March 2022 Investment Insights

Systematic Investment Solutions:
ESG is quality, it just isn't really

There is a perception in the market that ESG and quality approaches are either similar, or that findings that purport to show strong performance to ESG might in fact be capturing exposure to the quality factor. We propose to go a little deeper than previous approaches on this topic by using a 3x3 framework, recognizing and examining: 1) That ESG can be decomposed into E, S and G metrics 2) That quality can broadly be thought of as representing profitability, growth, and stability characteristics, and 3) That these relationships can usefully be examined across the three main equity regions – North America, Europe, and the Emerging Markets.

Introduction

In the past decades, humankind has been facing evermore alarming events which have shifted our consciousness towards more sustainable thinking. Natural disasters, such as immense bushfires in Australia, countless floods throughout Europe, Asia and the US or social disasters, such as private data leaks or salaries below minimum wage are only the tip of the iceberg. Subsequently, it is not surprising that investors are becoming more aware of the implications that their investments might have as they do not want to support companies that harm the society or the environment. This gave rise to the idea of sustainable investing, which is generally termed as ESG (Environmental, Social, Governance) investing. ESG investing can take many forms, for example simple exclusions of harmful companies (negative screening), portfolio weight tilting towards ESG friendly companies (positive screening) or even solely investing into companies who declare social or environmental impact as their main business goal (impact investing).

Since the establishment of ESG investing, many academics have not only researched the sustainable implications of ESG but also its significance on a portfolios risk and return profile. Even though some researchers were able to shed some more light on this topic, there is still no general agreement on whether ESG harms or enhances risk adjusted performance. Questions have also been raised as to whether ESG performance can be partly or completely explained by its inherent tilt towards other risk, country, or industry factors, Sidorovitch et al. (2018) have tried to shed some light on this question. In this paper specifically, we explore the interrelation between ESG and the quality factor and in particular, whether returns to ESG are actually hidden returns to quality. The quality factor contains information about a firm's profitability and risk measures and has been quoted several times as the main factor responsible for ESG outperformance, as discussed in more detail in the literature part of this paper.

Structure

We establish a simple overview of the ESG and quality landscape across three regions, Europe, North America and the Emerging Markets. We evaluate whether and why both factors are present and have led to positive abnormal returns. In order to shed some light on the relationship between the ESG and the quality factors, the analysis of this research is structured into three sub-sections. We first analyze this interrelation on a more evident level based on score correlations to identify whether ESG and quality scores are highly correlated or unrelated. Following, we go one step further and compare the returns of ESG and quality portfolios to see whether we can reinforce our findings from the score analysis or even see differing results. In the last part of this paper, we will then dig deeper and explore whether ESG still

has an inherent premium after accounting for other factor effects. Investors can use this to determine whether or not ESG and quality characteristics overlap, and, if they don't, whether or not the returns to each are relatively independent (and both harvestable as a result).

Literature Review

The core topic of this paper is the relationship between the quality factor and ESG. Before elaborating on existing studies, the idea and methodology of the quality factor is explained in detail. In their research paper "Quality Minus Junk", Clifford S. Asness, Andrea Frazzini, and Lasse Heje Pedersen (2017), conduct an in-depth research on the quality factor. Their research question is whether high-quality stocks demand higher prices. Asness et al. (2019) define three quality measures, namely growth, profitability, and safety to measure the quality of a company. After testing how quality affects stock prices, they also construct a portfolio where they go long in high-quality and short in junk stocks. This factor yields highly significant risk-adjusted returns. The definitions of quality vary throughout several research papers and implementation methods e.g., MSCI defines quality using five sub-categories, leverage, profitability, earnings variability, earnings quality and investment quality. For this paper, quality is defined as a combination of safety (leverage & earnings variability), profitability (profitability & earnings quality) and stability (investment quality), the exact calculation is discussed in the methodology part.

A widespread opinion is that the quality factor is largely correlated with ESG and that the outperformance of ESG throughout recent years can be explained by its inherent quality tilt. Demers et al. (2020) find that the outperformance of ESG disappears after controlling for several other factors, such as size, momentum, growth, and some factors associated with quality. They develop a parsimonious logit-based model to explain the best and worst performing stocks during the financial crisis and then use this fitted model to predict winners and losers during the COVID-19 pandemic. However, this study only looks at the period during the COVID-19 crisis and there was no score or return correlations conducted.

On the other hand, a study by Chen et al. (2020) found that portfolios constructed with a combination of ESG, and quality factors show more positive return characteristics than each factor alone. This study also proofs that the score correlations between quality and ESG are surprisingly small. The return correlation of both factors however is larger. Nevertheless, a combination of these two factors with small score and large return correlations leads to superior returns when running a time series analysis on the factors by quintiles.

Concerning the relationship between ESG and other common risk factors, we find a study by Hanna (2020) that analyses the effect of ESG-driven sector exclusions within a minimum volatility universe and concludes that ESG minimum volatility portfolios do not significantly impact variance and Sharpe Ratio while improving the ESG profile of the portfolio. Further, a study by Kaiser (2020) concludes that ESG criteria increase the portfolios ESG profile without significant negative impact on performance measures for growth, value and momentum portfolios. Another interesting finding is that companies with a positive rating trend outperformed the benchmark and a comparable ESG strategy, this method uses ESG as a predictor in a change in valuation and therefore stock returns, i.e., ESG momentum (Giese, 2019).

In the next section we discuss whether ESG could be a risk factor of itself. Before elaborating the question whether ESG could be a new risk factor, we first discuss the definition of a factor and give short overview of some established factors. Factors have shown to be persistent drivers of return and can help to accomplish different investment goals, such as diversification, increasing returns, or reducing risk. The above-market performance of factors must be explainable by one of the following three reasons: additional risk, structural impediments or (irrational) investor behavior (Blackrock, 2019). Two of the most well-known factors, value and size, have been first used in a multifactor model by Fama and French in 1993, followed by the momentum factor (Jegadeesh and Titman, 1993). Another example is the quality factor, which is discussed in more depth in the next chapter. Hence, in order for ESG to be added to this list of risk factors, it should be persistent in generating abnormal return, risk reduction or diversification when compared to established risk factors. If it has a systematic influence that drives all company returns equally, and can explain the differences in their returns, it may be defined as an alpha factor. There have also been efforts to separate the residual part of ESG scores from its "overlapping" characteristics, Giese et al. (2019) have neutralized the ESG factor by industry and size and analyzed the distribution of several financial variables on these size and industry adjusted quintile portfolios. Robeco (2017) has gone a step further and neutralized the factor by other biases, such as quality. Hence, research has been carried out, using various definitions and methodologies which makes it troublesome to draw coherent conclusions. Renshaw (2018) found that there was no significant performance difference of ESG and residual ESG. Residual ESG was calculated by regressing ESG scores against traditional risk factors. He then calculated backtest portfolios maximizing either ESG or residual ESG and compares risk and return figures.

Bruno et al. (2021), in their paper show that no significant ESG outperformance can be found when corrected for other

risk factors using multifactor regressions. Further, they find no downside protection through ESG strategies. Their explanation of ESG outperformance is that it can be traced back to investor attention, hence, increasing flows and ESG-stock valuation. However, a paper by MSCI in early 2021 finds contradicting results to this thesis. The study shows that ESG-return did not come from increasing inflows, but rather high ESG-rated companied with superior returns and a higher rate of reinvestment. Further, Giese et al. (2021) suggests that ESG could be characterized as a fundamental factor. This conclusion was drawn from a return attribution on ESG tercile portfolios that showed ESG performance contribution was not fully explainable by other risk factors.

Bennani et al. (2018) found that ESG didn't add value in terms of return, risk and drawdown during the period between 2010 – 2013. However, the picture is different for the period between 2014-2017, where they found investing in ESG stocks would have been rewarded. They further found that ESG is likely to be a new risk factor in Europe, whereas it improves diversification of factor portfolios in North America. Hence, ESG could turn out to be a rare cross-sectional risk factor. This finding can also be related to results found in Sidorovitch et al. (2018), ESG ratings in Europe are generally more positively distribute and further, Europe was the first market to widely implement ESG strategies (Global Sustainable Investment Alliance, 2018). Bennani et al. (2018) has tested multifactor models as well as factor picking and found that ESG could be a risk factor in the Eurozone but not in North America where ESG becomes redundant as a factor in well-diversified portfolios. Interestingly ESG is even more significant than momentum and low volatility in the Eurozone.

The study by Renshaw (2018) found that ESG outperforms in Europe after 2016 and in Japan after 2015 and no outperformance in the rest of Europe. In their US sample, residual ESG has rarely underperformed. Demers et al. 2020 find that the positive performance of ESG during the COVID-19 crisis widely disappears after correcting for country, industry and risk factor effects.

Factors usually only receive their alpha status after being widely implemented in the investment universe and hence explain cross-sectional dispersions, which would explain the differences in the European and North American market due to the more widespread use of ESG in Europe. Consequently, even though ESG did not necessarily seem to be a global risk factor, chances are high that it will become one in the future considering its rapid growth. This theory can also be strengthened by the findings of PWCs report (2016), whereas in 2011 only 20% of all companies in the S&P500 reported ESG data, the percentage was above 80% in 2016 (maybe newer data). The following paragraph will discuss the data and methodology used in this research.

Data and Methodology

Firstly, the major methodology structure will be briefly introduced, then data sources will be discussed, and, finally, the methodology and all research questions will be explained in detail.

In order to explain the relationship between the ESG and the quality factors, the methodology part of this research is structured into three sub-sections. We first analyze this interrelation on a more evident level based on score correlations to identify whether ESG and quality scores are highly correlated or unrelated. Following, we go one step further and compare the returns of ESG and quality portfolios, to see whether we can reinforce our findings from the score analysis or even see differing results. In the last part of this paper, we will then dig deeper and explore whether ESG still has an inherent premium after accounting for other factor effects.

Data

Data sources

The universes used for this research are the MSCI North America, the Eurostoxx 600 and the MSCI Emerging Markets where we excluded Chinese A-shares to keep the universe size and exposure comparable over time. The research timeframe is from January 2012 to August 2021 and since January 2013 for the Emerging Markets data due to low data quality in the time period prior. The data source for scores based on balance sheet information is Worldscope, return data is retrieved from Data Stream, with returns for the Eurostoxx 600 in EUR and for the rest of the data in USD. Further, MSCI Barra Portfoliomanager is used for several backtest analyses. Missing data points are supplemented from the previous month if existing.

The quality score

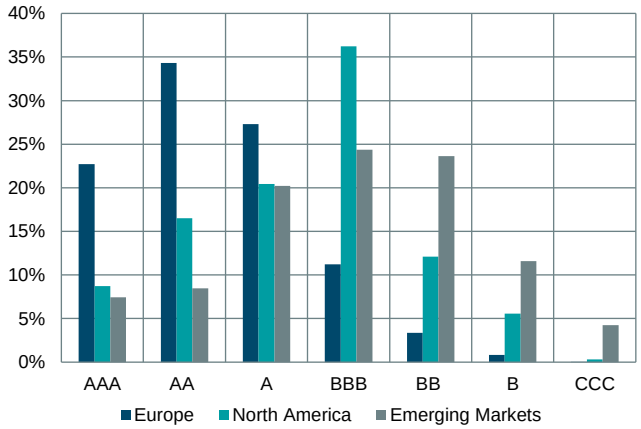
As mentioned in the literature review, the quality score is defined as a combination of safety (leverage & earnings variability), profitability (profitability & earnings quality) and stability (investment quality). Hereby leverage is calculated as a z-score of a company's debt to assets, book leverage and market leverage, the leverage score is calculated in a descending order to give a higher score to companies with less leverage. The second component of our safety measure is earnings variability, which is calculated from the variability in sales, earnings, cash flow and forecasted EPS, this score is also calculated in a descending order. Similar measures can be found in Assness et al. (2019) where the safety component is comprised of leverage and low return on equity

(ROE) volatility. The first component of our profitability score is earnings quality, which consists of cash earnings over earnings, balance sheet accruals and cash flow statement accruals. The second component is profitability which is made up of asset turnover, profitability, profit margin and return on assets (ROA). Similar we can find in Assness et al. (2019) accruals, ROA and gross profit margin. FTSE Russell also uses ROA and accruals for their profitability part of the quality metric and Fama et al. (1993) as well included the gross profit over equity as their profitability. The last building block of our quality score is stability, which is a combination of asset growth, capex growth and issuance growth. Asset growth was also established as one factor by Fama et al. (1993) and we discovered a high correlation towards Assness et al. (2019)'s growth measure.

The ESG score

ESG data is provided by MSCI Research. The MSCI ESG ratings cover a broad universe of companies and take into consideration industry and business specific risk. The rating scale ranges from AAA-CCC relative to industry peer performance. Exhibit 1 shows the regional distribution of the ESG scores based on the broad indices used in this paper. The good ratings are tilted towards EMEA and the lower ratings towards North America and then the Emerging Markets. As a result, portfolios with a higher ESG score inherit a secondary exposure towards EMEA stocks that should be considered. Therefore, to avoid unwanted tilts during our analysis, we split our data in three more homogeneous regions, Europe, North America and Emerging Markets. We use the Environmental Pillar Score, the Social Pillar Score and the Governance Pillar Score, which build the MSCI Weighted Average Key Issue Score when combined. The Weighted Average Key Issue Score from MSCI combines the three ESG components into one by giving each company an individual weighting for the component based on their risk derived from them.

EXHIBIT 1: ESG RATING DISTRIBUTION AS MARKET VALUE OF EACH INDEX



Sources: MSCI Barra Portfolio Manager; as of 31/08/2021

All scores used are based on z-scores with outlier removal and if stated as sector neutral, the scores are standardized within each GICS sector. However, all calculations in this research have also been conducted on an industry group basis as a robustness check of our findings. While these tables are not included as this would be out of scope for this research, we can say that no large deviations for the findings discussed in this paper that were calculated on the basis of sectors have been found.

Methodology

As mentioned above, our research is structured into three sections which dive one step deeper than the prior analysis. All three are now discussed in detail.

Research thesis 1: Are ESG and quality scores highly correlated?

Since we want to evaluate the relationship between ESG and quality and shed some light on the question whether ESG returns can be completely explained by an inherent quality tilt, the seemingly most intuitive test of the interrelation between ESG and quality is to calculate score correlations of both factors. We will then have an idea of whether stocks that have high ESG score also have high quality scores and vice versa. This will be a first indication of connection between ESG and quality.

Therefore, we use the Kendall Tau rank correlation as a non-parametric way of measuring the dependency between both measures based on the τ coefficient.

Equation 1: Tau

$$\tau = \frac{\mathrm{P} - \mathrm{Q}}{\sqrt{((\mathrm{P} + \mathrm{Q} + \mathrm{T}) * (\mathrm{P} + \mathrm{Q} + \mathrm{U}))}}$$

where P is the number of concordant pairs, Q the number of discordant pairs, T the number of ties only in x, and U the number of ties only in y. If a tie occurs for the same pair in both x and y, it is not added to either T or U.
We further break down ESG into environment, social and governance, as well as quality into profitability, safety, and stability. This is done to analyze whether there is a specific driver within each factor in a correlation matrix.

Research thesis 2: Are the returns of ESG and quality correlated?

To get an overview of the data and the characteristics of the components of ESG, we first calculate ESG-score weighted portfolios investing long in the highest ESG-rated stocks and short in the lowest rated stocks. We then use MSCI Barra Portfolio Manager to calculate factor exposures and attributions. This analysis gives first insights in risk and return profiles, as well as possible exposures of ESG portfolios in different regions. We use equal weighted portfolios to capture pure factor effects unaffected by market cap weights

To reinforce our findings from part one, we also analyze whether ESG and quality returns are correlated. The analysis of both types of correlations helps us to identify both, the interrelation between the factors and the relationship between their returns.

Finally, we will look at the return correlations of these portfolios defined by the Pearson Correlation of the log return from the above portfolios. We use log returns to avoid non-linear relationships and heteroscedasticity.

Equation 2: Pearson Correlation

$$Corr(X,Y) = \frac{\mathrm{Cov}(\mathrm{X},\mathrm{Y})}{\sqrt{Var(X)} * \sqrt{Var(Y)}}$$

Where Cov is the covariance and Var the variance.

Research thesis 3: Does ESG produce positive abnormal returns and if so, is this performance fully explainable by quality or is there additional information and could ESG be a new risk factor?

In the next step, we analyze if ESG still has an inherent premium after accounting for other factor effects. The first part of our analysis will focus on a cross sectional regression, which we prefer over a simple time series regression due to the following reasons: firstly, Fama at al. (2020) proved that the cross-sectional approach is superior in explaining returns to a constant slope time series model, mainly driven by the time-varying characteristics in loadings for cross-sectional models. And secondly, we will add additional value by looking at this topic from a different angle as previous existing papers mainly used the time series. Further, Jacobs et al. (2021) note that one benefit of cross-sectional factor research is the possibility of controlling for effects of other factors while investigating further anomalies. With this method, we can explain the return differences in the cross-section of stocks, extract the ESG premium, and test for significance. As part of this analysis, we assume to already know the individual factor exposures, which are approximated by our scores. Through this analysis, we can show whether an ESG premium still exists when all other drivers are considered.

Following a cross sectional approach like Fama and MacBeth (1973), we run the following regression:

Equation 3: Fama MacBeth cross-sectional regression

$$\begin{bmatrix} R_{1,t} \\ R_{2,t} \\ \vdots \\ R_{N,t} \end{bmatrix} = a_t + \begin{bmatrix} z_{11,t-1} \\ z_{21,t-1} \\ \vdots \\ z_{N1,t-1} \end{bmatrix} \cdot f_t^1 + \begin{bmatrix} z_{12,t-1} \\ z_{22,t-1} \\ \vdots \\ z_{N2,t-1} \end{bmatrix} \cdot f_t^2 + \cdots + \begin{bmatrix} z_{1K,t-1} \\ z_{2K,t-1} \\ \vdots \\ z_{NK,t-1} \end{bmatrix} \cdot f_t^K + \begin{bmatrix} e_{1,t} \\ e_{2,t} \\ \vdots \\ e_{N,t} \end{bmatrix}$$

where $R_{i,t}$ is the log return of asset i in month t minus the mean return in the GICS sector, $z_{i,t}$ the score of assets i in month t standardized in its GICS sector and f_t^k is the OLS-Beta representing an estimated risk premium.
And test if the premium is different from zero with:

Equation 4: t-test Fama MacBeth

$$t(\bar{f}_{ESG}) = \frac{\bar{f}_{ESG}}{\bar{\sigma}_{\bar{f}_{ESG}}/\sqrt{T}}$$

with $\bar{f}_{ESG}$ as the mean premium from Equation 3, $\bar{\sigma}_{\bar{f}_{ESG}}$ as the standard deviation of the t estimated f_t^{ESG}.
In addition to the theoretical analysis, we also want to present a more applied method to discuss this problem. Therefore, the second part of this analysis is to test several ESG backtest portfolios where we set other factor exposures to zero und evaluate the backtest performance before and after neutralizing factor exposures. We run long/short backtests using the normalized ESG scores as alpha signal within each region. Then, we run new backtests, with the addition of setting the quality exposures to zero to see whether ESG performance disappears in the absence of quality exposures. In order to rule out that any outperformance can be attributed

to other risk factors, we then set the exposure to all common risk factors equal to zero. Exposures are set to a maximum of 50 bps on industry levels to rule out major performance attribution due to industry under- or overweighs. Further, due to large country exposures within the Emerging Markets universe, as discussed above, those backtests have an additional country restriction of a maximum of 50 bps. The optimization software will then, each month chose the optimal portfolio with the highest utility, considering all restrictions. We compare these backtests to the performance of the same backtests without any factor or industry restriction to evaluate whether the performance of ESG is compromised when correcting for risk and industry factors.
Therefore, we follow the Jobson and Korkie (1981) Sharpe Ratio test with the Memmel (2003) correction as follows:

Equation 5: Sharpe Ratio test

$$z = \frac{(SR_{ESG} - SR_{rest})}{\sqrt{\left(\frac{1}{N}\right) * \left[2\left(1-\rho_{ESG,rest}\right) + \left(\frac{1}{2}\right)\left(SR_{ESG}^2 + SR_{rest}^2 - SR_{ESG}SR_{rest}\left(1+\rho_{ESG,\text{rest}}^2\right)\right)\right]}}$$

where ρ is the correlation between the restricted and unrestricted portfolio and N is the number of observations.

We then use the following Alternative Hypothesis of SR1 ≠ SR2 against the Null Hypothesis of SR1 = SR2 to test the statistical significance of the difference between the Sharpe Ratios.

Results

Research thesis 1: Are ESG and Quality Scores highly correlated?

In the following tables we display the results from our score correlation analysis. As expected, we can confirm the findings of Chen et al. (2020), the score correlations between ESG and quality are noticeably low in all three regions. The lowest score correlation appears to be between the ESG score and profitability. The highest score correlations can be found between ESG and safety. Looking at the score correlations of the components of ESG to the components of quality, social is the one with the lowest correlation while governance experiences the highest correlation, on average. Further, these findings can be strengthened by our exposure analysis in Appendix 3. Additionally, there is an obvious size tilt towards larger companies receiving better environmental scores, while smaller companies receive better governance scores.

EXHIBIT 2: AVERAGE CROSS SECTIONAL RANK CORRELATION BETWEEN EACH ESG METRIC AND THE CORRESPONDING FACTOR

Europe	Safety	Stability	Profitability	Quality	Value	Size	Momentum
Environment	0.041	0.026	-0.001	0.025	-0.022	-0.135	-0.009
Social	0.028	0.005	-0.023	-0.007	0.026	-0.023	0.006
Governance	0.120	0.000	0.082	0.110	-0.131	0.104	0.040
ESG	0.107	0.026	0.008	0.056	-0.023	-0.056	0.020

North America	Safety	Stability	Profitability	Quality	Value	Size	Momentum
Environment	0.058	0.077	0.013	0.053	-0.041	-0.146	0.013
Social	0.044	0.008	0.008	0.026	-0.030	-0.019	0.000
Governance	0.062	0.011	0.033	0.056	-0.040	0.042	0.025
ESG	0.082	0.050	0.022	0.066	-0.056	-0.066	0.006

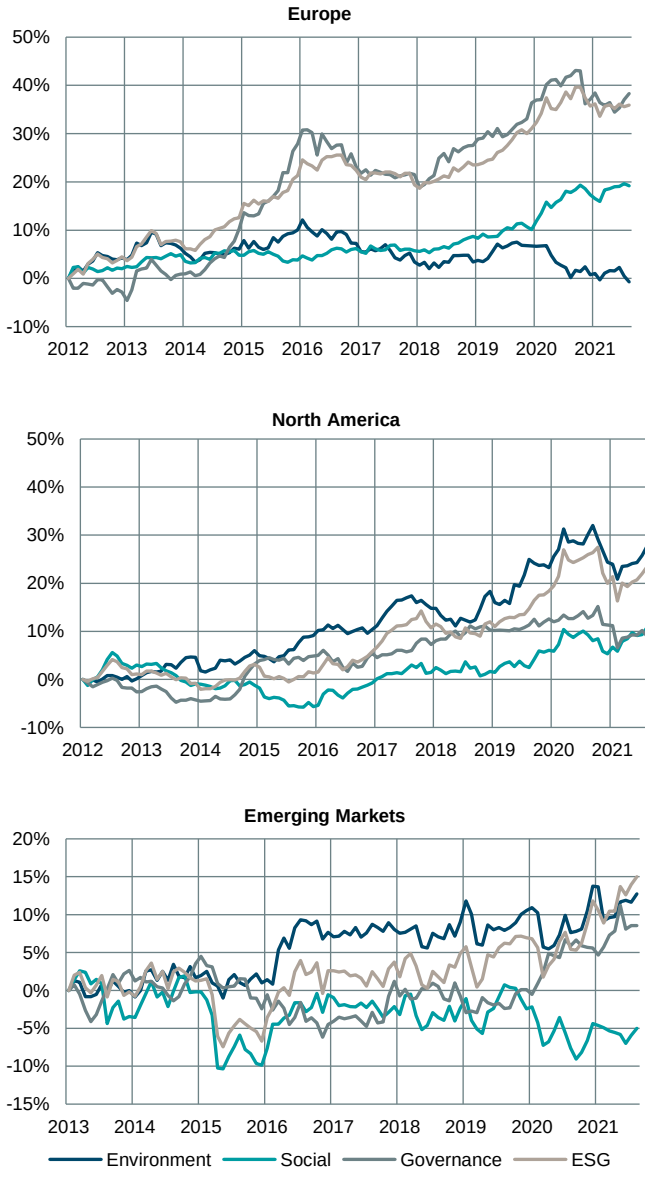
Emerging Markets	Safety	Stability	Profitability	Quality	Value	Size	Momentum
Environment	0.008	0.003	0.054	0.047	-0.032	-0.045	0.017
Social	0.058	0.034	0.022	0.057	-0.076	-0.011	0.019
Governance	0.026	0.010	0.048	0.052	-0.032	0.042	0.007
ESG	0.055	0.038	0.054	0.080	-0.063	-0.021	0.021

Sources: MSCI Barra Portfolio Manager; as of 31/08/2021

Research thesis 2: Are the returns of ESG and quality correlated?

Exhibit 3 shows the portfolio graphs of our score weighted analysis, return and risk data is displayed in Appendix 1.

EXHIBIT 3: ESG-SCORE WEIGHTED LONG-SHORT PORTFOLIOS



Sources: MSCI Barra Portfolio Manager; as of 31/08/2021

What can be observed is that environment and ESG seem to be the strongest factors in North America while in Europe the best performing ones are governance and ESG. In the Emerging Markets all component portfolios are mostly flat until the beginning of the COVID-19 pandemic where all components except from social experience a sharp increase in returns. Especially noticeable is the poor performance of the environmental factor in Europe.

Exhibit 4 shows the return attribution of the ESG portfolios to several factors, including our quality components. A full table can be found in Appendix 2. Social is the factor that, throughout Europe and North America, shows the lowest return attribution from the quality factors, coupled with the lowest or even negative exposures. Highest return attributions and exposures come from the governance factor. There are generally high returns attributable to the safety factor with negative exposures to leverage and earnings variability, which suggests a risk reducing property of ESG. Further, the high negative exposures and high returns from residual volatility imply that ESG can reduce the idiosyncratic risk exposure of a portfolio.

Appendix 2 reveals another interesting finding, which is high specific return attribution values. These are the returns that are not explainable by any other factors. This is a first sign pointing into the direction that our ESG portfolios contain unexplained ESG-specific returns. Appendix 3 contains the portfolio exposures to all common risk factors. As expected, we see negative exposures to beta, which is characteristic for the risk reducing characteristics of ESG, as well as negative growth exposures, as high growth companies are often subject to higher risk, and high exposures to large caps, which are, again, more stable companies.

Lastly, in the Emerging Markets region we see a notably high (negative) attribution value from the country factor. This tells us that our portfolios in this region contain many country bets. This is mainly due to a short tilt in stocks from China, which generally have bad ESG ratings and a long tilt in stocks from Brazil and South Africa, which generally have high ESG ratings. Therefore, we adjusted the Emerging Markets backtests for country exposures as mentioned in the methodology part.

EXHIBIT 4: FACTOR RETURN ATTRRIBUTION FOR ESG-SCORE WEIGHTED LONG-SHORT PORTFOLIO

	EU				North America				Emerging Markets			
	ESG	**E**	**S**	**G**	**ESG**	**E**	**S**	**G**	**ESG**	**E**	**S**	**G**
Profitability	-0.005	0.077	-0.187	0.298	0.182	0.032	0.112	0.298	0.164	0.125	0.125	0.165
Profitability Exp.	*0.079*	*0.038*	*-0.108*	*0.385*	*0.173*	*0.014*	*0.101*	*0.316*	*0.088*	*0.110*	*0.064*	*0.139*
Earnings Qu. Exp.	*-0.097*	*0.052*	*-0.058*	*-0.155*	*-0.046*	*0.002*	*0.001*	*-0.093*	*0.172*	*0.065*	*0.144*	*0.081*
Stability	0.132	0.134	0.023	0.095	0.188	0.272	0.086	0.113	0.201	0.038	0.144	0.119
Exposure	*0.218*	*0.145*	*0.140*	*0.107*	*0.211*	*0.238*	*0.138*	*0.115*	*0.058*	*-0.026*	*0.085*	*0.003*
Safety	0.297	0.227	0.190	0.167	0.320	0.332	0.174	0.092	0.236	0.092	0.206	0.076
Leverage Exp.	*-0.128*	*0.073*	*0.035*	*-0.262*	*0.037*	*0.219*	*0.036*	*-0.118*	*-0.092*	*-0.041*	*-0.093*	*-0.093*
Earnings Va. Exp.	*-0.366*	*-0.257*	*-0.165*	*-0.316*	*-0.327*	*-0.312*	*-0.158*	*-0.158*	*-0.223*	*-0.115*	*-0.225*	*-0.225*
Residual Vol.	0.426	0.257	0.110	0.611	0.413	0.353	0.139	0.345	0.408	0.106	0.255	0.314
Exposure	*-0.302*	*-0.187*	*-0.120*	*-0.363*	*-0.255*	*-0.200*	*-0.119*	*-0.198*	*-0.054*	*0.057*	*-0.005*	*-0.124*

Source: MSCI Barra Portfolio Manager; 01/2012 – 08/2021 (start EM 01/2013), annualized returns in percent

EXHIBIT 5: RETURN CORRELATIONS FOR SCORE-WEIGHTED LONG-SHORT PORTFOLIOS

	Europe				North America				Emerging Markets			
	Safe.	**Prof.**	**Stab.**	**Qual.**	**Safe.**	**Prof.**	**Stab.**	**Qual.**	**Safe.**	**Prof.**	**Stab.**	**Qual.**
Environment	0.281	0.107	0.050	0.275	0.554	0.332	-0.035	0.430	0.025	0.259	0.106	0.192
Social	0.192	0.047	0.087	0.171	0.210	0.280	0.121	0.308	0.487	0.496	0.001	0.530
Governance	0.596	0.375	-0.568	0.399	0.487	0.427	0.129	0.518	0.153	0.199	-0.027	0.189
ESG	0.551	0.302	-0.165	0.474	0.499	0.454	0.032	0.516	0.382	0.509	0.093	0.513

Source: MSCI ESG scores and Worldscope; 01/2012 – 08/2021 (start EM 01/2013)

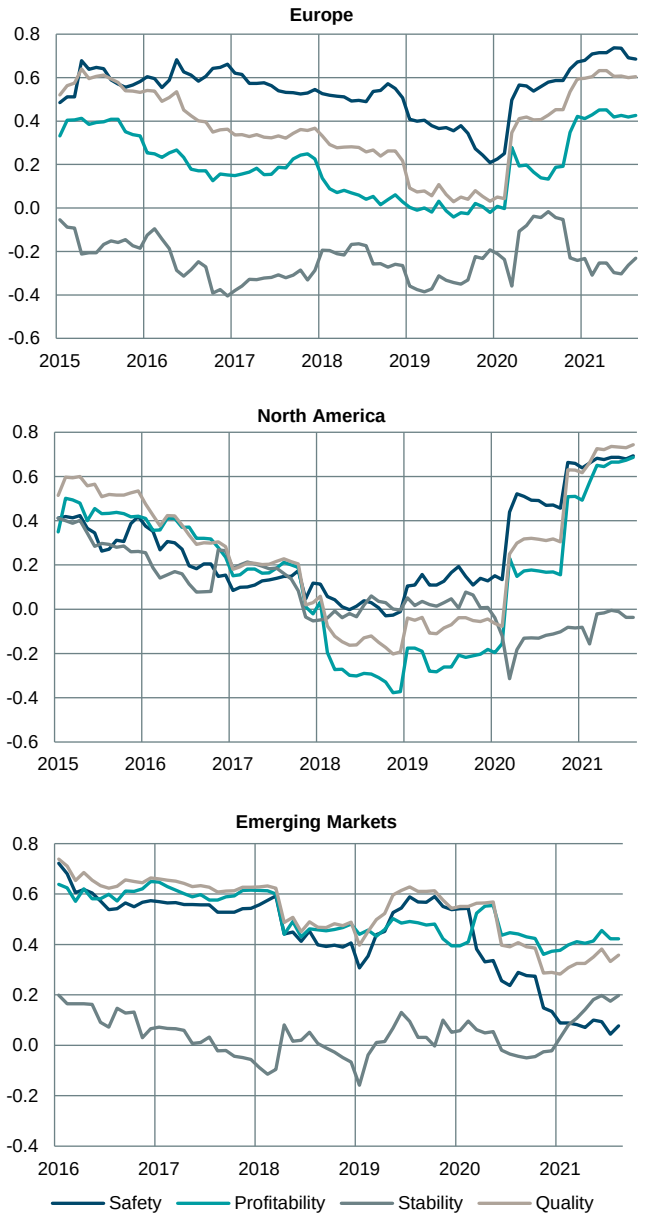
In Exhibit 5 we display the return correlations from our ESG and quality portfolios. With this analysis we hope to see how the scores and exposures translate into the portfolio. Our findings concerning the return correlations of quality and ESG can also confirm Chen et al. (2020)'s findings. While score correlations are very low, the return correlations of ESG and quality are somewhat higher and approximately 0.4-0.5. What is interesting is that social sticks out again, having the lowest return correlation of all ESG factors towards the quality factors (except in the EM). The least correlated factor on the quality side is stability with sometimes even negative correlations.

As mentioned above, correlations are dependent on the time frame. When cutting the time series off before the first news of the corona virus emerged in December 2019, we generally find a lower correlation between the ESG and quality factors. In Exhibit 6 this change in correlations can be observed in a more intuitive illustration.

The correlation presented above is not a stable process and changed with the time. It was in decline since 2015 and was heavily influenced by the extreme market movements during the pandemic. However, in the Emerging Markets we can see the opposite picture with correlations beginning to decline with the start of the pandemic.

The low correlation between ESG and quality scores, coupled with the semi-positive return correlations might seem puzzling at first glance, however what it indicates is that the two signals identify attractive companies through very different approaches. For this reason, each factor return should be neutralized and analyzed in isolation of other drivers to see if an excess value remains. This issue is taken up in the next part.

EXHIBIT 6: 36 MONTH ROLLING RETURN CORRELATION



Source: MSCI ESG scores and Worldscope, 01/2012 – 08/2021 (start EM 01/2013)

Research thesis 3: Does ESG produce positive abnormal returns and if so, is this performance fully explainable by quality or is there additional information and could ESG be a new risk factor?

Exhibit 7 presents our findings from the Fama MacBeth analysis. Next to the quality factor, momentum, size and value are included into the analysis, a full table can be found in Appendix 4. While all ESG variables except environment are statistically significant in Europe, in North America, social is not significant. There were no significant results in the Emerging Markets. Including quality in our analysis slightly reduces the ESG premium in the full sample, but we still find significant results in the same variables as without including quality. Adding the quality factors into the regression shows us that the cross section of ESG scores contains information that is not covered by the standard quality factors. Further, ESG factors in comparison to other factors had a smaller mean (premium) but were relatively stable with a low volatility. To conclude, this finding tells us that ESG does have a risk premium that is not completely explained by quality.

Continuing with the applied part of our analysis, exhibit 8 shows the Sharpe Ratios and t-statistics of our unrestricted and factor restricted ESG backtest portfolios. This method is also a more realistic way to look at the problem as it includes a risk model in the portfolio construction.

In Europe there is no significant change in Sharpe Ratio (SR), when neutralizing for quality or all other risk factors, for ESG and social, however, for governance the SR significantly worsens after excluding the factor exposures. For environment the SR even increases after factor exclusions, which seems counter intuitive at first glance. In North America there is no significant change in SR when correcting for quality in all variables except governance and social, where the SR significantly worsens after neutralizing the portfolios. However, there are significant changes in Sharpe Ratio when neutralizing for all factors in environment. In the Emerging Markets we only see significant negative SR changes for environment when correcting for all factors.

Governance seems to be the most influenced factor by other risk factor returns in Europe and North America, while Environment is the most influenced in the Emerging Markets. However, we can conclude that all other ESG factors are not significantly driven by other factor returns in their risk/return profiles. These findings also match with the findings from our cross-sectional analysis.

EXHIBIT 7: FAMA MCBETH REGRESSION

		Europe		North America		Emerging Markets	
		Excl Quality	Incl Quality	Excl Quality	Incl Quality	Excl Quality	Incl Quality
Environment	**Mean**	0.018	0.014	0.090	0.080	0.028	0.015
	Std	0.390	0.391	0.361	0.357	0.604	0.592
	T-Stat	0.508	0.386	2.692*	2.415*	0.468	0.263
Social	**Mean**	0.085	0.080	0.046	0.041	0.008	-0.001
	Std	0.2670	0.271	0.361	0.344	0.584	0.562
	T-Stat	3.431*	3.178*	1.365	1.266	0.139	-0.014
Governance	**Mean**	0.131	0.112	0.074	0.066	0.061	0.050
	Std	0.401	0.403	0.342	0.321	0.535	0.530
	T-Stat	3.504*	2.975*	2.316*	2.190*	1.166	0.953
ESG	**Mean**	0.131	0.114	0.096	0.088	0.065	0.050
	Std	0.341	0.347	0.389	0.368	0.643	0.607
	T-Stat	4.117*	3.522*	2.640*	2.551*	1.026	0.835

Source: MSCI ESG scores and Worldscope, 01/2012 – 08/2021 (start EM 01/2013). Statistically significant values on a 5% level are marked with an *

EXHIBIT 8: SHARPE RATIO TEST OF UNRESTRICTED VS. RESTICTED ESG BACKTEST

	Europe		North America		Emerging Markets	
	Sharpe	T-stat	Sharpe	T-stat	Sharpe	T-stat
Environment	0.178		0.552		0.673	
Environment F0	0.430	4.938*	0.419	-3.380*	0.587	-2.832*
Environment Q0	0.258	4.341*	0.570	0.752	0.675	0.174
Social	0.559		0.218		0.274	
Social F0	0.501	-1.647	0.287	2.657*	0.307	1.529
Social Q0	0.588	1.241	0.189	-2.083*	0.348	4.937*
Governance	0.951		0.615		-0.119	
Governance F0	0.773	-3.552*	0.564	-1.374	-0.273	-1.861
Governance Q0	0.873	-3.386*	0.522	-3.764*	0.290	2.857*
ESG	0.888		0.819		0.743	
ESG F0	0.934	1.026	0.739	-1.830	0.824	2.462*
ESG Q0	0.909	0.687	0.815	-0.175	0.744	0.033

Source: MSCI Barra Portfolio Manager, 01/2012 – 08/2021 (start EM 01/2013). Statistically significant values on a 5% level are marked with an *. F0 corresponds to the portfolios with all risk factor exposures set to zero, Q0 corresponds to the portfolios with the quality factor set to zero

Conclusion

This paragraph discusses the major findings of this work and discusses potential implications. On a regional level we find that our results are least significant and reliable within the Emerging Markets which is due to bad and short ESG data coverage. In Europe, ESG and governance show the highest risk adjusted returns, however the performance of governance significantly worsens when taking quality out of the equation while ESG returns are stable. The worst performing factor here is environment, which seems to profit when neutralizing quality. In North America the picture changes with environment and ESG being the best performing factors while social and governance lose performance after taking out quality.

Social is the factor within the determinants of ESG that sticks out most during our analysis, as it has the lowest return attributable to the quality factor, as well as the lowest score correlations coupled with the lowest return correlations, on average. Further, in our cross-sectional analysis, social is the one building block of ESG that shows almost no significant change in Sharpe Ratio when neutralizing for quality. Hence, we conclude that social seems to be part of ESG that is least explainable by quality. On the other hand, its most influenced counterpart seems to be governance, with the highest return attributions and exposures, as well as the highest score correlations coupled with the highest return correlations. Further, within the cross-section of the European and North American sample, there is a significant decrease in Sharpe Ratio after neutralizing for quality.

We see low score correlations between ESG and profitability which could be explained by the fact that implementing ESG is often associated with a higher cost for the company. The highest score and return correlations can be found between ESG and safety, which also makes sense as ESG has been found to be a drawdown-shield and risk reduction tool in many studies. The lowest return correlations are found in the stability factor, which are even sometimes negative, this points towards a diversifying relationship between stability and ESG.

So, can ESG be completely explained by the quality factor? The short answer is no, low score correlations coupled with high return correlations indicates that the two signals can identify attractive companies through different approaches. Nevertheless, each dataset successfully identifies higher performing stocks using its unique methods. Even though the factors are built in uncorrelated approaches, they might have other factor exposures inherent to them which overlap with one another and result in higher return correlations. This could be an indication of latent factors. To further investigate this finding, we look at each factor in isolation of other potential value drivers. The cross-sectional analysis confirms the finding that ESG contains information that is not covered by other risk factors and hence has a risk premium which is not fully explainable by quality. Further, we find relatively high values for the specific (not explainable) return attribution of our ESG weighted portfolios.

A potential future research topic is the connection between the COVID-19 pandemic and the relationship between quality and ESG, as there seems to be a shift in the behavior. Behringer et al. (2020) have investigated the performance shift of the social factor and found that risk adjusted returns have significantly increased during the pandemic. Similar findings could be possible for the other variables.

Appendices

APPENDIX 1: PERFORMANCE OF ESG LONG-SHORT PORTFOLIOS

	Europe				North America				Emerging Markets			
	E	S	G	ESG	E	S	G	ESG	E	S	G	ESG
Return	-0.075%	1.848%	3.442%	3.256%	2.578%	1.071%	0.908%	2.217%	1.408%	-0.596%	0.959%	1.642%
Std	3.486%	2.378%	4.845%	3.319%	3.767%	3.261%	3.215%	3.944%	4.917%	5.948%	4.620%	5.826%
T	-0.067	2.406*	2.199*	3.037*	2.118*	1.017	0.874	1.740	0.839	-0.293	0.608	0.826

Source: MSCI Barra Portfolio Manager, 01/2012 – 08/2021 (start EM 01.2013)

APPENDIX 2: FACTOR RETURN ATTRIBUTION FOR ESG-SCORE WEIGHTED LONG SHORT PORTFOLIOS

	Europe				North America				Emerging Markets			
	ESG	E	S	G	ESG	E	S	G	ESG	E	S	G
Total Active	3.257	-0.075	1.848	3.442	2.217	2.578	1.071	0.908	1.642	1.408	-0.596	0.959
Residual	3.191	0.048	1.770	3.325	2.276	2.521	1.266	0.892	1.530	1.611	-0.452	-0.126
Country	0.597	-0.351	0.805	-0.083	-0.173	0.052	-0.173	-0.263	-2.373	-0.913	-1.910	-1.097
Industry	0.720	0.513	0.303	0.574	0.389	0.476	0.533	0.344	-0.347	0.351	-0.417	-0.390
Risk Indices	0.713	0.574	0.019	0.694	0.520	0.637	0.193	0.602	1.037	0.556	0.656	0.527
Profitability	-0.005	0.077	-0.187	0.298	0.182	0.032	0.112	0.298	0.164	0.125	0.125	0.165
Profitability Exposure	0.079	0.038	-0.108	0.385	0.173	0.014	0.101	0.316	0.088	0.110	0.064	0.139
Earnings Qu. Exposure	-0.097	0.052	-0.058	-0.155	-0.046	0.002	0.001	-0.093	0.172	0.065	0.144	0.081
Stability	0.132	0.134	0.023	0.095	0.188	0.272	0.086	0.113	0.201	0.038	0.144	0.119
Exposure	0.218	0.145	0.140	0.107	0.211	0.238	0.138	0.115	0.058	-0.026	0.085	0.003
Safety	0.297	0.227	0.190	0.167	0.320	0.332	0.174	0.092	0.236	0.092	0.206	0.076
Leverage Exposure	-0.128	0.073	0.035	-0.262	0.037	0.219	0.036	-0.118	-0.092	-0.041	-0.093	-0.093
Earnings Va. Exposure	-0.366	-0.257	-0.165	-0.316	-0.327	-0.312	-0.158	-0.158	-0.223	-0.115	-0.225	-0.225
Residual Vola	0.426	0.257	0.110	0.611	0.413	0.353	0.139	0.345	0.408	0.106	0.255	0.314
Exposure	-0.302	-0.187	-0.120	-0.363	-0.255	-0.200	-0.119	-0.198	-0.054	0.057	-0.005	-0.124
Other	-0.132	-0.114	-0.121	-0.52	-0.606	-0.361	-0.324	-0.253	0.052	0.205	-0.070	-0.146
Specific	1.478	-0.742	0.728	2.366	1.636	1.517	0.746	0.218	2.752	1.574	1.029	0.751

Source: MSCI ESG scores and Worldscope, 01/2012 – 08/2021 (start EM 01/2013)

APPENDIX 3: FACTOR EXPOSURE OF ESG-SCORE WEIGHTED LONG-SHORT PORTFOLIOS

Europe

	ESG	Environment	Social	Governance
Beta	-0.061	-0.006	0.007	-0.276
Book-to-Price	-0.108	-0.070	0.071	-0.369
Dividend Yield	0.196	0.185	0.105	0.056
Earnings Quality	-0.097	0.052	-0.058	-0.155
Earnings Variability	-0.366	-0.257	-0.165	-0.316
Earnings Yield	0.016	0.026	0.002	-0.011
Growth	-0.112	-0.085	-0.074	-0.034
Investment Quality	0.218	0.145	0.140	0.107
Leverage	-0.128	0.073	0.035	-0.262
Liquidity	-0.002	-0.063	-0.006	0.089
Long-Term Reversal	-0.046	0.025	0.001	-0.220
Mid Capitalization	-0.048	-0.113	-0.029	0.169
Momentum	0.086	-0.012	0.031	0.182
Profitability	0.079	0.038	-0.108	0.385
Residual Volatility	-0.302	-0.187	-0.120	-0.363
Size	0.125	0.254	0.084	-0.276

North America

	ESG	Environment	Social	Governance
Beta	-0.086	-0.065	-0.055	-0.125
Book-to-Price	-0.203	-0.140	-0.107	-0.150
Dividend Yield	0.198	0.206	0.072	0.138
Earnings Quality	-0.046	0.002	0.001	-0.093
Earnings Variability	-0.327	-0.312	-0.158	-0.158
Earnings Yield	-0.029	0.002	-0.025	0.099
Growth	-0.136	-0.174	-0.087	-0.002
Investment Quality	0.211	0.238	0.138	0.115
Leverage	0.037	0.219	0.036	-0.118
Liquidity	-0.110	-0.260	-0.037	0.058
Long-Term Reversal	0.022	0.055	0.033	-0.140
Mid Capitalization	-0.130	-0.255	-0.036	0.068
Momentum	0.054	0.056	0.014	0.105
Profitability	0.173	0.014	0.101	0.316
Residual Volatility	-0.255	-0.200	-0.119	-0.198
Size	0.188	0.338	0.070	-0.081

Emerging Markets

	ESG	Environment	Social	Governance
Beta	-0.262	-0.050	-0.293	-0.047
Book-to-Price	-0.170	-0.052	-0.203	-0.178
Dividend Yield	0.024	0.006	0.034	-0.028
Earnings Quality	0.172	0.065	0.144	0.081
Earnings Variability	-0.223	-0.115	-0.225	-0.070
Earnings Yield	-0.093	-0.061	-0.064	-0.122
Growth	-0.004	0.017	0.023	-0.023
Investment Quality	0.058	-0.026	0.085	0.003
Leverage	-0.092	-0.041	-0.093	-0.056
Liquidity	-0.186	-0.116	-0.226	0.026
Long-Term Reversal	-0.122	-0.011	-0.147	-0.098
Mid Capitalization	-0.156	-0.110	-0.163	0.091
Momentum	0.097	0.034	0.082	0.044
Profitability	0.088	0.110	0.064	0.139
Residual Volatility	-0.054	0.057	-0.005	-0.124
Size	0.262	0.166	0.273	-0.123

Source: MSCI ESG scores and Worldscope, 01/2012 – 08/2021 (start EM 01/2013)

APPENDIX 4: FAMA MACBETH RESULTS EUROPE EXCLUDING QUALITY (TOP) AND INCLUDING QUALITY (BOTTOM)

Europe

	E			S			G			ESG		
	Mean	Std	T	Mean	Std	T	Mean	Std	T	Mean	Std	T
Variable	0.014	0.391	0.386	0.080	0.271	3.178*	0.112	0.403	2.975*	0.114	0.347	3.522*
Momentum	0.276	1.110	2.669*	0.275	1.112	2.650*	0.269	1.108	2.608*	0.275	1.109	2.659*
Profitability	0.036	0.396	0.961	0.038	0.393	1.036	0.028	0.399	0.762	0.036	0.394	0.990
Safety	0.126	0.644	2.097*	0.123	0.647	2.043*	0.112	0.641	1.881	0.110	0.652	1.809
Size	0.028	0.641	0.464	0.025	0.625	0.436	0.003	0.617	0.058	0.030	0.626	0.511
Stability	0.001	0.442	0.031	-0.001	0.446	-0.029	-0.002	0.447	-0.049	-0.002	0.444	-0.055
Value	-0.039	0.904	-0.460	-0.035	0.902	-0.418	-0.022	0.894	-0.266	-0.034	0.910	-0.401
Constant	0.010	0.161	0.662	0.009	0.159	0.609	0.008	0.159	0.536	0.010	0.159	0.657

	Mean	Std	T	Mean	Std	T	Mean	Std	T	Mean	Std	T
Variable	0.018	0.390	0.508	0.085	0.267	3.431*	0.131	0.401	3.504*	0.131	0.341	4.117*
Momentum	0.297	1.159	2.751*	0.296	1.160	2.740*	0.289	1.154	2.687*	0.295	1.156	2.736*
Size	0.031	0.647	0.517	0.029	0.630	0.493	0.002	0.632	0.029	0.034	0.629	0.588
Value	-0.070	1.002	-0.746	-0.067	1.003	-0.718	-0.046	0.981	-0.499	-0.062	1.005	-0.658
Constant	0.010	0.165	0.680	0.010	0.164	0.629	0.008	0.162	0.527	0.010	0.164	0.678

North America

	E			S			G			ESG		
	Mean	Std	T	Mean	Std	T	Mean	Std	T	Mean	Std	T
Variable	0.080	0.357	2.415*	0.041	0.344	1.266	0.066	0.321	2.190*	0.088	0.368	2.551*
Momentum	0.095	1.156	0.883	0.091	1.149	0.848	0.089	1.152	0.833	0.092	1.149	0.860
Profitability	0.011	0.458	0.268	0.012	0.456	0.278	0.012	0.457	0.277	0.012	0.455	0.289
Safety	0.047	0.598	0.846	0.046	0.596	0.830	0.045	0.597	0.817	0.041	0.596	0.739
Size	-0.085	0.603	-1.517	-0.100	0.608	-1.770	-0.108	0.615	-1.887	-0.098	0.606	-1.725
Stability	0.067	0.509	1.420	0.075	0.505	1.587	0.074	0.504	1.584	0.069	0.506	1.453
Value	-0.105	0.639	-1.768	-0.111	0.640	-1.861	-0.105	0.642	-1.747	-0.104	0.643	-1.733
Constant	0.014	0.096	1.566	0.015	0.095	1.658	0.014	0.095	1.553	0.013	0.096	1.479

	Mean	Std	T	Mean	Std	T	Mean	Std	T	Mean	Std	T
Variable	0.090	0.361	2.692*	0.046	0.361	1.365	0.074	0.342	2.316*	0.096	0.389	2.640
Momentum	0.098	1.189	0.888	0.094	1.182	0.850	0.092	1.182	0.833	0.096	1.180	0.874
Size	-0.090	0.641	-1.506	-0.108	0.650	-1.780	-0.117	0.664	-1.895	-0.104	0.645	-1.725
Value	-0.099	0.667	-1.594	-0.106	0.668	-1.694	-0.099	0.667	-1.586	-0.098	0.670	-1.565
Constant	0.015	0.098	1.623	0.016	0.097	1.720	0.014	0.096	1.603	0.014	0.098	1.532

Emerging Markets

	E			S			G			ESG		
	Mean	Std	T	Mean	Std	T	Mean	Std	T	Mean	Std	T
Variable	0.015	0.592	0.263	-0.001	0.562	-0.014	0.050	0.530	0.953	0.050	0.607	0.835
Momentum	0.153	1.058	1.470	0.154	1.056	1.477	0.145	1.058	1.394	0.155	1.056	1.488
Profitability	0.111	0.489	2.301*	0.111	0.498	2.267*	0.110	0.497	2.255*	0.108	0.485	2.262*
Safety	0.118	0.760	1.581	0.115	0.754	1.550	0.119	0.761	1.584	0.112	0.752	1.518
Size	-0.061	0.719	-0.866	-0.062	0.697	-0.905	-0.065	0.704	-0.943	-0.063	0.693	-0.928
Stability	-0.047	0.456	-1.050	-0.044	0.450	-0.990	-0.047	0.456	-1.045	-0.047	0.445	-1.072
Value	0.140	0.996	1.422	0.140	0.966	1.470	0.135	1.003	1.368	0.143	0.984	1.477
Constant	0.036	0.201	1.821	0.037	0.201	1.851	0.035	0.202	1.781	0.037	0.201	1.845

	Mean	Std	T	Mean	Std	T	Mean	Std	T	Mean	Std	T
Variable	0.028	0.604	0.468	0.008	0.584	0.139	0.061	0.535	1.166	0.065	0.643	1.026
Momentum	0.152	1.051	1.471	0.153	1.049	1.477	0.145	1.051	1.396	0.154	1.049	1.494
Size	-0.083	0.706	-1.199	-0.085	0.683	-1.256	-0.090	0.686	-1.332	-0.085	0.681	-1.267
Value	0.091	1.052	0.883	0.093	1.018	0.931	0.088	1.060	0.839	0.098	1.035	0.957
Constant	0.038	0.205	1.890	0.039	0.205	1.913	0.037	0.206	1.820	0.039	0.205	1.908

Source: MSCI ESG scores and Worldscope, 01/2012 – 08/2021 (start EM 01/2013). Statistically significant values on a 5% level are marked with an *. T is the t-statistic

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