,61**	***	**0,68**	***	**0,67**	***	**0,98**	***	**0,62**	***	**0,57**	***
	14,4		14,14		6,34		12,45		15,36		6,78		8,65		9,89		14,95	
Neutral	**0,66**	***	**0,87**	***	**0,84**	***	**0,83**	***	**0,89**	***	**0,83**	***	**0,68**	***	**0,77**	***	**0,94**	***
	13,29		14,36		8,41		13,29		13,07		9,03		8,21		14,05		13,56	
Bad	**0,96**	***	**0,83**	***	**1,34**	***	**0,84**	***	**0,86**	***	**1,41**	***	**1,42**	***	**0,78**	***	**0,78**	***
	8,46		8,29		6,23		9,41		10,64		6,45		6,22		8,09		7,85	

Small minus Big

CSR Notation	Book-to-market Low		Neutral		High		Investment Aggress.		Neutral		Cons.		Operating profitability Weak		Neutral		Robust	
Good	**-0,38**	***	**-0,49**	***	**-0,49**	**	**-0,24**	*	**-0,27**	**	**-0,57**	**	**-0,04**		**-0,39**	**	**-0,34**	***
	-3,87		-4,25		-2,13		-1,96		-2,43		-2,29		-0,16		-2,5		-3,56	
Neutral	**-0,03**		**0,35**	**	**0,06**		**0,4**	**	**0,05**		**0,03**		**0,25**		**-0,04**		**0,16**	
	-0,24		2,31		0,25		2,56		0,31		0,14		1,21		-0,32		0,94	
Bad	**0,69**	**	**1,19**	***	**-0,05**		**1,24**	***	**0,41**	**	**-0,01**		**0,31**		**0,91**	***	**0,94**	***
	2,41		4,71		-0,1		5,52		2,05		-0,02		0,54		3,79		3,78	

High minus Low

CSR Notation	Book-to-market Low		Neutral		High		Investment Aggress.		Neutral		Cons.		Operating profitability Weak		Neutral		Robust	
Good	**-0,49**	***	**0,08**		**1,11**	***	**0**		**-0,18**		**0,95**	***	**0,27**		**0,62**	***	**-0,34**	***
	-4,87		0,66		4,61		-0,02		-1,52		3,65		0,93		3,83		-3,43	
Neutral	**-0,31**	**	**0,11**		**0,77**	***	**-0,26**		**0,02**		**0,47**	*	**1,25**	***	**-0,1**		**-0,39**	**
	-2,39		0,7		2,94		-1,62		0,1		1,96		5,74		-0,68		-2,13	
Bad	**-0,01**		**0,22**		**0,46**		**-0,08**		**0,13**		**0,56**		**0,23**		**0,39**		**0,71**	***
	-0,03		0,82		0,81		-0,32		0,61		0,98		0,38		1,57		2,74	

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Table 6
Time series regressions of monthly excess returns of Panels A, B and C with the Fama-French-Carhart four-factor model: June 2002 to May 2015

At the end of each year, stocks are classified into three CSR groups with respect to their extra-financial ratings (good, neutral and bad). Stocks are subsequently allocated independently to three book-to-market groups (low to high), three investment groups (conservative to aggressive), and three operating profitability groups (low to high). The intersections of the two sorts produce 9 value-weighted portfolios corresponding to the LHS (left-hand-side) variables of panels A, B and C. Those dependent variables are then regressed using the Fama-French-Carhart four-factor model. The table below presents, for each portfolio, its slope (bold figures) and the corresponding Student t-test results represented by stars ($*p < 0.1; **p < 0.05; ***p < 0.01$).

Fama-French-Carhart four-factor model (1997)

		Book-to-market						*Investment*						*Operating profitability*					
		Low		Neutral		High		Aggress.		Neutral		Cons.		Weak		Neutral		Robust	
Intercepts																			
Good		**0,00**	**	**0,00**		**0,01**	*	**0,00**		**0,00**		**0,01**		**0,00**		**0,00**		**0,00**	
		2,35		1,24		1,73		1,10		-0,13		1,59		-0,62		0,81		1,45	
Neutral		**0,01**	***	**0,00**		**0,00**		**0,01**	*	**0,01**	*	**0,00**		**0,00**		**0,00**		**0,01**	**
		3,06		0,14		-0,36		1,71		1,67		1,13		-1,15		1,55		2,22	
Bad		**0,01**	**	**0,01**		**0,01**		**0,01**	*	**0,01**	***	**0,01**		**0,01**		**0,01**		**0,01**	
		1,99		1,35		0,77		1,84		3,70		0,55		0,80		1,44		1,29	
Market Premium																			
Good		**0,54**	***	**0,62**	***	**0,47**	***	**0,62**	***	**0,64**	***	**0,48**	***	**0,88**	***	**0,49**	***	**0,57**	***
		13,11		12,61		4,91		11,70		13,72		4,96		7,37		8,11		13,81	
Neutral		**0,67**	***	**0,82**	***	**0,70**	***	**0,83**	***	**0,75**	***	**0,67**	***	**0,56**	***	**0,69**	***	**0,86**	***
		12,56		12,75		6,81		12,46		11,37		7,29		6,61		12,32		11,92	
Bad		**0,82**	***	**0,75**	***	**1,21**	***	**0,83**	***	**0,71**	***	**1,11**	***	**1,20**	***	**0,68**	***	**0,71**	***
		6,97		7,04		5,28		8,70		8,89		4,96		5,00		6,74		6,78	
Small minus Big																			
Good		**-0,37**	***	**-0,47**	***	**-0,42**	*	**-0,24**	**	**-0,25**	**	**-0,46**	**	**0,01**		**-0,32**	**	**-0,34**	***
		-3,77		-4,09		-1,89		-1,97		-2,25		-1,99		0,05		-2,22		-3,50	
Neutral		**-0,04**		**0,39**	**	**0,15**		**0,40**	**	**0,13**		**0,13**		**0,32**		**0,01**		**0,21**	
		-0,28		2,56		0,62		2,52		0,85		0,60		1,62		0,05		1,23	
Bad		**0,77**	***	**1,24**	***	**0,02**		**1,24**	***	**0,50**	***	**0,17**		**0,44**		**0,97**	***	**0,98**	***
		2,78		4,96		0,05		5,49		2,68		0,31		0,78		4,10		3,94	
High minus Low																			
Good		**-0,51**	***	**0,04**		**0,97**	***	**0,00**		**-0,23**	*	**0,71**	***	**0,16**		**0,47**	***	**-0,35**	***
		-4,95		0,29		4,09		0,04		-1,94		2,95		0,53		3,13		-3,41	
Neutral		**-0,30**	**	**0,04**		**0,59**	**	**-0,26**		**-0,15**		**0,27**		**1,10**	***	**-0,20**		**-0,48**	***
		-2,26		0,26		2,33		-1,55		-0,90		1,19		5,22		-1,45		-2,67	
Bad		**-0,18**		**0,11**		**0,30**		**-0,08**		**-0,05**		**0,20**		**-0,04**		**0,27**		**0,63**	**
		-0,62		0,42		0,52		-0,34		-0,27		0,35		-0,07		1,10		2,42	
Winners Minus Losers																			
Good		**-0,05**		**-0,12**	**	**-0,40**	***	**0,02**		**-0,13**	**	**-0,65**	***	**-0,33**	**	**-0,43**	***	**-0,01**	
		-0,92		-2,06		-3,40		0,29		-2,34		-5,40		-2,27		-5,72		-0,29	
Neutral		**0,03**		**-0,19**	**	**-0,50**	***	**0,02**		**-0,46**	***	**-0,56**	***	**-0,41**	***	**-0,29**	***	**-0,26**	***
		0,50		-2,44		-3,93		0,26		-5,63		-4,96		-3,97		-4,22		-2,94	
Bad		**-0,48**	***	**-0,30**	**	**-0,44**		**-0,02**		**-0,51**	***	**-1,01**	***	**-0,76**	***	**-0,34**	***	**-0,22**	*
		-3,33		-2,26		-1,57		-0,15		-5,18		-3,67		-2,58		-2,71		-1,67	

CSR Notation (row label applied to the Good / Neutral / Bad groups in each panel)

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Table 7

Time series regressions of monthly excess returns of Panels A, B and C with the Fama-French five-factor model: June 2002 to May 2015

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At the end of each year, stocks are classified into three CSR groups with respect to their extra-financial ratings (good, neutral and bad). Stocks are subsequently allocated independently to three book-to-market groups (low to high), three investment groups (conservative to aggressive), and three operating profitability groups (low to high). The intersections of the two sorts produce 9 value-weighted portfolios corresponding to the LHS (left-hand-side) variables of panels A, B and C. Those dependent variables are then regressed using the Fama-French five-factor model. The table below presents, for each portfolio, its slope (bold figures) and the corresponding Student t-test results represented by stars ($*p < 0.1; **p < 0.05; ***p < 0.01$).

Fama-French five-factor model (2015)

Intercepts

CSR Notation		Book-to-market			Investment			Operating profitability		
		Low	Neutral	High	Aggress.	Neutral	Cons.	Weak	Neutral	Robust
	Good	**0,01** **	**0,00**	**0,01** ***	**0,00**	**0,00**	**0,01**	**0,00**	**0,00**	**0,00**
		2,48	1,51	2,67	1,45	0,53	1,21	-0,12	0,80	1,39
	Neutral	**0,01** ***	**0,00**	**0,00**	**0,01** **	**0,01** **	**0,00**	**-0,01**	**0,00**	**0,01** ***
		3,61	0,43	0,08	2,19	2,15	0,68	-1,34	1,32	3,14
	Bad	**0,02** ***	**0,01**	**0,01**	**0,01** **	**0,01** ***	**0,01**	**0,01**	**0,01** *	**0,01**
		2,82	1,36	0,65	2,53	3,42	0,77	1,09	1,71	1,40

Market Premium

CSR Notation		Book-to-market			Investment			Operating profitability		
		Low	Neutral	High	Aggress.	Neutral	Cons.	Weak	Neutral	Robust
	Good	**0,50** ***	**0,60** ***	**0,40** ***	**0,59** ***	**0,57** ***	**0,53** ***	**0,80** ***	**0,48** ***	**0,54** ***
		11,46	11,21	3,95	10,25	11,76	4,66	6,20	6,93	12,30
	Neutral	**0,64** ***	**0,74** ***	**0,67** ***	**0,73** ***	**0,72** ***	**0,74** ***	**0,58** ***	**0,68** ***	**0,80** ***
		10,98	11,03	5,92	10,46	9,80	6,97	6,08	10,89	10,48
	Bad	**0,74** ***	**0,75** ***	**1,20** ***	**0,79** ***	**0,76** ***	**1,06** ***	**1,11** ***	**0,61** ***	**0,78** ***
		5,91	6,46	4,81	7,69	8,35	4,27	4,25	5,61	6,89

Small minus Big

CSR Notation		Book-to-market			Investment			Operating profitability		
		Low	Neutral	High	Aggress.	Neutral	Cons.	Weak	Neutral	Robust
	Good	**-0,43** ***	**-0,52** ***	**-0,52** **	**-0,25** **	**-0,35** ***	**-0,62** **	**-0,12**	**-0,45** ***	**-0,39** ***
		-4,46	-4,42	-2,35	-2,01	-3,25	-2,48	-0,43	-2,98	-4,01
	Neutral	**-0,03**	**0,25** *	**0,02**	**0,31** **	**0,00**	**0,02**	**0,20**	**-0,10**	**0,13**
		-0,22	1,69	0,07	2,03	0,01	0,08	0,94	-0,70	0,80
	Bad	**0,65** **	**1,17** ***	**-0,14**	**1,26** ***	**0,42** **	**-0,13**	**0,20**	**0,83** ***	**1,02** ***
		2,38	4,58	-0,25	5,62	2,13	-0,24	0,35	3,45	4,12

High minus Low

CSR Notation		Book-to-market			Investment			Operating profitability		
		Low	Neutral	High	Aggress.	Neutral	Cons.	Weak	Neutral	Robust
	Good	**-0,33** ***	**0,04**	**0,65** **	**-0,01**	**-0,05**	**0,77** **	**0,18**	**0,57** ***	**-0,17**
		-2,63	0,24	2,27	-0,06	-0,37	2,38	0,50	2,90	-1,35
	Neutral	**-0,42** **	**0,36** *	**0,49**	**0,01**	**-0,22**	**0,25**	**1,28** ***	**-0,06**	**-0,67** ***
		-2,54	1,87	1,52	0,05	-1,04	0,83	4,67	-0,31	-3,05
	Bad	**-0,52**	**0,05**	**0,57**	**-0,44**	**-0,27**	**0,16**	**-0,11**	**0,42**	**0,16**
		-1,47	0,16	0,80	-1,50	-1,06	0,23	-0,14	1,34	0,51

Robust minus Weak

CSR Notation		Book-to-market			Investment			Operating profitability		
		Low	Neutral	High	Aggress.	Neutral	Cons.	Weak	Neutral	Robust
	Good	**0,03**	**-0,36** *	**-1,73** ***	**-0,13**	**-0,31** *	**-1,03** **	**-1,03** **	**-0,75** ***	**0,15**
		0,16	-1,77	-4,54	-0,61	-1,69	-2,38	-2,10	-2,84	0,89
	Neutral	**-0,33** **	**-0,20**	**-1,37** ***	**0,05**	**-1,24** ***	**-0,85** **	**-0,43** **	**-0,37**	**-1,18** ***
		-1,48	-0,78	-3,19	0,19	-4,45	-2,10	-1,18	-1,53	-4,06
	Bad	**-2,01** ***	**-0,69**	**-0,45**	**-0,91** **	**-1,22** ***	**-2,41** **	**-2,11** **	**-0,76** *	**-0,98** **
		-4,22	-1,55	-0,47	-2,33	-3,53	-2,55	-2,12	-1,83	-2,29

Conservative minus Aggressive

CSR Notation		Book-to-market			Investment			Operating profitability		
		Low	Neutral	High	Aggress.	Neutral	Cons.	Weak	Neutral	Robust
	Good	**-0,47** ***	**-0,31** *	**-0,74** **	**-0,14**	**-0,77** ***	**-0,73** *	**-1,00** **	**-0,78** ***	**-0,35** **
		-3,05	-1,66	-2,08	-0,70	-4,53	-1,83	-2,21	-3,19	-2,30
	Neutral	**-0,07**	**-1,01** ***	**-0,83** **	**-0,78** ***	**-0,82** ***	**-0,37** *	**-0,63** *	**-0,58** ***	**-0,61** **
		-0,36	-4,27	-2,09	-3,16	-3,19	-1,00	-1,85	-2,65	-2,27
	Bad	**-0,91** **	**-0,35**	**-0,91**	**-0,01**	**-0,27**	**-1,78** **	**-1,59** *	**-1,01** ***	**0,46**
		-2,07	-0,87	-1,03	-0,02	-0,84	-2,04	-1,72	-2,63	1,16

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Table 8
Time series regressions of monthly excess returns of Panels A, B and C with the CSR model: June 2002 to May 2015

At the end of each year, stocks are classified into three CSR groups with respect to their extra-financial ratings (good, neutral and bad). Stocks are subsequently allocated independently to three book-to-market groups (low to high), three investment groups (conservative to aggressive), and three operating profitability groups (low to high). The intersections of the two sorts produce 9 value-weighted portfolios corresponding to the LHS (left-hand-side) variables of panels A, B and C. Those dependent variables are then regressed using the two-factor model (2017). The table below presents, for each portfolio, its slope (bold figures) and the corresponding Student t-test results represented by stars ($*p < 0.1; **p < 0.05; ***p < 0.01$).

CSR two-factor model (2018)

Intercepts

ESG Rating		Book-to-market						Investment						Operating profitability					
		Low		Neutral		High		Aggress.		Neutral		Cons.		Weak		Neutral		Robust	
Good		**0**	*	**0**		**0**		**0**		**0**		**0**		**-0,01**		**0**		**0**	
		1,87		0,54		0,77		1,18		-0,86		0,27		-1,01		-0,62		1,2	
Neutral		**0,01**	***	**0**		**-0,01**		**0,01**	*	**0**		**0**		**-0,01**	*	**0**		**0**	
		3,13		-0,3		-1,27		1,93		0,18		-0,23		-1,81		0,37		1,43	
Bad		**0**		**0**		**0**		**0,01**	*	**0,01**	**	**-0,02**	**	**-0,01**		**0**		**0**	
		0,72		0,6		-0,58		1,74		2,08		-2,11		-1		0,5		0,81	

Market Premium

ESG Rating		Book-to-market						Investment						Operating profitability					
		Low		Neutral		High		Aggress.		Neutral		Cons.		Weak		Neutral		Robust	
Good		**0,51**	***	**0,71**	***	**0,82**	***	**0,63**	***	**0,68**	***	**0,92**	***	**1,09**	***	**0,77**	***	**0,55**	***
		13,69		16,47		9,18		14,35		16,86		10		11		12,98		15,16	
Neutral		**0,6**	***	**0,88**	***	**0,98**	***	**0,76**	***	**0,89**	***	**0,9**	***	**0,88**	***	**0,76**	***	**0,86**	***
		13,26		15,86		10,6		13,22		14,66		10,76		10,76		15,41		13,68	
Bad		**0,76**	***	**0,68**	***	**1,01**	***	**0,63**	***	**0,79**	***	**1,01**	***	**0,98**	***	**0,67**	***	**0,76**	***
		8,5		7,96		6,75		8,39		11,36		7,79		6,52		8,45		8,61	

Bad minus Good

ESG Rating		Book-to-market						Investment						Operating profitability					
		Low		Neutral		High		Aggress.		Neutral		Cons.		Weak		Neutral		Robust	
Good		**-0,09**	***	**-0,06**	**	**-0,01**		**-0,04**		**-0,05**	*	**-0,13**	**	**-0,15**	**	**-0,04**		**-0,07**	***
		-3,5		-2,07		-0,18		-1,25		-1,95		-2,07		-2,33		-1,11		-2,81	
Neutral		**0,01**		**0,01**		**0,02**		**0,02**		**0**		**0,06**		**0,06**		**-0,01**		**0**	
		0,18		0,21		0,38		0,45		-0,09		1,15		1,18		-0,24		-0,05	
Bad		**0,44**	***	**0,37**	***	**0,99**	***	**0,37**	***	**0,19**	***	**1,21**	***	**1,15**	***	**0,36**	***	**0,3**	***
		7,45		6,54		9,91		7,46		4,13		13,9		11,45		6,9		5,05	

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Table 9
Adjusted coefficient of determination related to the time series regressions of Panels A, B and C with five asset pricing models: June 2002 to May 2015

An adjusted R^2 is used to indicate how well terms fit a line and creates an adjustment depending on the number of factors in a model. Adding useless variables decreases the adjusted R^2 contrary to the standard R^2.

		Sharpe-Lintner-Black CAPM (1964)								
		Book-to-market			Investment			Operating profitability		
		Low	Neutral	High	Aggress.	Neutral	Cons.	Weak	Neutral	Robust
ESG Rating	Good	0,51	0,63	0,37	0,58	0,65	0,38	0,42	0,53	0,58
	Neutral	0,55	0,64	0,44	0,55	0,60	0,46	0,46	0,62	0,57
	Bad	0,36	0,34	0,28	0,36	0,50	0,29	0,26	0,36	0,37
		Fama-French three-factor model (1993)								
		Book-to-market			Investment			Operating profitability		
		Low	Neutral	High	Aggress.	Neutral	Cons.	Weak	Neutral	Robust
ESG Rating	Good	0,61	0,67	0,45	0,58	0,66	0,43	0,42	0,58	0,64
	Neutral	0,56	0,65	0,47	0,57	0,60	0,47	0,56	0,62	0,58
	Bad	0,38	0,42	0,27	0,46	0,50	0,29	0,25	0,42	0,45
		Fama-French-Carhart four-factor model (1997)								
		Book-to-market			*Investment*			*Operating profitability*		
		Low	Neutral	High	Aggress.	Neutral	Cons.	Weak	Neutral	Robust
ESG Rating	Good	0,61	0,68	0,49	0,58	0,67	0,52	0,43	0,65	0,63
	Neutral	0,56	0,66	0,51	0,57	0,66	0,54	0,60	0,66	0,60
	Bad	0,42	0,44	0,28	0,46	0,58	0,34	0,28	0,44	0,46
		Fama-French five-factor model (2015)								
		Book-to-market			*Investment*			*Operating profitability*		
		Low	Neutral	High	Aggress.	Neutral	Cons.	Weak	Neutral	Robust
ESG Rating	Good	0,63	0,67	0,51	0,58	0,70	0,45	0,44	0,61	0,65
	Neutral	0,57	0,68	0,50	0,60	0,65	0,48	0,56	0,63	0,62
	Bad	0,44	0,43	0,27	0,47	0,54	0,32	0,27	0,45	0,47
		CSR two-factor model (2018)								
		Book-to-market			*Investment*			*Operating profitability*		
		Low	Neutral	High	Aggress.	Neutral	Cons.	Weak	Neutral	Robust
ESG Rating	Good	0,55	0,65	0,37	0,58	0,65	0,39	0,44	0,53	0,60
	Neutral	0,56	0,64	0,45	0,55	0,60	0,46	0,47	0,63	0,57
	Bad	0,54	0,49	0,56	0,53	0,54	0,69	0,60	0,52	0,47

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Table 10
GRS test Statistics results for Panels A, B and C: June 2002 to May 2015

The regressions use, among others, the Sharpe-Lintner-Black (1964) [CAPM], the Fama-French three-factor (1993) [FF3F], the Fama-French-Carhart four-factor (1997) [FFC4F], the Fama-French five-factor (2015) [FF5F] and the CSR two-factor (2018) [CSR2F] models on a variety of factors in the three panels (A, B and C). The GRS statistic tests whether the intercepts in a set of 9 (3x3) regressions are jointly equal to zero.

Tested Model	1 CAPM	2 FF3F	3 FFC4F	4 FF5F	5	6	7	8 CSR2F	9	10
$r_M - r_f$	X	X	X	X	X	X	X	X	X	X
SMB		X	X	X	X	X	X			
HML		X	X	X						X
WML			X			X			X	X
RMW				X	X					
CMA				X	X		X			
BMG						X	X	X	X	X
GRS: Panel A (BM + A4)	2,09	2,66	2,124	2,99	2,54	1,63	2,44	1,98	1,56	1,89
GRS: Panel B (INV + A4)	1,99	1,82	2,256	2,12	2,11	2,19	1,62	1,88	2,18	2,07
GRS: Panel C (OP + A4)	1,39	1,64	1,84	2,058	1,67	1,60	1,70	1,19	1,62	1,84

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FIGURES

Figure 1
Track record for portfolios with good and bad ESG rating stocks from June 2002 to May 2015
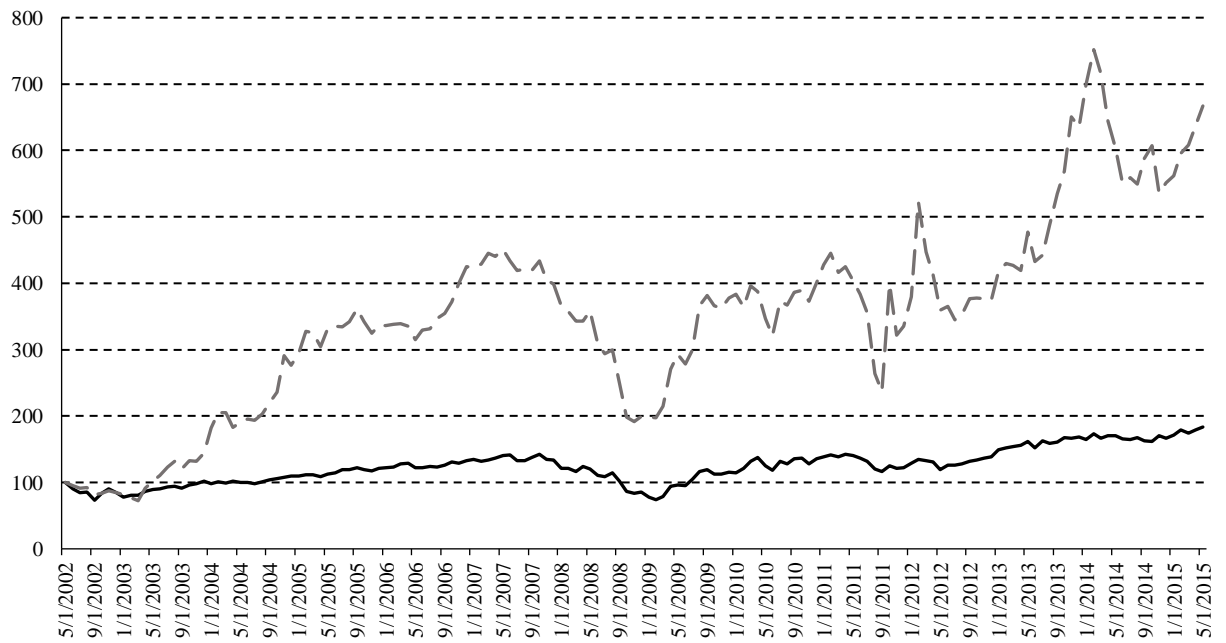
(2002/06/28 - 2015/05/29), monthly frequency, (157 months)
Track record where $i = 100$ in $t = 0$ (2002/05/31)

———— Good CSR rating   — — Bad CSR rating