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THE PERFORMANCE OF SOCIALLY RESPONSIBLE INVESTMENT FUNDS

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ABSTRACT

Socially responsible investing (SRI) is a growing field of investing that incorporates social criteria to the investment decision. The increasing trend towards sustainability has captured the attention of governments and investors alike, which has resulted in a rapid growth of socially responsible investment funds. A SRI-fund in essence is a normal investment fund with the exception that the individual stocks are screened for different social criteria. The issue with socially responsible investment funds is that adding several screens to the stock selection dramatically compromises the possible investment universe. Thus according to the Modern Portfolio Theory, this results in a less diverse investment universe and a lower risk adjusted return.

The performance of SRI-funds has been studied throughout during the last fifteen years with the most common way of evaluating the performance through comparison between the SRI-funds and conventional funds. More recent studies have examined the issue of screening intensity, where the SRI-funds are compared to each other rather than conventional funds. In the empirical part of this study, the effect of positive and negative screening strategies to the performance of the funds in Europe during the years 2002 to 2014 is examined.

The findings of this study were that negatively screened funds have on average overperformed the positively screened funds during this time period. Additionally, the empirical part provides support for the overperformance hypothesis as the relationship between screening intensity and fund performance is positive for negatively screened funds and curvilinear for positively screened funds.

KEYWORDS: Socially responsible, screening, investment fund, investment performance

1. INTRODUCTION

Socially responsible investing (SRI), also known as ethical investing, has gained increasing popularity during the last decade as Corporate Social Responsibility (CSR) has emerged as a major point for policy makers and the public. Environment, society and stakeholders in general are all different criteria that corporations are now demanded to be responsible of (Renneboog, Horst & Zhang 2008A: 1730). Corporate Social Responsibility itself is defined as a concept whereby companies integrate social and environmental concerns in their business operations and in their interaction with their stakeholders on a voluntary basis (Commission of the European communities: GREEN PAPER: Promoting a European framework for Corporate Social Responsibility 2001). Issues, for example global warming, have made governments initiate regulations that are contributing to ethical investing in a positive way.

Because of the new movement towards sustainability, the environment has become a major criterion in the investment process and SRI has answered this demand by providing investors the opportunity to satisfy their social needs by offering products that reflect the investors' values and provide returns to satisfy their goals (Benson & Humphrey 2008: 1850). Essentially this means that investment decisions are not solely based on financial criteria, for example risk-and-reward, but also ethical and social criteria.

The trend towards sustainability can be seen in the increasing amount of investments in this area of investing. From the year 1995 to 2012 the total amount of managed assets in the United States that are engaged in sustainable and responsible investment practice, has grown from $639Billion to $3744Billion. (Figure 1.) The socially responsible assets account for 11.3% of total assets in the United States. (9.3% in 2005) The investment funds incorporating environmental, social, and governance factors have experienced a more dramatic growth, from $12Billion in 1995 to $1013Billion in 2012. (Figure 2.) (Ussif 2012.)

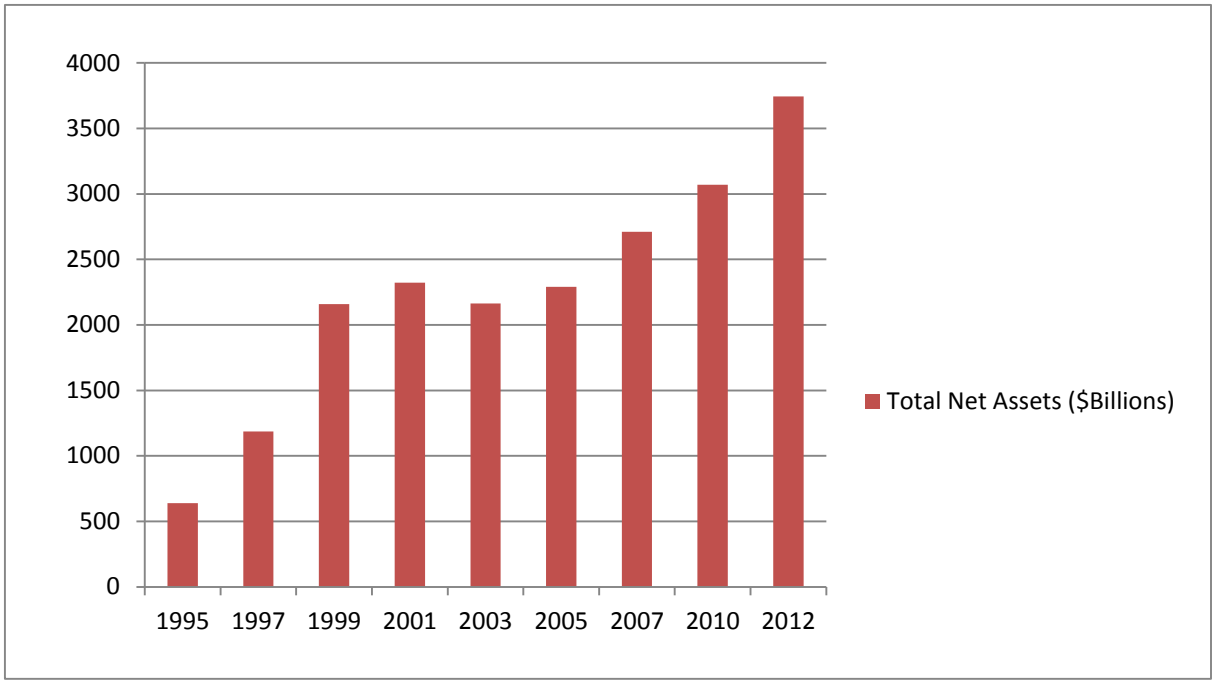

Figure 1. Socially responsible investing in the United States 1995-2012 (Ussif)

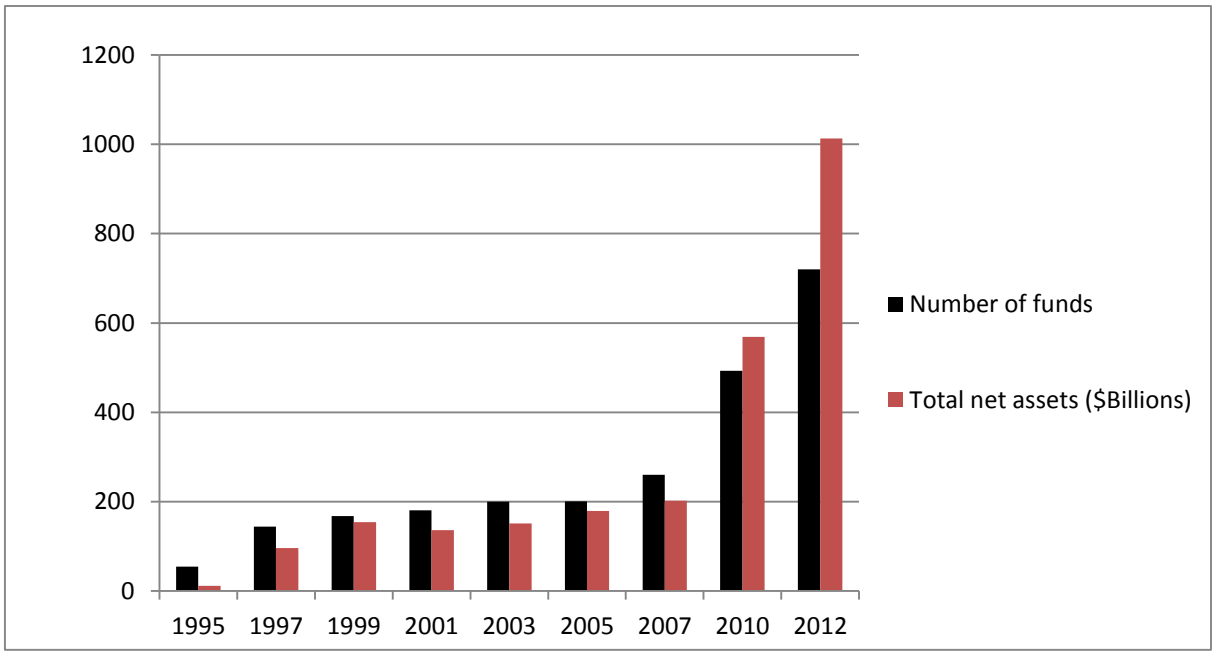

Figure 2. Socially responsible investment funds in the United States 1995-2012 (Ussif)

The research of socially responsible investing has also developed simultaneously as the trend towards sustainability has risen. The first studies concerning SRI and especially SRI-funds were focused on comparing SRI-funds to conventional investment funds in order to see if investors' returns would suffer because of the different non-financial criterion. But as the movement matured, studies began to compare the performance of SRI-funds within themselves. The examination of screening intensity and the effects of specific non-financial screening strategies have been the latest trends in the field of studies concerning the performance of socially responsible investment funds.

The largest concern in the field of SRI-funds is the issue of diversification. The Modern Portfolio Theory (MPT) by Markowitz (1952) argues that the performance of a portfolio is closely related to its potential investment universe. SRI-funds have to select their companies from a smaller investment universe which results in a lower diversification, and in theory a lower risk adjusted performance.

1.1. Purpose of the study

The purpose of this study is to examine the effects of screening intensity on socially responsible investment funds domiciled Europe and to examine if there is a difference in the performance between positively and negatively screened SRI-funds. The hypotheses used in previous literature concerning the performance of SRI funds can be divided in to two parts. The first hypothesis is the underperformance hypothesis. According to the MPT, the screening intensity should lower the performance of SRI-funds as a result of a diminishing investment universe. Also, SRI-funds may underinvest in financially attractive companies due to ESG resctrictions. In the empirical part of the study, the effect of screening intensity to socially responsible investment funds domiciled in Europe is examined according to the underperformance hypothesis: (Renneboog, Horst, Zhang 2008B: 304-305.)

H1: The increasing screening intensity lowers the performance of socially responsible investment funds.

The second hypothesis is the overperformance hypothesis. The intensive screening of companies may result in an exclusion of companies with bad social and environmental stand-

ards and in an inclusion of companies with superior corporate governance and managerial competence, which should result in an overperformance. Thus the second hypothesis is: (Renneboog et al. 2008B: 304-305.)

H2: The increasing screening intensity increases the performance of socially responsible investment funds

Next, the screening intensity is divided in to two parts. The intensity can be measured in both positive and negative screens, with positive screening being an inclusion of certain companies that match the criteria, and negative being an exclusion of certain companies. The examination of the performance of different funds is done by examining the monthly returns of investment funds that are only using either negative or positive screening strategies. In this part, the under- and overperformance hypotheses are examined with funds incorporating only either negative or positive screens. Thus, hypotheses 3-6 are:

H3: Positive screening intensity has a negative effect to the performance of the fund

H4: Positive screening intensity has a positive effect to the performance of the fund

H5: Negative screening intensity has a negative effect to the performance of the fund

H6: Negative screening intensity has a positive effect to the performance of the fund

1.2. Socially responsible investment funds in previous research

The field of socially responsible investing is fairly young and it has reached mainstream popularity just at the turn of the millennium, with most of the studies concerning this area of investing published in the past decade. The greater parts of the studies which have examined the performance of the funds are using the 1990s and early 2000s as a database. (Bauer, Koedijk & Otten 2004: 1765; Bengtsson 2008: 975.)

What makes the topic of performance interesting is that socially responsible investment funds are only a subset of the whole financial universe, and thus they are not able to invest

in the same companies as a conventional investment fund. Clearly this doesn't apply the other way around, which suggests that even the best managed ethical portfolio should only perform as good as a conventional portfolio.

Newer studies have tackled the issue of screening and these studies have tried to find out if there is a correlation between the screens and investment returns. The common view would be that adding more screens would provide worse returns because of the restricted investment universe, as presented by Markowitz (1952). (Barnett & Salomon 2006: 1106-1119; Lee, Humphrey, Benson & Ahn 2010: 351-368.)

Some studies have taken a more unique perspective to the discussion. For example, the study of Barreda-Tarazona, Matallin-Saez & Balaguer-Franch (2011) studies the problem of investors' investment decisions when taking into account their own preferences other than investment returns and diversification.

The consensus in the results of the performance-oriented studies has been that, with the exception of some countries, there is no statistical difference in risk-adjusted returns between SRI-funds and more conventional investment funds, but there is a negative correlation between the screening intensity and systematic risk alongside with a slight underperformance when more screens are taken into the investment decisions. (Barnett et al. 2006: 1118; Lee et al. 2010: 368; Renneboog et al. 2008A: 1737.)

Although the research on socially responsible investment funds has accelerated in recent years, the heterogeneity of SRI has been a problem for the research and experts. SRIs fragmented state makes it harder for researchers to compare results in different markets and the research of SRI would flourish if there was to be certain kind of standards. Although, according to the interviews in the UK, the heterogeneity of the SRI is hardly a problem for mainstreaming the application of SRI. (Sandberg, Juravle, Hedesström & Hamilton, I. 2009.)

1.2.1. Studies comparing the performance of SRI-funds to conventional funds

The study of Meir Statman (2000), which is the first major study published in the 21st century that focuses the performance of SRI-funds, uses 31 different mutual funds as a data-

base. The performance of the SRI-funds is compared to 62 conventional funds with similar size and mean expense ratios (1.50% and 1.56% respectively) during the time period of 1990-1998. The main model used in this study is the Jensen's alpha. Also, the study solely focuses on the funds existing in the United States. (Statman 2000: 33-34.)

The findings of the study were that the SRI-funds outperformed the reference group of conventional funds, but the results were not statistically significant. When using the S&P 500 as a benchmark, the average performance of both types of funds was worse than the index. With -5.02% annualized average difference for the socially responsible funds and -7.45% for the conventional funds, with only one socially responsible fund, The Citizens Index, bearing a positive alpha compared to the S&P 500. (Statman 2000: 34, 38.)

The study of Michael Schröder, "*The performance of socially responsible investments: investment funds and indices*" (2004)**,** focuses on 40 US, and 16 German and Swiss SRI-funds and also measures the performance of different SRI-indices. Difference in the study of Schröder compared to the previous study, is the time period of 1990-2002, the amount of funds, and the fact that this study expands the question of performance to global measures. Like in the previous study, the compared measure is the Jensen's Alpha. (Schröder 2004: 125.)

The results in the study of Schröder were that out of the alphas of 46 SRI-funds, 38 were negative, from which only 4 were significant at a .5% level. This suggests that the SRI-funds do not underperform their benchmark, consisting of large- and small-cap stocks, at a statistically significant level. The most interesting finding in the study is that the SRI-funds in the United States tend to be more exposed to large-cap stocks, whereas the German and Swiss are more exposed to small-cap stocks. Also, most of the SRI-indices examined in the study bore positive, although statistically insignificant, alphas. All in all, the findings of the study are summarized in the last sentence: …*on average – an investor does not have to expect a significantly lower performance due to the restricted investment universe.* (Schröder 2004: 131.)

N. Kreander, R.H. Gray, D.M. Power and C.D. Sinclair (2005) use 60 different funds as a base to measure the performance of ethical funds in four different countries in Europe. The study of Kreander et al. matches 30 ethical funds against 30 conventional funds from Janu-

ary 1995 to December 2001. The countries used in the study were traditional European countries that have been pioneering in the field of ethical investing; The United Kingdom, Sweden, Germany and Netherlands with 34, 14, 8 and 4 different funds in each country respectively.

The results were that the average weekly return for ethical funds during the time period was 0.13%, which was identical to the returns for non-ethical funds. The average Sharpe-ratio for ethical funds, 0.034, was slightly higher than the ratio for non-ethical funds which was 0.024. The average monthly alpha was 0.20% and 0.13% for SRI-funds and conventional funds respectively, but the difference was not statistically significant. (Kreander et al. 2005: 1481, 1490.)

The study also examined the market timing ability of both funds, and received similar results for both funds, that neither type of fund possessed an ability to time the market with each of the results being statistically significant at 5% level. The last finding in the study was that the management fee is a significant variable for Jensen's alpha, but the findings were different compared to previous studies. (Kreander et al. 2005: 1486-1489.)

"International evidence on ethical mutual fund performance and investment style" (Rob Bauer, Kees Koedjik, Rogér Otten, 2005) uses 103 German, UK, and US ethical mutual funds as a database with the time period of 1990-2001. The aim of the study is to compare the returns of socially responsible mutual funds to conventional mutual funds with an international database. The main models used in the study are the Capital asset pricing model (CAPM), Fama-French 3-factor model and the Carhart 4-factor model.

The study finds out that first, the expense ratio, on average, is higher for ethical funds. Second, there seems to be no significant difference in the return of ethical funds compared to conventional funds, when controlled with factors as book-to-market, momentum and size. The study also suggests that ethical mutual funds went through a catching-up phase during the 1990s, after which the ethical mutual funds provided comparable returns with the more conventional mutual funds. Also, the use of CAPM seems to be inferior when comparing the results to that of the Carhart model. (Bauer et al. 2005: 1765-1766.)

The study of Rob Bauer, Rogér Otten and Alireza Tourani Rad (2006) differs from the mainstream studies by using a non-conventional database that consists of 25 ethical open-ended equity mutual funds and 291 conventional funds with the time period starting from November 1992 to April 2003. The study uses the Carhart 4-factor model to evaluate the performance of the SRI-funds, with Worldscope indices used as a benchmark. (Bauer et al. 2006: 36.)

The development of the studies concerning SRI-funds can be seen here. In previous studies, the US market for SRI-funds was always present, but the study of Bauer et al. (2006) only mentions US ethical funds in the literature review. Also the use of CAPM is no longer present, as previous studies have proved that multi-factor models, especially Carhart 4-factor model, are better in explaining the results.

The study finds out that the domestic ethical funds in Australia underperform their conventional counterparts by -1.56% per year. On the other hand, international ethical funds provided better returns compared to their conventional counterparts (3.31%). These results however, are not statistically significant.

The studies comparing the returns of the SRI-funds to those of the conventional funds provide mixed results. It is clear that the multi-factor models are more powerful in explaining the returns of SRI-funds, but the results have not been statistically significant.

1.2.2. Studies examining the effect of screening intensity on SRI-fund performance

In newer studies, the status of SRI-funds seems to have been accepted as a true method of investing and the performance is evaluated by a comparison between SRI-funds rather than comparing them to other conventional funds. Also, the increase in the number of benchmark indices have made it possible to compare SRI-funds in new ways.

The study of Barnett & Salomon (2006) uses 67 different SRI funds in order to examine if the screening intensity has an effect on the fund performance. No comparison to conventional investment funds is made and the study is purely studying socially responsible investment funds.

The study found out that there is evidence of a curvilinear, non-monotonic relationship between the screening intensity and fund performance. Also the study found that the increase in screening intensity lowers the risk-adjusted performance at first until the amount of screens reaches 7, but then as the screening intensity increases, the performance starts to grow once again. (Barnett & Salomon 2006: 1114.)

Lee et al. (2010) also studies the performance of SRI-funds from a slightly different angle compared to earlier performance oriented studies. As in the study of Barnett et al. the focus of the study is to compare the number of screens used and the investment returns. The study uses 61 mutual funds in the United States filtered by the standards of United States' socially responsible investment forum to ensure a homogenous group. The model used to calculate the performance is the Carhart 4-factor model.

The results were that the screening intensity does not have an effect on fund's unadjusted return, but the risk adjusted-performance of screen intense funds is worse by approximately -0,7% per screen when using the Carhart-model. Also, the study finds out that there is a curvilinear relationship between the screening intensity and systematic risk. (Lee et al. 2010: 351-370.)

These studies indicate that there is some support for the hypothesis that the performance of socially responsible investment funds suffers as the number of screens increases. Although, at least according to the two studies examined here, the relationship seems to be curvilinear but non-monotonic. (Lee et al. 2010: 351-370; Barnett et al. 2006: 1114.)

1.3. Structure of the thesis

The first part of this paper is dedicated to the introduction of the subject. First, a short summary of the starting point for the study is given before continuing to summary of previous researches concerning this subject. The literature review is divided into two sections where first, the traditional performance oriented studies that are built on comparing SRI-funds to their more conventional counterparts, are examined. This is followed by the introduction of newer studies that are discussing the performance of SRI-funds by comparing

them to with each other. Next, the structure of the study is explained after which the study continues to examine the concept of socially responsible investing.

The next part, which is the historical review of ethical investing, is focused more on the modern history of SRI. This part of the paper is divided by the geographical location, where the history of socially responsible investing during the 1900s is examined in different continents and countries. The absolute roots of ethical investing can be traced all the way back to the ancient teachings over 2000 years ago and there seems to be a silent agreement of the foundations where the concept of ethical investing was built. Although, it should be noted that the sources addressing these matters are not reliable as they are based on ancient teachings that are several hundred years old.

The history of modern concept of socially responsible investment funds on the other hand is something that is up for debate. There seems to be no definite agreement on where did the concept exactly arise from, and newer studies have found varying results on the emergence of socially responsible investing and socially responsible investment funds which also seems to vary between different countries. (Bengtsson 2008; Renneboog et al. 2008A: 1725.)

There is no clear consensus on what non-economic criteria should be prioritized and a clear lack of standards and the heterogeneity of the SRI-market is an issue that should not be taken lightly. Although the issue of heterogeneity could possibly be a more of a problem for academics only than SRI-professionals, as there is a lack of incentives for professionals to initiate standards, but academics feel that a set of standards would help the research to develop. (Sandberg et al. 2009: 529.)

Next, the concept of screening and the fundamental theory of investment portfolios are presented. Screening in the investment decision has a remarkable effect on the performance, and to the risk of the funds. This is because of the compromised investment universe, which directly collides with Markowitz's (1952) portfolio theory. Screening is at the foundations of the SRI-investing and the diversity of the screens makes different kinds of investment portfolios possible, but at the same time it has a negative impact on homogeneity and thus makes it harder to set standards in the field of ethical investing. The fundamental theory of investment portfolios includes the explanation of Modern Portfolio Theory and the concept

of risk and return. This part does not discuss the issue of efficient markets but for the sake of the functionality of the theories, it is assumed that all investors are rational and markets are efficient.

In the sixth part of the study, the data and methodology used in the empirical part of the thesis is explained, before going to the examination of the results of the empirical part. The sample data used in this paper is consisted of a total of 326 socially responsible funds from 15 different countries domiciled in Europe from 2002 to 2014.

Finally, the last two parts in the study are committed to the examination of the empirical results on the performance of socially responsible investment funds. The aim is to test the hypotheses by applying the methods explained in the methodology section, and to examine and interpret the results. The paper ends with a conclusion which summarizes all the main findings of the study.

2. SOCIALLY RESPONSIBLE INVESTING

Socially responsible investing is a new and highly innovative field of investing and thus agreeing on standards is something that is hard for both researchers and investors. This new style of investing is continuously integrating new factors to the investing decisions, which makes the concept difficult to define accurately. Also, the two major proponents of SRI, United States sustainable investment forum (Ussif) and European sustainable investment forum (Eurosif) have difficulties in agreeing on standards. Even though they are two of the most popular sources of SRI-based data in academic research, it is difficult to even compare them to each other because of the lack of standardization.

2.1. Definition

In the study of Renneboog et al. (2008A), Socially Responsible Investing is defined as:

> ”*An investment process that integrates social, environmental, and ethical considerations into investment decision making. Unlike conventional types of investments, SRI apply a set of investment screens to select or exclude assets based on ecological, social, corporate governance or ethical criteria, and often engages in the local communities and in shareholder activism to further corporate strategies towards the above aims”*

Another definition for SRI is used in the European SRI-report of 2008 by The European sustainable investment forum:

> *”SRI, a generic term covering Ethical investments, responsible investments, sustainable investments, and any other investment process that combines investors' financial objectives with their concerns about environmental, social and governance (ESG) issues ”*

There seems to be slight agreement on the terminology and the definition of socially responsible investing (Sandberg et al. 2009: 529-530). Although SRI seems to be the most popular term used, there are others that have also thrived. In many cases the terms ethical, socially responsible and environmental are used as synonyms (Bengtsson 2008). At its broadest, because of the fact that defining SRI is rather difficult, this could potentially mean

that a significantly larger amount of assets could be potentially be classified as SRI. For example, over 50% of European assets under management have policies that exclude certain weapons manufacturing companies. (Eurosif 2012.)

The highly changing area makes it hard to for the industry to agree on definitions. Even in the annual reports of Eurosif and Ussif, the definitions are constantly changing and vary between themselves.

As of now in Europe, the different processes how fund managers incorporate ethical or socially responsible criteria in to the investment decisions are separated into seven different categories**.** The different criteria are explained in Table 1. (Eurosif 2012.)

Table 1. Investment criteria (Eurosif 2012)

Sustainability themed investment	Investments in themes or assets linked to the development of sustainability. Thematic funds focus on specific or multiple issues related to ESG.
Best-in-Class investment selection	Approach where leading or best-performing investments within a universe, category, or class are selected or weighted based on ESG-criteria.
Norms-based screening	Screening of investments according to their compliance within international standards and norms.
Exclusion of holdings from investment universe	An approach that excludes specific investments or classes of investment from the investible universe such as companies, sectors or countries.
Integration of ESG in financial analysis	The explicit inclusion by asset managers of ESG risks and opportunities into traditional financial analysis and investment decisions based on a systematic process and appropri-

	ate research sources.
Engagement and voting in sustainability matters	Engagement activities and active ownership through voting of shares and engagement with companies on ESG matters. This is a long-term process, seeking to influence behavior or increase disclosure.
Impact investing	Impact investments are investments made into companies, organizations and funds with the intention to generate social and environmental impact alongside a financial return. Impact investments can be made in both emerging and developed markets, and target a range of returns from below market-to-market rate, depending upon the circumstances.

2.2. History

Ethical investing can be traced all the way back to the ancient Jewish, Christian and Islamic teachings. Taken from the text of the Old Testament: (Renneboog et al. 2008A: 1725.)

> *"If you lend money to my people, to the poor among you, you are not to act as a creditor to him; you shall not charge him interest"*.

Other examples of ethical behavior include the founder of Methodist-movement, John Wesley, who preached: (Renneboog et al 2008A: 1725.)

> "*Therefore we may not engage or continue in any sinful trade, any that is contrary to the law of God, or of our country*."

The modern concept of socially responsible investing is said to be born during the social conflicts during the 1960s as a consequence of the anti-war and anti-racism movements, which made the investors realize the social consequences of their investments. Thus, the

first modern socially responsible mutual fund, Pax world Fund was founded in 1971. It was mainly created for anti-war investors opposing the Vietnam-war with a negative screen on weapon contractors. According to the European sustainable investment forum, this was the happening that made socially responsible investment funds a part of mainstream investing, away from its religious foundations. (Renneboog et al. 2008A: 1725; Eurosif 2012.)

There exists some critique on the statement that the modern application of SRI-fund was born in US and started to flow to other countries form there. There are some evidence from different studies and releases, that modern ethical funds were founded in other parts of the world at the same time during the 1960s and 1970s. (Bengtsson 2008.)

The Methodist church in the UK avoided investing in ”sin stocks” or sinful companies as early as the 1920s and Sweden has been a pioneer in the practice of SRI for several decades. The first Scandinavian ethical fund was launched in the 1960s in Sweden with Norway and Denmark following by founding their first ethical funds during the late 1980s and early 1990s respectively. Finland is clearly behind other Scandinavian countries, as it founded its first ethical fund in the year 1999. (Scholtens & Sievänen 2013; Bengtsson 2008.)

There are different opinions on the time and place of the birthplace of modern concept of SRI, which seem to differentiate between researches. The history is, as are many other parts of SRI, slightly covered in mist and there is no clear agreement between different parties on the fact how the modern SRI was founded. (Eurosif 2003; Renneboog et al. 2008A; Bengtsson 2008; Sandberg et al. 2009.)

3. SCREENING AND THEORY OF INVESTMENT PORTFOLIOS

Socially responsible investing-decisions revolve around the idea of screening. Essentially, there can be two kinds of screens, negative or positive. In negative screening, an asset is excluded because it directly collides with the ESG criteria of one's investment process, for example tobacco industry and pornography. Simplified, this means that companies that are viewed as ”bad”, or produce negative externalities, are dismissed from the portfolio. Whereas, positive screen means that an asset is chosen because it satisfies the investors' preferences by supporting the ESG criteria and thus, it is selected to the portfolio. It must be noted that these screens do not take into account the financial performance of the companies, but only the ESG criteria. (Eurosif 2012.)

According to the study of Renneboog et al. 2008A, socially responsible portfolios, in theory, should underperform more conventional portfolios. This can be explained in a simple table with four different outcomes with four different companies. **(**Table 2.**)** One that has positive net-present value (NPV) and produce positive externalities (i.e. Reduce pollution), one that has positive NPV but produce negative externalities (i.e. Produce excess pollution), one that has negative NPV and produce positive externalities, and one that has negative NPV and produce negative externalities. The problem is that conventional portfolio would invest in the companies that have positive NPV and the externalities do not have any impact on the investment decision. But a SRI portfolio on the other hand would, in this simplified case, dismiss the other company that has positive NPV and invest in the company that produce positive externalities instead. (Renneboog et al. 2008A: 1728.)

Table 2. Net present value and Externalities (Adapted from Renneboog et al. 2008A)

	Negative externalities	**Positive externalities**
Positive NPV	Conventional	SRI/Conventional
Negative NPV	Neither	SRI

This is rather simplified and does not essentially imitate real life. Also, the supporters of SRI argue that social screens represent filters that enable the identification and selection of firms with higher quality of management relative to their less responsible competitors. Also it can be said that by dismissing the other company that has Positive-NPV, the SRI portfolio is also lowering the risk of the portfolio by preparing for a possible social crisis that cannot be foreseen. On the other hand, according to Markowitz's (1952) portfolio theory, socially responsible portfolios suffer from smaller investment universe, and thus bear more risk because of smaller diversification, which leads to underperformance. The diminishing investment universe is presented in Figure 3.

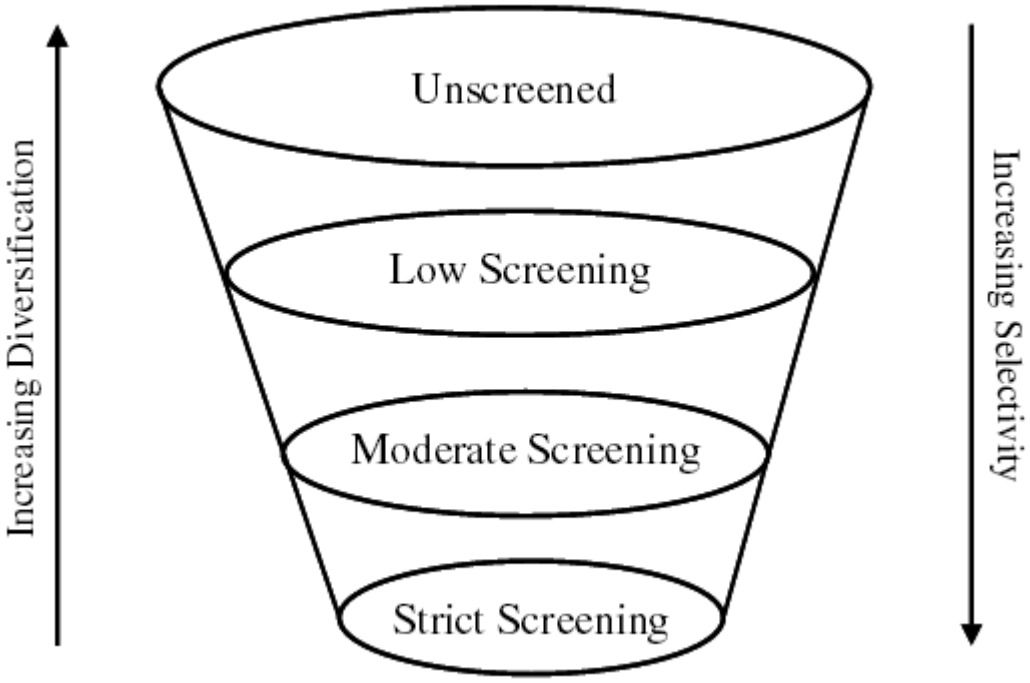

Figure 3. Diminishing investment universe (Barnett & Salomon 2006: 1106)

3.1. Risk and return

Socially responsible investment funds are essentially professionally managed portfolios which consist of several different stocks, which in this case are screened for different non-economic criteria. The Modern Portfolio Theory, which was developed by Harry Markowitz in 1952, aims to maximize the investment returns while bearing the minimum risk for the portfolio through diversification. As stated before in the paper, SRI-funds suffer from a less diverse investment universe, and thus in theory they should suffer from a greater risk. This chapter aims to explain the theoretical background for risk and return and the Modern Portfolio Theory.

One of the fundamental ideas behind investing is the concept of risk and return. The uncertainty of the expected returns in a certain time period of a particular asset is the risk factor. Investments with higher returns are usually riskier, because the risk factor needs to be compensated with a higher return.

The expected value for a random variable can be presented as the sum of each possible outcome multiplied by its probability (Sharpe, Alexander & Bailey 1999: 164). This is presented in equation (1).

$$(1) \qquad EV = \sum_{i=1}^{N} p_i X_i$$

Where: EV = expected value of a random variable
p_i = probability of the i^{th} value occurring
X_i = i^{th} possible value for the random variable
N = number of possible values that the random variable might take

As mentioned earlier, the risk component is the uncertainty of the expected return, or the probability that the return may differ from the expected return. The variance (and standard deviation) of a return is used as a measure for variability in returns in finance. Variance for an investment is presented in equation (2). (Sharpe et al. 1999: 164.)

$$\sigma^2 = \sum_{i=1}^{N} p_i \, (X_i - EV)^2 \quad (2)$$

Where: σ^2 = variance

Standard deviation, which is presented in equation (3) can also be used as a measure to see how much variation from the average exists. This term is a synonym for volatility in finance, which is simply the square root of variance. (Sharpe et al. 1999: 165.)

$$\sigma = \sqrt{\sigma^2} \quad (3)$$

Where: σ = Standard Deviaton

3.2. Modern portfolio theory

The Modern portfolio theory developed by Harry Markowitz revolves around the idea of diversification. Diversification essentially means that through constructing a portfolio with a diverse array of stocks, and investor can reduce the total risk of the portfolio.

The total risk of an investment can be divided into two parts, systematic risk and unsystematic risk. The systematic risk, or market risk, is the component that consists of macroeconomic factors that cannot eliminated through diversification. While nonsystematic risk is the component that is made of firm-level risk, which can be reduced through investing in several stocks that do not move in the same direction. (Sharpe et al. 1999: 184-187.)

First, the expected return of a portfolio must be clarified. The expected return of a portfolio is the sum of the weighted average of the returns for individual assets included in the portfolio (Markowitz 1952: 78). The mathematical formula for the expected return for a portfolio is presented in equation (4)

$$R = \sum_{i=1}^{N} X_i R_i \tag{4}$$

Where: R = Return for the portfolio
X_i = Relative amount invested in security i
R_i = Return of security i

The Modern Portfolio Theory assumes that the investor sees expected return as a desirable thing and the variance as undesirable. Now, the actual aim with diversification is to find the amount of assets weighed in a certain way, so that the minimum standard deviation is found. (Markowitz 1952: 77.)

The calculation for the standard deviation for a multi-stock portfolio is a difficult procedure that requires a computer for the calculations. For the sake of simplicity, the portfolio used in the example only consists of two stocks which is enough to explain the calculations for the volatility.

In order to construct the standard deviation for the portfolio, the covariance for the stocks must be also calculated. Covariance measures how much do two variables, in this case stocks, move together. Thus, the covariance must be calculated with each pair separately, which makes the calculations more complex when the amount of stocks increases. The purpose of this is to find weighted combination of stocks that are negatively correlated, which leads to the lowest standard deviation and variance. The formula for calculation of covariance between two stocks is presented in equation (5). (Bodie, Kane & Marcus 2011: 241.)

(5) $$Cov(R_A, R_B) = E(R_A R_B) - E(R_A)E(R_B)$$

Where: $E(R_i)$ = expected value of stock i

After the individual covariances are calculated, the mathematical formula for the variance of the portfolio can be constructed, from where the standard deviation can be also calculated. The mathematical formula for the variance of the portfolio is presented in equation (6). The volatility can be calculated by taking the square root from the equation (6). (Sharpe et al. 1999: 152, 178.)

(6) $$\sigma_p^2 = \sum_{i=1}^{N} \sum_{j=1}^{N} X_i X_j \sigma_{ij}$$

Where: σ_p^2 = Variance of the portfolio p
$X_i X_j$ = Weight of the security i and j in the portfolio p
σ_{ij} = Covariance between security i and j

The optimal portfolio can now be plotted by using the investors' personal indifference curves. (Figure 5). The shaded area in the graph is showing all possible combinations of stocks to form a portfolio. The Y-axis is the portfolio return and X-axis is the standard deviation. The lines I_n are the investors' individual indifference curves and the bolded line is the most efficient combinations of the securities, or the efficient frontier. The letters O, O*, S, H, G and E represent different possible portfolios.

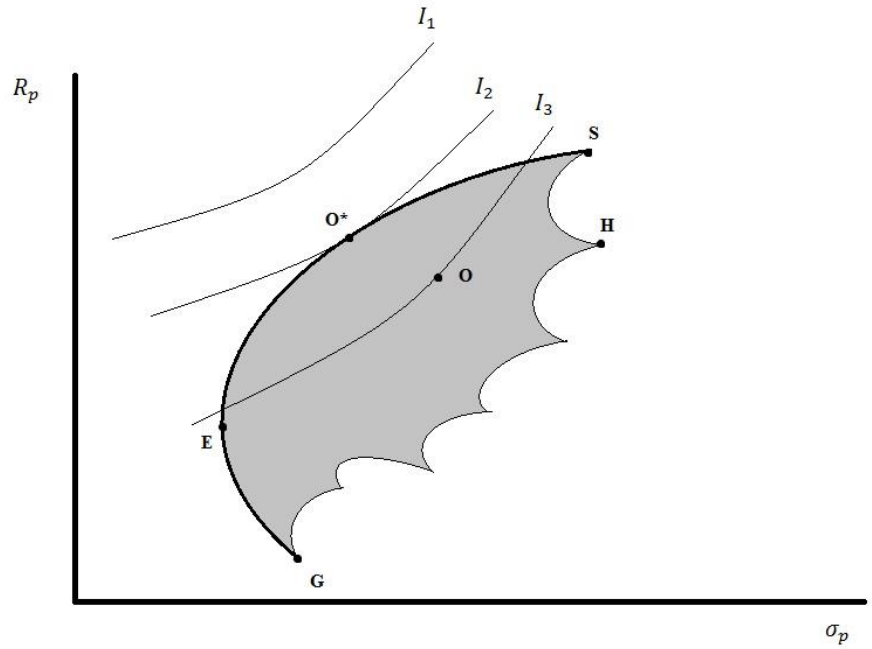

Figure 4. Selecting an optimal portfolio (Sharpe et al. 1999: 173)

The indifference curve I_1 is the most appealing, as it has the highest return for the risk, but such portfolio is does not exist as the curve does not meet the shaded area. The curve I_2 is tangent to the efficient frontier and has one available portfolio. The indifference curve I_3 has multiple available portfolios but none of which is as efficient as the portfolio in the curve I_2.

In this case, the portfolio O* is the most efficient as it is at a point that is the most north-west in the efficient frontier and thus has the most return for the risk. Point E in the graph is the portfolio that bears the least amount of risk as it has the lowest amount of standard deviation. On the other hand, portfolio H has the largest standard deviation, portfolio S has the highest expected return and portfolio G has the lowest expected return. (Sharpe et al. 1999: 173.)

3.3. Risk and diversification

There are diminishing returns in the effect of diversification to the risk. This means that the risk of the portfolio decreases significantly at the start when the portfolio consists of only a few securities, but the effect of diversification is lessened after the number of securities in the portfolio increases. This effect is presented in Figure 5.

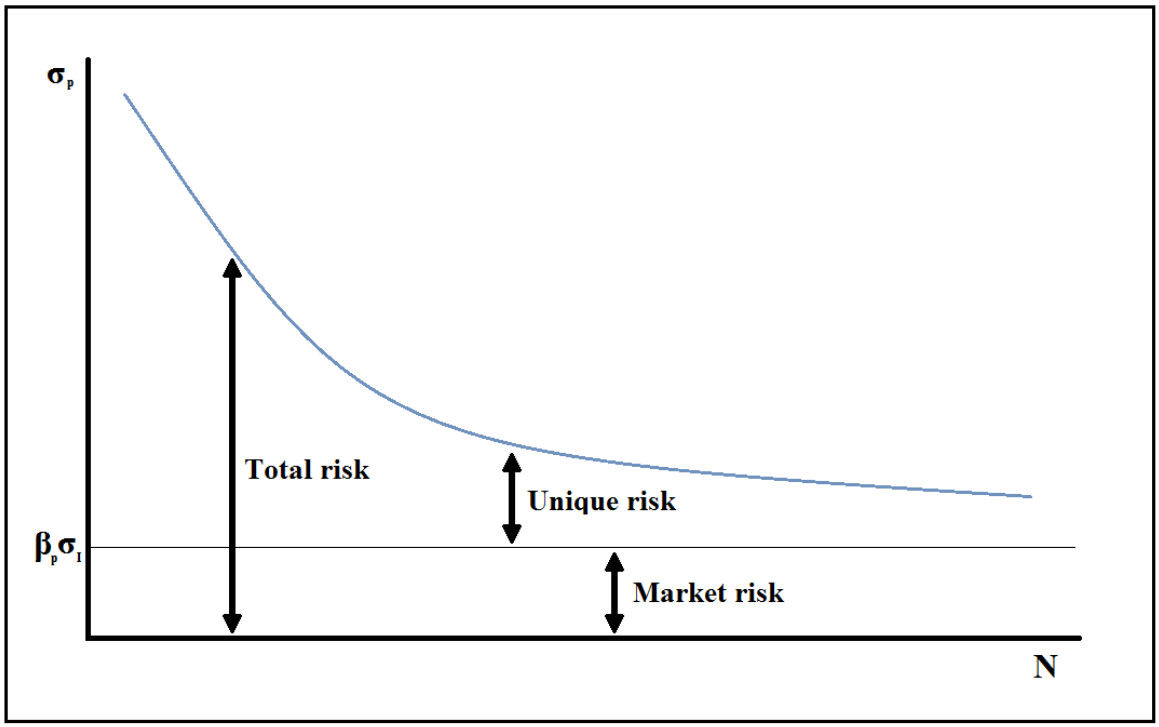

Figure 5. Risk and Diversification (Adapted from Bodie et al. 2014: 207)

Few conclusions can be made from observing the figure. First, the volatility of the portfolio decreases dramatically at first, but after applying enough stocks to the portfolio, the impact of diversification to the volatility lowers. Second, the market risk remains stationary, and cannot be diversified, thus the only risk that an investor should take account for after sufficient diversification, is the market risk.

The beta coefficient, used also in the previous figure, measures the stock's exposure to the market volatility. Simply put, beta coefficient signifies how an individual stock moves in relation to the market. The market, or in this case the market portfolio, is used as a benchmark for beta, and thus has it has a beta value of 1.

A stock with a beta coefficient more than 1 is called an aggressive stock, which means that the volatility of the stock is higher than that of the market portfolio. Vice versa, a beta value which is lower than 1 implies lower volatility than the market portfolio. The mathematical formula for calculating the beta is presented below in equation (6). (Sharpe et al. 1999: 183.)

(7) $$\beta_i = \frac{\sigma_{im}}{\sigma_m^2} = \frac{Cov(r_{it}, r_{mt})}{Var(r_{mt})}$$

Where: β_i = Beta coefficient for stock i
$Cov(r_{it}, r_{mt})$ = Covariance between the market return and the return of stock i
$Var(r_{mt})$ = the variance of the market return

The beta coefficient varies with time. Longer time periods result in better estimate, as different time periods can give greatly varying results.

5. METHODS IN EVALUATING THE PERFORMANCE

The methods for evaluating the performance of socially responsible investment funds have taken significant steps during the past two decades. The earliest SRI-studies published in the 1990s used the single factor Capital Asset Pricing Model as a way of evaluation, but the methods have evolved since. The use of multifactor models, for example Fama-French three factor model and the Carhart four-factor model, has gained popularity in the process of examining the performance of SRI-funds compared to conventional funds (Bauer et al. 2006). This chapter aims to explain the functions of the models and to examine the progress of the models used in the studies.

5.1. Sharpe Index

Sharpe Index, also known as an excess return to variability measure or Sharpe ratio, was developed by William F. Sharpe. The Sharpe Index measures the risk-adjusted performance of the portfolio by adjusting the excess returns of the portfolio with the volatility of the portfolio. The mathematical formula for Sharpe Index is presented in equation (7). (Elton, Gruber, Brown & Goetzmann 2011: 636-637; Sharpe 1966: 123.)

(8) $$S_p = \frac{R_p - R_f}{\sigma_p}$$

Where: R_p = Mean return of the portfolio
R_f = Risk free rate
σ_p = Standard deviation of the portfolio

Large positive value of Sharpe ratio indicates that the portfolio has performed superiorly when the risk is accounted for. Vice versa, a negative value would indicate that the portfolio does not perform sufficiently for the risk its bearing.

5.2. Treynor Index

The Treynor Index, developed by Jack L. Treynor (1965) measures the performance of the portfolio adjusted by the non-diversifiable risk, also known as beta-value. The formula for Treynor Index is presented in equation (8) (Elton et al. 2011: 641; Treynor 1965: 63-75.)

$$T_p = \frac{R_p - R_f}{\beta_p} \quad (9)$$

Where: R_p = Mean return of the portfolio
R_f = Risk free rate
β_p = Beta of the portfolio

The Treynor index is very similar to the Sharpe Index. Instead of using the standard deviation, Treynor index uses only the market risk, which is the beta value of the portfolio. The beta value of the portfolio is simply the sum of weighted average of individual betas in the portfolio. A higher Treynor measure indicates a superior portfolio performance.

5.3. Sortino ratio

The Sortino ratio, developed by Frank A. Sortino and Lee N. Price in 1994 is a performance measure similar to Sharpe ratio. The difference compared to the Sharpe is that the Sortino ratio only takes in to account the downside, or unwanted, deviation of the fund. It has been shown that the Sortino ratio is more powerful in explaining skewed distributions than Sharpe, but with normal distributions the results are similar that of the Sharpe ratio. The formula for Sortino ratio is given in equation 10. (Ashraf & Johnson 2008: 485-502.)

(10) $$Sortino \quad = \frac{R_p - R_f}{DD_p}$$

Where: DD_p= Downside deviation of the portfolio

5.4. Jensen's alpha

Jensen's alpha was first used as a measure by Michael Jensen in 1968 (Jensen 1968: 389-416). It measures the abnormal return between the return predicted by CAPM and the portfolio. The formula for alpha is presented in equation (10).

(11) $$\alpha_p = R_p - [R_f + \beta_p(R_m - R_f)]$$

Where: R_p = Mean return of the portfolio
R_f = Risk free rate
β_p = Beta of the portfolio
R_m = Mean return of market index

Jensen's alpha is one of the most widely used measures in the evaluation of the portfolio performance. Positive alpha signals positive abnormal returns over the returns of the return predicted by CAPM and superior portfolio management compared to the market portfolio. (Bodie, Kane & Marcus 2014: 840.)

5.5. Multi-factor models

The use of multifactor models has experienced a rapid growth since the study of Fama & French (1993). The basic idea behind the use of these models is to extend the explanatory power of single factor models by adding new variables which are intended to capture a

more wide range of risk. The general formula for a multi-factor model is presented in equation (10). (Bodie et al. 2014: 324-327, 340-342.)

$$R_i = \alpha_i + \beta_m R_m + \beta_1 F_1 + \beta_2 F_2 + \cdots \beta_n F_n + e_i \quad (12)$$

Where:
R_i = Return of a security i
α_i = Constant
β_m = Beta respect to the market
R_m = Market Return
B_n = Beta respective to each Factor
F_n = Explanatory factor
e_i = Error term

The two most profilic multi-factor models used in the academic literature are the Fama-French 3-Factor model and the Carhart 4-factor model. The former was developed by Eugene F. Fama and Kenneth R. French in 1993, which, extends the single factor model by accounting new variables, Small minus Big (SMB), and High minus Low (HML) to the existing model. The factor SMB measures the excess performance of small stocks over large stocks, while the factor HML measures the excess performance of value stocks over growth stocks. The study of Fama & French justified the use these variables through empirical observations. (Bodie et al 2014: 340-341; Fama & French 1996: 55-84.)

The Carhart 4-factor model extends the Fama-French 3-factor model by adding the momentum factor, which captures the Jegadeesh & Titman (1993) momentum anomaly. Momentum factor is the difference in return between a portfolio of past 12 month winners and a portfolio of past 12 month losers. (Carhart, M., 1997: 57–82; Bauer et al. 2005: 37.)

The Carhart 4-factor model has since been extended to a five factor model by Fama & French (2014) by adding profitability and investment factors to their original 3-factor model. Because of the young age of the model, the studies have not yet adapted the use of the model, but it should be expected to see the usage of the model in near future.

The methods listed in this chapter are the most commonly used models in the literature reviewed in this paper. These methods are also used in the empirical part of the study in this paper.

6. DATA DESCRIPTION AND METHODOLOGY

This chapter explains the data and methodology used in the empirical part of the study. First, the selection of the data is explained. Then the description of the data is presented before continuing to the methodology and the limitations of the study.

6.1. Data selection

As the idea of the empirical study is to examine the performance of SRI-funds according to their respective screening intensity, the SRI-funds must be first screened from conventional funds. Screening the mutual funds for socially responsible investment funds is difficult and most of the databases, including Morningstar, do not offer efficient search methods for free. The sample is also restricted to European funds only, because of the prevalence of positive screening strategies in Europe compared to the United States. Ussif could've provided a reliable listing of SRI-funds domiciled in the United States, but Eurosif does not deliver the same kind of data. This is why this paper used a free socially responsible investment-database called YourSRI. As the concept of SRI-funds is relatively new, the amount of funds has increased exponentially during the last decade, and thus the data period is restricted to 2002 to 2014 in order to capture as many funds as possible.

YourSRI is a part of CSSP (Center for Social and Sustainable Products AG) which an independent consulting and research house with a focus on responsible investments, impact investments and corporate social responsibility (YouSRI). CSSP is also in partnership with Eurosif and PRI, which is an initiative supported by the United Nations, of which goal is to understand the implications of sustainability for investors and support signatories to incorporate these issues into their investment decision making and ownership practices (YourSRI).

The database of YourSRI covers hundreds of socially responsible investment funds all around the world. The sample is first screened, in line with previous literature, by including investment funds that are investing in equity only. Next, the SRI-funds are restricted to funds domiciled in Europe only. This restricted the sample to 440 SRI-funds.

The raw sample data used in the study consists of 440 socially responsible investment funds from 15 different countries in Europe, which include Austria, Belgium Denmark, Finland, France, Germany, Ireland, Italy, Liechtenstein, Luxembourg, Netherlands, Norway, Sweden, Switzerland and The United Kingdom. Each of the funds is applying at least one ethical screen to the fund. The distribution by country is presented in figure 6.

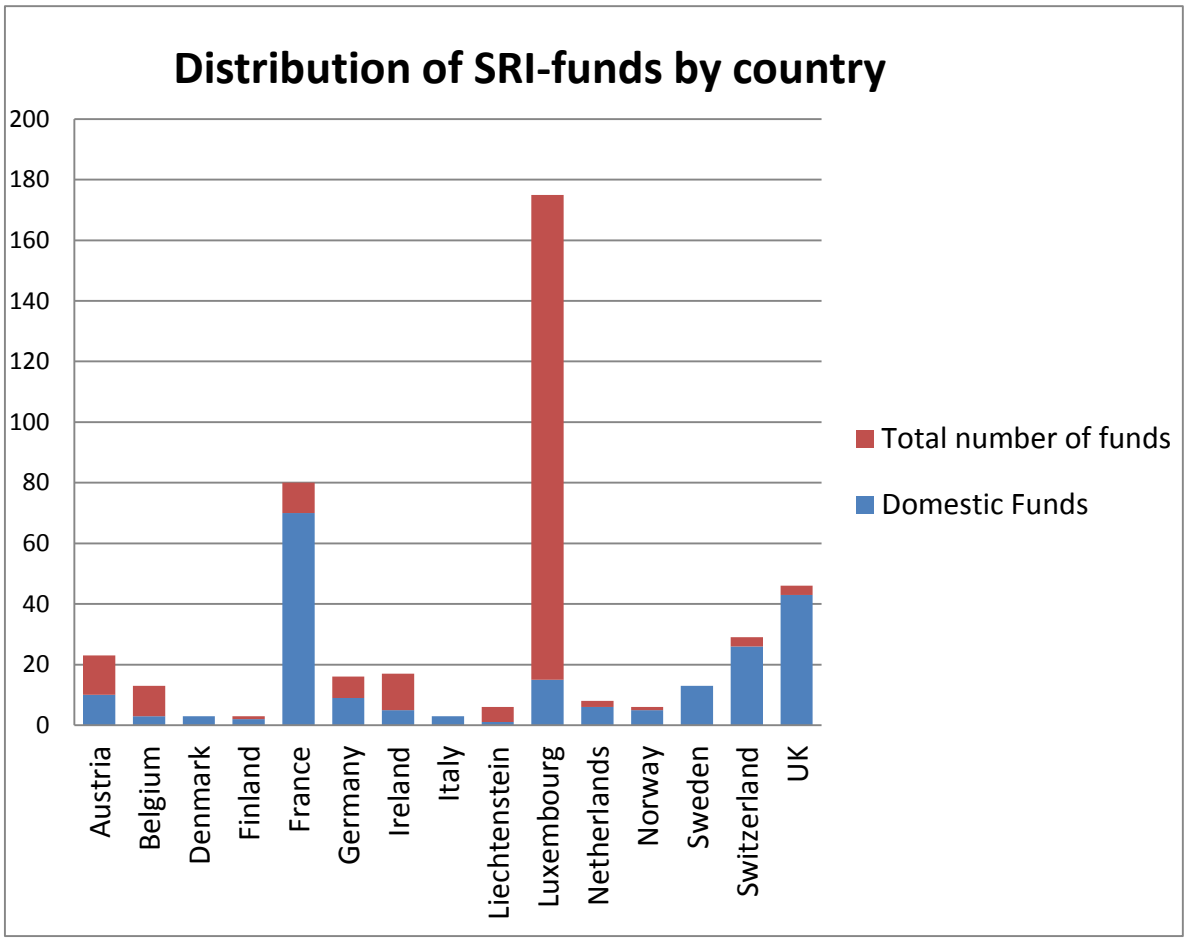

Figure 6. Distribution of SRI-funds in the raw sample data by country

Seen from the figure, the three countries with the largest number of SRI-funds are Luxembourg, France and the United Kingdom with Switzerland coming at fourth. The most striking difference between the top-3 three countries is the relative amount of domestic funds. A total of 175 SRI-funds, almost 40% of all the funds used in the study, is domiciled in Lux-

embourg, but the only 15 of the funds are registered for sale in Luxembourg only. The majority of the funds are sold in other countries, which is due to tax reasons. The same kind distribution between domestic and non-domestic funds can be seen in Austria, Belgium, Ireland and Liechtenstein.

In the sample data, the amount of different screens used by the funds was 30. The most common screening strategy, which was used by almost 70% of the funds in the sample was ESG-screening, which is a broad-based complicated screening strategy which incorporates environmental, social and governance factors to the investment decision. The next two most common screens were the exclusion of firms in relation with the production armaments or tobacco. The relative distribution of screens is presented in figure 7.

The screens Environmental, Social, Governance or their combination ESG was used by 96% of the funds in the data sample. These four screens are essentially all positive screens which are implying a general theme of the fund. Because the four screens cover almost all of the funds, and the definition is relatively vague, the empirical study in this paper omits these wide screening strategies and only examines the effect of positive impact themes to the funds. As several funds in the sample use only one screen that is either one of the before mentioned, these funds are excluded from the empirical study. A total of 4 funds were also excluded from the sample due to inconsistencies in the time series data. This brings the final sample size to 326 funds.

Positive impact screens applied by the SRI-funds are Renewable energy/Cleantech, Energy Efficiency, Water, Recycling, Carbon Emissions, Mobility, Agriculture, Health, Forestry and Green Building. The negative screens are Armaments, Tobacco, Gambling, Nuclear power, Adult Content, Violation of Human Rights, Alcohol, Violation of Labour Rights, Genetically Modified Organisms, Violation of Global Compact, Animal Testing, Agrochemicals, Controversial Eco Methods, Mining and Oil Production. (YourSRI.)

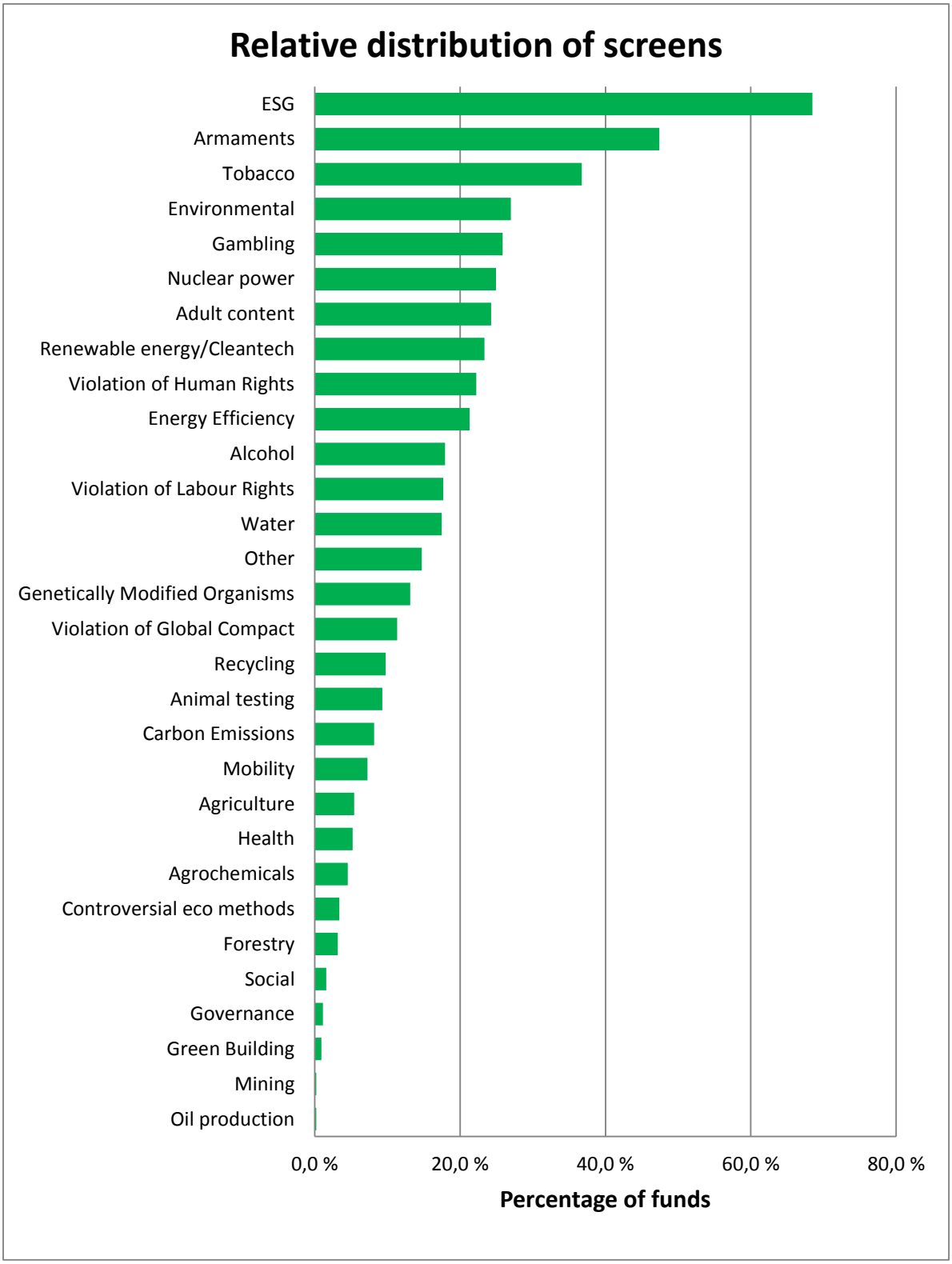

Figure 7. The Distribution of screens applied by % of funds.

After restricting the funds to 326 different SRI-fund, the daily data for each fund was obtained from datastream. As some funds have updated the prices only once week, the daily returns have been changed to compounded monthly returns in order to dispose the effect of daily variation. After transforming the daily data to monthly return for each fund, several different portfolios are formed according to the screening intensity and screen type.

6.2. Methodology of the empirical part

The empirical part of the study revolves around the examination of the performance of SRI-funds according to their screening intensity. The hypotheses are first studied by applying an independent samples T-test to different portfolios which are formed based on the screen type and screening intensity. Then a multi-factor regression is applied to different portfolios sorted by their screens. The aim of the regressions is to capture the characteristics of SRI-funds employing different amount of screens.

In order to test the statistical difference between two sample groups, the Student's T-test is applied. The test measures the difference of means between the sample groups in order to see if the variables of the sample groups are on average statistically different. The statistical significance is expressed at levels 0.01, 0.05 or 0.10. The formula for T-test is given in equation 13. (Ruxton 2006: 688.)

(13) $$t = \frac{\overline{x_1} - \overline{x_2}}{\sqrt{(\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2})}}$$

Where: $\overline{x_i}$ = mean of the sample i
σ_i^2 = variance of the sample i
n_i = degrees of freedom in the paired sample

The degrees of freedom in the Student's T-test is calculated as:

(14) $$df = n_1 + n_2 - 2$$

Where: n_i = amount of variables in sample i

The result of the T-test tells if the difference between the two sample groups is statistically different or not. If the p-value of the test is less than 0.1, the null hypothesis, that the average performance of the two groups does not differ from each other, is rejected on a 10% level. If the p-value is over 0.1, the null hypothesis is accepted, which tells that the average performance of the two sample groups is not statistically different.

After the T-tests are applied to the samples, in order to study the effects of screening intensity to the funds, multi-factor regressions are applied to the data set. This captures the effect of the screens to the fund performance and shows the differences in the characteristics of the funds.

The main regression used in the study is the Carhart 4-factor model shown in equation 15. The regressions in this paper are presented in a style where the factors are applied one after another. The purpose of this method is to examine the significance of the factors more clearly. Essentially this means that the first regression is the Jensen's alpha single factor model. This is followed by a two factor model and the Fama-French 3-factor model. With the addition of the final momentum factor, the Carhart-4 factor model is used. The factors were obtained from Kenneth French's website. The use of Fama-French 5-factor model would be the ideal choice, but the variables for European markets were not yet available. (Kenneth R. French Data Library.)

(15) $$R_p - R_f = \alpha_i + \beta_1(R_m - R_f) + \beta_2 SMB \quad + \beta_2 HML \quad + \beta_3 WML \quad + e_i$$

Where: SMB = Small minus Big
HML = High minus Low
WML = Winners minus Losers

The study uses two different proxies for a market benchmark. As the SRI-funds are constructed by applying different environmental, social and governance screens, a conventional benchmark may not be the suitable in explaining the performance of SRI-funds. This is why the first proxy used for market benchmark is the STOXX Europe Sustainability index. The index consists of almost 300 companies screened for ESG criteria from 18 different countries from Europe (STOXX Europe Sustainability).

The previous literature has shown that the ethical stock indices can be less powerful in explaining the performance of socially responsible investment funds (Bauer et al. 2005). Also, the SRI-funds in Europe are more exposed to small cap stocks whereas the funds in United States are more exposed to large cap stocks. Thus, the MSCI IMI Europe index is also used as a more conventional market index in order to see the differences between the indices. The MSCI IMI Europe captures the presentation of Large, Medium and Small cap companies from 15 different countries in Europe. The risk free rate used in the study is the European rate obtained from Kenneth French's website. (MSCI, Kenneth R. French Data Library.)

6.3. Limitations of the empirical study

The list of different SRI-funds is imported from the database of yourSRI. Although the site is a partner of the United Nations's principles of responsible investing, the legitimacy of the data could be questioned. The list of screens used by each of the funds is also drawn from yourSRI. This paper also assumes that the screening strategies used by the funds stay the same during the whole observation period, which could result in inaccurate results for respective portfolios.

7. RESULTS OF THE EMPIRICAL STUDY

This part of the thesis focuses on the results of the empirical study. First, the descriptive statistics of the data is given. Next, effect of screening intensity of both positive and negative screens is examined by applying a T-test to different sample groups. This is followed by applying the Carhart 4-factor regressions to the whole sample before applying the same regression to different portfolios sorted by the type of screens.

7.1. Descriptive statistics

In order to see the characteristics of the sample data, descriptive statistics of the data is given. The descriptive for the sample data of the study is presented in table 3.

Table 3. Descriptive statistics

Type of fund	Variable	Min	Mean	Max	Stdev	Skewness	Kurtosis
Whole sample	MonthlyR	-0.532	0.003	0.433	0.049	-0.925	4.510
n = 326	Alpha	-1.961	0.045	0.981	0.378	-0.970	3.268
	Sharpe	-0.174	0.058	0.476	0.111	0.942	1.120
	Sortino	-0.205	0.087	0.961	0.168	1.515	3.284
Positive	MontlhyR	-0.532	0.002	0.433	0.053	-0.955	6.871
n = 81	Alpha	-1.961	-0.034	0.981	0.485	-1.073	3.133
	Sharpe	-0.145	0.058	0.476	0.122	1.108	1.559
	Sortino	-0.183	0.098	0.961	0.201	1.716	4.070
Negative	MonthlyR	-0.309	0.003	0.341	0.046	-0.839	3.137
n = 187	Alpha	-0.880	0.062	0.947	0.314	-0.242	0.544
	Sharpe	-0.115	0.063	0.409	0.104	1.108	1.143
	Sortino	-0.143	0.089	0.734	0.150	1.510	2.703

Looking at the descriptive statistics, the average alphas for positively screened funds are lower compared to the rest of the sample, which implies that the funds have performed

worse compared to rest of the funds, whereas the negative funds have performed better on average than rest of the funds. The skewness for the whole sample of alphas show that the returns are concentrated to right side of the mean with the extreme values being on the left side. The same goes for positive and negative funds, although the skewness is less pronounced in negative funds.

The kurtosis is over 3 for alphas in the whole sample and for the positive funds. Especially the kurtosis in the positive funds show that the peak in the distribution is very sharp and there is a high probability for extreme values. The kurtosis for negative funds is only 0.544, which tells that the distribution is flat and the probability for extreme values is lower.

The Sharpe and Sortino ratios for screened portfolios are presented in figures 8-10. The Sharpe and Sortino ratios would be identical to each other if the alphas would be normally distributed. The ratios show signs of correlation with the screening intensity in the case of negatively screened funds, but in other cases there seems to be no consistency.

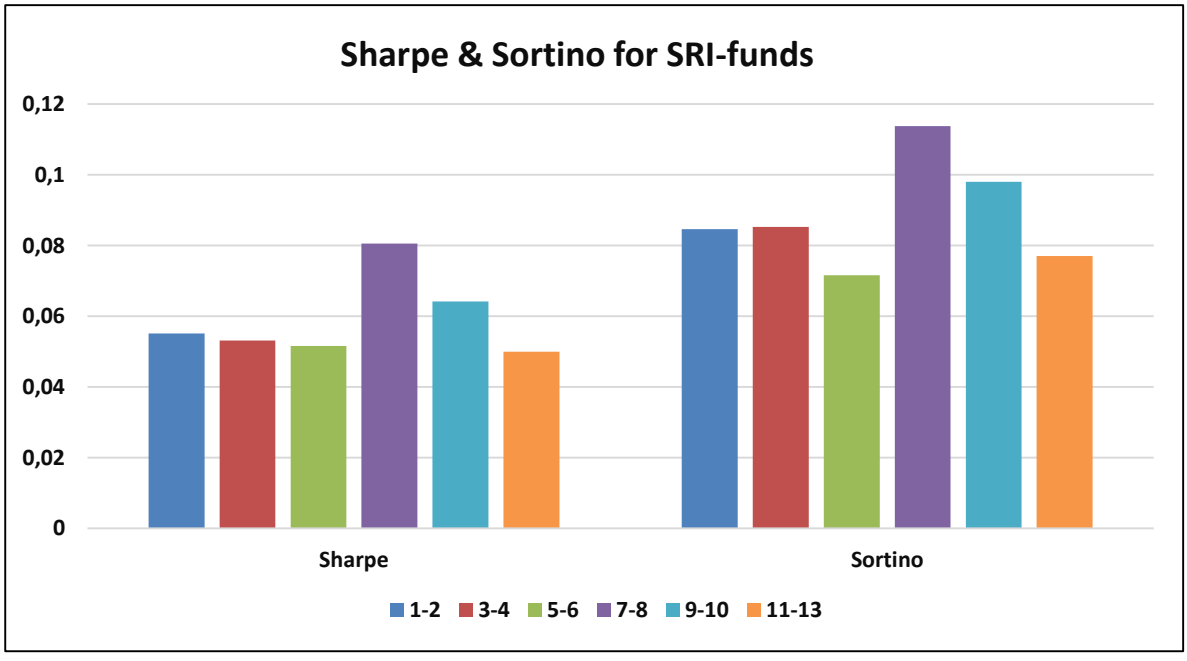

Figure 8. Sharpe & Sortino ratios for the whole sample

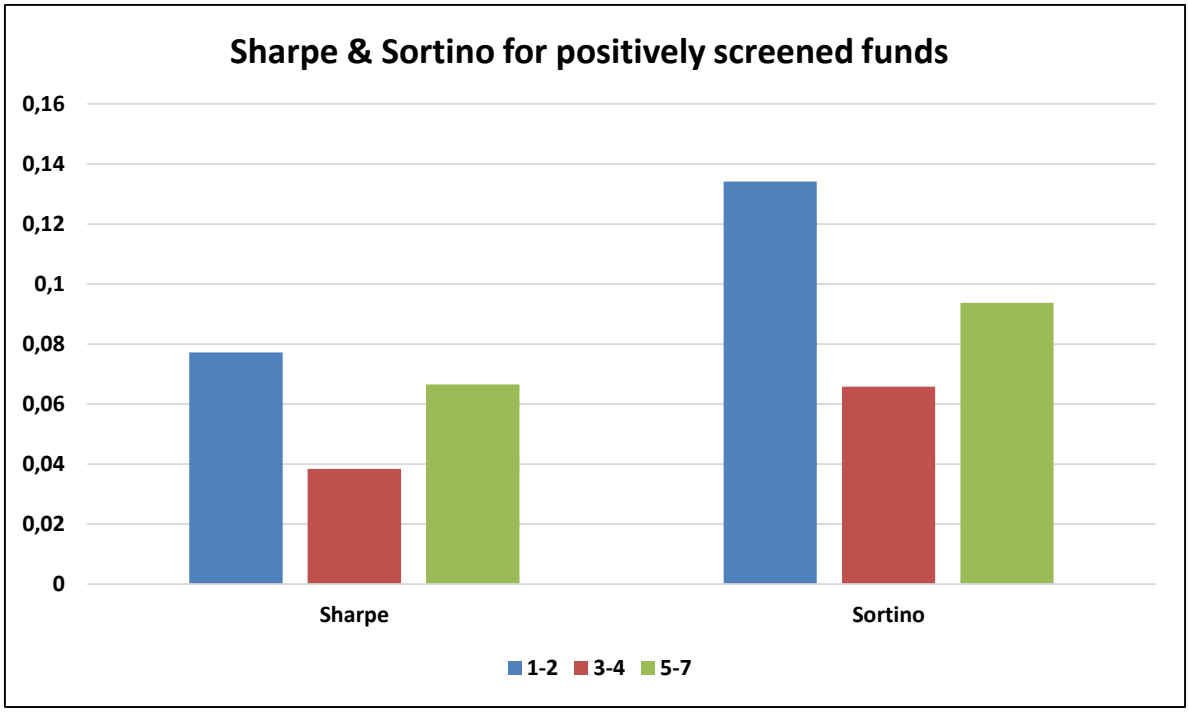

Figure 9. Sharpe & Sortino ratios for positively screened funds

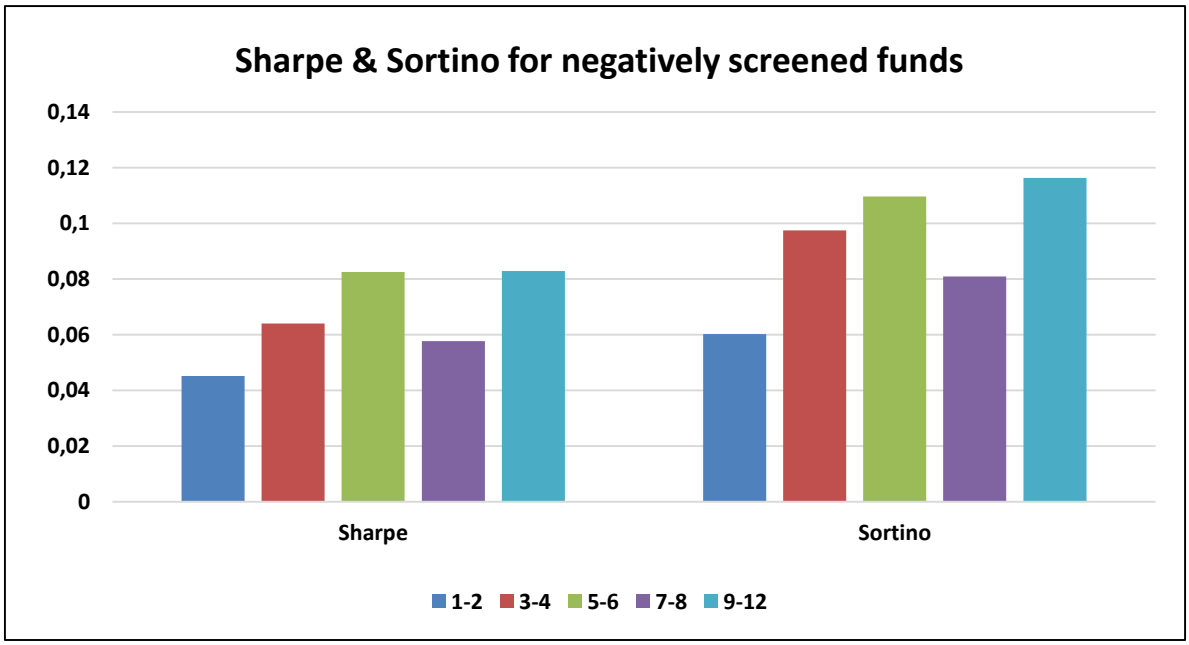

Figure 10. Sharpe & Sortino ratios for negatively screened funds

7.2. Independent samples T-tests

In order to test the statistical difference in the performance of the funds according to the type of fund and screening intensity, a T-test is applied to the data set. The first test (1) tests the difference between alphas of portfolios applying 1-4 screens and 5-13 screens covering the sample of 326 funds. The second (2) test tests the difference in alphas between negatively screened portfolios and positively screened portfolios. The third (3) T-test tests the difference in alphas between the lowest screened positive portfolios and the highest screened positive portfolios. The fourth test (4) examines the differences in alphas between the lowest screened negative portfolios and highest screened negative portfolios. The results are given in table 4.

Table 4. Results for the T-tests

Test	t	p	Mean difference	Std error difference
(1)	-1.856	0.064	0.040	0.002
(2)	1.933	0.054	0.096	0.031
(3)	-0.246	0.807	0.026	0.032
(4)	-2.136	0.034	0.097	0.011

The results of the T-tests indicate the following. The results for the first test show that there is a difference in low screened portfolios and high screened portfolios, which is statistically significant and the null hypothesis is rejected at a 10% level. As a support for the overperformance hypothesis, the relationship seems to be positive indicated by the negative T-value. The negative and positive sample groups are statistically different on a 10% level indicated by the p value of 0.054, and thus the null hypothesis is rejected. This implies that the alphas for negatively screened funds are on average higher than for the positively screened portfolios on a 10% level. Also, the T-test for the difference of low screened negative funds and high screened negative funds is statistically significant at 5% level. The negative T-value tells that on average, the high screened portfolios perform better compared to the low screened portfolios. This result also supports the overperformance hypothesis for the negatively screened funds. There seems to be no significance in the screening intensity

of positive portfolios, although if the effect of screening intensity to the performance of the fund happens to be U-shaped, the effect doesn't necessarily show in the T-tests. In the next three parts, the hypotheses 1-6 are examined by applying multiple factor regressions to the data set.

7.3. The effect of screening intensity to the performance of SRI-funds

In order to examine the effect of screening intensity to the performance of SRI-funds more closely, the Carhart 4-factor regression is applied to equally weighted portfolios, which are formed according to the number of screens used by the sub funds. Table 5. reports the effects of screening intensity with MSCI IMI Europe used as the market proxy. Table 6. reports the results for the same proxy but with merged portfolios. Tables 7-8 report the same estimated coefficients for the same factors, but this time using the STOXX Europe Sustainability index as the market benchmark.

Table 5. The effect of screening intensity on the performance of SRI-funds vs MSCI IMI Europe

# of Screens	α	β	SMB	HML	WML	Ad. R^2
1	0.05	0.96***				0.94
	0.02	0.97***	0.15***			0.94
	0.04	0.99***	0.16***	-0.08*		0.94
	0.04	0.98***	0.16***	-0.08*	-0.01	0.94
2	-0.08	0.99***				0.92
	-0.05	1.00***	0.22***			0.93
	-0.03	1.02***	0.23***	-0.07		0.93
	-0.04	1.02***	0.23***	-0.07	0.01	0.93
3	-0.00	1.01***				0.82
	-0.12	1.05***	0.57***			0.87
	-0.05	1.09***	0.59***	-0.26***		0.88
	-0.06	1.10***	0.59***	-0.25***	0.01	0.88
4	0.08	0.90***				0.91
	0.03	0.92***	0.27***			0.92
	0.07	0.94***	0.29***	-0.14***		0.93
	0.08	0.94***	0.29***	-0.14***	-0.01	0.92
5	-0.00	0.97***				0.94
	-0.03	0.98***	0.13***			0.94
	0.02	1.00***	0.14***	-0.15***		0.95
	0.05	0.99***	0.15***	-0.16***	-0.03	0.95

Table 5. Continued

# of Screens	α	β	SMB	HML	WML	Ad. R^2
6	0.05	0.91***				0.91
	0.00	0.93***	0.23***			0.92
	0.04	0.96***	0.24***	-0.16***		0.92
	0.10	0.93***	0.25***	-0.17***	-0.05**	0.92
7	0.05	0.86***				0.88
	-0.01	0.89***	0.31***			0.91
	0.01	0.90***	0.32***	-0.07		0.91
	-0.02	0.91***	0.32***	-0.06	0.03	0.91
8	0.14	0.95***				0.88
	0.07	0.97***	0.34***			0.90
	0.09	0.99***	0.35***	-0.09		0.90
	0.10	0.99***	0.35***	-0.09	-0.00	0.90
9	0.14	0.90***				0.87
	0.09	0.92***	0.26***			0.88
	0.11	0.93***	0.27***	-0.07		0.89
	0.10	0.93***	0.27***	-0.07	0.01	0.88
10	0.23	0.95***				0.84
	0.13	0.98***	0.51***			0.88
	0.15	0.99***	0.52***	-0.05		0.88
	0.15	0.99***	0.52***	-0.05	-0.00	0.88
11	0.03	0.88***				0.88
	-0.03	0.90***	0.29***			0.90
	0.00	0.91***	0.30***	-0.10*		0.90
	-0.02	0.93***	0.29***	-0.09*	0.02	0.90
12-13	0.04	0.84***				0.84
	-0.01	0.85***	0.25***			0.86
	0.06	0.90***	0.27***	-0.26***		0.87
	-0.01	0.93***	0.26***	-0.23***	0.08*	0.87

****=Significant at 1% level, **=Significant at 5% level, *=Significant at 10% level.*

Looking at Table 5, the values of adjusted R2s show that the regression fits the data well. The momentum factor seems to have little to no significance as only 2 portfolios are significant at a 10% level. The HML-factor is negative and highly significant in 5 of the portfolios when the conventional benchmark is used as a proxy. This implies that the SRI-funds could be more composed of growth stocks rather than value stocks, but there is no relationship between screening intensity. The SMB-factor is positive and significant in all of the portfolios, indicating a small cap bias in the portfolios.

The betas seem to be decreasing in relation to screening intensity, which could imply a support for the overperformance hypothesis as the riskiness of the fund could be diminished

due to the selection of companies with good ESG-standards. There seems to be no clear relationship with alphas the screening intensity, although majority of alphas are positive. This indicates that the funds have over performed the conventional benchmark, although none of the coefficients are significant. Table 6. reports the same regressions with merged portfolios.

Table 6. The effect of screening intensity with merged portfolios vs. MSCI IMI Europe

# of Screens	α	β	SMB	HML	WML	Ad. R^2
1-2	0.03	0.97***				0.94
	-0.01	0.98***	0.17***			0.94
	0.02	1.00***	0.18***	-0.08*		0.94
	0.02	0.99***	0.18***	-0.08*	-0.00	0.94
3-4	0.05	0.94***				0.89
	-0.02	0.96***	0.37***			0.92
	0.02	0.99***	0.39***	-0.17***		0.92
	0.03	0.99***	0.39***	-0.18***	-0.00	0.92
5-6	0.01	0.95***				0.94
	-0.02	0.96***	0.16***			0.95
	0.02	0.98***	0.18***	-0.14***		0.95
	0.05	0.97***	0.18***	-0.15***	-0.03	0.95
7-8	0.09	0.90***				0.89
	0.03	0.93***	0.32***			0.91
	0.05	0.94***	0.33***	-0.08		0.91
	0.04	0.95***	0.33***	-0.07	0.01	0.91
9-10	0.14	0.91***				0.88
	0.09	0.95***	0.32***	-0.07	0.01	0.90
	0.10	0.94***	0.32***	-0.07		0.90
	0.09	0.95***	0.32***	-0.07	0.01	0.90
11-13	0.04	0.86***				0.88
	-0.01	0.88***	0.27***			0.90
	0.04	0.91***	0.28***	-0.17***		0.90
	-0.01	0.93***	0.28***	-0.15***	0.05*	0.91

****=Significant at 1% level, **=Significant at 5% level, *=Significant at 10% level.*

The merged portfolios report marginally higher values of R2s compared to the individual screen portfolios and the trend of betas can be seen more clearly in merged portfolios. Also in the case of merged portfolios, the alphas are mainly positive but insignificant. Interestingly, the alphas are rising with screening intensity until the most screened portfolio, which would support the overperformance hypothesis. The different results in the last portfolio

can be somewhat explained with the small amount of sub funds in the highest screened portfolio compared to other portfolios. The next table reports the regressions for screened portfolios with an ethical index used as a proxy for a market benchmark. Results are given in table 7.

Table 7. The effect of screening intensity on the performance of SRI-funds vs STOXX Europe Sustainability

# of Screens	α	β	SMB	HML	WML	Ad. R^2
1	0.13	0.92***				0.89
	0.07	0.95***	0.29***			0.90
	0.07	0.95***	0.30***	-0.00		0.90
	0.06	0.96***	0.29***	0.00	0.02	0.90
2	0.07	0.94***				0.85
	0.00	0.98***	0.37***			0.88
	0.00	0.97***	0.37***	0.01		0.88
	-0.02	0.99***	0.37***	0.02	0.03	0.98
3	0.07	0.95***				0.75
	-0.06	1.02***	0.72***			0.82
	-0.01	1.05***	0.74***	-0.17**		0.82
	-0.04	1.06***	0.73***	-0.16*	0.03	0.82
4	0.16	0.86***				0.85
	0.08	0.90***	0.41***			0.88
	0.10	0.91***	0.41***	-0.06		0.88
	0.09	0.92***	0.41***	-0.06	0.01	0.88
5	0.08	0.93***				0.90
	0.03	0.96***	0.28***			0.91
	0.05	0.97***	0.28***	-0.07		0.91
	0.06	0.97***	0.28***	-0.07	-0.01	0.91
6	0.12	0.87***				0.85
	0.06	0.91***	0.36***			0.88
	0.08	0.92***	0.37***	-0.08		0.88
	0.11	0.91***	0.37***	-0.09	-0.03	0.88
7	0.12	0.82***				0.83
	0.04	0.87***	0.44***			0.87
	0.04	0.87***	0.44***	0.00		0.87
	-0.01	0.89***	0.44***	0.02	0.05	0.87
8	0.21	0.90***				0.82
	0.13	0.95***	0.48***			0.86
	0.13	0.95***	0.48***	-0.01		0.86
	0.11	0.96***	0.38***	-0.00	0.02	0.86
9	0.21	0.85***				0.80
	0.14	0.89***	0.39***			0.83
	0.14	0.89***	0.39***	0.01		0.83
	0.11	0.90***	0.39***	0.02	0.02	0.83

Table 7. Continued.

# of Screens	α	β	SMB	HML	WML	Ad. R^2
10	0.31*	0.89***				0.75
	0.19	0.95***	0.65***			0.82
	0.18	0.95***	0.65***	0.04		0.82
	0.16	0.95***	0.64***	0.04	0.02	0.82
11	0.10	0.84***				0.82
	0.03	0.88***	0.42***			0.85
	0.03	0.88***	0.42***	-0.02		0.85
	-0.01	0.91***	0.42***	-0.01	0.04	0.85
12-13	0.11	0.80***				0.79
	0.04	0.84***	0.37***			0.82
	0.10	0.87***	0.40***	-0.18***		0.83
	-0.00	0.92***	0.39***	-0.15***	0.11***	0.84

****=Significant at 1% level, **=Significant at 5% level, *=Significant at 10% level.*

The results in table 7 show that the ethical benchmark is less powerful in explaining the performance of SRI-funds proven by the lower R2s in table 7 compared to table 5. This is in line with the findings of previous literature, that the ethical indices are less powerful in explaining the returns of SRI-funds. The betas are also lower which implies greater volatility in the ethical market benchmark. The SMB-factors are all positive, significant, and higher when compared to the conventional benchmark. This tells that the conventional benchmark is more exposed to small cap stocks than the ethical index.

The most striking difference when compared to the conventional index is the significance of HML-factors. The smaller and less significant coefficients of HML-factors in table 5 imply that the ethical benchmark is more exposed growth stocks. The alphas are higher but none of the 4-factor alphas are significant. Table 8 reports the same regressions with merged portfolios

Table 8. The effect of screening intensity with merged portfolios vs. STOXX Europe Sustainability

# of Screens	α	β	SMB	HML	WML	Ad. R^2
1-2	0.11	0.93***				0.88
	0.05	0.96***	0.32***			0.90
	0.05	0.96***	0.31***	0.00		0.90
	0.03	0.97***	0.31***	0.01	0.02	0.90

Table 8. Continued

# of Screens	α	β	SMB	HML	WML	Ad. R^2
3-4	0.13	0.89***				0.83
	0.03	0.94***	0.51***			0.87
	0.06	0.95***	0.52***	-0.09		0.87
	0.04	0.96***	0.52***	-0.09	0.02	0.87
5-6	0.09	0.91***				0.90
	0.03	0.94***	0.31***			0.91
	0.05	0.95***	0.31***	-0.07		0.91
	0.06	0.95***	0.31***	-0.07	-0.01	0.91
7-8	0.17	0.86***				0.83
	0.08	0.91***	0.46***			0.87
	0.04	0.91***	0.46***	-0.00		0.87
	0.05	0.93***	0.46***	0.01	0.04	0.87
9-10	0.21	0.86***				0.80
	0.13	0.90***	0.44***			0.84
	0.13	0.90***	0.44***	0.01		0.84
	0.11	0.91***	0.44***	0.01	0.02	0.84
11-13	0.12	0.82***				0.83
	0.04	0.86***	0.40***			0.86
	0.07	0.88***	0.41***	-0.09		0.86
	0.00	0.91***	0.40***	-0.07	0.07**	0.86

****=Significant at 1% level, **=Significant at 5% level, *=Significant at 10% level.*

By merging the portfolios, the lower values of R2s are removed and even the lowest value of R2 indicates that the model performs better in explaining the merged portfolios. The lowering trend of beta when the ethical index is used as a proxy can also be seen more clearly in the case of merged portfolios.

The effect of screening intensity to the performance of SRI-funds was examined in the first four tables. The alphas were positive in majority of the portfolios which means that SRI-funds have over performed the market benchmark, both conventional and ethical. The alphas do not show signs of consistency when compared to the screening intensity and to the contrary to the latest previous literature, the relationship between screening intensity and risk adjusted returns is not negative or curvilinear. The most interesting finding is the behavior of beta in relation to the screening intensity. Beta values seem to decrease as the screening intensity increases, thus showing negative relationship between the two. This is shown graphically in figure 8. Also, none of the 4-factor alphas are significant. Neither the T-test, or the multiple-regression provided support for the underperformance hypothesis, and thus H1 is rejected. On the other hand, the T-test supported the overperformance hy-

pothesis but showed no consistency in the multiple-regression. Thus, there is strong evidence in support of H2.

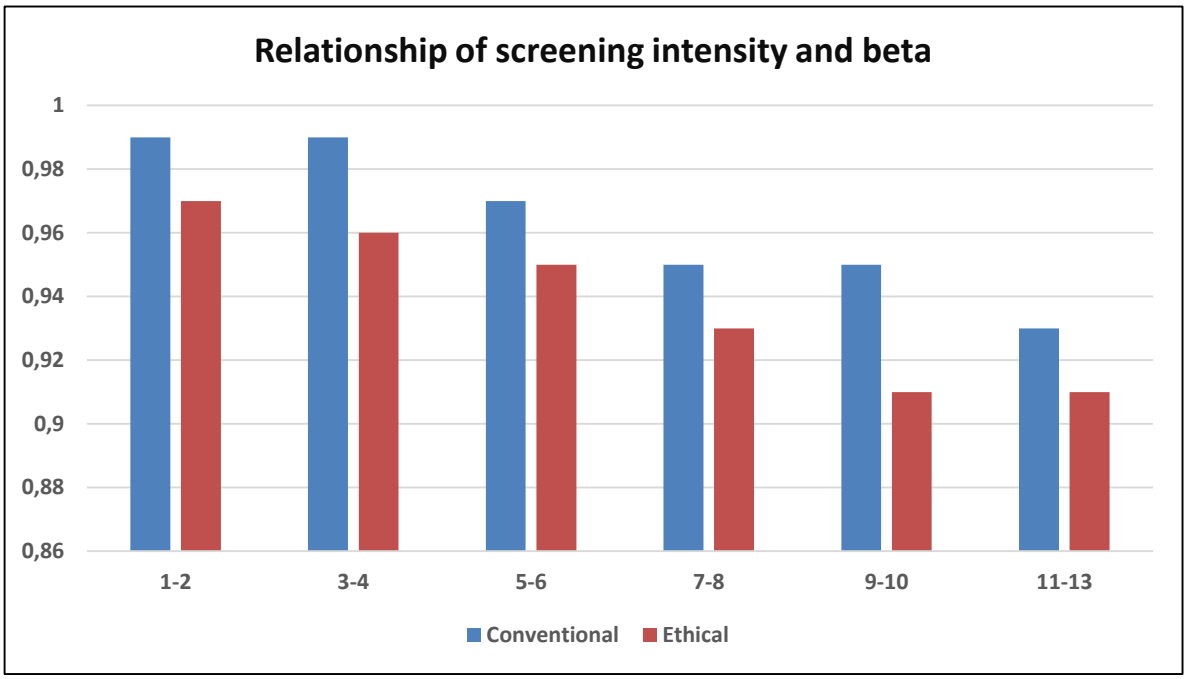

Figure 11. The relationship between screening intensity and fund beta

7.4. The effect of positive screening intensity to the performance of SRI-funds

The third and fourth hypotheses, that the performance of positively screened funds either increases or decreases with screening intensity is examined in the third part of the empirical study. Although the T-tests provided no significant differences between low and high screened funds, the characteristics of the funds is examined by applying multi-factor regressions to the portfolios. The results for the results for the regressions are presented in tables 9-12.

Table 9. The effect of positive screening intensity on the performance of SRI-funds vs MSCI IMI Europe

# of Screens	α	β	SMB	HML	WML	Ad. R^2
1	0.15	0.94***				0.82
	0.06	0.97***	0.43***			0.85
	0.11	1.00***	0.44***	-0.17**		0.85
	0.06	1.02***	0.44***	-0.16**	0.05	0.86
2	-0.19	0.89***				0.68
	-0.17	0.89***	0.44***			0.71
	-0.17	0.89***	0.44***	0.01		0.70
	-0.19	0.90***	0.45***	0.04	0.04	0.70
3	-0.01	1.03***				0.76
	-0.15	1.08***	0.70***			0.83
	-0.08	1.12***	0.72***	-0.24***		0.83
	-0.10	1.13***	0.72***	-0.23***	0.02	0.83
4	-0.05	0.92***				0.82
	-0.12	0.95***	0.39***			0.85
	-0.07	0.98***	0.41***	-0.21***		0.86
	-0.10	1.00***	0.41***	-0.20***	0.03	0.86
5	-0.22	1.02***				0.76
	-0.31	1.06***	0.50***			0.79
	-0.24	1.11***	0.53***	-0.29***		0.80
	-0.25	1.11***	0.53***	-0.29***	0.02	0.80
6-7	0.02	0.98***				0.67
	-0.04	1.00***	0.30**			0.68
	0.05	1.06***	0.34***	-0.32***		0.69
	0.12	1.03***	0.35***	-0.34***	-0.07**	0.69

****=Significant at 1% level, **=Significant at 5% level, *=Significant at 10% level.*

As seen from the results, the adjusted R2s are lower in the case of positively screened funds, this implies that the model does not explain the data of positive funds as well as the whole sample. The variability of R2s can be somewhat explained by the amount of sub-portfolios in the portfolios 1-7. The momentum-factor, WML has only one significant coefficient in the positive screened portfolios.

The fund betas seem to be increasing with the number of screens applied by the fund. Unlike in the case of the whole sample, there seems to be a positive relationship with the positive screening intensity and the fund beta. The coefficients for the SMB-factor are also highly significant and higher than in the total sample in all cases, but there is no consisten-

cy with screening intensity. This shows that the positively screened funds are even more composed of small cap stocks compared to the whole sample.

The HML factor is significant and increasing when using the MSCI-index as a proxy for a market benchmark. This implies that there is a bias for growth stocks in positively screened funds and the relationship is positive with the screening intensity. This is seems logical, as the positive screens are common themes for growth firms. The biasness towards growth stocks can also be an explanation for the rising betas. The next table reports the same regression with merged portfolios.

Table 10. The effect of positive screening intensity with merged portfolios vs MSCI IMI Europe

# of Screens	α	β	SMB	HML	WML	Ad. R^2
1-2	0.10	0.89***				0.81
(2)	0.02	0.92***	0.41***			0.84
(3)	0.06	0.95***	0.43***	-0.14**		0.84
(4)	0.01	0.97***	0.42***	-0.13*	0.05	0.84
3-4	-0.03	0.97***				0.81
(2)	-0.13	1.01***	0.53***			0.85
(3)	-0.07	1.05***	0.55***	-0.23***		0.86
(4)	-0.09	1.06***	0.55***	-0.22***	0.03	0.86
5-7	-0.11	1.00***				0.76
(2)	-0.19	1.03***	0.42***			0.78
(3)	-0.10	1.08***	0.45***	-0.31***		0.80
(4)	-0.07	1.07***	0.45***	-0.32***	-0.03	0.80

****=Significant at 1% level, **=Significant at 5% level, *=Significant at 10% level.*

The results for the merged portfolios show on average higher values of R2 and the trend of HML-factor can be seen more clearly in table 10. Even though the T-test showed no statistical difference between low and high screened positive funds, the regressions shows signs of curvilinear behaviour indicated by a U-shaped relationship between alphas and screening intensity, although the results are not statistically significant. The next table provides the results for the regression with STOXX Europe Sustainability-index used as a proxy for a market benchmark.

Table 11. The effect of positive screening intensity on the performance of SRI-funds vs STOXX Europe Sustainability

# of Screens	α	β	SMB	HML	WML	R^2
1	0.23**	0.88***				0.74
(2)	0.12	0.94***	0.56***			0.79
(3)	0.15	0.95***	0.57***	0.08		0.79
(4)	0.08	0.98***	0.57***	-0.06	0.07	0.79
2	-0.21	0.83***				0.58
(2)	-0.19	0.85***	0.53***			0.63
(3)	-0.17	0.82***	0.54***	0.12		0.63
(4)	-0.20	0.84***	0.56***	0.16	0.06	0.62
3	0.07	0.97***				0.68
(2)	-0.08	1.05***	0.85***			0.77
(3)	-0.04	1.07***	0.87***	-0.14		0.78
(4)	-0.08	1.09***	0.87***	-0.13	0.04	0.78
4	0.03	0.87***				0.75
(2)	-0.07	0.92***	0.53***			0.79
(3)	-0.03	0.94***	0.54***	-0.12		0.80
(4)	-0.08	0.96***	0.54***	-0.11	0.05	0.80
5	-0.14	0.96***				0.69
(2)	-0.26	1.02***	0.65***			0.74
(3)	-0.20	1.05***	0.68***	-0.19*		0.74
(4)	-0.23	1.07***	0.67***	-0.18*	0.03	0.74
6-7	0.10	0.93***				0.62
(2)	0.02	0.98***	0.45***			0.64
(3)	0.09	1.01***	0.48***	-0.23*		0.65
(4)	0.14	0.99***	0.48***	-0.25**	-0.05	0.65

****=Significant at 1% level, **=Significant at 5% level, *=Significant at 10% level.*

As seen from the table 11, the values of R2s are lower when compared to table 9, which was also in the case of the whole sample. The insignificance of momentum factor is also present, although the values are marginally higher. The SMB-factors are statistically significant in all of the cases and the values are higher with an ethical benchmark, which gives more evidence to the claim that the conventional index is more exposed to small cap stocks. The HML-factor is not significant in majority of the portfolios signalling that the ethical index is more exposed to growth stocks. The alphas are not significant but show signs of curvilinearity. The next table gives the results for merged portfolios for the same regression.

Table 12. The effect of positive screening intensity with merged portfolios vs ESTOXX Europe Sustainability

# of Screens	α	β	SMB	HML	WML	Ad. R^2
1-2	0.18	0.84***				0.72
(2)	0.08	0.89***	0.54***			0.78
(3)	0.09	0.90***	0.55***	-0.06		0.77
(4)	0.03	0.93***	0.54***	-0.04	0.06	0.78
3-4	0.05	0.91***				0.73
(2)	-0.07	0.98***	0.67***			0.80
(3)	-0.03	1.00***	0.69***	-0.14		0.80
(4)	-0.07	1.02***	0.68***	-0.13	0.04	0.80
5-7	-0.02	0.94***				0.70
(2)	-0.13	1.00***	0.56***			0.74
(3)	-0.07	1.03***	0.59***	-0.21*		0.74
(4)	-0.05	1.03***	0.59***	-0.22*	-0.02	0.74

****=Significant at 1% level, **=Significant at 5% level, *=Significant at 10% level.*

It is now clear that none of the alphas for positively screened portfolios are significant, but there is some evidence for curvilinear behaviour between screening intensity and fund performance. The excess returns are not rising with screening intensity, and are not statistically significant, thus the overperformance hypothesis for positively screened portfolios is rejected proven by the T-test and the regression. In line with previous literature concerning the relationship with screening intensity and excess returns, the effect seems to be somewhat curvilinear, but insignificant. The alphas are also on average smaller than for the whole sample, indicating that the positive funds have done worse during the sample period of 2002 to 2014 comparing to all of the SRI-funds. The results for the positively screened funds indicate no statistical difference between low and high screened funds.

The most interesting findings in the case of positively screened portfolios are the relationship between the screening intensity and beta, and the relationship between screening intensity and the HML-factor. The relationship between positive screening intensity, beta and the HML-factor is shown in figure 12.

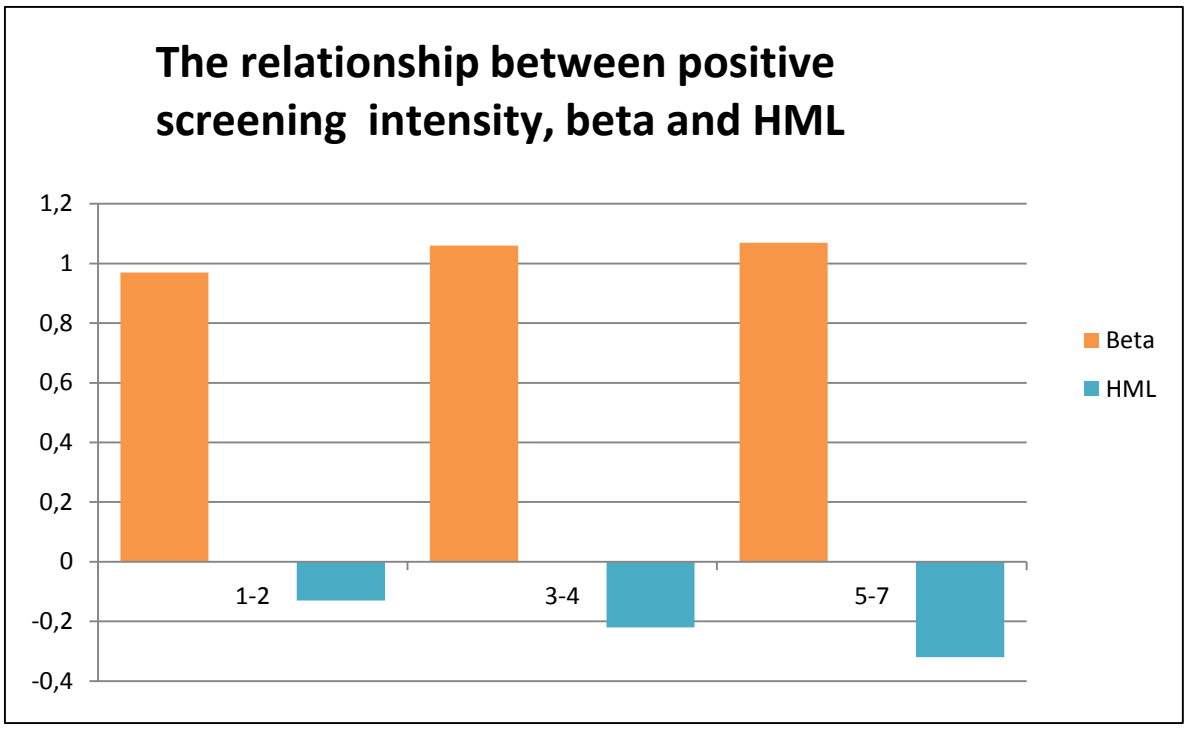

Figure 12. The relationship between positive screening, beta and HML

7.5. The effect of negative screening intensity to the performance of SRI-funds

In the fourth part of the empirical study, the effect of negative screening intensity is examined. Preliminary results provided by the T-test indicated a positive and statistically significant effect between screening intensity and the fund performance. The results for the regressions for negatively screened funds are presented in tables 13-16.

Table 13. The effect of negative screening intensity on the performance of SRI-funds vs MSCI IMI Europe

# of Screens	α	β	SMB	HML	WML	Ad. R^2
1	0.01	0.98***				0.95
	-0.00	0.98***	0.05			0.95
	0.05	0.98***	0.06	-0.18		0.95
	0.02	0.98***	0.06	-0.02	-0.01	0.95

Table 13. Continued

# of Screens	α	β	SMB	HML	WML	Ad. R^2
2	0.01	0.98***				0.95
	0.01	0.98***	0.03			0.95
	-0.01	0.98***	0.02	0.05		0.95
	-0.02	0.98***	0.02	0.06	0.00	0.94
3	-0.07	0.96***				0.88
	-0.13	0.98***	0.32***			0.89
	-0.09	1.00***	0.33***	-0.13**		0.90
	-0.06	0.99**	0.34***	-0.14**	-0.03	0.90
4	0.12	0.90***				0.94
	0.09	0.91***	0.17***			0.95
	0.09	0.91***	0.17***	-0.00		0.95
	0.13	0.89***	0.17***	-0.01	-0.04*	0.95
5	0.02	0.96***				0.94
	0.01	0.96***	0.08*			0.94
	0.04	0.98***	0.09**	-0.10**		0.94
	0.07	0.97***	0.10**	-0.11**	-0.03	0.94
6	-0.09	0.89***				0.90
	-0.13	0.91***	0.19***			0.92
	-0.08	0.93***	0.20***	-0.13***		0.92
	-0.02	0.90***	0.21***	-0.15***	-0.07**	0.92
7	-0.02	0.85***				0.78
	-0.06	0.86***	0.24***			0.79
	-0.02	0.88***	0.26***	-0.14*		0.79
	-0.02	0.89***	0.26***	-0.14*	0.00	0.79
8	0.16	0.93***				0.87
	0.11	0.95***	0.33***			0.89
	0.14	0.97***	0.34***	-0.11*		0.89
	0.14	0.97***	0.34***	-0.11*	0.00	0.89
9	0.15	0.91***				0.87
	0.11	0.92***	0.22***			0.88
	0.11	0.93***	0.23***	-0.02		0.88
	0.13	0.92***	0.23***	-0.02	-0.01	0.88
10-12	0.16*	0.87***				0.92
	0.12	0.88***	0.19***			0.93
	0.15*	0.90***	0.21***	-0.10**		0.93
	0.15	0.90***	0.20***	-0.10**	0.01	0.93

****=Significant at 1% level, **=Significant at 5% level, *=Significant at 10% level.*

Table 13 shows that the regression is explaining the data on a good basis indicated by the high values of R2. Continuing the trend of the findings of earlier regressions, the momentum factor is significant in only 2 of the portfolios. The HML-factor gives out mixed results and there seems to be no consistency in the findings. The SMB-factor is highly significant in 7 of the portfolios showing a slight bias towards small cap stocks although the coeffi-

cients are smaller compared to those of positively screened funds. Unlike in the case of positively screened portfolios, the beta is decreasing in relation with screening intensity. This could very well indicate that a fund employing several negative screens to the portfolio minimizes the risks of companies with bad environmental or social records. The alphas of the portfolios are not significant but unlike in previous literature, the results in table 13 show signs of a positive relationship between the performance of negatively screened funds and fund performance as the alphas in the funds employing 8 to 12 screens are higher than in the funds employing 1 to 3 screens. The next table shows the results for the same regression with merged portfolios.

Table 14. The effect of negative screening intensity with merged portfolios **vs.** MSCI IMI Europe

# of Screens (factor)	α	β	SMB	HML	WML	Ad. R^2
1-2	0.01	0.98***				0.95
	0.00	0.98***	0.05			0.95
	0.00	0.98***	0.05	-0.00		0.95
	0.01	0.98***	0.05	-0.00	-0.01	0.95
3-4	0.09	0.91***				0.94
	0.05	0.93***	0.20***			0.95
	0.05	0.93***	0.21***	-0.02		0.95
	0.09	0.91***	0.21***	-0.03	-0.04	0.95
5-6	0.01	0.94***				0.94
	-0.01	0.95***	0.10**			0.94
	0.02	0.96***	0.11***	-0.10**		0.95
	0.05	0.95***	0.12***	-0.11***	-0.03	0.95
7-8	0.07	0.88***				0.86
	0.02	0.90***	0.28***			0.88
	0.05	0.92***	0.30***	-0.12**		0.88
	0.05	0.93***	0.30***	-0.12**	0.00	0.88
9-12	0.15	0.89***				0.90
	0.11	0.91***	0.21***			0.91
	0.13	0.92***	0.22***	-0.05		0.91
	0.13	0.91***	0.22***	-0.05	-0.01	0.91

****=Significant at 1% level, **=Significant at 5% level, *=Significant at 10% level.*

The results for merged portfolios in table 14 are similar to that of the results in table 13. The decreasing trend of beta can be seen more clearly but other than that the findings are consistent with the previous table. Only difference is the positive values of alphas in all of the portfolios which signal that the negatively screened funds have over performed the con-

ventional market benchmark, and the positively screened funds during the time period of 2002-2014. Next table shows the results for the regression with the ethical index used as a proxy for a market benchmark.

Table 15. The effect of negative screening intensity on the performance of SRI-funds vs Estoxx sustainability

# of Screens	α	β	SMB	HML	WML	Ad. R^2
1	0.09	0.93***				0.89
(2)	0.06	0.96***	0.20***			0.90
(3)	0.04	0.95***	0.19***	0.06		0.90
(4)	0.03	0.95***	0.19***	0.06	0.01	0.90
2	0.09	0.94***				0.89
(2)	0.06	0.96***	0.17**			0.89
(3)	0.02	0.94***	0.15**	0.14**		0.89
(4)	-0.00	0.95***	0.15**	0.14**	0.02	0.89
3	0.00	0.91***				0.80
(2)	-0.07	0.95***	0.46***			0.84
(3)	-0.06	0.96***	0.46***	-0.04		0.84
(4)	-0.04	0.95**	0.46***	-0.05	-0.02	0.84
4	0.19*	0.86***				0.88
(2)	0.14	0.89***	0.30***			0.90
(3)	0.12	0.88***	0.29***	0.07		0.90
(4)	0.14	0.87***	0.29***	0.07	-0.02	0.90
5	0.10	0.93***				0.91
(2)	0.06	0.95***	0.22***			0.91
(3)	0.07	0.95***	0.23***	-0.03		0.91
(4)	0.07	0.95***	0.23**	-0.03	-0.00	0.91
6	-0.02	0.86***				0.86
(2)	-0.07	0.89***	0.32***			0.88
(3)	-0.06	0.90***	0.33***	-0.06		0.88
(4)	-0.01	0.88***	0.33***	-0.07	-0.04	0.88
7	0.05	0.81***				0.74
(2)	-0.01	0.85***	0.37***			0.77
(3)	0.01	0.86***	0.38***	-0.07		0.77
(4)	-0.02	0.87***	0.38***	-0.06	0.03	0.76
8	0.24	0.89***				0.81
(2)	0.16	0.93***	0.47***			0.85
(3)	0.17	0.94***	0.48***	-0.03		0.85
(4)	0.14	0.95***	0.47***	-0.03	0.03	0.85
9	0.23	0.86***				0.80
(2)	0.16	0.90***	0.36***			0.83
(3)	0.14	0.89***	0.35***	0.06		0.83
(4)	0.14	0.89***	0.35***	0.06	0.00	0.82

Table 15. Continued

# of Screens	α	β	SMB	HML	WML	Ad. R^2
10-12	0.23*	0.83***				0.87
(2)	0.17*	0.87***	0.32***			0.90
(3)	0.18*	0.87***	0.33***	-0.03		0.90
(4)	0.15	0.89***	0.33***	-0.02	0.03	0.90

****=Significant at 1% level, **=Significant at 5% level, *=Significant at 10% level.*

The ethical benchmark is clearly less powerful in explaining also the returns of negatively screened SRI-funds as the values of R2s are lower in each of the portfolios compared to the regression where a conventional benchmark is used as a proxy. As in the case of conventional benchmark, the coefficients for HML factors are not as prolific as in the case of positive funds. The decreasing trend of beta is evident also in the case of ethical proxy, although the values are lower when compared to the conventional benchmark. Also, the alphas are slightly higher compared to table 13, which shows that the ethical index has performed worse compared to the conventional index. The last table provides the results for merged portfolios with the ethical benchmark.

Table 16. The effect of negative screening intensity with merged portfolios vs. ESTOXX Europe Sustainability index

# of Screens (factor)	α	β	SMB	HML	WML	Ad. R^2
1-2	0.09	0.94***				0.90
(2)	0.06	0.96***	0.19***			0.90
(3)	0.03	0.94***	0.18***	0.08		0.90
(4)	0.02	0.95***	0.18***	0.08	0.01	0.90
3-4	0.16	0.87***				0.87
(2)	0.10	0.90***	0.34***			0.90
(3)	0.09	0.89***	0.33***	0.06		0.90
(4)	0.11	0.88***	0.33***	0.05	-0.02	0.90
5-6	0.08	0.90***				0.91
(2)	0.04	0.93***	0.24***			0.92
(3)	0.05	0.94***	0.25***	-0.03**		0.92
(4)	0.06	0.94***	0.25***	-0.03***	-0.00	0.92
7-8	0.14	0.85***				0.81
(2)	0.07	0.89***	0.42***			0.85
(3)	0.09	0.90***	0.42***	-0.05		0.85
(4)	0.06	0.91***	0.42***	-0.04	0.03	0.85

Table 16. Continued

# of Screens (factor)	α	β	SMB	HML	WML	Ad. R^2
9-12	0.22*	0.85***				0.84
(2)	0.17	0.88***	0.35***			0.87
(3)	0.16	0.88***	0.34***	0.03		0.87
(4)	0.15	0.89***	0.34***	0.03	0.01	0.86

****=Significant at 1% level, **=Significant at 5% level, *=Significant at 10% level*

Looking at table 17, the HML-factor is smaller and less significant in the negative screened portfolios compared to those of the positively screened portfolios. Also, the HML-factor is not consistent with the negative screening intensity. This implies that there is not a same kind of biasness towards growth stocks as there is in positive screened portfolios.

Looking at the results of the negatively screened portfolios in total, the alphas are higher than in the positively screened portfolios and the T-test provided evidence that the difference is statistically significant at a 10% level. By applying the Carhart 4-regression, the results showed that the negatively screened funds have performed better compared to the positively screened funds, although the results are not significant.

For the total sample, the T-test provided statistically significant evidence at 10% level that the high screened SRI-funds have overperformed low screened funds during the time period of 2002 to 2014. The multifactor model also supported the results of the T-tests, although the alphas were not significant and the most screened portfolio underperformed other portfolios. Overall the evidence is supporting the overperformance hypothesis although the results of the multifactor regressions are not significant.

The results for positively screened funds are mixed. The T-test provided no significant results between high and low screened funds and the multifactor model showed no consistency between screening intensity and fund performance, although it is clear that the positively screened funds have underperformed when compared to the negatively screened funds. The relationship between alpha and screening intensity shows signs of curvilinearity, which is in line with previous literature, but the results are not statistically significant.

According to the T-tests and the multi-factor regressions, the relationship between negative screening intensity and fund performance seems to be positive but not monotonic. The T-test showed a statistically significant difference at a 5% level in performance between high and low screened funds and the multifactor regression provided additional support for the overperformance hypothesis. Based on the evidence provided by the T-tests and multifactor regressions, the underperformance hypothesis is rejected and the overperformance hypothesis is accepted. The screening intensity seems to increase the performance of negatively screened funds, and it seems that the screening process is able to filter the companies with good ESG standards resulting in good performance indicated by the positive alphas, although the effect is not entirely linear. The relationship between each type of screening intensity and alpha is shown graphically in figures 10-12.

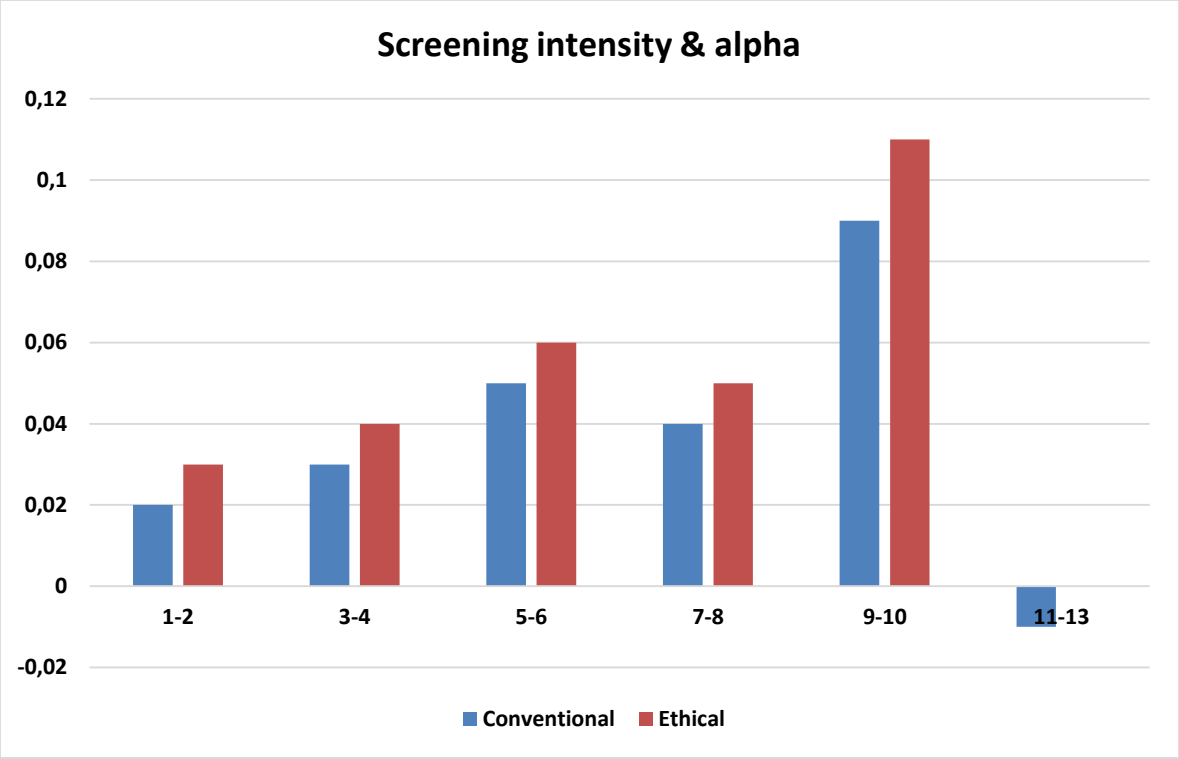

Figure 13. Relationship between Screening intensity and alpha

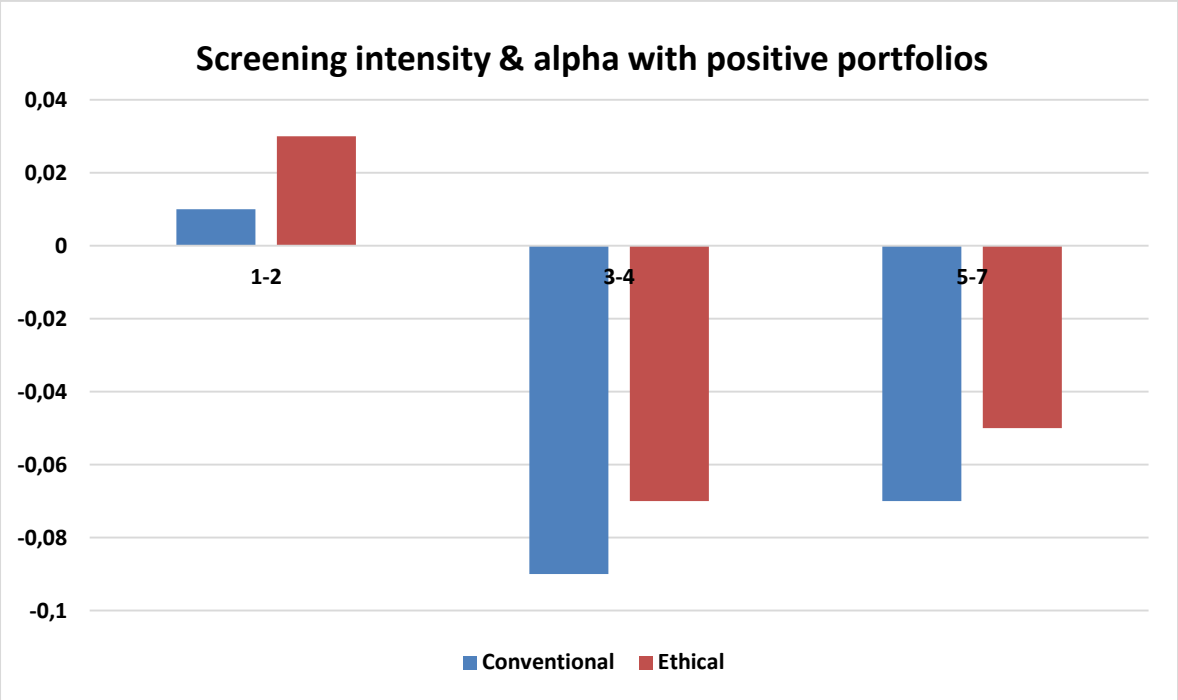

Figure 14. Relationship between positive screening intensity and alpha

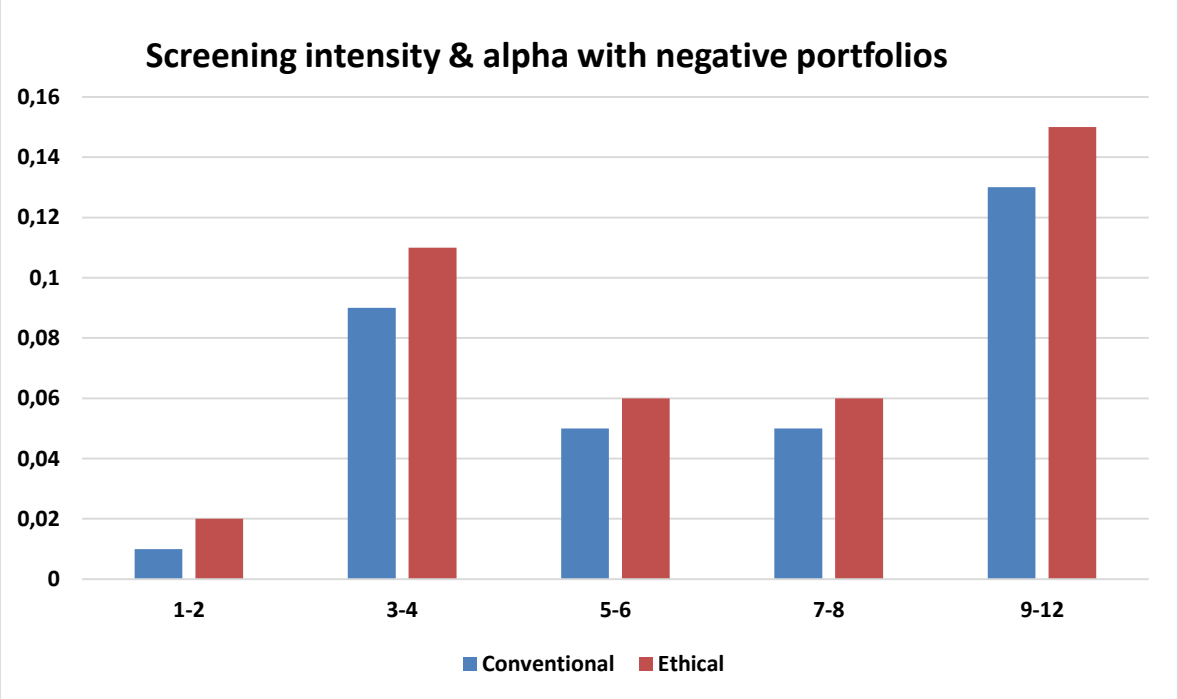

Figure 15. Relationship between negative screening intensity and alpha

8. CONCLUSIONS

Socially responsible investing has gained it's foothold during the last decades. The findings of the previous studies have been inconsistent, but the latest results have been positive from the perspective of SRI-funds. The empirical part of this study gave mixed results but provided evidence that there are significant differences between the funds employing either only positive or negative screens. The two common hypothesis used in the previous literature were examined in this paper and the results provided no support for the underperformance hypothesis, but gave some evidence in support for the overperformance, implying that the increasing screening intensity increases the performance of the SRI-fund.

The first finding as a result of the literature review was that there seems to be a slight disagreement on the emergence of SRI. The studies in North America seem to be biased on the claim that socially responsible investing, or ethical investing was born in the United States during 1960s and 1970s. But the new European studies show evidence that funds with ethical screening existed before that in the UK and Sweden (Bengtsson, 2008; Scholtens & Sievänen 2013; Eurosif 2012). It could be said that ethical investing had been practiced before the 1970s, but the social movements during that time in the US popularized the concept.

Second, in newer studies, the status of SRI-funds seem to have been accepted as a true method of investing and the performance of these funds are compared to other similar funds instead of conventional funds. Also the growth in the amount of benchmark-indices have made it possible to compare SRI-funds in several different ways. (Barnett et al. 2006; Lee et al. 2010.)

Third, there seems to be a repeating empirical finding in the literature concerning SRI funds that is not dependent on the complexity of the model that is used. According to the studies, the performance of socially responsible investment funds are comparable to normal investment funds, meaning that is there is no statistical difference in risk-adjusted returns between the portfolios. Also, there seems to be no difference between the countries and the model used. (Statman 2000; Schröder 2004; Kreander et al. 2005; Bauer et al. 2005; Bauer et al. 2006.)

Fourth, the use of multifactor models has emerged as the dominating way in evaluating the performance of socially responsible investments funds. There is a clear movement from the use of single-factor model to the use of Fama-French 3-factor model and to the Carhart 4-factor model. It would be plausible to expect that the amount of factors increases in the future, in order to achieve more significant results. On the other hand, it should be noted that the market size seems to have some effect on the performance. Smaller market leads to the situation where there are less diversified portfolios. The screening intensity affects smaller markets more because the number of available stocks is smaller, which leads to less diverse portfolio. There are also some differences in the composition SRI-funds between the countries, for example the US based funds tend to overweigh blue chip companies, and European portfolios are more invested in the use of small cap companies. (Bauer et al. 2005: 1762; Bauer et al. 2006; Cortez, Silva & Areal 2012: 254, 269-270)

The evidence from previous literature states that there is no clear disadvantage on ESG screening and less diverse investment universe of SRI-funds doesn't necessarily mean that investors should expect lower performance when compared to the more conventional investment funds. The real issue is the screening intensity. According to the studies, the screening intensity seems to have a negative, or curvilinear relationship with the performance of the socially responsible investment funds. (Schröder 2004, 131; Barnett & Salomon 2006; Lee et al. 2010; Cortez et al. 2012)

The empirical part of this paper divided the screening intensity to two different components, negative and positive. The T-tests provided results that showed a significant differences between the two methods, and thus the effects of the individual screening intensities were examined by applying a Carhart 4-Factor regression. The empirical results showed that first of all, the conventional benchmark is more powerful than the ethical benchmark in explaining the performance of SRI-funds and second, the results of the study are more in favor for the positive effect of screening intensity to the SRI-fund performance.

In the case of the whole sample, and with negatively screened funds, the relationship between screening intensity and beta seems to be negative. One explanation for this could be that the negative screening strategy succeeds in filtering out the companies with bad ESG-standards, and in including the companies with good ESG-standards, resulting in a superior performance (Gompers, Ishii, & Metrick 2001). The Carhart 4-factor model provided sup-

port for the overperformance hypothesis as the alphas were rising monotonically until the most screened portfolio, although none of the alphas were statistically significant. Also, it seems that SRI-funds have overperformed both the conventional and ethical market indices during 2002 to 2014.

The results of positively screened funds suggest a positive and monotonic relationship between screening intensity and beta. The coefficients for the HML-factor were increasing monotonically with the screening intensity, and the SMB-factor was negative and significant when the conventional index was used as a proxy. This implies that positively screened funds are more composed of small growth stocks, which could explain the rising betas, as growth stocks tend to be more volatile compared to value stocks. The relationship between screening intensity and alpha showed signs of curvilinearity, but the results were not statistically significant. Whereas the total sample of SRI-funds used in the study were performing better than the market, positively screened were on average bearing negative alphas.

The examination of negatively screened funds provided overall the most evidence in support of the overperformance hypothesis. The Sharpe & Sortino ratios were positive and rising in relation with screening intensity, and the Carhart 4-factor model provided evidence of a positive relationship between screening intensity and fund performance, although the effect was non-monotonic and the alphas were not statistically significant. In contrary to majority of the previous literature, the results of the empirical study suggest a positive relationship between screening intensity and fund performance for negatively screened funds. On the other hand, the effect seems to be curvilinear in the case of positively screened funds, which is more in line with the previous researches. (Barnett et al. 2006.)

In future research, the Fama-French 5-factor model could be applied for more accurate results. Although the paper where the model was introduced was already published when this study was made, the variables for the factors were not yet available for European markets. The US-market loadings could’ve been applied in this paper also, but according to Griffin (2002) the use market specific loadings yields better results. Also, the amount of funds employing purely positive screens is bound to increase in the future and larger sample data would increase the accuracy of the results.

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