Natalia Håberget og Susanne Pernille Jordheim

Active versus passive investing in sustainable and conventional funds

A comparison of U.S. sustainable and conventional equity funds in terms of active and passive management

Master's thesis spring 2021
Oslo Business School
Oslo Metropolitan University
MSc in economics and business administration

Abstract

This thesis examines whether it is possible to create an excess return in equity funds by following an active management strategy rather than a passive strategy. In addition, we compare sustainable and conventional funds in relation to both management styles. To study whether they create an excess return in relation to the market, we use the CAPM model and multi-factor models that control for various risk factors. To expand our understanding of the funds' performance and behaviour, we analyse a sub-sample period that excludes the recession period of 2020.

First, the regression results conclude that the majority of the funds underperform in relation to the market. The significant alpha values are exclusively negative. The passive funds perform better than their active counterparties, and the sustainable funds do better than the conventional funds. Despite these results, the differences are not statistically significant, and we can therefore not come to a clear conclusion. Second, when examining the sub-sample period, we find that the funds still underperform in relation to the market, but there is a positive change in the alpha values for all the funds. The findings imply that sustainable funds tend to outperform their conventional fund peers during the crisis period. Hence conventional funds are more sensitive and more exposed to market fluctuations during crises.

Our findings indicate that only a few American ETFs are skilled enough to generate abnormal returns compared to the market. However, the majority generate negative alpha values during both the entire time and sub-sample periods, suggesting that American markets are somewhat efficient.

Preface

This thesis is written as part of our master's degree in economics and administration, with a specialization in corporate finance, at Oslo Metropolitan University (OsloMet).

The thesis intends to examine the relationship between both sustainable and conventional investment opportunities and their financial performance. We wanted to write about this topic due to a general interest in financial markets and asset management. In several topics, we have been introduced to efficient markets and pricing models that can be used to investigate this. In addition, there are constant debates and disagreements about the possibility of creating excess returns with active management. Therefore, we wanted to use the knowledge we have previously acquired and investigate this issue ourselves.

The process has been time-consuming and challenging but also exciting and educational. Over time, we have gained valuable insight into the US fund market and learned how to apply economic theory in practice. We would like to express our gratitude to our supervisor, Danielle Zhang, which has contributed to good discussions and helpful feedback.

Contents

List of Figures

List of Tables

1. Introduction

Whether socially responsible investing enhances or reduces mutual fund performance is an important, long-standing question in the mutual fund literature. The intensity of this debate has also increased in line with the attention of sustainable funds in recent years. According to the Global Sustainable Investment Alliance (GSIA, 2018), the US-domiciled assets under management using sustainable strategies increased by 38%, from $8.7 trillion in 2016 to $12.0 trillion in 2018. This represented more than 26% of total assets under management. Despite the increasing popularity within these funds, it is highly debated whether these funds are able to compete with their conventional counterparties when it comes to risk-adjusted returns. However, several studies observe that sustainable funds outperform conventional funds during periods of downturn. In addition to this, there has been an increase in passively managed funds in recent years. The American market has long been dominated by active funds, but today, passively managed funds make up as much as 40% of the fund market, according to Norcap (2021).

The objective of this thesis is to compare risk-adjusted returns of sustainable funds with their conventional counterparties in the US, as well as examining if equity funds manage to justify active management by creating a higher risk-adjusted return compared to passive funds. We distinguish between two periods; crisis and non-crisis. In summary, we end up with three research questions:

1. *"Do American equity funds manage to justify active management to justify active management by creating a higher risk-adjusted return compared to passive funds?"*

2. *"Among actively and passively managed funds in the US, do sustainable funds outperform their conventional counterparties?"*

3. *"Do American sustainable funds outperform their conventional peers during a global market crisis?"*

We expect to find evidence that actively managed funds outperform passive funds. Furthermore, we expect to find no significant difference in the performance between the sustainable and conventional funds. In order to test these hypotheses, we apply both the CAPM

and multi-factor models. Additionally, we expect the sustainable funds to outperform the conventional funds during the crisis period. To investigate this, we apply the same factor models for a sub-sample period excluding 2020.

First, our results show that there are no significant differences between the financial performance of sustainable and conventional funds. Moreover, we find that both underperform in relation to the market during the whole time period. Second, we also find no evidence that there is a significant difference between actively and passively managed funds within the two categories. Third, the results from the sub-sample analysis imply that sustainable funds perform better during the global market crisis than conventional funds.

Earlier literature has reported mixed evidence as to the existence of a significant difference in performance between sustainable and conventional funds in the American market. For instance, Bauer et al. (2007) find that sustainable funds significantly underperform conventional funds, while Gil-Bazo et al. (2010) report the opposite. However, most of the studies do not find evidence that there is a significant difference between the two. Our first contribution to the literature is that we confirm that there is no significant difference between sustainable and conventional funds between 2015-2020. We also add to the literature by examining the effects of the crisis period. Our results are in line with the research of Omura, Roca, and Nakai (2020), which concluded that sustainable funds outperform their conventional peers during the COVID-19 crisis period. Our study differs from existing literature when studying the difference between actively and passively managed funds. Recent studies (e.g., Fama-French (2008)) suggest that actively managed funds perform better than passive ones and therefore justify the higher cost they charge. However, our findings do not find a significant difference between the two.

The remainder of this thesis is structured as follows. Section 2 gives an overview of earlier literature that covers academic papers relevant to the research questions and shows the development of the hypotheses. Section 3 introduces the methodology used in the paper. Section 4 covers the data and the construction process for the final data sample. In Section 5, we present and discuss the results, and in Section 6, we come with a conclusion of the thesis.

2. Literature review and hypothesis

2.1 Literature review

The following section reviews previous research on the performance of active versus passive investing, in addition to the performance of sustainable funds compared to conventional funds. We examine papers utilizing factor models, as well as research with different matching approaches. In this section, we include a range of studies that we believe are relevant to our research questions. The literature presented proves that it is difficult to reach a solid conclusion. One must take into account which funds have been analysed, which markets the funds are invested in, and which asset pricing model is the basis for the excess return.

2.1.1 Performance of actively managed funds compared to passively managed funds

The motivation of this thesis is the discussion behind the choice between active or passive management. Should you invest in a fund that is actively managed, or should you consider an index fund? There are three factors, in particular, that should be considered when choosing between passive and active management: What do you pay for the management of the fund, what return can you expect compared to the return on the benchmark index, and how much risk are you willing to take?

Passive management aims to "replicate the market." The manager seeks the least possible deviation from the benchmark in the most cost-effective way. Passive management does not involve any human judgment or assessments of which individual shares will create good or bad returns. The amount to be invested in each stock is determined by a computer programmed to allocate funds according to the composition of a particular index (Södeberg & Partners, 2021). This implies that the strategy will involve fewer transactions than for an active strategy, making it a cheaper alternative. According to the theory, a passive equity fund will achieve exactly the same return as the equity index, minus any costs in the fund. From an article in Norcap (2021), they found that index management has increased in popularity over the last ten years. In 2011, passive funds accounted for 14% of the global fund market, while today, they account for 31%. In the US, passive funds make up as much as 40% of the US fund market.

On the other hand, the objective of active management is to "beat the market" by using their own analyses and assessments as a basis for choosing investments. Instead of a computer with

a defined algorithm making decisions about buying and selling, human judgments decide which stocks to buy and sell. They manage the market developments closely and work to ensure that the fund performs better than the general market development and their respective benchmark index. Actively managed funds require the manager to invest in information and analysis, which makes management more expensive.

The theory of efficient markets is central to the assessment of whether active management is profitable. How efficient a market is, i.e., how well the prices in the market represent the fair value of the assets, determines what opportunities there are for achieving excess returns through active management. The extent to which a fund manager believes in the hypothesis of efficient markets is decisive for which management strategy they will choose. A manager who actively selects shares in an attempt to beat the market must have faith in a weak-form efficiency and that the manager can acquire information that is not priced into the share. The discussion and empirical data on market efficiency are extensive but not conclusive. However, what seems clear is that the market has become more efficient, especially after the internet became available. This leads to a faster and better flow of information. The EMH has never been accepted on Wall Street. It implies that a great deal of the activity of these portfolio managers – the search of mispriced securities – is at best-wasted effort, and therefore also harmful to clients that pay for active management. This explains why the debate is still a hot topic.

Whether actively managed funds produce returns that outperform their benchmark index is widely discussed in the literature. Kendall (1953) was one of the first to examine the stock market prices and found that there was no predictable pattern in stock prices. Jensen (1986) was early to investigate whether it was possible to create an excess return through an active investment strategy. This is based on the risk-adjusted performance measurement Jensen´s alpha, and he did not find a positive correlation between active management and excess returns. None of the funds achieved positive alpha´s. Later, Carhart (1997) extended this model to include additional risk factors like size, value, and momentum. He came to the same conclusion as Jensen.

In 2008, Fama-French extended the model further to additionally include a factor for investment and profitability. They look at fund data from 1962 to 2006 and concludes that active funds manage to create an excess return compared to the market before deducting fees. When they include brokerage, however, they do not get a positive alpha.

A more recent study from Chen & Scholtens (2018) focuses on active and passive investing in socially responsible investment funds in the period of 2004 to 2015. They found that both an active and a passive strategy underperformed the market and that those for the passive fund portfolios are more negative than those for the active fund portfolios in four out of five cases. However, the difference between the alphas in the various SRI fund types is statistically indistinguishable from zero, except for environmental funds. The active environmental fund's portfolio significantly outperforms its passive counterpart.

As we mentioned earlier, the theory of efficient markets is highly debated and criticized by several academics and professional portfolio managers. Warren Buffett (1984) argued against EMH, saying that markets are not always efficient. On the other hand, Malkiel (2003), supported the EMH by proving that the majority of professional portfolio managers have not managed to outperform the index. He also found that there is a small correlation between winners in one year and the winners in the next year.

2.1.2 Performance of sustainable funds

Societal development has led to more investors and organizations being concerned about making choices that do not affect society in a negative direction. Therefore, there has been an emerging trend for managers to create funds that take these perspectives into account, in addition to the financial considerations. For example, it may be important for investors to know that their investments also take into account social factors, the environment, sustainability, and other elements that affect society as a whole.

Based on this, there are a diversity of categories within mutual funds today that intend to make these decisions easier. These include green funds, socially responsible investments (SRI), and environmental, social, and governance-based investments (ESG). The latter is the category we will look at in more detail in this thesis. Nevertheless, these categories overlap and therefore have many resemblances. Further in the thesis, we will use the term sustainable and ESG funds alternately.

ESG funds are growing in popularity among investors who want to make a contribution to cutting global warming and adding to human development without compromising on financial returns (Robeco, 2020). The funds focus on the environmental, social, and governance aspects in the firms that they invest in. ESG funds should contain only securities with a high

sustainability score, which can result in higher screening costs for the managers. The environmental criteria consider how the company performs within the conservation and protection of the natural environment. These criteria may look at a company´s energy use, waste, pollution, and treatment of animals. It can also be used to look at the firm's ability to manage any environmental risk they may face in the future. The social criteria take into account the relationships with employees, suppliers, clients and communities. Within these criteria, they will look at labor standards, production quality and safety, and equal employment opportunities, among other things. The last criteria are governance. This focuses on the standards of the company leadership, risk controls, and shareholder rights (Vanguard, 2020).

In addition to investigating whether active funds outperform index funds, we also wanted to examine the financial performance of sustainable funds. Naturally, the construction of a sustainable portfolio leads to the existence of various constraints, like screening costs and a limited asset universe. Because of this, it is interesting to examine if these limitations affect the risk-adjusted return for sustainable funds compared to conventional funds. A lot of research has been done in the field of SRI and ESG funds. As they have some overlap, the literature within SRI may be relevant to shed light on the same issues for ESG investments.

Early studies of SRI or ESG funds suggest that there is no statistically significant difference in performance between sustainable funds and conventional funds. A study of the US market in the period 1981 to 1990 found no significant differences in Jensen's alpha for an SRI portfolio compared to a conventional portfolio (Hamilton, Jo & Statman, 1993). Similar results can be found in a study done by Renneboog, Horst, and Zhang (2008) in the period 1991-2003. They also found that both conventional and socially sustainable funds generally underperformed their domestic benchmark. Other papers that also support this conclusion are Statman (2000) and Schröder (2004).

Even though most studies find no evidence of SRI funds performing differently than conventional funds, some research still claims otherwise. A paper by Chang, Nelson & Witte (2012) looks at 131 green US funds and around 12,000 conventional funds. The results show signs that green funds are generally underperforming their conventional counterparty. The same conclusion is reported by Bauer, Koedijk & Otten (2004). In contrast to this discovery, Lean, Ang & Smyth (2014) and Gil-Bazo, Ruiz-Verdú & Santos (2010) reports the opposite finding.

2.1.3 Performance of sustainable funds compared to conventional funds during a market crisis

Reviewing the previous literature on a fund's financial performance during a market downturn shows a clear tendency that sustainable funds outperform their counterparts. In a paper by Nofsinger & Varma (2014), they concluded that the SRI funds performed slightly better than the conventional funds in their sample of 240 US funds. This covers the period of the financial crisis in 2008.

These results are later supported by Omura, Roca & Nakai (2020) that conducted research looking at fund performance before and during the recession. They concluded that SRI investments outperform conventional investments during the downturn. The analyses confirmed that the outperformance of SRI indices increased during the pandemic period, both globally and across regions. ESG funds, however, did not outperform benchmarks.

Section 2.1 summarizes the foundation of our research. Through this paper we aim to contribute to further expand the understanding of sustainable investing. Our research will also contribute to the understanding of ESG fund performance during a crisis and non-crisis periods compared to conventional funds. The available literature addresses previous time periods, so our goal is also to see if these results remain unchanged.

2.2 Hypothesis development

This section presents the hypotheses we explore in the thesis. The first two are related to the entire sample period, while the last one focuses on the sub-sample period that excludes 2020. All the hypotheses are derived from the literature discussed in section 2.1.

Hypothesis 1: Actively managed funds perform better than passively managed funds during the entire time period

As discussed in section 2.1.1, early research from Jensen (1986) and Carhart (1997) suggest that there is no significant difference between the performance between actively and passively managed funds and therefore supports the theory of efficient markets. However, more recent literature by Fama-French (2008) and Chen et al. (2018) finds evidence that actively managed funds achieve a higher risk-adjusted return than passive funds. As we consider the period from October 2015 - December 2020, we expect similar results as the more recent papers.

Hypothesis 2: There is no significant difference in the financial performance between sustainable and conventional funds

In section 2.1.2, we discussed the mixed evidence of a significant difference between sustainable and conventional funds. On the one hand, Cheng et al. (2012) and Bauer et al. (2004) find evidence that the sustainable funds significantly underperform relative to their conventional counterparties. On the other hand, we have Lean et al. (2014) and Gil-Bazo et al. (2010), which report the opposite conclusion. However, most studies on U.S. mutual funds find no statistical difference in the performance between sustainable and conventional funds (e.g., Hamilton et al. (1993), Renneboog et al. (2008), Statman (2000) and Schröder (2004)). Therefore, we have assumed that we will come to the conclusion that there is no difference between the two.

Hypothesis 3: Sustainable funds outperform their conventional peers during a market crisis

From section 2.1.3, we found that previous research (e.g., Nofsinger et al. (2014)) was unequivocal in the conclusion that sustainable funds outperform conventional funds during crises like the financial crisis in 2008 and the COVID-19 pandemic in 2020. Therefore, we predict the sustainable funds in our sample to be less sensitive for the downturn of 2020.

In summary, our results may be of interest to those who wish to examine the relationship between corporate social and financial performance. In addition, they show how active and passive management relate to sustainability. They could be useful for those who want to make sustainable investment choices, that also want to see if this choice affects the profitability in relation to investing in a conventional fund.

3. Methodology

3.1 Calculation of return

Historical returns are often associated with the past performance of a security or index, such as for a fund or the S&P 500 index. Analysing this data can provide insight into how the security has reacted to a variety of different variables (Kenton, 2020). Historical return is calculated as a change in the market value of the fund from a given time to another. The two most used methods for calculating return are arithmetic and geometric return.

Arithmetic return for a given period is defines as:

$$r^A = \frac{v_t}{v_{t-1}} - 1 \quad (1)$$

Geometric return for a given period is defined as:

$$r^G = \ln(\frac{v_t}{v_{t-1}}) \quad (2)$$

Where:

r^i	Return for the period
v_t	Net Asset Value (NAV)

For normally distributed populations and samples, the arithmetic mean is identical to median and mode. It is not a robust statistical mean, which means that it may be strongly affected by extreme values. If we have a sample that has a skewed distribution, this might result in an incorrect picture of the observations. The geometric mean will take into account the compounding that happens from period to period. Because of this, investors usually consider the geometric mean a more accurate measure of returns (Gallant, 2020). The geometric return will also assume a normally distributed shape. We will later argue for which of the methods we chose in our calculations.

3.2 Calculation of risk

Risk is defined as the chance that an outcome or investment´s actual gains will differ from an expected outcome or return. Risk is usually assessed by observing historical behaviours and

outcomes (Chen, 2020). In the context of financial theory, the risk is often referred to as volatility or fluctuations. It tells us something about the uncertainty linked to a specific security.

A fundamental idea in finance is that the relationship between risk and return is positive. If an investor is willing to take greater risk, there is also expected a higher return. On the other hand, there is a greater risk of losing some or all of the investment. Therefore, each investor owns their risk profile that determines their willingness to withstand risk. There are also possible to reduce risk by using strategies such as diversification and hedging.

In finance, the standard deviation is a common method to calculate risk. It measures the dispersion of a dataset relative to its mean and is calculated as the square root of the variance (Hargrave, 2020). If the asset has a high standard deviation, it means that it is exposed to greater risk. For index funds, we will expect lower volatility than for actively managed funds.

The formula for the standard deviation is defined as:

$$Standard\ deviation = \sqrt{\frac{\Sigma_{i=1}^{n}(x_i - \bar{x})^2}{n-1}} \quad (3)$$

Where:

x_i	Value of the i^{th} point of the dataset
$\bar{x}$	Value of the mean of the dataset
n	The number of observations

3.3 Factor models

Through this section, we will explain a widely used method to study whether funds can create a higher risk-adjusted return compared to passive funds. To test whether there is a significant excess return, a regression analysis of the data sample is necessary. To implement this, we have used Stata.

A factor model is used to examine whether the return can be explained by different factors in the market. The different models distinguish between systematic and unsystematic risk, i.e.,

market-specific and company-specific risk, respectively. The advantage of introducing models that differentiate between these conditions is that we get a better insight into which factors explain the individual fund's return. Evaluating whether a fund over-or underperforms is determined by the respective fund's alpha values and statistically significant. The first model is the traditional Capital Asset Pricing Model (CAPM), which looks at the alpha and beta values of the funds. Furthermore, we use Fama-French's three-factor model to examine whether the different fund portfolios deliver significant abnormal returns (alpha) after adjusting for SMB and HML. Then we use the Carhart four-factor model which is an extension of the three-factor model by including the momentum factor. Finally, we implement the Fama-French five-factor model. We begin by explaining the CAPM model.

3.3.1 The capital asset pricing model (CAPM)

In 1964, CAPM was introduced by William Sharpe, John Lintner, and Jan Mossin. The model is a continuation of Markowitz's modern portfolio theory and provides a theoretical explanation of the relationship between return and risk. The essence of CAPM is to show how risky assets are priced in the market, and in a simple way be able to predict returns on risky assets.

The CAPM is mathematically expressed as:

$$r_i - r_f = \beta_i(r_m - r_f) \tag{4}$$

Where:

r_i	The return of fund "i"
r_f	The risk-free rate of return
r_m	The return of the market
$r_m - r_f$	The market risk premium
β_i	The market beta for fund "i"

We can see from the formula that the expected return will only be based on the fund´s market beta, risk-free interest rates and the market's excess return. The model assumes that the security

is part of a larger diversified portfolio, as it ignores unsystematic risk. As we see from the formula, an investor's expected return will largely be determined by the portfolio's exposure to the market risk premium. A beta value equal to 1 fully corresponds to the market portfolio. A higher beta value will give an expected excess return beyond the market, while a lower beta value will give a negative expected excess return. This model examines the relationship between the return on the portfolios and the benchmark index.

Single Index Model

The practical approach to the CAPM is often called the "Single Index Model", which was developed by William Sharpe in 1963. The model is based on the fact that the portfolio's excess return can be explained by abnormal returns, beta to the portfolio and coincidences. The single index model includes an additional parameter called Jensen's alpha, which captures abnormal excess returns beyond what is theoretically expected according to CAPM.
The Single Index Model is expressed as:

$$r_i - r_f = \alpha_i + \beta_i(r_m - r_f) + \varepsilon_i \quad (5)$$

Where:

α_i	Excess return relative to the market index
ε_i	Error term of the model

A significant positive alpha indicates that the return has exceeded the expected return, based on the specified beta value, while a significant negative alpha indicates that the return has been lower than expected. Jensen's alpha is thus a measure of whether the fund has beaten the benchmark index.

3.3.2 Fama-French Three-Factor Model

Since the introduction of the CAPM model in 1964, it has been the basis for a large number of financial studies. Already in 1980, academics began to question the model and argue that the CAPM model alone fails to explain all the cross-sectional returns. Several factors have been proposed as complements and alternatives to the original model, but in 1993 Fama-French

introduced their three-factor model to explain the cross-sectional returns better. In their studies they found that there are two more factors that have significant explanatory power for the price development of shares, apart from market risk. They reported that companies with low market value tended to outperform companies with high market value, and companies with a high book value in relation to market value (value shares) tended to outcompete companies with a low book value in relation to market value (growth shares). Based on these findings, they expanded the CAPM model by two factors: A size and a value factor.

The Fama-French Three-Factor Model is expressed as:

$$r_i - r_f = \beta_i(r_m - r_f) + \beta_{i,SMB}SMB + \beta_{i,HML}HML + \varepsilon_i \quad (6)$$

Where:

$\beta_{i,SMB}$	The sensitivity of r_i to a change in SMB
SMB	"Small Minus Big" – Size factor
$\beta_{i,HML}$	The sensitivity of r_i to a change in HML
HML	"High Minus Low" – Value factor

SMB stands for "small market capitalization minus big" and takes into account that small companies have abnormally higher returns than expected according to the classic CAPM model. The second factor is referred to as the value factor (HML), which is an abbreviation for "high book-to-market ratio minus low." This factor implies that value companies perform better than growth companies. Ever since the introduction, it has commonly been used as a benchmark model.

3.3.3 Carhart's Four-Factor model

In 1997, Carhart expanded Fama-French's three-factor to a Four-Factor Model by including the momentum factor (MOM). The momentum factor represents the tendency of stock prices to continue rising if it is increasing in value and continuing declining if it is falling. This factor was added because a study made by Jagadeesh & Titman (1993) found that investment strategies that consequent bough winning stocks and sold losers, generate significant positive returns over three to twelve months holding periods. The factor is constructed by buying a portfolio of stocks that was ranked among the top 30 % in the previous year and short selling a

portfolio of stocks that ranked among the bottom 30 % in the previous year, hence winners and losers. The difference in return between the portfolios with the highest and lowest returns ultimately forms the factor MOM. Carhart (1997) found significant evidence that the four-factor model gives a more accurate measurement of portfolio returns than the previous models.

The four-factor model is expressed as:

$$r_i - r_f = \beta_i(r_m - r_f) + \beta_{i,SMB}SMB + \beta_{i,HML}HML + \beta_{i,MOM}MOM + \varepsilon_i \quad (7)$$

Where:

$\beta_{i,MOM}$	The sensitivity of r_i to a change in MOM
MOM	Momentum factor

A positive momentum factor confirms that the firms who perform well in the specific time period will continue to perform well, while underperformers will continue to underperform.

3.3.4 Fama-French Five-Factor Model

The most recent expansion of the models took place in 2015. Fama-French published a five-factor model where they include operating profitability (RMW) and investment (CMA) as two additional factors to the three-factor model. They show that the model explains the cross-section of returns better than the three-factor model of Fama-French (1993). RMW is short for "Robust Minus Weak" and represents the return for a portfolio with positive exposure to companies with robust earnings and negative exposure to companies with weak earnings. CMA stands for "Conservative Minus Aggressive", which represents the return on a portfolio with positive exposure to companies with low investment activity rather than companies with high investment activity. They added the two factors because they observed a positive relationship between expected profitability and expected stock return and a negative relationship between expected investment and expected stock return.

The model is expressed as:

$$r_i - r_f = \beta_i(r_m - r_f) + \beta_{i,SMB}SMB + \beta_{i,HML}HML + \beta_{i,RMW}RMW + \beta_{i,CMA}CMA + \varepsilon_i \quad (8)$$

Where:

$\beta_{i,RMW}$	The sensitivity of r_i to a change in RMW
RMW	"Robust Minus Weak" – Profitability factor
$\beta_{i,CMA}$	The sensitivity of r_i to a change in CMA
CMA	"Conservative Minus Aggressive" – Investment factor

3.4 Other performance measures

Factor models are a way of calculating excess returns. This section will introduce some other performance measures that can also be used for the same purpose. As we discussed earlier, the financial theory assumes a positive relationship between risk and return and each investor has their own risk profile which reflects the assets they choose to invest in. By including different theoretical performance measures, we can adjust for different types of risk and obtain comparable figures for the fund's actual performance.

There are a variety of measurements that can be used for this purpose. The main difference between these is the choice of reference. We have listed the performance measures that we believe are relevant for our analysis below:

1. Traditional
2. Sharpe ratio
3. Treynor ratio
4. Information ratio
5. Appraisal ratio

3.4.1 Traditional performance measurement

As mentioned earlier, one method of calculating return is to use an arithmetic approach. As performance measurement not only serves to evaluate results previously obtained by portfolio managers, but also as a predictor for their future results we will implement a portfolio approach.

When implementing a portfolio approach, one tries to build a strategy that can consequently outperform the market period after period. Usually, the portfolio is rebalanced after a given period and the total amount is reinvested based on the most recent information. Hence, the total amount is reinvested regardless of whether the portfolio has increased or not.

3.4.2 Sharpe ratio

In 1966, William Sharpe introduced the performance metric "reward-to-variability ratio", now commonly known as the Sharpe ratio. The ratio takes into account a portfolio's average return earned in excess of the risk-free rate, adjusted for the average standard deviation. A high Sharpe ratio indicates that the fund's risk-adjusted performance is high. Investors wish to maximize the Sharpe ratio and thus achieve a high amount of return given a certain risk level.

The formula of the Sharpe ratio is expressed as:

$$Sharpe\ ratio = \frac{\bar{R} - r_f}{\sigma_p} \tag{9}$$

Where:

σ_p	Standard deviation of the portfolio´s excess return
$\bar{R}$	Average return of the period

3.4.3 Treynor ratio

The Treynor ratio, also known as the "reward-to-volatility ratio" was developed by Jack Lawrence Treynor in 1965. It is a risk-adjusted measure of performance that takes the average excess return and divides it by the market beta of the portfolio. In contrast to the Sharpe ratio which adjusts for total risk, the Treynor Ratio will only adjust for the systematic risk. A higher Treynor ratio indicates that the portfolio is a more suitable investment.

The formula of the Treynor ratio is expressed as:

$$Treynor\ ratio\ = \frac{\bar{R} - r_f}{\beta_i} \tag{10}$$

3.4.4 Information Ratio

The information rate (IR) is a relative target figure where the fund's benchmark portfolio is used as a basis for comparison. The benchmark used is usually an index that represents the market or a particular sector. When using the information ratio, we obtain the value of active management and can evaluate the skill of a portfolio manager based on this.

The formula of the information ratio is given by:

$$Information\ ratio = \frac{r_p - r_m}{\sigma(r_p - r_m)} = \frac{\alpha_p}{Tracking\ Error} \quad (11)$$

Where:

$r_p - r_m$	The excess return of the fund
$\sigma(r_p - r_m)$	The standard deviation of the difference between the portfolio and benchmark returns
α_p	The portfolio´s alpha

3.4.5 Appraisal Ratio

The appraisal ratio (AR) is used to evaluate the portfolio manager's investment-picking ability. It considers the excess return per unit of residual risk.

The formula for the appraisal ratio is given by:

$$Appraisal\ ratio = \frac{\alpha_p}{\sigma(e_p)} \quad (12)$$

Where:

(e_p)	The unsystematic risk of the portfolio

A higher appraisal ratio implies that the portfolio manager is achieving a higher result in excess of the benchmark, given the risk applied through the active selection choices.

3.5 Activity measures

The main objective of active management is to achieve higher alpha values. Passive funds are expected to have a lower activity level than active funds. Both R^2 and tracking error are well-established measures that have been used as the parameters for evaluating how active equity funds are.

Active management by ESG funds may be motivated not only by alpha generation but also by the need to maintain holdings eligible to ESG standards (Chen et al., 2018). This may be an explanation if sustainable funds have a higher level of activity than conventional ones.

3.5.1 Tracking error

Tracking error measures the volatility of the difference in returns of a fund compared to its benchmark. It indicates how closely a portfolio follows the index to which it is benchmarked. High tracking error indicates that the portfolio deviates a lot from the benchmark, while low tracking error indicates that it follows the benchmark closely.

Tracking error is calculated as follows:

$$Tracking\ Error = \sigma(r_p - r_m) \tag{13}$$

Tracking error can be used to evaluate how actively a fund is managed and its corresponding risk level. Ideally, an investor would want to have a low tracking error and high excess return.

3.5.2 R^2

R-squared (R^2) is also a measure of the relationship between a portfolio and its benchmark, where R^2 is expressed as a percentage from 1 to 100. It measures the correlation between the portfolio's returns to the benchmark's returns. A mutual fund that does not deviate from the benchmark would have an R^2 close to 100%. This is typically a passive fund since such funds aim to achieve the same return as the benchmark index. A lower number will indicate a greater selectivity in the fund. For active funds, one will therefore expect a lower R^2 since they will try to beat the market index.

4. Data

In this section, we will present the data we have used for the analysis. We have considered funds that have the largest share of capital invested in the US market, which is traded worldwide, in the period of October 1, 2015 to December 31, 2020. We wanted to include as many funds as possible, given our time horizon. In addition, we will go through how we categorized the different funds into four different groups. By using the Thomson Reuters Eikon program, Kenneth French and Morningstar as our most important data sources, we consider the reliability of the data to be secured.

4.1 Sample selection

In this thesis we want to examine the differences between sustainable and conventional funds, as well as the difference between active and passive. We began with Morningstar´s database with a total of 26,193 funds. The first screening criterion used was to exclude all the funds that were not equity funds. In order to be categorized as an equity fund, they need to invest at least 80% of its capital in equities (Verdipapirfondenes Forening, 2017). This left us with 12,345 funds. Further, the analysis study funds that have a US investment perspective, hence we also needed to add a criterion to distinguish the funds from other countries. After incorporating these criteria, we were left with 5,577 funds in our dataset. Due to our research question, it was necessary to divide the dataset into different groups. First and foremost, we had to distinguish between actively and passively managed funds. The dataset contained 5,317 active funds and 260 passive funds. Second, we also had to distinguish between sustainable and conventional funds within the management styles. Later in this section we will explain how we determine which fund to categorize as sustainable and conventional funds. We were then left with the following:

Actively managed funds:

- Sustainable funds: 2,085
- Conventional funds: 3,102

Passively managed funds:

- Sustainable funds: 38
- Conventional funds: 20

To eliminate potential currency differences, we removed funds not having US Dollars as their base currency. In addition, we also eliminated funds with the same FundID, which represented different share classes of the same fund (e.g., "A" "B," "Z"). It was this part that constituted the largest elimination in our screening. Furthermore, we study the period of October 1, 2015 to December 31, 2020. We removed all funds without return data for this period. Later, we will discuss the choice of data period in more detail. After this screening our dataset contained the following:

Figure 1: Overview of funds in the dataset

The figure displays the information about the funds in our data sample, grouped into four categories.

Funds	Active	Passive
Sustainable	198	13
5 globes	101	2
4 globes	97	11
Conventional	203	41
3 globes	122	39
2 globes	59	2
1 globe	21	0

After incorporating all the criteria mentioned, we are left with four categories of funds: (1) Active ESG, (2) Passive ESG, (3) Active Conventional and (4) Passive Conventional. We then constructed four equally weighted portfolios.

The analysis includes funds that have data for the whole sample period, which implies that all funds were active during the whole time period. This may cause the dataset to suffer from survivorship bias (Rohleder, Sholz, Wilkens, 2007), which is a weakness of our analysis. Survivorship bias may lead to an overestimation of the average return.

4.1.1 Graph of the four portfolios

In addition, we want to provide a graph of the development of the four constructed portfolios in relation to the benchmark index. We created a hypothetical scenario where we invested $ 1000 in each of the four portfolios. Later, we will explain the choice of benchmark index in more details. The figures are shown below.

Figure 2: Overview of the four portfolios and the market index

Figure 2 shows an overview of the four different portfolios in terms of returns. All groups are separated into different colours. The calculations are based on an investment of $1000 in October 2015 and show the development through the whole time period.

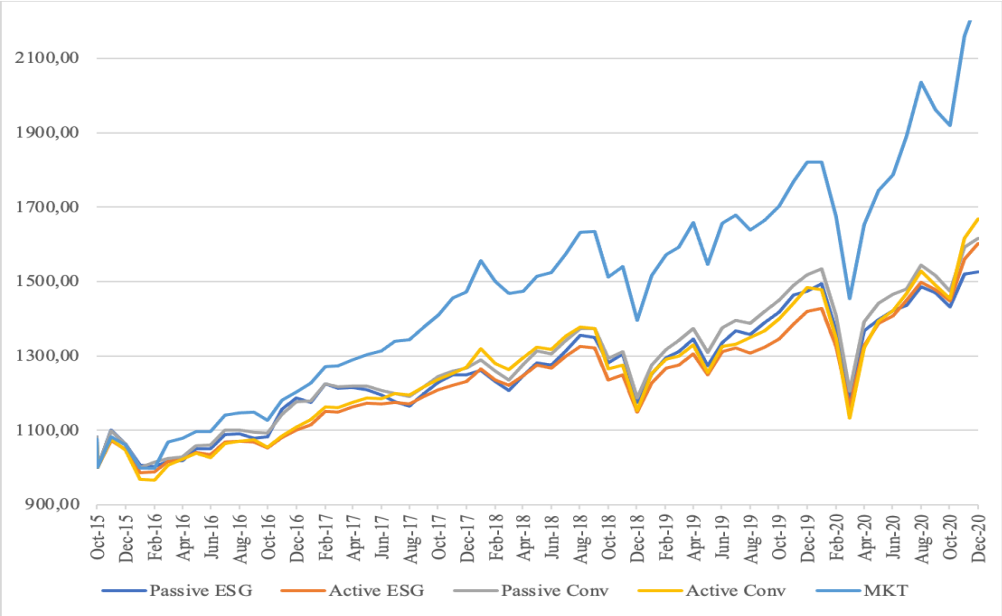


Figure 2 displays that there are no major discrepancies between the various portfolios. It is also worth mentioning that none of them is above the market index, even though everyone has had a positive development during the period. The market index has more than doubled in terms of value, while the other portfolios have increased over 50%. These graphs only consider the monthly returns, and do not take into account the risk. At the end of 2020, "Active Conventional" ends up with the highest return, followed by "Passive Conventional". “Passive ESG” turns out to have the lowest return during the period. The graph also shows clear effects of the two global downturns during December 2018 and March 2020. In both cases we can also see that the market is recovering quickly.

4.2 Data collection

4.2.1 Morningstar sustainability rating

As the purpose of this analysis is to compare the performance of ESG funds with conventional funds we needed criteria to distinguish between these funds. We incorporated Morningstar´s sustainability rating to be able to separate the funds into two different categories. Morningstar

Sustainability Rating measures how well the companies in a fund manage their ESG risk factors and opportunities compared to similar funds (Hale, 2016). Morningstar uses data obtained from Sustainalytics to calculate the ESG-rating of the company.[1] We have added a description of the different ratings below.

Figure 3: Illustration of the distribution of Morningstar´s sustainability rating

Figure 3 illustrates the distribution of the sustainability rating in the Morningstar universe.

Distribution	Score	Descriptive Rank	Rating Icon
Highest 10%	5	High	
Next 22.5%	4	Above Average	
Next 35%	3	Average	
Next 22.5%	2	Below Average	
Lowest 10%	1	Low	

Despite the fact that Morningstar has invented a system that makes it easier to choose funds that are more sustainable, we cannot assume that all funds within the upper categories necessarily have an explicit focus on sustainable investments. In fact, the raw Morningstar Sustainability Scores actually reveal that some non-SRI funds are just as sustainably invested as their SRI counterparts, when drilling down to look at the underlying holdings (Kitces, 2016). This means that some funds without a sustainability mandate make investments that align with the relevant ESG factors - simply because they find those to be good investments. Nevertheless, we have chosen to include funds with and without a sustainability mandate, as we consider it relevant for the thesis.

As mentioned earlier we apply the sustainability rating to create two different groups for our analysis; The group with ESG funds has a rating of four and above, while the conventional

[1] They are using the following formula:

$Portfolio\ Sustainability\ Score\ =\ Company\ ESG\ Score - Controversy\ Deduction.$

Then they sort the funds into five equally distributed groups. They normalize the numbers obtained from Sustainalytics to make the numbers comparable across industries.

group has a rating of three and below. Within these we distinguish between active and passive management.

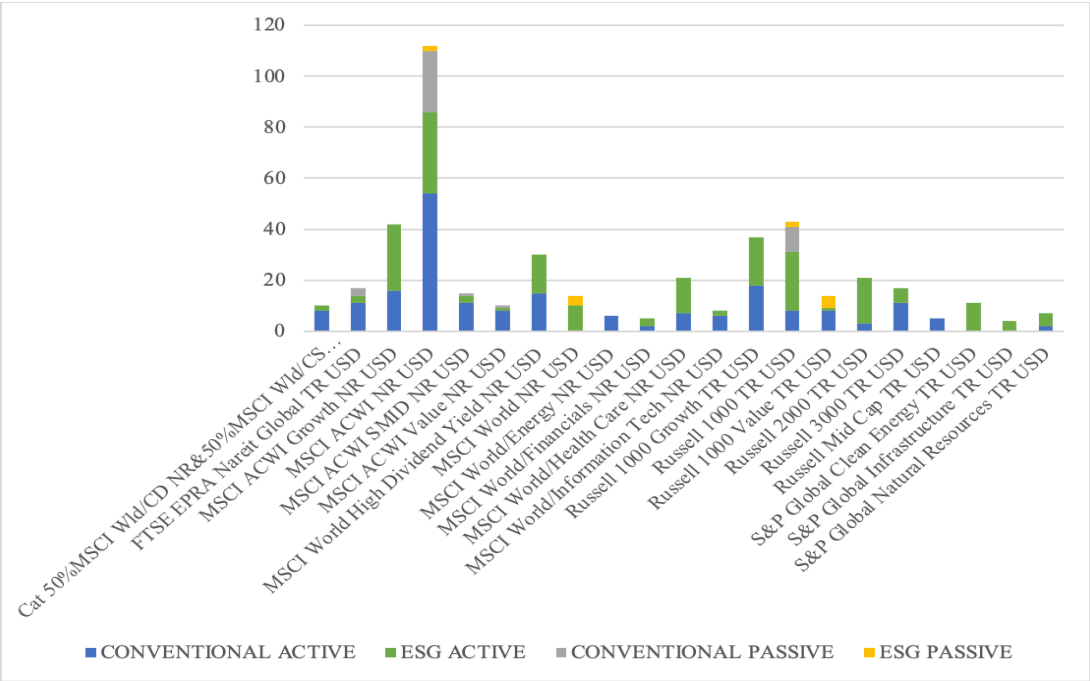
4.2.2 Benchmark index

To evaluate a fund's performance, we compare the fund to a benchmark or a market index to see if the fund has created an excess return. This is an important and necessary aspect of fund management. The choice of a benchmark index is central when analysing the extent to which the funds have succeeded in their management, as a good benchmark index represents the most precise basis for comparison of the fund's performance. As mentioned earlier, active funds aim to create an excess return relative to the benchmark, while passive funds aim to create the same return as the benchmark index.

In our sample, the funds are not characterized by one common benchmark index but a variety of different benchmarks. Below we have added a graph that presents the funds' benchmarks, divided into four groups. We have excluded those that contained only one fund.

Figure 4: Overview of the funds' benchmarks indexes.

The figure shows an overview of the number of benchmark indexes, distinguished by a different colour for the four groups. The benchmark indexes only used by one fund are excluded from the figure.



In summary, there is a clear predominance of funds that have MSCI ACWI NR USD as a benchmark index, followed by Russell 1000 TR USD and MSCI ACWI Growth NR USD. Nevertheless, there is a wide variety of indices used. One can argue that it is more optimal to use each fund's benchmark index, as this is the chosen benchmark the individual fund uses to measure their performance. However, using one predetermined benchmark index for all funds will create a better basis for comparison between the funds. Therefore, we have chosen to proceed with one index.

In our analysis we apply the market index from Kenneth R. French data library. It contains the "value-weight return of all CRSP firms incorporated in the US and listed on the NYSE, AMEX, or NASDAQ that have (i) a CRSP share code of 10 or 11 at the beginning of month t, (ii) good shares and price data at the beginning of t, and (iii) good return data for t" (French, 2020). Based on this we believe that this benchmark is a good representation of the general market development in the US. The index is adjusted for daily capital events, splits and dividends.

4.2.3 The risk-free rate of return

The analysis is based on excess returns in the time series minus risk-free interest rate, which results in the market premium. We need a risk-free interest rate that represents the market we are examining. In order to prevent unexpected macroeconomic shocks from affecting the effective interest rate, one should avoid choosing an interest rate with too long-time horizon. At the same time, the maturity of the interest rate should not be too short, as short-term interest rates tend to be very volatile during turbulent periods.

In our thesis we chose to use the 1-month T-bill for the US market, obtained from Ibbotson and Associates Inc obtained from Kenneth R. French data library.

Figure 5: The development for the 1-month T-bill during the sample period.

Figure 5 illustrates the development for the 1-month T-bill for the US market from the period October 2015 to December 2020.

4.2.4 Risk factors and fund data

We extracted data for the five different risk factors from the data library of Kenneth R. French. These are the size-factor (SMB), value-factor (HML), momentum factor (MOM), profitability factor (RMW) and the investment-factor (CMA). A more thorough description of these factors can be found in Section 3.3. Based on the risk factors, we want to investigate whether any of the fund groups are affected by one or more of the risk factors, and whether they deliver significantly abnormal returns (positive alpha values) after controlling for the additional factors.

Data for the fund´s size and benchmark index are obtained from Morningstar.

4.2.5 Return of the funds

In Section 3.1, we introduced two methods for calculating returns, arithmetic and geometric. The arithmetic return gives a nominal percentage return. The disadvantage of using this method is that it may be in conflict with the requirement for normal distribution in the regression analysis. On the other hand, the geometric method leaves us with logarithmic returns that will consequently fit a normal distribution, which will solve the problem above. The method for

geometric return weights the return relative and percentage in relation to the value of the investment at the start time for the given period. Due to the relative weighting, the geometric mean is always somewhat lower than the arithmetic, because negative returns weigh heavier in a geometric cut. However, the disadvantage is that the returns will not be asset-additive, which means that the weighted average of log-returns of individual stocks is not equal to the portfolio return (Miskolczi, 2016). Kenneth R. French data library uses an arithmetic calculation of the variables, and it is therefore reasonable for us to continue using this when calculating returns.

From the Thomson Reuters Eikon database, we obtained monthly observations of each fund´s Net Asset Value (NAV). Further, we use these to calculate the arithmetic returns for each fund. We chose to use monthly data in favour of daily data to avoid data becoming too volatile.

The mathematic formula for arithmetic returns:

$$r\,(t_0 - t_1) = \frac{NAV\,(t_1)}{NAV(t_0)} - 1 \qquad (1)$$

4.2.6 Data period

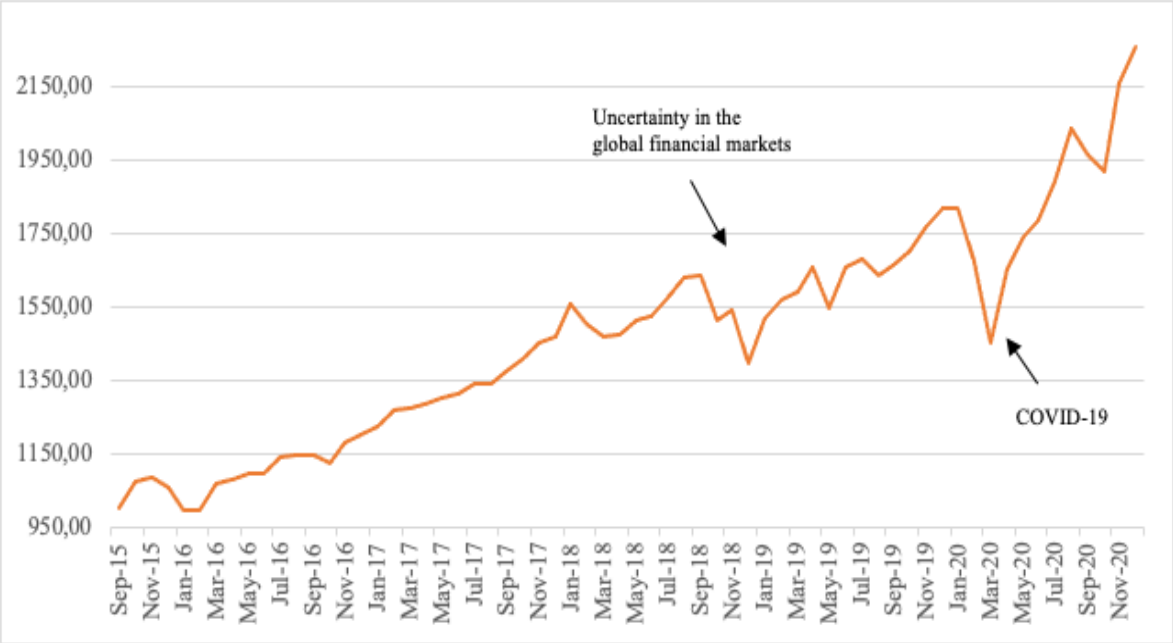
As mentioned earlier, our time period extends from October 2015 to December 2021. With monthly observations this implies that we have data for 63 months for all 455 funds in the sample, a total of 28,665 observations. The choice of data period was a balance between the number of funds and the number of months. We wanted to include as many funds as possible rather than choosing a longer time period, and this resulted in a five-year period. A longer time period would possibly make it easier to uncover any trends and economic conditions in the market and improve the statistical results.

During the time period, there are two events in particular that stand out. These will affect the overall results and it is therefore important to be aware of this. First, we have the fourth quarter of 2018 which was characterized by great uncertainty in the global financial markets. A number of uncertainties have been blamed for the fall in the stock market that took place that autumn, among other things the fear of increased interest rates in the US, concerns about growth in the world economy, trade wars and Brexit (Nilsen, 2018). The second period is the crisis of COVID-19 which resulted in a global stock market crash. This period is the largest stock market decline after the financial crisis in 2008. Therefore, it is relevant to analyse relationships both

with and without events that affect global financial markets. In order to examine this, we chose to do an additional analysis where we exclude 2020 and the effects of the corona crisis. This period leaves us with 12 fewer observation months.

Figure 6: The development of the market factor (MKT) during the time period

Figure 6 illustrates the development of the quarterly market factor from the period September 2015 to November 2020. The great uncertainty in the global financial markets is defined in the graph, which took place in the fourth quarter of 2018. The Great Lockdown 2020 is defined from March 2020 based on our assumptions.



5. Results

This section covers the results from the empirical analysis based on the CAPM model and multi-factor models described in Section 3. The main purpose of this study is to test whether there is a significant difference between the risk-adjusted return for active and passive management, as well as for sustainable and conventional funds. In the first subsection we will present the results for the entire sample period, and hence seek an answer to the first two hypotheses. Second, we present the results related to the last hypothesis of this paper, by looking at the sub-sample analysis. Finally, we have also added an additional analysis using a portfolio approach to try to find a strategy to beat the market index.

5.1 Fund performance of the entire sample period

In this section we will present the results related to the first two hypotheses. First, we will review the regression results for our portfolios and discuss them. Second, we will also discuss our results from the individual regressions. Lastly, we use well-known performance measures such as the Sharpe ratio, Treynor ratio, Information ratio and Appraisal ratio to evaluate performance. Through these analyses we aim to test the following:

Hypothesis 1: Actively managed funds perform better than passively managed funds during the entire time period

Hypothesis 2: There is no significant difference in the financial performance between sustainable and conventional funds

5.1.1 Regression results – combined portfolios

In order to test the second hypothesis, we have completed a regression analysis, where we have combined passive and active management within the two groups: Sustainable and Conventional. Table 1 presents the results from the CAPM model, Fama-French three-factor model, Carhart four-factor model and Fama-French five-factor model. In addition, we have included the difference between the respective groups by using the four- and the five-factor model. From columns (1) to (4), we present the regression results for the combined sustainable portfolio, while for columns (5) to (8) we have listed the conventional portfolio. At the end of

the table, the regression of the differences between the results using the Carhart model and the Fama-French five-factor model can be found.

The forthcoming regression results will have the same display.

Table 1: Regression results from the combined portfolios during the entire time period

The table shows the regression results of the combined portfolios for both the ESG and conventional portfolios. In columns (1) and (5) the CAPM is used. Column (2) and (6) shows the results from the Fama-French three-factor model. Column (3) and (7) contains the results from the Carhart four-factor model and column (4) and (8) displays the results from the Fama-French five-factor model. At the right side of the table, we have included the regressions of the differences between the Carhart model (9) and the Fama-French five-factor model (10).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	ESG	ESG	ESG	ESG	Conv	Conv	Conv	Conv	ESG-Conv	ESG-Conv
α	-0,0033**	-0,0033***	-0,0032***	-0.003**	-0,0043***	-0,0039***	-0,0039***	-0,0037***	0,0006	0,0007
	(-2,57)	(-2,68)	(-2,66)	(-2,48)	(-2,75)	(-2,84)	(-2,77)	(-2,74)	(-1,09)	(-1,13)
βmkt	0,884***	0,870***	0,878***	0,853***	0,949***	0,925***	0,926***	0,916***	-0,049***	-0,063***
	(16,47)	(15,04)	(15,38)	(15,00)	(17,43)	(16,74)	(16,36)	(17,65)	(-4,04)	(-3,80)
βSMB		0,060	0,071	0,054		0,073	0,074	0,059	-0,003	-0,005
		(1,14)	(1,39)	(0,94)		(1,42)	(1,46)	(1,04)	(-0,18)	(-0,22)
βHML		-0,0173	-0,003	0,030		0,013	0,014	0,053	-0,017	-0,023
		(-0,37)	(-0,05)	(0,51)		(0,22)	(0,20)	(0,72)	(-0,81)	(-0,87)
βMOM			0,031				0,003		0,028	
			(0,54)				(0,05)		(-0,93)	
βRMW				0,009				-0,025		0,034
				(0,06)				(-0,19)		(-0,83)
βCMA				-0,161*				-0,125		-0,035
				(-1,71)				(-1,20)		(-0,86)
N	63	63	63	63	63	63	63	63	63	63
R^2	0,930	0,932	0,932	0,934	0,933	0,935	0,935	0,936	0,315	0,310

From Table 1 we see that the alphas are significantly negative for all the models and that those for the conventional portfolio are more negative than for the sustainable portfolio. This indicates that both groups underperform in relation to the benchmark index. Nevertheless, we cannot state that there is a significant difference between the two groups, as the regression of the differences does not have a significant alpha value. This is in accordance with our second hypothesis.

Our results are in line with previous studies on the same subject. Hamilton et al. (1993) found no significant difference between sustainable funds and conventional funds in the period of

1981 - 1990. Similar results can be found in Renneboog et al. (2008). Both of the papers reveal that both groups underperform.

The estimated market beta (MKT) varies between 0.853 and 0.949, with a higher exposure for conventional funds. This suggests that they tend to follow the market closely in terms of volatility. All of these are statistically significant.

Furthermore, we notice that there is no exposure to the various factors that capture size, value, momentum and profitability. However, when using the five-factor model within the sustainable portfolio in column (4), the investment factor (CMA) is statistically significant at a 10% level. A negative regression coefficient indicates that the funds within the ESG are tilted towards more aggressive investments.

The degree of explanation, R^2, indicates that at least 93% and 93.3% of the variation in excess return for sustainable and conventional funds respectively can be explained by the CAPM model. When we extend the model to include more variables, R^2 increases marginally. This indicates that the new variables do not explain the variation in the excess return to a particularly large degree.

5.1.2 Regression results– separated into active and passive

Hypothesis one seeks to examine whether there are significant differences in performance between active and passive management strategies. In order to test this, we apply the same four regression models but divide the two categories into actively and passively managed funds. In this next subsection, we will first discuss the results from the sustainable portfolios before we move on to the conventional portfolios. Finally, we will examine if distinguishing between management styles will change the conclusion which we arrived at in the previous section.

Tables 2 and 3 show the results from the sustainable portfolios and the conventional portfolios, respectively.

Table 2: Regression results for the active and passive ESG portfolios during the entire time period

The table shows the regression results of the ESG portfolio divided into active and passive management. In columns (1) and (5), the CAPM is used. Column (2) and (6) shows the results from the Fama-French three-factor model. Column (3) and (7) contains the results from the Carhart four-factor model and column (4) and (8) displays the results from the Fama-French five-factor model. At the table's rightside, we have included the regressions of the differences between the Carhart model (9) and the Fama-French five-factor model (10).

	(1) Active	(2) Active	(3) Active	(4) Active	(5) Passive	(6) Passive	(7) Passive	(8) Passive	(9) Active-Passive	(10) Active-Passive
α	-0,0030***	-0,0030***	-0,0030***	-0,0028**	-0,0040*	-0,0027	-0,0026	-0,0025	-0,0004	-0,0004
	(-2,65)	(-2,82)	(-2,79)	(-2,64)	(-1,95)	(-1,34)	(-1,33)	(-1,19)	(-0,28)	(-0,22)
βmkt	0,783***	0,770***	0,776***	0,756***	0,812***	0,791***	0,816***	0,765***	-0,04	-0,009
	(-16,77)	(-15,34)	(-15,73)	(-15,48)	(-11,53)	(-10,27)	(-9,85)	(-9,11)	(-0,84)	(-0,20)
βSMB		0,057	0,065	0,0506		-0,0061	-0,030	0,016	0,035	0,035
		(-1,28)	(-1,48)	(-1,03)		(-0,06)	(-0,32)	(-0,14)	(-0,48)	(-0,41)
βHML		-0,024	-0,013	0,018		0,136**	0,185**	0,170**	-0,198***	-0,152***
		(-0,57)	(-0,25)	(-0,35)		(-2,22)	(-2,32)	(-2,35)	(-2,83)	(-2,83)
βMOM			0,023				0,104		-0,081	
			(-0,47)				(-1,06)		(-1,19)	
βRMW				0,003				0,105		-0,102
				(-0,02)				(-0,57)		(-1,03)
βCMA				-0,142*				-0,149		0,007
				(-1,71)				(-1,05)		(-0,06)
N	63	63	63	63	63	63	63	63	63	63
R^2	0,933	0,934	0,934	0,937	0,822	0,832	0,837	0,835	0,182	0,163

The analyses related to Table 2 shows that the alpha values for the active ESG funds are significantly negative for all factor models. We see the same in the passive funds, but the alpha is statistically significant only for the CAPM model. This indicates that the alpha loses significance when we control for other risk factors. Based on columns (9) and (10) we cannot state that there is any difference between the two investment strategies. Regarding our first hypothesis, stating that active management outperforms passive management, our results are not consistent with what we expected.

In the literature section, we presented several studies that come to different conclusions. In the oldest studies (Jensen (1986) and Carhart (1997)), the authors failed to find a significant difference between the active and passive strategies, while for the more recent studies (Fama-French (2008) and Chen et al. (2018)) the writers concluded that actively managed funds perform better. Our hypothesis is based on the more recent studies, but our results appear to be in line with what Jensen and Carhart found.

For the passive sustainable portfolio, we discover a positive exposure to the value factor (HML) for all the factor models. This implies that the excess return is due to the company's high book-to-market equity value. Additionally, the active portfolio has a negative exposure to the investment-factor (CMA).

We notice that R^2 is lower for the passive funds than for the active ones. This is in contrast to similar studies, such as Chen et al. (2018). The choice of the benchmark index can explain our results. The funds in the portfolio state a self-selected index, which may deviate from the index we have used in our analyses.

Next, we consider the results for the conventional portfolios.

Table 3: The regression results for the active and passive conventional portfolios during the entire time period

The table shows the regression results of the conventional portfolio divided into active and passive management. In columns (1) and (5) the CAPM is used. Column (2) and (6) shows the results from the Fama-French three-factor model. Column (3) and (7) contains the results from the Carhart four-factor model and column (4) and (8) displays the results from the Fama-French five-factor model. At the right side of the table, we have included the regressions of the differences between the Carhart model (9) and the Fama-French five-factor model (10).

	(1) Active	(2) Active	(3) Active	(4) Active	(5) Passive	(6) Passive	(7) Passive	(8) Passive	(9) Active-Passive	(10) Active-Passive
α	-0,0045***	-0,0041***	-0,0041 ***	-0,0039***	-0,0035*	-0,0026	-0,0025	-0,0024	-0,0016	-0,0015
	(-2,80)	(-2,96)	(-2,89)	(-2,92)	(-1,86)	(-1,49)	(-1,47)	(-1,34)	(-1,21)	(-1,19)
βmkt	0,969 ***	0,945 ***	0,944***	0,938***	0,842 ***	0,823***	0,832***	0,798***	0,112***	0,139***
	(-18,06)	(-17,55)	(-17,18)	(-18,99)	(-13,13)	(-11,8)	(-11,19)	(-10,99)	(-2,83)	(-3,67)
βSMB		0,083*	0,082	0,062		0,017	0,030	0,043	0,053	0,019
		(-1,69)	(-1,64)	(-1,14)		(-0,21)	(-0,38)	(-0,45)	(-0,85)	(-0,27)
βHML		-0,0008	-0,002	0,042		0,084	0,101	0,111	-0,104**	-0,069
		(-0,01)	(-0,03)	(-0,56)		(-1,46)	(-1,34)	(-1,49)	(-2,17)	(-1,57)
βMOM			-0,003				0,036		-0,039	
			(-0,05)				(-0,41)		(-0,64)	
βRMW				-0,051				0,114		-0,165*
				(-0,39)				(-0,68)		(-1,80)
βCMA				-0,125				-0,125		-0,0002
				(-1,18)				(-0,99)		(-0,00)
N	63	63	63	63	63	63	63	63	63	63
R^2	0,835	0,938	0,938	0,939	0,867	0,871	0,872	0,874	0,281	0,308

The findings for the conventional funds are similar to the results we obtained for the ESG portfolios. The active portfolio has significant alpha values, while its passive counterpart loses significance when we expand the CAPM model. Both underperform. None of the management

strategies shows signs of being exposed to the other variables from the factor models. Our conclusion remains the same for the conventional funds as for the sustainable ones; We cannot state that there is a difference between the active and the passive portfolio. As we discussed earlier, this is contrary to previous research. One plausible reason could be the choice of the time period and a low number of observations.

Due to our second hypothesis we want to further examine the relationship between the sustainable and conventional portfolios after they are distinguished into management style. Therefore, we include a regression of the differences as well. To concretize the results in this thesis, we chose to only submit the results from the Carhart four-factor model, while the results from the Fama-French five-factor model can be found in the appendix.

Table 4:Regression on the difference of the sustainable and conventional portfolio

The table shows the regression results done on the differences of the sustainable and conventional portfolios using the Carhart model.

	α	βmkt	βSMB	βHML	βMOM	N	R^2
Active ESG - Active Conv	0,0011	-0,168 ***	-0,0171	-0,011	0,026	63	0.7059
	(1.60)	(-11.70)	(-0.77)	(-0.42)	(0.76)		
Passive ESG - Passive Conv	-0,00003	-0,016	0	0,084*	0,068*	63	0.1623
	(-0.03)	(-0.69)	(0.00)	(1.74)	(1.88)		

In Table 4, we discover the same results as we obtained in Table 1, the difference is not statistically significant and therefore consistent with previous literature. Accordingly, we find no evidence that the ESG funds tend to outperform conventional funds when looking at the entire sample period.

5.1.3 Regression results - individual funds summary

To achieve broader insight into both the conventional and the sustainable portfolios, we have estimated the Carhart model and the Fama-French five-factor model on each fund's total return. Due to a large number of funds, we do not tabulate the regression results for each individual fund but focus on the summary statistics for the alpha and factor loadings instead.

We have sorted the results into five different groups based on sustainability rating, these are again divided into active and passive management. Due to our research question, we have

chosen to include an overview on the right side of the table to make it easier to compare between the groups.

Table 5 reports the performance and factor loadings for the Carhart model: Panel A shows the summary statistics of the alphas; Panel B presents the average factor loadings. The results from the Fama-French five-factor model can be found in the appendix.

Table 5: Summary of the individual regressions using Carhart four-factor model

This table presents the summary results from the regression on each individual fund using the Carhart four-factor model. These are then divided into five different groups, based on sustainability ratings 1 – 5. For each of these, we have divided them into active and passive funds. At the right end of the table, we have included a summary statistic. All numbers are in monthly terms.

	Rating 1	Rating 2		Rating 3		Rating 4		Rating 5		Summary statistics					
	Active	Active	Passive	Active	Passive	Active	Passive	Active	Passive	Conv	ESG	Diff	Active	Passive	Diff
A. Summary statistics for α															
Minimum	-0,012	-0,023	-0,004	-0,013	-0,006	-0,011	-0,006	-0,022	0,000	-0,012	-0,010	-0,002	-0,016	-0,004	-0,012
Median	-0,004	-0,005	-0,003	-0,005	-0,003	-0,004	-0,005	-0,003	0,001	-0,004	-0,002	-0,002	-0,004	-0,002	-0,002
Maximum	0,001	0,002	-0,003	0,048	0,004	0,002	0,003	0,003	0,003	0,010	0,003	0,008	0,011	0,002	0,009
Mean	-0,005	-0,005	-0,003	-0,004	-0,002	-0,004	-0,003	-0,003	0,001	-0,004	-0,002	-0,002	-0,004	-0,002	-0,002
Std dev.	0,003	0,004	0,001	0,007	0,002	0,003	0,003	0,003	0,001	0,004	0,003	0,001	0,004	0,002	0,002
No. of funds	21	60	2	122	39	97	11	101	2	244	211	33	401	54	347
No. of negative α															
At 10%	0	5	0	14	3	8	1	7	0	22	16	6	34	4	30
At 5%	5	15	1	22	2	19	1	7	0	45	27	18	68	4	64
At 1%	4	18	0	31	10	19	4	8	0	63	31	32	80	14	66
B. Mean factor loadings for β and R2															
βmkt	0,995	0,927	0,889	0,951	0,829	0,894	0,835	0,869	0,714	0,918	0,828	0,090	0,927	0,817	0,110
βSMB	0,152	0,136	0,253	0,052	0,018	0,066	0,022	0,080	0,070	0,122	0,060	0,063	0,097	0,091	0,006
βHML	0,040	0,021	0,181	-0,020	0,097	0,037	0,187	-0,066	0,175	0,064	0,083	-0,019	0,003	0,160	-0,157
βMOM	-0,089	-0,037	-0,054	0,021	0,041	0,000	0,082	0,051	0,220	-0,024	0,088	-0,112	-0,011	0,072	-0,083
R^2	0,820	0,809	0,882	0,805	0,763	0,795	0,771	0,733	0,510	0,816	0,702	0,114	0,793	0,732	0,061

The top portion of panel A in Table 5 shows the mean alpha is negative for all the groups, besides the passive funds with sustainability rating five. This group contains only two funds. The bottom portion of panel A reveals that there are no significantly positive alpha values. Almost half of the funds have a significant negative alpha at a minimum 10 % level. In the appendix we included charts that display a full overview of the alpha values separated by sustainable and conventional, in addition to management style.

Based on the average alpha value the difference between sustainable and conventional funds is small on a monthly basis, yet the ESG outperforms the conventional. The standard deviation of conventional funds is higher than for the ESG ones in both models. This implies that the

investors will take a higher risk when investing in funds with a sustainability rating of one, two or three. Investing in a randomly selected active fund with a sustainability rating of three will provide the highest risk. The passive funds outperform the active ones, however the difference between them is small. For the active funds we have a higher standard deviation, as expected. These outcomes reflect the results we found in both sections 5.1.1 and 5.1.2.

In all groups, R^2 is high, besides the passive funds with a rating of five. This indicates that the models that have been used explain the variation in the excess return well. One possible reason why the passive funds with rating five have a low R^2 may be that these funds focus on a specific type of renewable energy, which will mean that their active counterparties are much more diversified. This leads to the average for the passive funds being reduced and getting a lower R^2. If we ignore this group in the calculations, R^2 will be slightly higher for the passive funds. Nevertheless, we would have expected the difference between active and passive management to be larger.

We notice both sustainable and conventional funds being underexposed to the market portfolio with a beta below 1. The only category that has a beta over 1 is active funds with rating one using the Fama-French model. Both conventional and active funds have a higher exposure to market beta (MKT) than their counterparties. For all groups, the size factor (SMB) is positive but more than twice as large for conventional than sustainable funds. This implies that they are more exposed to small-cap stocks. Passive funds are more exposed to value stocks (HML), but regarding sustainable and conventional funds the difference is unremarkable. Furthermore, we observe that both ESG and passive funds are more exposed to the momentum factor (MOM) and the profitability factor (RMW). This means that they invest in robust companies that were last year's winners on the stock exchange. Common for all the groups is that the investment factor (CMA) is negative, which indicates that they have a more conservative investment strategy.

Both models used provide good explanatory power for the sample fund returns. However, the market beta (MKT) from the Carhart model is systematically upward biased compared with the Fama-French model, and we find the reveres pattern for the value factor (HML). Despite these differences, the two models give the same conclusions between the management styles and fund types; All groups underperform in relation to the benchmark index, but ESG achieves a higher alpha estimate than conventional funds. Passive performs better than the active management style.

5.1.4 Other performance measurements

We will now analyse the various performance measures we introduced in Section 3.4. In order to be able to compare the categories against each other, it is useful to use risk-adjusted-performance measurements. This helps us to nuance the picture of the risk associated with the return achieved. In this section we will address the Sharpe ratio, Treynor ratio, Appraisal ratio (AR) and information ratio (IR) for the entire sample period. We will also comment on the activity measurements, R^2 and Tracking error. Tables 6 and 7 show the performance and the activity measures for both the sustainable and conventional funds respectively, divided into active and passive management.

Table 6: The summary of performance measurements for the ESG funds

Table 6 displays a summary of the performance and the activity measurement for the active and passive ESG funds. The metrics used to calculate the different measurements are described in section 3. All the numbers are displayed in monthly terms.

	Active portfolio				Passive portfolio			
	Mean	Min	Max	Median	Mean	Min	Max	Median
Mean return	0,009	-0,008	0,015	0,010	0,008	0,004	0,013	0,008
Std. deviation	0,048	0,029	0,111	0,047	0,045	0,032	0,052	0,045
Sharpe ratio	0,181	-0,083	0,317	0,187	0,155	0,061	0,289	0,154
Four factor Treynorrate	0,010	-0,008	0,021	0,010	0,009	0,003	0,018	0,007
Five factor Treynorrate	0,010	-0,008	0,026	0,010	0,010	0,004	0,021	0,008
Four factor Appraisal ratio	-0,067	-0,250	0,083	-0,069	-0,052	-0,118	0,075	-0,094
Five factor Appraisal ratio	-0,062	-0,256	0,104	-0,066	-0,049	-0,119	0,076	-0,093
Four factor Information ratio	-0,151	-0,469	0,096	-0,146	-0,172	-0,385	0,082	-0,186
Five factor Information ratio	-0,141	-0,449	0,130	-0,141	-0,166	-0,367	0,083	-0,192
Tracking error	0,025	0,010	0,104	0,023	0,025	0,011	0,040	0,026
Four factor R^2	0,712	0,182	0,956	0,817	0,730	0,307	0,950	0,787
Five factor R^2	0,776	9,184	0,959	0,828	0,730	0,321	0,949	0,784

The active sustainable portfolio achieves a higher average monthly return and a higher standard deviation than the passive portfolio, but the difference is minor. Sharpe ratio tells us whether a portfolio's return is due to good investment decisions or if it is only a result of increased risk. In contrast to the Sharpe ratio, the Treynor ratio only takes into account systematic risk, as it uses the beta value for the individual fund. For the entire period, we observe that active management performs best with a Sharpe ratio of 0.181. The same applies to the four-factor Treynor rate, but the performance between passive and active is exactly the same with the five-factor model.

The appraisal ratio is used to measure the quality of a fund's ability to choose good investment options. It evaluates the fund's alpha in relation to the portfolio's unsystematic risk. The table shows that both management strategies give a negative AR, but the passive portfolio achieves the best result. In practice, a negative AR will mean that they do not achieve an excess return in relation to unsystematic risk. These values are not unexpected, considering that the majority of the alpha values are negative.

The information ratio (IR) measures the portfolio manager's ability to create excess returns relative to a benchmark index but is also an attempt to identify investor consistency. The higher the IR, the more consistent the manager will be. Active management provides a higher IR than a passive strategy, but both values are negative. Both models give the same results. This is also expected, as the formula for this target number also uses the alpha values we have obtained in the regressions.

Regarding the activity measurements, a high Tracking error and a low R^2 will demonstrate higher levels of active management. It is therefore expected that the active portfolio will show these signs. We can see from the table that there are no clear signs that the active portfolio yields a higher level of active management than the passive. These results are unexpected, as the tracking error for active funds usually is between 4% or 5% on an annual basis.

Table 7: The summary of performance measurements for the Conventional funds

Table 7 displays a summary of the performance and the activity measurement for the active and passive conventional funds. The metrics used to calculate the different measurements are described in section 3. All the numbers are displayed in monthly percentages.

	Active portfolio				Passive portfolio			
	Mean	Min	Max	Median	Mean	Min	Max	Median
Mean return	0,009	-0,005	0,067	0,008	0,009	0,003	0,014	0,009
Std. deviation	0,055	0,028	0,450	0,049	0,045	0,036	0,054	0,045
Sharpe ratio	0,124	-0,096	0,338	0,114	0,173	0,040	0,304	0,171
Four factor Treynorrate	0,007	-0,010	0,049	0,006	0,009	0,003	0,020	0,009
Five factor Treynorrate	0,059	0,042	0,831	0,050	0,010	0,003	0,022	0,009
Four factor Appraisal ratio	-0,084	-0,211	0,143	-0,094	-0,054	-0,131	0,096	-0,067
Five factor Appraisal ratio	-0,079	-0,219	0,165	-0,090	-0,050	-0,130	0,096	-0,063
Four factor Information ratio	-0,212	-0,590	0,154	-0,206	-0,167	-0,543	0,104	-0,131
Five factor Information ratio	-0,201	-0,580	0,178	-0,211	-0,161	-0,536	0,105	-0,125
Tracking error	0,025	0,011	0,097	0,024	0,022	0,011	0,039	0,021
Four factor R^2	0,809	0,058	0,958	0,863	0,769	0,404	0,954	0,804
Five factor R^2	0,814	0,028	0,958	0,886	0,772	0,398	0,957	0,806

For the conventional portfolios, both have the same average return per month, but the active portfolio yields a higher standard deviation than the passive one. Based on this, we can easily see that a risk-averse investor would choose the passive portfolio. Therefore, it is also expected that the passive portfolio has a higher Sharpe ratio. Both the four-factor and five-factor Treynor ratios come to the same conclusion.

Considering both the Appraisal and Information ratios, we get negative values for both funds, regardless of which model is used. Nevertheless, both methods conclude that the passive portfolio performs better than the active one.

The activity measurements reveal that the tracking error is higher for the active portfolio, as expected. However, it is at a lower level than we usually would expect for active funds. The R^2 is also at a higher level than the passive one, which is not in line with our expectations.

In summary, the different methods will provide different conclusions. This makes it difficult to give a clear answer to our hypotheses. However, comparing across fund types, the conventional active portfolio achieves the lowest risk-adjusted return regardless of which performance measurement that is used.

5.2 Fund performance of the sub-sample period

In section 4.2.6, we discussed the choice of the time period for the analysis and came to the conclusion that the period we have chosen is characterized by two downturns. Therefore, we chose to include another hypothesis for this thesis:

Hypothesis 3: Sustainable funds outperform their conventional peers during a market crisis

In order to test the hypothesis, we did an additional analysis where we excluded the year 2020 to observe the impact COVID-19 had on the sample. This subsection reviews the regression results by using the CAPM model, Fama-French three-factor, Carhart four-factor model and Fama-French five-factor model. It is separated into two different parts: The first one contains the regression for the combined portfolio, while the second displays the results from the regressions when we have divided it into active and passive management.

5.2.1 Regression results – combined portfolios

As elaborated in the hypothesis section, we expect to find that sustainable funds outperform their conventional peers during a market crisis. Table 8 below reports the portfolios' regression results before we have distinguished between active and passive management.

Table 8: Regression results for the combined portfolios, excluding 2020

The table shows the regression results of the combined portfolios for both the ESG and conventional portfolios when 2020 is excluded. In columns (1) and (5) the CAPM is used. Column (2) and (6) shows the results from the Fama-French three-factor model. Column (3) and (7) contains the results from the Carhart four-factor model and column (4) and (8) displays the results from the Fama-French five-factor model. At the left side of the table, we have included the regressions of the differences between the Carhart model (9) and the Fama-French five-factor model (10).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	ESG	ESG	ESG	ESG	Conv	Conv	Conv	Conv	ESG-Conv	ESG-Conv
α	-0,0024*	-0,0023*	-0,0023*	-0,0021*	-0,0026	-0,0025*	-0,0025*	-0,0024	0,0002	0,0003
	(-1,93)	(-1,85)	(-1,84)	(-1,71)	(-1,67)	(-1,70)	(-1,68)	(-1,66)	(0,31)	(0,44)
βmkt	0,845***	0,827***	0,828***	0,821***	0,870***	0,856***	0,852***	0,862***	-0,023	-0,041**
	(18,69)	(17,44)	(1,51)	(15,40)	(17,98)	(18,53)	(17,9)	(17,34)	(-1,56)	(-2,43)
βSMB		0,078	0,078	0,058		0,064	0,062	0,024	0,016	0,033
		(1,63)	(1,62)	(1,00)		(1,33)	(1,35)	(0,43)	(0,79)	(1,40)
βHML		-0,054	-0,051	-0,081		-0,054	-0,061	-0,044	0,01	0,019
		(-1,35)	(-1,04)	(-0,50)		(-0,96)	(-1,12)	(-0,63)	(0,47)	(0,54)
βMOM			0,004				-0,010		0,014	
			(0,09)				(-0,18)		(0,45)	
βRMW				-0,081				-0,151		0,070*
				(-0,76)				(-1,43)		(1,82)
βCMA				0,062				-0,0007		-0,061*
				(-0,73)				(-0,01)		(-1,79)
N	51	51	51	51	51	51	51	51	51	51
R^2	0,927	0,931	0,931	0,933	0,916	0,919	0,919	0,923	0,048	0,094

Table 8 reveals that the alpha values have become less significant when we exclude 2020. In relation to the market, both still underperform. As expected, both groups perform better than when we analysed the entire time period. The differences are still not statistically significant. One possible explanation for the alpha values being less significant is that we consider a shorter time period with fewer observations. Besides this, there are minimal changes in the results regarding the risk factors and R^2.

Due to the increased alpha values, the changes are greater for the conventional portfolio than for the sustainable one. This indicates that the conventional funds' risk-adjusted returns are to a greater extent negatively affected by a global market crisis such as COVID-19. This is consistent with our hypothesis and also in line with previous literature. Nofsinger et al. (2014) found evidence that sustainable funds outperformed conventional funds during the financial crisis of 2008, while Omura et al. (2020) found that they outperformed conventional investments during the covid-19 pandemic.

5.2.2 Regression results – separated into active and passive

In this second part we apply the same four regression models but divide the two categories into actively and passively managed funds. We will first discuss the results from the sustainable portfolios before we move on to the conventional portfolios. We do this in order to examine if we obtain the same conclusion as in 5.2.1 regardless of management style. Table 9 displays output from the results of the sustainable portfolio and Table 10 shows the results of the conventional portfolio.

Table 9: Regression results for the active and passive ESG portfolios, excluding 2020

The table shows the regression results of the ESG portfolios divided into active and passive management when 2020 is excluded. In columns (1) and (5) the CAPM is used. Column (2) and (6) shows the results from the Fama-French three-factor model. Column (3) and (7) contains the results from the Carhart four-factor model and column (4) and (8) displays the results from the Fama-French five-factor model.

	(1) Active	(2) Active	(3) Active	(4) Active	(5) Passive	(6) Passive	(7) Passive	(8) Passive
α	-0,0028*	-0,0028*	-0,0028*	-0,0026*	-0,0013	-0,0009	-0,0009	-0,0009
	(-1,75)	(-1,85)	(-1,82)	(-1,83)	(-0,71)	(-0,49)	(-0,53)	(-0,47)
βmkt	0,886***	0,872***	0,864***	0,880***	0,784***	0,767***	0,786***	0,767***
	(18,50)	(20,38)	(19,48)	(19,57)	(11,73)	(10,00)	(9,64)	(8,77)
βSMB		0,064	0,062	0,018		0,060	0,065	0,059
		(1,35)	(1,36)	(0,32)		(0,75)	(0,82)	(0,63)
βHML		-0,074	-0,087	-0,061		0,050	0,081	0,052
		(-1.22)	(-1.58)	(-0,86)		(0,90)	(1,14)	(0,64)
βMOM			-0,021				0,049	
			(-0,36)				(0,66)	
βRMW				-0,178*				-0,002
				(-1,78)				(-0.01)
βCMA				0,0001				-0,005
				(0,00)				(-0,04)
N	51	51	51	51	51	51	51	51
R^2	0,917	0,921	0,921	0,926	0,821	0,825	0,827	0,825

As we observed in the previous subsection, the alpha values are less negative for the regression that excludes 2020, which implies that the risk-adjusted return improves when the period of the COVID-19 pandemic is removed from the sample. For the active sustainable portfolio, we have statistically significant alpha values at a 10% level.

Furthermore, we see that there are few factors that have a statistically significant impact on the excess return. However, for the active portfolio, there is a negative exposure to the profitability factor (RMW). This implies that the portfolio is more exposed to companies with weaker profitability. R^2 remains at relatively the same level as before.

Table 10 contains the results from the active and passive conventional portfolios.

Table 10: Regression results for the active and passive conventional portfolios, excluding 2020

The table shows the regression results of the conventional portfolios divided into active and passive management when 2020 is excluded. In columns (1) and (5) the CAPM is used. Column (2) and (6) shows the results from the Fama-French three-factor model. Column (3) and (7) contains the results from the Carhart four-factor model and column (4) and (8) displays the results from the Fama-French five-factor model.

	(1) Active	(2) Active	(3) Active	(4) Active	(5) Passive	(6) Passive	(7) Passive	(8) Passive
α	-0,0023**	-0,0022**	-0,0022*	-0,0020*	-0,0020	-0,0012	-0,0014	-0,0011
	(-2,06)	(-2,02)	(-1,98)	(-1,90)	(-0,98)	(-0,63)	(-0,78)	(-0,52)
βmkt	0,746***	0,731***	0,729***	0,726***	0,803***	0,777***	0,828***	0,763***
	(18,89)	(18,10)	(17,00)	(16,10)	(11,16)	(9,71)	(9,05)	(8,10)
βSMB		0,068	0,068	0,049		0,083	0,099	0,087
		(1,66)	(1,64)	(0,99)		(0,89)	(1,04)	(0,78)
βHML		-0,058	-0,060	-0,032		0,138**	0,224***	0,169**
		(-1,61)	(-1,36)	(-0,74)		(2,07)	(2,97)	(2,03)
βMOM			-0,004				0,137*	
			(-0,10)				(1,70)	
βRMW				-0,076				0,008
				(-0,82)				-0,05
βCMA				-0,053				-0,084
				(-0,72)				(-0,57)
N	51	51	51	51	51	51	51	51
R^2	0,929	0,934	0,934	0,936	0,786	0,806	0,817	0,807

The findings in Table 10 reveal the same pattern as we saw in Table 9. The alpha values become less negative, but the passive portfolio has no significant alpha values.

We also notice that there is a positive exposure to both the value factor (HML) in all of the factor models and the momentum factor (MOM) when using the Carhart four-factor model for the passive portfolio. This indicates that they have invested in the winners on the stock market, as well as they are turned towards companies with a high book-to-market value. Both of these contributes to an increased excess return.

In summary, we see that the results from the sub-sample period contribute to a less negative alpha value in all portfolios, indicating that the crisis period captures some of the negative excess return. The changes from the whole sample period to the sub-sample period show that ESG is less sensitive to financial crises. In total, the alpha value of the sustainable portfolio changes by approximately 7%, while for the conventional portfolio it changes by almost 49%. All the analyses from Section 5.2 provide the same result as predicted in hypothesis three. This is in line with the previous studies.

The analysis related to Table 8 suggests that there is no statistical difference between the four portfolios when the active and passive management is combined. To further examine if this still holds after we distinguish between management styles, we have added regressions on the differences below. To concretize the results in this thesis, we chose to only submit the results from the Carhart four-factor model, while the results from the Fama-French five-factor model can be found in the appendix.

Table 11: Regression on the difference of the sustainable and conventional portfolio, excluding 2020

The table shows the regression results done on the differences of the sustainable and conventional portfolios using the Carhart model when 2020 is excluded.

	α	βmkt	βSMB	βHML	βMOM	N	R^2
Active ESG - Active Conv	0,0006	-0,135***	0,006	0,027	0,017	51	0,460
	(-0,74)	(-7,29)	(-0,25)	(-1,06)	(-0,45)		
Passive ESG - Passive Conv	-0,0018	0,0785	-0,004	-0,168***	-0,071	51	0,207
	(-1.33)	(-1,35)	(-0,05)	(-3,03)	(-1,08)		

Table 11 reveals the same results as earlier, and we find no statistical evidence that there is a difference between sustainable and conventional portfolios.

5.3 Additional analysis

This section represents an additional analysis of the funds that are located at each extreme in terms of sustainability rating. We assume that there are large differences between the structures of these two extremes regarding investment choices. For the group with a sustainability rating of five, there will be restrictions such as a limited asset universe. In contrast, the group with a rating of one will not face these challenges. It is likely that these funds contain investments that are not considered sustainable, for example in the fossil fuel industry (oil, gas and coal), the mining of minerals, ferrous, non-ferrous and precious metals, as well as other raw materials. In order to examine this, we created two new active portfolios: One with funds that have a rating of one and the other with a rating of five. By constructing these two portfolios, we get the opportunity to study whether there are any systematic differences between these when it comes to excess return and the sensitivity to different risk factors.

We have made regressions for both the entire time period and the sub-sample period where 2020 is excluded. The first section of the additional analysis examines the relationship between the two portfolios during the entire time period. This will help to create a better basis for responding to hypothesis 2. Second, we present the results that study the relationship when applying the sub-sample period in our regression. By including this, our aim is to give a further explanation of our third hypothesis.

Hypothesis 2: There are no significant difference for the financial performance between sustainable and conventional funds

Hypothesis 3: Sustainable funds outperforms their conventional peers during a market crisis

The results are presented in Tables 12 and 13. First, we examine the whole sample period.

Table 12: OneGlobe - FiveGlobes using the whole time period

Table 12 presents the results of the estimation from CAPM, Fama-French three-factor, and Carhart four-factor models for the whole time period. The model distinguishing between the different ratings. (1) to (3) represent the results for the conventional funds and column (4) to (6) represent the results for the ESG funds. Columns (9) and (10) show how the performance difference for 1 Globe funds relative to 5 Globes funds.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	1 Globe	1 Globe	1 Globe	1 Globe	5 Globes	5 Globes	5 Globes	5 Globes	1 Globe - 5 Globes	1 Globe - 5 Globes
α	-0,0060***	-0,0044***	-0,0045***	-0,0042***	-0,0025*	-0,0031**	-0,0031**	-0,0028**	0,0015	0,0014
	(-3,37)	(-2,86)	(-2,91)	(-2,80)	(-1,79)	(-2,34)	(-2,33)	(-2,14)	(-1,51)	(-1,53)
βmkt	1,084***	1,017***	0,995***	1,002***	0,859***	0,856***	0,869***	0,839***	-0,126***	-0,164***
	(-16,32)	(-14,99)	(-15,57)	(-15,86)	(-14,74)	(-13,67)	(-14,47)	(-13,49)	(-7,14)	(-5,06)
βSMB		0,183***	0,152**	0,170**		0,063	0,080	0,040	-0,072*	-0,130***
		(-2,96)	(-2,5)	(-2,36)		(-1,13)	(-1,45)	(-0,71)	(-1,90)	(-2,76)
βHML		0,082	0,040	0,132*		-0,090*	-0,066	-0,020	-0,106***	-0,153***
		(-1,39)	(-0,55)	(-1,77)		(-1,79)	(-1,04)	(-0,33)	(-3,31)	(-3,56)
βMOM			-0,089				0,051		0,140***	
			(-1,63)				(-0,84)		(-5,12)	
βRMW				-0,014				-0,037		-0,022
				(-0,08)				(-0,23)		(-0,31)
βCMA				-0,162				-0,220**		-0,057
				(-1,44)				(-2,21)		(-1,22)
N	63	63	63	63	63	63	63	63	63	63
R^2	0,925	0,938	0,940	0,940	0,909	0,913	0,914	0,918	0,801	0,738

From Table 12 we observe that the negative alpha values are statistically significant for both portfolios, regardless of which model is used. This indicates that the funds tend to underperform in relation to the market. However, the difference between the two portfolios is not statistically significant, hence we cannot state that there is a significant difference between the two. This supports our previous analyses and helps to further confirm that hypothesis 2 is true for our sample.

In terms of market beta, the coefficients for the portfolio with one globe are slightly greater than one, which implies that it is more sensitive to the fluctuations in the market returns. The opposite holds for the sustainable portfolio. For the least sustainable portfolio, we find evidence that excess return is partially driven by small-capitalization stocks. The five-factor model also shows that it has a positive exposure to the value factor (HML). We notice that the inclusion of extra risk factors for the sustainable portfolio causes the value factor (HML) to lose its level of significance. However, we find that the investment factor (CMA) is significant for the five-factor model. Hence, the excess return from CAPM can also be explained by this factor.

We find an R^2 above 90% for all models, which means that the model has high explanatory power. The degree of explanation does not increase much when additional risk factors are added. This indicates that the market beta explains most of the variation in the excess return.

Secondly, we will look at the sub-sample period.

Table 13: OneGlobe – FiveGlobes, excluding 2020

Table 13 presents the results of the estimation from CAPM, Fama-French three-factor, and Carhart four-factor Models when we exclude 2020. The model distinguishing between the different ratings. (1) to (3) represent the results for the conventional funds and column (4) to (6) represent the results for the ESG funds. Columns (9) and (10) show how the performance difference for 1 Globe funds relative to 5 Globes funds.

	(1) 1 Globe	(2) 1 Globe	(3) 1 Globe	(4) 1 Globe	(5) 5 Globes	(6) 5 Globes	(7) 5 Globes	(8) 5 Globes	(9) 1 Globe - 5 Globes	(10) 1 Globe - 5 Globes
α	-0,0045***	-0,0037**	-0,0036**	-0,0034**	-0,0023	-0,0024*	-0,0024*	-0,0021	0,0012	0,0014
	(-2,74)	(-2,34)	(-2,22)	(-2,23)	(-1,63)	(-1,80)	(-1,82)	(-1,60)	(-1,17)	(-1,16)
βmkt	0,993***	0,955***	0,919***	0,947***	0,842***	0,830***	0,837***	0,818***	-0,082***	-0,129***
	(-18,58)	(-18,01)	(-17,27)	(-15,58)	(-15,88)	(-15,61)	(-15,66)	(-13,76)	(-2,94)	(-3,83)
βSMB		0,144**	0,133**	0,111		0,070	0,072	0,038	-0,060	-0,074
		(-2,38)	(-2,34)	(-1,56)		(-1,41)	(-1,40)	(-0,63)	(-1,57)	(-1,60)
βHML		0,060	-0,001	0,106		-0,126***	-0,113*	-0,075	-0,111**	-0,180***
		(-1,11)	(-0,02)	(-1,48)		(-2,85)	(-1,98)	(-1,42)	(-2,66)	(-2,94)
βMOM			-0,097*				0,021		0,119***	
			(-2,01)				(-0,42)		(-3,66)	
βRMW				-0,131				-0,131		-0,0002
				(-0,95)				(-1,19)		(-0,00)
βCMA				-0,094				-0,110		-0,016
				(-0,72)				(-1,24)		(-0,16)
N	51	51	51	51	51	51	51	51	51	51
R^2	0,915	0,927	0,931	0,930	0,902	0,913	0,914	0,919	0,638	0,558

As expected, the alpha values become less negative when we exclude 2020 and the significance level decreases. For the five-globe portfolio, there is a smaller change than for the one-globe portfolio. This again emphasizes that more sustainable funds are less sensitive during crises and supports our third hypothesis.

The sub-sample period reveals that the factor measuring the size (SMB) for one globe loses its significance when controlling for additional risk factors from the five-factor model. In column (3), we see a negative exposure to the momentum factor (MOM), which means that the portfolio tends to invest more in past loser socks.

As before, the value factor for the portfolio with five globes loses its significance when we add more risk factors in the five-factor model. In addition, the investment factor (CMA) is no longer significant.

In summary, we come to the same conclusions as in chapter 5.1 and 5.2. There is no statistically significant difference between the extremes in the portfolio. The results also reveal that the period excluding 2020 contribute to less negative alpha values in the portfolios. Furthermore, the change is smaller for the five-globes, indicating that sustainable funds fare significantly better than non-sustainable funds.

5.4 Summary of the results

Section 5.1 presents the results related to the first and second hypotheses. In order to test these, we analysed active and passive management strategies within both ESG and conventional funds. We have done this by analysing the significance of the excess return that the funds have achieved over the last five-year period and looking at other variables that also affect this. In addition, we have assessed the funds by using known performance measurements to see if this is in line with the regression results. It is important to use risk-adjusted targets in such an analysis so that the return is attributed to the managers, and not risky positions.

Hypothesis 1: Actively managed funds perform better than passively managed funds during the entire time period

Hypothesis 2: There are no significant difference for the financial performance between sustainable and conventional funds

We began our analyses at an overall level by dividing the 455 funds into different portfolios. We then found evidence that the majority of the funds underperformed in relation to the chosen benchmark index (MKT). We used the CAPM model, Fama-French three-factor model, Carhart four-factor model and Fama-French five-factor model in our regressions to see if adding additional risk factors could help explain the risk-adjusted excess return. The results from these analyses suggested that passive funds outperformed active funds, however the differences were not statistically significant. These results were unexpected, and we could therefore not confirm hypothesis 1. Furthermore, we tested if there was a difference between sustainable and conventional funds and concluded that our results were in line with hypothesis 2.

Throughout all regressions, the market beta has been significant for the constructed portfolios. For the ESG portfolios, the excess return for the active portfolio could be explained by the

investment factor (CMA), while for the passive portfolio it was positively exposed to the value factor (HML). On the other hand, none of the risk factors were significant in the regressions made on the conventional portfolios.

Subsequently, further regressions were made for each individual fund within the four categories. These were then divided into five sustainability ratings to make it easier to compare them against each other and uncover any differences. This should also help to provide a better basis for answering our research question. Using average alpha values, the results we had previously obtained were further strengthened: on average, ESG achieved better alpha values than conventional funds, while passive funds had higher alpha than active funds. There were no significant positive alpha values. The outcomes we obtained in this section reflected the results we had achieved previously.

Finally, we also used different performance measures to assess whether our results are in line with other methods used to measure risk-adjusted returns. Using Sharpe and Treynor, we got divergent results from earlier regarding the ESG portfolios. The active portfolio ended up at a higher rate than the passive portfolio. The same thing happens with the use of information ratio. Despite this, the appraisal ratio supports the results we have obtained in the regression analysis.

The activity measures gave us unexpected results when we examine passive vs. active funds. We would expect the passive funds to have a higher R^2 and a lower tracking error than the active funds. We find that there are no major differences between the groups but are also aware that this may be explained by the choice of benchmark index.

Our choice of time period was also characterized by two different periods of decline; first in December 2018 and then in March 2020. Because of this, we included a third hypothesis:

Hypothesis 3: Sustainable funds outperforms their conventional peers during a market crisis

We chose to do a further study by removing one period to be able to see what effect this has had on our results. In the regression analyses performed on the constructed portfolios, we came to the same conclusion as before. All portfolios underperform in relation to the market, but we receive less significant alpha values. The most important difference is that the alpha value of the sustainable portfolio changes by approximately 7% from the full sample to the sub-sample, while for the conventional portfolio it changes by almost 49%. Consistent with previous research, our results indicate that the conventional funds' risk-adjusted returns are to a greater

extent negatively affected by a global market crisis such as COVID-19. All the analyses from Section 5.2 provide the same result as predicted in hypothesis three.

Table 12 and 13 is included to provide additional insight into the extremes of our funds, based on sustainability rating. From these results we find similarities with what we have seen before; Both those with a high ESG score and those with the lowest rank underperform in relation to the market, regardless of whether we include the entire period or the sub-sample period. According to the regression, it seems that the one with the highest-ranking does the best, but we cannot state that there is a difference between them.

In the next part, we have chosen to include an additional analysis to see if it is possible to create a strategy to beat the market index.

5.5 Portfolio approach to measure performance

Finally, we will use a portfolio approach to try to build a strategy that can consequently outperform the market. In order to test this, we constructed two different strategies that we tested: (1) Based on the highest mean return in the previous period and (2) Based on the highest Sharpe ratio for the previous period within both categories ESG and conventional. We chose each period to last half a year. After each period, we rebalanced the portfolio and made new investments based on the most recent information. The starting point for the investments was a sum of one million dollars. When rebalancing, we reinvested the remaining amount regardless of whether it had increased or not. The investment is based on a value-weighted approach that took the size of the fund into account. I.e., we invested more in the largest funds.

Since we have extracted data from October 2015 to December 2020, the first day of the investments begins in July 2016 and lasts until December 2020. We include two benchmark indexes in the same graphs. Due to the fact that many of the fund's state MSCI ACWI as their benchmark index we believe it is also reasonable to compare the strategies in relation to this index as well as the MKT index. The results are presented in Figures 7 and 8.

Figure 7: Strategy of using the highest mean returns with semi-annually rebalancing

Figure 7 illustrates the strategy when using the highest mean returns with semi-annually rebalancing. The blue and green line represents the conventional and ESG funds respectively, from the period January 2017 to December 2020. The grey line represents the market index (MKT), and the yellow line represents the MSCI ACWI Index. All numbers are in terms of millions.

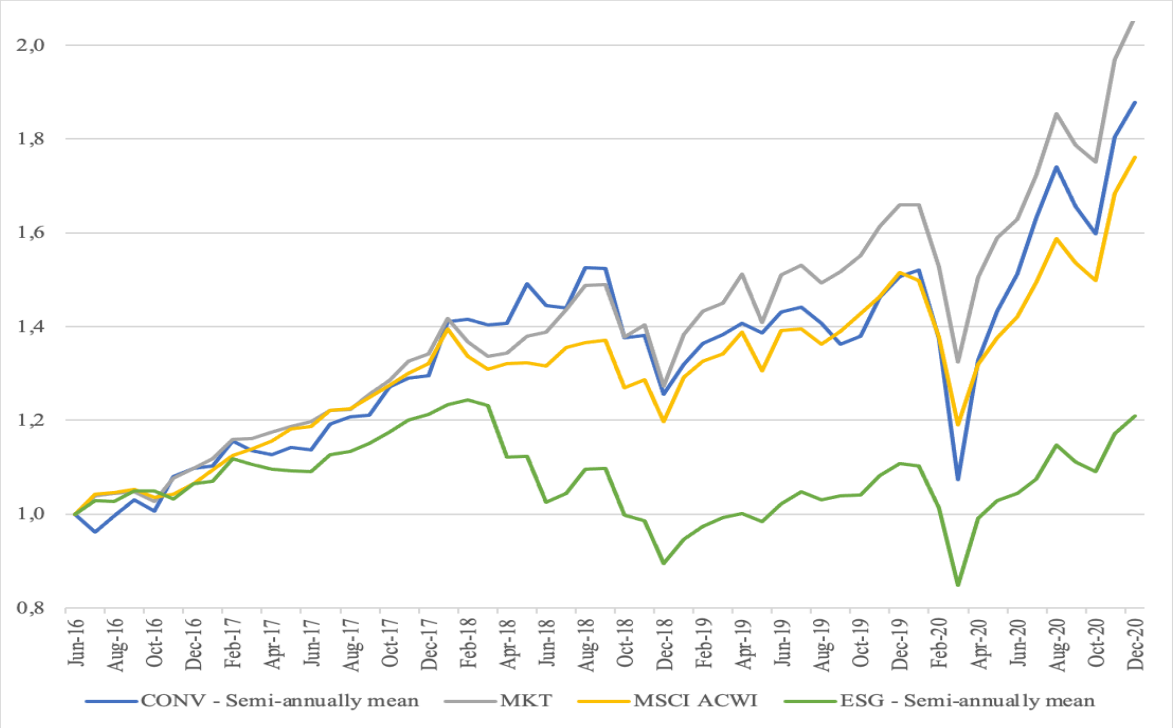
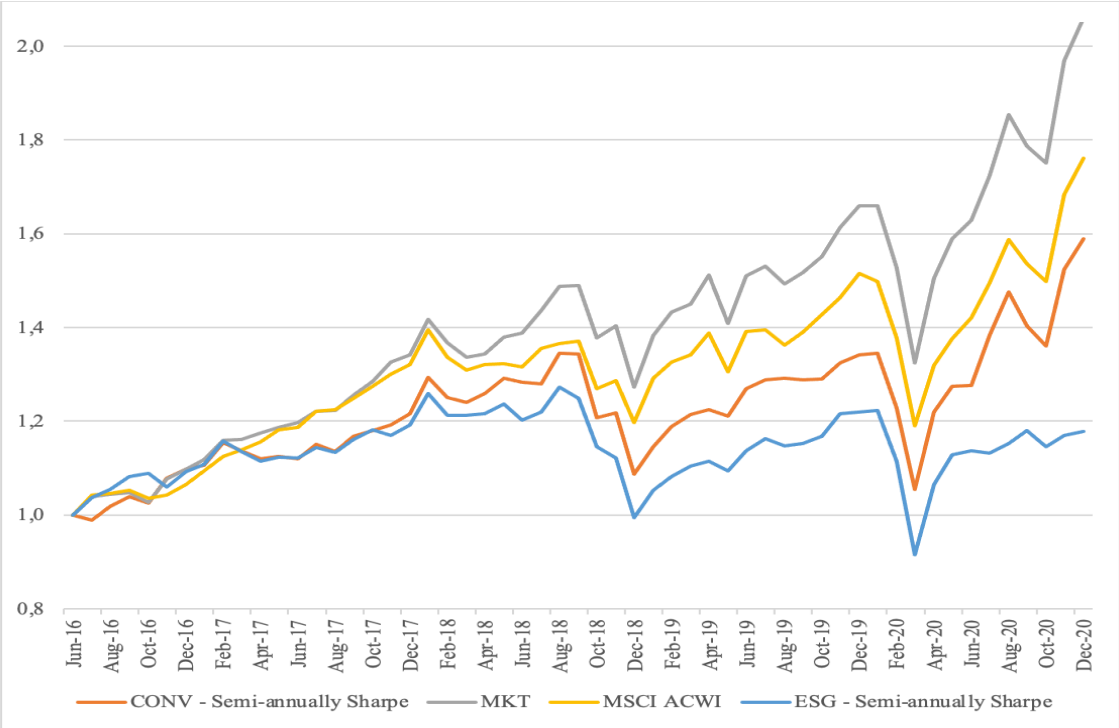


Figure 7 illustrates the strategy based on the highest mean return. From the figure, we observe that the strategy leads to a positive return for both the sustainable and the conventional portfolios when considering the entire period. However, there are major differences between the two. The conventional one achieves a total return of approximately 88%, while the sustainable accomplishes a return of approximately 21%. None of the strategies manage to beat the market index (MKT), but the conventional portfolio outperforms the MSCI when considering the entire time period. This reflects what we have seen earlier in the analysis and is not a surprising result considering most of the alpha values we have obtained are negative.

Next, we present the graph containing the strategy that uses the Sharpe ratio as the criteria.

Figure 8: Strategy of using the highest Sharpe ratio with semi-annually rebalancing

Figure 8 illustrates the strategy when using the highest Sharpe ratio with semi-annually rebalancing. The blue and green line represents the conventional and ESG funds respectively, from the period January 2017 to December 2020. The grey line represents the market index (MKT), and the yellow line represents the MSCI ACWI Index. All numbers are in terms of millions.



The results from Table 8 suggest that using the Sharpe method, none of the strategies manage to beat the two included benchmark indexes. Both of the portfolios achieve a positive return during the entire period, however using the Sharpe ratio seems to be an undesirable investment strategy compared to using the highest mean return as a criterion. The conventional portfolio yields a total return of approximately 59%, while the sustainable end up with 18%.

In summary, we can state that it is difficult to find a strategy that beats the market index (MKT). The market has more than doubled during the time period that we examine, and it is difficult to find a strategy that can match this. Nevertheless, we see that it may be possible to develop a strategy that can beat the MSCI index.

Despite this, there are no unambiguous results when using a specific strategy. Despite the fact that we have observed that the strategy using the highest mean return for the conventional portfolio tends to outperform the MSCI ACWI index, we cannot state with certainty that it will work in the future. There is therefore a high probability that this may be due to luck. This is not

unexpected and summarizes the results we have seen throughout the thesis with almost exclusively negative alpha values.

5.6 Limitation of the dataset

As mentioned earlier, all our funds are active throughout the sample period. During the period there will be “dead funds” that are either terminated or merged into other funds because of poor performance. When not including these funds, the data will be likely to suffer from survivorship bias. This can lead to an upward bias of the results, and the conclusions might differ from a situation where all funds were included (Rohleder et al., 2007). However, since our thesis is dependent on data for the sustainability rating of the funds, we could not include terminated funds in our research. The reason being the lack of sustainability ratings for funds that do no longer exist. In addition, we find it reasonable to assume that “dead” funds are equally distributed between the ESG funds and the conventional funds. Since part of our research question is to compare the performance of the two groups, we assume that this will not affect our results significantly.

When we had to distinguish between the two groups for ESG and conventional, we chose to use the Morningstar sustainability rating. For ESG we chose all the funds that had a rating "above average" and above, while for conventional we chose those with an "average" rating and below. To create a clearer distinction between these two groups, it can be argued that the group with the "average" rating should have been excluded.

Furthermore, the data provided by Morningstar displays how the funds perform in relation to the various ESG factors at the present time. This means that you cannot see how they have performed in the past. In a paper published by Wimmer (2012) he found that funds with a high ESG score maintained a high score for two years on average. This means that we cannot fully rely on the sustainability scores obtained for each fund. However, the risk that there have been changes in this score decreases when analysing a shorter time period. Based on this, one should choose a shorter dataset to get the most accurate rating of the funds.

By choosing a shorter length of the time horizon, there is a danger that the period will not be sufficient to reveal any trends and economic conditions in the market, which is easier to capture if you use longer time periods. It will also be more difficult to generalize our results. Since our

time period also includes two periods of decline, there is a danger that the distribution of the data may be particularly affected by the extreme observations measured in conjecture with these two periods. Nevertheless, we have chosen to keep these outliers, as a change to the dataset can lead to an artificial improvement to the dataset. These can also be sources of interesting information. Choosing a longer period of time would also lead to a smaller selection of funds.

Therefore, we are left with a trade-off between choosing a shorter horizon that allows us to include more funds and means that the Morningstar sustainability ratings are more relevant or a longer dataset that can more easily reveal trends and economic conditions, which also makes it easier to generalize the results. We therefore tried to find a balance between these and ended up with a range of just above five years.

6. Conclusion

The main purpose of this study is to compare sustainable and conventional investment opportunities by looking at both active and passive management. We examine whether there is a difference in financial performance and explore potential differences in risk factor exposure between the two investment approaches. We examine 455 different equity funds over a period from October 2015 to December 2020. The choice of this period gives us the opportunity to study the COVID-19 pandemic and its effects. Therefore, we included a sub-sample period excluding the year 2020 to capture this.

Based on our analyses, we find evidence that both active sustainable and conventional funds underperform in relation to the market, with an indication that sustainable funds perform slightly better. However, we find no significant difference between these. Based on previous research on the same issue, it was expected that we would not have a statistically significant difference between the two approaches. Unlike previous studies, we get fewer negative alpha values for the funds that are categorized within ESG. This can be explained by choice of the time period and how we have chosen to distinguish between sustainable and conventional.

It also appears that the passive funds in the data set have a higher alpha value than their respective counterparties, but it is difficult to establish this due to the fact that we have not received significant differences. These results are also in contrast to what we have seen in previous studies.

The results from our sub-sample period imply that the sustainable funds perform better during a financial crisis such as COVID-19 than the conventional funds. The funds underperform even though 2020 is excluded, but the results have improved. This is in line with previous studies covering the same period.

We conclude that we do not find evidence that active funds exhibit superior financial performance, nor do we find evidence that it pays to invest in sustainable alternatives. If we were only to take into account the individual regressions and disregard the level of significance, a preferred choice would be to invest in passive ESG funds. The passive funds would also be favoured by a risk-averse investor as opposed to their active counterparties due to the lower cost of investing and no evidence that it pays to invest in active funds.

Our results may be of interest to those who wish to examine the relationship between corporate social and financial performance. In addition, they show how active and passive management relate to sustainability. They could be useful for those who want to make sustainable investment choices, that also want to see if this choice affects the profitability in relation to investing in a conventional fund.

7. References

Arai, M., Lanz, D., O'Connor, S., Oulton, W., & Woll, L. (2018). *Global sustainable investment review*. Obtained from: http://www.gsi-alliance.org/wp-content/uploads/2019/06/GSIR_Review2018F.pdf

Bauer, R., Koedikj, K., & Otten, R. (2004). *International evidence on ethical mutual fund performance and investment style.* Obtained from: https://www.sciencedirect.com/science/article/pii/S0378426604001372

Beers, B. (2021, 14 May). P-Value. Obtained from: https://www.investopedia.com/terms/p/p-value.asp

Bodie, Z., Kane, A. & Marcus, A.J. (2017). *Investments* (11th edition), New York: McGraw-Hill Education.

Breadley, R.A., Myers, S.C., & Allen, F. (2017). *Principles of Corporate Finance* (12th edition). New York: McGraw-Hill Education.

Buffet, W. (1984). *The Superinvestors of Graham-and-Doddsville*. Obtained from: https://www8.gsb.columbia.edu/articles/columbia-business/superinvestors

Brooks, C. (2008). *Introductory Econometrics for Finance* (2th edition), New York: Cambridge University Press.

Boganes, H., & Olesen, A.V. (2019). *Active versus passive investing in emerging markets.* (NHH, Bergen). Obtained from: https://openaccess.nhh.no/nhh-xmlui/bitstream/handle/11250/2611605/masterthesis.pdf?sequence=1&isAllowed=y

Chang, C. E., Nelson, W. & Witte, H. D. (2012). *Do green mutual perform well? Management Research Review.* Obtained from: https://www.researchgate.net/publication/235263419_Do_green_mutual_funds_perform_well

Chappelow, J. (2021, January 19). Survivorship Bias Risk. Obtained from: https://www.investopedia.com/terms/s/survivorship-bias-risk.asp

Chen, J. (2020, November 7). Tracking Error. Obtained from: https://www.investopedia.com/terms/t/trackingerror.asp

Chen, J. (2020, October 6). Risk. Obtained from: https://www.investopedia.com/terms/r/risk.asp

Chen, X., Scholtens, B. (2018). *The urge to act: A comparison of active and passive socially responsible investment funds in the United States.* Obtained from: https://onlinelibrary.wiley.com/doi/abs/10.1002/csr.1529

Cheung, M.S.W., & Jerve, V.T. (2020). *Socially Responsible Investing (SRI) Mutual Funds and Market Crises.* (NHH, Bergen). Obtained from: https://openaccess.nhh.no/nhh-xmlui/bitstream/handle/11250/2679485/masterthesis.pdf?sequence=1

Christensson, L.S.B., & Skagestad, O.J. (2017). *Performance of Sustainable Investments.* (NHH, Bergen). Obtained from: https://openaccess.nhh.no/nhh-xmlui/bitstream/handle/11250/2486956/master2017.PDF?sequence=1

Fama, E.F. (1970). *Efficient capital markets: A review of theory and empirical work.* Obtained from: http://www.jstor.org/stable/2325486?seq=1#page_scan_tab_contents

Fama, E.F. & French K.R. (2008). "*Mutual Fund Performance*". Obtained from: https://www.evidenceinvestor.com/evidence/mutual-fund-performance-fama-french/mutual-fund-performance-fama-french-august-2008/

Fama, E.F., & French, K.R. (2010). *Luck versus Skill in the Cross Section of Mutual Fund Returns, The Journal of Finance*. Obtained from: https://onlinelibrary.wiley.com/doi/full/10.1111/j.1540-6261.2010.01598.x

French, K. (2021). Data Library. Obtained from http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

Ghoul, S.E., & Karoui, A. (2016). *Does corporate social responsibility affect mutual fund performance and flows?* Obtained from: https://www.sciencedirect.com/science/article/pii/S0378426616301935

Gil-Bazo, J., Ruiz-Verdu, P., & Santos, A.A.P. (2010). *The Performance of Socially Responsible Mutual Funds: The Role of Fees and Management Companies*. Obtained from: https://www.researchgate.net/publication/226251686_The_Performance_of_Socially_Responsible_Mutual_Funds_The_Role_of_Fees_and_Management_Companies

Grønnsund, N. & Lunde, K. (2010). *Aktiv forvaltning av norske aksjefond.* (NHH, Bergen). Obtained from: https://openaccess.nhh.no/nhh-xmlui/bitstream/handle/11250/168731/Gronsund%20og%20Lunde%202010.PDF?sequence=1&isAllowed=y

Hale, J. (2016, March 17). Morningstar Sustainability Rating. Obtained from: https://www.morningstar.no/no/news/148087/morningstar-sustainability-rating.aspx

Hall, M. (2020, June 5). What's the Relationship Between R-Squared and Beta? Obtained from: https://www.investopedia.com/ask/answers/012915/whats-relationship-between-r-squared-and-beta.asp

Hamilton, S., Jo, H., & Statman, M. (1993). *Doing Well while Doing Good? The Investment Performance of Socially Responsible Mutual Funds. Financial Analysts Journal 49(6, November-December):62-66.* Obtained from: https://www.academia.edu/449339/Hamilton_S_H_Jo_and_M_Statman_1993_Doing_Well_While_Doing_Good_The_Investment_Performance_of_Socially_Responsible_Mutual_Funds_Financial_Analysts_Journal_49_6_November_December_62_66

Hovstad, A. & Langedal, A.O. (2018). *Aktiv forvaltning i det norske Fondsmarkedet*. (NHH, Bergen). Obtained from: https://openaccess.nhh.no/nhh-

xmlui/bitstream/handle/11250/2586281/masterthesis.PDF?sequence=1&isAllowed=y&fbclid=IwAR04T2JmGqbY7SWL8T6rdJgH0SAnYVyuDMIYW4bGKhced2pWGYKXP7vAc7o

Hargrave, M. (2021, April 5). Standard Deviation. Obtained from: https://www.investopedia.com/terms/s/standarddeviation.asp

Hayes, A. (2020, October 3). Mutual Fund. Obtained from: https://www.investopedia.com/terms/m/mutualfund.asp

Jensen, M. (1968). "*The Performance of Mutual Funds in the Periode 1945-1964".* Obtained from: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=244153.

Kitces, M. (2016, September 7). Could The New Morningstar Sustainability Ratings Actually Change Corporate Responsibility? Obtained from: https://www.kitces.com/blog/morningstar-sustainability-ratings-review-esg-environment-social-governance-factor-globe-scores/

Keller, G. (2005). *Managerial Statistics* (7th edition), Duxbury.

Kendall, M. (1953). *The Analysis of Economic Time Series.* Obtained from: https://www.jstor.org/stable/2980947?seq=1#metadata_info_tab_contents

Kenton, W. (2021, April 1). Capital Asset Pricing Model (CAPM). Obtained from: https://www.investopedia.com/terms/c/capm.asp

Kenton, W. (2020, August 1). Historical Returns. Obtained from: https://www.investopedia.com/terms/h/historical-returns.asp

Lean, H. H., Ang, W. R., & Smyth, R. (2014). Performance and Performance Persistence of Socially Responsible Investment Funds in Europe and North America. Obtained from: https://www.researchgate.net/publication/266476109_Performance_and_Performance_Persistence_of_Socially_Responsible_Investment_Funds_in_Europe_and_North_America

Liberto, D. (2020, December 11). Appraisal Ratio. Obtained from: https://www.investopedia.com/terms/a/appraisalratio.asp

Lioudis, N. (2020, February 15). Passive vs. Active Portfolio Management: What's the Difference? Obtained from: https://www.investopedia.com/ask/answers/040315/what-difference-between-passive-and-active-portfolio-management.asp

Malkiel, B. G. (2003). *The Efficient Market Hypothesis and Its Critics.* Obtained from: https://www.aeaweb.org/articles?id=10.1257/089533003321164958

Miskolczi, P. (2017). *Note on simple and logarithmic return*. Obtained from: https://core.ac.uk/download/pdf/161062652.pdf

Murphy, C. (2020, October 1). Information Ratio – IR. Obtained from: https://www.investopedia.com/terms/i/informationratio.asp

Nilsen A.A. (2018, December 21). Nedgangen fortsetter – Oslo Børs under 800 poeng. *E24*. Obtained from: https://e24.no/boers-og-finans/i/4daggR/nedgangen-fortsetter-oslo-boers-under-800-poeng

Norcap. (2020, December). Passiv eller aktiv forvaltning? Obtained from: https://www.norcap.no/markedskommentar/passivelleraktivforvaltning/

Omura, A., Roca, E., & Nakai, M. (2020). *Does responsible investing pay during economic downturns: Evidence from the COVID-19 pandemic*. Obtain from: https://reader.elsevier.com/reader/sd/pii/S1544612320317281?token=1835670AE021135FB77E5A842B545CDEC625852C88393E2424B285310F56CD8F3AC500D9AC5AFC0276253AD7B07093D6&originRegion=eu-west-1&originCreation=20210503132737

Rennebog, L., Horst, J.T., & Zhang, C. (2008). *The price of ethics and stakeholder governance: The performance of socially responsible mutual funds*. Obtained from: https://reader.elsevier.com/reader/sd/pii/S0929119908000278?token=DABEC5FED386A07048D53D0E8832E71DD10B117AD051A1F8CF28F8BF732F741BE50CBCEF6636A92FB1C93D65D1E2E171&originRegion=eu-west-1&originCreation=20210503125523

Robeco (2020). ESG funds. Obtained from: https://www.robeco.com/en/key-strengths/sustainable-investing/glossary/esg-funds.html

Rohleder, M., Scholz, H., & Wilkens, M. (2011). *Survivorship Bias and Mutual Fund Performance: Relevance, Significance, and Methodical Differences.* Obtained from: https://www.semanticscholar.org/paper/Survivorship-Bias-and-Mutual-Fund-Performance%3A-and-Rohleder-Scholz/c697736c58ddcb5b59c07f34112a872522e11499

Rønningen, E.T., & Endresen, B. (2018). *Hvordan har nordisk-forvaltede grønne fond prestert mot alternative fondsinvesteringer?* (NMBU, Ås). Obtained from: https://nmbu.brage.unit.no/nmbu-xmlui/bitstream/handle/11250/2559059/EndresenR%C3%B8nningen2018.pdf?sequence=1&isAllowed=y&fbclid=IwAR3gu08SIvdi8EUsvFwALjnmalB8e11teIBJa3RUXpBcP0e26w6kbFWl_-s

Schröder, M. (2004). *The Performance of Socially Responsible Investments: Investment Funds and Indices*. Obtained from: https://www.researchgate.net/publication/227323290_The_Performance_of_Socially_Responsible_Investments_Investment_Funds_and_Indices

Statman, M. (2000). *Socially Responsible Mutual Funds*. Obtained from: https://www.researchgate.net/publication/240311517_Socially_Responsible_Mutual_Funds

Vanguard. (2020, July 31) What's ESG investing? Obtained from: https://investor.vanguard.com/investing/esg/

Verdipapirfondenes Forening. (2017). Hva er verdipapirfond. Obtained from https://vff.no/fondshandboken/tema/hva-er-verdipapirfond

Wimmer, M. (2012). *ESG-persistence in Socially Responsible Mutual Funds.* Obtained from: http://www.ccsenet.org/journal/index.php/jms/article/view/19237

Wooldridge, J.M. (2009). *Introductory econometrics -A Modern Approach*. Obtained from: https://books.google.no/books?hl=no&lr=&id=wUF4BwAAQBAJ&oi=fnd&pg=PR3&dq=Wooldridge,+J.M.+(2009).+Introductory+econometrics&ots=cASzXFoufr&sig=Uu2RHTdIcP_29h2QcLFcFLpKl8U&redir_esc=y#v=onepage&q&f=false

Appendix

Table A.1: Regression on the difference of the sustainable and conventional portfolio

The table shows the regression results done on the differences of the sustainable and conventional portfolios using the Fama-French five-factor model.

	α	βmkt	βSMB	βHML	βRMW	βCMA	N	R^2
Active ESG - Active Conv	0,0011	-0,182***	-0,012	-0,024	0,054	-0,017	63	0.7066
	(1.64)	(-10.97)	(-0.42)	(-0.73)	(1.23)	(-0.35)		
Passive ESG - Passive Conv	-0,00007	-0,034	-0,027	0,06	-0,009	-0,023	63	0.0932
	(-0.07)	(-1.48)	(-0.60)	(1.43)	(-0.12)	(-0.30)		

Table A.2: Regression on the difference of the sustainable and conventional portfolio excluding 2020

The table shows the regression results done on the differences of the sustainable and conventional portfolios using the Fama-French five-factor model when 2020 is excluded.

	α	βmkt	βSMB	βHML	βRMW	βCMA	N	R^2
Active ESG - Active Conv	0,0006	-0,154***	0,032	0,029	0,102 **	-0,053	51	0,491
	(-0,81)	(-7.79)	(-1,08)	(-0,68)	(-2,25)	(-1,27)		
Passive ESG - Passive Conv	-0,0018	0,113*	-0,042	-0,113*	-0,176	0,005	51	0,223
	(-1.27)	-1,98	(-0,53)	(-1,78)	(-1,62)	-0,05		

Table B: Summary of the individual regressions using the Fama-French five-factor model

This table presents the summary results from the regression on each individual fund using the Fama-French five-factor model. These are then divided into five different groups, based on sustainability ratings 1 – 5. For each of these we have divided them into active and passive funds. At the right end of the table, we have included a summary statistic. All numbers are in monthly terms.

	Rating 1	Rating 2		Rating 3		Rating 4		Rating 5		Summary statistics					
	Active	Active	Passive	Active	Passive	Active	Passive	Active	Passive	Conv	ESG	Diff	Active	Passive	Diff
A. Summary statistics for α															
Minimum	-0,011	-0,024	-0,004	-0,014	-0,006	-0,011	-0,006	-0,022	0,001	-0,012	-0,010	-0,002	-0,016	-0,004	-0,012
Median	-0,004	-0,005	-0,003	-0,005	-0,003	-0,004	-0,004	-0,002	0,002	-0,004	-0,002	-0,002	-0,004	-0,002	-0,002
Maximum	0,002	0,003	-0,002	0,045	0,004	0,003	0,003	0,004	0,003	0,010	0,003	0,007	0,011	0,002	0,009
Mean	-0,004	-0,005	-0,003	-0,003	-0,002	-0,003	-0,003	-0,003	0,002	-0,004	-0,002	-0,002	-0,004	-0,002	-0,002
Std dev.	0,003	0,004	0,001	0,007	0,002	0,003	0,003	0,004	0,001	0,004	0,003	0,001	0,004	0,002	0,002
No. of funds	21	60	2	122	39	97	11	101	2	244	211	33	401	54	347
No. of negative α															
At 10%	0	4	1	15	2	7	3	5	0	22	15	7	31	6	25
At 5%	6	16	0	23	2	20	0	9	0	47	29	18	74	2	72
At 1%	3	16	0	33	10	19	4	8	0	62	31	31	79	14	65
B. Mean factor loadings for β and R2															
βmkt	1,002	0,936	0,887	0,939	0,794	0,880	0,793	0,839	0,610	0,912	0,780	0,132	0,919	0,771	0,148
βSMB	0,170	0,114	0,271	0,022	0,031	0,074	0,016	0,040	0,016	0,122	0,037	0,085	0,084	0,084	0,000
βHML	0,132	0,082	0,244	0,014	0,104	0,063	0,172	-0,020	0,161	0,115	0,094	0,021	0,054	0,170	-0,116
βRMW	-0,014	-0,102	0,020	-0,059	0,119	0,044	0,097	-0,037	0,144	-0,007	0,062	-0,069	-0,034	0,095	-0,129
βCMA	-0,162	-0,113	-0,128	-0,128	-0,125	-0,101	-0,112	-0,220	-0,348	-0,131	-0,195	0,064	-0,145	-0,178	0,034
R^2	0,821	0,813	0,881	0,812	0,767	0,810	0,771	0,744	0,507	0,819	0,708	0,111	0,800	0,731	0,069

Table C: Overview of the alpha values for the Conventional active funds.

The table shows an overview of the alpha values for the Conventional active funds.

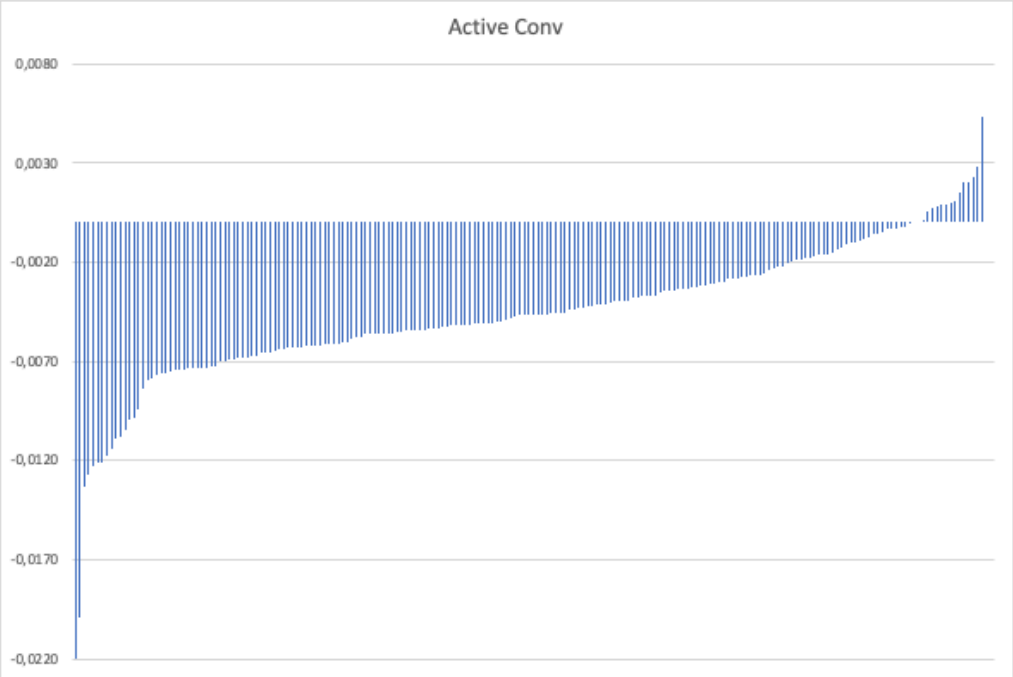


Table C.1: Overview of the alpha values for the ESG active funds.

The table shows an overview of the alpha values for the ESG active funds.

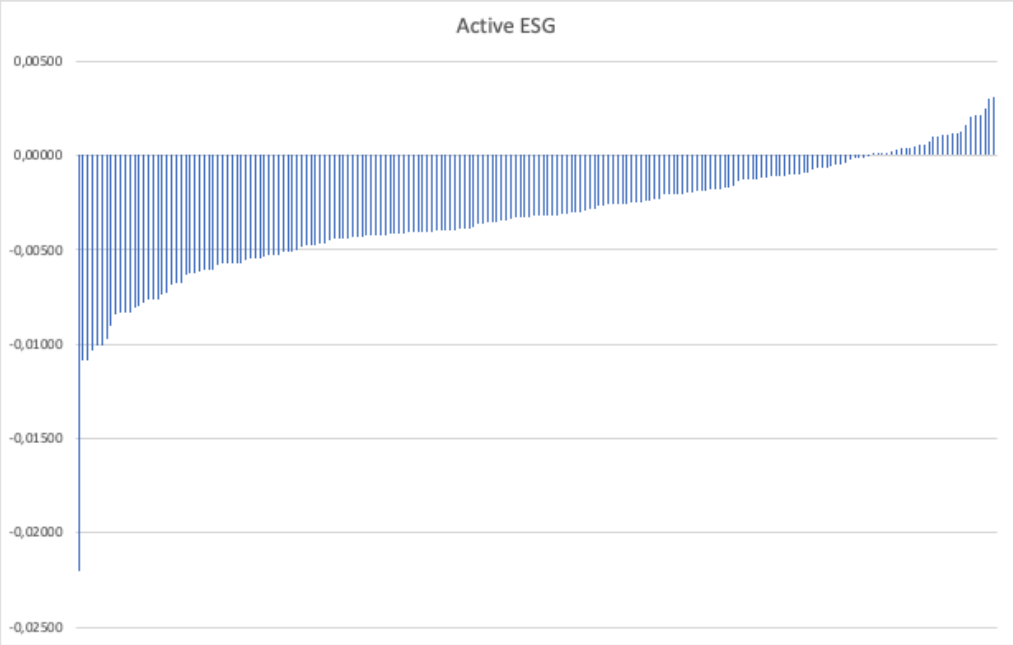


Table C.2: Overview of the alpha values for the Conventional passive funds.
The table shows an overview of the alpha values for the Conventional passive funds.

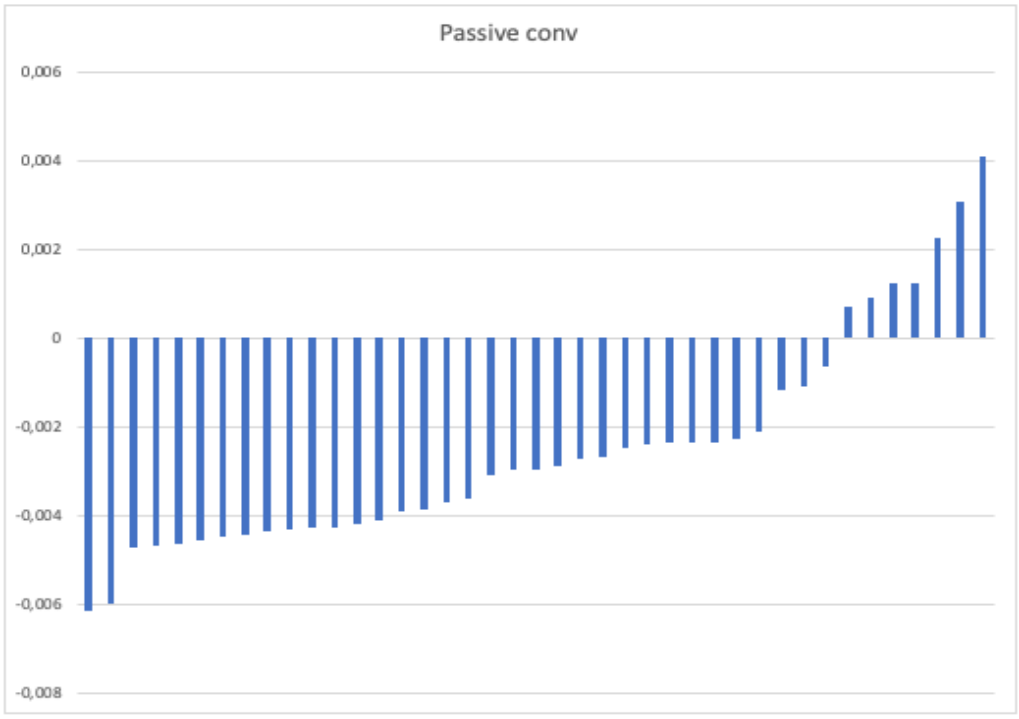


Table C.3: Overview of the alpha values for the ESG passive funds.

The table shows an overview of the alpha values for the ESG passive funds.