A Firm's Engagement in Environmental, Social and Governance (ESG) Issues and its Effect on Portfolio Returns

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ABSTRACT

This thesis examines how a firm's engagement in environmental, social and governance (ESG) issues affect portfolio returns, which in previous research have resulted in contradicting results. By using the improved Fama and French five-factor model and ESG dataset from Sustainalytics that report both the total ESG score, the individual scores of E, S and G and adjust the ESG issues depending on the sector, this thesis's result will be more accurate than previous research using a similar approach. I show that a portfolio only consisting of firms that report ESG independent of level of engagement generates a positive alpha of 8.1% annually compared with the US stock market. By only investing in firms that are top ESG performers the annual alpha will drop to 2.7%. Firms that are top performers in one of the environmental, social or governance areas will not generate any alpha, but an above average engagement in these issues excluding the top performers will generate an annual alpha of 3.7%, 5.7% and 5.0% respectively. Therefore, I propose that investors should invest in firms engaging in ESG issues to increase portfolio return, but too much engagement in all of these areas or in one particular area will lead to diminishing positive effect on portfolio return or no increase in portfolio return at all.

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Introduction

Environmental, social and governance (ESG) issues have been set on the agenda in the developed world, and in 2000 the very first ESG reporting framework was introduced by the Global Reporting Initiative (GRI). Thus, the majority of large firms have started to report ESG issues. The OECD Round Table on Sustainable Development disclose that out of the 100 largest companies 73%, 76% and 71% in each of Europe, America and Asia respectively report ESG issues in 2014 and these numbers are increasing. There are initiatives like the UN initiative, Sustainable Development Goals that put pressure on regulators, whom in turn put pressure on institutional investors to encourage and invest in sustainable companies. The dependency on institutional investors makes more firms engage in ESG issues. It is here the dilemma arises; will firms that engage in ESG issues still be able to maximize shareholder value? The core ESG issues can be contradicting to core profit maximizing concepts. Can working conditions for employees improve at the same time as people are laid off to reduce costs? Can inclusion of women on the board be better than hiring the best-suited candidate independently of gender? Can investing in carbon filters increase firm value? These are only some of the issues that a firm will be challenged with when engaging in sustainability issues. If firms engage in sustainability and this hurts the task of maximizing shareholder value, then in the long run this can hurt economic development and growth. Since there is an increasing number of firms engaging in ESG issues this will be a central question to examine.

It is evident that the relationship between firm value and ESG engagement is difficult to measure since previous researchers have found contradicting results depending on the study's approach. Thus, the effect on firm value of engaging in ESG issues is highly debated. The relationship between engaging in ESG issues and firm value has been found to have a negative relationship (e.g. Kruger, 2015), no relationship (e.g. Schrek, 2011), a positive relationship under certain conditions (e.g. Nollet, Filis and Mitrokostas, 2016) and a positive relationship (e.g. Czerwinska and Kazmierkiewicz, 2015). It is the different combinations of method, region, time interval and the data used that have resulted in the variety of results.

Compared to previous research, I will use a different combination of method, region, time-interval and data source since there have been updated versions of these

components that has not been used to study the relationship between ESG performance and portfolio return. It is because of the contradicting previous research that modernized components are of importance to be able to find the actual relationship between ESG performance and portfolio return. The improved results from this study will therefore be an important complement to the existing contradicting literature.

I will use the Fama-French five-factor model developed by Fama and French (2014) to see if investing in firms engaging in ESG issues will generate alpha compared with the US stock market. Previous researches have been using asset-pricing models, but not the five-factor model of which Fama and French (2014) argues to be superior to previous models. Since this model is developed and tested on firms from stock exchanges in the United States (the US), this thesis will also use US data to ensure the fit of the model. Galema, Plantinga and Scholtens (2008), Gomez-Bezares, Przychodzen and Przychodzen (2016) and Halbritter and Dorfleitner (2015) are similar researches to this thesis, but they all use the four-factor model. The ESG data from Sustainalytics will be used since it is the later data source and it reports the total ESG score as well as the individual E, S and G scores and adjusts the issues and scores to fit the specific industry. Adjusting the score depending on the sector is of importance when analysing firms from different sectors as this thesis do. Nearly all studies that I have came across have included firms from all sectors, but been using ESG data that does not adjust for that e.g. Galema et al. (2008). There are only newer studies like Auer and Schuhmacher (2016) that have been able to use Sustainalytics ESG data source since they only have reported data since 2004, which limits the number of years to study compared with other data sources ranging back to early 90's. However, Auer and Schuhmacher (2016) do not use an asset-pricing model to study this affect. The individual E, S and G scores will also make it possible to study where the total ESG effect derives from and to see which area is creating more value if engaged in. The constant increase in the number of firms reporting ESG issues will also make the dataset of this thesis larger than previous researcher's dataset, which another important and improved component.

When a firm report ESG issues it is required to measure key environmental, social and governance performance indicators, which is a first step to be able to manage, develop and set up goals for a sustainable business. Therefore, firms that do not report ESG issues are most likely not engaged in these issues or would generate a

lower ESG score than the firms that do report ESG issues. This thesis will therefore assume that reporting ESG issues are synonymously with engaging in these issues, hence be able to examine if firms that report ESG issues will generate more firm value than firms that do not report these issues. Among the firms that report ESG issues, the level of engagement in ESG issues will also be analysed to see the affect of this on portfolio returns.

There are several different key performance indicators (KPIs) that are used to measure the firm's E, S and G performance. A firm's environmental performance builds on KPIs like amount of greenhouse gas emissions, water usage, energy usage, amount of waste and recyclability. A firm's social performance builds on KPIs like accident ratio, employee turnover, job creation and level of diversity. A firm's governance performance builds on KPIs like ratio between executive pay and average worker pay, percentage women on board or in management positions, levels of diversity on the board or in management positions, financial efficiencies, percentage of revenue spend on research and development, level of innovation, level of pension plans, level of meritocracy and percentage of employee undergoing training. These KPIs are compared with firms from the same industry and will receive a score depending on how its peers have performed. Some of the KPIs used are only relevant to certain sectors, thus only measured and included in the total ESG score in that specific sector. Therefore a higher ESG score means that the firm has less impact on the climate, use less natural resources, have a healthier working environment and smaller internal economic and social inequalities in comparison to its peers.

Three natural research questions arise from this: Will firms that engage in ESG issues generate higher portfolio returns than firms that do not engage in these issues? Out of the firms that engage in ESG issues, will a higher level of ESG performance generate higher portfolio returns than the firms that are less engaged? Will effort put into one of the environmental, social or governance areas generate more portfolio return than another?

My results suggest that firms should engage in ESG issues and that these efforts will be a part in maximizing shareholder value. Firms that report ESG issues are shown to generate on average an annual alpha of 8.1%. Firms that are in the top 50-10% of all ESG performers generate on average an annual alpha of 5.0%. Firms that are in the top 10% of all ESG performers generate on average an annual alpha of 2.7%. This suggests that too much effort can decrease the positive effect on firm

value from ESG engagement, yet any level of ESG engagement is positive for firm value.

Firms that are top 10% performers in each of the E, S and G areas do not generate any alpha. This suggests that focusing on one out of the three ESG areas and putting too many resources on this will not generate any firm value. Yet, the above average E, S or G performers excluding the top 10% performers generate annual alpha of 3.7%, 5.7% and 5.0% respectively. These alphas are statistically significant, but the difference between the alphas are not statistically significant, which means that average performance in any of the three areas are not more beneficial than another area. This again implies that engaging in E, S or G issues up to a certain level will generate firm value.

Thus, the increasing number of firms that engage in ESG issues will spur economic growth. However, it is important to point out the diminishing positive effect when firms engage too much in ESG issues.

Literature Review

The individual affect on firm value from engaging in E, S or G issues

The ESG score is a way to measure the complex sustainability performance of a firm. ESG covers three main areas within sustainability and each area consists of several different issues. These issues can have positive, negative or no effect on firm value. Combining the effects from all different issues might lead to insignificant results like in Schreck (2011), Halbritter and Dorfleitner (2015) and Auer and Schuhmacher (2016). By examining the effect on firm value from the E, S and G areas separately; it will be clearer how the total ESG engagement can affect firm value.

A firm that engages in environmental issues can both cut costs and reduce downside risk. But, it can require large readjustments for a firm to for instance begin using recyclable materials, sorting waste, use alternative energy sources or investing in carbon filters to reduce greenhouse gas emissions. This might require changes of suppliers, new waste disposal methods, investing in environmentally friendly machines, invest in alternative energy sources and hiring or training of managers to successfully implement these new processes. It will be costly in the short-run to get all these aspects in place, but the long-run benefits might outweigh these costs. If the

costs are decreasing in the long run, this will immediately boost profits by increased margins or the opportunity to lower prices to eliminate competitors and gain market power.

Environmental regulations are getting tougher and by being proactive the firm can protect itself from being forced to make these types of investments at a less appropriate time or paying fees for not meeting the standards. This would be similar to insurance. Investing in these issues can therefore reduce downside risk and the value of the firm will increase, but only if the cost of implementing it early is lower than the risk of paying fees or implementing this at a future less appropriate time.

Environmentally friendly actions have in previous studies shown different effects on firm value, with some showing a positive relationship (e.g. Menguc, Auh and Ozanne, 2009) and some a negative relationship (e.g. Sarkis and Cordeiro, 2001). Yet, Sarkis and Cordeiro (2001) did look at the short-run effect of pollution preventions on financial performance, and it is expected that changes like this require costly changes in the short-run. Lucas and Noordewier (2016) argues that engaging in environmental issues only pay off in certain circumstances and find that engaging in environmental issues increases firm value only for the dirty and non-proactive industries, which are the ones exposed to tougher future regulations. Therefore, the relationship between a high environmental score and firm value is complex, and the initial investment costs might or might not be paid off by the reduced downside risk and reduced annual costs in the long run.

Firms that engage in social issues will aim to, for instance, lower accident ratio, lower employee turnover, improve working conditions for workers in their supply chain, improve consumer protection, create more jobs and have a diverse group of employees. These factors are contributing to a healthier work environment and Edmans (2012) found that job satisfaction affected firm value positively. However, improving the working conditions for the firm's supply chain and implementing consumer rights is expected to be additional costs for the firm. In turn the firm will reduce the risk of illegal actions and lawsuits and improve the firm's reputation.

Job satisfaction, in turn, can help the recruiting process, which creates a positive circle. And, by recruiting people from different cultures, with different backgrounds and different sex this will enable the firm to recruit from a broader group of talents, which will improve the quality of the work force.

By improving the working environment and the quality of the work force the firm will be more productive, which can increase firm value. Halbritter and Dorfleitner (2015) found that engaging in social issues affected the firm value positively, while engaging in environmental or governance issues did not contribute firm value.

A firm that engages in governance issues will aim to, for instance, lower the ratio between executive pay and average worker pay, have as many women as men on the board of directors or in management positions, higher level of diversity on the board or in management positions, increase financial efficiencies, increase percentage of revenue spend on research and development, increase level of innovation, advance the level of pension plans, improve the level of meritocracy and increase percentage of employee undergoing training.

To preserve or boost management's incentives it is important to have a balanced compensation plan set up between fixed salary and bonus and also have controls to know that the management behaves. Advancement within the firm should be driven by talent, ability and achievements, and not by any other means. If this is in place and the management increases incentives to perform well, then this will have a positive effect on firm value. Balachandran and Faff (2015) argue that most literature finds that higher executive compensation have a positive relationship with weak governance, which do not contribute to firm value and is in line with the agency theory and incentive schemes as discussed above. Lower the ratio between executive pay and average worker pay and improve the level of meritocracy might therefore drive managers' incentives, which in turn will drive firm value.

Investing in employee training or research and development (R&D) activities lay the foundation for improvements and innovations. Improvements and innovations are an important part to increase productivity and create a competitive edge, which in turn drive economic growth. However, for an individual firm, investing in training or R&D is costly and it is uncertain when, how much and if this generate returns.

The increase in firm value from engaging in governance issues is dependent on several factors, and increasing managers' incentives or investing in training and R&D are some of the factors that increase the firms' chances of becoming successful. Van Duuren et al. (2015) found that engaging in governance issues is the most dominant factor affecting firm value compared with engaging in environmental and social issues.

The three main areas within sustainability consist of several different issues, and as discussed above, they can have positive, negative or no effect on firm value. The effects of engaging in each of the three main areas vary, but have shown to be more inconclusive for the environmental area and more positive for the social and governance areas. Therefore, by combining the effects from all the three main areas within sustainability, it is expected to have a total positive effect on firm value.

The combined affect on portfolio return from engaging in ESG issues

There are two main approaches that are used to examine the relationship between firm value and engagement in environmental, social and governance issues. Performing event studies are one approach that examines the stock price movement after new ESG information for a firm have been published. The price movement reflects the investor's new future expectations of the firm's performance. Performing time series regressions is another approach that measures the actual historical value change when firms are engaging in sustainability issues. It is of interest to compare the results from these two approaches since it reflects investors' beliefs about how engagement in sustainability affects firm value versus how engagement in sustainability actually have affected firm value historically. This will create an idea of if investors are overvaluing or undervaluing a firm's engagement in sustainability issues.

Good ESG news can be that the firm has invested in alternative energy, increased safety system for workers or put more employees on training while bad ESG news can be oil leakage, higher employee turnover or increased gap between managers' incomes and workers' incomes. Kruger (2015) finds that good ESG news has a positive effect on firm value if the firm has had bad historical incidents concerning these issues, e.g. corruption or oil leakage. Otherwise, he finds that both good and bad news about ESG will have a negative affect on firm value. But, bad news will have a strong negative effect while good news will have a weaker negative affect. He argues that the good news has a negative effect as well because of agency problems. The managers could use the shareholder's money to invest in ESG issues, which makes the manager look good externally or among other managers. Shareholders can therefore view these investments as having a negative net present value, which shareholders react negatively to. Crifo, Forget and Teyssier (2015) finds that private equity investors react more to negative ESG news than to good ESG

news. This is because shareholders do not value positive ESG news as explained above, but at the same time bad ESG news is still considered to harm firm value.

Event studies have also been performed to see how the value of the firm reacts to reporting ESG issues, if the firm have not reported this before. Cahan, De Villiers, Jeter, Naiker and Van Staden (2016) finds that unexpected disclosures of good ESG scores are positive for firm value while expected disclosures of good ESG score does not have any effect on firm value. This has to do with shareholders and other observers expecting some firms to report good ESG scores, so when they do, it is no surprise and the expectations are already incorporated into the stock price. By disclosing a firm's engagement in sustainability issues Dhaliwal, Li, Tsang, and Yang (2011) show that firms raise more capital. This is because the bank or private equity firm will have more information regarding the firm's governance and social structure and be able to better evaluate the firm's credibility or investment opportunity.

Time series regressions have been used by Flammer (2015) to compare a group of firms that did not engage in ESG issues to a group that did engage in ESG issues. The two groups were similar from the beginning, since it compares firms that barely passed a sustainability proposal to firms that were just below the threshold of imposing sustainability issues to their firms. He finds that the group of firms that engaged in ESG issues increased firm value more than the group of firms that did not engage in ESG issues. The results indicate that firms that engage in ESG both increase accounting performance and returns, thus increasing firm value. Nollet et al. (2016) also finds a positive relationship between firm value and ESG scores, but only in the long run. He found that in the short run the firm value decreased because of the additional costs of implementing these issues, but in the long run the firm value was affected positively from the ESG investments. Gomez-Bezares et al. (2016) also finds a positive relationship between ESG scores and firm value in the long run. It also finds a negative relationship with volatility, which improved the results during the financial crisis. There are also older research that has found engagements in sustainability to have a negative effect on firm value, e.g. Friedman (1970) argues that engaging in sustainability is costly and will therefore not be in favour of shareholders nor economic growth

Regional differences

The ESG score has proven to vary depending on region. Western Europe is the top performer in the ESG ranking made by RobecoSAM in 2016, followed by the US and lastly the Asian countries. LGT Capital Partners' annual ESG report survey 170 private equity managers, and find Europe to be the top ESG performer followed by Asia and lastly the US. The main contributors of Europe's results are the high ESG score of the western and the northern European countries.

Auer and Schuhmacher (2016) find that European firms with high engagement in ESG issues will affect firm value in a negative way while Asian and North American firms with high ESG engagement will not have any significant effect on firm value. One reason for this might be that Western Europe is more socialistic and therefore it becomes more a question about philanthropy, or they might be over optimistic of ESG engagement and firm value. A survey done by Van Duuren, Plantinga and Scholtens (2015) reveals that portfolio managers in Europe believe that engaging in ESG issues will affect firm value positively while US managers believe that engaging in ESG issues will only add additional cost and therefore not increase firm value. Therefore, investors in the US that invest in firms engaging in ESG issues, who do not believe that engaging in ESG issues will create firm value, might generate alpha if engaging in these issues actually create firm value. But, if investors in Europe believe that firms engaging in ESG issues will create more value than other firms, then the price will increase and investing in these firms might therefore not generate any alpha. These conditions will only hold if investors are only allowed to invest in their own regions.

Most studies have been done on US companies, which will create a bias picture if applied to other countries than the US. Cahan et al. (2016) finds that countries with stronger institutions promote ESG disclosure and therefore when firms do disclose ESG issues this does not have any effect on the firm value. On the other hand, countries with weak institutions are affected positively if ESG scores are disclosed. This might be the case with Poland since few firms report ESG there and Czerwinska and Kazmierkiewicz (2015) find that high ESG scores have lead to over average returns. However, a study done by Mittal, Sinha and Singh (2008) in India find that firms engaging in ESG issues perform worse than average, which would contradict the above statement. So, there are exceptions or some volatility in that statement.

A study by Ioannou and Serafeim (2012) includes 42 countries and examines why similar firms in different countries perform differently on ESG and they find that the main reason is because of the political system. There are countries with political systems that are more pro-ESG issues, and they influence institutional investors to also take into account ESG issues. This will in turn push firms to report ESG scores and/or to report higher ESG scores, since many firms are dependent on institutional investors. This article also argues that the country's labour system, educational system and its culture also affect the firm's ESG engagement. On the other hand, the financial system did not show to have an impact on the engagement in ESG issues in different countries.

The great differences between the characteristics and the ESG development across continents and even countries have a great impact on how ESG engagement will affect portfolio returns. This study is only focusing on US firms, and the results generated from this study should therefore only apply to the US market.

Literature review summary

The results from the event studies suggest that investors do not believe that a firm's engagement in ESG issues will create firm value. The only firms that are expected to benefit from engagement in ESG issues are firms in "dirty" industries or firms with bad historical sustainability track record. This is contradictory to the general results from the time-series regressions where firms that engage in ESG issues have increased firm value more than other firms on average. Engaging in ESG issues have therefore spurred revenues and growth. Noticeable exceptions from this are European firms that are highly involved in ESG issues. These firms' engagements have shown to have a negative effect on firm value.

If investors have undervalued the positive effect on firm value from engaging in ESG issues, then these firms will be undervalued. Investing in these firms will therefore generate excess return. Investor's belief can however change over time. Halbritter and Dorfleitner (2015) examines this effect during different time periods and find that the returns have declined. They argue that this is because investors are including ESG issues more and more when analysing stocks. ESG aspects are therefore starting to be included in stock prices and therefore there should be no unexpected additional returns going forward.

Hypotheses

Hypothesis 1: If investors invest in firms that engage in ESG issues, then they will generate higher portfolio returns because the positive net return from investing in ESG issues and the reducing of the firm's idiosyncratic risk is undervalued.

Hypothesis 2: If investors invest in firms that are extraordinarily involved in ESG issues, then they will not generate as high portfolio returns as when investing in firms engaged to a lesser extent because these firms put too much effort and resources into these issues, which takes away focus from other profit maximization parts of the firm.

Hypothesis 3: If firms mainly engage in environmental issues, then these firms generate less portfolio returns than firms that mainly engage in social or governance issues because environmentally friendly actions benefit the climate while social and governance actions will benefit that specific firm.

Theory and Methodology

This thesis will use the five-factor model developed in Fama and French (2014) to examine how firm value is affected by a firm's engagement in ESG issues. This model has what I know not been used to examine this relationship in any previous study. This multi-factor model is a product of testing all combinations of the main known factors affecting return (ibid.). The methodology for this will be explained below.

To generate higher returns an investor can take on more risk. Stocks with higher risk have higher price volatility. This risk and reward profile of a stock can be described by several different risk factors. The most known risk factor is the beta in the Capital Asset Pricing Model (CAPM) shown in equation (I). Stocks with higher betas have more systematic risk (market risk), and will thus require higher return. R_i is the assets return, R_f is the risk free rate and R_m is the return of the market.

CAPM:

$$E(R_i) - R_f = \beta_i(\mathrm{E}(R_m) - R_f) \qquad \text{(I)}$$

The other risk factors that explain why some stocks have higher returns are the risk associated with the following factors. Investing in small market capitalization stocks should require excess return since its business and geographical exposure is probably less diversified, which makes it sensitive to distressed situations. Investing in high book-to-market ratios should require excess return since low valuations makes the firm more exposed to defaults. Investing in firms with low investment ratio can capture that the firms is distressed, which would require excess return. Investing in firms with high profitability should require excess return since with competition profits are likely to go down. The rational behind the investment and profitability risk factors are not clear, but in Fama and French (2014) they are still proven to be significant risk factors explaining return. Investing in firms with positive momentum should require excess return since it takes the risk of the stock not having a momentum. Investing in illiquid stocks should require excess return because of the higher transactions costs. The creations of these risk factors are explained in the *Method* section.

Including some or all of the risk factors in the CAPM will create multi-factor models. These models are not based on theory, but instead build on how the volatility of returns has been historically. The factors included are all proven to explain the difference in returns. The average effect of these factors creates benchmarks on the firms' future expected returns. Since these factors are not based on theory, but instead based on real world data, these factors can change over time. It is also not given that the volatility of future returns will follow the same patterns as historical data. Yet, the best guess of future returns will be from looking at historical returns and be able to compare returns of similar assets.

One of the oldest and most used multi-factor model is the three-factor model by Fama and French (1992) shown in equation (II). The two additional factors included are the size factor (SMB) and a market-to-book factor (HML). Czerwinska and Kazmierkiewicz (2015) is one study that used this model to study the relationship between firm value and ESG engagement.

Three-factor model:

$$R_i = \alpha_i + \beta_m(R_m - R_f) + \beta_{HML}HML_i + \beta_{SMB}SMB_i + \varepsilon_i \qquad \text{(II)}$$

Carhart (1997) extends the three-factor model and create the four-factor model, which adds the momentum factor (UMD) shown in equation (III). Gomez-Bezgares et al. (2016), Halbritter and Dorfleitner (2015) and Galema et al. (2008) used this model to study the relationship between firm value and ESG engagement.

Four-factor model:

$$R_i = \alpha_i + \beta_m(R_m - R_f) + \beta_{HML}HML_i + \beta_{SMB}SMB_i + \beta_{UMD}UMD_i + \varepsilon_i \quad \text{(III)}$$

Fama and French (2014) test the combinations of all the seven factors mentioned in the beginning of this section. This results in the five-factor model that includes the market factor, the size factor, the book-to-market factor, the profitability factor (RMW) and the investment factor (CMA) shown in equation (IV). Neither the momentum factor nor the liquidity factor improved the model and was therefore left out. Including all seven factors did not improve the model either because it created multicollinearity problems.

Five-factor model:

$$R_i = \alpha_i + \beta_m(R_m - R_f) + \beta_{HML}HML_i + \beta_{SMB}SMB_i + \beta_{RMW}RMW_i + \beta_{CMA}CMA_i + \varepsilon_i \quad \text{(IV)}$$

The greatest flaw of the five-factor model is that it cannot explain the expected returns of small firms that invest a lot but have poor profitability. However, since this thesis only includes firms that report ESG issues many small firms are excluded, which might take out some of this problem. For the purpose of this thesis, profitability and investment factors are important to include since these are the quality factors. Quality factors might be correlated with ESG because firms that have high profitability and invest a lot will be more prone to also afford and invest in ESG issues. Therefore, the five-factor model will be an appropriate model to analyse the different ESG portfolios' alphas.

If the five-factor model is superior to any of the other multifactor models stated above, then previous literatures have included too few factors. This can lead to omitted variable bias and might explain the variation in the previous results. However, the five-factor model might have omitted variable bias as well since the

liquidity and the momentum factors are left out. This would only be true if the liquidity or the momentum factor is correlated with any of the included factors. If they are correlated, this will violate the Gauss Markov assumption for the OLS regression. It states that the error term cannot be correlated with any of the factors (F): $\text{cov}(\varepsilon, F) = 0$. E.g. the size factor can be correlated with the liquidity factor since a larger firms might be traded more i.e. more liquid. However, as stated in Fama and French (2014), the momentum or the liquidity factor did not improve the model and by including them this might cause multicollinearity problems instead. Therefore, the five-factor model might be the most appropriate model to use, and will present more accurate results of how the relationship between different ESG aspects effect firm value.

The alpha is included in the multi-factor models to see if the asset has any abnormal returns after adjusting for the risk factors mentioned above. The assets in this case are the ESG portfolios that will be presented in the *ESG Portfolios* section. If the portfolios are constantly generating excess return, then these portfolios have alpha. In regards to the Efficient-market hypothesis (EMH) there should be no alpha since all available information should be reflected in the price. However, even if firms that report ESG issues are even more transparent than other listed firms, the additional information is hard to interpret and know the effect of. This statement is particularly true for firms that engage in ESG issues since previous studies have shown inconclusive results on how these issues affect firm value. If engaging in ESG issues generates firm value without investors knowing about this, then this additional value is not priced into the stock price. It is in this case that alpha can be generated, which means that engagement in ESG issues are creating firm value. If alpha has been generated from historical ESG portfolios, there will be no guarantee that these portfolios will generate alpha in the future since the effect might be incorporated into the price going forward.

As argued for above, the five-factor model seems to be the most appropriate model to use for this thesis. However, the CAPM and the three-factor model will also be used to evaluate the ESG portfolio. The results from the three different models will then be compared to see if the five-factor model was able to explain the variation in the portfolio returns better than the other two models.

This thesis will not focus on how to construct a portfolio with an optimal risk and reward profile, but instead focus on if investing in securities that report ESG

issues will generate excess return compared with other securities. One can study the effect of individual securities, but this will have a lot of noise because is will be a one observation sample. The portfolio approach is similar to have a large sample where individual stock's noise will be eliminated.

Method

Five-factor model

To be able to use the five-factor model the factors must first be created. The creation of the factors is a complex process, especially when as many as five factors are included in the model. Luckily, Kenneth R. French provides the public service of generating these factors and updates them every month, so I have obtained the monthly factors for the time period 2007 to 2015 from his website. Yet, the process of how to generate these factors is explained below.

Retrieve information about market capitalization, book to market ratio, profitability measures and investment rates for all the firms in a specific market. Rank all firms for each specific variable previously mentioned. By using the ranking it is possible to divide up small and big companies into two equal groups, the book to market ratios into the three equally sized groups Value, Neutral and Growth, the profitability measures into the three equally sized groups Robust, Neutral and Weak, and lastly the investment ratios into the three equally sized groups Conservative, Neutral and Aggressive. Since these variables are constantly changing the groups are updated each month.

If a firm is located in the Small and the Value group, then this firm is a member of the SV group, or if a firm is located in the Big and Conservative group, then this firm is a member of the BC group etcetera. The combinations of the four factors and their grouping of either two or three groups can lead to 54 different groups (2*3*3*3). However, the groups obtained from Kenneth R. French's website only contain groups that includes the size factor. This is since some of the 54 groups will become too small. Thus, only groups that contain S or B are included, which end up being a total of 18 groups (2*3+2*3+2*3). For each group the average monthly return is calculated from the stock price less dividends and less risk free rate to get the excess return. The firms are equally weighted in these calculations since the result of each deal is of equal interest, thus a larger firm do not have higher weight in the

results in this thesis. These groups are used in the equation below to create the factors HML, SMB, RMW and CMA.

HML (high minus low) is the historic excess return by being long high book-to-market firms and being short low book-to-market firms: 1/2 (Small Value + Big Value) - 1/2 (Small Growth + Big Growth). SMB (small minus big) is the historic excess return by being long small firms and short large firms: 1/9 (Small Value + Small Neutral + Small Growth + Small Robust + Small Neutral + Small Weak + Small Conservative + Small Neutral + Small Aggressive) - 1/9 (Big Value + Big Neutral + Big Growth + Big Robust + Big Neutral + Big Weak + Big Conservative + Big Neutral + Big Aggressive). RMW (robust minus weak) is the historic excess return by being long robust firms and short weak firms with below average profitability: 1/2 (Small Robust + Big Robust) - 1/2(Small Weak + Big Weak). CMA (conservative minus aggressive) is the historic excess return by being long conservative firms and short aggressive firms that invest more than average: 1/2 (Small Conservative + Big Conservative) - 1/2(Small Aggressive + Big Aggressive). The four factors described above and the market beta are located on the right hand side of the five-factor model.

$$R_i = \alpha_i + \beta_m(R_m - R_f) + \beta_{HML}HML_i + \beta_{SMB}SMB_i + \beta_{RMW}RMW_i + \beta_{CMA}CMA_i + \varepsilon_i, \qquad i=1, \ldots, N$$

The five-factor model is a time-series regression for each portfolio *i,* which returns are calculated as explained in the *ESG portfolios* section. $R_i = R_{portfolio} - R_f$, T x 1 vector of monthly excess returns of the portfolio *i* where T=108 (January 2007- December 2015). R_f is the risk free rate, and in this case it is the US one-month Treasury bill rate. α_i is the "Five-factor alpha". $(R_m - R_f)$, is a T x 1 vector of the monthly return of the chosen market, which in this case are firms listed on the NYSE, AMEX, and NASDAQ.HML_i, SMB_i, RMW_i and CMA_i are all T x 1 vectors of excess returns. $\beta_{HML}, \beta_{SMB}, \beta_{RMW}$ and β_{CMA} show how much each factor explain the portfolios return. If the betas are positive, then the portfolio acts like a value portfolio, small market capitalization portfolio, high profitability portfolio and conservative portfolio and is thus exposed to the respective risk. The opposite is true if the betas

are negative. By combining all the K (K=5) factors F the equations looks like the following:

$$\underset{(T\ x\ 1)}{R_i} = \underset{(1\ x\ 1)}{\alpha_i} + \underset{(T\ x\ K)}{F}\ \underset{(K\ x\ 1)}{\beta_i} + \underset{(T\ x\ 1)}{\varepsilon_i}$$

$$\underset{(T\ x\ K)}{F} = \begin{pmatrix} R_{11} & . & R_{K1} \\ . & . & . \\ R_{1T} & . & R_{KT} \end{pmatrix}$$

The assumptions for the five-factor model are that the errors are uncorrelated with one another since all the variation of the returns should be captured by the included factors, and that the error terms are uncorrelated with the included factors:

$$\text{Cov}(\varepsilon_i, \varepsilon_j) = 0\ for\ i = 1, 2, \dots, N, j = 1, 2, \dots, N\ and\ i \neq j$$

$$\text{Cov}(\varepsilon_i, factor_k) = 0\ for\ i = 1, 2, \dots, N\ and\ k = 1, 2, \dots, K$$

The betas in the five-factor model states how the portfolio's return is acting compared with the returns from the different factors specified above. E.g. if the beta for the SMB factor is positive, then the portfolio's return acts more like small firms than large firms. Or, if the beta for the HML factor is negative, then the portfolio's return acts more like low book to market firms than high book to market firms.

ESG portfolios

There will be nine different portfolio's excess returns that are regressed on the five factors explained above. One portfolio contains all firms reporting ESG score to be able to see if investing in firms that report ESG scores in general perform better than the US market. It is expected that reporting any score is better than not reporting at all since investors receive more information and therefore do not have to take as much precaution for unknown variables. Four portfolios contain the top 10% performers of the total ESG score and in each E, S and G area. This is to see if investing in firms that have the most outstanding E, S, G and ESG score creates any alpha compared to the US market. As discussed previously high ESG performers are shown to have a negative effect on firm value in some researches. Four portfolios will also be created that contain the top 50% of the firms reporting ESG, but taken away

the top 10% performers. This is to see if this level of ESG performance is an optimal engagement level for firms.

The excess returns for each portfolio are generated monthly over the period 2007 to 2015. The returns are also adjusted for dividend payouts. The arithmetic average has been used since the point of interest here does not depend on market capitalization. The ESG scores are updated annually, so the portfolio will be updated annually as well. This means that every year between 2007 and 2015 there will be new firms put into the portfolio while other firms are taken out of the portfolio depending on if they meet the criteria set above. To prevent self-selection bias, firms that go bankrupt or are taken off the stock exchange are still included to not create positive bias. Table 1 shows how many firms that are included to calculate the monthly average excess return for each portfolio. E.g. when examining the portfolio containing the top 10% ESG performers there will be 99 firms included when calculating the monthly average excess return for the twelve months in 2007, 122 firms included when calculating the monthly excess return for the twelve months in 2008 etcetera. Since there are nine years included and each year have twelve months there will be 108 monthly excess returns ranging from January 2007, to December 2015 for each of the nine portfolios.

Number of Observations									
ESG Portfolios	2007	2008	2009	2010	2011	2012	2013	2014	2015
ESG top 10%	99	122	153	247	265	272	281	289	276
ESG top 10-50%	386	502	586	983	1024	1099	1093	1150	1004
ESG all	966	1223	1534	2460	2643	2711	2798	2885	2762
E top 10%	34	45	55	62	67	75	80	84	80
E top 10-50%	137	180	218	247	270	298	318	334	318
S top 10%	75	95	106	124	131	149	157	164	157
S top 10-50%	300	379	424	495	525	594	629	656	628
G top 10%	96	122	153	246	264	271	280	289	276
G top 10-50%	385	487	612	983	1057	1084	1119	1154	1105

Table 1 Number of firms included each year for each portfolio when calculating the cross-sectional equally weighted monthly returns. The number of firms included depends on how many firms reported ESG scores that year.

The portfolios created in previous studies that have used multi-factor models have created their portfolios in similar ways. Galema et al. (2008) uses the KLD ESG data of which a firm can score on the concern or the strength side for each ESG issue.

This research investigates six ESG issues and thus have created 12 different portfolios; firms that have scored on the concern side for one of the ESG issues will end up in that issue's concern portfolio and a firm that have scored on the strength side of the ESG issue will end up in that issue's strength portfolio. Each portfolio is equally weighted and since the ESG scores are updated each year the portfolios are also updated each year. This setup is equivalent to comparing top performers to poor performers for the main ESG issues. Similarly, Halbritter and Dorfleitner (2015) created two portfolios with one consisting of the top 20% ESG performers and one consisting of the bottom 20% performers. These portfolios were tested both when they were value-weighted and when they were equally weighted. To be able to compare these two portfolios they were going long the top performers portfolio and short the bottom performers portfolio. Gomez-Bezgares et al. (2016) created a portfolio from all firms reporting ESG on the FTSE 350 listening. Their portfolio ended up consisting of 65 firms, which will be the 65 largest companies reporting ESG of which are listed on the London Stock Exchange. This portfolio is then compared with the other firms listed on the same stock exchange to see if the ESG portfolio created any alpha.

Data

This thesis will include all listed firms in the US that are reporting ESG scores. Sustainalytics found in the Bloomberg terminal show all firms in the US reporting ESG scores. Sustainalytics displays the firm's total ESG score as well as the individual E, S and G score. There are a total of 70 different issues that can be evaluated and by that be included when calculating the scores. Sustainalytics adjust which issues that build up the score depending on the sector. Since this thesis includes all sectors this factor is one of the reasons why Sustainalytics is chosen as a data source. Sustainalytics whole dataset incorporates ESG issues from 42 different global sectors, and in 2016 Sustainalytics reported ESG scores for approximately 6500 firms worldwide. It should be mentioned that Bloomberg points out that the environmental score provided are taken from public sources, so the truthfulness of the score can vary. Yet, Bloomberg double-checks the scores with the specific firm before publishing it.

Even if this thesis uses ESG data from Sustainalytics the most commonly used ESG data is the Kinder, Lydenberg, and Domini Research & Analytics (KLD) data source, which have the most comprehensive data set since it includes the most number of companies in the US and have ESG data since 1990. A downside to the KLD data is that the issues included in the ESG score are not adjusted depending on the industry. Other sources used for ESG scores are ASSET4 from Thomson Reuters business and Oekom research AG. Halbritter and Dorfleitner (2015) compares the KLD, ASSET4 and Sustainalytics ESG ratings and find great differences between the rating agencies in the construction of the score. Yet, all data sources were used to examine if a high ESG score increase firm value and neither of them found any significant positive effect. Therefore, he argues that the differences between the effects of the data sources were not that different.

Independently of what source is used all of them will be exposed to the possibility of a bias sample of the population. This is because the firms that report ESG issues do so voluntarily and it is unlikely that firms report their ESG score if it is poor. Therefore, the average of all ESG scores that are reported will most likely be higher than the ESG scores of firms that do not report their ESG score.

The ESG data in Sustainalytics are updated annually, and more and more firms are included since more and more firms begin reporting ESG figures. Table 2 presents the change in number of firms reporting ESG score and its summary statistics. In 2004 there were only 20 firms that reported ESG scores in Sustainalytics and in 2015 the number has increased to 2 762 firms, which is out of the 13 420 firms included in the Bloomberg terminal today.

The mean ESG score has declined, which is most likely due to that more firms are pushed to report ESG score even if their score is not that great as discussed above. Since there are an increasing number of firms reporting ESG a current sample of the ESG score is of utmost importance, thus researches should update their data continuously to get the benefit of a larger sample.

I do not include data from 2004 to 2006 because there are too few firms reporting during this time period making the sample for these years too small. As seen there are fewer firms reporting ESG score in 2015 than in 2014. This is probably not due to reduced number of firms reporting ESG scores in 2015, but instead due to an administrative time lag before all ESG scores are collected and published in the terminal. The ESG scores from 2015 will still be included since, in comparison to

previous years, it seems like a high percentage of all firms reporting in 2015 is still included. If the reason behind why the firms that have not reported their ESG score for 2015 is because of e.g. negative events or poor performance, then the scores from 2015 can be biased. Thus, by not including these firms the average return for the firms in this year would then be higher, which would cause the portfolios alpha do be higher than it should be. But, it is more likely that this is due to other administrative issues and will therefore not bias this years average returns.

By looking at the skewness of the data it is evident that the data is mostly skewed to the right since the skewness is positive (a normal distribution have zero skewness). This means that most firms have lower scores and then there are some firms that have higher scores.

The kurtoses for the ESG and governance data are above three, which means that the data is heavy tailed and more spread out. The social data is nearly normally distributed since its kurtosis is close to three. The environmental data have a kurtosis close to zero. This means that the data is light tailed, which means that the range of the scores is narrower.

The skewness and kurtosis of the ESG score will affect what ESG scores that the firms have that are included in the top 10% and 50-10% portfolios. For example, when the data is right skewed then there will be firms that have a lot higher ESG scores than the majority of the other firms. If there is a large difference in portfolio returns between the highest ESG performers in the right skewed data compared to the highest ESG performers in the data that is normally distributed, then this can affect the five-factor model's result. If e.g. the returns for firms with very high ESG scores are a lot lower than firms with only relatively high ESG scores, then the results with the right skewed data show that higher ESG performers return less return than what it would have shown if the data was normally distributed. It will be the opposite effect when the data is heavy tailed. However, even if the results might be effected by the distribution of the ESG data, it will still pick up the general effect from how the returns for the different levels of ESG performers plays out. Skewed data and heavy tailed data is better than if nearly all firms had the same ESG score since then it would be very hard to separate out the effects of good and bad ESG performance.

Summary Statistics

Number of firms reporting	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
ESG	20	115	318	966	1223	1534	2460	2643	2711	2798	2885	2762
Environmental	13	79	170	342	449	545	617	674	746	795	836	796
Social	19	113	278	749	947	1061	1237	1312	1486	1572	1639	1570
Governance	20	115	317	963	1218	1530	2458	2642	2711	2797	2885	2762
Mean	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
ESG	21.5	23.5	21.2	17.5	17.6	17.5	15.9	16.2	16.8	17.1	17.1	16.4
Environmental	14.8	18.8	19.3	17.4	17.0	17.5	18.2	19.1	19.2	19.6	19.0	18.3
Social	16.8	17.0	16.0	12.3	12.9	13.8	14.2	15.4	16.2	17.0	17.4	16.4
Governance	52.8	54.0	53.0	51.0	51.1	51.0	50.5	50.5	50.6	50.7	50.8	50.5
SD	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
ESG	10.6	10.6	11.3	9.8	10.2	10.6	9.5	9.9	10.1	10.3	10.2	10.0
Environmental	14.2	11.6	13.7	14.8	15.8	16.6	16.9	17.3	17.3	17.2	17.4	16.9
Social	14.2	14.2	14.7	12.8	13.1	13.8	13.7	13.9	13.6	13.4	13.3	13.5
Governance	6.8	7.6	7.1	6.9	6.6	6.5	5.6	5.6	5.7	5.7	5.2	4.7
Median	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
ESG	16.9	21.1	16.3	14.0	14.0	13.6	12.3	12.0	12.8	12.8	12.8	12.0
Environmental	12.4	15.5	16.2	13.2	11.6	11.6	11.6	13.2	13.2	13.5	11.7	11.5
Social	14.0	14.0	8.8	8.8	8.8	8.8	8.8	8.8	12.5	14.0	14.0	13.3
Governance	51.8	53.6	51.8	51.8	51.8	51.8	48.2	48.2	48.2	48.2	48.2	48.2
Skewness	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
ESG	1.2	0.8	1.2	2.0	2.2	2.3	2.9	2.8	2.6	2.4	2.5	2.6
Environmental	1.4	0.7	0.7	0.8	1.0	1.0	1.0	1.0	1.0	0.9	1.0	1.0
Social	0.7	1.0	1.6	2.1	2.1	2.0	1.9	1.8	1.6	1.5	1.5	1.5
Governance	-1.3	-2.2	-2.0	-2.3	-1.9	-1.1	0.3	0.5	0.3	0.3	0.8	1.5
Kurtosis	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
ESG	0.4	0.0	0.8	3.8	4.7	5.3	8.6	8.1	6.8	5.7	6.0	6.4
Environmental	1.2	-0.3	-0.5	-0.3	0.2	0.3	0.2	0.2	0.2	-0.1	0.1	0.0
Social	-1.0	0.4	1.9	4.2	4.0	3.9	3.6	3.0	2.6	2.2	2.2	2.3
Governance	3.1	12.0	14.8	16.5	17.2	12.2	9.8	9.3	9.7	7.2	6.4	6.6

Table 2 ESG summary statistics. Based on yearly data from all US firms reporting ESG scores.

The factors' standard deviations are pretty high as presented in Table 3 and the range includes both positive and negative figures, this indicates that the factors are pretty volatile. The expected return of the asset will therefore also be volatile. None of these means are statistically significant since the mean plus or minus the standard deviation will make the mean vary between positive and negative values. Yet, the mean expected returns show that high volatility firms will outperform low volatility firms by 0.6% per month (7.2% annually), smaller firms will outperform larger firms by 0.1% per month (1.0% annually), low book-to-market firms will outperform high book-to-market firms by 0.3% per month (3.1% annually), robust firms will outperform weak firms by 0.3% per month (3.4% annually) and conservative firms

will outperform aggressive firms 0.02 (0.3% annually). Despite the insignificant signs of the means all of them have the correct expected signs except for the HML factor. This means that the high book-to-market firms did not have a significant value premium during the time period used in this thesis. The results from the HML factor should thus be interpreted in the opposite way than what is described in the *Method* section. The average one month US Treasury bill or the risk free rate has an average rate of 0.1% per month (0.7% annually) during this time period. Yet, the rate is constantly falling from 0.44% per month in January 2007 to 0.00% per month in December 2015.

Factor Summary Statistics						
	Mkt-RF	**SMB**	**HML**	**RMW**	**CMA**	**RF**
Mean	0.6%	0.1%	-0.3%	0.3%	0.02%	0.1%
SD	4.6%	2.4%	2.7%	1.6%	1.3%	0.1%
Range	-17.23 ➡ 11.35	-4.82 ➡ 6.63	-11.25➡ 7.85	-3.64 ➡ 4.95	-3.33 ➡ 3.23	0 ➡ 0.44

Table 3 Factor summary statistics (based on monthly data from January 2007 to December 2015)

Data tests

The average monthly returns that is used as the dependent variable in the regression is tested for heteroskedasticity by using the Breusch and Pagan test, autocorrelation by using the Durbin Watson (DW) test and normality by using the chi-squared test. The results will be more reliable if the data pass these three tests since the model assumes that these criteria are fulfilled. The data passed both the Breusch and Pagan test and the Chi-Squared test, which mean that the residuals are homoscedastic and normally distributed. The DW test shows inconclusive results, which means that there are no significant negative or positive autocorrelation. However, autocorrelation can still not be precluded. The results of these tests show that there is no apparent problem with the data used in the regressions performed in this thesis.

Results and Analysis

The regressions result from the three different ESG portfolios using the CAPM, the three-factor model and the five-factor model are shown in Table 4. All three models are able to explain the variation in returns of our portfolio to a high degree since the Adjusted R-Squares are all above 85%. The CAPM model has the lowest Adjusted R-square for two out of the three portfolios since it is missing the small minus large market capitalisation (SMB) and the high minus low book-to-market (HML) factors which are two statistically significant factors explaining the variation in returns as seen in both the three-factor and four-factor model. This creates a negative omitted variable bias in the CAPM model since the alpha is lower for all three portfolios compared to the other two models.

The R-squared is expected to be high in the three-factor and four-factor model because they are created from firms listed on different exchanges in the US and the portfolios created are consisting of between 966 and 2762 firms from this market. These firms have therefore affected the factors included in the model. However, this is not expected to affect the alpha. The alpha will only show if the firms that are chosen to be included in the portfolio are generating higher returns than all listed firms on the US market taking into account the effect of the five factors.

The robust minus weak profitability (RMW) factor is not significant in any of the regressions on the ESG portfolio. This means that the beta is not significantly different from zero and can be taken away from the model. The conservative minus aggressive (CMA) factor is not statistically significant in two out of the three regressions, and therefore this factor might be dropped out as well. If both these factors are dropped out, then we are left with the three-factor model. This can explain why the three-factor model and the five-factor model generate nearly identical results.

The alphas from the three-factor model will be used as the final result in this thesis since it has a slightly higher Adjusted R-square than the five-factor model. The alpha for the portfolio containing all the firms reporting ESG score have the greatest alpha of 0.65% (8.1% annually), which is statistically significant at the 1% level. The alpha for the portfolio containing the top 10% ESG performers has the smallest alpha of 0.22% (2.7% annually), which is statistically significant at the 5% level. The portfolio containing above average ESG scores, but excludes the top 10% performers,

have an alpha of 0.41% (5.0% annually), which is statistically significant at the 1% level.

The three ESG portfolios tested in the three-factor model have market betas (βMKT) of 1.13, 1.06 and 1.08. This means that the portfolios are more volatile than the market average. The SMB's beta (βSMB) are 0.54, 0.14 and 0.53 and if they are all positive, then it means that the portfolios are acting more like small stocks and is thus exposed to the higher risk of small market capitalization stocks. The HML's beta (βHML) are all positive: 0.16, 0.08 and 0.18. In regards to Fama and French (2014) it means that the portfolio is acting more like high book-to-market stocks, but since the HML factor in this thesis was on average negative this means that the portfolio is acting more like low book-to-market stocks i.e. is exposed to less value risk.

Monthly Excess Returns on ESG Portfolio

T=108, N= see Table 1	CAPM	Fama-French 3-factor model	Fama-French 5-factor model
All firms reporting ESG			
Adjusted R-Square	85.11%	88.79%	88.66%
α	0.59%	0.65%	0.63%
	(2.47)**	(3.12)***	(2.92)***
βMKT	1.25	1.13	1.13
	(24.75)***	(23.04)***	(20.70)***
βSMB		0.54%	0.54%
		(5.57)***	(5.46)***
βHML		0.16%	0.07%
		(1.95)*	(0.64)
βRMW			-0.01%
			(-0.07)
βCMA			0.06%
			(0.34)
Top 10% ESG performers			
Adjusted R-Square	97.09%	96.97%	96.96%
α	0.19%	0.22%	0.21%
	(2.00)**	(2.45)**	(2.28)**
βMKT	1.1	1.06	1.06
	(54.51)***	(50.31)***	(45.53)***
βSMB		0.14%	0.15%
		(3.39)***	(3.56)***
βHML		0.08%	0.08%
		(2.18)**	(1.85)*
βRMW			0.04%
			(0.61)
βCMA			-0.07%
			(-0.95)

Top 50-10% ESG performers			
Adjusted R-Square	90.91	95.28%	95.59%
α	0.34%	0.41%	0.45%
	(1.97)*	(3.27)***	(3.56)***
βMKT	1.21	1.08	1.06
	(32.73)***	(36.44)***	(33.32)***
βSMB		0.53%	0.53%
		(8.99)***	(9.18)***
βHML		0.18%	0.17%
		(3.67)***	(2.94)***
βRMW			-0.05%
			(-0.52)
βCMA			-0.23%
			(-2.17)**

*** significant at 1% level, ** significant at 5% level, *significant at 10% level

Table 4 Regression results. ESG portfolios monthly average returns regressed on the factors in the five-factor model.

A Z-test is performed to see if there are any statistically significant differences between the alphas for the three different portfolios generated by the five-factor model. The z-score is 1.79 for the difference between alpha for the portfolio consisting of all ESG firms compared to the alpha of the portfolio consisting of the top 10% ESG performers, so the test is significant at the 4% level (P (Z<1.79)=0.96). The z-score is 0.74 for the difference between alpha for the portfolio consisting of all ESG firms compared to the alpha of the portfolio consisting of top 50-10% ESG performers, which means that this test is insignificant (P (Z<0.74)=0.77). The z-score is 1.52 for the difference between alpha for the portfolio consisting of top 50-10% ESG performers compared to the alpha of the portfolio consisting of the top 10% ESG performers, so the test is significant at the 6% level (P (Z<1.52)=0.94).

This means that the alpha for the portfolio consisting of all ESG firms and the portfolio consisting of top 50-10% ESG performers is not significantly different from each other, but they both have an alpha significantly higher from the alpha of the portfolio consisting of the top 10% ESG performers. This shows that investing in firms that report ESG issues in general or investing in firms performing in the top 50-10% will generate approximately the same results, yet having a greater alpha than if investing in the portfolio consisting of the top 10% performers.

$$Z_1 = \frac{(\alpha_{all} - \alpha_{top10\%})}{\sqrt{(se\alpha_{all}^2 + se\alpha_{top10\%}^2)}} = \frac{(0.63-0.21)}{\sqrt{(0.22^2+0.09^2)}} = 1.79$$

$$Z_2 = \frac{(\alpha_{all} - \alpha_{top50-10\%})}{\sqrt{(se\alpha_{all}^2 + se\alpha_{top50-10\%}^2)}} = \frac{(0.63-0.45)}{\sqrt{(0.22^2+0.13^2)}} = 0.74$$

$$Z_3 = \frac{(\alpha_{top50-10\%} - \alpha_{top10\%})}{\sqrt{(se\alpha_{top50-10\%}^2 + se\alpha_{top10\%}^2)}} = \frac{(0.45-0.21)}{\sqrt{(0.13^2+0.09^2)}} = 1.52$$

The regressions result of the six different E, S and G portfolios are shown in Table 4. The five-factor model explains the variation in returns for all six portfolios very well because the Adjusted R-Square is between 92-97%. For the top 10% environmental and social performers' portfolios the only factor that is statistically significant at a 1% level is the market factor. This suggests that a CAPM model would perform equally well in explaining the returns for these two portfolios. On the other hand the market, SMB and HML factor are statistically significant at the 1% level of the portfolio consisting of top 10% governance performers and the portfolios consisting of the top 50-10% environmental, social and governance performers. This suggests the same actions as in the ESG portfolios above, thus both the RMW and the CMA factors can be dropped out. The five-factor model would then again become the three-factor model.

None of the top 10% E, S or G performer portfolios generate any alpha since none of them are statistically significant at the 1% level. However, all three portfolios consisting of top 50-10% environmental, social and governance performers generate alpha of 0.30% (3.7% annually), 0.46% (5.7% annually) and 0.41% (5.0% annually) respectively and are statistically significant at the 1% level.

Monthly Excess Returns on E, S & G Portfolios			
T=108, N= see Table 1	Fama-French 5-factor model		
	E	S	G
Top 10% ESG performers			
Adjusted R-Square	95.74%	95.48%	96.42%
α	-0.00%	0.15%	0.20%
	(0.00)	(1.41)	(1.93)*
βMKT	1.02	1.01	1.08
	(39.46)***	(38.06)***	(41.32)***
βSMB	0.02%	0.08%	0.16%
	(0.32)	(1.68)*	(3.41)***
βHML	0.04%	0.04%	0.17%
	(0.92)	(0.83)	(3.46)***
βRMW	0.03%	0.07%	0.08%
	(0.37)	(0.97)	(1.11)
βCMA	-0.01%	-0.08%	-0.16%
	(-0.08)	(-0.85)	(-1.85)*
Top 50-10% ESG performers			
Adjusted R-Square	96.96%	92.42%	95.95%
α	0.30%	0.46%	0.41%
	(2.72)***	(2.70)***	(3.42)***
βMKT	1.08	1.17	1.04
	(38.52)***	(26.86)***	(34.70)***
βSMB	0.3%	0.49%	0.52%
	(5.86)***	(6.15)***	(9.58)***
βHML	0.14%	0.09%	0.16%
	(2.68)***	(1.08)	(2.82)***
βRMW	0.07%	0.17%	-0.08%
	(0.87)	(1.34)	(-0.96)
βCMA	-0.14%	-0.18%	-0.20%
	(-1.45)	(-1.26)	(-1.98)*

*** significant at 1% level, ** significant at 5% level, *significant at 10% level

Table 5 Regression results of the E, S and G portfolios

The Z test is performed to see if there is any statistical difference between the alphas for the top 50-10% E, S or G portfolios. The z-score is 0.79 (P (Z<0.79)=0.79), 0.63 (P (Z<0.63)=0.74) and 0.28 (P (Z<0.28)=0.61), which means that the alphas are not statistically different from one another. Therefore, these portfolios create similar alphas, so investors should value the three areas the same and managers should put as much resources to all these three areas.

$$Z_4 = \frac{(\alpha_S - \alpha_E)}{\sqrt{(se\alpha_S^2 + se\alpha_E^2)}} = \frac{(0.46-0.30)}{\sqrt{(0.17^2+0.11^2)}} = 0.79$$

$$Z_5 = \frac{(\alpha_G - \alpha_E)}{\sqrt{(se\alpha_G^2 + se\alpha_E^2)}} = \frac{(0.41-0.30)}{\sqrt{(0.12^2+0.11^2)}} = 0.63$$

$$Z_6 = \frac{(\alpha_S - \alpha_G)}{\sqrt{(se\alpha_S^2 + se\alpha_G^2)}} = \frac{(0.46-0.41)}{\sqrt{(0.17^2+0.12^2)}} = 0.28$$

Discussion and Conclusions

The results of this thesis show that firms in the US that engage in ESG issues have increased firm value more than firms that do not engage in ESG issues. Therefore, in answer to the question if firms that engage in ESG issues still are able to maximize shareholder value, I will instead claim that firms that do not engage in ESG issues are not able to maximize shareholder value. The improved working conditions for employees, the investments in environmentally friendly equipment or the decreased economic and social inequalities will in total generate more revenues than what these actions cost to implement. This is true up to a certain limit. If firms engage too much in all or any specific environmental, social or governance area, this will have a diminishing positive effect on firm value or result in no increase in firm value at all. In comparison, Western Europe of which are the top performers in the ESG ranking have shown a negative relationship between ESG score and portfolio return (Auer and Schuhmacher, 2016).

These results suggest that there is a level of optimal engagement in ESG issues. It might be that the first ESG projects or investments might be the easy ones to implement or the most profitable ones, but to achieve an even higher level of engagement some investments are required that might not be as easy or profitable. The positive effect from ESG engagement is therefore diminishing. Or, a more practical example of how ESG engagement can be implemented in an effective and positive way is when a firm recruits people to sit on the board. Imagine they have a man and a woman that is equally qualified for the position, then the firm should choose the woman if there are a majority of men on the board to benefit from a more diverse group. However, if the woman was chosen to sit on the board only because of her gender when there were better male candidates, then the firm will not benefit from

this. Engagement in ESG issues should therefore not be forced, but instead used when a situation allows for it.

Another factor affecting stock price is demand. The alpha generated from the ESG portfolios in this thesis might not only be generated from the actual increased ESG efforts, but also because of the increased demand from institutional investors. Institutional investors are pushed to invest more and more in sustainable firms, which creates an increased demand for firms engaged in ESG issues. This demand will increase stock prices and by that look like the firm value has increased because of the ESG engagement but instead it is because of the increased demand. Independently of the reason behind the value increase, firms that do not engage in ESG issues will still have a disadvantage in this situation as well.

The increase in firm value of firms that engage in ESG issues might also be because of the lower costs of capital and increased access to private equity (Dhaliwal et al., 2011). The reason for this is the increased transparency that reporting ESG issues brings. Transparency is important for shareholders and capital providers to be able to analyse the firm more correctly and reduce uncertainties. Institutional investors are also pushed to invest in firms engaged in ESG issues, which makes it easier for these firms to attract private equity.

Alpha is generated when an investor invests in undervalued stocks. The positive alphas generated from the ESG portfolios examined in this thesis show that a firm engaging in ESG issues are on average undervalued. Engaging in ESG issues will generate additional revenue, but this is not expected. This is shown by examining previous performed event studies, which for instance, shows that investors react negatively to positive ESG news (Kruger, 2015). Thus, investors do not value firms that engage in ESG issues correctly. It is not until investors start valuing these efforts that stock prices will increase to the correct level. Halbritter and Dorfleitner (2015) examines this effect during different time periods and find that the alpha has declined over time. This signals that investors are including ESG issues more and more when analysing stocks. When these firms are priced correctly, then no alpha will be generated anymore. Yet, firms that do not engage in ESG issues might be left behind, and are not able to be as productive and cost efficient as their peers who do engage in ESG issues. This will in turn create disadvantages for these firms. This theory can be tested by continuing examining the alpha of an ESG portfolio and investors' expectations about the relationship between firm value and ESG score in the future.

My recommendation for firms is to engage in ESG issues, but the issues each firm should engage in will differ depending on the current situation of the firm. Engagement in ESG should not be done just for the sake of it, but it should be applied when it is suitable. Investors should also start to incorporate ESG aspects into their due diligence processes, since these issues are proven to affect the development of the firm.

This thesis can also contribute to the discussion of what factors that should be included in an asset-pricing model. Fama and French (2014) studied the volatility in returns for firms listed on US stock exchanges and found the five-factor model to outperform the three-factor model. This thesis included nearly 3000 firms listed on stock exchanges in the US, which is a large proportion of the firms that Fama and French (2014) included in their study. Therefore, it is expected that the five-factor model used in this study would also outperform the three-factor model. However, this is not observed. The included profitability (RMW) and investment (CMA) factors did not improve the model. Thus, they do not explain the variation in returns for the firms examined in this thesis and a three-factor model would have resulted in the same results. Thus, my thesis does not support Fama and French (2014) claim that the five-factor model outperforms the three-factor model.

The four-factor model was not used or tested in this thesis, but this model might perform better than both the three- and five-factor model. E.g. Galema et al. (2008) uses the four-factor model to examine the ESG engagement's effect on firm value. His market factor, SMB and HML factors are statistically significant at the 1% level and that the momentum factor is statistically significant at the 5% level. Since all four factors are statistically significant, this model might outperform both the three- and five-factor model. Therefore, the four-factor model might be the best asset-pricing model to use in future research examining the effect on firm value from ESG engagement in the US.

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Appendix

Data tests

The Breusch and Pagan test is performed by saving all the residuals from the five-factor model regression. I have used the regression when the ESG portfolio for all firms is included since all the data that is used in this thesis is included here. Square the residuals and use them as the dependent variable in a new regression with all the independent variables used in the first regression. The only factor of interest in the result is the F statistic, which generated an F-score of 1.15 with significance of 0.20. This means that the residuals cannot be explained by the independent variables, thus the test is not statistically significant, so we cannot reject null of homoscedastic error terms. Error terms are correctly specified.

The DW test is performed by again saving all the residuals from the five-factor model regression. I have again used the regression when the ESG portfolio for all firms is included since all the data that is used in this thesis is included here. Then take the difference between each residual and the one-month lagged residual and square them. Sum up all of these squared differences and divide it by the sum of the squared residuals. This will result in the DW score. The DW score is 1.59, which is in between the upper and lower limit and the test is then inconclusive. The upper and lower limit of the test is taken from the Durban Watson Significance Table by using the information of five regressors and 108 observations. An inconclusive results means that there are no statistically significant results showing that the error terms are negatively or positively autocorrelated. However, auto correlation can still not be precluded.

$$DW = \frac{\sum_{t=2}^{T}(e_t - e_{t-1})^2}{\sum_{t=1}^{T} e_t^2} = 1.59$$

$$d_L = 1.441$$

$$d_U = 1.647$$

The Chi-squared test resulted in a chi squared of 2.6 with a P-value of 0.45. This means that the null of normally distributed data cannot be rejected, hence the data is normally distributed.

Regressions

1% significance level
5% significance level
10% significance level

SUMMARY OUTPUT
All firms reporting ESG

Regression Statistics	
Multiple R	0.94
R Square	0.89
Adjusted R Square	0.89
Standard Error	2.13
Observations	108

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	5.00	3822.35	764.47	168.38	0.00
Residual	102.00	463.09	4.54		
Total	107.00	4285.44			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95,0%*	*Upper 95,0%*
Alpha	0.63	0.22	2.92	0.00	0.20	1.06	0.20	1.06
Mkt-RF	1.13	0.05	20.70	0.00	1.02	1.24	1.02	1.24
SMB	0.54	0.10	5.46	0.00	0.35	0.74	0.35	0.74
HML	0.07	0.10	0.64	0.52	-0.14	0.27	-0.14	0.27
RMW	-0.01	0.16	-0.07	0.95	-0.32	0.30	-0.32	0.30
CMA	0.06	0.18	0.34	0.73	-0.30	0.43	-0.30	0.43

Table 6 Regression results using the five-factor model and including all US firms reporting ESG scores

SUMMARY OUTPUT
All firms reporting ESG

Regression Statistics	
Multiple R	0.94
R Square	0.89
Adjusted R Square	0.89
Standard Error	2.12
Observations	108

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3.00	3818.32	1272.77	283.37	0.00
Residual	104.00	467.13	4.49		
Total	107.00	4285.44			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95,0%*	*Upper 95,0%*
Intercept	0.65	0.21	3.12	0.00	0.24	1.06	0.24	1.06
Mkt-RF	1.13	0.05	23.04	0.00	1.04	1.23	1.04	1.23
SMB	0.54	0.10	5.57	0.00	0.35	0.73	0.35	0.73
HML	0.16	0.08	1.95	0.05	0.00	0.32	0.00	0.32

Table 7 Regression results using the three-factor model and including all US firms reporting ESG scores

SUMMARY OUTPUT
All firms reporting ESG

Regression Statistics	
Multiple R	0.92
R Square	0.85
Adjusted R Square	0.85
Standard Error	2.44
Observations	108

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1.00	3653.37	3653.37	612.68	0.00
Residual	106.00	632.07	5.96		
Total	107.00	4285.44			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95,0%*	*Upper 95,0%*
Intercept	0.59	0.24	2.47	0.02	0.12	1.05	0.12	1.05
Mkt-RF	1.25	0.05	24.75	0.00	1.15	1.35	1.15	1.35

Table 8 Regression results using the CAPM model and including all US firms reporting ESG scores

SUMMARY OUTPUT
ESG top 10% performers

Regression Statistics	
Multiple R	0.99
R Square	0.97
Adjusted R Square	0.97
Standard Error	0.91
Observations	108.00

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	5.00	2816.84	563.37	684.35	0.00
Residual	102.00	83.97	0.82		
Total	107.00	2900.81			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95,0%*	*Upper 95,0%*
Alpha	0.21	0.09	2.28	0.02	0.03	0.39	0.03	0.39
Mkt-RF	1.06	0.02	45.53	0.00	1.01	1.10	1.01	1.10
SMB	0.15	0.04	3.56	0.00	0.07	0.23	0.07	0.23
HML	0.08	0.04	1.85	0.07	-0.01	0.17	-0.01	0.17
RMW	0.04	0.07	0.61	0.54	-0.09	0.17	-0.09	0.17
CMA	-0.07	0.08	-0.95	0.35	-0.23	0.08	-0.23	0.08

Table 9 Regression results using the five-factor model and only including the top 10% ESG performers in the US

SUMMARY OUTPUT
ESG top 10% performers

Regression Statistics	
Multiple R	0.99
R Square	0.97
Adjusted R Square	0.97
Standard Error	0.91
Observations	108

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3.00	2815.28	938.43	1141.06	0.00
Residual	104.00	85.53	0.82		
Total	107.00	2900.81			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95,0%*	*Upper 95,0%*
Intercept	0.22	0.09	2.45	0.02	0.04	0.39	0.04	0.39
Mkt-RF	1.06	0.02	50.31	0.00	1.02	1.10	1.02	1.10
SMB	0.14	0.04	3.39	0.00	0.06	0.22	0.06	0.22
HML	0.08	0.04	2.18	0.03	0.01	0.15	0.01	0.15

Table 10 Regression results using the three-factor model and only including the top 10% ESG performers in the US

SUMMARY OUTPUT
ESG top 10% performers

Regression Statistics	
Multiple R	0.98
R Square	0.97
Adjusted R Square	0.97
Standard Error	0.97
Observations	108

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1.00	2800.89	2800.89	2971.34	0.00
Residual	106.00	99.92	0.94		
Total	107.00	2900.81			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95,0%*	*Upper 95,0%*
Intercept	0.19	0.09	2.00	0.05	0.00	0.37	0.00	0.37
Mkt-RF	1.10	0.02	54.51	0.00	1.06	1.14	1.06	1.14

Table 11 Regression results using the CAPM model and only including the top 10% ESG performers in the US

SUMMARY OUTPUT
ESG top 50-10% performers

Regression Statistics	
Multiple R	0.98
R Square	0.96
Adjusted R Square	0.96
Standard Error	1.24
Observations	108.00

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	5.00	3557.92	711.58	464.77	0.00
Residual	102.00	156.17	1.53		
Total	107.00	3714.08			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95,0%*	*Upper 95,0%*
Alpha	0.45	0.13	3.56	0.00	0.20	0.70	0.20	0.70
Mkt-RF	1.06	0.03	33.32	0.00	0.99	1.12	0.99	1.12
SMB	0.53	0.06	9.18	0.00	0.42	0.64	0.42	0.64
HML	0.17	0.06	2.94	0.00	0.06	0.29	0.06	0.29
RMW	-0.05	0.09	-0.52	0.60	-0.23	0.13	-0.23	0.13
CMA	-0.23	0.11	-2.17	0.03	-0.45	-0.02	-0.45	-0.02

Table 12 Regression results using the five-factor model and only including the top 50-10% ESG performers in the US

SUMMARY OUTPUT

ESG top 50-10% performers

Regression Statistics	
Multiple R	0.98
R Square	0.95
Adjusted R Square	0.95
Standard Error	1.28
Observations	108

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3.00	3543.55	1181.18	720.34	0.00
Residual	104.00	170.54	1.64		
Total	107.00	3714.08			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95,0%*	*Upper 95,0%*
Intercept	0.41	0.13	3.27	0.00	0.16	0.66	0.16	0.66
Mkt-RF	1.08	0.03	36.44	0.00	1.02	1.14	1.02	1.14
SMB	0.53	0.06	8.99	0.00	0.41	0.64	0.41	0.64
HML	0.18	0.05	3.67	0.00	0.08	0.28	0.08	0.28

Table 13 Regression results using the three-factor model and only including the top 50-10% ESG performers in the US

SUMMARY OUTPUT

ESG top 50-10% performers

Regression Statistics	
Multiple R	0.95
R Square	0.91
Adjusted R Square	0.91
Standard Error	1.78
Observations	108

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1.00	3379.67	3379.67	1071.27	0.00
Residual	106.00	334.41	3.15		
Total	107.00	3714.08			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95,0%*	*Upper 95,0%*
Intercept	0.34	0.17	1.97	0.05	0.00	0.68	0.00	0.68
Mkt-RF	1.21	0.04	32.73	0.00	1.13	1.28	1.13	1.28

Table 14 Regression results using the CAPM model and only including the top 50-10% ESG performers in the US

SUMMARY OUTPUT
E top 10% performers

Regression Statistics	
Multiple R	0.98
R Square	0.96
Adjusted R Square	0.96
Standard Error	1.01
Observations	108.00

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	5.00	2438.33	487.67	482.13	0.00
Residual	102.00	103.17	1.01		
Total	107.00	2541.50			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95,0%*	*Upper 95,0%*
Alpha	0.00	0.10	0.00	1.00	-0.20	0.20	-0.20	0.20
Mkt-RF	1.02	0.03	39.46	0.00	0.97	1.07	0.97	1.07
SMB	0.02	0.05	0.32	0.75	-0.08	0.11	-0.08	0.11
HML	0.04	0.05	0.92	0.36	-0.05	0.14	-0.05	0.14
RMW	0.03	0.07	0.37	0.71	-0.12	0.17	-0.12	0.17
CMA	-0.01	0.09	-0.08	0.94	-0.18	0.17	-0.18	0.17

Table 15 Regression results using the five-factor model and only including the top 10% Environmental performers in the US

SUMMARY OUTPUT
E top 50-10% performers

Regression Statistics	
Multiple R	0.98
R Square	0.96
Adjusted R Square	0.96
Standard Error	1.09
Observations	108.00

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	5.00	3162.73	632.55	528.59	0.00
Residual	102.00	122.06	1.20		
Total	107.00	3284.79			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95,0%*	*Upper 95,0%*
Alpha	0.30	0.11	2.72	0.01	0.08	0.52	0.08	0.52
Mkt-RF	1.08	0.03	38.52	0.00	1.02	1.14	1.02	1.14
SMB	0.30	0.05	5.86	0.00	0.20	0.40	0.20	0.40
HML	0.14	0.05	2.68	0.01	0.04	0.24	0.04	0.24
RMW	0.07	0.08	0.87	0.38	-0.09	0.23	-0.09	0.23
CMA	-0.14	0.09	-1.45	0.15	-0.33	0.05	-0.33	0.05

Table 16 Regression results using the five-factor model and only including the top 50-10% Environmental performers in the US

SUMMARY OUTPUT
S top 10% performers

Regression Statistics	
Multiple R	0.98
R Square	0.96
Adjusted R Square	0.95
Standard Error	1.04
Observations	108.00

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	5.00	2452.11	490.42	452.91	0.00
Residual	102.00	110.45	1.08		
Total	107.00	2562.56			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95,0%*	*Upper 95,0%*
Alpha	0.15	0.11	1.41	0.16	-0.06	0.36	-0.06	0.36
Mkt-RF	1.01	0.03	38.06	0.00	0.96	1.07	0.96	1.07
SMB	0.08	0.05	1.68	0.10	-0.01	0.18	-0.01	0.18
HML	0.04	0.05	0.83	0.41	-0.06	0.14	-0.06	0.14
RMW	0.07	0.08	0.97	0.34	-0.08	0.23	-0.08	0.23
CMA	-0.08	0.09	-0.85	0.40	-0.26	0.10	-0.26	0.10

Table 17 Regression results using the five-factor model and only including the top 10% Social performers in the US

SUMMARY OUTPUT
S top 50-10% performers

Regression Statistics	
Multiple R	0.96
R Square	0.93
Adjusted R Square	0.92
Standard Error	1.69
Observations	108.00

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	5.00	3754.57	750.91	261.92	0.00
Residual	102.00	292.43	2.87		
Total	107.00	4047.00			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95,0%*	*Upper 95,0%*
Alpha	0.46	0.17	2.70	0.01	0.12	0.81	0.12	0.81
Mkt-RF	1.17	0.04	26.86	0.00	1.08	1.25	1.08	1.25
SMB	0.49	0.08	6.15	0.00	0.33	0.64	0.33	0.64
HML	0.09	0.08	1.08	0.28	-0.07	0.25	-0.07	0.25
RMW	0.17	0.12	1.34	0.18	-0.08	0.41	-0.08	0.41
CMA	-0.18	0.15	-1.26	0.21	-0.48	0.11	-0.48	0.11

Table 18 Regression results using the five-factor model and only including the top 50-10% Social performers in the US

SUMMARY OUTPUT
G top 10% performersSUMMARY OUTPUT

Regression Statistics	
Multiple R	0.98
R Square	0.97
Adjusted R Square	0.96
Standard Error	1.02
Observations	108.00

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	5.00	2987.54	597.51	578.16	0.00
Residual	102.00	105.41	1.03		
Total	107.00	3092.95			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95,0%*	*Upper 95,0%*
Alpha	0.20	0.10	1.93	0.06	-0.01	0.40	-0.01	0.40
Mkt-RF	1.08	0.03	41.32	0.00	1.02	1.13	1.02	1.13
SMB	0.16	0.05	3.41	0.00	0.07	0.26	0.07	0.26
HML	0.17	0.05	3.46	0.00	0.07	0.26	0.07	0.26
RMW	0.08	0.07	1.11	0.27	-0.07	0.23	-0.07	0.23
CMA	-0.16	0.09	-1.85	0.07	-0.34	0.01	-0.34	0.01

Table 19 Regression results using the five-factor model and only including the top 10% Governance performers in the US

SUMMARY OUTPUT
G top 50-10% performers

Regression Statistics	
Multiple R	0.98
R Square	0.96
Adjusted R Square	0.96
Standard Error	1.17
Observations	108.00

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	5.00	3451.40	690.28	507.44	0.00
Residual	102.00	138.75	1.36		
Total	107.00	3590.15			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95,0%*	*Upper 95,0%*
Alpha	0.41	0.12	3.42	0.00	0.17	0.64	0.17	0.64
Mkt-RF	1.04	0.03	34.70	0.00	0.98	1.10	0.98	1.10
SMB	0.52	0.05	9.58	0.00	0.41	0.63	0.41	0.63
HML	0.16	0.06	2.82	0.01	0.05	0.27	0.05	0.27
RMW	-0.08	0.09	-0.96	0.34	-0.25	0.09	-0.25	0.09
CMA	-0.20	0.10	-1.98	0.05	-0.40	0.00	-0.40	0.00

Table 20 Regression results using the five-factor model and only including the top 50-10% Governance performers in the US