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Can Sustainability Criteria Enhance Returns and Reduce Risk on Stocks?

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Abstract

This thesis investigates whether sustainability criteria can be used to enhance return and reduce risk on stocks. This is done through conducting an empirical analysis on European stocks from 2007-2016, with the purpose of identifying a four-factor model that includes the sustainability score in addition to the three Fama and French factors.

The methodology is based upon famous techniques to test asset pricing models, performing one two-pass regression inspired by Fama and Macbeth (1973) and one two-pass regression inspired by Fama and French (1992). The results show that the criteria can be used to obtain higher expected return, less volatility and less company-specific risk by investing in companies with better sustainability scores.

Content

1.0 Introduction

Remember in 2015 when Volkswagen lost more than 20% shareholder value the week of an emission scandal?[1] Or in 2010 when BP stock prices fell 55% after the Deepwater Horizon incident?[2] Or in 2017 when a video footage of law enforcement forcible dragging a ticketed passenger from United Airlines plane went viral?[3] The company stock price subsequently fell approximately 4%. Events as these have triggered critical questions on the relationship between sustainability and financial performance.

The focus on sustainability has boomed over the last years. From 2014 to 2016 assets being professionally managed under sustainable strategies have increased by 25 percent (The Global Sustainable Investment Alliance, 2016). Some even claim sustainability to be one of the most significant trends in financial markets for decades (Clark et al., 2015). To facilitate for more capital flowing into a sustainable economy, the financial impact needs to be addressed. Previous research has failed to reach consensus on this link. According to Modern Portfolio Theory, imposing constraints on the investment universe will sacrifice diversification.

This thesis' contribution is to shed light on the link between sustainability and the financial performance with a focus of an investor who integrate the sustainability score of a stock into his investment decision analysis. This is in contrast to most previous research that has focused on how the average ESG (Environmental, Social and Governance) investment does. More precisely, the following research question and hypotheses have been chosen:

[1] In September 2015, German car manufacturer Volkswagen admitted that 11 million of its vehicles were equipped with software that was used to cheat on emissions tests.

[2] In April 2010, there was an explosion on the Deepwater Horizon rig caused by a blowout that killed 11 crew members. Two days later, Deepwater Horizon sank while the well was still active and caused the largest offshore oil spill in U.S. history.

[3] In April 2017, a United Airlines passenger was forced to give up his seat due to an overbooked plane. The videos and footage of the scene show how he was dragged down the aisle by the arms and legs while other passengers shouted in protest.

Can sustainability criteria enhance returns and reduce risk on stocks?

1. An investor can use the ESG rating to enhance return

2. An investor can use the ESG rating to reduce risk

The analysis in this thesis is limited to the European market. Europe has the highest portion, 52.6%, of global sustainable investments assets in the world, and is considered a region with high living standard which has the right conditions for ESG policies (Global Sustainable Investment Alliance, 2016). According to the Country Sustainability Ranking as of October 2016, several European countries are considered to be among the top performers in the world (RobecoSam and Robeco, 2016).

As a proxy for sustainability, the Thomson Reuters ESG score is used. It provides a reliable objective way to evaluate how investments are meeting ESG issues challenges, and can be downloaded from the database for investors to use.

The analysis conducted builds upon two different two-pass regressions. Both regressions are using a four-factor model that includes an ESG term in addition to the three Fama and French factors. In the first analysis stocks are grouped into factor-mimicking portfolios based upon their ESG score, and subsequently the Fama and French factors. Then, these portfolios are used in a two-pass regression inspired by Fama and Macbeth (1973). The second method is a two-pass regression of each individual stock. The results achieved indicate a positive, significant relationship between ESG and return, and a negative relationship between ESG and risk. The practical implication of this is that an investor can benefit from adding the ESG score of a company to his investment analysis process.

The remainder of this paper is composed as follows:

- Chapter 2 provides background on material of responsible investing, by starting with a more broadly and historical perspective and narrowing it down to the sustainability term that will be applied in this thesis. Thereafter, general strategies of responsible investing will be introduced.

- Chapter 3 summarizes the core literature that exists on sustainability, and is followed by a description of Fama and Macbeth (1973) and Fama and French (1992).
- Chapter 4 introduces the fundamental theory, Modern Portfolio Theory.
- Chapter 5 contains a description of the methodology used.
- Chapter 6 explains the data used in the empirical analysis, goes more into depth of the Thomson Reuters ESG rating, and introduce preliminary results.
- Chapter 7 and 8 provide the analysis and conclusion.

2.0 Responsible Investing

Responsible Investing or Social Responsible Investing (SRI) is a strategy which combines an investor's intention to maximize both financial return and social return. This fast growing industry is particularly growing among among women and the millennial generation, two groups that are quickly becoming more influential investment decisions makers. A survey conducted by the Morgan Stanley Institute for Sustainable Investing (2015) found that (1) female investors are nearly twice as likely as male investors to consider ESG factors when making investment decisions, and (2) millennial investors are twice as likely to make sustainable investment decisions as other investors.

It is useful to have a common understanding of the investment strategy that incorporate ethical conditions in order to optimize financial return. SRI has emerged in recent years as a dynamic and quickly growing segment of the financial services worldwide. Traditionally, SRI was about the alignment of investments and the values of the investor. Common themes that were inconsistent with the value of the SRI investors were typically gambling, tobacco, alcohol etc. Investors practiced this by avoiding investments in companies that offer such products. The asset managers easily implemented the exclusion strategy of such areas, but those investors with values concerning sustainability were missing a reliable basis for selection of stocks. Investors required more information about companies' behavior related to ESG issues. Researchers addressed this by creating ESG evaluations, where the companies that do well on these evaluations indicate sustainable companies. Still, it is often difficult to classify an ESG issue as only an environmental, social or governance issue, as they are often interlinked. Even though investors use slightly different measures of ESG, some common examples are presented in the table below.

Table 1 ESG Issues

Environmental issues	Social issues	Governance issues
Climate change and carbon emissions	Customer satisfaction	Board composition
Air and water pollution	Data protection and privacy	Audit committee structure
Biodiversity	Gender and diversity	Bribery and corruption
Energy efficiency	Employee engagement	Executive compensation
Waste management	Community relations	Lobbying
Water scarcity	Human rights	Political contributions
		Whistleblower schemes

Retrieved from Hayat, U., & Orsagh, M. (2015). Environmental, Social, and Governance Issues in Investing: A Guide for Investment Professionals. Copyright by the CFA Institute.

More broadly, sustainable and responsible investment is defined as an investment approach that incorporate the environmental, social and governance factors in the investment process. Within this context, there are three main strategies investors employ for responsible investing: community investment, shareholder advocacy and screening. This thesis will focus on screening.

2.1 Community investment

Community investment is a way of sustainable investing. Investors allocate a percentage of their investment directly to Community Development Financial Institutions (CDFIs) to support economic development. Typically, they provide capital to low-income or disadvantaged communities.

2.2 Shareholder Advocacy

Generally, stock ownership comes with rights, such as the right to vote in annual meetings. Shareholder advocacy describes the actions investors take by using their shares in companies to improve the environmental, social and governance practices. Other examples of shareholder advocacy are proxy voting, dialogues with corporate leaders and shareholder resolution.

2.3 Screening

Screening is the practice of excluding or including companies from portfolios based on ethical criteria. Generally, investors seek to own profitable companies that make positive contribution to the society. There are several types of approaches for screening:

- **Norm-based screening** is a strategy that involves assessing each company held in the investment portfolio against global norms, principals or

standards such as environmental protection. The norms or principals are typically set out in international initiatives and guidelines such as OECD, UN Global Compact or other governmental or intergovernmental organizations, for example international labour organization (ILO).

- **Negative screening** excludes companies from investors' investment universe, due to the fact that these companies operate in industries that do not meet the ethical criterion of sustainable investment. Typically, companies are avoided due to their controversial business areas such as alcohol, tobacco or gambling. Negative screening may cause a reduction in investment opportunities since investors exclude companies, consequently, limiting diversification of risk. For example, Norway's Governance Pension Fund excludes companies that base 30% or more of their activities on coal, and/or derive 30% of their revenues from coal.
- Investors that practice **positive screening** include companies in their investment universe based on ESG performance. While negative screening will only reduce the investment universe, positive screening will lead to different optimal weights for each investment in the optimal portfolio. In other words, investors are facing three objectives: maximize financial return, minimize risk and maximize impact.

The screening process can be very expensive for individuals, and as a consequence the demand for a reliable rating has soared. Two major agencies providing this rating are Thomson Reuters and Morningstar. Both Thomson Reuters and Morningstar provide positive screening based on a best-in-class approach. This approach is favoring investments with best practice amongst several sector peers, and is chosen as it will allow a sector balance within the investable universe.

3.0 Related Literature

In 2009, Hong and Kacperczyk found that "sin stocks" outperform market benchmark in the US. Sin stocks are stocks that promote vice, that is, alcohol, tobacco and gaming firms. They further argued that these stocks are neglected by investors because of social norms, and are undervalued. Yet, this research has been criticized as it compares sin stocks (which are not value-weighted) with a value-weighted benchmark. Since small capitalization (cap) stocks tend to outperform large cap stocks their findings might be biased. To cope with this, Lobe and Walkshäusl (2011) studied similar value-weighted sin stock and found that value-weighted portfolios do not significantly outperform their benchmarks. Still, there is a lack of applicability of earlier research since it relies on a different definition of sustainability.

Research using ESG inclusion criteria is relatively new. An analysis concluded that 85% of the studies were focusing on one ESG dimension only (United Nations Environment Program Finance Initiative and Mercer Investment Consulting, 2007). Results have been mixed, but these studies are often criticized due to the interconnection of the three dimensions. Common findings of these studies are that companies with higher ESG scores are associated with less company-specific risk, lower cost of debt and higher credit ratings (Bauer et al., 2009; Bauer and Hann, 2011, Lee and Faff, 2009, cited in Hoepner, 2013).

Examining several meta-studies and review papers, a general conclusion can be drawn that there is a positive correlation between sustainability and operational performance (Fulton et al. 2012, Hoepner and McMillian 2009, McWiliams et al. 2006, Salzmann 2005). Moreover, there seem to be an increase in the number of studies finding a positive link between ESG performance and financial performance. Eccles et al. (2014) found that "high" sustainability companies outperform "low" sustainability companies in the US in terms of stock market and operational performance. More specifically, they found that the annual abnormal performance is higher for the high sustainability group compared to the low sustainability group by 3.0% (significant at less than 5% level) on a value-weighted

base and by 2.5% (significant at less than 10% level) on an equal-weighted base. A review by Arabesque and Oxford University (2015) report that companies with strong sustainability scores are also less risky. They examined over 200 studies, and reported that 80% of the studies showed that stock price performance of companies is positively influenced by good sustainability practices.

3.1 Fama and MacBeth

The two-stage procedure devised by Fama and MacBeth are based on stocks listed on NYSE in the period 1935-1968 and is described as following: First-pass regression consists of running N time series regression on each security against the market portfolio in order to estimate the market beta. Followed by constructing 20 portfolios according to their ranked market betas. Second-pass regression consists of running T cross-sectional regressions of the 20 portfolios' return and portfolio beta against the market portfolio in order to estimate the risk premium on beta. Lastly, they calculate the average portfolio beta.

Fama and MacBeth proposed the following specification to test the implications of the CAPM model:

$$\tilde{R}_p = \hat{\gamma}_{0,t} + \hat{\gamma}_{1,t}\hat{\beta}_{p,t-1} + \hat{\gamma}_{2,t}\hat{\beta}^2_{p,t-1} + \hat{\gamma}_{3,t}\bar{s}_{p,t-1}(\hat{e}_i) + \tilde{\eta}_{p,t}$$

where $\hat{\gamma}_{0,t}$ is the intercept, $\bar{s}_{p,t-1}(\hat{e}_i)$ represents the standard deviation of residual returns for each security. Fama and MacBeth tested CAPMs validity through basic statistical analysis of the estimates for the various $\hat{\gamma}$s.

Assuming that the return and the consequently parameters are normally distributed; simple t-test could be constructed in order to test the three implications below:

1. In an efficient portfolio the relationship between expected return on a security and its risk is linear i.e $\hat{\gamma}_{2,t} = 0$.
2. Only the systematic risk measured by β_P is priced i.e $\hat{\gamma}_{3,t} = 0$.
3. Investors are risk- averse i.e higher risk should be associated with higher expected return $E(r_i) - rf > 0$.

The results of Fama and MacBeth provide some evidence for the CAPM. The expected return-beta relationship is linear and increase with beta i.e $\hat{\gamma}_{2,t}$ is not significantly different from 0. Further, the non-systematic risk does not matter for excess return i.e $\hat{\gamma}_{3,t}$ is not significantly different from 0.

3.2 Fama and French: Three-factor Model

In 1992, Eugene Fama and Kenneth French analyzed the role of market beta, firm size, financial leverage and book- to market equity ratio on the NYSE, AMEX and NASDAQ stocks from July 1963 until December 1990. By performing a two-pass regression inspired by Fama and Macbeth they found that firm size and book-to-market equity ratio could explain the cross-section of returns. The model is commonly known as the Fama and French Three-factor Model, and is expressed as follows:

$$r_i - rf = a_i + \beta_{M,i}(r_m - rf) + \beta_{SMB,i}(SMB) + \beta_{HML,i}(HML) + \varepsilon_i$$

where β_{Mi} is the market beta for stock i and $(r_m - r_f)$ is the market risk premium. $\beta_{SMB,i}$ is the size beta for stock i, and the risk factor SMB is the difference between returns on small cap stocks over big cap stocks. Lastly, $\beta_{HML,i}$ is the book-to-market beta for stock i and HML is the difference between the returns on high and low book-to-market ratio stocks. Alpha is the intercept of the model and $\varepsilon_{i,t}$ is the error term for stock i at time t.

More precisely, they found that smaller market cap stocks outperform large cap, and stocks with high book-to-market ratio outperform those with a smaller one. They argue that this is due to risk, that smaller firms and firms with high book-to-market ratio are riskier and therefore investors are compensated with higher rates of return. Moreover, they found an insignificant market beta when SMB and HML were included.

4.0 Modern Portfolio Theory

Capital Asset Pricing Model (CAPM) provided the first coherent framework to the fundamental question in finance, how the risk of an investment should affect its expected return. The model was developed by Sharpe (1964), Lintner (1965), Mossin (1966) and was an outgrowth of Markowitz (1952) concept of efficient frontier. While some studies raise doubt about CAPMs validity, it's still the major workhorse in the financial industry. Yet, the model has been under constant scrutiny due to its' observed market anomalies and thereby scholars have further developed the model in attempt to improve the predictive power. One famously known expansion of CAPM was introduced by Fama and French (1992), the Three-factor Model, introduced in the previous chapter.

4.1 Mean-variance Analysis

The concept of mean-variance analysis outlined by Markowitz (1952) raises the important trade-off between expected return and risk when evaluating an investment. Modern Portfolio Theory (MPT) assumes investors are risk averse, meaning that they will prefer a less risky portfolio to a riskier portfolio for a given level of return. The investor will take on more risk only if he/she is expecting more reward, and conversely must accept more risk if he/she wants higher expected return.

The trade-off between risk and reward is equal for all investors, but different investors evaluate the trade-off contingent on their individual risk aversion characteristics. In order to optimize the trade-off, the investor has to distinguish between two types of risk: systematic and unsystematic. The unsystematic factor consists of company-specific events, and can be reduced or eliminated by spreading investments across less correlated assets. Systematic risk, on the other hand, cannot be eliminated through diversification. This risk affects the overall market, not just a particular stock or industry, and can only be mitigated through hedging or by using the right asset allocation strategy.

4.2 Portfolio Evaluation

The central theme in MPT is that an investor cannot just look at the risk-reward trade-off for each investment, but has to assess the relative impact it has on the risk-reward of the overall portfolio. Hence the most important determinant of an investment's contribution to portfolio risk is not the risk of the investment itself, but rather whether the portfolio moves in the same direction as the other investments in the portfolio and to what degree. The sensitivity of an investment with respect to a systematic risk factor is a common measure for this, the beta:

$$\beta = \frac{cov(r_i, r_s)}{var(r_s)}$$

where "i" denotes the security, $cov(r_i, r_s)$ *is the covariance between security i and the systematic risk factor, and var is the variance of the systematic risk factor.*

In case of multiple systematic factors, the beta should be measured through a regression as the factors often interact with each other.

4.3 The Link between MPT and ESG Investing

According to MPT, a conventional universe should be more diversified than an ESG-universe as the ESG-universe is only a portion of the conventional universe. This conventional view will imply that a strict ESG portfolio will yield less return for the same risk level as a conventional portfolio. If this is true, investing in sustainable stocks will not provide excess risk-adjusted return. Yet, the usefulness of this thesis is not limited to portfolio-by-portfolio or stock-by-stock analysis. If an investor can earn excess return or reduce risk by over-weighting good ESG performing stocks and under-weighting ESG investments in his overall portfolio, or vice versa, the ESG score is a good criterion for investing.

5.0 Methodology

5.1 Motivation and Limitations

The Fama and French factors are already accepted by investors, meaning that they acknowledge they need greater exposures to the three factors in order to maximize expected return. Therefore, it seems natural to use this model, and see the outcome when an ESG term is added. The two-pass regression technique is a common methodology to test asset pricing models, and have been used to test both the CAPM, Arbitrage Pricing Theory, as well as the Fama and French 3-factor model.

5.1.1 Analysis on Portfolios

The motivation for using portfolios is based upon the fact that individual stock returns are so volatile that it is too hard to reject the hypothesis that all average returns are the same. By grouping stocks into portfolios based on characteristics related to return, the resulting portfolio variance will be reduced making it possible to detect average return differences. Moreover, Fama and Macbeth (1973) claimed grouping stocks into portfolios are a better way to measure betas since they are more stable over time. [4]

5.1.2 Analysis on Individual Securities

In the later years, using regression on portfolios have been criticized due to the shrinkage of information used in the second-pass regression. In 1992, Fama and French claimed that despite portfolios might estimate the market beta more precise, the consequence is less accurate size and book-to-market estimates for risk premiums. Consistently, Ang et. al (2008) empirically showed that even though the sampling uncertainty of factor loadings is reduced by using grouping stocks into portfolios this does not lead to lower standard errors for risk premium estimates. They argued that the standard errors of risk premium estimates are determined by the cross-sectional distribution of factor loadings and residual risk, and using portfolios will shrink this dispersion.

[4] Fama and Macbeth (1973) used the portfolio method to measure the CAPM beta. This is not done in this thesis, since yearly data is used instead of monthly thereby reducing the volatility of stock returns. Another reason is possible inference with other variables.

5.2 Portfolio Analysis

The Fama and French approach estimates the systematic risk factors by constructing factor-mimicking portfolios. The portfolios used in this thesis are formed as follows:

1. Form three equal-weighted portfolios based on lagged ESG scores.

2. Within each of the three equal-weighted portfolios the stocks are divided into two: large cap and small cap by the median lagged market capitalization value.

3. Within each of the 3 small cap and 3 large cap portfolios, the portfolios are subdivided into three more pieces: the 0-30th percentile lowest book-to-market ratio (growth), the 30-70th percentile mid (neutral) and 70-100th highest percentile book-to-market ratio (value). This is also done using the lagged values.

In total, this results in 18 equal-weighted portfolios with different characteristics. The portfolios are held for one year before being re-forming.

5.3 Two-pass Regression of Portfolios

5.3.1 First-stage Regression

In the first regression, the betas are estimated from ordinary least squares (OLS) time series regression of the excess return on the systematic risk factors. We run the following regression where a sustainability factor has been added to the theoretical Fama and French Three-factor Model:

$$R_{i,t} - Rf_t = \alpha_{i,t} + \beta_{mkt,i}\left(RP_{Market-rf,t}\right) + \beta_{SMB,i}\left(RP_{SMB,t}\right) + \beta_{HML,i}\left(RP_{HML,t}\right) + \beta_{ESG,i}\left(RP_{ESG,t}\right) + \varepsilon_{i,t}$$

where β_{Mi} is the market beta for portfolio i, $\beta_{SMB,i}$ is the size beta for portfolio i, $\beta_{HML,i}$ is the book-to-market beta for portfolio i, , $\beta_{ESG,i}$ is the ESG beta for portfolio i. Further, RP denotes the risk premium for respectively the market excess return, small cap minus large cap, high book-to-market ratio minus low and high ESG score minus low. Alpha is the intercept of the model, and $\varepsilon_{i,t}$ is the error term for portfolio i at time t.

5.3.2 Second-stage Regression

A cross-sectional regression is done on the estimated betas to determine the risk premiums for each factor. The regression is run on a period-by-period basis, resulting in time series of the intercept and slope coefficients. The risk factors' significance can then be evaluated, providing evidence to claim whether the hypotheses hold. Fama and Macbeth (1973) further suggest that the estimate of the average risk premiums and alphas can be calculated as the simple average of the time regressions coefficients.

5.3.3 Adjusting Standard Errors

For comparison, test statistics will be reported based on OLS standard errors, Fama and Macbeth adjusted standard errors and Newey-West adjusted standard errors. The OLS distribution is only correct when the residuals are independently and identically drawn from a population. When the errors are cross-sectionally correlated the standard error will be too low. One improvement is the Fama and Macbeth approach. Still, this approach has some lacks due to heteroscedasticity of the residuals. To mitigate this, the Newey-West adjusted standard errors are also reported. Because of a limited dataset, only 1 lag is used.

5.4 Two-pass Regression of Individual Stocks

5.4.1 First-stage Regression

In the first regression the betas are estimated from OLS time series regression of the excess return on the systematic risk factors. Since the company-specific variables will be used, the variables are transformed into more stationary variables before running the regression. In line with Fama and French (1992), the natural logarithm of the market cap (in billions) and the book-to-price equity ratio have been taken. By the same intuition, taking the natural logarithm of the ESG score is also performed.

We run the following regression:

$$R_{i,t} - Rf_t = \alpha_{i,t} + \beta_{mkt,i}\left(RP_{Market-rf,t}\right) + \beta_{MC\,i}(\ln(MC)_{it}) + \beta_{book/price,i}\left(\ln(\frac{Book}{Price})_{i,t}\right) + \beta_{ESG,i}\left(\ln(ESG)_{i,t}\right) + \varepsilon_{i,t}$$

where β_{Mi} is the market beta for portfolio i, $\beta_{SMB,i}$ is the size beta for portfolio i, $\beta_{HML,i}$ is the book-to-market beta for portfolio i, , $\beta_{ESG,i}$ is the ESG beta for portfolio i. Alpha is the intercept of the model, and $\varepsilon_{i,t}$ is the error term for portfolio i at time t.

5.4.2 Second-stage Regression

The next step is running cross-sectional regressions on the estimated betas to determine the risk premiums for each factor. The regression is run on a year-by-year basis, resulting in time series of the intercept and slope coefficients. This enables an evaluation of the risk factors' significance, thereby providing the evidence to claim whether the presented hypotheses hold.

6.0 Data

6.1 Data Description

The data is gathered from Thomson Reuters Eikon database for 1123 European public companies in the years from 2007 to 2016. Companies have been eliminated from the dataset due to the lack of necessary ESG information and/or negative book-to-price ratio. This latter operation is consistent with Fama and French (1992). Hence, there are 607 companies left in the sample.

6.1.1 Return

The annual return provided by Thomson Reuters include dividends and is reported at the end of each fiscal year. It is calculated as follows:

$$r_{t,t+1} = \frac{P_{t+1} + D_{t,t+1}}{P_t} - 1$$

where P denotes the price, D the dividend, and t the time period.

6.1.2 Market Portfolio

The Morgan Stanley Capital International Europe Equal Weighted Index (MSCI) is used as a proxy for the market portfolio. It captures large and mid-capitalization companies across 15 developed markets countries in Europe, and is rebalanced quarterly to weight each constitute equally.

6.1.3 Risk-free Rate

As a proxy for the risk-free rate, Euro Interbank Offered Rate (Euribor) is used. The Euribor rates are based on the average interest rates at which a large panel of European banks borrow funds from one another, and is therefore considered close to risk-free. Twelve months' maturity is used, as it serves as an alternative to investing in a risky asset over the same time period.

6.1.4 Size

Market value is gathered from Thomson Reuters, and is defined as the share prices multiplied by the number of ordinary shares in issue at the end of each fiscal year.

6.1.5 Book-to-market ratio

Thomson Reuters reports the market-to-book ratio per stock in the end of each fiscal year. This ratio is transformed by dividing 1 on the market-to-book ratio, resulting in the desired book-to-market ratio. The market value is defined as the market value of the ordinary common equity, and the book value as the balance sheet value of the ordinary common equity.

6.2 Thomson Reuters ESG Rating

The Thomson Reuters ESG database is one of the most comprehensive ESG databases in industry covering 6,000 public companies, across more than 400 different ESG metrics with a history going back to 2002. Further details and information can be found on Thomson Reuters homepage (2017A, 2017B).

Thomson Reuters have collected the ESG metrics from the companies' public disclosure, such as annual reports, CSR reports and company websites. They have carefully selected a subset of 178 most relevant data points to power the overall company assessments and scoring process, considering materiality, availability and industry relevance, and are grouped into 10 categories. Of environmental these are resources used, emissions and innovation. Of governance, these are management, shareholders and CSR strategy. Of social, these are workforce, human rights, community and product responsibility. The following methodology is used:

Step 1: Category Scores Calculation

The percentile rank scoring is based on three factors, and is calculated with the following formula:

$$Score = \frac{\#\ of\ companies\ with\ a\ worst\ value + \frac{\#of\ companies\ with\ the\ same\ value\ included\ the\ current\ one}{2}}{\#\ of\ companies\ with\ a\ value}$$

Each category score is the equally weighted sum of all the indicators used to create it. The normalized weights are calculated excluding indicators with no data available in the public domain.

Step 2: Category Benchmarks

Issues tend to be more relevant and similar to companies within the same industries, and thus an industry benchmark is used (TRBC Industry Group). To calculate the Governance categories, countries are used as a benchmark.

Step 3: Category Weights

To calculate the overall ESG score, the count of measures per category determines the weight of the respective category, and is shown in the table below:

Table 2 Category Weights

Pillar	Category	Indicators in Scoring	Weights
Enviromental	Resource Use	20	11%
	Emissions	22	12%
	Innovation	19	11%
Social	Workforce	29	16%
	Human Rights	8	4.50%
	Community	14	8%
Governance	Product Responsibility	12	7%
	Management	34	19%
	Shareholders	12	7%
	CSR Strategy	8	4.50%
Total		178	100%

6.3 Preliminary Results

6.3.1 Summary Statistics of Individual Stocks

The summary statistics of the five variables are presented in the table below, where excess return is calculated as the nominal return minus the risk free rate. The average excess return is 8.2% and is in line with the fact that the sample period is characterized as an overall bull market. The high kurtosis and positive skewness imply that the return does not follow a normal distribution. On average, the stocks in the sample selected are scored approximately 0.6 on ESG.

Table 3 Summary statistics

All figures are reported on yearly basis. Market capitalization is expressed in billions. Average is calculated as the simple arithmetic average.

Variable	Average	Volatility	Kurtosis	Skewness
Excess Return	0.082	0.47	101.42	4.85
Market -RF	0.019	0.26		
Market Cap.	15.80	29.1		
Book-to-Price	0.914	4.23		
ESG	0.596	0.17		

The correlation between the variables indicate that the four factors are related to expected return. There is a slightly positive relationship between the ESG score and excess return. The ESG score is negatively correlated with market cap (MC) and book-to-price (BP) showing that companies with better ESG scores tends to be larger and have lower book-to-price ratio. According to the Fama and French intuition, they seem to be less risky investments.

Table 4 Correlation matrix

Variable	Exc. Return	Market-Rf	LN (MC)	LN (BP)	LN (ESG)
Exc. Return	1.000	0.535	0.083	-0.264	0.037
Market-Rf	0.535	1.000	0.069	-0.122	0.037
LN (MC)	0.083	0.069	1.000	-0.209	-0.009
LN (BP)	-0.264	-0.122	-0.209	1.000	-0.049
LN (ESG)	0.037	0.037	-0.009	-0.049	1.000

6.3.2 Summary Statistics of Portfolios

The average return matrix in table 5, gives a simple picture of the three-dimensional variation in average returns that results when stocks are grouped into portfolios based upon ESG score, company size and book-to-market equity ratio. On average, the portfolio that constitutes of the best ranked ESG scores achieve 8.76% the year after the ranking, while the worst ranked portfolio achieves 12.96%. Small cap stocks monotonically outperform large cap stocks, with an average spread of 5.97% (13.82% - 7.85%). Within a size decile, returns typically increase with book-to-price ratio. On average, the returns on the lowest and highest book-to-price ratio in a size decile differ by 1.18% (11.71% - 10.53%). Hence, the sizable differences in return implies that controlling for size and book-to-market equity is critical for the later regression.

Table 5: The Return in Percentage of Portfolios Formed on ESG Score

Stocks are sorted on January 1st yearly from 2008-2016 into decile portfolios based on their previous year' ESG score. The portfolios are equally weighted. Portfolio 1 comprise the worst decile (worst 33%), portfolio 2 the middle decile (mid 33%) and portfolio 3 the best decile (best 33%). The table shows the (arithmetic) average annual returns. Panel A shows the arithmetic average of the nine FF portfolios, while panel B-D shows the arithmetic average of the nine FF portfolios for ESG portfolios 1-3 respectively.

Panel A: Average Annual Return

	All	Growth	Neutral	Value
All	10.84%	10.53%	10.28%	11.71%
Small MC	13.82%	11.54%	12.81%	17.12%
Large MC	7.85%	9.52%	7.75%	6.29%

Panel B: Average Annual Return of Portfolio 1

	All	Growth	Neutral	Value
All	12.96%	11.91%	10.85%	16.12%
Small MC	16.57%	12.07%	12.53%	25.10%
Large MC	9.35%	11.74%	9.16%	7.14%

Panel C: Average Annual Return of Portfolio 2

	All	Growth	Neutral	Value
All	10.80%	11.05%	12.79%	8.57%
Small MC	13.75%	13.65%	15.61%	11.99%
Large MC	7.86%	8.45%	9.97%	5.14%

Panel D: Average Annual Return of Portfolio 3

	All	Growth	Neutral	Value
All	8.76%	8.64%	7.20%	10.43%
Small MC	11.15%	8.91%	10.28%	14.26%
Large MC	6.36%	8.37%	4.11%	6.60%

The yearly correlations between SMB, HML and the market excess return are positive, while the correlation between ESG and the three factors are negative (table 6). If these results can be generalized, an investor can use the ESG criteria to create a natural hedge by overweighting good ESG-performing companies and underweighting bad ESG-performing companies.

Table 6: Correlation of Factor Mimicking Portfolios

Stocks are sorted on January 1st yearly from 2008-2016 into decile portfolios based on their previous year' ESG score, market capitalization and book-to-market ratio following the methodology descried in section 5.1. The portfolios are equally weighted. The table shows the correlation between the average annual returns of the factor mimicking portfolios.

Variable	Market-Rf	SMB	HML	ESG
Market-Rf	1.000	0.699	0.771	-0.741
SMB	0.699	1.000	0.453	-0.870
HML	0.771	0.453	1.000	-0.600
ESG	-0.741	-0.870	-0.600	1.000

In table 7, the differences in estimated volatilities are reported. The estimate for the best ESG portfolio is 38.82%, while the worst is 89.83%.

Table 7: Volatilities of Portfolios Formed on ESG Score

Stocks are sorted on January 1st yearly from 2008-2016 into decile portfolios based on their previous year' ESG score. The portfolios are equally weighted. Portfolio 1 comprise the worst decile (worst 33%), portfolio 2 the middle decile (mid 33%) and portfolio 3 the best decile (best 33%). The table shows the estimated volatility of the different nine FF portfolios in panel A, subdivided into ESG portfolio in panel B-D for portfolio 1-3 respectively.

Panel A: Average Annual Volatility

	All	Growth	Neutral	Value
All	57.24%	35.31%	74.52%	61.89%
Small MC	51.56%	39.87%	33.23%	81.58%
Big MC	62.93%	30.75%	115.82%	42.21%

Panel B: Volatility of Portfolio 1

	All	Growth	Neutral	Value
All	89.83%	41.07%	148.23%	80.20%
Small MC	64.32%	45.86%	37.78%	109.33%
Big MC	115.34%	36.29%	258.68%	51.06%

Panel C: Volatility of Portfolio 2

	All	Growth	Neutral	Value
All	43.07%	34.93%	41.79%	52.49%
Small MC	46.09%	38.50%	32.52%	67.25%
Big MC	40.06%	31.37%	51.06%	37.73%

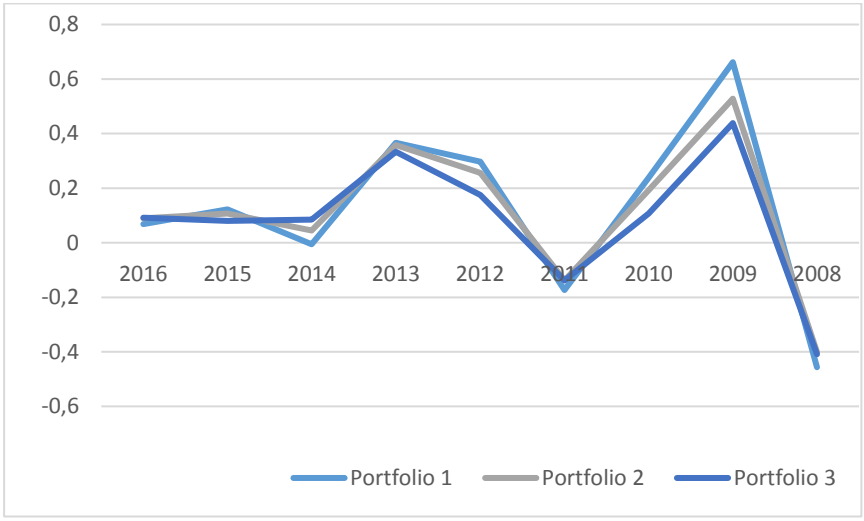
Panel D: Volatility of Portfolio 3

	All	Growth	Neutral	Value
All	38.82%	29.93%	33.55%	52.99%
Small MC	44.26%	35.25%	29.37%	68.15%
Big MC	33.39%	24.60%	37.73%	37.83%

Moreover, better ESG portfolios outperform worse ESG portfolios in times of unfavorable market conditions, as emphasized in figure 1. It can therefore be claimed that better ESG score is associated with less average return and less volatility.

Figure 1: Performance of Portfolios Formed on ESG Score

Stocks are sorted on January 1 yearly from 2008-2016 into decile portfolios based on their previous year' ESG scores. The portfolios are equally weighted. Portfolio 1 comprise the worst decile (worst 33%), portfolio 2 the middle decile (mid 33%) and portfolio 3 the best decile (best 33%). The figure shows the average (arithmetic) return of the portfolios based the year following the ranking, i.e. 2008-2016



7.0 Analysis

7.1 Two-pass Regression of Portfolios

7.1.1 First-pass Regression

In table 8, the different factor sensitivities are reported. The sensitivity to market changes is around 1, as expected. An apparent pattern in the SMB and HML exposures is not detected, however the most interesting pattern is the ESG coefficient. For portfolio 3, a positive link between excess return and the sensitivity of ESG is found, which is substantially stronger than for portfolio 1 and 2.

Table 8: First-pass Regression

Stocks are sorted on January 1st yearly from 2008-2016 into decile portfolios based on their previous year' ESG score. The portfolios are equally weighted. Portfolio 1 comprise the worst decile (worst 33%), portfolio 2 the middle decile (mid 33%) and portfolio 3 the best decile (best 33%). The table shows the OLS time-series regression of return based on the estimated risk premiums for the market excess return, SMB HML and ESG. The coefficients are reported in the table, with the different 18 portfolios on the vertical axis. The number denote the different ESG portfolios, S/B whether it is small or big cap and G for growth, N for neutral and V for value. The t-statistics are reported in the parentheses.

Portfolio	Excess Return	St.dev	Alpha	Market -Rf	SMB	HML	ESG	Adj. R^2
1 SG	9.69%	0.46	4.8% (1.53)	1.20 (9.06)	0.14 (0.51)	-0.18 (1.70)	-0.20 (0.41)	0.924
1 SN	10.99%	0.38	4.8% (2.32)	1.12 (10.87)	0.46 (1.99)	0.18 (1.65)	0.75 (1.90)	0.984
1 SV	18.29%	1.09	1.6% (1.66)	1.19 (5.37)	0.22 (0.40)	0.50 (1.67)	0.11 (0.11)	0.900
1 BG	9.66%	0.36	7.2% (3.71)	1.17 (17.01)	0.16 (0.92)	0.50 (-4.78)	0.65 (2.12)	0.961
1 BN	7.99%	2.59	1.4% (0.98)	1.20 (21.43)	0.72 (5.85)	0.49 (-6.21)	1.07 (4.06)	0.981
1 BV	5.63%	0.51	0.3% (0.16)	0.83 (12.37)	0.40 (1.96)	0.11 (0.93)	0.50 (1.85)	0.975
2 SG	11.72%	0.38	5.2% (2.44)	0.98 (8.62)	0.76 (3.57)	0.32 (-2.76)	1.13 (2.93)	0.960
2 SN	14.06%	0.33	7.9% (6.07)	1.10 (20.91)	0.46 (3.21)	0.04 (-0.63)	0.63 (2.62)	0.994
2 SV	8.74%	0.67	4.2% (1.12)	1.07 (9.26)	0.04 (0.12)	0.47 (2.79)	0.12 (0.26)	0.976
2 BG	7.49%	0.31	6.6% (0.02)	1.00 (17.29)	0.18 (-0.82)	0.44 (-4.38)	0.06 (-0.20)	0.963
2 BN	8.34%	0.51	4.5% (2.02)	0.96 (12.00)	0.34 (2.07)	0.18 (-2.26)	0.75 (2.01)	0.952
2 BV	3.74%	0.38	.2% (-0.09)	0.94 (11.67)	0.23 (1.14)	0.00 (0.00)	0.45 (1.16)	0.956
3 SG	8.80%	0.35	5.5% (3.67)	1.00 (15.37)	0.35 (3.20)	-0.14 (1.29)	1.06 (5.19)	0.965
3 SN	9.55%	0.29	3.9% (2.02)	0.97 (21.43)	0.59 (4.24)	-0.05 (0.52)	1.05 (4.11)	0.974
3 SV	10.28%	0.68	5.4% (2.15)	1.20 (8.56)	0.52 (1.38)	0.73 (2.96)	1.98 (2.90)	0.943
3 BG	8.36%	0.25	5.9% (4.99)	0.79 (13.71)	0.27 (4.12)	-0.10 (1.61)	0.88 (4.62)	0.970
3 BN	2.73%	0.38	0.7% (0.39)	0.95 (8.08)	0.16 (0.58)	0.01 (0.07)	0.96 (1.80)	0.911
3 BV	5.34%	0.38	4.1% (1.51)	1.17 (11.97)	-0.08 (0.37)	0.06 (0.48)	0.72 (1.57)	0.949

7.1.2 Second-pass Regression

Table 9 shows the time-series averages of the slopes from the year-by-year Fama-Macbeth regressions of the cross-section of stock returns on market beta, size, value and ESG. In six of the nine years a positive ESG coefficient is found, and in the three remaining years the coefficients are concluded insignificant.

Table 9: Second-pass Regression

Stocks are sorted on January 1st yearly from 2008-2016 into decile portfolios based on their previous year' ESG score. The portfolios are equally weighted. Portfolio 1 comprise the worst decile (worst 33%), portfolio 2 the middle decile (mid 33%) and portfolio 3 the best decile (best 33%). The table shows the OLS time-series regression of return based on the beta coefficients estimated in the first-pass regression, reported in table 6. The coefficients are reported in the table, with the different 18 portfolios on the vertical axis. The number denote the different ESG portfolios, S/B whether it is small or big capitalization and G for growth, N for neutral and V for value. The t-statistics are reported in the parentheses

Year	Alpha	Market -Rf	SMB	HML	ESG	Adj. R^2
2016	7.7% (1.16)	-0.04 (-0.63)	0.01 (0.18)	0.12 (3.16)	1.31 (3.02)	0.605
2015	11.1% (1.53)	-0.16 (-2.09)	0.12 (3.69)	-0.08 (-3.22)	2.16 (8.81)	0.612
2014	16.6% (3.03)	-0.17 (-3.10)	-0.28 (-5.59)	-0.10 (-2.86)	0.38 (1.03)	0.724
2013	-15.6% (-0.93)	0.40 (2.31)	0.14 (1.53)	0.35 (6.13)	1.64 (2.29)	0.788
2012	-15.1% (-1.50)	0.41 (4.85)	0.16 (1.51)	0.08 (1.38)	-0.13 (-0.18)	0.383
2011	6.9% (0.29)	-0.21 (-0.92)	-0.11 (-0.83)	-0.33 (-4.38)	-0.08 (-0.08)	0.376
2010	5.3% (0.47)	0.04 (0.33)	0.25 (5.35)	-0.13 (-3.59)	0.84 (1.91)	0.706
2009	6.6% (0.19)	0.20 (0.54)	0.43 (2.06)	0.55 (4.55)	3.21 (1.88)	0.517
2008	-11.2% (0.46)	-0.17 (-0.34)	-0.07 (-0.28)	-0.31 (-2.00)	-1.88 (-0.86)	0.055

The average slopes in table 10 provide evidence for determining which explanatory variables on average have non-zero expected premiums during the 2008 to 2016 period, together with the OLS-, Fama and Macbeth adjusted- and Newey West adjusted test-statistics. From 2008-2016, insignificant market-, size- and value premiums are detected. A significant risk premium associated with the ESG score is found.

Table 10: Adjusting Test-statistics

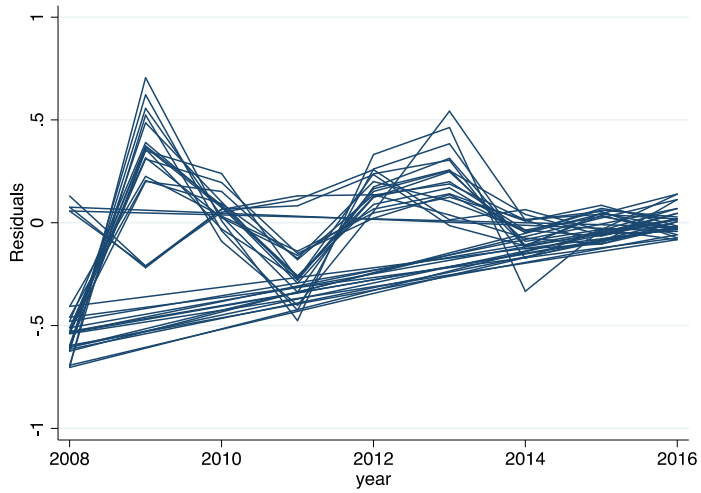
The table shows the estimated risk premiums for the four variables: Market – risk free rate, SMB, HML, ESG and the intercept of the model. Test-statistics are reported in the parentheses, respectively using the Fama Macbeth -, Newey West-, and OLS method. The t-statistics are reported in the parentheses

Variable	FMB	Newey-West	OLS
Alpha	0.01 (0.34)	0.01 (0.32)	0.01 (0.08)
Market - Rf	0.03 (0.40)	0.03 (0.41)	0.03 (0.18)
SMB	0.07 (1.03)	0.07 (1.15)	0.07 (0.70)
HML	0.02 (0.17)	0.02 (0.22)	0.02 (0.25)
ESG	0.83 (1.68)	0.83 (2.13)	0.83 (1.01)

In figure 2, the apparent cross-correlation and heteroscedasticity is graphed between the OLS regression residuals, and hence the Newey-West adjusted standard error is the most correct one. With a test statistic of 2.13 the null hypothesis is rejected and we claim that an investor can use the ESG score to enhance expected return

Figure 2: Cross-correlation of Returns

The figure shows the residuals of the OLS regression from 2008-2016.



With regards to company-specific risk, the four-factor model suggests that better ESG ranked stocks outperform worse ESG ranked stocks. This can be concluded by the different estimated ESG betas for portfolio 1, 2 and 3, and the fact that portfolio 1 has greater standard deviation than portfolio 3. Hence, we conclude that an investor also can use the ESG score to reduce risk by investing in the better-ranked ones.

7.3 Two-pass Regression on Individual Securities

7.3.1 First-pass Regression

In table 11 the average beta coefficients, test statistics and variance of the different factors are reported. The average market beta coefficient is positive with very high test statistic. The most interesting estimate is the ESG coefficient that fluctuates greatly from company to company, which is on average positive.

Table 11: First-pass Regression

Running OLS times-series regression for each stock. In total it is 607 regressions. The table shows an average of each coefficient, t-stat and variance.

Variable	Alpha	Market - Rf	LN (MC)	LN (BP)	LN (ESG)
Average	-19.7%	0.80	-0.03	-0.36	0.14
Variance	3.49	0.54	1.01	1.11	2.04
T-stat	-1.39	36.73	-0.64	-7.99	1.72

7.3.2 Second-pass Regression

Table 12 shows the time-series averages of the slopes from the year-by-year Fama-Macbeth regressions of the cross-section of stock returns on market beta, market cap, book-to-price and ESG. In 5 of the 10 years, a negative coefficient of ESG is found. In the remaining years, a positive ESG coefficient is found.

Table 12: Second-pass Regression

Estimated cross-sectional regression for each year across the stocks based on the betas from the OLS-regressions. The reported estimates are the time-series averages of a yearly cross-sectional regression from 2007-2016. The t-statistics are on the time-series of the coefficients.

Year	Alpha	Market - Rf	LN (MC)	LN (BP)	LN (ESG)	Adj. R^2
2016	-0.7% (-0.27)	0.07 (3.20)	0.11 (3.52)	-0.14 (-5.05)	-0.00 (-0.23)	0.047
2015	11.4% (4.81)	-0.01 (-0.64)	-0.04 (-1.57)	0.01 (0.49)	-0.01 (-0.76)	0.005
2014	8.9% (4.36)	-0.05 (-3.14)	-0.02 (-0.66)	0.02 (1.11)	-0.00 (0.69)	0.015
2013	20.9% (6.24)	0.13 (4.75)	0.09 (2.41)	-0.07 (-2.16)	-0.00 (-0.29)	0.030
2012	14.7% (5.37)	0.12 (5.34)	-0.01 (-0.20)	0.05 (1.84)	-0.01 (-0.69)	0.073
2011	-2.5% (-1.30)	-0.14 (-9.25)	-0.05 (-2.39)	0.06 (3.07)	-0.01 (-1.33)	0.136
2010	11.2% (4.25)	0.03 (1.49)	0.05 (1.82)	-0.08 (-2.89)	0.01 (1.08)	0.016
2009	-13.2% (-2.75)	0.70 (18.33)	0.15 (2.77)	-0.18 (-3.69)	-0.03 (-2.05)	0.404
2008	-25.1% (-16.86)	-0.23 (-19.54)	-0.09 (-5.11)	0.06 (4.27)	-0.00 (-0.96)	0.400
2007	-2.0% (-0.82)	-0.03 (-1.41)	0.03 (1.10)	-0.06 (-2.51)	-0.00 (-0.44)	0.020

The average slopes reported in table 13 show the explanatory variables that on average have non-zero expected premiums during the 2007 to 2016 period, which are in line with the findings on portfolio basis.

Table 13: Adjusting Test-statistics

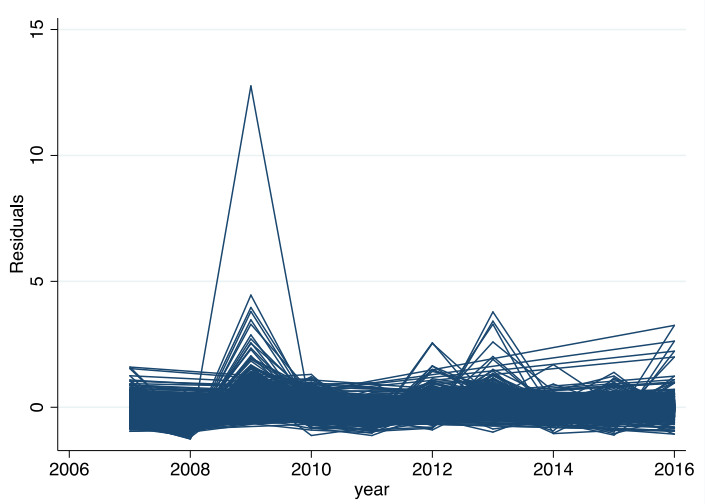
The table shows the estimated risk premiums for the four variables: Market – risk free rate, ln(MC), ln(BP), ln(ESG) and the intercept (alpha) of the model. Test-statistics are reported in the parentheses, respectively using the Fama Macbeth -, Newey West-, and OLS method.

Variable	FMB	Newey-West	OLS
Alpha	0.02 (0.53)	0.02 (0.45)	0.02 (2.01)
Market - Rf	0.06 (0.73)	0.06 (0.88)	0.06 (6.24)
LN (MC)	0.02 (0.96)	0.02 (1.19)	0.02 (1.75)
LN (BP)	-0.03 (-1.18)	-0.03 (-1.33)	-0.03 (-2.75)
LN (ESG)	-0.01 (-1.88)	-0.01 (-2.62)	-0.01 (-1.61)

In figure 3, the apparent cross-correlation and heteroscedasticity between the OLS regression residuals is graphed, and hence it the Newey-West adjusted standard error is the most correct one. With a test statistic of 2.62 the null hypothesis is rejected and it can be claimed that an investor can use the ESG score to enhance expected return.

Figure 3: Cross-correlation of Returns

The figure shows the residuals of the OLS regression from 2007-2016.



7.4 Discussion of Results

7.4.1 Unifying Results

Both analyses point towards a unifying picture that an investor can use the ESG score to enhance return and reduce risk. As discussed in the methodology part, individual stock figures might be too volatile for a first-pass regression and the beta estimates of the portfolio analysis should therefore be highlighted. Both first-pass regressions provide positive ESG betas estimates, although the portfolio betas are generally higher.

The estimated risk premiums are significantly positive, 0.83 and 0.99 for portfolios and individual securities respectively. This implies that an investor can earn almost one percent by longing good ESG ranked stocks and shorting poor ESG ranked stocks. The contribution to the expected return of an individual stock will be determined by the sensitivity of the stock to the ESG score, its ESG beta.

7.4.2 Methodological Limitations

A point of discussion is related to the distribution of stock returns. As Fama (1965) and Blume (1970) claim, the distribution of stock returns is "thick-tailed" relative to the normal distribution, consistent with our estimates for kurtosis and skewness. This means that the significance levels obtained are likely to be overestimated due to the fact that the underlying variables of the large test statistics are normal. For this reason, the null hypotheses that are rejected under the assumption of normality are still rejected when the distribution is fat-tailed. Hence, we claim that the test statistics of 2.62 and 2.13 are sufficiently high to reject the null hypotheses.

Another area of discussion in this thesis is the selection of ESG scores. The different methodologies measuring ESG scores illustrate a crucial problem that confronts anyone who hopes to measure ESG performance by companies. This problem is known as inter-rater reliability. We may have wrongly assumed that the ESG score on each company in the time-series are true. However, as there is no clear way of measuring ESG score and in addition the perception of ESG has changed over time, our sample consists of what we define as a good ESG rating.

Statistically speaking, we allocate ESG data from a single database and eliminate the companies where the data is not available. This may lead to a sample-selection

bias. Yet, we believe it is better to have fewer companies rather than including several debatable companies with lack of information. Another limitation with this study is the fact that the major events (i.e. the financial crisis) have happened during the sample period, which may have caused changes in the structural relations between the variables. This may lead to a time-period or sample selection bias. However, it is important to keep in mind that the results presented are based upon the historical data available at Thomson Reuters.

7.4.3 Practical Relations

In line with related literature, the analysis is based upon a sample where an average ESG investment is associated with slightly positive or insignificant abnormal returns. Insignificant abnormal return seems to be common among related literature on the field. Further comparison of results is difficult, since the authors of this thesis did not find similar methodology with related literature. In particular, previous literature does not tend to cope with the fixed effects as done in the thesis.

Related to theory, the findings challenge the basic principle of some famous asset pricing models, such as the CAPM and the Fama and French Three-factor Model. This principle yields that systematic risk and expected financial return are positively correlated, i.e. an investor needs a greater exposure to the factors in order to obtain higher expected return. The analysis in this thesis shows that companies with better ESG score are associated with less overall volatility and when using the four-factor model also less company-specific risk. Less company-specific risk is likely due to an omitted variable. Could it be that ESG scandals are more likely to occur for companies with poor ESG scores?

8.0 Conclusions

This thesis investigates whether an investor can use sustainability criteria to enhance return and reduce risk. By conducting an empirical analysis on European stocks from 2007 to 2016, evidence is found that a four-factor model containing an ESG term can help explain the cross-sectional variance of returns. The implication is that an investor can use the criteria to (1) enhance expected return, (2) reduce overall volatility and (3) reduce company-specific risk by overweighting his investments in stocks with better ESG scores. The results are robust using both regressions on individual stock level and combining them into portfolios based on their ESG scores.

For the society, these findings are great news. Since companies with higher scores will be better financial investments, it should translate to more capital flowing into sustainable companies. This should also be an incentive for the companies, as they have to take sustainable considerations in order to get external funding. The authors of this thesis hope future research will dig more into this world, as we believe it to be a growing concern of investors. It would be interesting to see whether dealing with the limitations of this thesis would lead to different results, e.g using a different measure of ESG, using a different time period or adding a variable for changes in ESG scores.

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