Erasmus School of Economics

Master Thesis

MSc. Econometrics and Management Science: Quantitative Finance

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Dissecting the ESG premium, an industry based study.

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Abstract

This paper investigates the ESG premium per industry. Specifically, the sorting exercise of Ciciretti et al. (2023) is performed for each individual industry with newly created ESG characteristics based on the Performance Ratio methodology of Benuzzi et al. (2023). Firm specific ESG and accounting data from July 2001 to December 2023 is used of firms in the Europe, North America and Asia-Pacific regions. The analysis during the sorting exercise shows that the ESG premium based on one combined ESG characteristic differs in magnitude per industry and is mostly negative. The separate Environmental, Social and Governance characteristics also have premia, namely negative, slightly negative and slightly positive respectively. However, contrary to Ciciretti et al. (2023) we find that the ESG betas(risk) are more important than the ESG characteristics(preferences) for the ESG premium and related cross-sectional variation.

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1 Introduction

In the last decade, Environmental, Social, and Governance (ESG) investing has witnessed a remarkable surge in popularity, reflecting a growing global consciousness about sustainable and responsible business practices. Investors, corporations, and stakeholders are increasingly recognizing the importance of aligning financial objectives with environmental conservation, social responsibility, and robust governance structures. For example, in 2006 the United Nations introduced the United Nations Principles for Responsible Investments (UNPRI). This consists of six principles that its signatories implement while making their investment decisions. By the end of 2021, it had more than 3800 signatories which have a combined value of assets under management over 120 trillion dollars.[1] Adding to this, globally it is reported that around 30 trillion dollars were invested in sustainable assets in 2022[2]. Although this indicates a decrease compared to 2020, it is due to tighter definitions of sustainable assets to tackle "greenwashing". This indicates that the industry of ESG investing is continuously evolving to better capture what exactly are "green" assets and what are not. Also, to better guide investors, new legislation, such as the Sustainable Finance Disclosure Regulation (SFDR), was introduced in 2021 in Europe. This requires financial market participants to disclose how ESG factors are integrated in the investment process. Therefore, adding to the literature on ESG in the context of financial markets is extremely relevant.

In this research, we focus on the ESG premium, namely the premium that investors pay to incorporate ESG sound firms in their portfolios. In this field, we investigate the differences of the ESG premium between industries based on one combined ESG characteristic or per separate sub-pillar of ESG, namely Environmental, Social or Governance. This offers an answer to the following two research questions:"*Does the ESG premium differ per industry?* and"*Does the premium differ for the separate Environmental, Social and Governance pillars?*"

An exploration of whether the ESG premium differs by industry offers a critical lens through which to better understand the intricate relationship between sustainability and various industries. Recognizing that industries operate within distinct environments, in-

[1]UNPRI: `https://www.unpri.org/about-us/about-the-pri`

[2]Global sustainable investment review 2022: `https://www.gsi-alliance.org/members-resources/gsir2022/`

fluenced by their unique challenges and opportunities, is paramount. By evaluating ESG premiums across industries, we also stay in line with the findings of Papenkov (2019), who show that adding sector specific risk factors to the original Fama-French model leads to higher explanatory power.

Beyond industry-wide exploration, understanding the ESG premium at the sub-pillar level—Environmental, Social, and Governance— will offer a more granular perspective. This level of detail becomes especially relevant in light of the industry-specific impacts on ESG factors. Each industry contributes uniquely to the broader ESG landscape. Therefore, we will also be delving into the distinct contributions of the separate Environmental, Social and Governance pillars by using their respective firm characteristics.

The research is based on the recent findings of Ciciretti et al. (2023). They implement the methodology introduced by Chordia et al. (2017) in the context of the ESG premium to perform a sorting exercise. This includes a two-pass procedure, as in Fama and MacBeth (1973), where both the firm characteristics and risk factors are taken into account. They find that the ESG characteristic of a firm is negatively related to expected returns and that the ESG risk factor, constructed following Becchetti et al. (2018) methodology, is insignificant. Therefore, they show that the ESG firm characteristic helps explain expected returns, not the ESG risk factor. We extend Ciciretti et al. (2023) by investigating whether the ESG premium varies between industries, by following their proposed sorting exercise. Additionally, we do not only consider the combined ESG premium, but also investigate the separate Environmental, Social and Governance premia.

Furthermore, we use self-constructed ESG characteristics made using the so-called Performance Ratio Approach of Benuzzi et al. (2023), in addition to the London Stock Exchange Group (LSEG) ESG characteristics used by Ciciretti et al. (2023). This is due to the methodological drawbacks of the LSEG ESG characteristics, as noted by Benuzzi et al. (2023). Firstly, the LSEG ESG characteristics of firms which are rated for longer periods are inflated by first-time rated firms. Secondly, the LSEG ESG characteristics do not possess relative-performance insights, affecting the results of the Fama-Macbeth procedure. Thirdly, LSEG incorporates specific weights to make the characteristics comparable across industries, as not all metrics are relevant to each industry. This leads to firms having similar ESG characteristics, while operating in very distinct ESG landscapes. This third drawback again affects the Fama-Macbeth procedure.

The data we use to perform the analyses are all from the LSEG workspace database, to which access is provided by the internship company EY. From the LSEG workspace database we retrieve annual firm accounting data, ESG characteristics, underlying ESG datapoints, daily and monthly firm returns and dividends. In total, we use data from an unbalanced dataset consisting of more than 11,000 firms in the regions of Europe, North America and Asia-Pacific in the period of July 2003 until December 2023.

After performing the analyses, we find that the ESG premium indeed differs across the industries. The combined ESG premium is negative for most industries, which is in line with the literature, but the magnitudes of the premium differ. The premium for the Environmental pillar is negative, the premium for the Social pillar is slightly negative, and for the Governance pillar slightly positive. However, we do find that the magnitudes and signs of the premia differ across the industries. The result is plausible as the firms have the most risk related to ESG in Environmental pillar. These results are based on the cross-sectional regression coefficients. However, the main finding of the analyses are that the risks related to ESG are the largest contributor to the ESG premia and not the characteristic itself, which is against the findings of Ciciretti et al. (2023). This result could be explained by our use of industry specific ESG risk factors for both the combined and separate ESG risk factors. This confirms that the risks related to ESG are different for each industry and that investors should use the industry based ESG risk factors. This finding is amplified by the results of the ESG risk factor correlations and PCA across the industries. These show that the factor space of the ESG risk factors cannot be reduced and thus indicates that the risks are different. In addition, the ESG factor beta correlations show that the sensitivities of the firms in the different industries are also different. Confirming that the effect of shocks related to ESG are differently perceived across the industries.

The remainder of this paper is structured as follows: Firstly, a theoretical background is given on literature that is related to this research. Thereafter, the methodology used to perform the analyses in this research is given. Subsequently, the data used is discussed in more depth, and descriptive statistics are given. Then, the results of the sorting exercise are discussed. Finally, a conclusion is formulated to the research questions.

2 Theoretical background

In this section, we provide an in-depth analysis of the existing literature regarding Environmental, Social, and Governance (ESG) criteria and financial performance. Research on this topic explores factor models, industry-based analysis, characteristic methodologies, geographical variations, and other relevant research areas.

A significant strand in the literature has centred around the use of multi-factor models. The beginning of this methodology can be traced back to the pioneering work of Fama and French (1992). In their first study, they propose the three-factor model - comprising market, size, and value risk factors - to explain observed stock returns. Carhart (1997) introduced another version, incorporating the Momentum effect found by Jegadeesh and Titman (1993). This model is further extended by Fama and French (2015), who expand it to include two additional factors concerning profitability and investment.

As ESG can be viewed as how well a firm contributes to a healthier planet, creates greater social impact, and practises better corporate governance, firms such as LSEG started producing ESG-related characteristics of how well a firm performs. This led to the construction of the ESG risk factor by Becchetti et al. (2018). Later, Ciciretti et al. (2023) incorporate this ESG risk factor in the Fama-French models to assess the ESG premium, which they find to be negative.

Adding an unique vantage point to these models of stock return was the work by Pastor et al. (2021). They extend the horizon of conventional financial models to create an equilibrium model that examines sustainable investing. They find that theoretically, although in recent years "green" stocks have had an outperformance, this should not be suspected to hold forever. The high returns over the past years are mainly due to increased demand for "green" stocks, which means we should indeed expect a negative ESG premium. Pedersen et al. (2021) translate these theoretical advances into practical tools. They create an ESG efficient frontier, presenting a model illustrating the highest possible Sharpe ratio attainable for a portfolio of stocks with a certain ESG characteristic. This frontier possesses a bump, meaning that increasing the ESG characteristic of a portfolio initially increases the Sharpe ratio, but after a certain point it decreases.

Meanwhile, research focusing on industry variances in ESG performance is very limited and should therefore receive more attention. Papenkov (2019) argues there are marked differences across industries. Therefore, he introduces an industry-heterogenous model

to account for these diversities, showing that constructing a Fama-French model with industry-specific risk factors using only firms in that industry leads to higher explanatory power. Assael and Challet (2021) perform a study where they use machine-learning techniques to predict the return sign of stocks, using the separate ESG sub-pillars and focusing on different industries. They find that these indeed influence the return sign, which leads us to expect a similar result regarding the ESG premium.

Researchers have also looked into ESG characteristic methodologies and discrepancies, leading to critical examinations of different characteristic systems. Benuzzi et al. (2023) and Dobrick et al. (2023) critique the ESG scoring methodology employed by LSEG for perceived biases. They unveil a size bias and an inflation bias for firms that have been rated for extended periods. Avramov et al. (2022) note higher market risk and decreased investments due to discrepancies between the ESG characteristic providers. To overcome the issue of lacking clarity of the weights used per industry, Del Vitto et al. (2023) apply machine learning techniques to uncover LSEG's ESG characteristics model. They discover unlearnable noise in the current ESG characteristics systems, indicating areas for future refinement. With this in mind, one should not blindly follow the currently available ESG characteristics.

The connection between ESG criteria and corporate valuations has also received a fair share of attention. Ammann et al. (2011) and Brighi et al. (2023) find that better corporate governance and improved ESG characteristics, respectively, lead to superior market valuations, showing the crucial influence of ethical corporate practices on financial outcomes. Adding to this strand of literature, Lee et al. (2023) argue that balanced weights for the separate pillars of the ESG characteristic provide a more comprehensive indicator of firm performance, showing the equal importance of the subpillars.

Research tracing cross-industry and regional trends in ESG characteristics has unveiled additional nuances. Pillai et al. (2024) compare industry-related and regional differences in ESG characteristics, finding significant variability in ESG practices across regions and industries. These findings are mirrored by Gupta et al. (2022), who find distinct variances across different industries in India and show regional variations among the top 100 companies in India. These studies highlight a high degree of heterogeneity in the characteristics of ESG between countries and industries, underlining the need for a more localized understanding of the impacts of ESG.

The risk implications of ESG practices have also been the subject of several papers. Cerqueti et al. (2021), for example, show how firms with high ESG characteristics are better equipped to weather periods of financial turbulence due to their relative stability, conditional on lower asset volatility. Perhaps the most extensive research is done by Friede et al. (2015). They compile a comprehensive review concluding that nearly 90% of studies find a positive relation between ESG and corporate valuations, however leading to lower expected returns. This raises the suspicion that the ESG premium is negative, as higher ESG characteristics are related to lower risk.

While ESG characteristics have gained substantial ground, researchers and industry practitioners alike have to be prepared for future trajectories that might deviate from current trends. Pastor et al. (2022) draw attention to this fact, warning that outperformance of "green" stocks witnessed in recent years could be a short-lived phenomenon. As a product of increased demand for green stocks, not continuous returns. This observation aligned with the research by Hong and Kacperczyk (2009), in which they reveal how the so-called "Sin stocks" -which could be seen as the other end of the spectrum to "green" stocks- often outperformed, setting the stage for future research.

3 Methodology

In this section, we provide the econometric models and methods used in this research. First, we present the ESG characteristic methodology of LSEG and discuss its drawbacks. We then construct new ESG characteristics following the Performance Ratio Approach of Benuzzi et al. (2023) to address these issues. Next, we discuss the level of industry granularity used in the research and explain the methods to assess whether industry-specific risk factors are necessary. Finally, we discuss in detail the sorting exercise method used by Ciciretti et al. (2023).

3.1 ESG characteristics

3.1.1 LSEG ESG characteristics

London Stock Exchange Group (LSEG) is one of the leading providers of ESG characteristics, with characteristics dating back to 2003. In addition to this long history, another benefit is that LSEG provides access to the data points behind their ESG characteristics,

as well as to their relative transparent methodology compared to other ESG characteristic providers[3]. However, their methodology has some drawbacks.

LSEG collects more than 630 ESG metrics of each firm, from these they create 186 scoring variables (SV) which are comparable between firms and used in the ESG characteristic calculation. These SVs can be either boolean or numeric. However, not all 186 SVs are relevant for every industry. Therefore, LSEG chooses a subset of these SVs for every industry. This selection is done at the so-called Industry Group granularity level following The Refinitiv Business Classification (TRBC). Adding to this, LSEG uses peer-percentile ranking to compute the sub-pillar characteristic. This means that LSEG creates for every SV an Indicator Variable (IV) for every firm in an Industry Group. This IV of a firm is constructed by dividing the number of firms with a worse value of the SV in its respective Industry Group plus the number of firms with the same value of the SV divided by two, by the total number of firms in the Industry Group. Leading to values between 0 and 100. These IVs are then used to compute the so-called sub-pillar characteristics, where again peer-percentile ranking is applied. However, this peer-percentile ranking inflates the ESG characteristics overtime when new firms are added. This inflation occurs because as new worse performing firms are added, the ESG characteristic of a firm with constant metrics will still increase. Figure 1, taken from Benuzzi et al. (2023), shows the full structure of the LSEG sub-pillar characteristic computation hierarchy.

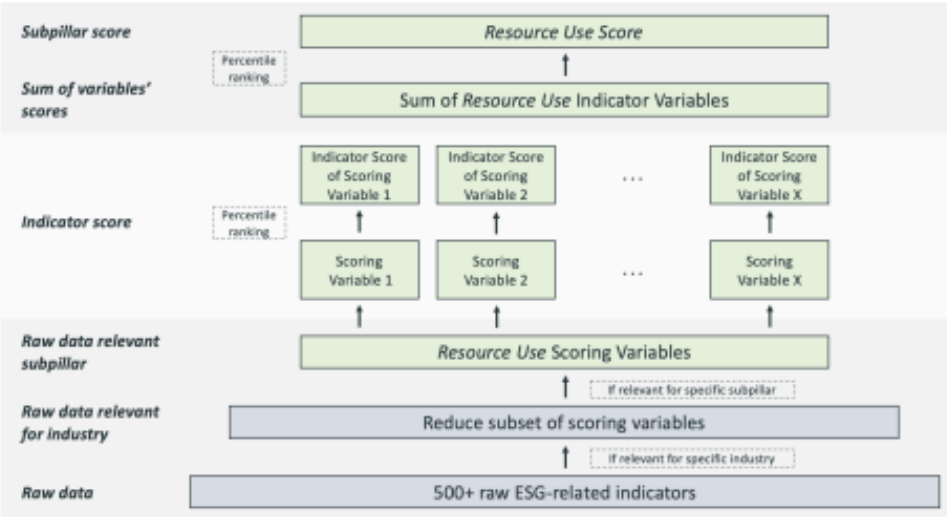


Figure 1: LSEG sub-pillar characteristic hierarchy

[3]Full LSEG ESG methodology: `https://www.lseg.com/en/data-analytics/sustainable-finance/esg-scores`

Besides that different SVs are considered per Industry Group, the weights given to each sub-pillar characteristic also differ. Figure 2, taken from Benuzzi et al. (2023), shows which sub-pillar contributes to each separate Environmental, Social or Governance characteristic.

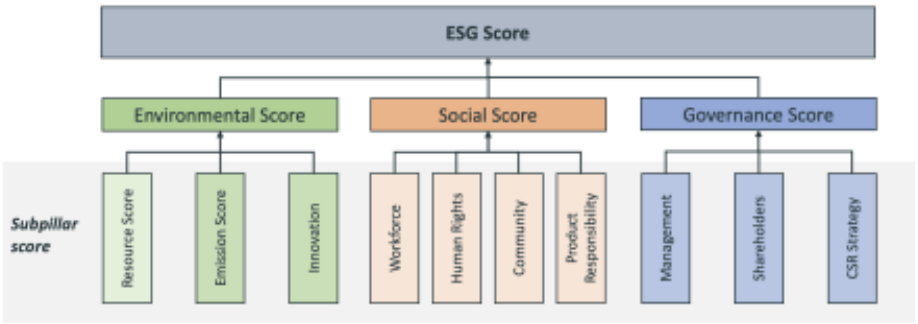


Figure 2: LSEG ESG characteristic hierarchy

In conclusion, the LSEG ESG methodology leads to ESG characteristics which cannot be objectively compared outside their respective Industry Group and are prone to inflation due to new firms being added.

3.1.2 Performance Ratio ESG characteristic

To overcome the drawbacks of the LSEG ESG characteristics, we calculate new ESG characteristics for all firms using the methodology introduced by Benuzzi et al. (2023) and compare the results of both characteristic methodologies. In contrast to the drawbacks that the LSEG ESG methodology has by using percentile ranking, their methodology uses ratio-based ranking which provides relative-performance insights and is less inflated by the introduction of many lower-rated firms throughout the years. This is done by first computing the following Performance Ratio for every SV for every firm i in a specific sector s in year t:

$$PR_{i,s,t} = \frac{SV_{i,s,t} - \min_{\forall x \in F_{s,t}}(SV_{x,s,t})}{\max_{\forall x \in F_{s,t}}(SV_{x,s,t}) - \min_{\forall x \in F_{s,t}}(SV_{x,s,t})} * 100, \tag{1}$$

where $F_{s,t}$ is the set of firms that disclosed the specific SV in sector s in year t. Firms that do not disclose the SV, receive a zero Performance Ratio by definition. For SVs with a negative polarity, meaning that a higher SV is perceived as worse, we calculate the Performance Ratio by subtracting Formula (1) from 100. In the case of boolean SVs, a firm thus either receives a 0 or 100 Performance Ratio.

The average of the Performance Ratios are then taken per individual sub-pillar, leading to the sub-pillar characteristics. To construct the separate E, S and G characteristic, a weighted average of the sub-pillars is taken, based on the amount of underlying Performance Ratios in each sub-pillar. Finally, the combined ESG characteristic is calculated by taking an average over all three separate E, S and G pillars. This is done to stay in line with the insights provided by Lee et al. (2023), as discussed in Section 2.

Another benefit of this methodology is that it offers flexibility in the sector granularity, as LSEG does not disclose how the sub-pillar weights are calculated.

3.2 Industry specific risk factors

At the basis of this research lies the question of whether the ESG premium differs between various industries. Therefore, we need to define what exactly are these industries and what level of granularity we use. The majority of the data used in this paper are retrieved from LSEG, who makes use of The Refinitiv Business Classification (TRBC). Therefore, we take their definitions and granularity as the starting point. In their methodology, they have a five-level hierarchy. These five levels are: 13 Economic sectors, 33 Business sectors, 62 Industry groups, 154 Industries and 898 Activities. As described in Section 3.1.1, LSEG selects the SVs for the ESG characteristic calculation per Industry Group level and gives each Industry Group separate weights for each sub-pillar. However, the amount of firms per Industry Group that provide ESG data is small, certainly for years in the beginning of the history. Therefore, we use the largest granularity available, namely the Economic Sector, in this research. These Economic Sectors are: Energy, Basic Materials(BaMa), Industrials(Ind), Consumer Cyclicals(CC), Consumer Non-Cyclicals(CNC), Financials(Fin), Healthcare(Health), Technology(Tech), Utilities(Util), Real Estate(RE), Institutions & Associations & Organizations, Government Activity and Academic & Educational Services. To compute the ESG characteristics, we use the union of the subsets of the SVs used by LSEG to compute their ESG characteristics per Industry Group.

To create the combined ESG and separate environmental, social, and governance risk factors, we use a methodology in line with Becchetti et al. (2018). They construct risk factors in the same way as Fama and French (2015). Firstly, the set of firms available is divided in half based on market capitalization. Thereafter, the two subsets, small companies and large companies, are divided into three subsets based on the 30th and 70th

percentile of the specific characteristic, resulting in a two-by-three sort. The risk factor is computed by taking the average of the small worst and big worst portfolio excess returns, which are value weighted, minus the small best and big best portfolio excess returns. The portfolios are re-evaluated yearly at the end of June. After having constructed all the risk factors based on the Economic Sectors, we perform a Principle Component Analysis (PCA) and analyze the correlation between the ESG risk factors to investigate if they are similar or differ per industry.

3.3 Sorting exercise

To investigate the ESG premium per industry, we follow the same sorting exercise as proposed by Ciciretti et al. (2023). The first step in the sorting exercise is to estimate all the factor betas. The factor betas are estimated through time-series regressions of excess stock returns on factors using several specifications of the Fama-French model for each specific industry.

$$r^e_{i,t} = \alpha_i + \beta_i' f_{s,t} + \epsilon_{i,t} \tag{2}$$

where $r^e_{i,t}$ is the excess return of firm i at time t over the risk-free rate, α_i is the intercept of firm i, $\beta_{i,t}$ is a (k_m x 1) vector of factor betas of firm i for the k factors in the (k_m x 1) vector $f_{s,t}$ constructed for industry s of which firm i is part at time t, which responds to the m-th specification of the Fama-French model and $\epsilon_{i,t}$ is the error term for stock i at time t. The regressions are run for rolling windows of two years of past daily stock returns to obtain estimates for monthly time-varying betas. The model specifications we use are a 4 factor-model including the market, separate Environmental, Social and Governance risk factors, and a 7 and 9 factor model including all five Fama and French (2015) factors and respectively the combined ESG factor and the separate Environmental, Social and Governance factors. The properties of the estimated factor betas are investigated afterwards by looking into their distributions and correlations.

In this step of the sorting exercise, we additionally perform an analysis of the ESG premium by means of investigating the properties of quintile portfolios sorted on the different ESG characteristics. On these sorted portfolios different multi-factor time-series regressions are performed, together with the GRS-test to test if the alphas are significantly different from zero. This analysis shows whether an ESG premium existed in the past time period in an individual industry and if it is a positive or negative premium. To test if

the premium is significant, we perform the Patton and Timmermann (2010) monotonicity test on the portfolio sorts. This test shows whether the excess returns over the portfolio sorts decreases or increases, thus indicating a significant negative or positive premium.

The second step consists of cross-sectional regressions with an Error-in-Variables (EIV) correction for $N_{s,t}$ given stocks in sector s at time t:

$$E_{t-1}[r^e_{i,t}] = \gamma_{0,s} + \gamma'_{1,s}\hat{\beta}_{i,t-1} + \gamma'_{2,s}Zsc_{i,t-1} =: \hat{X}_t\Gamma_s \tag{3}$$

where $\hat{X}_t := [1_{N_{s,t}}, \hat{B}_{s,t-1}, Zsc_{s,t-1}]$ is a matrix which contains an unit vector $1_{N_{s,t}}$ with $N_{s,t}$ the number of firms in the selected sector s at time t, the (k_m x $N_{s,t}$) matrix of estimated factor betas $\hat{B}_{s,t-1}$ at time $t-1$ and a (C x $N_{s,t}$) matrix of the firm characteristics Zsc_{t-1} of firms for time $t-1$. $\Gamma_s := (\gamma_{0,s}, \gamma'_{1,s}, \gamma'_{2,s})'$ consists of the zero-beta rate $\gamma_{0,s}$, a (k_m x 1) vector of beta premiums $\gamma_{1,s}$ and a (C x 1) vector of firm characteristic premiums $\gamma_{2,s}$ for firms in sector s. Therefore, consistent with Chordia et al. (2017) and Ciciretti et al. (2023), we use constant beta premiums.

The Error-in-Variables correction is done for every cross-sectional regression over the months. It is done by means of the following correction:

$$\hat{\Gamma}^{EIV}_{s,t} = (\hat{X}'_{s,t}\hat{X}_{s,t} - \sum_{l=i}^{N_{s,t}} M'\hat{\Sigma}_{\hat{B}_{l,s,t-1}}M)^{-1}\hat{X}'_{s,t}r^e_t \tag{4}$$

where $M = [0_{k_m\ x\ 1}, \mathbf{I}_{k_m\ x\ k_m}, 0_{k_m\ x\ C}]$ makes sure that the correction only applies to the factor betas and not the constant or the characteristics. $\hat{\Sigma}_{\hat{B}_{i,s,t-1}}$ is a White (1980) heteroskedasticity-consistent covariance matrix for $\hat{B}_{i,s,t-1}$. The correction is performed to account for the errors in the estimated variables in step one. The EIV-corrected estimator is defined using a matrix to ensure that the adjustment applies only to the factor betas and not the constant or the characteristics. However, as noted by Chordia et al. (2017), the EIV correction can posses finite-sample issues which causes the correction to overshoot and make the part between parenthesis in formula (4) not positive definite anymore. This is attempted to be dealt with by means of two added rules. Firstly, the elements in the correction matrix are Winsorized at the 1% and 99% level. Secondly, if the part between parenthesis becomes not positive definite, the EIV-corrected estimator is replaced with the OLS estimator for that month.

The cross-sectional regressions are run for each month, utilizing the specified variables. EIV correction is applied to obtain the EIV-corrected estimator for each cross-sectional

regression. The time-series average of the cross-sectional coefficients $\hat{\Gamma}_{s,t}^{EIV}$ is then derived to end up with the final estimate of Γ. These cross-sectional regression show the relation between the expected excess stock returns and the firm characteristics and risk factors. These results are used to assess what the impact of the ESG characteristics and the ESG risk factor is per industry and if the ESG premium in the quintile portfolio sorts is truly present. The results also show what the premia are for the separate Environmental, Social and Governance characteristics.

As a final step, the relative contribution of the betas and characteristics is calculated to assess their importance. To do so, expected excess returns in each month are calculated using the obtained estimates for the factor betas and firm characteristics coefficients:

$$E_{t-1}[r_t^e] = \hat{\gamma}_{s,0} + \hat{B}_{s,t-1}\hat{\gamma}_{s,1} + Zsc_{s,t-1}\hat{\gamma}_{s,2} \tag{5}$$

Then, we calculate the relative contribution of the betas and characteristics as follows for each month t:

$$C_{\hat{B}_{s,t}} = \frac{\sigma_{cs}^2(\hat{B}_{s,t-1}\hat{\gamma}_{s,1})}{\sigma_{cs}^2(E_{t-1}[R_t^e])} \tag{6}$$

$$C_{Zsc_{s,t}} = \frac{\sigma_{cs}^2(Zsc_{s,t-1}\hat{\gamma}_{s,2})}{\sigma_{cs}^2(E_{t-1}[R_t^e])} \tag{7}$$

This involves computing the ratio of the beta component to the cross-sectional variance of expected returns and the ratio of the characteristic component to the cross-sectional variance of expected returns. Then the time-series averages are taken and reported. These ratios represent the average contribution of factor betas and characteristics to the variation of cross-sectional expected returns over time. These relative contributions can also be used to assess if the newly created Performance Ratio ESG characteristics have a larger explanatory power of excess stock returns compared to the LSEG ESG characteristics.

4 Data

This Section provides a detailed description of the data that we use in this paper. Firstly, we discuss the general outline of the data similar to that used by Ciciretti et al. (2023). Thereafter, attention is given to the LSEG ESG data.

The data set is of the time period July 2001 up to and including December 2023, because LSEG offers ESG data starting from July 2003 and we need two years of previous returns for the time-series regressions. All data is retrieved from the LSEG Workspace.

Firstly, we use annual firm-level data to create the firm characteristics using Fama and French (2015) methodology. These are the size of a firm (ME), defined as the market capitalization, the book-to-market ratio (BE/ME), defined as the amount of common equity divided by the market capitalization of a firm, the operating profitability (Pro), defined as the annual revenues minus the cost of goods, interest, selling, general and administrative expenses divided by common equity of a firm, Investment (Inv), defined as total assets this year minus total assets last year divided by total assets last year.

Thereafter, we retrieve the monthly and daily stock returns, with dividend yields, for the firms used in the cross-sectional regression and for the estimation of the monthly rolling-window betas. Using these returns we also create the Momentum(Mom) characteristic defined as the return of a firm over the past $t-12$ until $t-2$ months. By doing so, we stay in line with the methodology of the five-factor model of Fama and French (2015), instead of using only the past six month return as in Ciciretti et al. (2023).

Using all these characteristics, we create industry specific risk factors using a subset of the data, as Papenkov (2019) shows that these factors differ per industry. These factors are the size(SMB), value(HML), profitability(RMW), investment(CMA) and momentum(WML) factors and are created using the same methodology as described in Fama and French (2015). These portfolios are re-evaluated yearly at the end of June.

We retrieve the individual Scoring Variables used per Industry Group from the LSEG workspace to create the LSEG ESG characteristics. Using these Scoring Variables, we download all underlying data points for each firm disclosing ESG data within each Economic Sector. These data points are used to construct the new ESG characteristics. From these we remove ADRs, preferred shares, Units and participation shares, following Fama and French (1992), and only keep ordinary shares. This leads to an unbalanced data sample of 11.381 firms. To ensure that we have enough data in a year for an industry to produce representative portfolio sorts, a minimum of 15 firms per portfolio is established. This leads to the exclusion of some years for certain industries, resulting in the following meta-data per industry:

Table 1: Meta data per industry

	Energy	BaMa	CC	CNC	Fin	Health	Tech	Util	RE	Ind
Begin month	July 2006	July 2005	July 2003	July 2005	July 2003	July 2006	July 2005	July 2006	July 2006	July 2003
Number of firms	513	1040	1425	657	1425	309	1483	1276	610	1599

4.1 Descriptive statistics

Table 2 shows the means of the firm characteristics per industry, where for the size, value and momentum of a firm the natural logarithm is taken. We can see that on average the Consumer Non-Cyclicals industry has the largest firms and Healthcare the smallest. Real Estate firms have on average the highest book to market value and Healthcare firms the lowest. We also observe that the Real Estate firms are on average the most profitable and Healthcare firms the least. The firms in Industrials have the highest investments and Consumer Non-Cyclicals the lowest. Over the past twelve months, Industrials firms have had on average the highest returns and Energy firms the lowest. However, it should be noted that the averages of these characteristics are sometimes affected by extreme firms, which are double checked and found correct.

Table 2: Mean descriptive statistics for firm-level characteristics per industry

						Performance Ratio				LSEG			
	lME	lBtM	Pro	Inv	lRet12	Env	Soc	Gov	ESG	Env	Soc	Gov	ESG
Energy	21.896	-0.370	0.084	1.322	-0.032	24.771	31.715	56.534	37.673	38.511	42.371	51.434	43.331
BaMa	22.107	-0.539	0.172	30.574	0.036	26.539	30.687	52.599	36.608	41.371	39.511	50.791	42.926
CC	22.077	-0.771	0.278	1.058	0.044	18.562	26.032	48.627	31.074	33.963	41.635	46.169	41.523
CNC	23.124	-0.896	0.269	0.230	0.055	25.604	32.072	51.322	36.333	41.373	44.179	50.426	45.050
Fin	22.264	-0.279	0.333	84.283	0.036	17.547	24.509	50.559	30.872	38.199	42.887	50.211	43.060
Health	21.368	-1.238	-1.592	4.327	-0.012	17.874	26.862	52.771	32.502	24.607	42.634	46.628	39.900
Tech	22.163	-1.010	4.562	2.431	0.046	23.151	29.044	50.835	34.343	34.507	44.806	49.926	44.399
Util	23.108	-0.419	0.143	55.846	0.030	32.813	34.810	54.700	40.774	45.434	44.008	53.728	47.070
RE	22.126	-0.214	590.020	34.491	0.006	21.094	26.236	52.198	33.176	34.525	45.043	45.618	41.572
Ind	22.078	-0.737	0.267	5096.869	0.057	20.528	28.512	48.687	32.575	36.891	41.635	48.051	42.169

The table shows the time-series means of the firm characteristics size (logarithm of market equity), value (logarithm of book to market ratio), profitability, investments, momentum (logarithm of return over past $t-12$ up to and including $t-2$ months), Environmental, Social, Governance and combined ESG characteristics per industry. The time period used ends December 2023 and the start dates per sector can be found in Table 1.

The table also shows the mean ESG characteristics of the firms per industry, based on the Performance Ratio or LSEG methodology. As noted in Section 3.1.1, the characteristics cannot objectively be compared between industries. However, we can see that the characteristics based on the Performance Ratio methodology are lower compared to the LSEG based characteristics for the Environmental, Social and combined ESG characteristics. This is to be expected due to the relative performance ratio, which penalizes lower scoring firms more. The Governance characteristics are however higher for the Performance Ratio methodology. This is because the Governance characteristic has a large amount of true boolean Scoring Variables, which inflate the characteristics. In the re-

mainder of this paper, we only consider the Performance Ratio based characteristics. The analyses are also done with the LSEG characteristics and are shown in the Appendix. In the case of large deviations between the outcomes of the two methodologies, we will discuss it.

Tables 20-29 in the Appendix show the entire distribution and correlations of the characteristics per industry. We observe that, as noted in the literature, the ESG characteristics have a large correlation with the Size characteristic of a firm. In addition to this, the correlations between the separate ESG characteristics are also high, which is expected.

5 Results

This section discusses the results obtained after performing the analyses introduced in Section 3. First, the correlations and results of the PCA are provided, along with the analyses of the estimated factor betas. Next, we discuss the first part of the sorting exercise, which consists of the quintile portfolio sorts. We show the results of the GRS test on all quintile portfolio alpha's and the Patton and Timmermann (2010) monotonicity tests for the combined ESG characteristic and the separate ESG characteristics. These tests assess whether the factor models can explain the firm excess returns and whether ESG premia exist. Finally, we present the second step step of the sorting exercise, which is the cross-sectional regression. We display the cross-sectional regression estimates of the ESG characteristics and factor betas and discuss their effects on expected excess firm returns. We start by focusing on all results using only the combined ESG characteristic and risk factor. Afterwards, we repeat the same steps, but this time using the separate Environmental, Social and Governance characteristics and risk factors.

5.1 Combined ESG premium

5.1.1 Industry risk factor analysis

Firstly, we consider the correlations, PCA, and estimated factor betas of the combined ESG risk factor for each industry to assess whether they differ by industry. Table 3 shows the correlations between the combined ESG risk factors for each industry. We observe that all correlations are positive, but very close to zero. Most of the correlations range between 0.00 and 0.15, with some exceptions which remain small and below 0.25. These

small correlations are a first indication that the risk related to ESG differs by industry.

Table 3: Correlations between the industries' combined ESG risk factors computed using Performance Ratio methodology.

	Energy	BaMa	CC	CNC	Fin	Health	Tech	Util	RE	Ind
Energy	1.000									
BaMa	0.082	1.000								
CC	0.090	0.063	1.000							
CNC	0.069	0.084	0.141	1.000						
Fin	0.032	0.242	0.072	0.091	1.000					
Health	0.079	0.062	0.095	0.087	0.188	1.000				
Tech	0.121	0.146	0.147	0.094	0.120	0.124	1.000			
Util	0.076	0.109	0.019	0.099	0.159	0.058	0.052	1.000		
RE	0.097	0.123	0.194	0.097	0.216	0.116	0.114	0.069	1.000	
Ind	0.154	0.241	0.234	0.113	0.121	0.003	0.157	0.123	0.238	1.000

Figure 3 shows the elbow plot of the PCA on the combined ESG risk factors for each industry. The elbow plot confirms the low correlations between the combined ESG risk factors by showing a nearly linear line. This indicates that the factor space of the risk factors cannot be reduced, further indicating that the combined ESG risk factors are different by industry. This is expected, as the different industries react differently to shocks related to ESG issues. For instance, industries have varying relationships to energy price changes. In the case of an increase, lower-rated firms in the Energy industry, such as oil companies, would likely have higher returns. On the opposite, higher ESG-rated firms in the Utilities industry would likely have higher returns as these will be more efficient in their energy usage.

Figure 3: PCA of Performance Ratio based combined ESG risk factors across industries

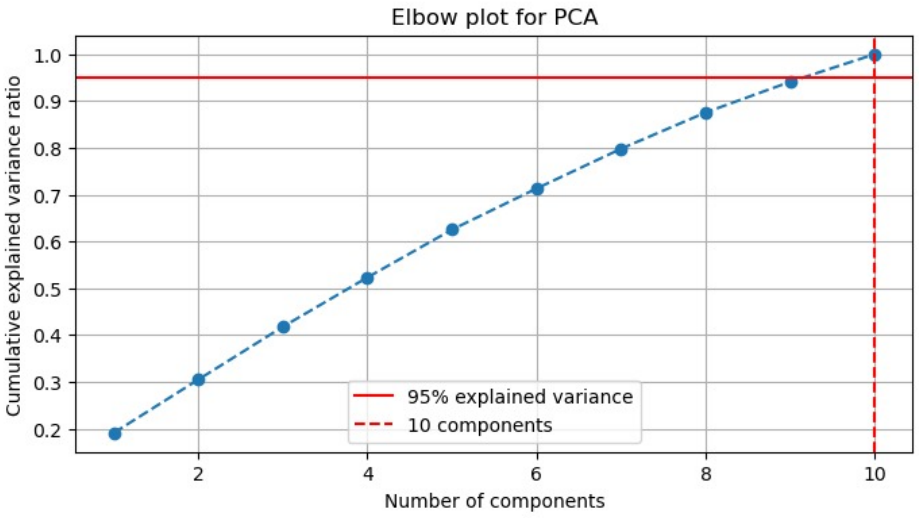


Table 4 shows the distributions and correlations of the estimated combined ESG risk

factor betas for each industry. The table shows that the sensitivities of the firms to the combined ESG risk factor are low, but vary between the industries. We observe that the firms in the Energy, Healthcare and Real Estate industries have, on average, a negative sensitivity to the combined ESG risk factor, while most other industries exhibit a positive sensitivity. However, it is important to remember that the combined ESG risk factor also varies by industry. This fact can also be seen in the correlations, where the factor betas for the Consumer Non-Cyclicals and Financials industry seem to be distributed similarly, but are not correlated at all(-0.063). Further investigating the correlations, we observe that the factor betas show more significant correlations than the combined ESG risk factor itself between industries. This indicates that firms in some industries respond similarly to their industry-specific ESG risks in cases of positive correlation and oppositely in cases of negative correlation. However, these results appear rather random and are not easily explained by specific industry characteristics.

Table 4: Descriptive statistics of the combined ESG risk factor betas per industry.

	Panel A: Cross-sectional Distributions									
	Energy	BaMa	CC	CNC	Fin	Health	Tech	Utilities	RE	Ind
Mean	-0.068	0.056	0.054	0.011	0.013	-0.059	0.080	0.121	-0.015	0.013
Stdev	0.306	0.339	0.297	0.218	0.315	0.385	0.337	0.407	0.376	0.400
10%	-0.413	-0.289	-0.276	-0.211	-0.252	-0.452	-0.276	-0.310	-0.430	-0.462
25%	-0.228	-0.135	-0.116	-0.113	-0.114	-0.258	-0.115	-0.132	-0.206	-0.223
50%	-0.064	0.026	0.040	-0.002	0.006	-0.069	0.055	0.068	-0.021	0.004
75%	0.080	0.219	0.206	0.120	0.127	0.123	0.248	0.313	0.197	0.238
90%	0.264	0.441	0.387	0.258	0.284	0.346	0.479	0.636	0.393	0.493
	Panel B: Correlations									
	Energy	BaMa	CC	CNC	Fin	Health	Tech	Util	RE	Ind
Energy	1.000									
BaMa	0.116	1.000								
CC	0.503	0.393	1.000							
CNC	0.274	-0.606	-0.135	1.000						
Fin	-0.128	-0.044	0.032	-0.063	1.000					
Health	0.191	-0.059	0.078	0.550	0.173	1.000				
Tech	0.413	0.378	0.483	-0.231	-0.207	-0.336	1.000			
Util	-0.341	0.343	-0.183	-0.678	-0.348	-0.425	0.011	1.000		
RE	0.662	0.204	0.495	-0.083	-0.537	-0.358	0.687	0.029	1.000	
Ind	-0.234	0.277	0.039	-0.628	-0.172	-0.535	0.505	0.635	0.236	1.000

The risk factor betas shown in this table are estimated using the 7-factor model. The cross-sectional distributions are shown per industry over the entirely available time period of that industry. The correlations between the risk factor betas only use the time period July 2008 up to and including December 2023, as this is the time-period for which all industries have factor beta estimates. The correlations shown are the correlations between the cross-sectional monthly means of the factor betas per industry.

5.1.2 Time series regressions

The first part of the sorting exercise are the time series regressions. The estimated combined ESG factor betas are previously discussed in Section 5.1.1. In this section, we discuss the general results for the quintile portfolio sorts formed using the combined ESG characteristic for each industry, which are shown in Table 5. The detailed tables can be found in Tables 44-63 in the appendix. The quintile portfolios are formed based on the quintile cut-off points of the most recent combined ESG characteristic and are value-weighted. The table provides the multi-factor time series regression alphas and the GRS test of Gibbons et al. (1989) based on the 4, 7 and 9 factor specifications including ESG risk factors. These are inspected to assess whether the ESG risk factor models are able to explain excess returns. The table also includes the returns of a difference portfolio between the best and worst quintiles and the Patton and Timmermann (2010) test for decreasing monotonicity over the portfolios. This test gives a positive test value if there is a decreasing trend and a negative test value if there is an increasing trend. A decreasing trend suggests a negative risk premium, meaning a firm with a higher ESG characteristic has lower excess returns, while an increasing trend suggests the opposite. Thus, the table provides an initial indication of whether an industry-specific ESG premium existed over the past twenty years.

The results of the GRS tests show that for most industries, the factor models are able to explain the excess returns for all quintile sorts. This indicates that the risks related to the combined ESG factor and also the separate ESG factors are an important factor for the firm returns in most industries. However, for the Basic Materials industry, significant GRS test values are observed for all models. The Industrials industry shows significant values for the 7 and 9-factor models, and the Consumer Non-Cyclicals and Financials industries only show significance for the 9-factor model. Another observation from the results is that the GRS test statistics for all 9-factor models are higher than for the 4-factor models. The 9-factor model, compared to the 4-factor model, also includes the size, value, profitability, investment, and momentum factors. This indicates that the addition of other Fama-French factors introduces more noise to the factor models, potentially due to the relatively high absolute correlations between the ESG risk factors and the Fama-French risk factors.

The results of the monotonocity tests and difference portfolios show only two signifi-

cant combined ESG premia, specifically for the Basic Materials and Technology industries. These two industries have had a significant positive combined ESG premia over the past twenty years, with an 0.966% and 0.684% higher excess return for the best-rated portfolio over the worst-rated portfolio respectively. Although many premia are not significant, we do observe distinct premia over the industries, with most being positive. The Energy industry again depicts opposite results to the other industries which are dependent on energy such as Basic Materials, CNC and Ind.

Table 5: Resutls of the GRS and Patton and Timmermann (2010) decreasing monotonicity test for the quintile portfolio sorts based on the combined ESG characteristic per industry.

Industry:	Energy	BaMa	CC	CNC	Fin	Health	Tech	Util	RE	Ind
GRS:										
4-factor	[0.391]	[3.559]***	[1.287]	[1.831]	[1.602]	[0.923]	[0.387]	[0.744]	[0.686]	[0.848]
7-factor	[0.690]	[3.118]***	[1.389]	[1.856]	[1.827]	[1.733]	[0.966]	[0.996]	[0.792]	[2.594]**
9-factor	[0.804]	[3.293]***	[1.465]	[2.963]**	[3.411]***	[1.528]	[0.521]	[1.361]	[0.784]	[2.766]**
Diff	-0.316	0.966	0.343	0.147	-0.146	-0.632	0.684	0.040	0.370	0.394
	(9.037)	(7.444)	(6.581)	(7.656)	(7.538)	(8.504)	(7.030)	(6.198)	(7.243)	(6.353)
Monotonicity	0.517	-1.796^{++}	-0.864	-0.282	0.323	1.124	-1.546^{+}	-0.100	-0.831	-1.026
Test	(0.302)	(0.964)	(0.806)	(0.611)	(0.373)	(0.130)	(0.939)	(0.540)	(0.797)	(0.848)

The table reports the GRS test statistics on all quintile portfolio alphas, the average monthly excess return of the difference between the Best and Worst portfolios, standard deviation and the test statistic and p-value of the decreasing monotonicity tests. The p-value for an increasing monotonocity test is one minus the value given. The ***, ** and * indicate a significance of 1%, 5% and 10% respectively.

5.1.3 Cross Sectional regressions

The second part of the sorting exercise involves the cross-sectional regressions. The complete results of the regressions are shown in Tables 64-73 in the Appendix. This section focuses on the estimates of the combined ESG characteristic and the combined ESG risk factor, as these provide answers to our research question. Table 6 shows the time series average of the cross-sectional regression coefficients of the EIV-corrected parameters, t-statistics, and relative contributions for the 7-factor model per industry. The relative contribution results are examined to determine which ESG scoring methodology has the highest explanatory power.

The results show that all the combined ESG risk factor betas are not significantly different from zero over the months, and the combined ESG characteristic is only significant for the Consumer Non-Cyclicals and Utilities industries. In these two industries, the monthly premia for the combined ESG characteristics is negative, with coefficients of -0.025 and -0.018, respectively. This means that a one standard deviation increase in

combined ESG characteristic results in a decrease in expected excess annual return of 4.074%(-0.025 x 13.581 x 12) and -2.638%(-0.018 x 12.212 x 12) respectively. The combined ESG characteristic coefficients vary across industries, with some being positive, contrasting with most previous literature. Comparing the premia found in the quintile portfolio sorts to the coefficients of the combined ESG characteristic, we observe contrasting results in most cases, as most premia following the cross-sectional regressions are negative. This could be explained by the high demand for higher ESG-rated firms in recent years, as noted by Pastor et al. (2022), resulting in higher returns for the best-rated quintile portfolios. However, the real combined ESG premia, found by the cross-sectional regressions, is negative and varies by industry, thus aligning with the literature. Another notable result from the cross-sectional coefficients are the magnitudes of the coefficients. In most cases, the coefficients of the combined ESG factor betas are large in absolute value, while the coefficients related to the characteristic are small. However, in both cases of significant characteristics, this trend is reversed. This highlights the importance of including ESG-related variables, whether as a characteristic or a risk factor.

Additionally, the tables in the appendix reveal that the relative contribution of all the combined ESG characteristics and risk factors based on the Performance Ratio is higher than those based on the LSEG methodology. This suggests that using Performance Ratio-based characteristics is preferable to LSEG characteristics, as it better explains the expected excess returns.

Table 6: Cross-sectional regression coefficients of the combined ESG characteristics and factor betas per industry based on Performance Ratio methodology.

Industry:	Energy	BaMa	CC	CNC	Fin	Health	Tech	Util	RE	Ind
ESG	-0.008	-0.001	0.004	-0.025**	0.014	-0.019	0.010	-0.018**	-0.005	-0.001
	(-0.006)	(-0.147)	(0.419)	(-2.123)	(1.405)	(-0.754)	(0.498)	(-2.123)	(-0.537)	(-0.105)
$\hat{\beta}_{ESG}$	-3.902	-2.042	-0.369	-0.123	4.319	-4.472	-1.074	-0.590	1.506	0.569
	(-1.399)	(-1.380)	(-0.403)	(-0.129)	(1.598)	(-1.219)	(-0.520)	(-0.910)	(1.176)	(0.961)

The table shows the time series averages of the combined ESG EIV corrected coefficients estimated using a 7-factor model following Equation 3. The full set of coefficients per industry can be found in Tables 64-73 in the Appendix. The 7-factor includes the firm's size, value, profitability, investment, momentum and combined ESG characteristic characteristic, as well as the market, size, value, profitability, investment, momentum and combined ESG risk factor betas estimated by time-series regressions using Equation 2. To estimate the betas, at least 400 past daily observations are required. The ***, ** and * indicate the significance of the coefficients at the 1%, 5% and 10% level respectively.

From our analysis of the results using combined ESG characteristics, we can conclude that the risk related to ESG varies by industry, as demonstrated by the combined ESG risk factors. This variation reflects the different ways industries respond to changes in the

ESG landscape, such as shifts in energy prices or regulatory changes. The sorting exercise further indicates that the ESG risk factor is a more important explanatory variable than the characteristic itself, as evidenced by its higher relative contribution. These findings highlight the importance of constructing combined ESG risk factors specific to each industry, as the industry-wide ESG risk factor used in Ciciretti et al. (2023) was found to be less significant than the characteristics. To assess the premium related to ESG, we use the coefficients of the combined ESG characteristic. The premium turns out to be negative for most industries, following the previous literature, but different in magnitude across the industries.

5.2 Separate ESG premia

We again first consider the correlations, PCA and estimated factor betas, but now for the three separate ESG characteristics to determine if their risk factors differ between them and across industries. Thereafter, we again perform the quintile portfolio analysis, but now sorted based on one of the separate ESG characteristics to analyze if the premia differ per ESG pillar and across the industries. if the premia differ for each ESG pillar and across industries. Finally, we present the estimated cross-sectional regression coefficients of the models, which include the separate ESG characteristics and risk factors.

5.2.1 Industry risk factor analysis

Table 7 shows the average correlations between the separate ESG risk factors over all the different industries to provide a first insight into their relations. We observe that the Environmental and Social risk factor have the highest correlation with 0.458, followed by the Social and Governance risk factor with 0.339 and the least correlated are the Environmental and Governance risk factors.

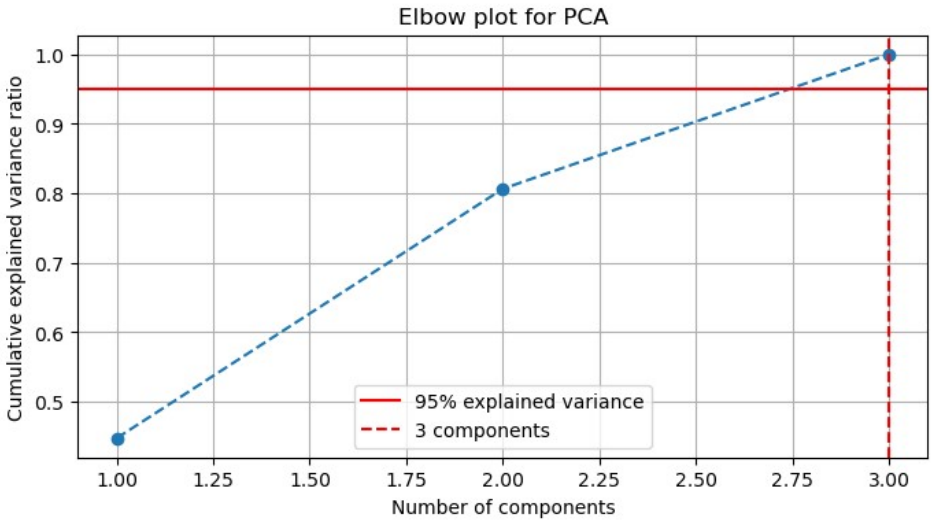
Table 7: Average correlations between the separate ESG risk factors over the different industries.

	Env	Soc	Gov
Env	1.000		
Soc	0.458	1.000	
Gov	0.123	0.339	1.000

Some of these correlations are relatively high and therefore PCA could perhaps indicate the possibility of a reduction in the factor space. However, when we run PCA for each industry on the three separate ESG risk factors, we observe elbow plots such as can be

seen in Figure 4 for the Industrials industry. Where we again observe a very linear plot, not indicating that we should reduce the factor space. Interestingly, the PCA factor loadings consistently show that the first principal component tends to represent an average of the three separate ESG risk factors (i.e., the combined ESG risk factor), while the second principal component often reflects a difference between the Environmental (sometimes the Social) and the Governance risk factor. Figures 6-14 in the Appendix show the PCA's of the other industries.

Figure 4: PCA of Performance Ratio based separate ESG risk factors in the Industrials industry.



The results thus far indicate that the separate ESG risk factors differ, particularly with the Governance risk factor showing distinct differences from the Environmental risk factor, while the Social risk factor exhibits some correlation with both. We now explore whether these differences in the ESG risk factors also vary across industries, similar to the combined ESG risk factor.

Table 8 shows the correlations between the Evironmental risk factors per industry. The correlations resemble those observed with the combined ESG risk factor—positive and close to zero. Although the correlations for the Environmental risk factor are slightly higher on average compared to those for the combined ESG risk factor, they still indicate that the Environmental risk factor varies across industries.

Table 8: Correlations between Environmental risk factors constructed per industry using Performance Ratio characteristics.

	Energy	BaMA	CC	CNC	Fin	Health	Tech	Util	RE	Ind
Energy	1.000									
BaMa	0.122	1.000								
CC	0.113	0.158	1.000							
CNC	0.046	0.080	0.115	1.000						
Fin	0.062	0.241	0.117	0.107	1.000					
Health	0.077	0.066	0.124	0.030	0.196	1.000				
Tech	0.148	0.152	0.140	0.058	0.116	0.140	1.000			
Util	0.071	0.066	0.009	0.053	0.030	0.024	0.042	1.000		
RE	0.161	0.126	0.190	0.100	0.103	0.121	0.162	0.122	1.000	
Ind	0.221	0.281	0.281	0.084	0.187	0.084	0.197	0.071	0.278	1.000

Table 9 shows the correlations between the Social risk factors across industry. The pattern is similar to that observed with the combined ESG risk factor. However, there is one negative correlation between the Energy and Financials industries. On average, the correlations for the Social risk factor are slightly lower than those for the combined ESG risk factor. Nevertheless, we can still conclude that the Social risk factor varies across industries.

Table 9: Correlations between Social risk factors constructed per industry using Performance Ratio characteristics.

	Energy	BaMA	CC	CNC	Fin	Health	Tech	Util	RE	Ind
Energy	1.000									
BaMA	0.075	1.000								
CC	0.032	0.029	1.000							
CNC	0.048	0.074	0.088	1.000						
Fin	-0.036	0.279	0.027	0.074	1.000					
Health	0.021	0.055	0.043	0.109	0.155	1.000				
Tech	0.084	0.097	0.135	0.124	0.099	0.149	1.000			
Util	0.106	0.124	0.048	0.079	0.159	0.043	0.044	1.000		
RE	0.007	0.051	0.118	0.083	0.148	0.108	0.083	0.043	1.000	
Ind	0.083	0.273	0.110	0.097	0.211	0.031	0.113	0.150	0.070	1.000

Table 10 shows the correlations between the Governance risk factors per industry. We observe higher correlations than those of the combined ESG risk factor, with some industries even above 0.500. These results would suggest us to think that the Governance risk factor is not definitely different across every industry. However, when we compare the results based on the Performance Ratio methodology to the results based on the LSEG methodology in Table 32 in the Appendix we see a large difference. The results of the LSEG based methodology are again in line with the previous results, namely that the Governance risk factor differs across the industries due to correlations close to zero.

Table 10: Correlations between Governance risk factors constructed per industry using Performance Ratio characteristics.

	Energy	BaMA	CC	CNC	Fin	Health	Tech	Util	RE	Ind
Energy	1.000									
BaMA	0.202	1.000								
CC	0.238	0.315	1.000							
CNC	0.239	0.247	0.394	1.000						
Fin	0.215	0.340	0.528	0.399	1.000					
Health	0.245	0.251	0.448	0.388	0.409	1.000				
Tech	0.158	0.248	0.322	0.287	0.354	0.306	1.000			
Util	0.224	0.190	0.273	0.258	0.259	0.334	0.188	1.000		
RE	0.176	0.303	0.514	0.391	0.597	0.399	0.364	0.271	1.000	
Ind	0.232	0.323	0.474	0.312	0.453	0.378	0.325	0.298	0.434	1.000

Table 11 shows the distributions and correlations of the estimated Environmental risk factor betas per industry. The results show that the sensitivities of the firms to the Environmental risk factor are again low and differ between the industries. However, opposite to the mean sensitivities to the combined ESG risk factors, the sensitivities to the Environmental risk factors are mostly negative instead of positive. From the correlations we observe that the different industries have large absolute correlations and thus behave either similar or opposite to their respective Environmental risk factor. For instance the Utilities industry seems to behave quite different to the other industries as it has substantial negative correlations for most industries, except Industrials and Consumer Non-Cyclicals. This could also be caused by its relation to energy prices, as these industries are all large energy users.

Table 11: Descriptive statistics of the Environmental risk factor betas per industry.

	Panel A: Cross-sectional Distributions									
	Energy	BaMa	CC	CNC	Fin	Health	Tech	Utilities	RE	Ind
Mean	-0.068	-0.057	0.025	-0.052	-0.053	-0.096	-0.062	0.139	-0.047	-0.020
Stdev	0.336	0.457	0.324	0.289	0.380	0.406	0.305	0.503	0.401	0.430
10%	-0.448	-0.554	-0.330	-0.372	-0.482	-0.517	-0.374	-0.433	-0.494	-0.526
25%	-0.259	-0.312	-0.154	-0.181	-0.225	-0.299	-0.209	-0.194	-0.270	-0.272
50%	-0.071	-0.074	0.016	-0.035	-0.035	-0.092	-0.058	0.105	-0.072	-0.023
75%	0.108	0.183	0.195	0.098	0.165	0.109	0.093	0.421	0.226	0.217
90%	0.302	0.462	0.383	0.234	0.344	0.322	0.245	0.731	0.427	0.492
	Panel B: Correlations									
	Energy	BaMa	CC	CNC	Fin	Health	Tech	Util	RE	Ind
Energy	1.000									
BaMa	0.269	1.000								
CC	0.208	0.508	1.000							
CNC	-0.159	0.176	0.430	1.000						
Fin	0.155	0.731	0.601	0.065	1.000					
Health	0.576	0.410	0.287	-0.320	0.430	1.000				
Techn	0.386	0.453	0.585	0.388	0.584	0.195	1.000			
Util	-0.631	-0.709	-0.405	0.077	-0.595	-0.552	-0.668	1.000		
RE	0.704	0.506	0.266	0.152	0.165	0.320	0.311	-0.509	1.000	
Ind	-0.071	-0.260	0.064	0.683	-0.309	-0.580	0.211	0.231	0.121	1.000

The risk factor betas shown in this table are estimated using the 9-factor model. The cross-sectional distributions are shown per industry over the entirely available time period of that industry. The correlations between the risk factor betas only use the time-period July 2008 up and including December 2023, as this is the time-period for which all industries have factor beta estimates. The correlations shown are the correlations between the cross-sectional monthly means of the factor betas per industry.

Table 12 shows the distributions and correlations of the estimated Social risk factor betas for each industry. The results show that all the industries have positive mean factor betas. However, looking at the correlations we observe that this does not mean that the correlations between the factor betas across the industries are high and always positive. This is only the case for the industries Basic Materials, Financials and Industrials, all having correlations around the 0.7.

Table 12: Descriptive statistics of the Social risk factor betas per industry.

	Panel A: Cross-sectional Distributions									
	Energy	BaMa	CC	CNC	Fin	Health	Tech	Utilities	RE	Ind
Mean	0.094	0.113	0.060	0.059	0.067	0.045	0.093	0.076	0.032	0.033
Stdev	0.315	0.469	0.344	0.311	0.372	0.483	0.387	0.486	0.338	0.419
10%	-0.242	-0.359	-0.309	-0.250	-0.317	-0.380	-0.309	-0.426	-0.251	-0.441
25%	-0.079	-0.137	-0.127	-0.107	-0.136	-0.157	-0.112	-0.180	-0.119	-0.223
50%	0.075	0.089	0.049	0.039	0.060	0.034	0.088	0.040	0.008	0.015
75%	0.240	0.335	0.235	0.201	0.249	0.226	0.290	0.282	0.158	0.270
90%	0.453	0.627	0.436	0.407	0.473	0.469	0.504	0.579	0.368	0.541
	Panel B: Correlations									
	Energy	BaMa	CC	CNC	Fin	Health	Tech	Util	RE	Ind
Energy	1.000									
BaMa	0.074	1.000								
CC	0.297	0.301	1.000							
CNC	0.254	0.104	0.061	1.000						
Fin	-0.073	0.754	0.300	0.470	1.000					
Health	0.474	0.467	-0.052	0.067	0.173	1.000				
Tech	-0.344	-0.158	0.045	-0.071	0.103	-0.451	1.000			
Util	0.450	0.197	0.108	-0.184	-0.139	0.721	-0.380	1.000		
RE	-0.453	0.007	-0.154	0.036	-0.083	0.001	-0.306	-0.169	1.000	
Ind	0.208	0.671	0.192	0.255	0.738	0.217	0.087	-0.048	-0.475	1.000

The risk factor betas shown in this table are estimated using the 9-factor model. The cross-sectional distributions are shown per industry over the entirely available time period of that industry. The correlations between the risk factor betas only use the time-period July 2008 up and including December 2023, as this is the time-period for which all industries have factor beta estimates. The correlations shown are the correlations between the cross-sectional monthly means of the factor betas per industry.

Table 13 shows the distributions and correlations of the estimated Governance risk factor betas per industry. The sensitivities of the firms to the Governance risk factor are on average low and negative, except for the Basic Materials, Technology, Real Estate and Industrials industries. The correlations show that the Energy industry's factor betas behave oppositely to the other industries, as all correlations are negative. Between the other industries, most correlations are positive.

Table 13: Descriptive statistics of the Governance risk factor betas per industry.

	Panel A: Cross-sectional Distributions									
	Energy	BaMa	CC	CNC	Fin	Health	Tech	Utilities	RE	Ind
Mean	-0.117	0.017	-0.034	-0.027	-0.048	-0.097	0.051	-0.090	0.030	0.017
Stdev	0.425	0.436	0.425	0.329	0.430	0.533	0.379	0.561	0.400	0.332
10%	-0.625	-0.453	-0.548	-0.401	-0.490	-0.705	-0.367	-0.726	-0.428	-0.387
25%	-0.388	-0.150	-0.263	-0.217	-0.262	-0.409	-0.179	-0.455	-0.204	-0.173
50%	-0.114	0.060	-0.010	-0.032	-0.037	-0.088	0.031	-0.072	0.049	0.039
75%	0.133	0.252	0.200	0.149	0.173	0.180	0.256	0.203	0.237	0.217
90%	0.364	0.444	0.419	0.349	0.368	0.476	0.500	0.543	0.423	0.382
	Panel B: Correlations									
	Energy	BaMa	CC	CNC	Fin	Health	Tech	Util	RE	Ind
Energy	1.000									
BaMa	-0.233	1.000								
CC	-0.205	0.316	1.000							
CNC	-0.234	0.357	0.709	1.000						
Fin	-0.062	0.362	0.663	0.623	1.000					
Health	-0.017	0.439	0.346	0.459	0.714	1.000				
Tech	-0.649	0.155	0.160	0.389	-0.057	-0.141	1.000			
Util	-0.105	-0.019	0.279	0.077	0.568	0.279	-0.347	1.000		
RE	-0.188	0.417	0.561	0.535	0.107	-0.144	0.498	-0.344	1.000	
Ind	-0.605	0.452	0.456	0.560	0.583	0.704	0.290	0.305	0.082	1.000

The risk factor betas shown in this table are estimated using the 9-factor model. The cross-sectional distributions are shown per industry over the entirely available time period of that industry. The correlations between the risk factor betas only use the time-period July 2008 up and including December 2023, as this is the time-period for which all industries have factor beta estimates. The correlations shown are the correlations between the cross-sectional monthly means of the factor betas per industry.

5.2.2 Time series regressions

Tables 14-16 show the same tables as discussed in Section 5.1.2, but now using quintile sorts based on each separate ESG characteristic of a firm. We start with the results of the sorts based on the Environmental characteristic in Table 14. The GRS tests show that, similar to the combined ESG sorts, the factor models explain the factor returns well for nearly all industries. However, significant test values are observed for some models in the Basic Materials, Consumer Cyclicals, Financials, Utilities, and Industrials industries. When investigating the monotonicity tests, we observe that only the Consumer Cyclicals, Technology and Utilities industries have had significant premia. The premia are 0.940%, 1.179% and -0.634% per month on average respectively. While most industries do not exhibit significant premia, the premia vary across industries, particularly in terms of their sign. Notably, the Energy industry shows a large negative premium.

Table 14: Resutls of the GRS and Patton and Timmermann (2010) decreasing monotonicity test for the quintile portfolio sorts based on the Environmental characteristic per industry.

Industry:	Energy	BaMa	CC	CNC	Fin	Health	Tech	Util	RE	Ind
GRS:										
4-factor	[0.153]	[1.705]	[2.302]**	[0.998]	[1.139]	[0.507]	[0.615]	[2.076]*	[0.594]	[1.125]
7-factor	[0.363]	[2.507]**	[3.965]***	[1.027]	[1.487]	[0.874]	[1.316]	[1.526]	[0.538]	[3.086]**
9-factor	[0.598]	[2.385]**	[2.834]**	[1.524]	[2.233]*	[0.994]	[0.965]	[2.769]**	[0.553]	[2.961]**
Diff	-1.762	0.396	0.940	-0.178	0.159	0.144	1.179	-0.634	-0.264	-0.017
	(33.742)	(7.247)	(7.645)	(7.077)	(7.620)	(9.948)	(7.735)	(6.382)	(8.432)	(6.044)
Monotonicity	0.796	-0.817	-2.150^{++}	0.367	-0.298	-0.239	-2.506^{+++}	1.554^{-}	0.528	0.043
Test	(0.213)	(0.793)	(0.984)	(0.357)	(0.617)	(0.595)	(0.994)	(0.060)	(0.299)	(0.483)

The table reports the GRS test statistics on all quintile portfolio alphas, the average monthly excess return of the difference between the Best and Worst portfolios, standard deviation and the test statistic and p-value of the decreasing monotonicity tests. The p-value for an increasing monotonocity test is one minus the value given. The ***, ** and * indicate a significance of 1%, 5% and 10% respectively.

Table 15 shows the results of the quintile sorts based on the Social characteristics. Firstly, we observe that, similar to the Environmental quintile sorts, most factor models are able to explain the firm returns, except for some models of the Basic Materials, Consumer Non-Cyclicals, Financials and Industrials industries. The monotonicity tests show that only the Basic Materials and Technology industries have significant premia. The premia are 0.626% and 0.669% per month on average respectively. We again see that most industries do not have significant premia, but we do note that the premia differ variably over the industries and that all industries but Healthcare have had positive premia.

Table 15: Resutls of the GRS and Patton and Timmermann (2010) decreasing monotonicity test for the quintile portfolio sorts based on the Social characteristic per industry.

Industry:	Energy	BaMa	CC	CNC	Fin	Health	Tech	Util	RE	Ind
GRS:										
4-factor	[0.554]	[2.988]**	[1.021]	[0.956]	[0.703]	[0.645]	[0.782]	[0.228]	[0.670]	[1.219]
7-factor	[0.551]	[3.283]***	[1.687]	[1.268]	[1.214]	[1.299]	[1.119]	[0.240]	[0.924]	[3.828]***
9-factor	[0.768]	[3.598]***	[1.114]	[1.913]*	[1.933]*	[0.885]	[0.887]	[0.357]	[0.837]	[3.899]***
Diff	0.232	0.626	0.421	0.065	0.234	-0.405	0.669	0.112	0.317	0.065
	(9.928)	(6.696)	(7.325)	(7.869)	(7.578)	(8.807)	(7.644)	(6.862)	(10.075)	(6.092)
Monotonicity	-0.327	-1.324^{+}	-0.998	-0.114	-0.546	0.716	-1.405^{+}	-0.241	-0.424	-0.196
Test	(0.628)	(0.907)	(0.841)	(0.545)	((0.707)	(0.237)	(0.920)	(0.595)	(0.664)	(0.578)

The table reports the GRS test statistics on all quintile portfolio alphas, the average monthly excess return of the difference between the Best and Worst portfolios, standard deviation and the test statistic and p-value of the decreasing monotonicity tests. The p-value for an increasing monotonocity test is one minus the value given. The ***, ** and * indicate a significance of 1%, 5% and 10% respectively.

Table 16 shows the results of the quintile sorts based on the Governance characteristics.

The results show that the factor models are able to explain the results for some industries. However, all the GRS tests for the Consumer Cyclicals are significant, as well as for the 7 and 9 factor models for the Basic Materials, Financials and Industrials industries. The monotonicity tests show that half of the industries have significant positive premia. The other industries have premia very close to zero, except for Real Estate.

Table 16: Resutls of the GRS and Patton and Timmermann (2010) decreasing monotonicity test for the quintile portfolio sorts based on the Governance characteristic per industry.

Industry:	Energy	BaMa	CC	CNC	Fin	Health	Tech	Util	RE	Ind
GRS:										
4-factor	[0.651]	[1.299]	[2.497]**	[0.398]	[0.781]	[0.269]	[1.201]	[1.538]	[0.152]	[1.857]
7-factor	[0.749]	[2.218]*	[2.379]**	[1.428]	[3.285]***	[1.030]	[0.833]	[0.997]	[0.924]	[2.457]**
9-factor	[0.703]	[2.401]**	[2.403]**	[1.321]	[2.961]**	[0.488]	[0.717]	[0.830]	[0.354]	[2.953]**
Diff	-0.090	0.533	0.614	0.045	-0.023	-0.045	0.499	0.633	0.450	0.586
	(6.695)	(5.813)	(5.596)	(5.230)	(6.371)	(5.872)	(5.062)	(5.613)	(7.301)	(5.204)
Monotonicity	0.218	-1.365^{+}	-1.835^{++}	-0.129	0.056	0.113	-1.476^{+}	-1.686^{++}	-0.932	-1.658^{++}
Test	(0.414)	(0.914)	(0.967)	(0.551)	(0.478)	(0.455)	(0.930)	(0.954)	(0.824)	(0.951)

The table reports the GRS test statistics on all quintile portfolio alphas, the average monthly excess return of the difference between the Best and Worst portfolios, standard deviation and the test statistic and p-value of the decreasing monotonicity tests. The p-value for an increasing monotonocity test is one minus the value given. The ***, ** and * indicate a significance of 1%, 5% and 10% respectively.

Overall, industries such as Basic Materials, Consumer Cyclicals, Financials, and Technology exhibit positive premia across all separate ESG characteristic sorts. However, in other industries, the premia vary with different ESG sorts. For instance, in the Energy, Utilities, and Real Estate industries, the Social and Governance sorts show a positive premium, whereas the Environmental sort shows a negative premium. Notably, when considering only the significant premia, all but one are positive, though only a limited number of sorts demonstrate significant premia. This suggests that while the separate ESG risk factors are distinct across industries, the resulting premia are not always different. From these results, we conclude that the premia across industries vary, with the greatest variability observed in the Environmental sorts. The Environmental sorts display both positive and negative premia, while the Social and Governance sorts predominantly show positive premia. This outcome is plausible, as the Environmental pillar tends to have the most varied risks related to ESG. Additionally, similar to the combined ESG characteristic sort, the GRS test statistics for the 9-factor models are consistently higher than those for the 4-factor model, indicating that the 4-factor model—which includes only the market risk factor and separate ESG risk factors—might be the most suitable model.

5.2.3 Cross-sectional regressions

Tables 17-19 show the same tables as discussed in Section 5.1.3, but now for the cross-sectional regression estimates of the 4 and 9 factor models. Firstly, we discuss the estimates of the Environmental characteristic and risk factor in Table 17. The time series averages of the cross-sectional estimates show that, although their high explanatory power in the quintile sorts, the 4-factor models do not have significant coefficients for the characteristics nor the risk factor betas. For the 9-factor models we do observe some Environmental characteristic coefficients significantly different from zero over time, namely for the Consumer Cyclicals, Financials and Utilities. The coefficients indicate that in these industries an increase of one standard deviation of the Environmental characteristic, leads to an 2.020%, -2.919% and -3.960% increase in expected annual excess return respectively. Comparing the coefficients of the 4-factor model to the 9-factor model, we do note that they all have the same sign. Furthermore, the characteristic coefficients are different across the industries and mostly negative with some exceptions. The coefficients mostly indicate opposite premia compared to what was found by the quintile sorts, except for the Consumer Cyclicals, Utilities and Real Estate industries. When looking at the estimates of the factor betas, we observe that only the Environmental risk factor betas are significantly different from zero over the months, with a coefficient of 4.792.

Table 17: Cross-sectional regression coefficients of the Environmental characteristics and factor betas per industry based on the Performance Ratio methodology.

Industry:	Energy	BaMa	CC	CNC	Fin	Health	Tech	Util	RE	Ind
Env:										
4-factor	0.002	-0.006	0.008	-0.004	-0.005	-0.001	-0.002	-0.006	-0.013	0.004
	(0.169)	(-0.902)	(1.161)	(-0.595)	(-1.084)	(-0.074)	(-0.296)	(-0.949)	(-1.567)	(0.771)
9-factor	0.003	-0.005	0.010*	-0.013*	-0.001	-0.008	-0.006	-0.019**	-0.009	0.001
	(0.375)	(-0.792)	(1.661)	(-1.866)	(-0.211)	(-1.067)	(-0.789)	(-2.078)	(-1.352)	(0.135)
$\hat{\beta}_{Env}$:										
4-factor	-0.277	0.085	0.308	-1.102	-0.056	-1.084	-1.159	0.071	-0.294	0.160
	(-0.212)	(0.085)	(0.553)	(-1.471)	(-0.094)	(-0.940)	(-1.132)	(0.149)	(-0.360)	(0.273)
9-factor	-0.617	-0.047	0.772	0.126	4.792**	-1.735	-2.720	-0.857	0.047	-0.018
	(-0.700)	(-0.066)	(1.302)	(0.116)	(2.045)	(-1.127)	(-1.331)	(-0.885)	(0.090)	(-0.019)

The table shows the time series averages of the Environmental EIV corrected coefficients estimated using a 4 and 9-factor model following Equation 3. The full set of coefficients per industry can be found in Tables 64-73 in the Appendix. The 4 and 9-factor includes the firm's size, value, profitability, investment, momentum and all three separate ESG characteristics. The models also includes the market and the three separate ESG risk factor betas, and the 9-factor model also the size, value, profitability, investment, momentum factor betas, estimated by time-series regressions using Equation 2. To estimate the betas, at least 400 past daily observations are required. The ***, ** and * indicate the significance of the coefficients at the 1%, 5% and 10% level respectively.

Table 18 shows the time series averages of the cross-sectional estimates of the Social

characteristic and the Social risk factor betas. Opposite to the results for the Environmental table, the 4-factor models have the only significant coefficients for the characteristics and the 9-factor model has no significant Social characteristic coefficients. For the Healthcare and Technology industries are the Social characteristic coefficients significantly different from zero over the months. The coefficients indicate that in these industries an increase of one standard deviation of the Social characteristic, leads to an 3.508% and 3.047% decrease in expected annual excess return respectively. Comparing the coefficients of the 4-factor model to the 9-factor model, we observe that the coefficients have for half of the industries different signs and for the other half quite similar coefficients. Therefore, again the characteristic coefficients are different across the industries and not necessarily positive or negative. For the Social risk factor beta coefficient we observe that the coefficients are significant in the 9-factor model for the Consumer Non-Cyclicals and Financials and in the 4-factor model for the Healthcare and Technology industries.

Table 18: Cross-sectional regression coefficients of the Social characteristics and factor betas per industry based on the Performance Ratio methodology.

Industry:	Energy	BaMa	CC	CNC	Fin	Health	Tech	Util	RE	Ind
Soc										
4-factor:	-0.015	0.008	-0.007	-0.002	-0.005	-0.020*	-0.018*	0.012	-0.013	-0.006
	(-0.907)	(0.757)	(-0.862)	(-0.273)	(-0.863)	(-1.683)	(-1.894)	(1.392)	(1.180)	(-0.995)
9-factor:	-0.010	0.005	-0.009	0.010	0.009	0.008	-0.080	-0.009	0.009	-0.003
	(-0.656)	(0.572)	(-1.266)	(-2.045)	(0.554)	(0.536)	(-1.238)	(-0.767)	(1.174)	(-0.500)
$\hat{\beta}_{Soc}$:										
4-factor	0.711	0.224	0.385	-1.206	-0.166	-3.533*	-1.874**	-0.151	-1.663	-0.379
	(0.513)	(0.236)	(0.232)	(-1.279)	(-0.256)	(-1.831)	(-2.213)	(-0.313)	(-1.042)	(-0.819)
9-factor	2.214	-0.667	0.674	-2.541**	4.450*	0.787	-10.237	-0.683	0.401	-0.290
	(1.460)	(-0.653)	(0.963)	(-2.148)	(1.892)	(0.848)	(-1.175)	(-0.936)	(0.542)	(-0.352)

The table shows the time series averages of the Environmental EIV corrected coefficients estimated using a 4 and 9-factor model following Equation 3. The full set of coefficients per industry can be found in Tables 64-73 in the Appendix. The 4 and 9-factor includes the firm's size, value, profitability, investment, momentum and all three separate ESG characteristics. The models also include the market and three separate ESG risk factor betas, and the 9-factor model also the size, value, profitability, investment, momentum factor betas, estimated by time-series regressions using Equation 2. To estimate the betas, at least 400 past daily observations are required. The ***, ** and * indicate the significance of the coefficients at the 1%, 5% and 10% level respectively.

Table 19 shows the time series averages of the cross-sectional estimates of the Governance characteristic and the Social risk factor betas. The results show that, again opposite to the results for the Environmental table, the 4-factor models have the only significant coefficients for the characteristics and the 9-factor model has no significant Social characteristic coefficients. The Governance characteristic coefficients are significantly different from zero over the months for the Consumer Cyclicals, Consumer Non-Cyclicals and Real

Estate. The coefficients indicate that in these industries an increase of one standard deviation of the Social characteristic, leads to an -1.975%, -2.800% and 6.443% increase in expected annual excess return respectively. When we compare the coefficients of the 4-factor model to the 9-factor model, we see that the coefficients differ more than is the case for the Environmental characteristic coefficients, but the sign is the same with an exception for the Utilities industry coefficients. Overall, the characteristic coefficients are different across the industries and in half of the industries positive and in half negative. Compared to the premia found in the quintile sorts we observe opposite results, except for the Technology and Real Estate industries. The estimates of the factor beta coefficients show that only for all models of the Consumer Non-Cyclicals and for the 9-factor Financials model the Governance risk factor betas are significantly different from zero over the months. The coefficients are negative for the Consumer Non-Cyclicals and positive for the Financials industry.

Table 19: Cross-sectional regression coefficients of the Governance characteristics and factor betas per industry based on the Performance Ratio methodology.

Industry:	Energy	BaMa	CC	CNC	Fin	Health	Tech	Util	RE	Ind
Gov:										
4-factor	0.002	-0.011	-0.014*	-0.018**	0.002	0.002	0.000	-0.017	0.049**	-0.004
	(0.179)	(-1.023)	(-1.669)	(-2.135)	(0.259)	(0.197)	(0.009)	(-1.460)	(2.255)	(-0.554)
9-factor	0.003	-0.006	-0.009	-0.000	0.012	0.003	0.072	0.011	0.004	-0.006
	(0.239)	(-0.614)	(-0.944)	(-0.001)	(0.586)	(0.234)	(1.380)	(0.782)	(0.328)	(-0.525)
$\hat{\beta}_{Gov}$:										
4-factor	0.230	0.122	-0.219	-2.691***	0.325	-0.880	-0.355	-0.658	0.316	-0.297
	(0.305)	(0.153)	(-0.344)	(-2.817)	(0.840)	(-1.166)	(-0.313)	(-1.520)	(0.405)	(-0.669)
9-factor	-0.096	-0.034	-0.917	-2.158**	4.312**	-0.001	-0.794	-0.427	-0.030	-1.046
	(-0.099)	(-0.034)	(-0.910)	(-2.251)	(2.017)	(-0.000)	(-0.443)	(-0.688)	(-0.067)	(-1.337)

The table shows the time series averages of the Environmental EIV corrected coefficients estimated using a 4 and 9-factor model following Equation 3. The full set of coefficients per industry can be found in Tables 64-73 in the Appendix. The 4 and 9-factor includes the firm's size, value, profitability, investment, momentum and all three separate ESG characteristics. The models also include the market and three separate ESG risk factor betas, and the 9-factor model also the size, value, profitability, investment, momentum factor betas, estimated by time-series regressions using Equation 2. To estimate the betas, at least 400 past daily observations are required. The ***, ** and * indicate the significance of the coefficients at the 1%, 5% and 10% level respectively.

The results of the cross-sectional regressions show that premia related to the separate ESG characteristics, which we observe via the coefficients of the characteristics, indeed differ. Overall, the premia related to the Environmental characteristic seems negative, to the Social characteristic undecided but tends to be more often negative, and to the Governance characteristic also undecided. These premia also differ across the industries in magnitude. Although that we assess the premia by means of the characteristic coefficients,

the risk factor betas have the largest relative contribution of the two ESG based variables. The higher relative contributions indicate the importance of the ESG risk factors and suggests that the ESG risk rather than preference drives the premia more. These relative contributions can be found in Tables 64-73.

6 Conclusion

This paper investigates the ESG premium across different industries by performing the sorting exercise introduced by Ciciretti et al. (2023) on individual industries for a combined ESG characteristic and for all the separate Environmental, Social, and Governance premia. We aim to answer the following research questions: "*Does the ESG premium differ per industry?* and"*Does the premium differ for the separate Environmental, Social and Governance pillars?*"

Firstly, we investigate the combined ESG risk factors, which are constructed per industry, to see if they are related by examining their correlations and principal component analysis (PCA). The results show that the combined ESG risk factors have low correlations across industries, with PCA confirming their relation. This indicates that the risks related to ESG vary across industries. The mean factor betas reveal that sensitivities to these risks also differ, as industries react differently to ESG-related shocks, such as those involving energy supply or use. The results of the quintile portfolios in the first step of the sorting exercise show that the ESG risk factors explain firm excess returns well, as most GRS statistics are not significant. This suggests that the risk factors are more important than the characteristics since most premia found across the quintile portfolios are not significant. The second step of the sorting exercise confirms this, as the relative contribution of the ESG risk factor betas is higher than for the combined characteristics. We also find that in most industries, the ESG premium based on the combined characteristic coefficient is negative but varies in magnitude. From these results, we conclude that the ESG premium differs across industries, reflecting the variation in ESG-related risks and differences in coefficient magnitude.

Secondly, we explore how the Environmental, Social, and Governance pillars behave and what their premia are. The correlations and PCA indicate that the risk factors for these pillars differ across industries but show some correlation within the industry, especially the Social risk factor with the other two factors. However, PCA suggests that we

do not need to reduce the factor space. In the quintile sorts, we again find that the factor models explain firm returns well, as they often have insignificant GRS test statistics. The cross-sectional regressions also show that the relative contribution of the ESG risk factors is higher than that of the characteristics. The premia for the Environmental, Social, and Governance characteristics are negative, slightly negative, and slightly positive, respectively, but the magnitude and sign vary across industries. Additionally, this indicates that the Environmental pillar is the main contributor to the combined ESG premium, as it is also negative. This result is expected, given that the Environmental pillar involves the most significant ESG-related risks and is often the primary focus in ESG discussions. We conclude that, similar to the combined ESG, the separate pillars of the ESG premium differ among themselves and across industries.

The results in this paper demonstrate that the ESG premium varies across industries, and the separate ESG pillars each have distinct premia and associated risks. However, the analyses in this research could be improved by incorporating robustness checks, such as using alternative ESG characteristic distributors to construct the risk factors. Future research could also benefit from a longer time period, as the current maximum of twenty years could skew results due to certain short periods of extreme returns. This limitation also applies to the relatively low number of firms with an ESG characteristic at present, resulting in smaller portfolios for both the quintile sorts and risk factor construction.

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Appendix

Programming files

The zip file "MasterThesisCodeRubenSchorno.zip" includes all programming files used to perform the data preparation and analyses done in this thesis. In this section, I will provide a short description for each individual file in order of execution.

PerformanceRatioCalculation - EU_NA_AP.ipynb

This Python Jupyter Notebook is used to compute the Performance Ratio based ESG characteristics. These are computed in 6 steps, industry by industry and year by year. The 6 steps are all declared as separate formulas in the bottom of the notebook.

FactorCalcultation - EU-NA-AP V2.ipynb

This Python Jupyter Notebook is used to construct all the risk factors, Fama-French as well as ESG. These are computed per industry, where firstly a formula is defined to assign the weights to each firm and export them to excell files. These excell files are in the following two formulas imported, to compute the factor returns on a daily(first formula) or monthly(second formula) basis.

PCA_Correlation_Analysis - EU_NA_AP V2.ipynb

This Python Jupyter Notebook is used to perform the PCA and check the correlations. First, all the PCA's are performed for every industry individually with the separate ESG risk factors. Then we perform PCA for every separate ESG risk factor with all industries. Thereafter, all the correlation matrices are constructed for the risk factors.

Table1_Generator.ipynb

This Python Jupyter Notebook is used to construct the descriptive statistics for all risk factors and firm characteristics. First, all formulas are defined and performed per industry which compute and reformat the descriptive statistics. Thereafter, formulas are defined which are able to show the descriptive statistics in the desired table format. Finally, the descriptive statistics are shown per industry.

QuintilePortfolioCalculation - EU_NA_AP.ipynb

This Python Jupyter Notebook is used to construct the quintile portfolios and compute their monthly returns used in the time-series tables.

QuintileTimeSeries.ipynb

This Python Jupyter Notebook is used to perform the time-series regression on the quintile portfolios, as well as to perform the GRS tests.

CodeForMonotonicityTest.R

This R Studio code is used to perform the Patton and Timmermann (2010) monotonicity tests.

Sorting Excercise Part 1 V2.ipynb

This Python Jupyter Notebook is used to perform the time-series regressions and compute the factor betas.

Sorting Excercise Part 2 V2.ipynb

This Python Jupyter Notebook is used to perform the cross-sectional regressions and compute the relative contributions.

Feedback incorporation

After the first draft of this thesis, I receive feedback from my supervisor concerning a couple of improvements which could be made. I incorporated this feedback in the following manner: Firstly, I changed the definitions of the "Overall" and "Individual" ESG characteristics to "Combined" and "Separate". This was proposed by the supervisor to improve the readability and remove any confusion. Secondly, I extended the part on the main findings in the introduction by including a more extensive description of the results. Thirdly, I added more concluding remarks at the end of each subsection of the results to give the reader earlier on in the paper some findings instead of only in the conclusion. Lastly, I tried to give the reader more economic meaning of my results.

I did not receive any feedback on the second draft of the thesis by the supervisor nor the second assessor.

Descriptive Statistics

The following tables show in Panel A the distributions of the firm characteristics across the industries. Panel B shows the correlations between the monthly means of the characteristics.

Table 20: Descriptive statistics for firm-level characteristics of the **Energy** sector

	Panel A: Cross-sectional Distributions												
						Performance Ratio				LSEG			
	lME	lBtM	Pro	Inv	lRET12	Env	Soc	Gov	ESG	Env	Soc	Gov	ESG
Mean	21.896	-0.370	0.084	1.322	-0.032	24.771	31.715	56.534	37.673	38.511	42.371	51.434	43.331
St.dev.	2.903	1.009	1.828	22.703	0.495	20.083	12.782	9.879	12.13	27.543	24.323	22.865	21.229
10%	18.557	-1.615	-0.168	-0.14	-0.585	1.481	15.939	43.866	23.467	1.624	12.455	20.371	15.902
25%	19.961	-0.951	-0.015	-0.031	-0.277	6.608	22.292	50.605	27.983	12.472	22.367	32.548	25.315
50%	21.54	-0.376	0.108	0.068	-0.014	21.028	30.299	57.082	36.171	37.403	38.505	51.492	42.334
75%	23.682	0.123	0.238	0.204	0.237	41.102	40.929	63.38	46.113	60.753	61.716	70.301	59.125
90%	25.516	0.571	0.422	0.517	0.511	54.466	49.622	68.664	55.487	77.493	78.837	82.611	73.566
	Panel B: Correlations												
						Performance Ratio				LSEG			
	lME	lBtM	Pro	Inv	lRET12	Env	Soc	Gov	ESG	Env	Soc	Gov	ESG
lME	1.000												
lBtM	-0.815	1.000											
Pro	0.256	-0.338	1.000										
Inv	-0.070	0.070	0.016	1.000									
lRET12	0.155	-0.147	0.108	-0.087	1.000								
Env	0.039	0.395	0.077	0.048	0.225	1.000							
Soc	-0.160	0.560	-0.112	-0.065	0.153	0.928	1.000						
Gov	-0.066	0.561	-0.275	0.033	0.166	0.816	0.878	1.000					
ESG	-0.071	0.534	-0.118	0.003	0.187	0.951	0.978	0.943	1.000				
Env	-0.047	0.316	0.017	0.350	0.243	0.906	0.780	0.694	0.819	1.000			
Soc	-0.387	0.586	-0.222	0.057	0.157	0.855	0.962	0.801	0.914	0.828	1.000		
Gov	-0.172	0.182	0.014	0.235	0.088	0.519	0.467	0.163	0.383	0.706	0.608	1.000	
ESG	-0.267	0.475	-0.112	0.200	0.187	0.890	0.895	0.723	0.868	0.939	0.958	0.762	1.000

Table 21: Descriptive statistics for firm-level characteristics of the **Basic Materials** sector

	Panel A: Cross-sectional Distributions.												
							Performance Ratio				LSEG		
	lME	lBtM	Pro	Inv	lRET12	Env	Soc	Gov	ESG	Env	Soc	Gov	ESG
Mean	22.107	-0.539	0.172	30.574	0.036	26.539	30.687	52.599	36.608	41.371	39.511	50.791	42.926
Stdev	2.888	0.930	2.625	849.843	0.457	18.177	13.308	12.689	12.232	27.473	23.968	22.493	21.330
10%	18.405	-1.729	-0.097	-0.087	-0.460	2.502	12.930	34.674	21.102	3.079	9.587	20.044	14.691
25%	20.072	-1.085	0.028	-0.009	-0.209	9.444	20.666	44.589	27.249	16.121	19.916	32.564	24.962
50%	22.231	-0.490	0.124	0.071	0.029	26.251	30.325	54.301	36.468	41.548	35.894	51.241	42.890
75%	23.894	0.045	0.240	0.196	0.279	42.009	40.389	62.289	45.497	64.321	57.441	69.318	59.403
90%	25.861	0.526	0.405	0.464	0.553	51.432	48.182	67.456	53.337	79.071	75.026	80.478	72.135
	Panel B: Correlations.												
							Performance Ratio				LSEG		
	lME	lBtM	Pro	Inv	lRET12	Env	Soc	Gov	ESG	Env	Soc	Gov	ESG
lME	1.000												
lBtM	-0.588	1.000											
Pro	0.018	0.031	1.000										
Inv	-0.37	0.381	0.124	1.000									
lRET12	0.059	-0.157	-0.146	-0.366	1.000								
Env	0.721	0.061	0.064	-0.038	-0.036	1.000							
Soc	0.819	-0.091	0.066	-0.131	-0.014	0.930	1.000						
Gov	0.719	0.058	-0.024	-0.298	0.046	0.891	0.933	1.000					
ESG	0.775	0.005	0.028	-0.188	0.007	0.953	0.982	0.978	1.000				
Env	0.771	-0.341	0.230	0.086	-0.004	0.744	0.721	0.542	0.664	1.000			
Soc	0.872	-0.283	0.055	-0.223	0.122	0.823	0.96	0.864	0.914	0.776	1.000		
Gov	0.629	0.024	0.035	-0.088	-0.082	0.761	0.868	0.812	0.844	0.590	0.843	1.000	
ESG	0.866	-0.263	0.099	-0.140	0.064	0.851	0.953	0.838	0.905	0.852	0.987	0.864	1.000

Table 22: Descriptive statistics for firm-level characteristics of the **Consumer Cyclicals** sector

	Panel A: Cross-sectional Distributions												
							Performance Ratio				LSEG		
	lME	lBtM	Pro	Inv	lRET12	Env	Soc	Gov	ESG	Env	Soc	Gov	ESG
Mean	22.077	-0.771	0.278	1.058	0.044	18.562	26.032	48.627	31.074	33.963	41.635	46.169	41.523
Stdev	2.790	0.959	2.830	28.195	0.404	16.836	12.541	11.756	11.285	28.560	23.436	21.561	19.95
10%	18.767	-2.173	-0.058	-0.084	-0.404	0.299	10.234	30.570	16.917	0.294	12.028	17.210	16.317
25%	20.074	-1.381	0.073	-0.010	-0.168	3.428	16.53	41.326	23.030	6.496	23.240	29.127	25.417
50%	21.779	-0.739	0.180	0.064	0.046	14.331	24.504	51.191	29.772	29.950	38.574	45.882	39.754
75%	23.698	-0.184	0.334	0.169	0.260	30.868	34.716	56.878	39.239	56.714	59.403	62.807	56.151
90%	26.057	0.265	0.651	0.360	0.491	42.636	43.495	62.035	46.345	76.796	75.571	75.933	70.262
	Panel B: Correlations												
							Performance Ratio				LSEG		
	lME	lBtM	Pro	Inv	lRET12	Env	Soc	Gov	ESG	Env	Soc	Gov	ESG
lME	1.000												
lBtM	-0.828	1.000											
Pro	-0.279	0.071	1.000										
Inv	0.268	-0.090	-0.405	1.000									
lRET12	-0.061	-0.001	-0.067	-0.116	1.000								
Env	0.483	0.034	-0.363	0.189	-0.067	1.000							
Soc	0.692	-0.207	-0.424	0.326	-0.126	0.911	1.000						
Gov	0.810	-0.353	-0.442	0.329	-0.047	0.861	0.955	1.000					
ESG	0.712	-0.216	-0.429	0.302	-0.081	0.938	0.987	0.979	1.000				
Env	0.480	-0.080	-0.466	0.286	-0.157	0.861	0.833	0.727	0.820	1.000			
Soc	0.734	-0.343	-0.587	0.389	-0.172	0.814	0.931	0.887	0.912	0.907	1.000		
Gov	0.847	-0.602	-0.537	0.398	-0.032	0.496	0.795	0.829	0.760	0.523	0.778	1.000	
ESG	0.716	-0.322	-0.573	0.380	-0.152	0.828	0.933	0.880	0.913	0.931	0.995	0.777	1.000

Table 23: Descriptive statistics for firm-level characteristics of the **Consumer Non-Cyclicals** sector

	Panel A: Cross-sectional Distributions												
						Performance Ratio				LSEG			
	lME	lBtM	Pro	Inv	lRET12	Env	Soc	Gov	ESG	Env	Soc	Gov	ESG
Mean	23.124	-0.896	0.269	0.230	0.055	25.604	32.072	51.322	36.333	41.373	44.179	50.426	45.050
Stdev	3.057	0.957	2.834	2.476	0.352	18.712	14.963	12.961	13.581	29.707	25.736	23.583	23.056
10%	19.486	-2.202	0.005	-0.052	-0.324	1.131	12.006	33.462	18.461	1.328	11.344	17.342	14.264
25%	20.819	-1.467	0.089	0.006	-0.120	8.300	19.798	42.660	25.556	12.972	21.769	31.616	25.695
50%	22.924	-0.827	0.177	0.067	0.057	24.475	31.614	52.979	36.410	41.033	41.866	51.281	43.714
75%	24.987	-0.267	0.300	0.160	0.237	41.470	43.644	60.893	46.837	66.631	65.115	70.134	64.320
90%	26.997	0.170	0.546	0.337	0.440	50.797	51.922	67.011	54.438	83.024	81.279	81.457	76.379
	Panel B: Correlations												
						Performance Ratio				LSEG			
	lME	lBtM	Pro	Inv	lRET12	Env	Soc	Gov	ESG	Env	Soc	Gov	ESG
lME	1.000												
lBtM	-0.820	1.000											
Pro	-0.384	0.016	1.000										
Inv	0.230	-0.208	-0.087	1.000									
lRET12	-0.099	0.122	-0.086	-0.121	1.000								
Env	0.605	-0.106	-0.392	-0.034	-0.052	1.000							
Soc	0.850	-0.467	-0.501	0.138	-0.188	0.866	1.000						
Gov	0.878	-0.461	-0.526	0.113	-0.044	0.890	0.950	1.000					
ESG	0.827	-0.389	-0.500	0.088	-0.099	0.936	0.976	0.985	1.000				
Env	0.383	-0.091	-0.277	0.074	-0.246	0.678	0.684	0.563	0.654	1.000			
Soc	0.834	-0.691	-0.401	0.111	-0.244	0.532	0.86	0.756	0.763	0.653	1.000		
Gov	0.098	0.217	-0.359	-0.046	0.018	0.609	0.479	0.411	0.498	0.689	0.282	1.000	
ESG	0.653	-0.382	-0.427	0.093	-0.227	0.708	0.867	0.749	0.807	0.911	0.884	0.651	1.000

Table 24: Descriptive statistics for firm-level characteristics of the **Financials** sector

	Panel A: Cross-sectional Distributions												
						Performance Ratio				LSEG			
	lME	lBtM	Pro	Inv	lRET12	Env	Soc	Gov	ESG	Env	Soc	Gov	ESG
Mean	22.264	-0.279	0.333	84.283	0.036	17.547	24.509	50.559	30.872	38.199	42.887	50.211	43.060
Stdev	2.954	0.819	20.401	2812.914	0.327	19.112	12.617	11.138	12.568	27.188	22.000	23.287	19.784
10%	18.867	-1.241	0.045	-0.057	-0.287	0.000	9.168	34.116	16.573	12.601	14.975	17.207	18.288
25%	20.029	-0.643	0.138	0.012	-0.109	0.946	15.378	44.774	22.012	15.258	25.8	31.386	27.782
50%	21.773	-0.224	0.224	0.077	0.046	9.638	22.321	51.988	27.593	27.583	40.68	51.575	40.919
75%	24.195	0.122	0.415	0.178	0.194	30.669	32.236	57.705	39.091	60.523	58.945	69.221	57.024
90%	26.152	0.489	1.203	0.355	0.359	48.639	42.764	63.859	50.270	82.460	74.593	80.47	71.976
	Panel B: Correlations												
						Performance Ratio				LSEG			
	lME	lBtM	Pro	Inv	lRET12	Env	Soc	Gov	ESG	Env	Soc	Gov	ESG
lME	1.000												
lBtM	-0.028	1.000											
Pro	-0.014	0.554	1.000										
Inv	0.162	-0.069	0.016	1.000									
lRET12	-0.028	-0.026	-0.039	0.220	1.000								
Env	0.457	0.723	0.440	-0.094	-0.099	1.000							
Soc	0.735	0.551	0.282	-0.003	-0.186	0.877	1.000						
Gov	0.796	0.547	0.347	0.089	-0.055	0.856	0.926	1.000					
ESG	0.71	0.620	0.368	0.012	-0.109	0.937	0.969	0.975	1.000				
Env	-0.697	0.058	-0.008	0.095	0.105	-0.014	-0.418	-0.459	-0.335	1.000			
Soc	0.861	0.342	0.150	0.047	-0.102	0.727	0.954	0.925	0.913	-0.565	1.000		
Gov	-0.449	0.296	0.042	-0.363	-0.044	0.163	-0.053	-0.189	-0.055	0.330	-0.198	1.000	
ESG	0.589	0.536	0.178	-0.153	-0.125	0.859	0.929	0.832	0.902	-0.316	0.880	0.260	1.000

Table 25: Descriptive statistics for firm-level characteristics of the **Healthcare** sector

	Panel A: Cross-sectional Distributions												
						Performance Ratio				LSEG			
	lME	lBtM	Pro	Inv	lRET12	Env	Soc	Gov	ESG	Env	Soc	Gov	ESG
Mean	21.368	-1.238	-1.592	4.327	-0.012	17.874	26.862	52.771	32.502	24.607	42.634	46.628	39.900
Stdev	2.837	1.027	66.165	87.899	0.530	21.342	14.617	10.504	13.534	27.557	24.189	22.767	20.797
10%	18.062	-2.718	-0.837	-0.196	-0.609	0.000	10.844	38.439	19.266	0.000	12.726	17.619	15.822
25%	19.328	-1.868	-0.228	-0.019	-0.259	0.000	16.672	47.047	23.269	0.000	23.629	28.506	23.535
50%	21.041	-1.230	0.093	0.101	0.023	8.315	23.088	53.901	27.981	13.258	39.096	44.511	36.035
75%	23.306	-0.677	0.239	0.334	0.274	30.541	35.321	59.360	39.954	44.916	59.416	64.874	54.321
90%	25.125	-0.183	0.480	1.017	0.545	52.489	49.433	65.279	53.752	68.942	80.19	78.449	71.424
	Panel B: Correlations												
						Performance Ratio				LSEG			
	lME	lBtM	Pro	Inv	lRET12	Env	Soc	Gov	ESG	Env	Soc	Gov	ESG
lME	1.000												
lBtM	-0.925	1.000											
Pro	-0.013	0.026	1.000										
Inv	0.423	-0.441	-0.516	1.000									
lRET12	0.015	-0.151	0.159	0.118	1.000								
Env	-0.538	0.575	0.318	-0.525	0.283	1.000							
Soc	0.216	0.075	0.236	-0.190	-0.017	0.372	1.000						
Gov	0.739	-0.521	-0.067	0.229	0.023	-0.329	0.626	1.000					
ESG	0.189	0.056	0.229	-0.245	0.196	0.540	0.923	0.607	1.000				
Env	-0.572	0.708	0.241	-0.357	0.110	0.875	0.279	-0.461	0.366	1.000			
Soc	0.92	-0.851	-0.089	0.462	-0.115	-0.607	0.331	0.827	0.206	-0.609	1.000		
Gov	-0.646	0.742	0.296	-0.442	0.147	0.925	0.295	-0.517	0.368	0.963	-0.661	1.000	
ESG	-0.450	0.598	0.298	-0.352	0.118	0.891	0.432	-0.346	0.490	0.969	-0.460	0.964	1.000

Table 26: Descriptive statistics for firm-level characteristics of the **Technology** sector

	Panel A: Cross-sectional Distributions												
						Performance Ratio				LSEG			
	lME	lBtM	Pro	Inv	lRET12	Env	Soc	Gov	ESG	Env	Soc	Gov	ESG
Mean	22.163	-1.0100	4.562	2.431	0.046	23.151	29.044	50.835	34.343	34.507	44.806	49.926	44.399
Stdev	3.020	1.012	126.557	62.701	0.414	20.814	14.107	12.061	13.396	28.87	24.170	23.074	21.170
10%	18.552	-2.314	-0.120	-0.091	-0.423	0.000	10.961	33.205	18.091	0.000	12.653	17.928	16.675
25%	19.950	-1.607	0.035	-0.006	-0.175	3.216	18.025	43.182	23.893	5.221	25.121	31.650	27.221
50%	21.970	-0.979	0.138	0.083	0.052	18.335	27.508	52.852	32.783	31.234	43.712	50.691	42.990
75%	24.001	-0.434	0.263	0.231	0.276	40.018	39.463	58.910	44.454	59.543	63.046	68.236	60.826
90%	26.149	0.025	0.489	0.539	0.508	53.293	49.014	65.216	52.921	75.834	78.580	80.620	73.984
	Panel B: Correlations												
						Performance Ratio				LSEG			
	lME	lBtM	Pro	Inv	lRET12	Env	Soc	Gov	ESG	Env	Soc	Gov	ESG
lME	1.000												
lBtM	-0.951	1.000											
Pro	-0.127	-0.039	1.000										
Inv	0.155	-0.126	-0.097	1.000									
lRET12	0.020	-0.064	-0.315	-0.049	1.000								
Env	-0.010	0.221	-0.433	0.052	0.138	1.000							
Soc	0.720	-0.498	-0.438	0.134	-0.017	0.546	1.000						
Gov	0.788	-0.589	-0.490	0.194	0.082	0.482	0.963	1.000					
ESG	0.632	-0.398	-0.513	0.157	0.074	0.705	0.969	0.957	1.000				
Env	-0.637	0.711	0.030	-0.098	-0.016	0.558	-0.260	-0.369	-0.102	1.000			
Soc	0.772	-0.641	-0.374	0.184	0.073	0.422	0.932	0.936	0.896	-0.394	1.000		
Gov	-0.816	0.790	0.260	-0.199	-0.065	0.235	-0.617	-0.706	-0.483	0.862	-0.718	1.000	
ESG	-0.148	0.300	-0.139	-0.018	-0.023	0.852	0.339	0.209	0.468	0.771	0.260	0.457	1.000

Table 27: Descriptive statistics for firm-level characteristics of the **Utilities** sector

	Panel A: Cross-sectional Distributions												
						Performance Ratio				LSEG			
	lME	lBtM	Pro	Inv	lRET12	Env	Soc	Gov	ESG	Env	Soc	Gov	ESG
Mean	23.108	-0.419	0.143	55.846	0.03	32.813	34.810	54.700	40.774	45.434	44.008	53.728	47.070
Stdev	2.359	0.728	0.378	908.658	0.316	17.370	14.031	11.741	12.212	26.039	23.024	23.097	20.153
10%	20.207	-1.263	0.003	-0.036	-0.311	7.431	16.448	38.646	24.004	9.107	14.147	20.410	20.012
25%	21.633	-0.834	0.063	0.013	-0.123	19.312	24.434	47.529	31.584	24.853	25.259	35.026	31.55
50%	23.096	-0.457	0.122	0.063	0.039	34.023	34.259	56.448	40.731	44.736	42.161	55.364	46.435
75%	24.511	-0.036	0.196	0.141	0.185	46.415	45.496	63.611	51.014	66.066	62.101	72.751	63.373
90%	26.207	0.418	0.315	0.308	0.358	55.153	52.807	68.114	56.578	81.848	75.731	83.216	73.372
	Panel B: Correlations												
						Performance Ratio				LSEG			
	lME	lBtM	Pro	Inv	lRET12	Env	Soc	Gov	ESG	Env	Soc	Gov	ESG
lME	1.000												
lBtM	-0.288	1.000											
Pro	-0.586	-0.366	1.000										
Inv	0.020	0.051	0.059	1.000									
lRET12	0.113	0.207	-0.099	-0.085	1.000								
Env	0.807	0.145	-0.650	-0.167	0.136	1.000							
Soc	0.915	-0.046	-0.678	-0.101	0.075	0.957	1.000						
Gov	0.858	0.217	-0.784	0.061	0.235	0.874	0.890	1.000					
ESG	0.895	0.107	-0.736	-0.056	0.157	0.966	0.978	0.96	1.000				
Env	0.876	-0.101	-0.739	0.196	0.095	0.780	0.889	0.861	0.885	1.000			
Soc	0.906	-0.224	-0.591	0.125	0.121	0.785	0.915	0.769	0.857	0.902	1.000		
Gov	-0.290	-0.385	0.471	-0.382	-0.070	-0.136	-0.206	-0.482	-0.314	-0.279	-0.285	1.000	
ESG	0.895	-0.244	-0.607	0.103	0.112	0.81	0.924	0.775	0.869	0.952	0.966	-0.116	1.000

Table 28: Descriptive statistics for firm-level characteristics of the **Real Estate** sector

	Panel A: Cross-sectional Distributions												
						Performance Ratio				LSEG			
	lME	lBtM	Pro	Inv	lRET12	Env	Soc	Gov	ESG	Env	Soc	Gov	ESG
Mean	22.126	-0.214	590.020	34.491	0.006	21.094	26.236	52.198	33.176	34.525	45.043	45.618	41.572
Stdev	2.558	0.920	14233.26	651.55	0.337	18.801	12.143	10.958	11.913	29.176	21.029	21.802	19.850
10%	19.329	-1.313	-0.019	-0.068	-0.363	0.896	11.137	36.829	18.636	0.893	16.853	16.378	15.913
25%	20.391	-0.698	0.030	0.003	-0.151	4.472	17.223	46.559	24.422	6.306	29.203	28.097	26.452
50%	21.838	-0.151	0.075	0.085	0.024	17.053	25.326	54.033	31.800	30.206	44.166	45.339	39.41
75%	23.511	0.254	0.155	0.221	0.188	33.939	33.552	59.829	40.722	59.062	60.043	63.203	56.155
90%	25.324	0.680	0.274	0.451	0.358	49.944	43.056	64.600	50.391	78.292	73.223	74.467	69.580
	Panel B: Correlations												
						Performance Ratio				LSEG			
	lME	lBtM	Pro	Inv	lRET12	Env	Soc	Gov	ESG	Env	Soc	Gov	ESG
lME	1.000												
lBtM	-0.219	1.000											
Pro	0.324	-0.095	1.000										
Inv	-0.209	-0.179	-0.071	1.000									
lRET12	0.065	-0.156	-0.146	0.087	1.000								
Env	0.690	0.410	0.234	-0.220	-0.072	1.000							
Soc	0.732	0.41	0.279	-0.255	-0.184	0.947	1.000						
Gov	0.878	0.231	0.214	-0.271	0.081	0.875	0.867	1.000					
ESG	0.789	0.368	0.253	-0.257	-0.068	0.977	0.975	0.942	1.000				
Env	0.723	0.237	0.369	-0.204	0.051	0.942	0.910	0.861	0.942	1.000			
Soc	0.870	0.090	0.323	-0.345	-0.030	0.864	0.970	0.895	0.948	0.877	1.000		
Gov	0.834	0.136	0.352	-0.311	-0.051	0.807	0.954	0.856	0.909	0.807	0.977	1.000	
ESG	0.819	0.184	0.370	-0.274	0.007	0.930	0.976	0.904	0.976	0.964	0.971	0.933	1.000

Table 29: Descriptive statistics for firm-level characteristics of the **Industrials** sector

	Panel A: Cross-sectional Distributions												
						Performance Ratio				LSEG			
	lME	lBtM	Pro	Inv	lRET12	Env	Soc	Gov	ESG	Env	Soc	Gov	ESG
Mean	22.078	-0.737	0.267	5096.869	0.057	20.528	28.512	48.687	32.575	36.891	41.635	48.051	42.169
Stdev	2.782	0.896	4.019	193026.632	0.378	15.861	12.453	12.182	10.996	27.590	23.289	21.536	19.594
10%	18.767	-1.878	-0.015	-0.070	-0.354	1.752	12.19	30.71	18.485	1.152	11.577	18.482	16.523
25%	20.067	-1.264	0.077	-0.002	-0.144	6.293	18.798	40.334	24.543	11.507	22.426	30.871	26.712
50%	21.821	-0.715	0.167	0.068	0.058	18.095	28.217	51.005	32.207	34.599	39.745	48.168	40.986
75%	23.729	-0.205	0.309	0.173	0.258	32.443	37.651	57.751	40.453	59.76	59.497	65.427	57.637
90%	25.972	0.253	0.593	0.365	0.477	43.312	44.837	62.871	47.144	75.967	74.398	76.459	69.076
	Panel B: Correlations												
						Performance Ratio				LSEG			
	lME	lBtM	Pro	Inv	lRET12	Env	Soc	Gov	ESG	Env	Soc	Gov	ESG
lME	1.000												
lBtM	-0.581	1.000											
Pro	-0.164	-0.199	1.000										
Inv	0.234	-0.079	-0.085	1.000									
lRET12	-0.105	-0.051	0.092	0.265	1.000								
Env	0.591	0.223	-0.343	0.138	-0.160	1.000							
Soc	0.838	-0.066	-0.315	0.252	-0.207	0.894	1.000						
Gov	0.837	-0.068	-0.281	0.213	-0.111	0.897	0.972	1.000					
ESG	0.797	0.003	-0.316	0.214	-0.160	0.943	0.986	0.989	1.000				
Env	0.53	0.123	-0.362	0.170	-0.255	0.909	0.810	0.762	0.836	1.000			
Soc	0.894	-0.243	-0.268	0.308	-0.176	0.825	0.977	0.950	0.953	0.808	1.000		
Gov	0.841	-0.137	-0.245	0.323	-0.058	0.841	0.962	0.965	0.958	0.783	0.968	1.000	
ESG	0.775	-0.078	-0.313	0.262	-0.204	0.910	0.955	0.923	0.955	0.931	0.966	0.946	1.000

ESG factor Correlations

Table 30: Correlations between **Environmental** factors constructed using LSEG characteristics.

	Energy	BaMA	CC	CNC	Fin	Health	Tech	Util	RE	Ind
Energy	1.000									
BaMA	0.099	1.000								
CC	0.094	0.171	1.000							
CNC	-0.026	0.121	0.082	1.000						
Fin	0.035	0.213	0.151	0.181	1.000					
Health	0.005	0.132	0.124	0.042	0.115	1.000				
Tech	0.059	0.209	0.146	0.097	0.145	0.123	1.000			
Util	0.071	0.033	0.029	0.048	0.054	0.006	0.030	1.000		
RE	0.100	0.190	0.190	0.099	0.239	0.077	0.131	0.123	1.000	
Ind	0.141	0.302	0.224	0.081	0.191	0.081	0.161	0.064	0.211	1.000

Table 31: Correlations between **Social** factors constructed using LSEG characteristics.

	Energy	BaMA	CC	CNC	Fin	Health	Tech	Util	RE	Ind
Energy	1.000									
BaMA	0.122	1.000								
CC	0.020	0.078	1.000							
CNC	-0.012	0.056	0.088	1.000						
Fin	0.056	0.211	0.055	0.041	1.000					
Health	-0.037	-0.003	0.075	0.100	0.038	1.000				
Tech	0.023	0.092	0.130	0.120	0.034	0.111	1.000			
Util	0.105	0.098	0.053	0.071	0.107	-0.003	0.039	1.000		
RE	-0.006	0.012	0.103	0.076	0.090	0.130	0.052	0.001	1.000	
Ind	0.065	0.257	0.083	0.096	0.231	-0.022	0.083	0.103	0.021	1.000

Table 32: Correlations between **Governance** factors constructed using LSEG characteristics.

	Energy	BaMA	CC	CNC	Fin	Health	Tech	Util	RE	Ind
Energy	1.000									
BaMA	0.066	1.000								
CC	-0.013	0.029	1.000							
CNC	0.088	0.036	0.142	1.000						
Fin	-0.117	0.061	0.014	-0.084	1.000					
Health	-0.010	-0.045	0.085	0.077	0.066	1.000				
Tech	0.045	0.004	0.067	0.115	-0.015	0.035	1.000			
Util	-0.017	0.005	-0.039	-0.030	-0.001	-0.044	-0.015	1.000		
RE	0.050	0.080	-0.046	0.020	-0.105	-0.054	-0.022	-0.016	1.000	
Ind	0.018	0.031	0.136	0.117	0.079	0.033	0.089	-0.040	-0.091	1.000

Table 33: Correlations between **ESG** factors constructed using LSEG characteristics.

	Energy	BaMA	CC	CNC	Fin	Health	Tech	Util	RE	Ind
Energy	1.000									
BaMA	0.093	1.000								
CC	0.019	0.122	1.000							
CNC	-0.009	0.056	0.124	1.000						
Fin	-0.024	0.125	0.044	0.093	1.000					
Health	0.018	0.044	0.084	0.031	-0.035	1.000				
Tech	0.058	0.119	0.108	0.065	-0.029	0.068	1.000			
Util	0.056	0.024	0.031	0.043	0.037	-0.074	0.019	1.000		
RE	0.093	0.086	0.16	0.060	-0.052	0.008	0.038	0.014	1.000	
Ind	0.096	0.206	0.245	0.079	0.202	-0.010	0.089	0.072	0.128	1.000

Table 34: Correlations between the ESG factors for the **Energy** sector.

	EnvPR	SocPR	GovPR	ESGPR	EnvLSEG	SocLSEG	GovLSEG	ESGLSEG
EnvPR	1.000							
SocPR	0.252	1.000						
GovPR	0.106	0.052	1.000					
ESGPR	0.584	0.526	0.461	1.000				
EnvLSEG	0.551	0.418	-0.245	0.323	1.000			
SocLSEG	0.221	0.748	-0.213	0.316	0.552	1.000		
GovLSEG	0.260	0.314	0.406	0.555	0.105	0.062	1.000	
ESGLSEG	0.419	0.642	-0.074	0.480	0.629	0.669	0.409	1.000

Table 35: Correlations between the ESG factors for the **Basic Materials** sector.

	EnvPR	SocPR	GovPR	ESGPR	EnvLSEG	SocLSEG	GovLSEG	ESGLSEG
EnvPR	1.000							
SocPR	0.582	1.000						
GovPR	0.169	0.303	1.000					
ESGPR	0.695	0.774	0.421	1.000				
EnvLSEG	0.711	0.199	0.217	0.496	1.000			
SocLSEG	0.592	0.928	0.320	0.785	0.297	1.000		
GovLSEG	0.310	0.316	0.430	0.445	0.358	0.424	1.000	
ESGLSEG	0.740	0.578	0.372	0.760	0.734	0.680	0.631	1.000

Table 36: Correlations between the ESG factors for the **Consumer Cyclicals** sector.

	EnvPR	SocPR	GovPR	ESGPR	EnvLSEG	SocLSEG	GovLSEG	ESGLSEG
EnvPR	1.000							
SocPR	0.620	1.000						
GovPR	0.079	0.239	1.000					
ESGPR	0.801	0.877	0.263	1.000				
EnvLSEG	0.952	0.608	0.075	0.793	1.000			
SocLSEG	0.489	0.845	0.276	0.743	0.492	1.000		
GovLSEG	0.215	0.320	0.172	0.376	0.196	0.297	1.000	
ESGLSEG	0.684	0.824	0.224	0.859	0.673	0.803	0.582	1.000

Table 37: Correlations between the ESG factors for the **Consumer Non-Cyclicals** sector.

	EnvPR	SocPR	GovPR	ESGPR	EnvLSEG	SocLSEG	GovLSEG	ESGLSEG
EnvPR	1.000							
SocPR	0.522	1.000						
GovPR	0.378	0.500	1.000					
ESGPR	0.738	0.805	0.482	1.000				
EnvLSEG	0.780	0.527	0.374	0.668	1.000			
SocLSEG	0.537	0.947	0.469	0.798	0.576	1.000		
GovLSEG	0.389	0.250	0.424	0.333	0.424	0.247	1.000	
ESGLSEG	0.822	0.706	0.476	0.817	0.813	0.727	0.490	1.000

Table 38: Correlations between the ESG factors for the **Financials** sector.

	EnvPR	SocPR	GovPR	ESGPR	EnvLSEG	SocLSEG	GovLSEG	ESGLSEG
EnvPR	1.000							
SocPR	0.471	1.000						
GovPR	0.464	0.634	1.000					
ESGPR	0.673	0.849	0.703	1.000				
EnvLSEG	0.554	0.171	0.031	0.302	1.000			
SocLSEG	0.363	0.838	0.369	0.669	0.278	1.000		
GovLSEG	0.030	0.180	-0.083	0.171	0.143	0.298	1.000	
ESGLSEG	0.276	0.491	0.085	0.453	0.444	0.644	0.715	1.000

Table 39: Correlations between the ESG factors for the **Heatlhcare** sector.

	EnvPR	SocPR	GovPR	ESGPR	EnvLSEG	SocLSEG	GovLSEG	ESGLSEG
EnvPR	1.000							
SocPR	0.508	1.000						
GovPR	0.340	0.534	1.000					
ESGPR	0.625	0.857	0.667	1.000				
EnvLSEG	0.845	0.492	0.424	0.621	1.000			
SocLSEG	0.548	0.833	0.651	0.879	0.563	1.000		
GovLSEG	0.372	0.543	0.293	0.595	0.265	0.499	1.000	
ESGLSEG	0.569	0.815	0.500	0.848	0.544	0.792	0.738	1.000

Table 40: Correlations between the ESG factors for the **Technology** sector.

	EnvPR	SocPR	GovPR	ESGPR	EnvLSEG	SocLSEG	GovLSEG	ESGLSEG
EnvPR	1.000							
SocPR	0.470	1.000						
GovPR	0.222	0.534	1.000					
ESGPR	0.676	0.807	0.576	1.000				
EnvLSEG	0.894	0.418	0.267	0.624	1.000			
SocLSEG	0.404	0.860	0.580	0.734	0.363	1.000		
GovLSEG	0.573	0.407	0.365	0.609	0.568	0.364	1.000	
ESGLSEG	0.634	0.779	0.534	0.865	0.602	0.771	0.647	1.000

Table 41: Correlations between the ESG factors for the **Utilities** sector.

	EnvPR	SocPR	GovPR	ESGPR	EnvLSEG	SocLSEG	GovLSEG	ESGLSEG
EnvPR	1.000							
SocPR	0.552	1.000						
GovPR	-0.257	-0.014	1.000					
ESGPR	0.622	0.810	0.201	1.000				
EnvLSEG	0.862	0.543	-0.332	0.510	1.000			
SocLSEG	0.622	0.893	-0.147	0.720	0.620	1.000		
GovLSEG	0.252	0.503	0.099	0.452	0.285	0.463	1.000	
ESGLSEG	0.718	0.736	-0.244	0.609	0.805	0.771	0.591	1.000

Table 42: Correlations between the ESG factors for the **Real Estate** sector.

	EnvPR	SocPR	GovPR	ESGPR	EnvLSEG	SocLSEG	GovLSEG	ESGLSEG
EnvPR	1.000							
SocPR	0.236	1.000						
GovPR	-0.259	0.410	1.000					
ESGPR	0.427	0.756	0.508	1.000				
EnvLSEG	0.974	0.213	-0.285	0.410	1.000			
SocLSEG	0.195	0.898	0.409	0.678	0.182	1.000		
GovLSEG	-0.147	0.200	0.305	0.162	-0.157	0.157	1.000	
ESGLSEG	0.535	0.699	0.079	0.569	0.541	0.684	0.277	1.000

Table 43: Correlations between the ESG factors for the **Industrials** sector.

	EnvPR	SocPR	GovPR	ESGPR	EnvLSEG	SocLSEG	GovLSEG	ESGLSEG
EnvPR	1.000							
SocPR	0.368	1.000						
GovPR	-0.010	0.196	1.000					
ESGPR	0.748	0.686	0.248	1.000				
EnvLSEG	0.878	0.436	0.049	0.718	1.000			
SocLSEG	0.275	0.919	0.152	0.606	0.361	1.000		
GovLSEG	0.502	0.226	0.022	0.456	0.476	0.222	1.000	
ESGLSEG	0.686	0.747	0.067	0.827	0.713	0.729	0.610	1.000

Risk factor PCA's

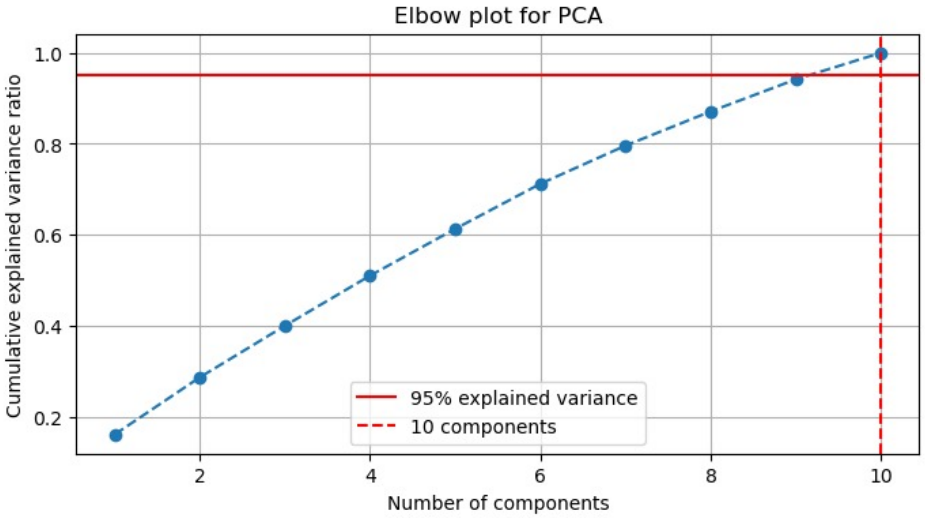


Figure 5: PCA of LSEG based combined ESG risk factors across industries

Figure 6: PCA of Performance Ratio based separate ESG risk factors in the Energy industry.

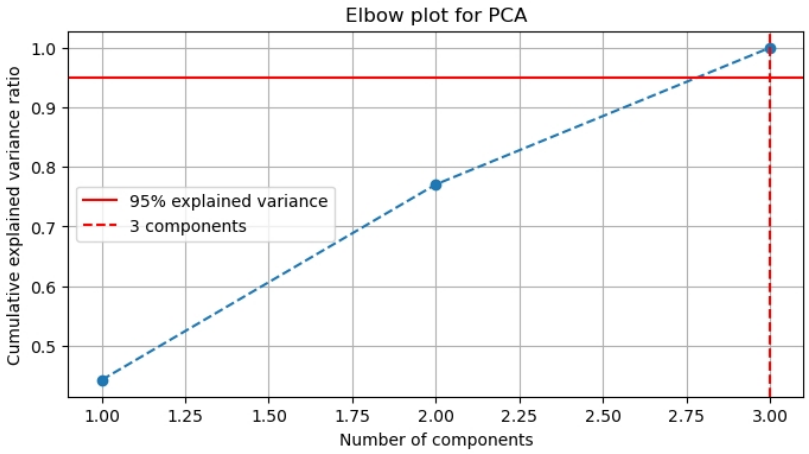


Figure 7: PCA of Performance Ratio based separate ESG risk factors in the Basic Materials industry.

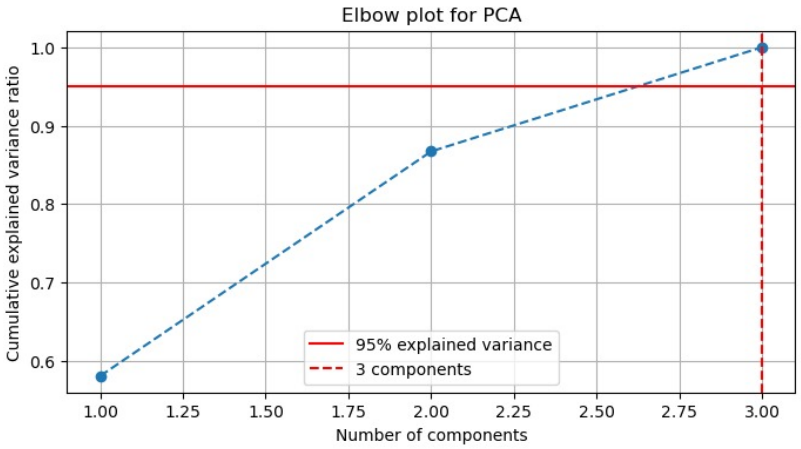


Figure 8: PCA of Performance Ratio based separate ESG risk factors in the Consumer Cyclicals industry.

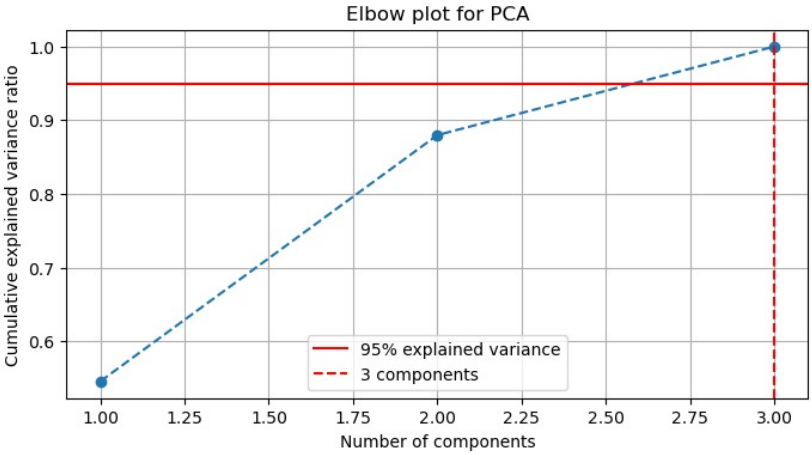


Figure 9: PCA of Performance Ratio based separate ESG risk factors in the Consumer Non-Cyclicals industry.

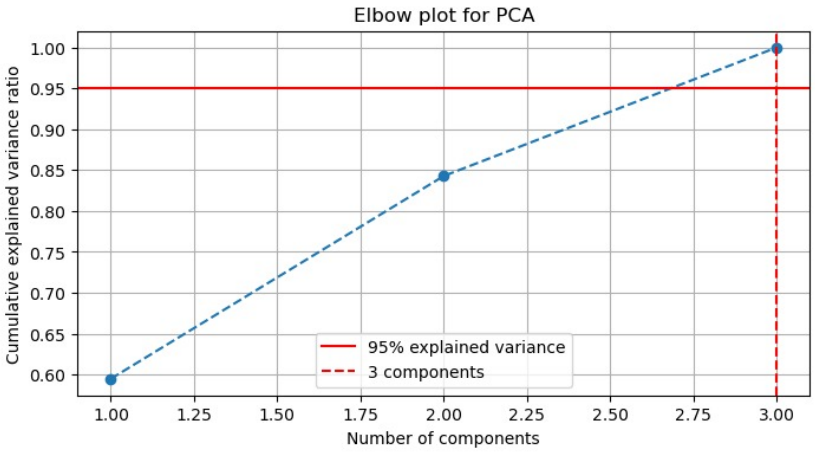


Figure 10: PCA of Performance Ratio based separate ESG risk factors in the Financials industry.

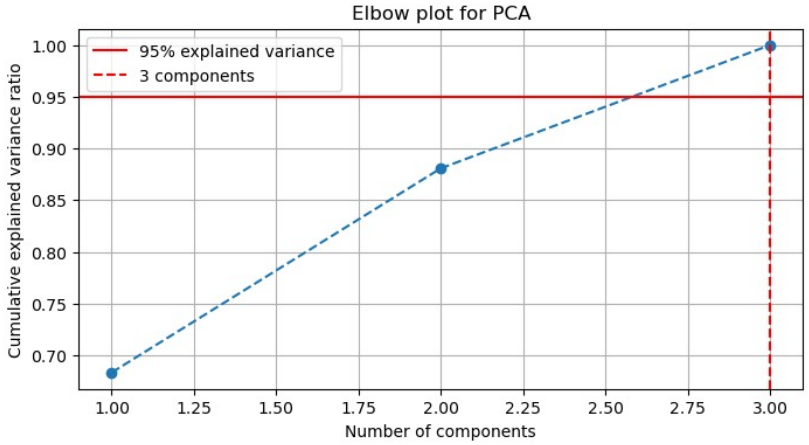


Figure 11: PCA of Performance Ratio based separate ESG risk factors in the Healthcare industry.

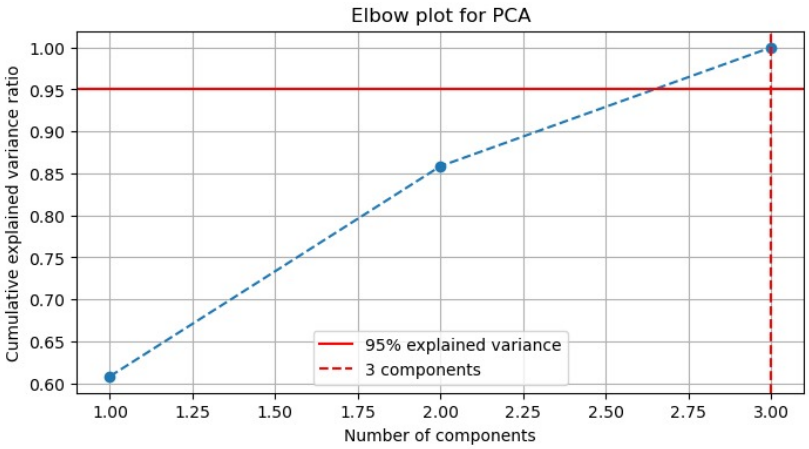


Figure 12: PCA of Performance Ratio based separate ESG risk factors in the Technology industry.

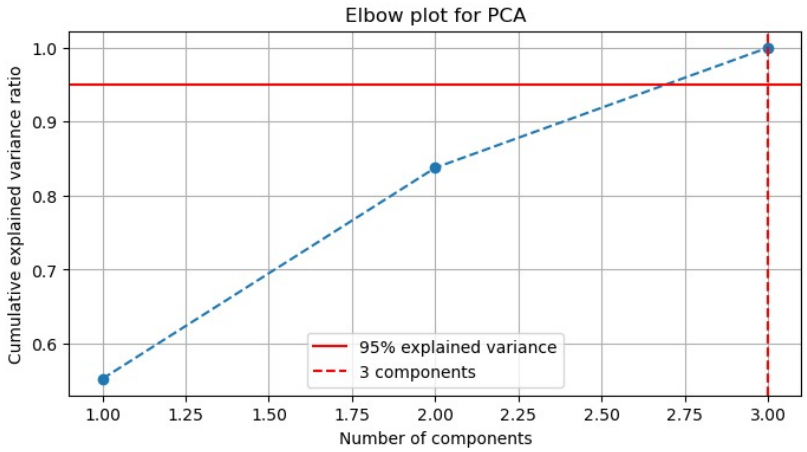


Figure 13: PCA of Performance Ratio based separate ESG risk factors in the Utilities industry.

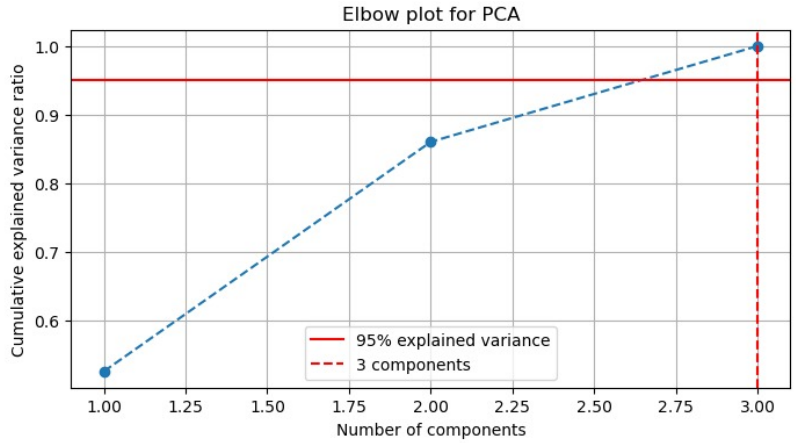
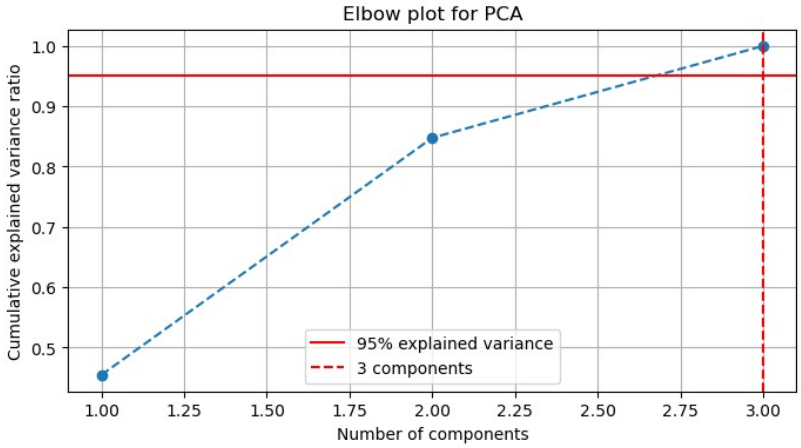


Figure 14: PCA of Performance Ratio based separate ESG risk factors in the Real Estate industry.



Quintile portfolios

The following tables report in Panel A the average monthly excess return, standard deviation and Sharpe Ratio of the quintile portfolios and the difference between the Best

and Worst portfolios, as well as the decreasing monotonicity tests. The p-value for an increasing monotonocity test is one minus the value given. Panel B shows the multi-factor time series regression alphas with t-statistics and the GRS test statistics. The ***, ** and * indicate a significance of 1%, 5% and 10% respectively.

Energy

Table 44: Properties of the quintile portfolios sorted on Performance Ratio characteristics of the **Energy** sector.

	Panel A: Descriptives.											
Sort:	Environment			Social			Governance			ESG		
	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p
Worst	2.582	34.220	0.075	0.709	9.535	0.074	1.000	7.018	0.142	0.877	8.832	0.099
2	0.672	8.235	0.082	0.782	6.881	0.114	0.972	7.906	0.123	0.624	7.896	0.079
3	1.089	8.518	0.128	0.732	7.599	0.096	0.543	7.992	0.068	0.923	7.232	0.128
4	0.895	7.717	0.116	0.924	6.890	0.134	0.682	7.675	0.089	1.334	8.035	0.166
Best	0.820	7.021	0.117	0.940	7.015	0.134	0.909	5.983	0.152	0.561	6.914	0.081
Diff	-1.762	33.742	-0.052	0.232	9.928	0.023	-0.090	6.695	-0.013	-0.316	9.037	-0.035
Decr		0.796 (0.213)			-0.327 (0.628)			0.218 (0.414)			0.517 (0.302)	
	Panel B: Multifactor time-series regression alphas and GRS test.											
Sort:	Environment			Social			Governance			ESG		
	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact
Worst	-0.116	-0.271	-0.188	-0.578	-0.598	-0.661*	-0.193	-0.130	-0.073	-0.279	-0.279	-0.281
	(-0.185)	(-0.506)	(-0.367)	(-1.450)	(-1.400)	(-1.674)	(-0.676)	(-0.446)	(-0.259)	(-0.600)	(-0.584)	(-0.605)
2	-0.354	-0.285	-0.358	-0.215	-0.074	-0.085	-0.137	-0.202	-0.214	-0.352	-0.279	-0.271
	(-0.749)	(-0.638)	(-0.801)	(-0.634)	(-0.225)	(-0.260)	(-0.352)	(-0.552)	(-0.579)	(-0.774)	(-0.609)	(-0.597)
3	-0.026	-0.295	-0.322	-0.204	-0.102	-0.063	-0.453	-0.532	-0.659	0.010	0.058	-0.074
	(-0.087)	(-0.744)	(-1.184)	(-0.498)	(-0.255)	(-0.159)	(-1.009)	(-1.298)	(-1.583)	(0.028)	(0.165)	(-0.212)
4	-0.080	-0.177	-0.247	-0.071	-0.073	-0.201	-0.157	-0.140	-0.305	0.182	0.001	-0.199
	(-0.202)	(-0.454)	(-0.635)	(-0.209)	(-0.222)	(-0.628)	(-0.367)	(-0.338)	(-0.779)	(0.465)	(0.003)	(-0.557)
Best	-0.185	-0.174	-0.239	-0.054	-0.206	-0.289	0.197	0.196	-0.018	-0.389	-0.442	-0.457
	(-0.599)	(-0.620)	(-0.942)	(-0.189)	(-0.734)	(-1.231)	(0.632)	(0.735)	(-0.077)	(-1.149)	(-1.603)	(-1.635)
Diff	-0.069	0.097	-0.051	0.523	0.391	0.371	0.389	0.325	0.055	-0.110	-0.163	-0.177
	(-0.119)	(0.174)	(-0.096)	(1.198)	(0.742)	(0.885)	(1.022)	(0.860)	(0.165)	(-0.209)	(-0.290)	(-0.340)
GRS	[0.153]	[0.363]	[0.598]	[0.554]	[0.551]	[0.768]	[0.651]	[0.749]	[0.703]	[0.391]	[0.690]	[0.804]

Table 45: Properties of the quintile portfolios sorted on LSEG characteristics of the **Energy** sector.

	Panel A: Descriptives.											
Sort:	Environment			Social			Governance			ESG		
	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p
Worst	0.650	9.194	0.071	0.583	9.549	0.061	0.738	6.997	0.106	1.403	10.088	0.139
2	0.378	9.633	0.039	0.496	7.948	0.062	0.788	7.565	0.104	0.220	8.215	0.027
3	1.262	6.296	0.200	0.994	6.870	0.145	0.435	7.872	0.055	1.106	7.116	0.155
4	0.708	7.609	0.093	1.072	6.324	0.169	0.912	7.876	0.116	0.953	6.901	0.138
Best	0.963	6.909	0.139	0.936	8.110	0.115	0.749	7.208	0.104	0.787	7.415	0.106
Diff	0.313	9.174	0.034	0.353	9.581	0.037	0.011	6.732	0.002	-0.616	9.266	-0.066
Decr		-0.512 (0.696)			-0.545 (0.707)			-0.026 (0.51)			1.071 (0.142)	
	Panel B: Multifactor time-series regression alphas and GRS test.											
Sort:	Environment			Social			Governance			ESG		
	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact
Worst	-0.079	0.270	0.148	-0.680	-0.611	-0.726*	-0.311	-0.123	–0.221	0.065	0.110	-0.014
	(-0.135)	(0.499)	(0.275)	(-1.631)	(-1.404)	(-1.742)	(-0.851)	(-0.348)	(-0.610)	(0.153)	(0.248)	(-0.034)
2	-0.924*	-0.626	-0.812*	-0.477	-0.189	-0.345	-0.361	-0.294	-0.278	-0.759*	-0.494	-0.651
	(-1.904)	(-1.311)	-1.721)	(-1.135)	(-0.455)	(-0.859)	(-0.970)	(-0.799)	(-0.774)	(-1.706)	(-1.100)	(-1.467)
3	0.394	0.461	0.402	0.089	0.249	0.163	-0.536	-0.536	-0.496	0.143	0.366	0.217
	(1.296)	(1.373)	(1.330)	(0.241)	(0.700)	(0.464)	(-1.333)	(-1.267)	(-1.243)	(0.382)	(1.031)	(0.605)
4	-0.3323	-0.448	-0.423	0.194	0.206	0.186	-0.055	-0.257	-0.328	-0.059	-0.128	-0.095
	(-1.009)	(-1.295)	(-1.299)	(0.610)	(0.654)	(0.589)	(-0.135)	(-0.662)	(-0.890)	(-0.190)	(-0.432)	(-0.323)
Best	0.079	-0.145	-0.140	-0.133	-0.445	-0.431	-0.166	-0.306	–0.390	-0.161	-0.472*	-0.458
	(0.243)	(-0.506)	(-0.538)	(-0.355)	(-1.384)	(-1.411)	(-0.498)	(-0.960)	(-1.432)	(-0.435)	(-1.665)	(-1.589)
Diff	0.158	-0.415	-0.289	0.547	0.167	0.295	0.144	-0.183	-0.268	-0.169	-0.582	-0.444
	(0.259)	(-0.725)	(-0.512)	(1.174)	(0.357)	(0.671)	(0.327)	(-0.446)	(-0.418)	(-0.487)	(-1.354)	(-0.997)
GRS	[1.450]	[1.481]	[1.599]	[0.950]	[0.906]	[1.064]	[0.705]	[0.816]	[1.081]	[0.797]	[1.597]	[1.181]

Basic Materials

Table 46: Properties of the quintile portfolios sorted on Performance Ratio characteristics of the **Basic Materials** sector.

	Panel A: Descriptives.											
Sort:	Environment			Social			Governance			ESG		
	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p
Worst	0.146	8.618	0.017	0.085	7.369	0.012	0.274	6.752	0.041	0.037	7.313	0.005
Two	0.449	6.160	0.073	0.628	6.539	0.096	0.496	7.376	0.067	0.732	6.93	0.106
Three	0.214	6.632	0.032	0.422	8.004	0.053	1.306	9.687	0.135	0.092	8.168	0.011
Four	0.206	7.936	0.026	-0.009	7.142	-0.001	0.644	6.968	0.092	0.259	7.376	0.035
Best	0.542	6.443	0.084	0.711	7.877	0.090	0.807	6.457	0.125	1.003	7.762	0.129
Diff	0.396	7.247	0.055	0.626	6.696	0.093	0.533	5.813	0.092	0.966	7.444	0.130
Decr		-0.817 (0.793)			-1.324 (0.907)			-1.365 (0.914)			-1.796 (0.964)	
	Panel B: Multifactor time-series regression alphas and GRS test.											
Sort:	Environment			Social			Governance			ESG		
	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact
Worst	-0.447	-0.793*	-0.625	-0.508*	-0.785**	-0.638**	-0.333	-0.507*	-0.393	-0.571**	-0.754**	-0.621**
	(-1.138)	(-1.891)	(-1.561)	(-1.671)	(-2.437)	(-2.139)	(-1.281)	(-1.717)	(-1.534)	(-1.971)	(-2.494)	(-2.168)
2	-0.247	-0.500*	-0.476	0.116	-0.022	0.056	-0.603	-0.448**	-0.518	0.190	-0.141*	-0.060
	(-0.822)	(-1.697)	(-1.597)	(0.327)	(-0.062)	(0.158)	(-2.105)	(-1.467)	(-1.772)	(0.510)	(-0.369)	(-0.160)
3	-0.500	-0.712**	-0.699**	-0.434	-0.342	-0.354	0.040	-0.177	-0.258	-0.904**	-0.701*	-0.716*
	(-1.534)	(-2.113)	(-2.115)	(-1.101)	(-0.813)	(-0.880)	(0.082)	(-0.362)	(-0.558)	(-2.404)	(-1.781)	(-1.863)
4	-0.868**	-0.762**	-0.782**	-0.906***	-0.971***	-0.955***	-0.329	-0.690**	-0.713**	-0.907***	-0.844***	-0.913***
	(-2.454)	(-2.288)	(-2.346)	(-2.704)	(-2.941)	(-2.913)	(-1.035)	(-2.207)	(-2.417)	(-3.165)	(-2.901)	(-3.223)
Best	-0.363	-0.483*	-0.491**	-0.574*	-0.575*	-0.684**	-0.081	-0.586**	-0.608**	-0.082	-0.293	-0.315
	(-1.502)	(-1.762)	(-2.078)	(-1.873)	(-1.814)	(-2.268)	(-0.266)	(-2.377)	(-2.527)	(-0.230)	(-0.796)	(-0.879)
Diff	0.084	0.310	0.134	-0.066	0.210	-0.046	0.252	-0.079	-0.215	0.489	0.461	0.306
	(0.229)	(0.752)	(0.350)	(-0.221)	(0.564)	(-0.150)	(0.838)	(-0.232)	(-0.772)	(1.231)	(1.097)	(0.754)
GRS	[1.705]	[2.507]**	[2.385]**	[2.988]**	[3.283]***	[3.598]***	[1.299]	[2.218]*	[2.401]**	[3.559]***	[3.118]***	[3.293]***

Table 47: Properties of the quintile portfolios sorted on LSEG characteristics of the **Basic Materials** sector.

	Panel A: Descriptives.											
Sort:	Environment			Social			Governance			ESG		
	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p
Worst	-0.148	8.523	-0.017	0.223	7.429	0.03	0.557	7.046	0.079	0.315	7.583	0.042
Two	0.349	6.555	0.053	0.381	6.550	0.058	0.691	7.411	0.093	0.603	6.479	0.093
Three	0.527	8.114	0.065	0.248	7.516	0.033	0.169	7.487	0.023	0.391	7.93	0.049
Four	0.303	6.690	0.045	0.355	7.586	0.047	0.519	7.864	0.066	0.103	7.602	0.014
Best	0.417	7.103	0.059	0.855	7.621	0.112	0.299	7.319	0.041	0.530	7.485	0.071
Diff	0.564	7.156	0.079	0.632	6.647	0.095	-0.259	7.035	-0.037	0.215	6.528	0.033
Decr		-1.193 (0.884)			-1.358 (0.913)			0.565 (0.286)			-0.464 (0.679)	
	Panel B: Multifactor time-series regression alphas and GRS test.											
Sort:	Environment			Social			Governance			ESG		
	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact
Worst	-0.923**	-1.081***	-0.927**	-0.538*	-0.769**	-0.664**	-0.242	-0.294	-0.32	-0.472	-0.681**	-0.592**
	(-2.431)	(-2.591)	(-2.386)	(-1.841)	(-2.369)	(-2.268)	(-0.764)	(-0.878)	(-0.999)	(-1.586)	(-2.091)	(-1.985)
2	-0.346	-0.529	-0.523	-0.142	-0.433	-0.299	-0.349	-0.49	-0.668*	0.039	-0.318	-0.264
	(-1.041)	(-1.561)	(-1.525)	(-0.409)	(-1.23)	(-0.873)	(-0.984)	(-1.267)	(-1.847)	(0.112)	(-0.915)	(-0.740)
3	-0.512	-0.482	-0.684**	-0.642*	-0.675*	-0.723*	-0.827**	-0.801**	-0.839**	-0.512	-0.438	-0.516
	(-1.463)	(-1.197)	(-1.961)	(-1.718)	(-1.776)	(-1.888)	(-2.336)	(-2.239)	(-2.338)	(-1.430)	(-1.098)	(-1.384)
4	-0.536*	-0.443	-0.413	-0.624*	-0.492	-0.504	-0.481	-0.519	-0.506	-0.962***	-0.779**	-0.920***
	(-1.694)	(-1.440)	(-1.356)	(-1.811)	(-1.443)	(-1.467)	(-1.375)	(-1.423)	(-1.436)	(-2.768)	(-2.208)	(-2.714)
Best	-0.668***	-0.756***	-0.725***	-0.455*	-0.322	-0.572**	-0.457	-0.732**	-0.584*	-0.562**	-0.643**	-0.593**
	(-2.990)	(-3.022)	(-3.238)	(-1.657)	(-1.031)	(-2.142)	(-1.363)	(-2.099)	(-1.757)	(-2.160)	(-2.329)	(-2.271)
Diff	0.254	0.326	0.202	0.083	0.447	0.092	-0.215	-0.439	-0.264	-0.091	0.038	-0.000
	(0.664)	(0.777)	(0.508)	(0.322)	(1.152)	(0.354)	(-0.541)	(-0.962)	(-0.640)	(-0.300)	(0.112)	(-0.001)
GRS	[2.397]**	[2.797]**	[2.835]**	[2.145]*	[2.110]*	[2.373]**	[1.543]	[2.073]*	[1.986]*	[2.651]*	[2.648]**	[2.702]**

Consumer Cyclicals

Table 48: Properties of the quintile portfolios sorted on Performance Ratio characteristics of the **Consumer Cyclicals** sector.

	Panel A: Descriptives.											
Sort:	Environment			Social			Governance			ESG		
	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p
Worst	-0.359	7.475	-0.048	0.179	7.297	0.025	0.262	5.773	0.045	0.274	6.739	0.041
Two	0.064	7.976	0.008	0.053	7.37	0.007	0.101	6.621	0.015	0.446	7.431	0.060
Three	0.074	6.441	0.012	0.378	7.197	0.053	0.772	7.243	0.107	0.330	6.912	0.048
Four	0.403	5.545	0.073	0.340	6.985	0.049	1.222	6.035	0.203	0.375	6.491	0.058
Best	0.581	6.003	0.097	0.600	5.800	0.103	0.876	5.754	0.152	0.618	6.009	0.103
Diff	0.940	7.645	0.123	0.421	7.325	0.057	0.614	5.596	0.110	0.343	6.581	0.052
Decr		-2.150 (0.984)			-0.998 (0.841)			-1.835 (0.967)			-0.864 (0.806)	
	Panel B: Multifactor time-series regression alphas and GRS test.											
Sort:	Environment			Social			Governance			ESG		
	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact
Worst	-0.862***	-0.823***	-0.730**	-0.265	-0.392	-0.300	-0.237	-0.305	-0.189	-0.142	-0.126	0.000
	(-2.766)	(-2.600)	(-2.383)	(-0.882)	(-1.284)	(-1.044)	(-1.269)	(-1.517)	(-1.090)	(-0.611)	(-0.604)	(-0.001)
2	-0.404	-0.631*	-0.461	-0.550	-0.261	-0.229	-0.832	-0.624***	-0.665**	0.000**	-0.214	-0.001
	(-1.086)	(-1.803)	(-1.299)	(-1.435)	(-0.744)	(-0.637)	(-3.004)	(-2.407)	(-2.540)	(0.001)	(-0.595)	(-0.003)
3	-0.340	-0.492	-0.261	-0.254	-0.560	-0.414*	-0.231	-0.286	-0.330	-0.438	-0.543	-0.461
	(-1.053)	(-1.523)	(-0.858)	(-0.765)	(-1.784)	(-1.316)	(-0.641)	(-0.806)	(-0.944)	(-1.273)	(-1.638)	(-1.380)
4	-0.338	-0.305	-0.324	-0.471	-0.469	-0.378	0.089	0.158	0.037	-0.531**	-0.510**	-0.498
	(-1.235)	(-1.193)	(-1.286)	(-1.548)	(-1.616)	(-1.324)	(0.391)	(0.659)	(0.178)	(-1.844)	(-2.026)	(-1.950)
Best	-0.373**	-0.256*	-0.311**	-0.342*	-0.178	-0.243	-0.225	-0.228	-0.355**	-0.355*	-0.172	-0.248
	(-2.042)	(-1.621)	(-2.114)	(-1.734)	(-1.033)	(-1.435)	(-0.987)	(-1.270)	(-2.216)	(-1.908)	(-1.026)	(-1.561)
Diff	0.489	0.567	0.419	-0.077	0.214	0.057	0.012	0.077	-0.166	-0.213	-0.046	-0.248
	(1.458)	(1.626)	(1.239)	(-0.257)	(0.627)	(0.185)	(0.054)	(0.302)	(-0.880)	(-0.955)	(-0.195)	(-1.074)
GRS	[2.302]**	[3.965]***	[2.834]**	[1.021]	[1.687]	[1.114]	[2.497]**	[2.379]**	[2.403]**	[1.287]	[1.389]	[1.465]

Table 49: Properties of the quintile portfolios sorted on LSEG characteristics of the **Consumer Cyclicals** sector.

	Panel A: Descriptives.											
Sort:	Environment			Social			Governance			ESG		
	$\bar{R}^e_p$	σ_p	ShR_p	$\bar{R}^e_p$	σ_p	ShR_p	$\bar{R}^e_p$	σ_p	ShR_p	$\bar{R}^e_p$	σ_p	ShR_p
Worst	0.203	7.151	0.028	-0.010	7.507	-0.001	0.091	6.507	0.014	0.390	6.901	0.057
Two	0.334	7.683	0.043	0.606	6.605	0.092	0.569	6.687	0.085	0.177	6.520	0.027
Three	-0.286	6.698	-0.043	0.344	6.342	0.054	0.733	6.887	0.106	0.164	7.357	0.022
Four	0.354	5.854	0.06	0.192	6.799	0.028	0.300	6.087	0.049	0.418	6.524	0.064
Best	0.574	5.845	0.098	0.681	6.293	0.108	-0.010	6.656	-0.001	0.402	6.036	0.067
Diff	0.371	7.193	0.052	0.691	7.755	0.089	-0.101	7.164	-0.014	0.012	6.664	0.002
Decr		-0.834 (0.798)			-1.498 (0.933)			0.242 (0.404)			-0.028 (0.511)	
	Panel B: Multifactor time-series regression alphas and GRS test.											
Sort:	Environment			Social			Governance			ESG		
	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact
Worst	-0.348	-0.497	-0.413	-0.594**	-0.642**	-0.513*	-0.717***	-0.549**	-0.674**	-0.270	-0.106	-0.102
	(-1.039)	(-1.623)	(-1.299)	(-1.961)	(-2.180)	(-1.779)	(-2.608)	(-1.977)	(-2.564)	(-0.904)	(-0.398)	(-0.382)
2	-0.122	-0.536	-0.138	-0.079	0.010	0.046	-0.302	-0.026	-0.156	-0.377	-0.610**	-0.475
	(-0.368)	(-1.480)	(-0.421)	(-0.247)	(0.032)	(0.147)	(-0.968)	(-0.089)	(-0.546)	(-1.323)	(-2.131)	(-1.643)
3	-0.864***	-1.017***	-0.830***	-0.438	-0.424	-0.436	-0.007	-0.213	-0.095	-0.531	-0.636*	-0.519
	(-2.695)	(-3.155)	(-2.653)	(-1.439)	(-1.457)	(-1.472)	(-0.022)	(-0.706)	(-0.316)	(-1.463)	(-1.795)	(-1.489)
4	-0.402	-0.349	-0.337	-0.548**	-0.694***	-0.441*	-0.310	-0.439	-0.324	-0.344	-0.428*	-0.283
	(-1.563)	(-1.458)	(-1.383)	(-2.006)	(-2.595)	(-1.777)	(-1.108)	(-1.619)	(-1.197)	(-1.251)	(-1.677)	(-1.115)
Best	-0.372 **	-0.171	-0.264*	-0.222	-0.063	-0.086	-0.628**	-0.783***	-0.491**	-0.505**	-0.340**	-0.321*
	(-1.963)	(-1.055)	(-1.658)	(-1.034)	(-0.307)	(-0.472)	(-2.405)	(-2.628)	(-1.993)	(-2.583)	(-1.986)	(-1.879)
Diff	-0.025	0.326	0.149	0.372	0.58	0.427	0.089	-0.234	0.184	-0.236	-0.235	-0.219
	(-0.072)	(0.958)	(0.424)	(1.216)	(1.592)	(1.390)	(0.287)	(-0.584)	(0.578)	(-0.848)	(-0.83)	(-0.773)
GRS	[1.873]*	[3.427]***	[2.433]**	[1.414]	[2.349]**	[1.537]	[2.139]*	[3.001]**	[2.244]*	[1.686]	[2.484]**	[1.743]

Consumer Non-Cyclicals

Table 50: Properties of the quintile portfolios sorted on Performance Ratio characteristics of the **Consumer Non-Cyclicals** sector.

	Panel A: Descriptives.											
Sort:	Environment			Social			Governance			ESG		
	$\bar{R}^e_p$	σ_p	ShR_p	$\bar{R}^e_p$	σ_p	ShR_p	$\bar{R}^e_p$	σ_p	ShR_p	$\bar{R}^e_p$	σ_p	ShR_p
Worst	0.424	5.763	0.074	0.508	6.297	0.081	0.393	5.505	0.071	0.435	5.736	0.076
Two	0.203	5.848	0.035	0.629	5.483	0.115	0.365	5.685	0.064	0.663	6.970	0.095
Three	0.646	5.727	0.113	0.218	6.666	0.033	0.632	6.370	0.099	0.129	5.961	0.022
Four	0.376	5.489	0.068	0.344	5.617	0.061	0.666	4.667	0.143	0.559	5.682	0.098
Best	0.246	5.930	0.042	0.573	6.197	0.092	0.439	3.638	0.121	0.582	6.495	0.090
Diff	-0.178	7.077	-0.025	0.065	7.869	0.008	0.045	5.230	0.009	0.147	7.656	0.019
Decr		0.367 (0.357)			-0.114 (0.545)			-0.129 (0.551)			-0.282 (0.611)	
	Panel B: Multifactor time-series regression alphas and GRS test.											
Sort:	Environment			Social			Governance			ESG		
	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact
Worst	0.040	-0.285	-0.17	0.137	-0.292	-0.136	-0.130	-0.537*	-0.318	0.106	-0.171	-0.016
	(0.117)	(-0.823)	(-0.502)	(0.425)	(-0.829)	(-0.414)	(-0.513)	(-1.832)	(-1.230)	(0.361)	(-0.569)	(-0.053)
2	-0.146	-0.391	-0.253	0.228	0.096	0.166	-0.298	-0.557*	-0.482	0.447	-0.150	0.208
	(-0.417)	(-1.089)	(-0.708)	(0.688)	(0.292)	(0.494)	(-0.972)	(-1.752)	(-1.547)	(1.100)	(-0.332)	(0.525)
3	0.154	-0.244	-0.078	-0.313	-0.577	-0.424	-0.158	-0.252	-0.279	-0.492	-0.699**	-0.617*
	(0.484)	(-0.736)	(-0.252)	(-0.806)	(-1.502)	(-1.116)	(-0.479)	(-0.705)	(-0.812)	(-1.417)	(-1.982)	(-1.746)
4	-0.131	-0.405	-0.295	-0.300	-0.523	-0.462	0.082	-0.128	-0.232	0.030	-0.312	-0.261
	(-0.413)	(-1.162)	(-0.902)	(-0.885)	(-1.501)	(-1.340)	(0.304)	(-0.473)	(-0.911)	(0.088)	(-0.857)	(-0.754)
Best	-0.475*	-0.623*	-0.683**	-0.194	-0.466	-0.452*	0.037	-0.299	-0.382**	-0.379	-0.597**	-0.669**
	(-1.736)	(-1.874)	(-2.487)	(-0.789)	(-1.448)	(-1.821)	(0.168)	(-1.511)	(-1.991)	(-1.251)	(-2.043)	(-2.190)
Diff	-0.514	-0.338	-0.512	-0.331	-0.174	-0.317	0.167	0.238	-0.064	-0.485	-0.426	-0.652*
	(-1.342)	(-0.807)	(-1.333)	(-1.089)	(-0.413)	(-1.022)	(0.653)	(0.740)	(-0.247)	(-1.407)	(-1.591)	(-1.851)
GRS	[0.998]	[1.027]	[1.524]	[0.956]	[1.268]	[1.913]*	[0.398]	[1.428]	[1.321]	[1.831]	[1.856]	[2.963]**

Table 51: Properties of the quintile portfolios sorted on LSEG characteristics of the **Consumer Non-Cyclicals** sector.

	Panel A: Descriptives.											
Sort:	Environment			Social			Governance			ESG		
	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p
Worst	0.600	5.955	0.101	0.556	6.665	0.083	0.465	5.529	0.084	0.476	5.710	0.083
Two	0.570	6.557	0.087	0.505	5.252	0.096	0.741	7.369	0.101	0.517	7.054	0.073
Three	0.305	5.116	0.060	0.344	6.66	0.052	0.412	5.152	0.080	0.727	5.951	0.122
Four	0.605	5.846	0.104	0.117	5.912	0.020	0.346	5.938	0.058	0.283	5.645	0.050
Best	0.291	5.838	0.050	0.677	5.78	0.117	0.540	4.889	0.110	0.579	6.031	0.096
Diff	-0.309	7.110	-0.043	0.121	8.079	0.015	0.075	6.247	0.012	0.103	7.355	0.014
Decr		0.591 (0.277)			-0.222 (0.588)			-0.167 (0.566)			-0.212 (0.584)	
	Panel B: Multifactor time-series regression alphas and GRS test.											
Sort:	Environment			Social			Governance			ESG		
	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact
Worst	0.069	-0.207	-0.207	0.080	-0.184	-0.142	-0.145	-0.192	-0.242	0.079	-0.110	-0.077
	(0.212)	(-0.572)	(-0.622)	(0.240)	(-0.483)	(-0.416)	(-0.507)	(-0.650)	(-0.851)	(0.265)	(-0.336)	(-0.253)
2	-0.016	-0.174	-0.158	0.086	-0.069	-0.090	0.064	-0.143	-0.138	-0.151	-0.291	-0.330
	(-0.050)	(-0.489)	(-0.491)	(0.259)	(-0.202)	(-0.269)	(0.167)	(-0.339)	(-0.354)	(-0.386)	(-0.746)	(-0.874)
3	-0.163	-0.308	-0.298	-0.347	-0.534	-0.543	-0.206	-0.442	-0.518*	0.256	0.086	0.110
	(-0.512)	(-0.950)	(-0.935)	(-1.025)	(-1.478)	(-1.611)	(-0.667)	(-1.379)	(-1.655)	(0.695)	(0.222)	(0.291)
4	0.022	-0.209	-0.221	-0.597*	-0.868**	-0.883**	-0.474	-0.487	-0.541	-0.296	-0.476	-0.522
	(0.062)	(-0.560)	(-0.589)	(-1.696)	(-2.376)	(-2.433)	(-1.424)	(-1.379)	(-1.570)	(-0.872)	(-1.326)	(-1.484)
Best	-0.487*	-0.668**	-0.782***	-0.168	-0.303	-0.443*	0.022	-0.406	-0.329	-0.362	-0.554**	-0.652**
	(-1.731)	(-2.198)	(-2.825)	(-0.656)	(-1.050)	(-1.722)	(0.080)	(-1.462)	(-1.285)	(-1.284)	(-1.994)	(-2.282)
Diff	-0.556	-0.461	-0.575	-0.248	-0.119	-0.300	0.167	-0.214	-0.087	-0.441	-0.444	-0.575*
	(-1.446)	(-1.111)	(-1.474)	(-0.747)	(-0.276)	(-0.878)	(0.537)	(-0.585)	(-0.281)	(-1.346)	(-1.297)	(-1.713)
GRS	[0.723]	[1.099]	[1.729]	[0.973]	[1.527]	[2.230]*	[0.602]	[1.007]	[1.210]	[0.998]	[1.255]	[2.007]*

Financials

Table 52: Properties of the quintile portfolios sorted on Performance Ratio characteristics of the **Financials** sector.

	Panel A: Descriptives.											
Sort:	Environment			Social			Governance			ESG		
	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p
Worst	0.459	7.384	0.062	0.384	6.573	0.058	0.585	6.331	0.092	0.757	6.850	0.110
Two	1.014	7.108	0.143	0.607	6.736	0.090	0.769	7.927	0.097	0.455	7.602	0.060
Three	0.498	6.423	0.078	0.742	9.034	0.082	1.215	7.357	0.165	0.863	8.358	0.103
Four	0.560	7.322	0.076	0.386	6.612	0.058	0.429	5.938	0.072	0.148	7.126	0.021
Best	0.618	6.054	0.102	0.617	6.656	0.093	0.562	6.419	0.088	0.611	6.304	0.097
Diff	0.159	7.620	0.021	0.234	7.578	0.031	-0.023	6.371	-0.004	-0.146	7.538	-0.019
Decr		-0.298 (0.617)			-0.546 (0.707)			0.056 (0.478)			0.323 (0.373)	
	Panel B: Multifactor time-series regression alphas and GRS test.											
Sort:	Environment			Social			Governance			ESG		
	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact
Worst	-0.182	-0.740*	-0.697*	-0.277	-0.483	-0.507	-0.308	-0.496*	-0.627**	-0.102	-0.313	-0.379
	(-0.434)	(-1.865)	(-1.740)	(-0.799)	(-1.359)	(-1.541)	(-1.033)	(-1.797)	(-2.454)	(-0.328)	(-1.032)	(-1.374)
2	0.007	-0.182	-0.200	-0.298	-0.480	-0.536*	-0.438	-0.386	-0.650*	-0.500	-0.675*	-0.744*
	(0.021)	(-0.532)	(-0.590)	(-0.866)	(-1.517)	(-1.731)	(-1.144)	(-0.998)	(-1.894)	(-1.200)	(-1.758)	(-1.934)
3	-0.360	-0.449	-0.537*	-0.481	-0.679	-0.768*	0.175	0.122	0.042	-0.315	-0.599	-0.667*
	(-1.116)	(-1.552)	(-1.854)	(-1.042)	(-1.527)	(-1.782)	(0.456)	(0.314)	(0.112)	(-0.727)	(-1.482)	(-1.653)
4	-0.554	-0.451	-0.711**	-0.597*	-0.598*	-0.743**	-0.356	-0.541**	-0.520**	-0.893**	-0.917***	-1.127***
	(-1.576)	(-1.301)	(-2.407)	(-1.793)	(-1.958)	(-2.575)	(-1.384)	(-2.249)	(-2.161)	(-2.555)	(-2.749)	(-3.885)
Best	-0.003	-0.025	-0.168	-0.349	-0.355	-0.488**	-0.159	-0.658***	-0.539***	-0.062	-0.206	-0.207
	(-0.009)	(-0.089)	(-0.636)	(-1.417)	(-1.424)	(-2.312)	(-0.619)	(-3.366)	(-2.969)	(-0.237)	(-0.942)	(-0.920)
Diff	0.179	0.715	0.529	-0.072	0.128	0.02	0.15	-0.162	0.088	0.04	0.107	0.172
	(0.385)	(1.500)	(1.160)	(-0.241)	(0.322)	(0.064)	(0.720)	(-0.613)	(0.421)	(0.147)	(0.390)	(0.633)
GRS	[1.139]	[1.487]	[2.233]*	[0.703]	[1.214]	[1.933]*	[0.781]	[3.285]***	[2.961]**	[1.602]	[1.827]	[3.411]***

Table 53: Properties of the quintile portfolios sorted on LSEG characteristics of the **Financials** sector.

	Panel A: Descriptives.											
Sort:	Environment			Social			Governance			ESG		
	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p
Worst	0.828	7.043	0.118	0.276	6.417	0.043	0.677	5.872	0.115	0.425	6.321	0.067
Two	0.946	7.533	0.126	0.865	7.624	0.113	0.357	6.506	0.055	0.655	6.351	0.103
Three	0.282	6.671	0.042	0.53	7.649	0.069	0.945	8.112	0.117	0.551	7.495	0.073
Four	0.461	6.991	0.066	0.69	6.759	0.102	0.384	6.968	0.055	1.183	8.219	0.144
Best	0.396	6.869	0.058	0.633	6.726	0.094	0.945	6.895	0.137	0.502	6.52	0.077
Diff	-0.432	7.44	-0.058	0.357	6.697	0.053	0.269	6.162	0.044	0.077	6.61	0.012
Decr		0.937 (0.174)			-0.936 (0.797)			-0.716 (0.763)			-0.187 (0.574)	
	Panel B: Multifactor time-series regression alphas and GRS test.											
Sort:	Environment			Social			Governance			ESG		
	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact
Worst	0.032	-0.273	-0.319	-0.417	-0.680**	-0.622*	-0.006	-0.322	-0.264	-0.231	-0.533*	-0.416
	(0.080)	(-0.686)	(-0.827)	(-1.243)	(-2.155)	(-1.930)	(-0.018)	(-1.144)	(-0.941)	(-0.747)	(-1.747)	(-1.409)
2	-0.276	-0.406	-0.429	-0.178	-0.308	-0.42	-0.513	-0.717**	-0.588**	-0.187	-0.352	-0.344
	(-0.780)	(-1.231)	(-1.273)	(-0.487)	(-0.786)	(-1.252)	(-1.711)	(-2.422)	(-2.018)	(-0.560)	(-1.104)	(-1.062)
3	-0.682**	-0.57	-0.667**	-0.472	-0.534	-0.513	-0.283	-0.38	-0.387	-0.442	-0.518	-0.592
	(-1.968)	(-1.619)	(-1.966)	(-1.171)	(-1.312)	(-1.273)	(-0.715)	(-0.957)	(-0.981)	(-1.148)	(-1.295)	(-1.599)
4	-0.478	-0.367	-0.445	-0.362	-0.396	-0.490*	-0.679**	-0.468	-0.612*	-0.071	-0.297	-0.388
	(-1.417)	(-1.210)	(-1.426)	(-1.173)	(-1.292)	(-1.669)	(-2.034)	(-1.374)	(-1.881)	(-0.190)	(-0.774)	(-1.117)
Best	-0.318	-0.375	-0.365	-0.241	-0.296	-0.314	-0.194	-0.183	-0.355	-0.314	-0.257	-0.333
	(-1.057)	(-1.162)	(-1.286)	(-0.901)	(-1.136)	(-1.253)	(-0.705)	(-0.556)	(-1.347)	(-1.09)	(-0.971)	(-1.256)
Diff	-0.35	-0.102	-0.046	0.176	0.384	0.308	-0.188	0.139	-0.091	-0.083	0.276	0.084
	(-0.817)	(-0.237)	(-0.109)	(0.620)	(1.413)	(1.077)	(-0.659)	(0.372)	(-0.319)	(-0.283)	(1.028)	(0.287)
GRS	[0.996]	[0.862]	[1.256]	[0.544]	[1.167]	[1.286]	[1.138]	[1.369]	[1.147]	[0.358]	[0.973]	[0.923]

healthcare

Table 54: Properties of the quintile portfolios sorted on Performance Ratio characteristics of the **Healthcare** sector.

	Panel A: Descriptives.											
Sort:	Environment			Social			Governance			ESG		
	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p
Worst	0.463	10.426	0.044	1.141	9.498	0.120	0.722	6.619	0.109	1.138	9.201	0.124
Two	0.596	9.304	0.064	1.169	9.721	0.120	0.490	6.301	0.078	0.510	6.749	0.076
Three	1.062	8.796	0.121	0.541	6.296	0.086	0.714	4.954	0.144	1.009	6.335	0.159
Four	0.535	6.625	0.081	0.309	6.150	0.050	0.834	5.076	0.164	0.387	5.903	0.066
Best	0.607	4.912	0.124	0.736	4.373	0.168	0.677	3.806	0.178	0.506	4.634	0.109
Diff	0.144	9.948	0.015	-0.405	8.807	-0.046	-0.045	5.872	-0.008	-0.632	8.504	-0.074
Decr		-0.239 (0.595)			0.716 (0.237)			0.113 (0.455)			1.124 (0.130)	
	Panel B: Multifactor time-series regression alphas and GRS test.											
Sort:	Environment			Social			Governance			ESG		
	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact
Worst	-0.331	-0.074	-0.237	0.330	0.574	0.430	0.049	-0.004	0.073	0.347	0.559	0.414
	(-0.495)	(-0.118)	(-0.373)	(0.843)	(1.542)	(1.284)	(0.217)	(-0.021)	(0.397)	(0.930)	(1.554)	(1.289)
2	-0.219	-0.037	-0.213	0.334	0.421	0.083	-0.156	-0.424	-0.283	-0.122	-0.146	-0.146
	(-0.388)	(-0.066)	(-0.381)	(0.528)	(0.651)	(0.132)	(-0.449)	(-1.306)	(-0.911)	(-0.301)	(-0.379)	(-0.374)
3	0.468	0.403	0.544	-0.091	-0.23	-0.174	0.118	0.228	0.167	0.402	0.168	0.177
	(1.264)	(1.115)	(1.561)	(-0.255)	(-0.666)	(-0.497)	(0.393)	(0.769)	(0.579)	(1.027)	(0.462)	(0.481)
4	-0.152	-0.443	-0.370	-0.388	-0.614*	-0.544	0.220	0.306	0.215	-0.261	-0.558*	-0.440
	(-0.419)	(-1.304)	(-1.15)	(-1.106)	(-1.880)	(-1.638)	(0.73)	(1.105)	(0.765)	(-0.784)	(-1.908)	(-1.515)
Best	-0.083	-0.212	-0.159	0.137	0.018	0.052	0.097	0.219	0.097	-0.187	-0.324	-0.322*
	(-0.338)	(-1.052)	(-0.838)	(0.572)	(0.095)	(0.289)	(0.507)	(1.147)	(0.572)	(-0.812)	(-1.616)	(-1.672)
Diff	0.248	-0.138	0.078	-0.193	-0.557	-0.378	0.048	0.223	0.024	-0.534	-0.882**	-0.736**
	(0.368)	(-0.199)	(0.113)	(-0.534)	(-1.350)	(-1.120)	(0.242)	(0.996)	(0.132)	(-1.465)	(-2.190)	(-2.167)
GRS	[0.507]	[0.874]	[0.994]	[0.645]	[1.299]	[0.885]	[0.269]	[1.030]	[0.488]	[0.923]	[1.733]	[1.528]

Table 55: Properties of the quintile portfolios sorted on LSEG characteristics of the **Healthcare** sector.

	Panel A: Descriptives.											
Sort:	Environment			Social			Governance			ESG		
	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p
Worst	0.851	10.202	0.083	0.593	9.706	0.061	0.526	9.649	0.055	0.707	10.179	0.069
Two	0.422	13.068	0.032	1.344	9.035	0.149	1.132	8.394	0.135	0.621	7.561	0.082
Three	0.813	8.269	0.098	0.537	6.465	0.083	0.285	6.232	0.046	0.406	6.459	0.063
Four	0.579	5.873	0.099	0.584	5.996	0.097	0.507	5.396	0.094	0.404	6.108	0.066
Best	0.518	4.76	0.109	0.647	4.543	0.142	0.609	5.282	0.115	0.72	4.868	0.148
Diff	-0.333	10.377	-0.032	0.054	9.009	0.006	0.083	9.447	0.009	0.013	9.307	0.001
Decr	0.513 (0.304)			-0.097 (0.539)			-0.156 (0.562)			-0.025 (0.510)		
	Panel B: Multifactor time-series regression alphas and GRS test.											
Sort:	Environment			Social			Governance			ESG		
	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact
Worst	0.285	0.415	0.398	-0.188	0.185	0.177	-0.126	0.074	0.083	-0.082	0.265	0.269
	(0.434)	(0.654)	(0.626)	(-0.371)	(0.419)	(0.407)	(-0.252)	(0.163)	(0.185)	(-0.154)	(0.577)	(0.599)
2	-0.481	0.035	-0.044	0.709	0.642	0.648	0.318	0.341	0.27	-0.027	0.043	0.016
	(-0.638)	(0.050)	(-0.064)	(1.490)	(1.367)	(1.390)	(0.798)	(0.878)	(0.739)	(-0.064)	(0.102)	(0.038)
3	0.160	-0.295	-0.211	-0.200	-0.365	-0.368	-0.417	-0.495	-0.481	-0.212	-0.296	-0.250
	(0.389)	(-0.715)	(-0.550)	(-0.544)	(-1.044)	(-1.079)	(-1.169)	(-1.550)	(-1.499)	(-0.562)	(-0.829)	(-0.708)
4	-0.101	-0.236	-0.132	-0.143	-0.248	-0.203	-0.155	-0.376	-0.371	-0.347	-0.649**	-0.570**
	(-0.349)	(-0.839)	(-0.580)	(-0.429)	(-0.808)	(-0.709)	(-0.496)	(-1.427)	(-1.418)	(-1.108)	(-2.124)	(-2.167)
Best	-0.272	-0.357*	-0.440**	-0.014	-0.010	-0.065	-0.182	-0.238	-0.204	-0.017	0.085	0.028
	(-1.227)	(-1.866)	(-2.439)	(-0.060)	(-0.047)	(-0.311)	(-0.792)	(-1.020)	(-1.061)	(-0.067)	(0.426)	(0.136)
Diff	-0.557	-0.772	-0.839	0.174	-0.195	-0.242	-0.056	-0.312	-0.287	0.066	-0.18	-0.240
	(-0.806)	(-1.101)	(-1.195)	(0.344)	(-0.409)	(-0.510)	(-0.112)	(-0.584)	(-0.597)	(0.122)	(-0.348)	(-0.475)
GRS	[0.562]	[0.922]	[1.223]	[0.644]	[0.899]	[1.077]	[0.681]	[1.191]	[1.411]	[0.281]	[0.997]	[1.051]

Technology

Table 56: Properties of the quintile portfolios sorted on Performance Ratio characteristics of the **Technology** sector.

	Panel A: Descriptives.											
Sort:	Environment			Social			Governance			ESG		
	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p
Worst	-0.143	6.237	-0.023	0.383	7.121	0.054	0.480	5.520	0.087	0.403	6.195	0.065
Two	0.783	7.172	0.109	0.459	6.491	0.071	0.635	5.779	0.110	0.466	8.028	0.058
Three	0.714	6.844	0.104	0.649	6.934	0.094	0.65	6.271	0.104	0.609	7.141	0.085
Four	0.254	4.952	0.051	0.086	6.224	0.014	0.580	5.457	0.106	0.286	5.628	0.051
Best	1.037	6.351	0.163	1.052	6.027	0.175	0.979	5.163	0.190	1.087	6.405	0.170
Diff	1.179	7.735	0.152	0.669	7.644	0.087	0.499	5.062	0.099	0.684	7.030	0.097
Decr	-2.506 (0.994)			-1.405 (0.920)			-1.476 (0.930)			-1.546 (0.939)		
	Panel B: Multifactor time-series regression alphas and GRS test.											
Sort:	Environment			Social			Governance			ESG		
	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact
Worst	-0.496	-0.757**	-0.598*	-0.122	-0.292	-0.074	-0.015	-0.347	-0.174	-0.094	-0.268	-0.069
	(-1.497)	(-2.119)	(-1.770)	(-0.373)	(-0.769)	(-0.222)	(-0.072)	(-1.456)	(-0.863)	(-0.358)	(-0.859)	(-0.259)
2	0.229	0.171	0.29	-0.063	-0.242	-0.107	-0.103	-0.118	-0.112	-0.065	-0.332	-0.176
	(0.600)	(0.448)	(0.739)	(-0.189)	(-0.679)	(-0.312)	(-0.381)	(-0.425)	(-0.410)	(-0.150)	(-0.770)	(-0.406)
3	0.046	-0.039	0.046	0.152	-0.162	-0.024	-0.158	-0.224	-0.257	-0.085	-0.174	-0.166
	(0.144)	(-0.121)	(0.141)	(0.409)	(-0.451)	(-0.066)	(-0.544)	(-0.728)	(-0.861)	(-0.231)	(-0.445)	(-0.438)
4	-0.169	-0.349	-0.25	-0.578*	-0.689**	-0.632**	0.073	-0.126	-0.098	-0.309	-0.446	-0.363
	(-0.626)	(-1.281)	(-0.973)	(-1.831)	(-2.14)	(-2.027)	(0.236)	(-0.432)	(-0.336)	(-1.096)	(-1.542)	(-1.308)
Best	0.060	0.056	-0.014	0.112	0.16	0.06	0.546**	0.188	0.213	0.105	0.14	0.062
	(0.341)	(0.280)	(-0.080)	(0.610)	(0.783)	(0.326)	(2.086)	(0.691)	(0.864)	(0.587)	(0.682)	(0.349)
Diff	0.556	0.813**	0.584	0.233	0.452	0.134	0.561**	0.534	0.387	0.199	0.408	0.131
	(1.503)	(2.110)	(1.573)	(0.688)	(1.132)	(0.391)	(2.083)	(1.610)	(1.461)	(0.664)	(1.282)	(0.436)
GRS	[0.615]	[1.316]	[0.965]	[0.782]	[1.119]	[0.887]	[1.201]	[0.833]	[0.717]	[0.387]	[0.966]	[0.521]

Table 57: Properties of the quintile portfolios sorted on LSEG characteristics of the **Technology** sector.

	Panel A: Descriptives.											
Sort:	Environment			Social			Governance			ESG		
	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p
Worst	-0.124	6.617	-0.0190	0.501	6.291	0.08	0.707	8.131	0.087	0.178	7.208	0.025
Two	0.533	7.503	0.071	0.198	6.335	0.031	0.622	5.896	0.105	0.620	6.945	0.089
Three	0.67	5.913	0.113	0.319	6.798	0.047	0.581	6.022	0.097	0.718	6.222	0.115
Four	0.286	6.082	0.047	0.294	5.861	0.050	0.478	5.709	0.084	0.429	5.553	0.077
Best	1.090	6.297	0.173	1.054	6.169	0.171	0.811	5.930	0.137	1.003	6.211	0.162
Diff	1.213	7.847	0.155	0.552	7.162	0.077	0.104	7.270	0.014	0.826	7.773	0.106
Decr	-2.534 (0.994)			-1.170 (0.879)			-0.231 (0.592)			-1.776 (0.962)		
	Panel B: Multifactor time-series regression alphas and GRS test.											
Sort:	Environment			Social			Governance			ESG		
	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact
Worst	-0.624*	-0.635*	-0.752**	-0.142	-0.182	-0.314	-0.216	-0.078	-0.302	-0.506	-0.372	-0.515
	(-1.743)	(-1.743)	(-2.073)	(-0.519)	(-0.572)	(-1.142)	(-0.548)	(-0.192)	(-0.780)	(-1.526)	(-0.968)	(-1.510)
2	-0.115	0.026	-0.055	-0.318	-0.2	-0.317	-0.077	-0.107	-0.213	0.182	0.259	0.09
	(-0.298)	(0.068)	(-0.144)	(-1.068)	(-0.644)	(-1.032)	(-0.278)	(-0.343)	(-0.783)	(0.466)	(0.734)	(0.229)
3	0.093	0.037	0.076	-0.369	-0.558*	-0.587*	0.090	0.062	0.04	-0.029	-0.075	-0.116
	(0.345)	(0.130)	(0.283)	(-0.987)	(-1.672)	(-1.737)	(0.276)	(0.188)	(0.119)	(-0.102)	(-0.249)	(-0.406)
4	-0.405	-0.672**	-0.637**	-0.332	-0.479*	-0.426	-0.108	-0.156	-0.185	-0.115	-0.306	-0.258
	(-1.322)	(-2.390)	(-2.324)	(-1.213)	(-1.701)	(-1.624)	(-0.335)	(-0.481)	(-0.573)	(-0.426)	(-1.093)	(-0.953)
Best	0.033	0.063	-0.001	0.069	0.116	0.054	-0.118	-0.146	-0.164	-0.03	-0.015	-0.058
	(0.208)	(0.295)	(-0.005)	(0.344)	(0.473)	(0.269)	(-0.683)	(-0.68)	(-0.955)	(-0.183)	(-0.075)	(-0.364)
Diff	0.658*	0.697*	0.751**	0.211	0.298	0.368	0.097	-0.068	0.139	0.476	0.357	0.456
	(1.755)	(1.837)	(1.995)	(0.744)	(0.789)	(1.297)	(0.248)	(-0.169)	(0.365)	(1.375)	(0.915)	(1.309)
GRS	[1.059]	[1.730]	[2.037]*	[0.754]	[1.094]	[1.524]	[0.181]	[0.205]	[0.472]	[0.500]	[0.534]	[0.649]

Utilities

Table 58: Properties of the quintile portfolios sorted on Performance Ratio characteristics of the **Utilities** sector.

	Panel A: Descriptives.											
Sort:	Environment			Social			Governance			ESG		
	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p
Worst	0.731	4.266	0.171	0.168	4.719	0.036	0.014	5.199	0.003	0.309	4.846	0.064
Two	0.221	5.904	0.038	0.243	5.082	0.048	0.556	5.790	0.096	-0.135	5.386	-0.025
Three	0.473	5.221	0.091	0.113	5.349	0.021	-0.207	6.406	-0.032	0.192	5.029	0.038
Four	-0.108	5.246	-0.021	-0.047	6.621	-0.007	0.595	3.970	0.150	0.365	6.437	0.057
Best	0.097	6.104	0.016	0.280	6.326	0.044	0.647	3.570	0.181	0.349	4.808	0.073
Diff	-0.634	6.382	-0.099	0.112	6.862	0.016	0.633	5.613	0.113	0.040	6.198	0.006
Decr	1.554* (0.060)			-0.241 (0.595)			-1.686 (0.954)			-0.100 (0.540)		
	Panel B: Multifactor time-series regression alphas and GRS test.											
Sort:	Environment			Social			Governance			ESG		
	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact
Worst	0.704***	0.544**	0.646***	0.206	0.131	0.175	0.07	0.049	-0.053	0.351	0.249	0.277
	(2.829)	(2.371)	(2.813)	(0.877)	(0.620)	(0.846)	(0.385)	(0.283)	(-0.398)	(1.455)	(1.141)	(1.33)
2	0.216	0.054	0.186	0.235	0.139	0.12	0.327	0.108	0.213	-0.128	-0.125	-0.062
	(0.710)	(0.200)	(0.716)	(0.925)	(0.622)	(0.562)	(1.139)	(0.363)	(0.736)	(-0.445)	(-0.518)	(-0.238)
3	0.434	0.309	0.401	-0.021	0.036	0.056	-0.443	-0.677**	-0.505	0.168	0.155	0.196
	(1.428)	(1.06)	(1.348)	(-0.071)	(0.128)	(0.199)	(-1.383)	(-2.032)	(-1.608)	(0.641)	(0.602)	(0.743)
4	-0.179	-0.288	-0.185	0.025	-0.047	0.014	0.289	-0.109	-0.101	0.17	-0.012	-0.113
	(-0.585)	(-0.937)	(-0.597)	(0.065)	(-0.12)	(0.035)	(1.486)	(-0.673)	(-0.648)	(0.561)	(-0.044)	(-0.382)
Best	0.054	0.071	-0.181	0.065	-0.156	-0.194	0.296*	-0.046	-0.079	0.007	-0.272	-0.309
	(0.230)	(0.259)	(-0.811)	(0.250)	(-0.636)	(-0.757)	(1.721)	(-0.295)	(-0.616)	(0.031)	(-1.182)	(-1.367)
Diff	-0.650**	-0.473	-0.827***	-0.142	-0.287	-0.37	0.226	-0.095	-0.025	-0.344	-0.521*	-0.586**
	(-2.239)	(-1.361)	(-2.873)	(-0.441)	(-0.989)	(-1.205)	(1.210)	(-0.399)	(-0.169)	(-1.135)	(-1.837)	(-2.161)
GRS	[2.076]*	[1.526]	[2.769]**	[0.228]	[0.240]	[0.357]	[1.538]	[0.997]	[0.830]	[0.744]	[0.996]	[1.361]

Table 59: Properties of the quintile portfolios sorted on LSEG characteristics of the **Utilities** sector.

	Panel A: Descriptives.											
Sort:	Environment			Social			Governance			ESG		
	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p
Worst	0.795	5.122	0.155	0.245	5.084	0.048	0.328	4.654	0.071	0.655	5.021	0.13
Two	0.277	5.722	0.048	0.344	4.851	0.071	0.135	5.916	0.023	-0.265	5.296	-0.05
Three	0.01	5.477	0.002	0.01	5.1	0.002	0.355	6.249	0.057	0.238	5.371	0.044
Four	-0.001	6.15	-0.	-0.017	5.263	-0.003	-0.52	7.071	-0.074	0.265	6.093	0.043
Best	-0.129	6.529	-0.02	0.311	6.178	0.05	0.365	4.597	0.079	-0.262	7.336	-0.036
Diff	-0.924	7.109	-0.13	0.066	7.34	0.009	0.036	5.257	0.007	-0.917	8.01	-0.114
Decr	1.851** (0.032)			-0.130 (0.552)			-0.088 (0.535)			1.669** (0.048)		
	Panel B: Multifactor time-series regression alphas and GRS test.											
Sort:	Environment			Social			Governance			ESG		
	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact
Worst	0.648**	0.480*	0.506*	0.019	0.195	0.102	0.202	0.178	0.196	0.454*	0.52**	0.464**
	(2.281)	(1.800)	(1.948)	(0.074)	(0.793)	(0.487)	(0.901)	(0.769)	(0.931)	(1.752)	(2.121)	(2.116)
2	0.206	0.017	0.184	0.099	0.2	0.045	-0.056	0.135	0.148	-0.396	-0.528**	-0.425*
	(0.670)	(0.063)	(0.723)	(0.482)	(0.804)	(0.228)	(-0.174)	(0.490)	(0.536)	(-1.477)	(-2.327)	(-1.840)
3	-0.089	-0.092	0.085	-0.124	0.041	0.076	0.225	0.238	0.29	0.058	0.296	0.323
	(-0.308)	(-0.307)	(0.297)	(-0.413)	(0.166)	(0.311)	(0.693)	(0.71)	(0.864)	(0.202)	(1.189)	(1.319)
4	-0.176	-0.31	-0.259	-0.116	-0.083	0.025	-0.662**	-0.400	-0.462*	0.149	0.086	0.139
	(-0.557)	(-0.966)	(-0.815)	(-0.420)	(-0.286)	(0.088)	(-2.352)	(-1.229)	(-1.798)	(0.422)	(0.248)	(0.400)
Best	-0.327	0.067	-0.126	0.169	-0.037	-0.092	0.318	-0.097	-0.072	-0.436	-0.134	-0.354
	(-1.344)	(0.291)	(-0.560)	(0.791)	(-0.176)	(-0.435)	(1.131)	(-0.363)	(-0.272)	(-1.641)	(-0.536)	(-1.363)
Diff	-0.974***	-0.414	-0.632**	0.151	-0.231	-0.195	0.116	-0.275	-0.268	-0.890***	-0.654**	-0.818***
	(-3.008)	(-1.243)	(-1.997)	(0.445)	(-0.707)	(-0.656)	(0.388)	(-0.841)	(-0.929)	(-3.038)	(-2.264)	(-2.791)
GRS	[2.492]**	[1.027]	[1.575]	[0.245]	[0.213]	[0.097]	[2.285]**	[0.586]	[2.012]*	[2.320]**	[2.433]**	[2.474]**

Real Estate

Table 60: Properties of the quintile portfolios sorted on Performance Ratio characteristics of the **Real Estate** sector.

	Panel A: Descriptives.											
Sort:	Environment			Social			Governance			ESG		
	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p
Worst	0.603	10.102	0.060	0.084	8.642	0.010	0.147	8.275	0.018	0.071	8.638	0.008
Two	-0.045	8.341	-0.005	0.345	8.372	0.041	0.609	9.755	0.062	-0.100	9.113	-0.011
Three	0.274	9.441	0.029	0.383	8.674	0.044	0.245	9.042	0.027	0.169	7.922	0.021
Four	0.686	5.974	0.115	-0.233	7.761	-0.03	0.511	6.621	0.077	0.56	7.778	0.072
Best	0.339	6.814	0.050	0.401	9.72	0.041	0.597	6.775	0.088	0.441	6.548	0.067
Diff	-0.264	8.432	-0.031	0.317	10.075	0.031	0.450	7.301	0.062	0.370	7.243	0.051
Decr	0.528 (0.299)			-0.424 (0.664)			-0.932 (0.824)			-0.831 (0.797)		
	Panel B: Multifactor time-series regression alphas and GRS test.											
Sort:	Environment			Social			Governance			ESG		
	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact
Worst	-0.26	-0.248	-0.287	-0.254	-0.222	-0.186	-0.184	-0.229	-0.119	-0.264	-0.258	-0.200
	(-0.487)	(-0.505)	(-0.598)	(-0.623)	(-0.604)	(-0.536)	(-0.463)	(-0.621)	(-0.369)	(-0.649)	(-0.688)	(-0.560)
2	-0.32	-0.396	-0.3	-0.204	-0.341	-0.315	-0.014	-0.253	-0.232	-0.673	-0.740*	-0.759*
	(-0.830)	(-1.039)	(-0.887)	(-0.430)	(-0.774)	(-0.714)	(-0.025)	(-0.473)	(-0.435)	(-1.355)	(-1.740)	(-1.744)
3	-0.339	-0.47	-0.391	-0.145	-0.165	-0.173	-0.409	-0.409	-0.415	-0.37	-0.49	-0.462
	(-0.739)	(-0.951)	(-0.977)	(-0.283)	(-0.335)	(-0.354)	(-0.822)	(-0.756)	(-0.839)	(-0.791)	(-1.135)	(-1.086)
4	0.276	0.119	0.199	-0.804*	-0.826**	-0.785**	-0.114	-0.182	-0.195	0.086	-0.115	0.025
	(0.793)	(0.369)	(0.624)	(-1.745)	(-2.086)	(-2.002)	(-0.320)	(-0.649)	(-0.712)	(0.183)	(-0.269)	(0.066)
Best	0.015	-0.139	0.020	-0.081	-0.36	-0.096	-0.144	-0.201	-0.214	0.041	-0.18	-0.033
	(0.037)	(-0.378)	(0.065)	(-0.209)	(-0.621)	(-0.275)	(-0.432)	(-0.879)	(-0.967)	(0.098)	(-0.543)	(-0.098)
Diff	0.275	0.11	0.307	0.173	-0.138	0.09	0.040	0.029	-0.095	0.305	0.078	0.166
	(0.649)	(0.215)	(0.729)	(0.671)	(-0.257)	(0.360)	(0.15)	(0.089)	(-0.404)	(0.823)	(0.275)	(0.464)
GRS	[0.594]	[0.538]	[0.553]	[0.670]	[0.924]	[0.837]	[0.152]	[0.236]	[0.354]	[0.686]	[0.792]	[0.784]

Table 61: Properties of the quintile portfolios sorted on LSEG characteristics of the **Real Estate** sector.

	Panel A: Descriptives.											
Sort:	Environment			Social			Governance			ESG		
	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p
Worst	0.619	10.123	0.061	-0.044	8.622	-0.005	0.262	8.683	0.030	-0.272	8.987	-0.030
Two	-0.08	8.518	-0.009	0.536	7.403	0.072	0.026	8.415	0.003	0.166	8.154	0.020
Three	0.719	7.245	0.099	0.089	9.083	0.01	0.399	7.929	0.050	0.404	9.159	0.044
Four	0.79	6.17	0.128	0.455	8.536	0.053	0.328	11.202	0.029	-0.388	8.931	-0.043
Best	0.284	6.889	0.041	0.434	9.785	0.044	0.202	9.005	0.022	0.834	8.049	0.104
Diff	-0.336	8.584	-0.039	0.478	9.941	0.048	-0.06	9.162	-0.007	1.105	8.284	0.133
Decr	0.637 (0.262)			-0.628 (0.735)			0.089 (0.464)			-1.757 (0.961)		
	Panel B: Multifactor time-series regression alphas and GRS test.											
Sort:	Environment			Social			Governance			ESG		
	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact
Worst	0.079	-0.24	-0.097	-0.633	-0.481	-0.591	-0.094	-0.331	-0.113	-0.684	-0.808*	-0.654
	(0.151)	(-0.504)	(-0.219)	(-1.372)	(-1.129)	(-1.382)	(-0.206)	(-0.701)	(-0.263)	(-1.430)	(-1.773)	(-1.504)
2	-0.791*	-0.712	-0.798*	0.148	0.021	0.023	-0.305	-0.598	-0.408	-0.331	-0.277	-0.371
	(-1.774)	(-1.54)	(-1.819)	(0.35)	(0.049)	(0.055)	(-0.69)	(-1.363)	(-1.015)	(-0.721)	(-0.612)	(-0.83)
3	0.138	0.054	0.082	-0.468	-0.625	-0.472	-0.149	-0.23	-0.197	-0.157	-0.242	-0.176
	(0.325)	(0.138)	(0.209)	(-0.868)	(-1.167)	(-0.878)	(-0.354)	(-0.560)	(-0.481)	(-0.292)	(-0.513)	(-0.369)
4	0.434	0.209	0.299	0.072	-0.31	-0.169	-0.279	-0.418	-0.287	-1.018**	-1.306***	-1.063**
	(1.238)	(0.629)	(0.950)	(0.141)	(-0.704)	(-0.393)	(-0.393)	(-0.586)	(-0.398)	(-2.122)	(-2.650)	(-2.220)
Best	-0.071	-0.228	-0.151	-0.395	-0.688	-0.363	-0.672	-0.506	-0.666	0.212	0.069	0.126
	(-0.175)	(-0.623)	(-0.441)	(-0.95)	(-1.533)	(-0.89)	(-1.449)	(-1.017)	(-1.551)	(0.452)	(0.168)	(0.309)
Diff	-0.15	0.012	-0.054	0.237	-0.207	0.228	-0.578	-0.175	-0.553	0.896**	0.877*	0.78*
	(-0.342)	(0.023)	(-0.124)	(0.721)	(-0.562)	(0.713)	(-1.584)	(-0.317)	(-1.511)	(2.180)	(1.973)	(1.950)
GRS	[1.639]	[0.838]	[1.522]	[0.567]	[0.646]	[0.442]	[0.756]	[0.496]	[0.760]	[1.413]	[1.719]	[1.375]

Industrials

Table 62: Properties of the quintile portfolios sorted on Performance Ratio characteristics of the **Industrials** sector.

	Panel A: Descriptives.											
Sort:	Environment			Social			Governance			ESG		
	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p
Worst	0.576	6.848	0.084	0.366	6.327	0.058	0.450	5.554	0.081	0.346	6.363	0.054
Two	-0.051	7.590	-0.007	0.656	6.660	0.098	0.520	6.444	0.081	0.576	7.909	0.073
Three	0.662	5.638	0.117	0.097	6.995	0.014	0.403	6.821	0.059	0.507	6.229	0.081
Four	0.354	7.055	0.05	0.511	6.305	0.081	0.947	5.272	0.18	0.311	6.432	0.048
Best	0.559	6.004	0.093	0.43	6.114	0.070	1.035	6.378	0.162	0.74	6.327	0.117
Diff	-0.017	6.044	-0.003	0.065	6.092	0.011	0.586	5.204	0.113	0.394	6.353	0.062
Decr	0.043 (0.483)			-0.196 (0.578)			-1.658 (0.951)			-1.026 (0.848)		
	Panel B: Multifactor time-series regression alphas and GRS test.											
Sort:	Environment			Social			Governance			ESG		
	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact
Worst	-0.060	-0.042	-0.173	-0.316	-0.346	-0.504**	-0.239	-0.430**	-0.524***	-0.317	-0.369	-0.515**
	(-0.199)	(-0.133)	(-0.568)	(-1.273)	(-1.326)	(-2.096)	(-1.275)	(-2.515)	(-3.337)	(-1.307)	(-1.523)	(-2.233)
2	-0.447	-0.847**	-0.736**	-0.274	-0.371	-0.504**	-0.215	-0.415**	-0.384*	-0.068	-0.348	-0.289
	(-1.308)	(-2.370)	(-2.240)	(-1.096)	(-1.364)	(-2.062)	(-0.988)	(-1.963)	(-1.832)	(-0.197)	(-1.019)	(-0.837)
3	0.060	-0.16	-0.187	-0.620**	-0.902***	-0.886***	-0.375	-0.740**	-0.720**	-0.272	-0.443*	-0.477*
	(0.236)	(-0.641)	(-0.743)	(-2.257)	(-3.327)	(-3.346)	(-1.220)	(-2.409)	(-2.337)	(-1.074)	(-1.788)	(-1.935)
4	-0.516**	-0.716***	-0.699***	-0.179	-0.414*	-0.378	0.266	-0.237	-0.21	-0.407*	-0.697***	-0.666***
	(-2.034)	(-2.92)	(-2.875)	(-0.707)	(-1.662)	(-1.514)	(1.284)	(-1.513)	(-1.352)	(-1.725)	(-3.161)	(-3.046)
Best	-0.262	-0.438**	-0.507***	-0.192	-0.618***	-0.519**	0.254	-0.178	-0.207	-0.014	-0.35	-0.352
	(-1.314)	(-2.122)	(-2.786)	(-0.826)	(-2.788)	(-2.423)	(0.896)	(-0.645)	(-0.803)	(-0.053)	(-1.395)	(-1.359)
Diff	-0.201	-0.395	-0.334	0.124	-0.272	-0.014	0.494*	0.252	0.316	0.302	0.019	0.162
	(-0.745)	(-1.249)	(-1.181)	(0.532)	(-0.963)	(-0.058)	(1.839)	(0.813)	(1.171)	(1.065)	(0.068)	(0.548)
GRS	[1.125]	[3.086]**	[2.961]**	[1.219]	[3.828]***	[3.899]***	[1.857]	[2.457]**	[2.953]**	[0.848]	[2.594]**	[2.766]**

Table 63: Properties of the quintile portfolios sorted on LSEG characteristics of the **Industrials** sector.

	Panel A: Descriptives.											
Sort:	Environment			Social			Governance			ESG		
	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p	$\bar{R}_p^e$	σ_p	ShR_p
Worst	0.56	6.622	0.085	0.316	6.527	0.048	0.356	5.891	0.06	0.225	6.322	0.036
Two	-0.061	7.461	-0.008	0.826	6.156	0.134	0.125	6.226	0.02	0.154	6.147	0.025
Three	0.208	5.848	0.036	0.35	6.875	0.051	0.578	6.803	0.085	0.776	7.183	0.108
Four	0.46	6.255	0.074	0.376	6.518	0.058	0.371	5.888	0.063	0.362	6.189	0.058
Best	0.576	6.25	0.092	0.229	6.018	0.038	0.477	6.385	0.075	0.339	6.453	0.053
Diff	0.015	6.148	0.003	-0.086	6.242	-0.014	0.121	5.741	0.021	0.115	6.106	0.019
Decr		0.042 (0.517)			0.243 (0.404)			-0.342(0.634)			-0.326 (0.628)	
	Panel B: Multifactor time-series regression alphas and GRS test.											
Sort:	Environment			Social			Governance			ESG		
	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact	4-Fact	7-Fact	9-Fact
Worst	0.011	-0.116	-0.192	-0.314	-0.394	-0.52	-0.156	-0.314*	-0.308	-0.307	-0.478*	-0.567**
	(0.039)	(-0.397)	(-0.686)	(-1.177)	(-1.425)	(-1.952)	(-0.7)	(-1.309)	(-1.431)	(-1.123)	(-1.759)	(-2.164)
2	-0.487	-0.763**	-0.516	0.003	-0.062	-0.24	-0.509*	-0.85***	-0.793***	-0.426	-0.47*	-0.489*
	(-1.508)	(-2.099)	(-1.607)	(0.013)	(-0.234)	(-1.04)	(-1.861)	(-3.173)	(-3.045)	(-1.473)	(-1.674)	(-1.662)
3	-0.44*	-0.649***	-0.694***	-0.474*	-0.622**	-0.656**	-0.298	-0.428*	-0.509**	0.05	-0.05	0.003
	(-1.8)	(-2.713)	(-2.964)	(-1.801)	(-2.362)	(-2.513)	(-1.163)	(-1.671)	(-2.036)	(0.166)	(-0.163)	(0.009)
4	-0.283	-0.368	-0.43*	-0.322	-0.514**	-0.46*	-0.322	-0.514**	-0.531**	-0.435*	-0.545**	-0.629***
	(-1.119)	(-1.473)	(-1.725)	(-1.204)	(-1.988)	(-1.756)	(-1.366)	(-2.272)	(-2.322)	(-1.953)	(-2.539)	(-3.032)
Best	-0.276	-0.473**	-0.52***	-0.379*	-0.785***	-0.678***	-0.287	-0.432**	-0.473**	-0.434**	-0.745***	-0.703***
	(-1.362)	(-2.436)	(-2.861)	(-1.758)	(-3.71)	(-3.378)	(-1.284)	(-1.824)	(-2.19)	(-1.984)	(-3.622)	(-3.398)
Diff	-0.287	-0.358	-0.328	-0.065	-0.39	-0.159	-0.13	-0.118	-0.165	-0.128	-0.267	-0.136
	(-1.105)	(-1.238)	(-1.236)	(-0.259)	(-1.318)	(-0.608)	(-0.587)	(-0.394)	(-0.707)	(-0.573)	(-1.061)	(-0.585)
GRS	[1.087]	[3.042]**	[3.035]**	[1.511]	[4.159]***	[3.767]***	[0.879]	[3.143]***	[3.150]***	[1.434]	[3.721]***	[3.882]***

Cross-sectional regressions

The following tables show the time series averages of the EIV corrected coefficients estimated using a 4, 7 or 9-factor model following Equation 3. To estimate the betas, at least 400 past daily observations are required. The ***, ** and * indicate the significance of the coefficients at the 1%, 5% and 10% level respectively.

Energy

Table 64: Cross-sectional regressions of the **Energy** sector.

Scoring:	Performance Ratio			LSEG		
	4-factor	7-factor	9-factor	4-factor	7-factor	9-factor
Const.	-0.098	-1.034	2.846*	-0.652	1.201	1.804
	(-0.081)	(-0.685)	(1.658)	(-0.553)	(0.752)	(1.209)
lME	0.023	0.124	-0.087	0.051	-0.010	-0.047
	(0.456)	(1.525)	(-1.184)	(1.031)	(-0.142)	(-0.684)
$lBtm$	0.274**	0.152	0.022	0.308***	0.148	0.125
	(2.374)	(1.333)	(0.163)	(2.715)	(1.190)	(0.610)
Pro	0.412	0.242	0.138	0.341	0.524*	0.244
	(1.459)	(0.798)	(0.390)	(1.178)	(1.894)	(0.621)
Inv	-0.052	-0.298	-0.006	0.002	0.286	0.273
	(-0.211)	(-0.787)	(-0.024)	(0.009)	(1.021)	(0.875)
$lRET12$	1.107***	0.737*	0.959**	1.002**	1.314*	1.911**
	(2.606)	(1.674)	(2.214)	(2.186)	(1.897)	(2.215)
Env	0.002		0.003	-0.002		0.003
	(0.169)		(0.375)	(-0.228)		(0.270)
Soc	-0.015		-0.010	-0.011*		-0.001
	(-0.907)		(-0.656)	(-1.746)		(-0.125)
Gov	0.002		0.003	0.006		-0.003
	(0.179)		(0.239)	(1.405)		(-0.475)
ESG		-0.008			-0.003	
		(-0.006)			(-0.919)	
$\hat{\beta}_{mk}$	-0.008	-2.596	0.231	0.071	-0.187	0.197
	(-0.006)	(-1.587)	(0.204)	(0.058	(-0.546)	(0.101)
$\hat{\beta}_{size}$		1.622*	-0.250		0.406	0.876
		(1.685)	(-0.349)		(1.347)	(0.746)
$\hat{\beta}_{value}$		-2.330	0.193		0.260	1.909
		(-0.762)	(0.122)		(0.927)	(0.519)
$\hat{\beta}_{Pro}$		1.820	2.748**		-0.603**	6.424**
		(1.049)	(2.225)		(2.239)	(2.382)
$\hat{\beta}_{Inv}$		-5.708*	-0.807		0.027	5.752
		(1.700)	(-0.526)		(0.093)	(1.225)
$\hat{\beta}_{Mom}$		-10.849*	-5.188		-0.673	-5.351
		(-1.717)	(-1.596)		(-1.577)	(-1.029)
$\hat{\beta}_{Env}$	-0.277		-0.617	0.569		-0.314
	(-0.212)		(-0.700)	(0.675)		-0.205
$\hat{\beta}_{Soc}$	0.711		2.214	-0.460		4.697
	(0.513)		(1.460)	(-0.393)		(1.288)
$\hat{\beta}_{Gov}$	0.230		-0.096	1.180		-0.091
	(0.305)		(-0.099)	(1.021)		(-0.046)
$\hat{\beta}_{ESG}$		-3.902			-0.158	
		(-1.399)			(-0.560)	
$\bar{C}_{Zcs}$	47.845	33.632	37.905	41.333	32.207	33.787
$\bar{C}_{\hat{\beta}}$	74.936	84.970	83.041	74.133	87.616	85.922
$\bar{C}_{ESG}$	16.474	4.886	11.401	11.153	4.363	7.925
$\bar{C}_{\hat{\beta}_{ESG}}$	87.339	20.074	46.637	67.177	20.925	56.177

The period used for Energy is July 2008 to December 2023 (186 months).

Basic Materials

Table 65: Cross-sectional regressions of the **Basic Materials** sector.

Scoring:	Performance Ratio			LSEG		
	4-factor	7-factor	9-factor	4-factor	7-factor	9-factor
Const.	1.926	1.354	2.518*	0.912	1.320	2.595
	(1.393)	(1.092)	(1.765)	(0.588)	(0.867)	(1.606)
lME	-0.050	-0.025	-0.074	-0.029	-0.035	-0.096
	(-0.884)	(-0.453)	(-1.280)	(-0.352)	(-0.516)	(-1.342)
$lBtm$	0.056	0.100	0.038	0.176	-0.067	0.130
	(0.453)	(0.603)	(0.346)	(0.976)	(-0.337)	(0.721)
Pro	0.064	0.059	0.232	0.141	0.219	-0.017
	(0.379)	(0.313)	(1.213)	(0.726)	(0.842)	(-0.084)
Inv	-0.239	-0.230	-0.428**	-0.122	-0.282	-0.271
	(-1.337)	(-1.329)	(-2.413)	(-0.503)	(-1.638)	(-1.290)
$lRET12$	0.732**	0.752*	0.852**	1.028**	0.576	0.643*
	(2.154)	(1.884)	(2.390)	(2.429)	(1.331)	(1.691)
Env	-0.006		-0.005	-0.006		-0.000
	(-0.902)		(-0.792)	(-1.274)		(-0.040)
Soc	0.008		0.005	0.003		0.001
	(0.757)		(0.572)	(0.478)		(0.190)
Gov	-0.011		-0.006	0.003		0.003
	(-1.023)		(-0.614)	(0.530)		(1.072)
ESG		-0.001			-0.004	
		(-0.147)			(-0.673)	
$\hat{\beta}_{mk}$	-0.020	-2.729*	0.120	0.457	-2.299	0.317
	(-0.020)	(-1.741)	(0.256)	(0.261	(-1.340)	(0.253)
$\hat{\beta}_{size}$		1.419	-0.257		1.414	-0.486
		(1.592)	(-0.491)		(1.273)	(-0.547)
$\hat{\beta}_{value}$		2.888**	0.727		3.324**	0.137
		(2.209)	(0.885)		(2.066)	(0.130)
$\hat{\beta}_{Pro}$		-3.155	-0.077		-4.481**	0.218
		(1.282)	(-0.081)		(-2.124)	(0.096)
$\hat{\beta}_{Inv}$		0.525	-0.843		-0.809	-0.679
		(0.224)	(-0.860)		(-0.243)	(-0.238)
$\hat{\beta}_{Mom}$		-0.579	-3.499*		1.068	-1.022
		(-0.122)	(-1.695)		(0.243)	(-0.405)
$\hat{\beta}_{Env}$	0.085		-0.047	0.366		0.962
	(0.085)		(-0.066)	(0.199)		(0.730)
$\hat{\beta}_{Soc}$	0.224		-0.667	0.254		1.280
	(0.236)		(-0.653)	(0.116)		(0.847)
$\hat{\beta}_{Gov}$	0.122		-0.034	1.037		-0.957
	(0.153)		(-0.034)	(0.303)		(-0.562)
$\hat{\beta}_{ESG}$		-2.042			-2.476	
		(-1.380)			(-1.433)	
$\bar{C}_{Zcs}$	40.283	27.985	35.880	40.732	27.833	33.115
$\bar{C}_{\hat{\beta}}$	77.915	83.003	74.154	80.123	83.586	79.524
$\bar{C}_{ESG}$	15.383	3.264	11.592	11.208	3.329	7.138
$\bar{C}_{\hat{\beta}_{ESG}}$	80.168	25.915	38.149	78.670	24.960	52.473

The period used for Basic Materials is July 2007 to December 2023 (198 months).

Consumer Cyclicals

Table 66: Cross-sectional regressions of the **Consumer Cyclicals** sector.

Scoring:	Performance Ratio			LSEG		
	4-factor	7-factor	9-factor	4-factor	7-factor	9-factor
Const.	2.436*	1.324	1.472	0.761	0.077	0.987
	(1.900)	(0.921)	(1.327)	(0.519)	(0.059)	(0.808)
lME	-0.063	-0.052	-0.029	-0.038	0.009	-0.035
	(-1.291)	(-0.812)	(-0.699)	(-0.644)	(0.157)	(-0.701)
$lBtm$	-0.003	-0.346*	-0.051	-0.003	-0.299*	0.174
	(-0.029)	(-1.731)	(-0.500)	(-0.029)	(-1.809)	(0.867)
Pro	0.036	-0.041	-0.009	0.015	-0.053	0.151
	(0.338)	(-0.559)	(-0.103)	(0.161)	(-0.796)	(1.033)
Inv	0.508**	0.373	0.356	-0.017	0.426	0.591
	(2.053)	(0.991)	(1.243)	(-0.061)	(1.315)	(1.246)
Mom	0.587	1.091**	0.504	0.614	0.852**	0.511
	(1.575)	(2.318)	(1.397)	(1.557)	(2.100)	(0.677)
Env	0.008		0.010*	-0.004		0.002
	(1.161)		(1.661)	(-1.073)		(0.490)
Soc	-0.007		-0.009	0.002		-0.002
	(-0.862)		(-1.266)	(0.412)		(-0.450)
Gov	-0.014*		-0.009	0.005		-0.002
	(-1.669)		(-0.944)	(1.266)		(-0.661)
ESG		0.004			0.001	
		(0.419)			(0.292)	
$\hat{\beta}_{mk}$	-0.344	-1.831	1.134	-0.106	-2.492	3.924
	(-0.292)	(-0.759)	(1.075)	(-0.045)	(-1.203)	(1.432)
$\hat{\beta}_{size}$		1.872	-0.318		2.206*	-1.912
		(1.192)	(-0.459)		(1.726)	(-1.167)
$\hat{\beta}_{value}$		3.838	-1.336		4.176*	-2.261
		(1.452)	(-1.095)		(1.897)	(-0.631)
$\hat{\beta}_{Pro}$		-4.757**	0.519		-4.348**	-0.101
		(-2.039)	(0.379)		(-2.287)	(-0.035)
$\hat{\beta}_{Inv}$		-0.812	-0.965		0.036	-0.812
		(-0.260)	(-1.041)		(0.014)	(-0.426)
$\hat{\beta}_{Mom}$		-2.317	-0.315		-2.418	0.756
		(-0.702)	(-0.292)		(-0.894)	(0.303)
$\hat{\beta}_{Env}$	0.308		0.772	-3.168		-0.317
	(0.553)		()1.302	(-1.377)		(-0.206)
$\hat{\beta}_{Soc}$	0.385		0.674	-0.606		-2.489
	(0.232)		(0.963)	(-0.180)		(-0.934)
$\hat{\beta}_{Gov}$	-0.219		-0.917	3.681		1.473
	(-0.344)		(-0.910)	(1.627)		0.697
$\hat{\beta}_{ESG}$		-0.369			-0.492	
		(-0.403)			(-0.565)	
$\bar{C}_{Zcs}$	51.316	31.621	41.218	47.097	30.078	39.103
$\bar{C}_{\hat{\beta}}$	86.039	91.905	80.707	86.129	88.957	76.992
$\bar{C}_{ESG}$	18.254	4.1117	14.329	10.078	2.691	7.587
$\bar{C}_{\hat{\beta}_{ESG}}$	71.107	17.790	37.123	73.424	18.999	33.662

The period used for Consumer Cyclicals is July 2005 to December 2023 (222 months).

Consumer Non-Cyclicals

Table 67: Cross-sectional regressions of the **Consumer Non-Cyclicals** sector.

Scoring:	Performance Ratio			LSEG		
	4-factor	7-factor	9-factor	4-factor	7-factor	9-factor
Const.	0.384	-0.978	1.361	-0.343	-2.215	-0.967
	(0.353)	(-0.670)	(0.998)	(-0.322)	(-1.458)	(-0.771)
lME	0.028	0.049	-0.045	0.031	0.104*	0.064
	(0.647)	(0.720)	(-0.892)	(0.562)	(1.738)	(1.288)
$lBtm$	0.013	-0.205	-0.024	-0.202	0.105	0.131
	(0.150)	(-0.586)	(-0.233)	(-1.433)	(0.846)	(0.878)
Pro	0.190**	0.347*	0.252***	0.033	0.238**	0.185**
	(2.371)	(1.919)	(3.166)	(0.280)	(1.964)	(2.157)
Inv	0.027	-0.900	0.014	0.065	-0.324	-0.513
	(0.123)	(-1.471)	(0.054)	(0.270)	(-0.993)	(-1.186)
Mom	0.397	0.485	0.428	0.528	0.643	0.324
	(1.107)	(0.481)	(0.973)	(1.200)	(1.194)	(0.664)
Env	-0.004		-0.013*	-0.007*		0.003
	(-0.595)		(-1.866)	(-1.674)		(0.414)
Soc	-0.002		0.010	-0.006		-0.010
	(-0.273)		(1.026)	(-1.530)		(-1.209)
Gov	-0.018**		-0.000	-0.008**		0.001
	(-2.135)		(-0.001)	(-2.451)		(0.178)
ESG		-0.025**			-0.015**	
		(-2.123)			(-2.045)	
$\hat{\beta}_{mk}$	-0.518	-3.901	-0.416	1.496	-0.947	0.058
	(-0.681)	(-1.456)	(-0.520)	(-0.550)	(-0.861)	(0.059)
$\hat{\beta}_{size}$		5.461*	-0.351		2.105	0.478
		(1.656)	(-0.508)		(1.578)	(0.562)
$\hat{\beta}_{value}$		6.267	1.100		2.094	-1.076
		(1.520)	(0.732)		(0.972)	(-0.493)
$\hat{\beta}_{Pro}$		9.520	-1.312		1.781	3.860
		(0.952)	(-0.772)		(0.772)	(1.209)
$\hat{\beta}_{Inv}$		-0.153	-0.755		-4.142	-0.398
		(-0.027)	(-0.320)		(-1.096)	(0.124)
$\hat{\beta}_{Mom}$		2.394	1.676		1.626	2.980
		(0.803)	(0.747)		(0.529)	(0.658)
$\hat{\beta}_{Env}$	-1.102		0.126	-1.667		1.289
	(-1.471)		(0.116)	(-1.549)		(0.957)
$\hat{\beta}_{Soc}$	-1.206		-2.541**	-3.168**		0.422
	(-1.279)		(-2.148)	(-2.176)		(0.402)
$\hat{\beta}_{Gov}$	-2.691***		-2.158**	-3.498***		-0.585
	(-2.817)		(-2,251)	(-2.607)		(-0.562)
$\hat{\beta}_{ESG}$		-0.123			-0.786	
		(-0.129)			(-0.675)	
$\bar{C}_{Zcs}$	49.618	36.022	41.888	47.583	34.310	38.113
$\bar{C}_{\hat{\beta}}$	84.633	84.440	79.919	87.874	83.612	81.368
$\bar{C}_{ESG}$	22.515	5.044	15.528	13.701	4.404	9.456
$\bar{C}_{\hat{\beta}_{ESG}}$	69.705	11.470	30.305	76.570	13.194	34.225

The period used for Consumer Non-Cyclicals is July 2007 to December 2023 (196 months).

Financials

Table 68: Cross-sectional regressions of the **Financials** sector.

Scoring:	Performance Ratio			LSEG		
	4-factor	7-factor	9-factor	4-factor	7-factor	9-factor
Const.	2.536**	1.531	1.249	2.278**	2.429**	2.047**
	(2.263)	(1.306)	(1.191)	(2.269)	(2.032)	(2.311)
lME	-0.080*	-0.077	-0.081	-0.095*	-0.105*	-0.079**
	(-1.672)	(-1.500)	(-1.611)	(-1.666)	(1.697)	(-1.966)
$lBtm$	-0.057	0.073	-0.000	-0.069	-0.076	-0.089
	(-0.665)	(0.793)	(-0.003)	(-0.859)	(-0.982)	(-0.770)
Pro	0.084	0.119**	0.132*	0.088	0.081	0.246
	(1.480)	(2.326)	(1.718)	(1.594)	(1.600)	(1.592)
Inv	0.112	-0.079	0.057	-0.025	0.067	-0.061
	(0.623)	(-0.464)	(0.266)	(-0.175)	(0.603)	-0.322
Mom	-0.013	-0.344	-0.181	0.145	0.940	0.579
	(-0.028)	(-0.488)	(-0.341)	(0.303)	(1.467)	(0.970)
Env	-0.005		-0.001	-0.002		-0.001
	(-1.084)		(-0.211)	(-0.676)		(-0.118)
Soc	-0.005		0.009	0.001		0.003
	(-0.863)		(0.554)	(0.304)		(0.737)
Gov	0.002		0.012	0.001		-0.004
	(0.259)		(0.586)	(0.386)		(-0.786)
ESG		0.014			-0.001	
		(1.405)			(-0.332)	
$\hat{\beta}_{mk}$	0.726	2.737**	-1.516	4.473	1.754*	3.352*
	(0.685)	(2.487)	(-1.133)	(1.333)	(1.805)	(1.902)
$\hat{\beta}_{size}$		-1.434	1.799*		-0.959	-2.493*
		(-1.622)	(1.941)		(-1.516)	(-1.905)
$\hat{\beta}_{value}$		-2.417**	0.442		-0.252	-1.222
		(-2.032)	(0.442)		(-0.383)	(-1.224)
$\hat{\beta}_{Pro}$		4.751	-3.438		-0.492	-3.054
		(1.281)	(-0.679)		(-0.182)	(-0.555)
$\hat{\beta}_{Inv}$		-2.247	1.180		0.000	-2.979
		(-0.558)	(0.780)		(0.000)	(-0.925)
$\hat{\beta}_{Mom}$		-2.720	0.476		-2.910	3.462
		(-0.804)	(0.079)		(-0.958)	(0.855)
$\hat{\beta}_{Env}$	-0.056		4.792**	-1.110		1.876
	(-0.094)		(2.045)	(-0.896)		(0.599)
$\hat{\beta}_{Soc}$	-0.166		4.450*	-0.076		0.030
	(-0.256)		(1.892)	(-0.102)		(0.016)
$\hat{\beta}_{Gov}$	0.325		4.213**	0.507		-3.935
	(0.840)		(2.017)	(0.520)		(-1.277)
$\hat{\beta}_{ESG}$		4.319			1.027*	
		(1.598)			(1.651)	
$\bar{C}_{Zcs}$	48.365	27.512	35.214	36.434	28.220	32.176
$\bar{C}_{\hat{\beta}}$	72.607	86.931	77.743	80.523	83.891	76.304
$\bar{C}_{ESG}$	12.875	4.141	9.937	8.355	3.011	6.431
$\bar{C}_{\hat{\beta}_{ESG}}$	77.280	24.562	44.065	79.582	17.071	43.095

The period used for Financials is July 2005 to December 2023 (222 months).

Healthcare

Table 69: Cross-sectional regressions of the **Healthcare** sector.

Scoring:	Performance Ratio			LSEG		
	4-factor	7-factor	9-factor	4-factor	7-factor	9-factor
Const.	1.249	3.237*	0.310	3.636**	3.703*	1.572
	(0.749)	(1.645)	(0.174)	(2.393)	(1.819)	(1.149)
lME	0.029	-0.060	0.047	-0.130*	-0.130	0.015
	(0.346)	(-0.516)	(0.552)	(-1.706)	(-1.296)	(0.273)
$lBtm$	-0.281*	-0.148	-0.262**	-0.184	0.072	-0.224
	(-1.748)	(-0.886)	(-2.059)	(-1.432)	(0.462)	(-1.582)
Pro	0.068	-0.051	-0.051	0.062	0.045	-0.089
	(0.285)	(-0.463)	(-0.404)	(0.394)	(0.495)	(-0.448)
Inv	-0.697	-0.035	0.292	-0.308	-0.375	-0.418
	(1.363)	(-0.110)	(0.735)	(-1.011)	(-1.199)	(-0.903)
Mom	0.388	-0.294	-0.243	0.361	-0.572	1.312**
	(0.489)	(-0.523)	(-0.319)	(0.803)	(-1.087)	(2.140)
Env	-0.001		-0.008	0.001		-0.012**
	(-0.074)		(-1.067)	(0.260)		(-1.984)
Soc	-0.020*		0.008	-0.001		-0.004
	(-1.683)		(0.536)	(-0.192)		(-0.700)
Gov	0.002		0.003	0.002		0.007*
	(0.197)		(0.234)	(0.398)		(1.656)
ESG		-0.019			-0.002	
		(-0.754)			(-0.249)	
$\hat{\beta}_{mk}$	-2.063	-2.591	-2.592**	2.370	1.837	-1.190
	(-0.676)	(-0.761)	(-2.168)	(0.916)	(0.521)	(-0.688)
$\hat{\beta}_{size}$		1.131	1.902		-1.291	0.011
		(0.498)	(1.404)		(-0.590)	(0.007)
$\hat{\beta}_{value}$		6.141*	-0.232		0.178	-2.045
		(1.874)	(-0.100)		(0.059)	(-0.957)
$\hat{\beta}_{Pro}$		-0.455	1.130		1.017	0.073
		(-0.159)	(0.687)		(0.391)	(0.067)
$\hat{\beta}_{Inv}$		5.427	6.970**		2.924	6.118
		(0.987)	(2.525)		(1.102)	(1.362)
$\hat{\beta}_{Mom}$		-0.226	-0.024		-0.475	-5.107*
		(-0.046)	(-0.009)		(-0.102)	-1.826
$\hat{\beta}_{Env}$	-1.084		-1.735	1.102		-2.268
	(-0.940)		(-1.127)	(0.859)		(-1.297)
$\hat{\beta}_{Soc}$	-3.533*		0.787	0.169		1.551
	(-1.831)		(0.848)	(0.157)		(0.882)
$\hat{\beta}_{Gov}$	-0.880		-0.001	-2.316		1.170
	(-1.166)		(-0.000)	(-1.234)		(0.490)
$\hat{\beta}_{ESG}$		-4.472			0.139	
		(-1.219)			(0.080)	
$\bar{C}_{Zcs}$	60.079	34.966	54.954	56.758	34.082	48.469
$\bar{C}_{\hat{\beta}}$	87.005	89.192	85.630	82.985	87.914	77.970
$\bar{C}_{ESG}$	19.647	4.161	18.021	15.202	3.825	12.520
$\bar{C}_{\hat{\beta}_{ESG}}$	80.950	29.550	52.265	82.718	20.349	52.002

The period used for Healthcare is July 2008 to December 2023 (186 months).

Technology

Table 70: Cross-sectional regressions of the **Technology** sector.

Scoring:	Performance Ratio			LSEG		
	4-factor	7-factor	9-factor	4-factor	7-factor	9-factor
Const.	0.165	1.544	-2.056	1.104	0.645	0.502
	(0.118)	(1.171)	(-1.076)	(0.118)	(0.618)	(0.286)
lME	0.019	-0.085	0.022	-0.020	-0.016	-0.076
	(0.369)	(-1.208)	(0.272)	(-0.379)	(-0.350)	(-1.063)
$lBtm$	-0.149	0.053	-0.207	-0.117	-0.232**	-0.266
	(-1.627)	(0.335)	(-0.968)	(-1.113)	(-2.208)	(-1.016)
Pro	-0.069	0.103	0.102	-0.055	0.046	0.084
	(-0.529)	(1.137)	(0.937)	(-0.535)	(0.570)	(0.648)
Inv	0.030	-0.163	-2.130	0.063	0.128	-0.698
	(0.111)	(-0.759)	(-1.155)	(0.255)	(0.756)	(-1.149)
Mom	0.249	0.332	2.949	-0.063	0.443	0.040
	(0.695)	(0.802)	(1.626)	(-0.172)	(1.349)	(0.051)
Env	-0.002		-0.006	-0.005*		0.019
	(-0.296)		(-0.789)	(-1.735)		(1.597)
Soc	-0.018*		-0.080	-0.011**		-0.020**
	(-1.894)		(-1.238)	(-2,020)		(-2.312)
Gov	0.000		0.072	0.001		-0.005
	(0.009)		(1.380)	(0.279)		(-0.890)
ESG		0.010			-0.004	
		(0.498)			(-1.033)	
$\hat{\beta}_{mk}$	1.059	2.125	2.547	3.550**	0.539	3.422
	(1.002)	(1.179)	(1.305)	(2.120)	(0.626)	(1.555)
$\hat{\beta}_{size}$		-1.353	-2.393		-0.289	-2.840
		(-1.161)	(-1.506)		(-0.406)	(-1.639)
$\hat{\beta}_{value}$		1.796	-4.847		0.983	4.868
		(0.984)	(-0.952)		(0.803)	(1.347)
$\hat{\beta}_{Pro}$		-3.853	0.536		-0.513	-4.844
		(-1.372)	(0.269)		(-0.557)	(-1.220)
$\hat{\beta}_{Inv}$		-2.080	-8.594		-2.058	-5.194
		(-1.227)	(-1.116)		(-1.532)	(-1.570)
$\hat{\beta}_{Mom}$		5.867	-17.830		-2.948*	1.359
		(1.045)	((-1.498))		(-1.732)	(0.224)
$\hat{\beta}_{Env}$	-1.159		-2.720	-0.508		-1.075
	(-1.132)		(-1.331)	(-0.605)		(-0.412)
$\hat{\beta}_{Soc}$	-1.874**		-10.237	-5.603**		-2.092
	(-2.213)		(-1.175)	(-2.386)		(-1.127)
$\hat{\beta}_{Gov}$	-0.355		-0.794	1.106		-1.842
	(-0.313)		(-0.443)	(-0.978)		(-0.614)
$\hat{\beta}_{ESG}$		-1.074			-0.654	
		(-0.520)			(-0.742)	
$\bar{C}_{Zcs}$	46.067	22.990	32.313	39.354	23.874	29.298
$\bar{C}_{\hat{\beta}}$	82.631	96.089	93.752	83.076	93.944	91.584
$\bar{C}_{ESG}$	22.817	3.668	13.765	9.299	3.568	6.738
$\bar{C}_{\hat{\beta}_{ESG}}$	70.454	34.979	54.943	82.884	29.344	61.014

The period used for Technology is July 2007 to December 2023 (196 months).

Utilities

Table 71: Cross-sectional regressions of the **Utilities** sector.

Scoring:	Performance Ratio			LSEG		
	4-factor	7-factor	9-factor	4-factor	7-factor	9-factor
Const.	3.280*	1.854	-0.784	2.318*	3.607***	1.842
	(1.850)	(1.170)	(-0.327)	(1.727)	(2.617)	(1.230)
lME	-0.101	-0.004	0.096	-0.084	-0.105*	-0.020
	(-1.456)	(-0.060)	(0.997)	(-1.362)	(-1.669)	(-0.312)
$lBtm$	0.086	-0.035	0.280	0.182	0.119	0.375*
	(0.578)	(-0.180)	(1.282)	(1.183)	(0.717)	(1.819)
Pro	-0.172	-0.460	-0.316	-0.095	-0.521	-0.179
	(-0.516)	(-1.289)	(-0.631)	(-0.276)	(-1.557)	-0.422
Inv	0.523	0.651	0.530	0.479	0.567	0.553
	(1.639)	(1.627)	(1.264)	(1.362)	(1.475)	(1.445)
Mom	0.630	0.095	1.131*	0.773*	0.397	1.258**
	(1.527)	(0.174)	(1.783)	(1.673)	(0.815)	(2.272)
Env	-0.006		-0.019**	-0.004		-0.003
	(-0.949)		(-2.078)	(-0.950)		(-0.810)
Soc	0.012		-0.009	0.005		-0.001
	(1.392)		(-0.767)	(1.295)		(-0.138)
Gov	-0.017		0.011	-0.001		0.003
	(-1.460)		(0.782)	(-0.457)		(0.911)
ESG		-0.018**			-0.006	
		(-2.123)			(-1.515)	
$\hat{\beta}_{mk}$	0.348	-0.733	-1.646*	-0.059	-0.124	-2.030
	(0.399)	(-0.782)	(-1.666)	(-0.059)	(-0.154)	(-1.489)
$\hat{\beta}_{size}$		-0.239	0.278		-0.447	0.549
		(-0.396)	(0.393)		(-0.864)	(0.730)
$\hat{\beta}_{value}$		0.192	-0.585		-0.088	-1.419
		(0.246)	(-0.735)		(0.927)	(-1.529)
$\hat{\beta}_{Pro}$		0.796	0.244		0.119	1.119
		(1.107)	(0.237)		(0.211)	(0.846)
$\hat{\beta}_{Inv}$		-0.777	0.553		0.420	-0.452
		(-0.683)	(0.394)		(0.666)	(-0.319)
$\hat{\beta}_{Mom}$		-2.430	-1.208		-0.412	-1.501
		(-1.095)	(-0.619)		(-0.264)	(-0.809)
$\hat{\beta}_{Env}$	0.071		-0.857	0.084		0.231
	(0.149)		(-0.885)	(0.144)		(0.325)
$\hat{\beta}_{Soc}$	-0.151		-0.683	0.086		1.040
	(-0.313)		(-0.936)	(0.125)		(0.868)
$\hat{\beta}_{Gov}$	-0.658		-0.427	-0.017		0.658
	(-1.520)		(-0.688)	(-0.027)		(0.838)
$\hat{\beta}_{ESG}$		-0.590			-0.644	
		(-0.910)			(-1.069)	
$\bar{C}_{Zcs}$	63.829	42.201	47.979	59.700	40.198	37.461
$\bar{C}_{\hat{\beta}}$	88.211	101.531	114.291	86.478	97.710	105.349
$\bar{C}_{ESG}$	28.228	6.387	19.113	16.109	5.385	8.592
$\bar{C}_{\hat{\beta}_{ESG}}$	95.211	31.402	93.026	92.101	34.859	74.430

The period used for Utilities is July 2008 to December 2023 (186 months).

Real Estate

Table 72: Cross-sectional regressions of the **Real Estate** sector.

Scoring:	Performance Ratio			LSEG		
	4-factor	7-factor	9-factor	4-factor	7-factor	9-factor
Const.	3.202	4.056**	0.388	0.427	0.302	1.139
	(-1.455)	(2.497)	(0.266)	(0.228)	(0.188)	(0.905)
lME	0.128	-0.192**	-0.014	-0.016	0.000	-0.049
	(1.387)	(-2.434)	(-0.237)	(-0.172)	(0.000)	(-0.833)
$lBtm$	0.209	-0.111	0.098	0.189	0.064	0.025
	(0.947)	(-0.846)	(0.590)	(1.183)	(0.482)	(0.153)
Pro	0.333	0.362	0.153	0.063	0.146	0.276
	(0.496)	(0.746)	(0.313)	(0.098)	(0.323)	(0.550)
Inv	0.789*	0.142	0.618*	0.265	0.077	0.552*
	(1.739)	(0.544)	(1.908)	(0.554)	(0.288)	(1.718)
Mom	0.271	0.907	0.554	1.334	0.521	0.672
	(0.409)	(1.507)	(0.969)	(1.568)	(0.809)	(1.220)
Env	-0.013		-0.009	-0.007		-0.005
	(-1.567)		(-1.352)	(-1.107)		(-1.204)
Soc	-0.013		0.009	-0.006		0.003
	(1.180)		(1.174)	(-1.085)		(0.626)
Gov	0.049**		0.004	0.001		0.004
	(2.255)		(0.328)	(0.100)		(1.372)
ESG		-0.005			-0.006	
		(-0.537)			(-1.438)	
$\hat{\beta}_{mk}$	-4.526	3.264	0.736	3.492	-1.392	0.982
	(-1.128)	(1.564)	(0.836)	(1.046)	(0.188)	(1.015)
$\hat{\beta}_{size}$		-2.446**	-0.226		0.724	-0.680
		(-2.011)	(-0.282)		(0.690)	(0.839)
$\hat{\beta}_{value}$		-0.359	-0.515		0.942	-0.216
		(-0.232)	(-0.648)		(0.716)	(-0.252)
$\hat{\beta}_{Pro}$		-2.266	0.443		2.258	-0.026
		(-1.446)	(0.414)		(1.013)	(-0.025)
$\hat{\beta}_{Inv}$		-1.985	-0.592		-0.379	-1.174
		(-1.282)	(-0.696)		(-0.305)	(-1.327)
$\hat{\beta}_{Mom}$		-2.515	-0.832		2.122	-2.452
		(-1.089)	(-0.578)		(0.900)	(-1.470)
$\hat{\beta}_{Env}$	-0.294		0.047	1.053		0.688
	(-0.360)		(0.090)	(0.967)		(1.178)
$\hat{\beta}_{Soc}$	-1.663		0.401	-9.832**		-0.406
	(-1.042)		(0.542)	(-2.249)		(-0.679)
$\hat{\beta}_{Gov}$	0.316		-0.030	-3.885		-0.357
	(0.405)		(-0.067)	(-1.227)		(-0.764)
$\hat{\beta}_{ESG}$		1.506			-2.515**	
		(1.176)			(-2.179)	
$\bar{C}_{Zcs}$	56.119	40.172	45.196	57.858	41.405	41.913
$\bar{C}_{\hat{\beta}}$	92.921	85.023	79.996	83.938	82.339	78.325
$\bar{C}_{ESG}$	24.338	4.736	15.759	12.768	4.090	8.782
$\bar{C}_{\hat{\beta}_{ESG}}$	80.224	32.818	39.898	73.593	20.108	43.097

The period used for Real Estate is July 2008 to December 2023 (186 months).

Industrials

Table 73: Cross-sectional regressions of the **Industrials** sector.

Scoring:	Performance Ratio			LSEG		
	4-factor	7-factor	9-factor	4-factor	7-factor	9-factor
Const.	2.060**	1.351	2.139	2.526***	1.743	1.378
	(2.206)	(1.326)	(1.608)	(2.604)	(1.576)	(1.394)
lME	-0.054	-0.021	-0.049	-0.092**	-0.048	-0.020
	(-1.286)	(-0.425)	(-0.913)	(-2.031)	(-0.876)	(-0.424)
$lBtm$	0.089	0.014	0.022	0.028	-0.009	0.086
	(1.231)	(0.186)	(0.235)	(0.365)	(-0.104)	0.984
Pro	-0.007	-0.022	-0.077	-0.054	-0.026	-0.009
	(-0.211)	(-0.928)	(-1.267)	(-1.591)	(-1.119)	(-0.216)
Inv	-0.254*	-0.111	-0.272	-0.460**	-0.135	-0.390**
	(-1.735)	(-0.613)	(-1.513)	(-2.413)	(-0.843)	(2.000)
Mom	0.976***	0.983**	0.886**	0.610*	0.700**	0.778**
	(3.251)	(2.314)	(2.506)	(1.807)	(2.115)	(2.060)
Env	0.004		0.001	-0.001		-0.005*
	(0.771)		(0.135)	(-0.547)		(-1.933)
Soc	-0.006		-0.003	0.003		0.000
	(-0.995)		(-0.500)	(0.836)		(0.145)
Gov	-0.004		-0.006	0.001		0.003
	(-0.554)		(-0.525)	(0.158)		(1.062)
ESG		-0.001			0.001	
		(-0.105)			(0.190)	
$\hat{\beta}_{mk}$	-0.163	-1.130	-0.422	0.158	-1.055	-0.754
	(-0.225)	(-1.130)	(-0.386)	(0.273)	(-1.367)	(-0.776)
$\hat{\beta}_{size}$		0.901	0.734		1.063**	0.927
		(1.136)	(0.827)		(2.023)	(1.363)
$\hat{\beta}_{value}$		-0.079	0.485		1.037	0.187
		(-0.050)	(0.373)		(0.716)	(0.175)
$\hat{\beta}_{Pro}$		0.663	-0.177		0.383	-0.253
		(0.771)	(-0.180)		(0.376)	(-0.357)
$\hat{\beta}_{Inv}$		-1.700	0.057		-0.444	-0.723
		(-1.039)	(0.052)		(-0.305)	-0.557
$\hat{\beta}_{Mom}$		-2.613	-0.132		-0.007	-1.174
		(-1.140)	()-0.019		(-0.007)	(-0.552)
$\hat{\beta}_{Env}$	0.160		-0.018	0.039		-1.048
	(0.273)		(-0.019)	(0.095)		(-1.323)
$\hat{\beta}_{Soc}$	-0.379		-0.290	-0.312		0.756
	(-0.819)		(-0.352)	(-0.622)		(0.784)
$\hat{\beta}_{Gov}$	-0.297		-1.046	-0.521		-0.130
	(-0.669)		(-1.337)	(-0.568)		(-0.159)
$\hat{\beta}_{ESG}$		0.569			0.366	
		(0.961)			(0.615)	
$\bar{C}_{Zcs}$	48.662	28.921	31.449	47.906	28.538	27.596
$\bar{C}_{\hat{\beta}}$	84.692	89.548	94.068	76.680	89.257	90.266
$\bar{C}_{ESG}$	17.206	3.050	11.287	9.567	2.488	4.915
$\bar{C}_{\hat{\beta}_{ESG}}$	70.304	17.615	45.760	61.892	13.258	43.216

The period used for Industrials is July 2005 to December 2023 (222 months).