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Financial Performance of Firms with Low Respectively High ESG Scores

A study of the US technology sector

Bachelor of Science in Economics – 15 ECTS

Diana Salim and Hanna Lindbo
Gothenburg, Sweden
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Supervisor: Charles Nadeau

Abstract

This study investigates the relationship between financial performance and ESG score over a five-year time period, January 2013 to January 2018, in the US market. To examine this, two small cap portfolios is constructed, one consisting of firms with high ESG scores and one with low ESG scores. Additionally, two portfolios are constructed likewise for firms with large market capitalization. Furthermore, Carhart's four factor model is applied to investigate if there appears to be a difference in the portfolios' stock performance. Evidence is found that the small cap portfolio with low ESG scores outperformed the small cap portfolio with high ESG scores. Although, no statistical evidence is found whether there is a relationship between stock performance and ESG score for firms with large market capitalization.

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1. Introduction

Environmental and social issues have come to be acknowledged during the last decades. This has affected the financial markets, as more investors choose a style of investment strategy called Socially Responsible Investment (SRI). Schueth (2003) define SRI as a process where the investor consciously selects to invest in firms based on personal and social preferences. Thus, investors that perform SRI often deselect companies that are not considered to be environmental and socially responsible. SRI have grown rapidly during the last decades. In 1985 SRI funds represented about 65 million US dollars, while in 2017 the value had grown to over 23 trillion US dollars (Dupler, 2003; Bloomberg, 2017). During the increase of SRI, different measurements of a company's social and environmental performance have been developed. For example, ESG score is one measurement that has evolved in the era of SRI. The score is provided by Thomson Reuters and take environmental, social and governance factors into account.

The question whether it is profitable for a company to improve their social and environmental performance has been widely discussed. Porter and Van der Linde (1995) argues that environmental responsibility leads to a more cost-efficient organization, which results in a competitive advantage for a company. Others, like Walley and Whitehead (1994), states that the shareholder value would decrease when a company improve their social and environmental standard. The argument is that the increasing cost would lead to higher price on products, which would lead to a lower demand for the products and result in a lower profit.

1.1 Research Questions

This analysis focus on the relationship between stock performance and ESG score. The collected data is from the US technology sector with the considered time period, January 2013 to January 2018. Within the field of technology, the United States is a leading country in the world. Therefore, it is of our interest to analyze the US market as a lot of technology firms acts there, and presumably have a wide spread in ESG score. The motive behind focusing on a single industry is that a majority of previous studies is made across industries. To evaluate whether ESG score have an impact on portfolio performance, following null hypotheses are constructed:

1. The risk-adjusted alphas are the same for two constructed *small* cap portfolios categorized by their level of ESG-score.
2. The risk-adjusted alphas are the same for two constructed *large* cap portfolios categorized by their level of ESG-score.

Both hypotheses will be tested by running OLS regressions using Carhart's (1997) four factor model. The motive behind choosing Carhart's model is that the it allows us to obtain the risk-adjusted alphas. Additionally, it captures four risk factors, which can be used to evaluate the characteristics of the portfolios.

1.2 Purpose
The intention of this thesis is to examine if ESG score have an impact on stock performance of technology firms in the US market. Moreover, the aim is to contribute to the literature involving studies focused on a specific sector.

1.3 Thesis Structure
This section is an introduction to our study. Next part presents a literature review of prior research involving the relationship between financial performance and sustainability factors. Following, a theoretical framework consisting of descriptions of the models, ESG score and statistical tests executed in this thesis are provided. Thereafter, the data and methodology section is formulated. Lastly, the empirical result with analysis is presented, followed by the conclusions.

2. Literature Review

As previously mentioned, the opinion whether a company benefits from improving their environmental and social standards diverges. Some, as Porter and Van der Linde (1995), states that it leads to profitability in the long run while others, as Walley and Whitehead (1994), states the opposite. Following section provides previous empirical studies that have investigated the relationship between financial performance and different types of environmental, social and governance measurements.

According to Park and Allaby (2017), the definition of eco-efficiency is the process of reducing environmental impact in production of goods and services. Thus, the eco-efficiency score is a measurement of how well a company reduce their ecological footprint. Derwall et al. (2005) uses the eco-efficiency score to range stocks from the US market. They constructed two portfolios with different rates of eco-efficiency, on low and one high, in order to identify the nexus between corporate eco responsibility and firm performance. The performance of the portfolios was measured by the theoretical models; Capital asset pricing model (CAPM), Fama and French's three factor model and Carhart's four factor model. The analysis proved, on a ten percent significance level, that the tested firms with high eco-efficiency performed better than the eco-inefficient companies during the time period 1995 to 2003. Additionally, the descriptive statistics in the study indicated that the high-ranked portfolio had a higher average monthly return than the market proxy, while the low-ranked portfolio had a lower average return than the market proxy. Thus, the result implied that an investment strategy of choosing eco responsible companies could give a positive influence on portfolio performance.

Correspondingly, Cohen, Fenn and Konar (1997) composed two portfolios, one consisting of firms with a low level of environmental pollution and one consisting of firms with a high level. This, in order to perceive if pollution have an impact on financial performance within the US market. The result indicated that the portfolio with low pollution performed better than, or as well as, the one with high pollution. Cohen et al. (1997) discuss that the reason why eco-friendlier firms are doing as well as, or better

than their more polluting counterparts, may be because of the fact that they can afford to invest in technologies that pollute less.

Several comparative studies have been made by investigating the performance of firms with high versus low corporate social responsibility (CSR). The studies have mainly been made across multiple industries, frequently resulting in contradictory conclusions. Soana (2008) considered the lack of studies focused on a single industry, a method which might give more consistent results. Further, it is discussed that ESG issues vary between sectors, meaning that it could be difficult to make fair conclusions about the financial performance when sectors are not studied separately. Moreover, many studies have focused on the financial performance of mutual funds instead of individual stocks. Derwall et al. (2005) states that studies based on mutual funds might be biased because of factors such as management skills, unknown portfolio holdings and screening methods. Furthermore, Brammer, Brooks and Pavelin (2006) claims that a research based on individual firms is preferable, since it is difficult to know if performance of funds has to do with the fund managers performance or the corporate social performance. Hence, using a method of constructing portfolios randomly could be considered to be less partial.

Brammer et al. (2006) used the CAPM and Carhart's four-factor model to investigate the relationship between CSR score and stock performance of firms in the UK market. The main finding of the study is that the companies with higher social responsibility scores performed worse than the ones with lower scores. According to the authors, the reason for this might be that expenditures associated with a firm improving CSR affect the income statement negatively. Due to a "bad" financial report, the firm is punished by the investor in form of a lower stock price. This conclusion is in line with Walley and Whitehead's (1994) theory about decreasing shareholder value because of increasing costs. Renneboog, Horst and Zhang (2008) studied the relationship between SRI funds and conventional mutual funds from several countries with Carhart's four factor model. As Brammer et al. (2006), they concluded that the SRI funds underperformed the conventional funds.

Lastly, the Sharpe ratio is a common measurement when considering the financial performance. Derwall et al. (2005) used this ratio to investigate the risk adjusted return for two constructed portfolios with different scores in eco-efficiency. The portfolio with higher ranking in eco-efficiency had a significantly higher Sharpe ratio than the portfolio in the lower range, indicating that the eco-efficient portfolio is preferable in terms of return relative to risk. Similarly, Goldreyer and Diltz (1999) compared Sharpe ratios of conventional mutual funds and funds with holdings picked based on their social goals or policies, during the period 1981 to 2007. Contrarily to Derwall et al. (2005), Goldreyer and Diltz (1999) found that the conventional funds generally had a higher ratio than the socially responsible funds.

To summarize, the studies presented different results on the financial performance of environmental and social responsibility portfolios. Whereas some of the reports showed that the SRI portfolios outperformed the conventional ones, other studies displayed the opposite. However, the analysis are based on diverse measurements, such as ESG, eco-efficiency and CSR, which might have contributed to the disparity in the outcomes. Other factors that might have contributed to the different results are the choice of time period, market and method of evaluating the financial performance. Furthermore, as Soana (2008) stated, there is a lack of research delimited to specific sectors and the effect of social responsibility on portfolio performance. Therefore, this analysis will focus on one single sector: the technology sector.

3. Theory Review

This section provides a description of the efficient market hypothesis and modern portfolio theory. Furthermore, it presents a description of the ESG score, which is the score used to categorize the firms in this study. Lastly, a presentation of the main model used for analysis in this thesis, the Carhart four-factor model, is provided.

3.1 Efficient Market Hypothesis

The Efficient Market Hypothesis, is a model which is recurrently used in economical analyses. The main notion of this theory is that the prices on securities fully reflect all available information regarding the underlying asset (Malkiel & Fama, 1970). Therefore, a market where prices completely reflect existent information is called efficient, and as a result it is impossible to outperform the stock market as all information is already considered in the stock prices.

Furthermore, the investment model can vary in three forms, Weak-form efficiency, Semi-strong efficiency and Strong-form efficiency. The weak form is based on prices in the market that reflect the historical and past costs. The semi strong form assumes that all prices are adjusted after public information, such as annual reports, publications of stock splits and new security distributions. Lastly, the strong form consists of prices that reflect all accessible information in the market, including insider and private information.

In order to obtain capital market efficiency there can be no transaction costs when trading financial securities. Information has to be transparent and available to all market participants. Furthermore, all investors have to agree on the implications of given information for the present price, and distributions of the future prices, of each security. However, Malkiel and Fama (1970) asserts that these conditions are potential sources that can lead to a market efficiency but are not necessary, as a market can retain its efficiency even if there is a sufficient quantity of investors that have ready access to available information.

3.2 Modern Portfolio Theory

When an investor takes a higher risk, the expected return increases (Bodie, Kane & Marcus, 2018). The modern portfolio theory is an investment model about how to construct a portfolio with a set of investment which optimizes the expected return, based on a given level of risk. According to the theory, a rational investor will always choose a portfolio with a low level of risk over one with a high level of risk, given that both portfolios have the same expected return. In order to reach minimal level of risk and still attain maximum level of return, the theory assumes that there has to be a variety of different assets within a portfolio. Through diversification, risk will be reduced without affecting expected return and thereby optimal return will be attained (Markowitz, 1952).

3.3 Environmental, Social and Governance (ESG) score

The environmental, social and governance score take count of a firm's ethical impact and sustainable performance. Firstly, the environmental criteria detect how a company handle resources, emissions and innovation. Furthermore, the social criteria focus on how human rights, workforce, product responsibility and the relationship between the corporation and the customers. Finally, the governance factor reflects a company's management in commitment towards ensuing corporate governance principles, shareholder rights and Corporate Social Responsibility (CSR) strategies (Thomson Reuters, 2018). The ESG-score used in this analysis is produced by Thomson Reuters (2018). The score range is between zero and 100, where a high value indicates a strong ESG responsibility.

3.4 Capital Asset Pricing Model (CAPM)

The Capital Asset Pricing Model was introduced independently by several economists, e.g. Sharpe (1964), Treynor (1961) and Mossin (1966). The model is a development of Harry Markowitz's modern portfolio theory, and is used to describe the relationship between the expected return and risk. According to the model, an investor is exposed to two different types of risks: systematic risk and the non-systematic risk. The systematic risk of a security is a market risk that affects the entire economy and cannot be eliminated by diversification (Bodie et al., 2018). Contrariwise, the non-systematic risk is a firm's specific risk and can therefore be eliminated by diversification. In order to

take additional risk, the CAPM model states that the investor is compensated by one risk premium. Furthermore, the expected return of the asset is equal to the risk-free rate plus the risk premium, while the required return by an investor should be above the expected return calculated by CAPM. The equilibrium risk return equation for CAPM is seen in formula (1).

$$r_{i,t} - r_{f,t} = \alpha_{i,t} + \beta_{1,i}(r_{m,t} - r_{f,t}) + \varepsilon_{i,t} \qquad (1)$$

$r_{i,t}$ = *return on the individual portfolio at time t*
$r_{f,t}$ = *risk-free rate at time t*
$\alpha_{i,t}$ = *four factor alpha, risk-adjusted return for the individual portfolio at time t*
$r_{m,t} - r_{f,t}$ = *market excess return at time t*
$\varepsilon_{i,t}$ = *error term for portfolio i at time t*

The intercept, denoted as alpha, in equation (1) represents the risk-adjusted abnormal return. A positive alpha indicates that the asset is outperforming the market, while a negative alpha implies that the asset is underperforming the market. The market excess return can be interpreted as the portfolios sensitivity to market risk. Moreover, a value higher than one on the market factor indicates that the portfolio is more exposed to market risk than the market portfolio. Contrarily, if the the value is below one, the factor implies that the portfolio inherits less market risk than the market portfolio.

3.5 Carhart's Four-Factor Model

The Carhart four-factor model is an extension of the CAPM and is the main model used in this thesis. Contrary to CAPM which captures one risk factor, the Carhart model includes four risk factors. To construct the Carhart model, Carhart (1997) added Fama and French's (1992) two risk factors and Jegadeesh and Titman's (1999) factor to the original CAPM. The Carhart four-factor model can be seen in formula (2).

$$r_{i,t} - r_{f,t} = \alpha_{i,t} + \beta_{1,i}(r_{m,t} - r_{f,t}) + \beta_{2,i}SMB_t + \beta_{3,i}HML_t + \beta_{4,i}MOM_t + \varepsilon_{i,t} \qquad (2)$$

$r_{i,t}$ = *return on the individual portfolio at time t*
$r_{f,t}$ = *risk-free rate at time t*
$\alpha_{i,t}$ = *four factor alpha, risk-adjusted return for the individual portfolio at time t*
$r_{m,t} - r_{f,t}$ = *market excess return at time t*
SMB_t = *small-minus-big factor at time t*
HML_t = *high-minus-low factor at time t*
MOM_t = *momentum factor at time t*
$\varepsilon_{i,t}$ = *error term for portfolio i at time t*

The alpha and the market excess return have the same interpretation as in equation (1). The second factor, the small minus big (SMB), take company size into consideration. Fama and French (1992) added this factor as they noticed a negative correlation between the size and the return of a company. A negative coefficient for the SMB-factor indicates that a portfolio mostly consists of companies with a large market capitalization, while a positive coefficient for the SMB-factor implies that the portfolio mainly inherits stocks from firms with small market capitalization.

The third risk factor, high-minus-low (HML), takes the book-to-market (B/M) ratio of a company into consideration. Fama and French (1992) found that the correlation between the B/M ratio and return performance had a positive sign, indicating that stocks with high B/M ratio (value stocks) outperformed firms with low B/M ratio (growth stocks). Thus, the HML-factor captures the difference in return between value stocks and growth stocks. Furthermore, a positive HML-factor can be interpreted as that the portfolio consists of value stocks to a greater extent. Opposite, a negative HML-factor indicates that the portfolio mainly includes growth stocks.

The fourth and last factor added to the original CAPM was the momentum factor (MOM). Jegadeesh and Titman (1999) argues that past year good performing stocks continue to perform good, while stocks that performed badly tend to continue to perform badly. Thus, the factor can be used to evaluate whether a portfolio consist of over or underperforming stocks. If the MOM-factor have a positive beta coefficient, the portfolio manager tends to buy winning stocks and sell losing stocks. Opposite, a negative MOM-factor indicates an investment style of buying losing stocks and selling winning stocks.

Lastly, the error term is the last risk factor. It captures the non-systematic risk, contrarily to the other factors who captures the systematic risk. As previously stated, the non-systematic risk can be removed by diversification, and therefore it does not receive a risk premium. No correlation between the error term and the other factors should occur for unbiased results (Berk & DeMarzo, 2013).

3.6 Sharpe Ratio

The Sharpe Ratio was introduced 1966 by William Sharpe and is used to measure the average return of an asset, such as a stock or a fund, relative to its risk. In other words, the Sharpe ratio is calculating the risk-adjusted return. The excess return is calculated by subtracting the risk-free return from the return of the asset, while the risk is equal to the standard deviation of the excess return. Furthermore, the Sharpe ratio is calculated by dividing the excess return with the standard deviation. See formula (3) for illustration of the Sharpe ratio.

$$\text{Sharpe Ratio} = \frac{\bar{r}_p - \bar{r}_f}{\sigma} \qquad (3)$$

$\bar{r}_p$ = *average return of the portfolio*
$\bar{r}_f$ = *average risk-free rate*
σ = *standard deviation for the excess return of the portfolio*

The Sharpe ratio is commonly used to rank and compare different stocks or portfolios. A portfolio with high Sharpe ratio has either higher portfolio returns or lower risk, or both, than a portfolio with a lower ratio. Thus, a high Sharpe ratio is preferable over a portfolio with a lower Sharpe ratio.

4. Data

This section presents the process of finding the firms that are used for evaluation in this thesis. Furthermore, it includes a description of the four Carhart factors collected from Kenneth R. French data library.

4.1 Screening for stocks

The purpose with the screenings was to identify ten stocks from four different groups to analyze in this thesis. The first group were made up of small cap stocks with high ESG scores, while the second group was made up of small cap stocks with low ESG scores. Afterwards, two remaining groups were composed the same way, with the exception that they included large cap stocks instead of small cap. The reason why we chose to divide the stocks based on market capitalization was that we noticed that the firms with a small market capitalization tended to generally have a lower ESG score than the firms with large market capitalization. In fact, the top ten large cap stocks all had higher ESG score than the top ten small cap stocks, while the bottom ten stocks for small cap stocks all had lower ESG score than their counterpart. Because of this, we decided to investigate large and small cap stocks separately.

Thomson Reuters database was used to filter and determine which stocks that would be used for the analysis in this thesis. The process started with a screening for technology firms in the US market with a market capitalization between 300 million and 2 billion US dollar (small cap) and an ESG score above zero. The filter for ESG score was required to retrieve the firms ESG score. Using the sorting tool in Thomson Reuters database, all firms besides the ten firms with the highest and ten lowest ESG score is dropped. Thereafter, the same process is used for companies with a market capitalization over 10 billion US dollars (large cap). All in all, four different screenings were made.

We chose to make our analysis over the time period January 2013 to January 2018, since it is a period close to present time and where no financial crisis occurred. Furthermore, we determined that each firm needed to meet two criteria's to be included in the analysis. First, the company must have data for the whole sample period. Second,

the selected firms needed to have at least two registered ESG scores within the five-year time period. When a firm did not fulfill both criterions a new screening was made, until 10 firms fitted for each category. At last, the screening resulted in a total of 40 firms divided by market capitalization and ESG scores. The gathered data for each firm was collected from Yahoo Finance, where the data consisted of daily stock price for the sample period. The listed companies and their associated ESG values are shown in the Appendix (Table 4 to 7).

4.2 Kenneth R. French Factors

The four Carhart factors, the Market, SMB, HML and MOM, is collected from Kenneth R. French database, where the data is from the US market on a monthly basis. The market return is calculated by Kenneth R. French as the value-weighted return of all stocks listed on the New York Stock Exchange, AMEX and NASDAQ. The risk-free rate is set equal to the one-month American Treasury Bill rate.

A total of six portfolios, three small and three big, are used by Kenneth R. French when calculating the SMB-factor. The factor is calculated by taking the average return on the three big portfolios and subtract it from the average return on the three small portfolios. Formula (4) illustrate the factor's equation.

$$\text{SMB} = \frac{\text{Small Value+Small Neutral+Small Growth}}{3} - \frac{\text{Big Value+Big Neutral+Big Growth}}{3} \quad (4)$$

In order to compute the HML-factor, four portfolios based on the book-to-market ratio are constructed by Kenneth R. French. Two of the portfolios consist of small value stocks and big value stocks, respectively, while the other two include small growth stocks and big value stocks. By taking the average return of the small respective big value portfolios and subtracting the average return of the small growth and big growth portfolios, the HML-factor is received. The calculation for the HML-factor is presented in formula (5).

$$\text{HML} = \frac{1}{2}(\text{Small Value} + \text{Big Value}) - \frac{1}{2}(\text{Small Growth} + \text{Big Growth}) \quad (5)$$

To be able to calculate the MOM factor for each month Kenneth R. French constructed different portfolios, where the portfolios consist of return data from stocks listed on NYSE, AMEX and NASDAQ. The portfolios are designed based on past returns and size. The breaking point for the size is the median of NYSE market equity, while the breaking point for the previous monthly return are the 30th respectively 70th percentile for NYSE. Thereafter, the MOM factor is calculated by subtracting the average of the low prior return portfolios from the average of the high prior return portfolios. The formula for the calculation is displayed in equation (6).

$$\text{MOM} = \frac{1}{2}(\text{Small High} + \text{Big High}) - \frac{1}{2}(\text{Small Low} + \text{Big Low}) \qquad (6)$$

5. Methodology

In section four, the Data section, it is explained how and why the selected data used in this thesis is chosen. However, in this part a description of the adaption of the data is presented, as well as the methodology used to statistically test the hypotheses stated in this study. Lastly, the method to evade biased results from our statistical testing is presented.

5.1 Econometric Analysis

The screening for stocks resulted in a total of 40 stocks, categorized by four different characteristics. The collected data from Yahoo finance is daily prices for each individual stock. We decided to change the data into monthly prices, meaning that all days but the last day of each month is removed from the data. Furthermore, the monthly prices are converted into monthly returns, which are calculated in Excel with formula (7).

$$R_t = \frac{P_t - P_{t-1}}{P_{t-1}} \qquad (7)$$

The monthly returns of the stocks are then sorted in Excel based on the firm's market capitalization and ESG score, resulting in ten stocks in each group. Furthermore, we construct four portfolios by equally weighting, i.e. the average monthly return for all stocks in each portfolio is summed up and divided by the number of stocks. This results in two small cap and two large cap portfolios, where each "cap" has one portfolio with high ESG score and one portfolio with low ESG score. The method of creating the portfolios are similar to the method Derwall et al. (2005) used, as they created portfolios based on eco-efficiency score. Moreover, equally weighted portfolios are commonly used in this type of studies, for example Renneboog et al. (2008) weighted their portfolios this way.

The four portfolios constructed for analysis in this thesis will be denoted as follows in upcoming sections: Small Top Portfolio, Small Bottom Portfolio, Large Top Portfolio and Large Bottom Portfolio. Furthermore, the Top portfolios consist of firms with high ESG score and the bottom portfolios of firms with low ESG score. Additionally, two

difference portfolios are conducted, where the first difference portfolio is constructed by subtracting the monthly returns from the Small Bottom Portfolio from the monthly returns for the Small Top Portfolio. The second difference portfolio is constructed in the same way for the large cap portfolios. The motive behind creating difference portfolios is to test the statistical difference between the top and bottom portfolio for firms with both small and large market capitalization.

To evaluate the portfolios risk-adjusted returns we run OLS regressions with Carhart's four factor model. The model is displayed in formula (8), and further information about the model can be found in the theory section. All regressions are made over the whole sample period, January 2013 to January 2018.

$$r_{i,t} - r_{f,t} = \alpha_{i,t} + \beta_{1,i}(r_{m,t} - r_{f,t}) + \beta_{2,i}SMB_t + \beta_{3,i}HML_t + \beta_{4,i}MOM_t + \varepsilon_{i,t} \qquad (8)$$

The data for the factors is collected from Kenneth R. French data library. The factors were presented in percentage form, hence, we transformed them into decimal form by dividing them with 100. This was done to get the data consistent with the data collected from Yahoo Finance.

5.2 Calculating the Sharpe Ratio

The Sharpe Ratio is calculated separately for all four constructed portfolios over the whole sample period. The monthly excess return is calculated by subtracting the risk-free rate from the monthly portfolio return, where Kenneth R. French's monthly treasury bill is used as a proxy for the risk-free rate. To obtain the Sharpe Ratio, the average monthly excess return is divided by the standard deviation for the monthly excess return. All calculations are executed in Excel. The equation for the Sharpe ratio can be seen in formula (3).

5.3 Statistical Tests

To ensure that the results in the OLS regression model is consistent, a few assumptions will be conducted. The first one is that there must be normal distribution in the sample. According to the central limit theorem, normal distribution in the data can be assumed when concerning large samples sizes. The verge for considering normal distribution is a sample size with over 30 observations (Kwak & Kim 2017). Additionally, a correlation

matrix is made for the independent regressors to test if there appears to be multicollinearity between the variables. The problem with multicollinearity is that it will be hard to obtain unique interpretation of the coefficients if two or more regressors are closely linearly related with each other (Field, 2013). Hence, it is not desirable to have high correlation between the Carhart factors.

Furthermore, to be able to trust the parameters of the OLS regression there should be homoscedasticity, meaning that the variance of the residual terms is constant (Jarque and Bera, 1980). If the assumption is violated there will be biased standard errors and the significance tests will be invalidated (Field 2013). To check for this assumption, both Breusch-Pagan and White tests are conducted for the four constructed portfolios and the difference portfolios. If necessary, robust standard errors will be used to overcome this problem. The third test is checking for seasonality in the portfolios by identifying potential patterns in the data that repeat over fixed periods. In order to test this, eleven dummy variables are created for the months, February to December. Thereafter, an F-test is made in Stata for each portfolio with the following null hypothesis, $H_0: \beta_1 = \beta_2 = \cdots = \beta_{11} = 0$, where each beta represents a single month. Furthermore, if the p-values for each F-test is higher than the alpha value the null hypothesis cannot be rejected, meaning no statistical evidence of existing patterns in the data is found. The result for these two assumptions is presented in Appendix (Table 1 and 2).

Finally, a test for serial correlation is made with Breusch-Godfrey in order to detect if the observations of the same variable during different periods is correlated across time (Anderson, 1942). The observations appear to be independent if the serial correlation of the variable is accounted to be zero. Contrariwise, the observations are dependent of one another if the serial correlation is skewed towards one, which means that future observations are influenced by past values. If serial correlation is presented in our dataset, Newey-West standard errors will be used to overcome the variable for not being random.

6. Empirical Results

This section presents the descriptive statistics of the data, followed by the results of the two null hypotheses. Lastly, a critical discussion is formulated.

6.1 Descriptive Statistics

A summary statistic table of the data used for analysis in this thesis is presented in Table 1. The mean denotes the monthly average return over the whole sample period, January 2013 to January 2018, while the standard deviation can be interpreted as the volatility of the portfolio.

Table 1: Descriptive Statistics

Portfolios	Mean	Standard Deviation	Min	Max	Sharpe Ratio
Market	0.0128	0.0285	-0.0604	0.0775	0.4436
Small Top	0.0118	0.0518	-0.107	0.107	0.2250
Small Bottom	0.0247	0.0550	-0.0747	0.172	0.4450
Large Top	0.0216	0.0371	-0.0566	0.100	0.5773
Large Bottom	0.0270	0.0487	-0.124	0.132	0.5512
Difference Small	-0.0128	0.0476	-0.113	0.106	
Difference Large	-0.0055	0.0417	-0.113	0.0902	
SMB	-0.0010	0.0238	-0.0437	0.0549	
HML	-0.0008	0.0230	-0.0412	0.0827	
MOM	0.0033	0.0308	-0.0737	0.103	

Note to Table 1: The difference portfolios are calculated by subtracting the return of the bottom portfolio from the return of the top portfolio, separately for small and large capitalization. The number of observations for each portfolio is 60.

Interestingly, both top portfolios have a lower average return compared to their counterpart, the bottom portfolios. This means that the portfolios consisting of stocks with low ESG scores have had a greater average return during the sample period, compared to the two portfolios with high ESG score. Although, the standard deviation is higher for the small cap portfolios than the large cap portfolios, indicating that the smaller firms inherit a higher risk. This is in line with Fama and French's (1992) findings, that smaller firms, in contrast to large firms, are more sensitive to movements in the market. Additionally, Table 1 displays that the Sharpe ratio is higher for the two large portfolios, suggesting that these portfolios are preferable in terms of return relative

to risk. Notable, the top portfolios place first respectively last when ranking all portfolios based on Sharpe ratio. This result is inconsistent with both Derwall et al. (2005) and Goldreyer and Diltz (1999), who concluded that a high eco-efficient portfolio respectively a conventional portfolio had a higher Sharpe ratio than their counterpart. Our results suggest that the difference in risk adjusted return might not have to do with the range of ESG score, but with the size of the companies included in each portfolio.

The market portfolio is beaten by all of the constructed portfolios, both in Sharpe ratio and the average return, except for the small top portfolio. This is contradictory to the efficient market hypothesis theory, which claims that an efficient stock market cannot be beaten as the prices always shall fully reflect the market value (Malkiel & Fama, 1970). A possible reason for this could be that all constructed portfolios consist of stocks from the technology sector and that the sector outperformed the market during the sample period.

Considering the factor portfolios from the Carhart four-factor model, the SMB and the HML portfolios shows a negative return over the whole period. Although, the momentum portfolio shows a positive return, which means that this portfolio outperformed the two other factor portfolios.

6.1.1 Portfolio Performances

Figure 1 illustrates the stock performance of the market portfolio and the two small cap portfolios during the sample period, January 2013 to January 2018. In order to compare the performances, the portfolios start at an initial value of 100. The portfolio consisting of firms with low ESG scores (Small Bottom portfolio) noticeably outperformed the portfolio consisting of firms with high ESG scores (Small Top portfolio) and the market portfolio during the time period.

Figure 1: Small Portfolio performance

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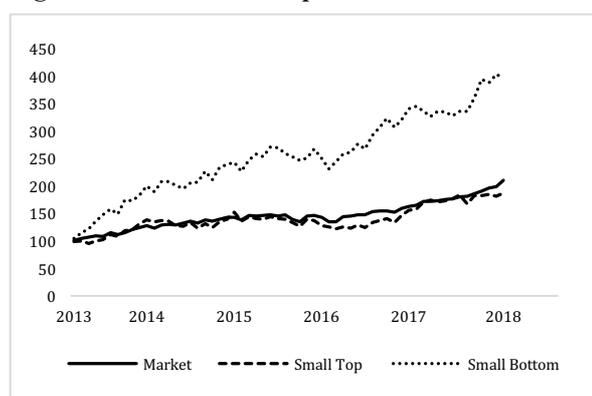
Figure 2: Monthly average returns

Complementary to Figure 1, an illustration of the monthly average returns in percent for the equally weighted portfolios is displayed in Figure 2. The graph indicate that the two small cap portfolios have had a higher volatility than the market portfolio, since their returns shows a greater spread compared to the market portfolio. According to Bodie et al. (2018), higher volatility gives a higher expected return. Hence, one could argue that the reason for that the Small Bottom portfolio outperformed the market portfolio is the high volatility the portfolio inherits. Although, the assumption about the risk-return trade-off does not hold for the Small Top portfolio, as this portfolio also have a higher volatility than the market portfolio, but still does not outperform the market portfolio. Furthermore, the only characteristic that differs between the two small cap portfolios is the level of ESG scores. Thus, the result indicates that firms in the technology sector with lower ESG scores performs better than firms in the same sector with high ESG scores, at least on a no risk adjusted basis.
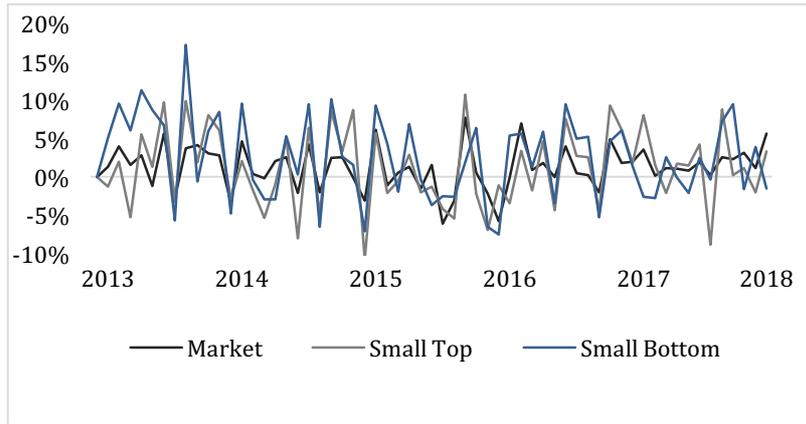
The performance of the portfolios in Figure 3 is constructed the same way as in Figure 1, with the exception that it displays the performance of the large cap portfolios. Furthermore, the monthly average returns in percent is displayed in Figure 4 for the market portfolio and the large cap portfolios. Similar to the comparison on the small cap portfolios, the portfolio with low ESG scores (Large Bottom portfolio) outperformed both the portfolio with high ESG scores (Large Top portfolio) and the market portfolio. Although, the Large Top portfolio also outperformed the market portfolio. This suggest that the technology sector in general performed well during the sample period.

Figure 3: Large Portfolio performance

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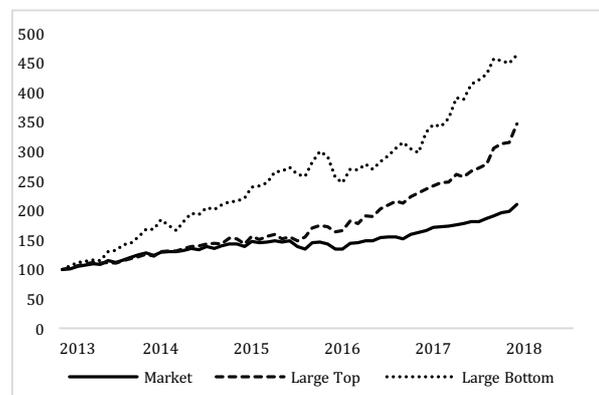
Figure 4: Monthly average returns

However, the Large Bottom portfolio performed better than the Large Top portfolio. Similar to the small cap portfolios, the large cap portfolios only differ in the level of ESG score. Therefore, the observations from Figure 3 and Figure 4 indicates that large cap stocks with low ESG score in the technology sector performs better than firms with high ESG score.
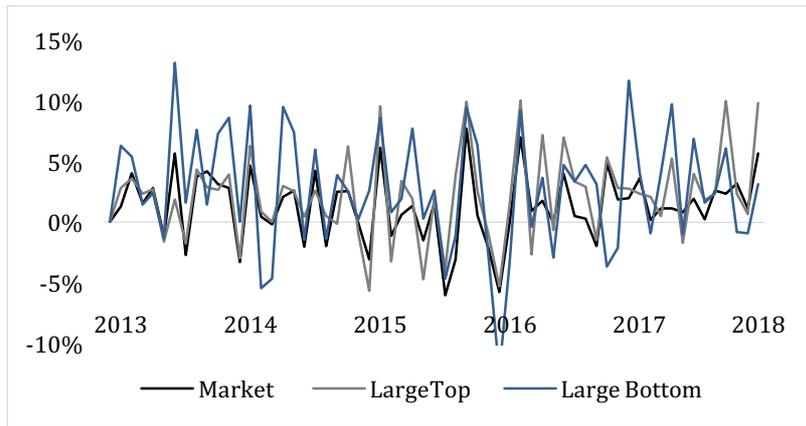
6.2 Hypothesis 1

The first hypothesis states that the risk adjusted return for the small cap portfolio with high ESG score is equal to the risk adjusted return for the small cap portfolio with low ESG score. In order to test the hypothesis, an OLS-regression is executed for each portfolio using Carhart's four factor model. The results are displayed in Table 2. The top small portfolio consists of the stocks with the highest ESG score, whereas the bottom small portfolio consists of the stocks with the lowest ESG score. The difference portfolio is constructed in a similarly way as Derwall (2005), that is, by subtracting the monthly average return for the small bottom portfolio from the top small portfolio.

Table 2: Carhart's Model on Small Cap Portfolios

Variable	Small Top Portfolio	Small Bottom Portfolio	Difference Portfolio
Four-factor alpha	-0.00184	0.0130**	-0.0148**
	(0.00493)	(0.00511)	(0.00674)
Market	1.151***	0.971***	0.180
	(0.168)	(0.190)	(0.248)
SMB	0.735***	1.019***	-0.284
	(0.172)	(0.222)	(0.280)
HML	0.235	0.145	0.0894
	(0.192)	(0.284)	(0.310)
MOM	0.0115	0.161	-0.150
	(0.133)	(0.183)	(0.238)

Note to Table 2: This table presents the estimates of the alpha and Carhart's four factors. The number of observations for each portfolio is 60. To proxy the Market factor, Kenneth R. French market index and one-month T-bill rate is used. Robust standard errors are correcting for eventual heteroscedasticity, and are displayed in parentheses. The used model to execute the OLS-regression is:

$$r_{i,t} - r_{f,t} = \alpha_{i,t} + \beta_{1,i}(r_{m,t} - r_{f,t}) + \beta_{2,i}SMB_t + \beta_{3,i}HML_t + \beta_{4,i}MOM_t + \varepsilon_{i,t}$$

* Significant at a 10% level
** Significant at a 5% level
*** Significant at a 1% level

In Table 2 it is presented that the bottom portfolio has a positive risk adjusted alpha, indicating that the portfolio outperformed the market on a monthly basis. Contrarily, the portfolio consisting of firms with high ESG scores presents a negative risk adjusted alpha, suggesting that the portfolio underperformed the market. However, the result for the top portfolio cannot be supported statistically as the coefficient is insignificant. On the other hand, the alpha for the difference portfolio is negative and statistically

significant on a five percent level. This indicates that the bottom portfolio performed better than the top portfolio. The results are in line with Brammer et al. (2006) and Renneboog et al. (2008), who concluded that socially responsible funds and stocks performed worse than conventional ones. Although, the results are inconsistent with results from other studies, like the ones executed by Derwall et al. (2005) and Cohen et al. (1997). In contrast to the result in this thesis, their studies suggested that the social responsible funds either outperformed or performed as well as the conventional ones.

The market factor suggest that the top portfolio inherits a higher market risk than the market, since it has a positive value higher than one. Contrariwise, the bottom portfolio shows a value lower than one, indicating that the portfolio has a lower market risk than the market portfolio. This implies that the top portfolio is more exposed to market risk than the bottom portfolio. Although, the difference cannot be stated by the difference portfolio as it does not present a statistically significant value. The SMB-factor is highly significant and positive for both the bottom and top portfolio, indicating that the portfolios are skewed towards stocks with small market capitalization. This outcome is not surprising, as the portfolios is constructed based on their market capitalization.

The third factor in the Carhart model, the HML-factor, is positive for both the top and bottom portfolio. The positive value for the HML-factors can be interpreted as both portfolios includes more value stocks than growth stocks. However, this statement cannot be proved statistically since the coefficients are not significant. Neither are the HML-factor statistically significant for the difference portfolio, which means that a conclusion about the relationship between the portfolios and the HML-factor cannot be made. Lastly, the MOM-factor is positive for both portfolios, suggesting an investment style of buying winners and selling losers. The bottom portfolio has a slightly higher MOM, indicating that the portfolio includes more winning stocks compared to the top portfolio. Yet, the statement cannot be supported statistically since neither of the portfolios, or the difference portfolio, presents statistically significant value on at least a 10 percent level.

To summarize, the results found by running the two regressions using Carhart's four-factor model suggest that the portfolio consisting of stocks with low ESG scores

performed better than the portfolio with high ESG scores. The result from the market variable also indicated that the top portfolio is more exposed to market risk. Although, no statistically evidence is found by looking at the HML and MOM-factor.

6.3 Hypothesis 2

The second hypothesis states that there is no difference in risk adjusted return between the large cap portfolio that consists of stocks with high ESG scores and the large cap portfolio consisting of stocks with low ESG scores. To approach this, the same method is used as when testing Hypothesis 1. The results from the OLS regression using the Carhart model is illustrated in Table 3.

Table 3: Carhart's Model on Large Cap Portfolios

Variable	Large Top Portfolio	Large Bottom Portfolio	Difference Portfolio
Four-factor alpha	0.00747**	0.0122**	-0.00473
	(0.00302)	(0.00471)	(0.00497)
Market	1.083***	1.104***	-0.0208
	(0.108)	(0.159)	(0.190)
SMB	-0.363***	0.180	-0.544**
	(0.115)	(0.203)	(0.220)
HML	-0.0632	-0.712**	0.649*
	(0.143)	(0.293)	(0.358)
MOM	-0.00795	0.136	-0.144
	(0.135)	(0.178)	(0.204)

Note to Table 3: This table presents the estimates of the alpha and Carhart's four factors. The number of observations for each portfolio is 60. To proxy the Market factor, Kenneth R. French market index and one-month T-bill rate is used. Robust standard errors are correcting for eventual heteroscedasticity, and are displayed in parentheses. The used model to execute the OLS-regression is:

$$r_{i,t} - r_{f,t} = \alpha_{i,t} + \beta_{1,i}(r_{m,t} - r_{f,t}) + \beta_{2,i}SMB_t + \beta_{3,i}HML_t + \beta_{4,i}MOM_t + \varepsilon_{i,t}$$

* Significant at a 10% level
** Significant at a 5% level
*** Significant at a 1% level

The risk adjusted alpha for the top and the bottom portfolio is shown to be significantly positive at a five percent level, which implies that both portfolios outperformed the market. However, the portfolio that consists of companies with low ESG scores presents a higher risk adjusted alpha, relative to the portfolio with high ESG scores. These findings are similar with what Atan et al. (2018) found, as they concluded that ESG

factors does not have an impact on firm performance. On the other hand, this outcome is inconsistent with the study performed by Derwall et al. (2005), as the conclusion of their analysis stated that the portfolios that takes more account to sustainability performs better than a one that is not.

Continuing with the other variables, the market coefficients provides statistically significant values for both the top and bottom portfolio. Both portfolios obtain a market factor higher than one, which indicates that the top and bottom portfolios are more exposed to market risk than the market. Nevertheless, the difference cannot be proved statistically, as the difference portfolio is insignificant. Additionally, the SMB-factor is negative for the top portfolio and positive for the bottom portfolio. Since the portfolios consist solely of firms with large capitalization, both portfolios should estimate a negative coefficient. Even so, the bottom portfolio estimates a positive value. However, the result should not be considered reliable, as it is not statistically significant on at least a ten percent level. Although, the difference portfolio displays a negative significant value at a five percent level for the SMB-factor, indicating that the top portfolio is more skewed towards large cap firms than the bottom portfolio. Likewise, Derwall et al. (2005) received a result where the top portfolio had a more negative value for the SMB-factor than the bottom portfolio. Although, the result was not statistically proved by their difference portfolio.

Displayed in Table 3, both the top and bottom portfolio shows a negative sign for the HML-factor, indicating that the portfolios consist of more growth stocks than value stocks. However, the HML-factor is statistically insignificant for the top portfolio. On the other hand, the difference portfolio supports the fact that the bottom portfolio consists of more growth stocks than the top portfolio. Lastly, the MOM-factor is negative for the top portfolio, implying that the portfolio contains underperforming stocks. Contrariwise, the bottom portfolio has a positive value on the MOM-factor, which indicates that the portfolio consists of good past-year performing stocks. Although, it is important to enlighten that the momentum factor does not attain statistical significance for any of the portfolios, nor the difference portfolio. Thus, the interpretation of the factor for each portfolio cannot be trusted.

To summarize, Table 3 indicates that both large cap portfolios is outperforming the market as they have positive and strong statistically significant values. The bottom portfolio has however a slightly higher value than the top portfolio. This implies that there is a difference in firm performance between portfolios constructed and categorized by ESG score. Although, the difference is not supported statistically by the difference portfolio.

6.4 Critical Evaluation of the Empirical Results

There are some aspects in this thesis that could be worth considering. First, the four constructed portfolios consist only of ten stocks each. A greater sample would make the data less likely to be biased. Although, in this thesis the constructed portfolios are ranged based on ESG scores. With more stocks in each portfolio the spread of ESG scores between the low ranked and high ranked portfolios would become smaller. In that case, it might be needed to deal with the problem about how to weighting the portfolios. For example, the highest ranked companies might have needed a greater weight than the lower ranked companies in each portfolio. In our case, we decided that no value weighting needed to be done, since our sample size is quite small.

Additionally, we could have created an ESG factor and added it as a fifth factor to the Carhart model, in order to examine its real effect on the financial performance. However, the reason why we did not examine this aspect was because a lot of technology firms had missing ESG scores for more than two of the five-year sample period. Neither did we want to assume ESG values for the missing periods, since we noticed that the score could differ significantly between the years.

7. Conclusion

Several studies have investigated the relationship between stock performance and corporate social responsibility. However, most of the previous studies have been made across industries instead of focusing on one specific sector. To contribute to this relatively unexplored field of studies, this thesis has focused on the technology sector.

The first null hypothesis states that there is no statistical significant difference in risk adjusted return between two small cap portfolios constructed based on the level of ESG-score. By running a regression over Carhart's four factor model (1997) this hypothesis was tested. Evidence is found on a five percent significance level that firms with low ESG-score outperform firms with high ESG-score, thus the null hypothesis can be rejected. The second hypothesis is formulated the same way as the first one, expect it consider firms with large market capitalization instead of small. From the given result, the null hypothesis can not be rejected on at least a ten percent level, as the difference portfolio is not statistically significant. Thus, no statistical proof of difference in risk adjusted return between the two large cap portfolios is found. Although, the regressions for the individual portfolios indicate that the portfolio with low ESG score performed better than the one with high ESG score.

Additionally, to the econometric analysis, the historical stock performance for each portfolio were calculated. The result showed that the portfolios with low ESG score performed better than the portfolios with High ESG-score. Furthermore, the return adjusted for risk was retrieved by calculating the Sharpe ratio for each portfolio. The result suggested that both large cap portfolios would have been a better investment than the small cap portfolios, on a risk adjusted basis, since their ratio was higher. Hence, the result raises the question whether market capitalization is more important than ESG score when it comes to stock performance of firms in the technology sector.

Lastly, the results from this study indicates that investors do not award firms in the technology sector for having high environmental, social and governance standards. A supplementary research could be to investigate different sectors to see whether there is a difference in the performance between the sectors and their level of ESG scores.

Furthermore, it would be interesting to investigate an industry that is known to directly affect the environment, as for instance the oil or the tobacco industry that commonly has an affect on the social factor in ESG.

8. Appendix

8.1 Tests for OLS assumptions

Table 1: Tests for Heteroscedasticity and Serial Correlation

Variables	Small Top	Small Bottom	Large Top	Large Bottom	Difference Small	Difference Large
Breusch-Pagan	0.3853	0.1179	0.8254	0.4874	0.3673	0.3048
White	0.5645	0.5658	0.6894	0.1081	0.6592	0.0644
Breusch-Godfrey	0.4209	0.2067	0.1782	0.9126	0.9443	0.9231

Note to Table 1: The null hypothesis for the Breusch-Pagan and White test states that the variance of the errors is independent, meaning that there is homoscedasticity. In order to test for serial correlation, the Breusch-Godfrey test with a lag of 1 is made. The values presented in the table is the p-values for each test.

The observed values in Table 1 displays the p-values for the three conducted tests. Both the Breusch-Pagan and White test for heteroscedasticity fails to reject the null hypothesis on a ten percent level for each portfolio. Thus, one cannot statistically verify that there is heteroscedasticity. Although, one cannot state that there is homoscedasticity either, since no rejection is done. Therefore, robust standard errors have been used in each regression for the analysis as it contributes to trustworthy errors. Moreover, the test for serial correlation, the Breusch-Godfrey test, indicates that no serial correlation occurs for any of the monthly observations in the portfolios.

Table 2: Correlation Matrix

Variables	Market	SMB	HML	MOM
Market	1			
SMB	0.2194	1		
HML	0.0269	0.1782	1	
MOM	-0.1999	-0.1356	-0.5022	1

Note to Table 2: The correlation matrix illustrates the correlation between the independent variables.

The correlation matrix, shown in Table 2, illustrates the correlation between the Carhart factors. There appears to be no multicollinearity problem, as the correlation between the independent regressors are more skewed towards zero than one (in absolute values).

Table 3: Seasonality

Variables	Small Top	Small Bottom	Large Top	Large Bottom	Difference Small	Difference Large
Seasonality	0.5308	0.5391	0.1739	0.4860	0.8253	0.9442

Note to Table 3: The displayed values are p-values and the null hypothesis of the test states that there is no patterns in the data.

Table 3, present the seasonality for each portfolio. Furthermore, there is no indication for patterns in the dataset over January 2013 to January 2018, as all of the six portfolios is insignificant on a ten percent basis.

Appendix 8.2 Firms and ESG scores

Table 4: ESG scores Small Top Portfolio

Stocks	2017	2016	2015	2014	2013
Unisys	-	77	61	51	64
Pitney Bowes	-	75	71	71	75
Adtran	63.2	61	-	-	-
Axcelis Technologies	62.8	62	-	-	-
Sierra Wireless	62.5	45	44	34	-
Virtusa	61.1	64	-	-	-
Insight	59.6	54	-	-	-
Plantronics	55	59	-	-	-
Vocera Communications	55	61	-	-	-
Netgear	-	51	51	51	51

Table 5: ESG scores Small Bottom Portfolio

Stocks	2017	2016	2015	2014	2013
Xperi	13.4	17	-	-	-
ComScore	18.7	8	-	-	-
Sapiens International	19.1	19	-	-	-
Shutterstock	20.8	24	27	-	-
Universal Electronics	21.2	28	-	-	-
Extreme Networks	21.5	20	-	-	-
GTT Communication	22	25	-	-	-
Overstock.com	23	25	-	-	-
Photronics	25	17	-	-	-
Inphi	28	29	24	-	-

Table 6: ESG scores Large Top Portfolio

Stocks	2017	2016	2015	2014	2013
Intel	91	94	89	92	85
Intuit	-	90	88	83	80
Texas Instruments	90	92	90	91	90
Microsoft	90	91	84	88	90
Cisco Systems	90	90	87	86	82
Accenture	89	92	95	86	88
Motorola Solutions	-	87	84	80	82
NVIDIA	85	85	83	84	78
IBM	-	85	83	81	80
Adobe Systems	83	86	80	77	84

Table 7: ESG scores Large Bottom Portfolio

Stocks	2017	2016	2015	2014	2013
InterActiveCorp	28	27	24	23	20
Netflix	29	23	21	17	12
SS&C Technologies	-	32	29	-	-
Jack Henry & Associates	33	33	29	-	-
Broadcom	39	42	38	38	44
ServiceNow	39	33	35	32	20
Baidu	47	52	35	32	27
Activision Blizzard	48	52	55	44	48
Palo Alto Networks	48	45	37	23	-
PTC	49	44	36	44	43

9. References

Anderson, R. L. (1942). Distribution of the serial correlation coefficient. *The Annals of Mathematical Statistics*, *13*(1), 1-13.

Atan, R., Alam M.M., Said, J. & Zamri, M., 2018. The impacts of environmental, social, and governance factors on firm performance: Panel study of Malaysian companies. *Management of Environmental Quality: An International Journal*, 29(2), pp.182–194.

Berk, J. & DeMarzo, P. (2013). *Corporate Finance* (3rd edition). Harlow: Pearson Education

Bloomberg (2017). *Global sustainable investments grow 25% to 23 trillion*. [Online] Retrieved from https://www.bloomberg.com/professional/blog/global-sustainable-investments-grow-25-23-trillion/ (Last visited 2019-01-04)

Bodie, Z., Kane, A., & Marcus, A. J. (2018). Investments. Eleventh Edition. *McGraw Hill Education.*

Brammer, S., Brooks, C., & Pavelin, S. (2006). Corporate social performance and stock returns: UK evidence from disaggregate measures. *Financial management*, *35*(3), 97-116.

Carhart, M. M. (1997). On persistence in mutual fund performance. *The Journal of finance*, *52*(1), 57-82.

Cohen, M.A., Fenn, S.A. & Konar, S., 1997. Environmental and financial performance: Are they related? *Working paper*, Vanderbilt University.

CompTIA. (2018) Cyberstates 2018. [Online]. Retrieved from: https://www.cyberstates.org/pdf/CompTIA_Cyberstates_2018.pdf (Last visited 2019-01-05)

Derwall, J., Guenster, N., Bauer, R. & Koedijk, K., 2005. The eco-efficiency premium puzzle. *Financial Analysts Journal,* 61(2) pp.51–63.

Dupler, D. (2003). Socially Responsible Investing. In *Environmental Encyclopedia*. Retrieved from http://go.galegroup.com.ezproxy.ub.gu.se/ps/i.do?p=GVRL&u=gu&id=GALE%7CCX3404801398&v=2.1&it=r&sid=exlibris (Last visited 2019-01-03)

Fama, E. F., & French, K. R. (1992). The cross-section of expected stock returns. *the Journal of Finance*, *47*(2), 427-465.

Field, A. (2013). *Discovering statistics using IBM SPSS statistics*. sage.

Goldreyer, E. F., & Diltz, J. D. (1999). The performance of socially responsible mutual funds: Incorporating sociopolitical information in portfolio selection. *Managerial Finance*, *25*(1), 23-36.

Jarque, C. M., & Bera, A. K. (1980). Efficient tests for normality, homoscedasticity and serial independence of regression residuals. *Economics letters*, *6*(3), 255-259.

Jegadeesh, N., & Titman, S. (1993). Returns to buying winners and selling losers: Implications for stock market efficiency. *The Journal of finance*, *48*(1), 65-91.

Kwak, S.G. & Kim, J.H., 2017. Central limit theorem: the cornerstone of modern statistics. *Korean Journal of Anesthesiology*, 70(2), pp.144–156.

Malkiel, B. G., & Fama, E. F. (1970). Efficient capital markets: A review of theory and empirical work. *The journal of Finance*, *25*(2), 383-417.

Markowitz, H., 1952. Portfolio Selection. *The Journal of Finance,* 7(1), pp.77–91.

Mossin, J. (1966). Equilibrium in a capital asset market. *Econometrica: Journal of the econometric society*, 768-783.

Park, C. & Allaby, M. (2017). *A dictionary of Environment and Conservation* (3rd edition). England: Oxford University Press.

Porter, M. E., & Van der Linde, C. (1995). Toward a new conception of the environment-competitiveness relationship. *Journal of economic perspectives*, *9*(4), 97-118.

Renneboog, L., Ter Horst, J., & Zhang, C. (2008). The price of ethics and stakeholder governance: The performance of socially responsible mutual funds. *Journal of Corporate Finance*, *14*(3), 302-322.

Schueth, S. (2003). Socially responsible investing in the United States. *Journal of business ethics*, *43*(3), 189-194.

Sharpe, W. F. (1964). Capital asset prices: A theory of market equilibrium under conditions of risk. *The journal of finance*, *19*(3), 425-442.

Sharpe, W. F. (1966). Mutual fund performance. *The Journal of business*, *39*(1), 119-138.

Soana, M. G. (2011). The relationship between corporate social performance and corporate financial performance in the banking sector. Journal of business ethics, 104(1), 133.

Thomson Reuters, 2017. *Thomson Reuters ESG Scores.* [Report]. Available at: http://www.esade.edu/itemsweb/biblioteca/bbdd/inbbdd/archivos/Thomson_Reuters_ESG_Scores.pdf [Last visited 2018-12-21]

Treynor, J. L. (1961). Market value, time, and risk.

Walley, N., & Whitehead, B. (1994). It's not easy being green. *Reader in Business and the Environment*, *36*, 81.

Databases:

French, K. (2018). *Kenneth R. French Data Library*. Retrieved from: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html (Last visited 2018-11-27)

Yahoo!. (2018). *Yahoo! Finance*. Retrieved from: https://finance.yahoo.com (Last visited 2018-11-30)

Eikon. (2018). *Thomson Reuters Eikon*. (Last visited 2018-12-07)