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Socially Responsible Investments: Performance analysis between a SRI and a conventional index

FTSE4Good compared to FTSE index

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Abstract

In 2018, the total Socially Responsible Investments SRI assets under management (AUM) amounted $30,7 trillion. In the world, the top 400 asset management companies represent approximately $65,7 trillion. This means that the SRI AUM counts for approximately half of the total assets under management in the world. Due to the huge increase of this investment philosophy, the following question about the performance of those investments could be raised:

Does Socially Responsible Investments show a significant difference in performance compared to conventional investments?

In order to answer this research question, the following study has been conducted. The FTSE4Good index family was compared to its correspondent benchmark, indices of the FTSE index family. Four geographic zones were selected, namely the US, the UK, the EU zone and the World as a global zone. In order to measure the comparative performance, the Sharpe ratio, a linear regression of the CAPM and the Fama and French three-factor model have been be used.

Using the Sharpe ratio, all the results were negative (for both SRI indices and the benchmarks). This means that the risk-adjusted excess returns were negative. But the SRI Sharpe ratios presented in the four regions higher values than the one of the benchmark indices.

The CAPM regression presented a positive alpha for US and the world, and a negative one for the UK and EU. However, the four alpha values, that represent the outperformance of the investment compared to its benchmark, were not statistically significant. For all regions except UK, the betas had values close to one, which means an almost similar level of risk for both indices.

The Fama and French three-factor model presented a SMB value negative and close to zero and a HML value close to zero, except for the World.

As a conclusion, it can be said that SRI has the potential to present outperformance to conventional investments, although the results obtained in our analysis are not particularly significant.

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List of Abbreviations

SRI	**S**ocially **R**esponsible **I**nvestment(s)/**I**nvesting
ESG	**E**nvironmental, **S**ocial, **G**overnance
GICS	**G**lobal **I**ndustry **C**lassification **S**tandard
CSR	**C**orporate **S**ocial **R**esponsibility
SDG	**S**ustainable **D**evelopment **G**oals
GSIA	**G**lobal **S**ustainable **I**nvestment **A**lliance
AUM	**A**sset **U**nder **M**anagement
CAPM	**C**apital **A**sset **P**ricing **M**odel
SML	**S**ecurity **M**arket **L**ine
SMB	**S**mall **M**inus **B**ig
HML	**H**igh **M**inus **L**ow

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Introduction

Nowadays, people's awareness is taking a boom. Various topics such as climate, environment, labor and human rights, corporate transparency, governance etc … are more and more points of attention. Several actions are put in place all around the world defending those topics: for example, strikes for the labor rights, increasing number of organizations that protect the human rights (e.g. Amnesty International), climate actions that took place all around Europe this year, organizations that seek to protect animals, the planet, the oceans (Greenpeace, 4Oceans).

This awareness is also reflected in investments habits. Indeed, the demand for investments that take into account those kinds of points of attention is skyrocketing this last decade. Those investments are called Socially Responsible Investments (SRI). In 2018, the total SRI Assets under Management (AUM) amounted $30,7 trillion, which represents an increase of 34 percent compared to 2016 (Global Sustainable Investment Review, 2018). In the world, the top 400 asset management companies represent approximately $65,7 trillion (IPE, 2019). This means that the SRI AUM counts for approximately half of the total assets under management in the world.

The goal of an investment is obviously to have a financial gain at the end. As SRI practices scatter all around the globe, it could be interesting to analyze if the performance is equal, better or less attractive than conventional investments. Therefore, we suggest analyzing and trying to answer the following research question in our master thesis:

Does Socially Responsible Investments show a significant difference in performance compared to conventional investments?

This thesis will unfold as follows: Chapter 1 will present the concept of SRI through history, its methodology, and its current state in the world. In a literature review the chapter 2 will provide some theoretical explanation of pricing concepts and a summary

of what has been already analyzed in the literature. Our own analysis and results using the theoretical concepts explained under chapter 2 will be presented in chapter 3. Some conclusion will be drawn in the last section of this thesis.

Chapter 1: Socially Responsible Investments

The aim of this chapter is to give the reader some context and the required background to understand this thesis. For this purpose, the terminology, the theoretical Socially Responsible Investments (SRI) concepts and the current SRI practices will be explained and detailed. In this thesis, the abbreviation SRI will be used for both Socially Responsible Investments and Investing.

2.1. Overview of Socially Responsible Investments

Firstly, the origins of SRI will be examined. Afterwards we will propose a large definition of SRI and analyze its related concepts.

2.1.1. History

Socially Responsible Investment is a concept that appeared a long time ago. More than 200 years ago, the Methodists[1] believed that one could not profit at the expense of his neighbors nor harm the workers. Already at that time, they avoided investing in industries like tanning and chemical productions where workers had no favorable or respectful labor rights and in companies that were related to gambling, tobacco, alcohol and arms production (BBC, 2011). Therefore, the Methodists are considered to be the first to put "social investment screens" in place.

Then the SRI concept became relevant again during the second part of the 20th century, simultaneously with several crises.

In the sixties, in the context of the Vietnam War, people decided to divest from firearms companies as well as all other companies involved to this conflict. Lack of civil rights, inequalities between women and men and labor issues were the main issues that socially concerned investors sought to address. At that time, the young generation

[1] *Methodists are Christians who follow the teachings of John Wesley and who have their own branch of the Christian church and their own form of worship. (Collins dictionary, 2019)*

privileged several banks established in low-income and minority communities for investments (Townsend, 2017).

In the seventies, labor management issues spread around corporations and at the same time the first concerns about the environment were raised. The first Earth Day[2] took place in 1970, and is an obvious proof of the raise of concerns and awareness about climate issues. Environment has since then also been taken into account in SRI.

During the eighties, efforts to end the racist system of apartheid in South Africa were continuous. Individual and institutional investors pulled their money from companies operating in South Africa. This led to economic instability and contributed to the eventual collapse of apartheid. Several mutual funds were also created during those years to answer the needs of socially responsible investors. To select the stocks that would be in the fund, the owners performed positive and negative screenings, including factors such as the primary Methodist concerns (AGTF – alcohol, gambling, tobacco and firearms) and modern issues (nuclear energy, environmental pollution and treatment of workers). An example of such a fund is the Calvert Social Investment Fund Balanced Portfolio launched in 1982. Commonly used SRI strategies will be explained and detailed later on in this thesis (Townsend, 2017).

In the nineties, a huge increase was observed in both the number of mutual funds with SRI criteria and the popularity of SRI as an investing approach. Indices were developed in order to compare and analyze the performance of these funds. For example, the Domini Social Index is constructed with the 400 largest-capitalization United States (US) companies, comparable to the S&P 500. This index was built with companies selected on the basis of social and environmental criteria, and provides the investors with a benchmark to compare the performance of their screened investments (Social Equity, 2019).

[2] Day to celebrate the earth and to promote respect to the environment (Earth Day, 2019)

Launched in 2001 by an SRI analyst *Unibanco*, a Brazilian bank was the first sell-side brokerage[3] to propose SRI research. This research targeted funds in Europe and the US; the main SRI concerns taken into account were environmental and social issues (not governance). Afterwards, this fund was developed and extended by an SRI fund manager at HSBC and Citigroup.
ABN AMRO also developed an SRI fund in an emerging market using those research reports. This fund became the largest and best performing stock fund in Brazil in 2008 (Camilleri, 2017).

Currently, the SRI trend continues to expand as issues such as income and wealth inequality, climate change are taken even more into account in the screening. Sustainability challenges that add critical financial values to the companies and their shareholders also accelerate the expansion of SRI.

2.1.2. Definition

Since the definition of SRI touches upon different concepts, those are first defined in the following section.

- **Environmental, Social and Governance** (**ESG**): This abbreviation contains the 3 criteria that socially conscious investors use to categorize and class companies during an SRI screening.
    - Environmental criteria allow evaluating how a company performs towards nature and the environment (e.g. CO_2 emissions, energy use, pollution, treatment of animals, water consumption, etc.). These criteria are also included in the evaluation of any environmental risk a company could face, and the management of this risk (e.g. contaminated land, hazardous waste, toxic emissions, compliance with governmental regulations, risk management procedures)
    - Social criteria are used to consider how the company manages relationships with customers, employees, suppliers, and the community

[3] Sell-side brokerage are the firms that pitch companies and try to sell to « buy-side » companies their securities.

where it operates (e.g. respect of their employees, labor rights, donation of profits, volunteer work of the employees, shareholders' interests taken into account, etc.)

- Governance criteria are focused on the company's leadership (e.g. independent Board of Directors, company audited by an independent committee, accurate and transparent accounting methods, etc.)

The ESG criteria thus help investors to select companies with values that match their own and that meet their requirements in terms of investments.

- **Sustainable development** was defined in 1987 by the Bruntland Commission (a commission with the objective to unite countries to pursue sustainable development together (Our Common Future, 1987)) as: "*development that meets the needs of the current generation without compromising the ability of future generations to meet their own needs*" (Our Common Future, 1987).
  Most Socially Responsible Investments respect this concept, although it lacks practical details (which can be found in the ESG criteria). Sustainable development is supported by the Sustainable Development Goals (SDG), which aim to improve the world through 17 objectives to reach by 2030 (Sustainable Development Goals, 2019).

- **Corporate Social Responsibility** (**CSR**) relates to the way some companies manage to produce an overall positive impact on society through their business processes. It has to concern the core business of the company, not just some additional activities – which are then called philanthropy. Such companies behave ethically; they improve the quality of life of their workforce and integrate the sustainable development goals in their business.

- The main idea behind **Impact investing** is to generate a positive impact on an environmental or social issue in addition to the financial benefit for the company. It is a subset of SRI, but where SRI seeks to avoid any harm to the society, Impact investing tries to make a difference by improving the current situation of an issue. Impact investing only select companies through proactive screening

(companies that have a positive impact) while SRI uses several strategies, explained later in this master thesis, among which proactive screening. Impact investing is thus a sub-part of SRI. (SRI-connect, 2018)

Those concepts being defined, we will try to propose a definition of SRI using differences and similarities with those.

Socially Responsible Investing/Investment (also known as Sustainable and Responsible Investment) is an investment considered socially responsible because of the nature of the business the company conducts. The main goal of SRI is to combine financial benefits and social impacts.

SRI investors will avoid investing in companies doing business in what is considered as having negative social effects (e.g. fast food, pornography, weapons, contraception/abortion, fossil fuel, military) and addictive substances (e.g. alcohol, tobacco, gambling). They will prefer companies engaged in social justice, promoting consumer protection, human rights, racial and gender equality, etc. Environmental sustainability will also be a criterion; companies using alternative energy and clean technology in their business processes will be preferred by SRI investors.

As mentioned above, there are different SRI-strategies and features. The Global Sustainable Investment Alliance (GSIA), along with all the equivalent institutions for the different regions of the globe provided a classification for those SRI strategies (Global Sustainable Investment Review, 2018):

- Negative/Exclusionary screening: exclusion based on specific ESG criteria
- Positive/Best-in-class screening: investments in sectors, companies selected for positive ESG performance compared to industry peers
- Norms-based screening: screening against minimum standards of business practice based on international norms (e.g. OECD, UN, UNICEF)
- ESG integration: inclusion of environmental, social and governance factors into financial analysis

- Sustainability themed investment: investment in themes or assets specifically related to sustainability (e.g. clean energy, green technology or sustainable agriculture)
- Impact/Community investing: investments aimed at solving social or environmental problems, and including community investing (where capital is directed to traditionally underserved individuals or communities)
- Corporate engagement and shareholder action: use of shareholder power to influence corporate behavior

As said above, there are various regional institutions that are similar to GSIA:

- Eurosif for Europe
- Japan Sustainable Investment Forum (JSIF)
- Responsible Investment Association Australasia (RIA Australia)
- Responsible Investment Association Canada (RIA Canada)
- US Sustainable Investment Forum (US SIF)

SRI-connect, a website which presents itself as "*where institutional investors & quoted companies involved in sustainable development meet online*" (SRI-connect, 2019) makes a distinction between 21 SRI strategies, going deeper in details than the GSIA, e.g. Sharia screening (part of Exclusionary screening), alternative/renewable energy investment, microfinance funds, "fonds solidaires", sustainable finance.

The website Investing Answers gives the following definition of SRI that can summarize this definition part: "*Socially Responsible Investment (SRI) is an investment strategy that seeks both financial return and social good."* (Investing Answers, 2019).

2.2. Current situation of SRI

This second part seeks to illustrate the current status of Socially Responsible Investments in the different parts of the globe, and will enlighten the reader on the

methodologies used by the institutions and experts to determine the SRI character of companies.

2.2.1. Current State around the World

As issues such as climate, social conditions, governance are main concerns for both companies and investors, the SRI supply and demand are skyrocketing. On one hand, companies are concerned by several objectives (SDGs, Global UN Compact) and try to improve their ESG criteria. On the other hand, investors (individual as well as institutional) seek to combine financial performance and positive impact. In the following section, enlightenment on the current state of SRI per regions of the globe will be provided through key facts and figures.

The Global Sustainable Investment Alliance (GSIA) recently issued its fourth edition of the Global Sustainable Investment Review for the year 2018. It gives an overview of the current status of all sustainable investments at the beginning of 2018 by collecting data from regional and national reports of GSIA members and other organizations to cover the rest of the globe (Africa and Latin America) (Global Sustainable Investment Review, 2018). The total SRI Assets under Management (AUM) in 2018 amounted $30.7 trillion, which represents an increase of 34 percent since 2016. The data presented in table 1 clearly show a domination of Europe and the US on the SRI market, while the amount of SRI AUM in Japan strongly increased from 2016 to 2018. SRI AUM represents half of the total managed assets in most parts of the world, except for the US and Japan. For Europe, this proportion is decreasing since 2014 (2014: 58.8%, 2016: 52.6% and now 48.8%).

Table 1: SRI assets per region (GSIA, 2018, pp. 8-9)

Overview of the SRI Assets under Management (AUM) by region, the relative proportion between SRI assets in the total managed AUM and the growth between 2016 and 2018 across the regions.

Region	SRI assets (in billions of USD)	Proportion relative to total managed assets (%)	Growth 2016-2018 (%)
Europe	14 075	48,8	11
United States	11 995	25,7	38
Canada	2 180	50,6	42
Australia/New Zealand	1 699	63,2	46
Japan	734	18,3	307
TOTAL	**30 683**		**34**

The repartition of SRI Assets per region is illustrated in figure 1. Europe (46%) still has the biggest proportion of SRI Assets, followed by the US (39%) and Japan. Canada and Australia follow with a way smaller percentage (respectively 7, 6 and 2%). The fact that Europe and the US have the most SRI capitalization (85%) compared to other countries can be explained by two factors: an advanced position in the cycle of expansion of the SRI investments and the fact that those 2 regions also have the highest number of assets in general.

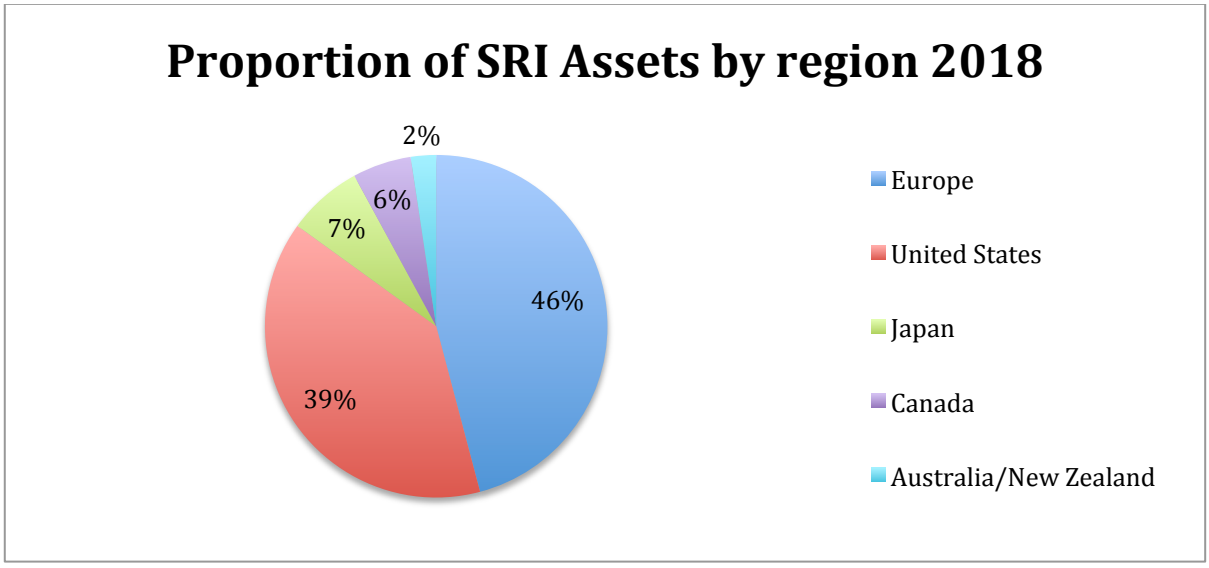

Figure 1: Proportion of SRI Assets by region in 2018 (GSIA, 2018, p.9)

The total SRI Assets in the world per strategy (GSIA, 2018, p10) is detailed in figure 2. From those data, it can be easily observed that Exclusionary screening and ESG integration are the two strategies mainly used (respectively 19,7 and 17,5 USD trillions) to categorize the companies. The 3 strategies least used in the world are impact investing, sustainability themed investing and best-in-class screening. As our study in the context of this master thesis will mainly focus on Europe, the US and the World, one can immediately identify that the proportion of assets per strategies is quite different between the Europe and the US: Europe dominates the US in the Exclusionary screening, Corporate engagement and Norms-based screening, while the US shows a higher proportion in all other strategies (see Appendix 2).

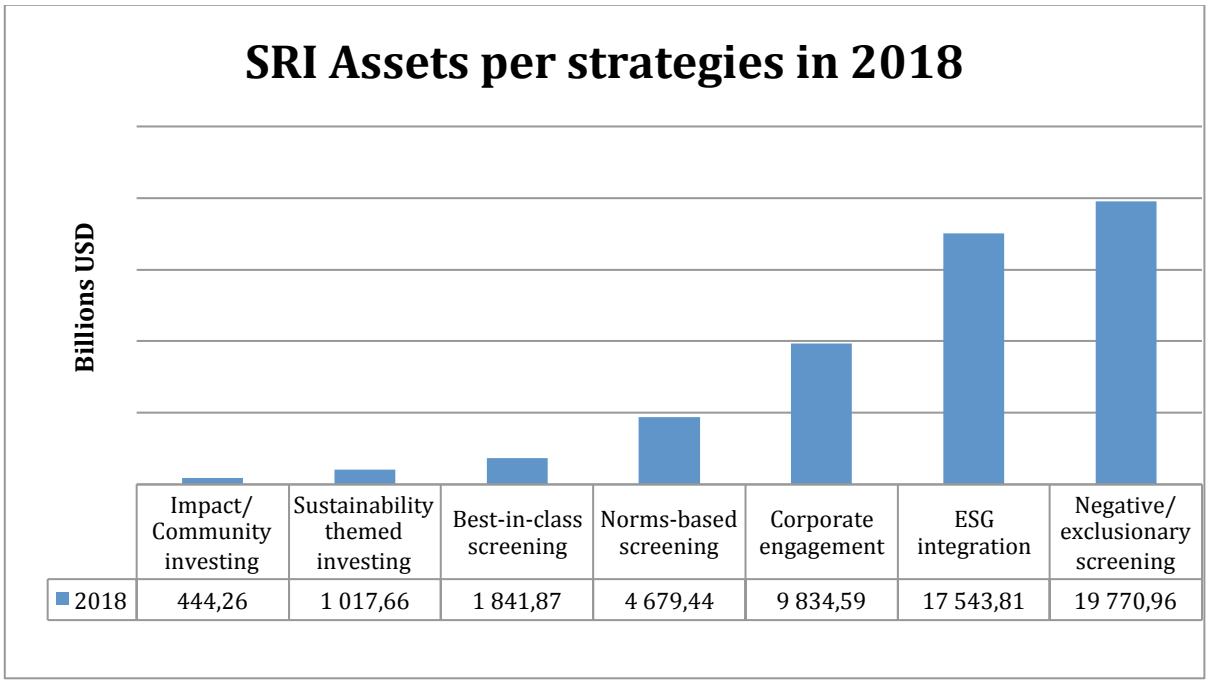

Figure 2: Proportion of SRI Assets per strategies in 2018 (GSIA, 2018, p.10)

2.2.2. SRI Methodology

The institutional and individual investors seek to invest in companies they share the vision and values with. When investing in SRI stocks, investors will target the securities succeeding in managing their ESG risks and opportunities. As explained earlier, SRI rejects companies that have negative social impacts, and prefers companies showing

commitment to high human rights standard and adherence to established international normative standards of corporate behavior as represented in the UN Global Compact.

To determine whether a company sufficiently respects the ESG criteria, different methodologies have been developed by different institutions. Two of them will be described in the following section:

- MSCI ESG rating
- FTSE4Good Index series

The first methodology is the ESG rating provided by Morgan Stanley Capital International (MSCI), well known for its international indices for developed and emerging markets. MSCI has developed a 4-steps ESG rating that is detailed as follows:

1. Companies are rated for their risk exposure and risk management for each of the 3 pillars: Environment, Social and Governance using the 37 ESG Key Issues on a 0-10 scale (see Appendix 3).
2. A global score is computed per pillar.
3. Through those 3 scores, a Final Industry Adjusted Score is computed for each company.
4. ESG rating expressed as a score between AAA and CCC, is the result of the weighted average of Key Issues scores and normalized by industry (following the Global Industry Classification Standards (GICS)[4]) (see Appendix 4 for conversion score in rating).

The rating of a company shows its ESG performance, which is intended to be relative to the standards and the performance of the company's industry peers.

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[4] *"In 1999, MSCI and S&P Dow Jones Indices developed the Global Industry Classification Standard (GICS), seeking to offer an efficient investment tool to capture the breadth, depth and evolution of industry sectors. GICS is a four-tiered, hierarchical industry classification system. Companies are classified quantitatively and qualitatively. Each company is assigned a single GICS classification at the Sub-Industry level according to its principal business activity. MSCI and S&P Dow Jones Indices use revenues as a key factor in determining a firm's principal business activity"* (MSCI, 2019)

The second methodology presented here is the FTSE4Good index series. FTSE4Good is an index published by FTSE Russell (FTSE stands for Financial Times Stock Exchange), a leading index provider and a wholly owned subsidiary of the London Stock Exchange Group. Since 2001, FTSE Russell provides the SRI indices FTSE4Good to investors. This makes the FTSE4Good index family one of the world's first global ESG index families. To determine whether a security can belong to this index, FTSE Russell has developed an ESG rating that screen over 4,000 securities in 47 Developed and Emerging markets. This rating can be broken down into the 3 ESG pillars and 14 themes that are based on more than 300 indicators (see Appendix 5). The 17 UN Sustainable Developments Goals are reflected in these 14 themes. Furthermore, the index provider company aims to be as transparent as possible: index and methodologies are publicly available so that investors can review the company assessment. They also tend to avoid subjectivity by having a clear ESG rating path and strong governance thanks to their independent external committee. This committee is composed of experts from NGOs, unions, academia, investments companies and business. The ratings follow 3 clear steps:

1. Constituent selection: The FTSE4Good selection aims to reflect strong ESG risk management practices. Companies rating have to be at least 3,1 on a scale of 5 for the developed markets to enter the FTSE4Good index. For the emerging markets, the minimum level is at 2,5 on 5. This threshold difference is explained by market differences between developed and emerging markets.
2. Exclusion of companies that present controverted activities (Tobacco, weapons, coal, controversial weapons (cluster munitions, anti-personal mines etc.)).
3. FTSE4Good is reviewed bi-annually (in June and December). If a company's rating is below the threshold, they have a 12-month period to improve; otherwise they will be removed from the index.

The delivery of FTSE4Good quality rating has several impacts. For example, by engaging with companies on the FTSE4Good assessment, they encourage those companies to improve their ESG practices. Once they are part of the indices, they benefit from a globally recognized brand image.

Bloomberg also provides a tool to classify and assess the ESG practices of companies, called the ESG disclosure. Through the *Bloomberg Environmental, Social and Governance Data* (BESG) function, it is possible to access a database with ESG score of more than 11 500 companies in 83 countries (Bloomberg, 2019). Bloomberg provides an ESG Disclosure Score, based on the level of ESG disclosure of the companies and their transparency.

To conclude the methodology part, it can be easily seen that, although the two rating methodologies present some differences, the aimed result is the same: being able to decide whether a company effectively demonstrates ESG practices or not, and categorize those companies in that respect. It also gives a global score to further class the companies.

Chapter 2: Literature review

The purpose of this chapter is to give an overview of what has already been studied on the subject, namely the performance of Socially Responsible Investments compared to conventional investments. Before going any further in the literature review, a first part explaining the different comparison tools that have been used in the past will be described. Then, the literature review will be divided in two distinct parts: the first one will focus on a comparison of portfolio and fund performances, while the second one will compare stock market indices performance.

3.1. Theoretical part: comparison tools

In this section most of the performance tools and pricing models used in the literature will be listed and described. Those pricing models are diverse and measure the performance of investment through factors such as returns and risk.

3.1.1. Capital Asset Pricing Model

Shortly after the foundation of the modern portfolio theory by Markowtiz in 1952, the Capital Asset Pricing Model (CAPM) was published in various articles by Sharpe (1964), Lintner (1965) and Mossin (1966) (Bodie, Kane & Marcus, 2018). Today, this model is still considered as a major development of the last decades and used a lot in the academic world as well as in the investment industry.

The CAPM describes the relationship that should be observed between an asset's risk and the expected return and rely on several assumptions, which will be explained below. Investors expect to be compensated for the risk taken and the time value of money. The time value of money is the so-called risk-free rate, the rate of return that can serve as a benchmark representing the "fair" or expected return. Then the other components of the CAPM formula account for the investor taking additional risk. Sharpe derives the CAPM to obtain the following equation (Sharpe, 1964):

$$E(R_i) = R_f + \beta_{iM}[E(R_m) - R_f] \quad (1)$$

Where:

$E(R_i)$ = Expected return of asset i

R_f = Risk-free rate

β_{iM} = Beta of the investment (measure of the systematic risk of asset i)

$E(R_m)$ = Expected return of market

$[E(R_m) - R_f]$ = Market risk premium

This equation reveals the way investors value their assets depending on the measure of the risk taken and the relation between expected return and risk (Fama & French, 2003). Indeed, the expectation of any asset ($E(R_i)$) is a function of the risk-free rate (R_f) plus a risk premium obtained by multiplying the beta of the investment (β_{iM}) (i.e. amount of risk taken) and the excess market return ($E(R_m) - R_f$) (i.e. reward for taking risk).

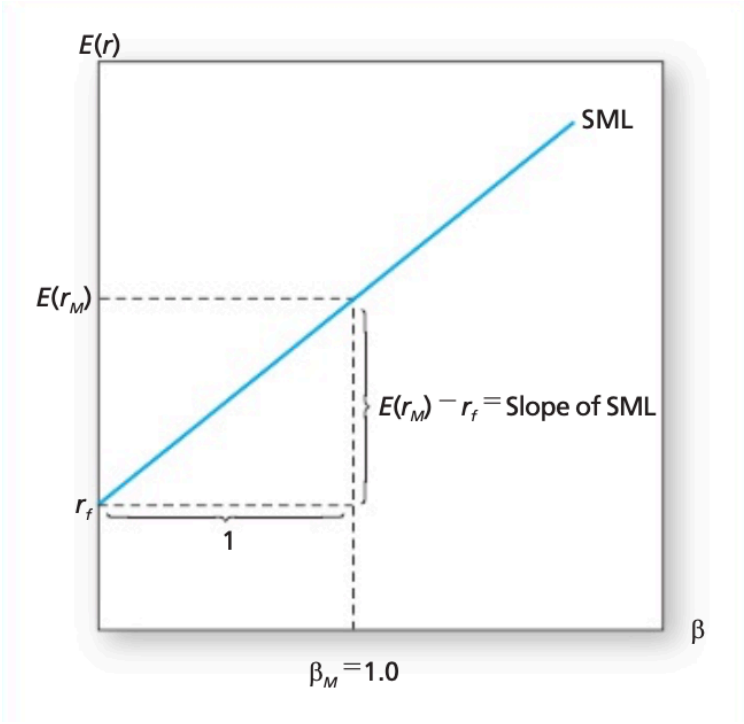

Figure 3: The Security Market Line (SML) (Bodie et. al., 2018, p.286)

As explained by Bodie, Kane and Marcus (2018), the expected return-beta relationship can be viewed as a reward-risk equation. The expected return-beta relationship can be portrayed graphically as the Security Market Line (SML). As the market's beta equals 1, the slope is the risk premium of the market portfolio. If the asset's beta is lower (higher) than 1, it is considered to be a defensive (aggressive) security.

> *"The SML (…) graphs individual asset risk premiums as a function of asset risk. (…) The security market line provides a benchmark for the evaluation of investment performance. Given the risk of an investment, as measured by its beta, the SML provides the required rate of return necessary to compensate investors for risk as well as the time value of money.*" (Bodie, Kane & Marcus, 2018).

It means that fairly price assets are situated exactly on the SML, while underpriced (overpriced) will plot above (under) the SML: Given their betas, their expected returns are greater than following the CAPM (Bodie et. al., 2018).

As mentioned earlier, the CAPM relies on 7 assumptions that allow the model to be accurate (Bodie et. al., 2018):

A. Individual behavior
    1. Investors are rational, mean-variance optimizers.
    2. Their common planning horizon is a single period.
    3. Investors all use identical input lists; an assumption often termed homogeneous expectations. Homogeneous expectations are consistent with the assumption that all relevant public information is available.
B. Market structure
    4. All assets are publicly held and trade on public exchanges.
    5. Investors can borrow or lend at a common risk-free rate, and they can take short positions on traded securities.
    6. No taxes.
    7. No transactions costs.

The CAPM also has its limitations. Roll (1977) argues that the CAPM has never been tested, and will never be. The market portfolio that lies in the center of the model is

theoretically and empirically elusive. There is no clear assets exclusion from the market portfolio (e.g. human capital, art) although data availability limits the assets that are included. Another limitation is the fact that the CAPM only relies on one factor explaining the return, while some other researches (Fama and French, 1992 and Carhart, 1997) claim that other factors should be used to correctly valuate an asset. The CAPM also relies on unrealistic assumptions. The fact that investors could borrow at the same risk-free rate, or the fact that the CAPM can only be used to estimate asset hold by investors for one single time-period makes the assumptions unrealistic. Finally, the CAPM only use historical data to predict the future value of assets. It could be acceptable that the future risk is measured based on historical beta if those betas where stable over time. Some academics claim that the beta of an asset is not static and evolves with the time.

3.1.2. Risk and Performance Indicators

Emerging from the CAPM, several indicators are used to measure the risk and performance of portfolios. The few presented here are the most used and more relevant for the objective of this master thesis.

3.1.2.1. Sharpe ratio

The Sharpe ratio was developed by William Sharpe in 1994 in its paper named "The Sharpe Ratio", which had the objective to clarify his previous work. The ratio divides the difference between the portfolio's return and the risk-free rate (which gives the adjusted excess return) by the standard deviation. Sharpe takes the assumption that all the risk is represented by the volatility, which limits the formula. The formula presents as follows (Sharpe, 1994):

$$SR = \frac{Rp - Rf}{\sigma} \qquad (2)$$

Where:

R_p = Return of portfolio

R_f = Risk-free rate

σ = Standard deviation

3.1.2.2. Treynor ratio

This ratio, also called the reward-to-risk ratio, divides the excess return by the systematic risk, represented by the portfolio's beta. The ratio is similar to the Sharpe ratio, with the difference that it uses the portfolio's beta instead of the total risk (standard deviation) in the SR. This ratio is based on historical data, and the choice of the benchmark to measure the beta is very decisive. The formula goes as follow (Treynor, 1965):

$$TR = \frac{Rp - Rf}{\beta} \tag{3}$$

Where:

R_p = Return of portfolio

R_f = Risk-free rate

β = Beta of the investment

3.1.2.3. Jensen's alpha

Jensen's alpha is a risk-adjusted performance measure derived from the CAPM. It measures the average return on an investment, using 4 different factors (Jensen, 1968); the realized return of an investment (R_i), the risk-free return (R_f), the realized return of the market index (R_m) and the beta of the investment with respect to the appropriate market index (β).

$$\alpha_p = R_i - (R_f + \beta*[R_m - R_f]) \tag{4}$$

Where:

R_i = Realized return of an investment

R_f = Risk-free rate of return

R_m = Realized return of the market index

β = Beta of the investment

3.1.3. Fama-French Three-factor model

The CAPM provides a pricing model that only uses the market risk factor to estimate assets value. Through the publication of several papers, Fama and French gained recognition in the academic world. In those scientific papers, they described their own pricing model in which they added two factors in extension to the CAPM and made several quantitative studies that show their added factors have a true signification. In the Fama-French Three-factor model, the value risk and size risk factor are added to expand the CAPM. Those factors are measured by the book-to-market ratio (book value per share divided by stock price) and market capitalization (market value of outstanding equity) (Fama & French, 1992; Fama & French, 1996).

The formula of the three-factor model can be written as follows (Fama & French, 1996; Bodie et. al., 2018, p.408):

$$E(R_i) - R_f = \alpha_i + \beta_{iM} * [E(R_M) - R_f] + \beta_{iSMB} * E(R_{SMB}) + \beta_{HML} * E(R_{HML}) \quad (5)$$

Where:

$E(R_i)$ = Expected total return of asset i

R_f = Risk-free rate of return

$E(R_i) - R_f$ = Expected excess return of asset i

α_i = Intercept of the equation

β_{iM} = Betas measuring the risk premium associated with each factor

$E(R_M) - R_f$ = Expected excess return on market portfolio

SMB = Small Minus Big, size premium (see below)

HML = High Minus Low, value premium (see below)

Small Minus Big (SMB) refers to the "size effect", or "small firm effect", *the return of a portfolio of small stocks in excess of the return on a portfolio of large stocks* (Bodie et. al., 2018). If a portfolio has included more small-cap companies, the related performance should be better on the long term. Computed by French, the SMB formula presents as follows (French, 2019):

$$SMB = 1/3\ (Small\ Value + Small\ Neutral + Small\ Growth) - 1/3\ (Big\ Value + Big\ Neutral + Big\ Growth) \quad (6)$$

High Minus Low (HML) factor is used to take into account the book-to-market ratio, *the return of a portfolio of stocks with a high book-to-market ratio in excess of the return on a portfolio of stocks with a low book-to-market ratio* (Bodie et. al., 2018). Once again, on the long term, a portfolio composed with a larger proportion of value stocks than one with growth stocks should outperform the other. HML formula is the following (French, 2019):

$$HML = 1/2\ (Small\ Value + Big\ Value) - 1/2\ (Small\ Growth + Big\ Growth) \quad (7)$$

Those factors where chosen and justified by Fama and French with several examples:

1. Firms with high book-to-market ratio are more likely to be in financial distress
2. Small stocks may be more sensitive to changes in business conditions

Those variables are thus able to capture some sensitivity to risk factors (Bodie et. al., 2018).

3.1.4. Carhart's Four-factor model

To the three-model factors of Fama and French, a fourth factor has been added to complete and improve the asset valuation. This momentum factor, proposed by Carhart (1997), tends to take into account the tendency for the stock to keep moving in the direction it moved last period (Jegadeesh and Titman, 1993). The formula of Carhart's four-factors model is the following (Carhart, 1997):

$$E(R_i) - R_f = \alpha_i + \beta_{iM} * [E(R_M) - R_f] + \beta_{iSMB} * E(R_{SMB}) + \beta_{HML} * E(R_{HML}) + \beta_{WML} * E(R_{WML}) \quad (8)$$

Where:

$E(R_i)$ = Expected return of asset i

R_f = Risk-free rate

$E(R_i) - R_f$ = Expected excess return of asset i

α_i = Intercept of the equation

β_{iM} = Betas measuring the risk premium associated with each factor

$E(R_M) - R_f$ = Expected excess return on market portfolio

SMB = Small Minus Big, size premium (see above)

HML = High Minus Low, value premium (see above)

WML = Winners Minus Losers, momentum factor (see below)

Called Winners Minus Losers (WML), the momentum factor is based on winners/losers for period of 12 months; thus, the winners (losers) of the last 12 months should outperform (underperform) the next 12 months (Carhart, 1997).

3.2. Comparing SRI and conventional investments performance

The first empirical studies on SRI performance dates back in 1972 where Moskowitz analyzed several companies that showed socially responsible corporate behavior (Moskowitz, 1972).

Since then, numerous studies have been made investigating the performance of Socially Responsible Investments and comparing it with conventional investments. Most of the results showed that there were no statistically significant under- or out-performance between SRI and conventional investments. These studies will be briefly explained below in two distinct sections; the first one will focus on a comparison of portfolio and fund performance, while the second one will compare stock market indices performance.

3.2.1. Comparing SRI fund and portfolio

Various performance measures have been used in the fund performance analysis, such as the CAPM and its ratios and multiple factor models.

In their study, Goldreyer and Diltz (1999) measured the performance for a US sample of SR and conventional mutual funds using several methods derived from the CAPM. They analyzed funds by investment strategy, size, systematic risk and the use of inclusion screens. The results did not show any advantage for one group compared to another, but it seemed evident from their results that funds with inclusion outperformed the others.
Hamilton, Jo and Statman (1993) compared in their study 32 socially responsible US mutual funds using the Jensen's alpha. Based on their results, most of those funds did not significantly differ from 0. Only one fund had a significant positive excess return and another had a significant negative excess return. The average excess return of 17 socially responsible mutual funds (founded in 1985 or earlier) was a loss of approximately six basis points[5] per month (Hamilton et. al., 1993).
Mallin, Saadouni and Briston (1995) studied the performance of 29 UK funds compared to non-ethical funds in 1995. They made two hypotheses, namely

- *"Ethical investment funds do not outperform (or underperform) the market,*
- *The performance of ethical investment funds is no different to that of non-ethical investment funds"*

Using the Sharpe ratio, the Treynor ratio and the Jensen's alpha, they found out that on a risk-adjusted basis, the ethical funds tended to outperform the non-ethical, while both underperformed the market. They also claimed that this weakly superior performance could be a temporary phenomenon due to people awareness for appropriate investments. (Mallin et. al., 1995)

This study, as well as studies of Gregory, Matatko and Luther (1997) and Kreander,

[5] *"Basis point (BPS) refers to a common unit of measure for interest rates and other percentages in finance. One basis point is equal to 1/100th of 1%, or 0.01%, or 0.0001, and is used to denote the percentage change in a financial instrument."* (Investopedia, 2019)

Gray, Power and Sinclair (2005) tried to avoid funds factors bias: Indeed, factors such as the size, age, investment universe and countries tend to have an impact on the fund performance. Thus, the previously enumerated studies compared socially responsible funds to conventional fund that present the same characteristics, which is called a matched pair approach.
The following other studies used multiple factor models, such as the Fama and French three factors model or Carhart's four-factor model, as explained in the introduction of the section.

Kreander et. al. (2005) extended the studies of Mallin et. al. (1995) by using matched pair approach to ethical fund performance analysis. The matching used the size, age, country and investment universe factors. The results revealed that no matter what performance tool used (Sharpe, Treynor ratio, Jensen's alpha), there was no significant difference between the matched pairs. The only difference found was the less riskiness of the ethical funds, as measured by the volatility of the returns and the betas of the funds. According to the Henriksson-Merton (1981) model, the non-ethical funds were also better at market timing than their conventional peers.
Nearly all the above-described studies focused on US and UK funds for their performance analysis.

On the contrary, Bauer, Koedijk and Otten (2005) analyzed an international sample of 103 US, UK and German ethical funds. Their performance measures addressed the question whether ethical funds differed on a risk-adjusted return basis and investment style from the conventional funds. The study was divided in two empirical sections; the first concerned the single-factor model analysis, while the second concerned the Carhart's four-factor model analysis.

From their analysis, they found out four interesting results.

First, German and UK ethical funds underperformed their conventional peers, while UK show a slight out-performance. However those differences appeared not to be significant after verification using others factors (size, momentum, book-to-market).

Secondly, they tried to explain the ethical fund performance using ethical and conventional indices. According to their results, it seemed that ethical indices performed worse than standard indices.
Third, the investment styles of the ethical funds were different than the one of conventional funds (market exposure, small versus large cap, etc.).
Fourth, using time varying Betas, the previous findings were corroborated except for UK ethical funds that outperformed significantly their conventional peers.

Geczy, Stambaugh and Levin (2005) studied the cost of investing in socially responsible mutual funds. They found out that the cost for the investors depended on their belief in both the asset pricing models and the stock-picking skill of the fund manager. For those who completely believed in the CAPM and ruled out the managerial skills, SRI only cost a few basis points per month. On the contrary, those who still disallowed the fund manager skill but believed in some degree in asset pricing giving importance to other factors (thus using the Fama and French three-factor model of Carhart four-factor model), "doing good" was much costlier; about 30 basis point per month. Finally, SRI costs much more to investors that believe in the fund manager skill and thus that heavily rely on individual funds' track record.
Although SRI funds could be costly as observed by Geczy et. al. (2005), Kempf and Osthoff (2007) proved that investors choosing for socially responsible portfolios never suffered from reaching their ethical goals. Indeed, the performance of their SRI funds was never significantly negative. On the contrary, portfolios with low social responsibility did suffer a significant performance loss for various screening. This could come from a market mispricing of companies with low social responsibility.

While lots of studies have been made on equity funds, Derwall and Koedijk (2009) analyzed the performance of mutual funds that invest in SRI fixed-income securities. Using multi-index performance evaluation models, they showed that the SRI bond funds performed similar to their matched conventional funds, while SRI balanced fund outperformed its conventional peers. Another important finding in their study is the fact that the expenses charged by SRI fund did not differ from those charged by conventional funds. This does not induce any SRI underperformance.

Lots of other studies have been made, such as analyses on "sin" stocks (industries in alcohol, tobacco, gaming) (Hong and Kacperczyk, 2009; Statman and Glushkov, 2008), studies on SRI performance using other tools (bivariate testing of difference in means, multivariate technique of structural equation models) (Sanchez and Sotorrio, 2011), but those will not be discussed here since these studies differ too much from the purpose of the study presented in this thesis.

3.2.2 Comparing indices performance

Besides the fund performance literature review, some authors have decided to analyze the performance of socially responsible indices. Indeed, those indices have the advantage to be free from any fund manager bias (stock-picking skills, age, size, investment universe).

Statman (2000) did a first performance comparison between socially responsible and a conventional index, comparing the Domini Social Index to the S&P500. He reported that the Domini did better than the S&P500, but none of the differences between their risk-adjusted returns were statistically significant. Later on, he extended his previous study to other indices: the Domini 400 Social Index (DS 400 Index), the Calvert Social Index, the Citizens Index, and the U.S. portion of the Dow Jones Sustainability Index (Statman, 2006). He analyzed the composition of the four SRI indices, and found out that the social responsibility scores were higher for the four SRI indices than the S&P500. He also found out that, for example, the DS 400 is the strongest on the environment, while the Calvert Index is the strongest on corporate governance. He also showed that the SRI indices performed, in general, better than the S&P500, but not in every sub-period. The correlations between the SRI indices and the S&P500 were also very high, but tracking errors were substantial (Statman, 2006). Sauer (1997) also studied the Domini 400 Social Index in order to avoid the portfolio bias such as transaction costs, management fees, and differences in investment policy. He concluded "*application of social-responsibility screens does not necessarily have an adverse impact on investment performance."* (Sauer, 1997).

Finally Schröder (2007) compared 29 indices worldwide, making the first SRI index study outside of the US. He applied single-equation model as well as multiple-equations systems to exploit all the information in the cross-section. He concluded that SRI stocks do not exhibit a difference in their risk-adjusted return compared to conventional indices, although their betas (and thus their risk level) are comparatively higher than those of the conventional ones.

Chapter 3: Data description and results

This chapter will focus on the quantitative analysis in order to answer our research question:

Does Socially Responsible Investments show a significant difference in performance compared to conventional investments?

Some explanations of the selected data and used methodology will be given. Afterwards, the performance analysis will be conducted. Finally, further discussion will be suggested, with aim to remind the limits of the analysis and the further observations that could be done.

4.1. Data description

The SRI indices that have been chosen to be studied and compared in this section are the FTSE4Good index family. FTSE4Good is an index published by FTSE Russell (FTSE stands for Financial Times Stock Exchange). FTSE Russell is a leading index provider and is a wholly owned subsidiary of the London Stock Exchange Group. They provide a lot of financial data such as equity, fixed income, exchange-traded funds (ETF), sustainability and ESG data, but also indices that are used as benchmark of various industries. FTSE4Good indices are composed of companies that demonstrate strong ESG practices (FTSE Russell, 2019). The methodology and criteria of those indices have been explained in the Methodology part of the Socially Responsible Investing chapter (see section 2.2.2, page 12).

The analyzed indices cover 4 geographic zones: the US, the Euro-zone, the United Kingdom and finally a global index for the World.
The data are collected from begin 2008 until the end of 2018. The selection of this time frame and those geographic zones was justified in order to find out if there were some differences between the 4 indices because of the 2008 crisis. Indeed, it is well known

that the 2008 crisis ended faster in the US than the Euro-zone: it started in December 2007 and ended in June 2009 in the US, while it still lasts until 2014 in Eurozone since the European Central Bank (ECB) helped some countries in need in Europe (National Bureau of Economic Research, 2010; ECB, 2016).

In the following table, the SRI indices are detailed with their correspondent index. The data were found using a Bloomberg Terminal. The benchmark indices were chosen trying to approximate in the best way possible the SRI indices. The prices of the UK and EU indices were expressed in GBP and EUR and stayed in the same currency; in our study, we only use the prices to compute returns. The currency does not have any impact on that, and keeping the data in the same currency avoids exchange rate bias.
The risk free rates that will be use to compute the excess return also comes from a Bloomberg Terminal, through the CRP function (Credit Risk Premium). This gives for each country an historical data of risk-free rate. The chosen risk-free rate are the 10 years government bonds, considered as risk-free (Investopedia, 2019).
For the World indices, the US risk-free rate was chosen since there was no global rate available.

Table 2: Socially Responsible Investments index versus conventional Benchmark index

Index Name	Abbrev	Region	Benchmark index	Abbrev
FTSE4Good US 100	US SRI	US	FTSE USA Index	US BM
FTSE4Good UK 50	UK SRI	UK	FTSE Local UK Index	UK BM
FTSE4Good Europe 50	EU SRI	Eurozone	FTSE Eurotop 100 Index	EU BM
FTSE4Good Global 100	World SRI	World	FTSE Global 100 Index	World BM

As the data from the above table show, all the SRI indices are composed of large-cap companies (the 100 biggest for the US and global, 50 biggest for EU and UK). Making this choice allows us to avoid taking into account "small cap bias". This bias is "*the relatively*

high investment weight of stocks with a low market capitalization" (Schröder, 2007). Due to the fact that the chosen indices only take the largest-cap companies, it can be considered that this bias is not relevant here.

4.2. Methodology

The purpose of the performance analysis is to determine if there was any out- or underperformance of the SRI index compared to the benchmark index. Therefore, the following measures have been used to compare the two indices:

- Sharpe ratio
- Linear regression of the CAPM
- Fama and French three-factor model

The returns were computed as the difference between the monthly price at time t and the previous month price, namely the price at time t-1 divided by the starting price. The yearly means as well as the general mean returns were computed, in order to be able to define a "trend" per year.
The excess returns are simply the difference between the returns and the risk-free rates per geographic zone, which allows observing how much the return exceeds the risk-free rate. A first comparison is conducted between the excess return of the SRI index and the benchmark index.
Two of the four geographic zones indices are expressed in another currency than the US Dollar (USD) (namely in Euro (EUR) and in Great Britain Pound (GBP)). Although it was logical to convert the prices into only one currency, the assumption was taken to keep it in the local currency since only the prices to compute the returns are used (which is a percentage and thus the currency does not matter anymore). Keeping the prices in the original currency also avoid bias in the converted price due to the exchange rate.

The performance measure used in this study is the **Sharpe ratio**, which is derived from the CAPM (see section 3.1.1, page 15). As a reminder, here is the Sharpe Ratio formula (Sharpe, 1994):

$$SR = \frac{Rp - Rf}{\sigma} \quad (2)$$

The return used in Sharpe's equation is, in our case, obviously the mean of the returns (not the excess returns), whereas the risk-free rate is the mean of the risk-free rates. The standard deviation, variable that indicates how much does the value differ from the mean, is computed using the following equation:

$$\sigma = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n}} \quad (9)$$

Where:

x_i = Return at time i

$\bar{x}$ = Mean of returns

n = Number of periods

Lastly, the cumulated returns were computed by simply adding all the returns. This cumulated return will show the global trend of the index (if there has been an increase in the price of the index, a decrease or not significant change). This trend is not specified year by year, but at a global scale (i.e. for the all period 2008-2018).

The Sharpe ratio will not be the only performance measure used in this analysis. Indeed, models with multiple factors could highlight other reasons of the good performance of an index. The choice of using multiple factor models has been made although Schröder (2005) presented the following three reasons showing that a single-factor model is sufficient for the study:

- Firstly, the SRI indices do not follow investment styles as SRI funds do.
- Secondly, the FTSE4Good indices are adjusted infrequently (2 times per year).
- Finally, the SRI indices in our case are related to conventional benchmark indices, which have been chosen to fit the SRI indices as much as possible.

The second tool used in the performance analysis is a **linear regression** of the CAPM. Indeed, a linear regression is a linear approach to model the relationship between a dependent variable and an explanatory variable. In this analysis, the dependent variable is the mean of excess returns of the SRI index, whereas the explanatory variable is the mean of excess returns of the benchmark index.

The explanatory variable will be unique (excess return benchmark index), therefore a simple linear regression is justified.

Although a linear regression is a tool with three major applications:

- Determine the strength of predictors
- Forecast an effect
- Trend forecasting

The analysis will focus on the determination of the strength of predictors and value of the constant and the regression coefficients.

The classical linear regression formula states as follows:

$$y = c + b*x \tag{10}$$

Where:

y = Estimated dependent variable

c = Constant

b = Regression coefficient

x = Explanatory variable

The linear regression formula that will be used is:

$$r^{SRI} = \alpha + \beta * r^{BM} + \varepsilon \tag{11}$$

Where:

r^{SRI} = Return of SRI index

α = Jensen's alpha

β = Beta of the index

r^{BM} = Return of Benchmark index

ε = Error

The performance of the SRI indices is estimated by the Jensen's alpha (α) (see section 3.1.2.3, page 19), which can be considered as the return that is not explained by the risk exposure. The beta coefficient (β) is used to compare the relative and systematic risk of the SRI index compared to the conventional benchmark index. The values of alpha and beta will be explained in the results part.

The third and last performance tool used in this analysis is the **Fama and French three-factor model** (FF3). As a reminder, the CAPM provides a pricing model that only uses the market risk factor to estimate assets value. Through the publication of several papers, Fama and French gained recognition in the academic world. In those scientific papers, they described their own pricing model in which they added two factors in extension to the CAPM and made several quantitative studies that show their added factors have a true signification. In the Fama-French Three-factors model, the value risk and size risk factor are added to expand the CAPM. Those factors are measured by the book-to-market ratio (book value per share divided by stock price) and market capitalization (market value of outstanding equity) (Fama & French, 1992; Fama & French, 1996).

The formula of the three-factor model can be written as follows (Fama & French, 1996; Bodie et. al., 2018, p.408):

$$E(R_i) - R_f = \alpha_i + \beta_{iM} * [E(R_M) - R_f] + \beta_{iSMB} * E(R_{SMB}) + \beta_{HML} * E(R_{HML}) \quad (5)$$

The SMB and HML data were retrieved from the Kenneth French website. As there were no available data for the UK geographic zone, we took the decision and the assumption to use the data for both the SMB and HML factors of the global region.
The linear regression will use the SRI excess return as dependent variable, and the BM excess return as market return.

As it is the case for most of the statistical calculation, the linear regression will present results (intercept and coefficient) and specify statistical significance. This significance is

given by the p-value. In a linear regression, a null hypothesis is made: the hypothesis is the fact that the coefficient is equal to zero, and thus has no effect on the dependent variable. If the p-value is lower than 0,05, this null hypothesis can be rejected, which means that the coefficient is a meaningful addition to the model, because changes in the predictor value will change the response variable. On the contrary, a p-value higher than 0,05 means that a change in the predictor value is not associated with the value of the response variable. It is commonly said that a p-value smaller than 0,05 is statistically significant, while a larger than 0,05 is insignificant.

All the data manipulations as well as the linear regressions have been carried out in Excel.

4.3. Results

The aim of this section is to observe and compare the results of the two tools performance analysis on the SRI indices versus the conventional benchmark indices:

- Sharpe ratio
- Linear regression of the CAPM
- Linear regression of the Fama and French three-factor model

4.3.1. Sharpe ratio

The first tool is the Sharpe Ratio, as explained above. The following table presents the data for the whole period (i.e. 2008-2018). Results per month and per region will be shown afterwards.

Table 3: SRI index Performance versus Benchmark Performance: Overview 2008-2018

	Mean Return	Mean Excess Return	Standard Dev.	Sharpe ratio	Cumulated return
US SRI	0,0057	**-0,0201**	0,0451	**-0,4463**	75%
US BM	0,0051	-0,0207	0,0434	-0,4779	67%
UK SRI	0,0011	**-0,0231**	0,0398	**-0,5814**	15%
UK BM	-0,0020	-0,0263	0,0444	-0,5917	-26%
EU SRI	-0,0011	-0,0179	0,0483	**-0,3699**	-15%
EU BM	-0,0006	**-0,0174**	0,0423	-0,4105	-8%
World SRI	0,0014	-0,0244	0,0479	**-0,5094**	19%
World BM	0,0028	**-0,0230**	0,0442	-0,5203	37%

As it can be observed from data presented in table 3, all the Sharpe ratios are negative. This means that all the excess returns are negative, and that none of the indices have a return that is higher than the risk-free rate in the all-period time. Although the Sharpe ratios show negative values, it can be observed that the SRI index's Sharpe ratios are in four cases higher than the benchmark index's Sharpe ratios (see highlighted data in bold). That means that the responsible investments have a better risk-adjusted performance than the conventional investments.

The UK and US SRI's excess returns are higher than the benchmark whereas this is not observed for the EU and the World index. All excess returns show negative values. This is a logical observation since those figures are included in the Sharpe ratio formula.

The standard deviation is pretty much the same for all the indices, is it between the SRI and conventional benchmark or between regions.

The cumulated return (computed as the sum of all the index's returns) quite differs from region to region. Indeed, the US indices show a cumulated return that approximates the 70%. On the contrary, the Europe indices clearly have negative cumulated returns, while UK is mitigated between SRI and benchmark indices; the SRI index show a cumulated return of 15% while the benchmark index performed negatively with a -26% cumulated

return. This can be explained by the macro economic context as well as the growth and prosperity in these markets were different during the studied period.

Table 4: SRI index Performance versus Benchmark Performance: Sharpe ratio overview per year

	US		UK		EU		World	
	SR SRI	**SR BM**	**SR SRI**	**SR BM**	**SR SRI**	**SR BM**	**SR SRI**	**SR BM**
2008	**-0,985**	-1,011	**-1,095**	-1,132	**-0,850**	-1,213	**-1,038**	-1,061
2009	**-0,132**	-0,200	**-0,327**	-0,388	-0,249	**-0,209**	**-0,156**	-0,193
2010	-0,402	**-0,366**	-0,608	**-0,586**	**-0,566**	-0,631	**-0,435**	-0,438
2011	-0,740	**-0,599**	**-0,982**	-1,000	**-0,588**	-0,746	-0,663	**-0,618**
2012	**-0,109**	-0,205	-0,429	**-0,337**	-0,190	-0,190	**-0,111**	-0,194
2013	-0,073	**-0,039**	-0,292	**-0,101**	-0,210	**-0,153**	-0,235	**-0,231**
2014	**-0,576**	-0,684	-0,991	**-0,869**	-0,425	**-0,408**	-1,010	**-0,915**
2015	**-0,498**	-0,559	-0,610	**-0,423**	-0,029	**-0,017**	-0,551	**-0,478**
2016	**-0,332**	-0,350	**-0,066**	-0,408	-0,115	**-0,064**	**-0,486**	-0,495
2017	**-0,404**	-0,559	**-0,269**	-0,284	0,004	**0,042**	-0,508	**-0,377**
2018	**-0,708**	-0,773	**-0,662**	-0,991	**-0,399**	-0,477	-0,901	**-0,828**

In the above table, nearly all Sharpe ratios are negative. The SRI indices performed better than the conventional benchmark indices during 8 years in the US, 5 years in the UK, 4 years in Europe and 5 years in the World, on a total of the observed eleven years.

The level of the Sharpe ratio through the different regions is not relevant to analyze, since it heavily depends on the risk-free rate. Since the risk-free rate differs from region to region, it is thus logical that no trend can be highlighted.

As almost all Sharpe ratios are negative, the standard deviation also has an important role in the results interpretation: the higher the standard deviation, the lower the Sharpe ratio and thus the better (since it is negative). As it will be explained in the linear regression results, the SRI indices have a slightly higher Beta, which means more systematic risk. In the Sharpe ratio, the risk is represented by the standard deviation. It is then logical that the SRI Sharpe ratios are lower than the SR of the benchmark when the standard deviation is higher.

Table 5: SRI index Performance versus Benchmark Performance: Cumulated return overview per year

	US		UK		EU		World	
	SRI	**BM**	**SRI**	**BM**	**SRI**	**BM**	**SRI**	**BM**
2008	-48%	-45%	-33%	-55%	-54%	-53%	-52%	-47%
2009	28%	24%	21%	13%	22%	24%	26%	26%
2010	11%	14%	7%	9%	1%	5%	3%	8%
2011	-2%	1%	-6%	-9%	-7%	-9%	-8%	-3%
2012	16%	13%	8%	11%	12%	11%	15%	12%
2013	26%	27%	16%	24%	13%	14%	20%	20%
2014	15%	11%	-2%	-3%	3%	4%	2%	2%
2015	1%	0%	-5%	4%	4%	5%	-2%	0%
2016	10%	10%	12%	-6%	-2%	0%	4%	5%
2017	20%	18%	7%	6%	5%	6%	18%	20%
2018	-3%	-5%	-9%	-22%	-11%	-13%	-7%	-6%

In the above table, the cumulated returns for each index are detailed. As said earlier, the macro-economic context as well as the growth and prosperity in the markets have been completely different for the US and the rest of the world. The trend analysis will be divided in two distinct comparisons:

- Comparison per region between SRI and benchmark index
- Comparison per year through all the geographic zones

In the US, the SRI index performed better or in the same range than its benchmark nearly all the years in the 11-years period.

The UK indices show higher level of differences between the two indices. In 2008, 2009, 2013, 2016 and 2018 the differences in cumulated return were significant. The SRI index outperformed its benchmark for all those years except in 2013, where the benchmark cumulated return was higher.

In the Euro-zone, like in the US, the cumulated returns were almost all the time in the same range for the SRI and conventional index. No significant differences were found.

Finally, the cumulated returns of the World indices were also almost the same, except for 2008, 2010 and 2011 were the conventional index cumulated return were 5% above the SRI index results.

For those results, we decided to take the assumption that a difference becomes significant above the 3%.

2008 was a really bad financial year because of the crisis, and this is confirmed by analyzing the cumulated returns of all regions, since those approximate the -50%.
2009, however, is a way better year where all regions show positive values, around of 20% in terms of cumulated return.
Since 2010 until 2018, the US cumulated returns show better results than the rest of the regions, with exception of the years 2012 and 2015. Although the US results are better, they stay in the same global trend. For example, in 2012, if the other regions show approximately 10% cumulated return, the US figures approximates the 15%. This could be explained by the crisis ending faster in the US than in the rest of the regions.
The last studied year, i.e. 2018, show quite bad results for all regions, since the end of the year was a difficult period in the global financial markets.

4.3.2. Linear regression of the CAPM

The second performance tool chosen in our analysis is the linear regression. As the regression estimates the alpha and the Beta, this tool allows us to immediately identify if:

- There is a positive (negative) alpha and thus an outperformance (underperformance) of the SRI index on the benchmark,
- The Beta is somehow different than 1 (benchmark). If the Beta is higher (lower) than 1, the risk of the SRI index is higher (lower) compared to the benchmark index.

The following assumptions have been made: the alpha's benchmark index equals zero and its Beta equals 1.
As a reminder, the coefficient of determination R^2 is used to determine how does the benchmark approximates the SRI index. High coefficient of determination means that the benchmark is correctly chosen for our SRI index.

Table 6: Linear regression of the CAPM coefficient

	Alpha	p-value	Beta	p-value	R^2
US	0,0010	0,2505	1,0192	0,0000*	96%
UK	-0,0026	0,2149	0,7799	0,0000*	75%
EU	-0,0008	0,1543	0,9854	0,0000*	98%
World	0,0000	0,9785	1,0617	0,0000*	97%

* means the p-value is statistically significant at the 5% level.

The alpha values are slightly positive for the US and World indices, and negative for the UK and EU. But none of those alphas are statistically significant, as shown by the p-value.

The betas approximate 1 except for UK, which is a way lower value. The entire beta coefficients are statistically significant, which means that they have a meaningful impact on the dependent variable. In the UK, it seems that the risk of the SRI index is lower than its correspondent benchmark.

Finally, the coefficients of determination of the US, EU and World show a good level of precision (above 90%), which translate a good prediction from the benchmark indices. For UK, the R^2 value only reaches 75% , which can raise some questions about the benchmark selection. This point will be further analyzed in the discussion part.

4.3.3. Fama and French 3 factor model

Although the alpha values of the linear regression of the CAPM are quite low, it still shows that there is a small outperformance (underperformance for the UK and EU) of the SRI index compared to the benchmark index. As it was a single factor analysis, we have to conclude that the outperformance (underperformance) only comes from the risk taken by the SRI index. But thanks to a multi-factor analysis, we could find other parameters that could explain these low alpha values.

Therefore another regression has been run, taking the SRI index monthly excess return as dependent variable, and the benchmark excess return together the SMB and HML variables as explanatory ones according to the Fama and French 3 factor model (see section 3.1.3, page 20). Those two last variables will give insight on the impact of the

size factor (SMB: small cap stocks) and on the book-to-market ratio (HML: high B/M ratio). As defined in an article of the Moneychimp website (2019), the beta coefficient of both the SMB and HML factors take values between 0 and 1. By the way those factors are defined, a beta for SMB equals to 1 (0) would be a small (large) cap portfolio and a beta coefficient for HML equals to 1 (0) would be a portfolio with a high (low) book/price ratio.

Table 7: Linear regression of the Fama-French 3 factor model coefficient

	Alpha	p-value	Beta	p-value	SMB	p-value	HML	p-value	R^2
US	0,0013	0,1404	1,032	0,000*	-0,0837	0,0263*	0,0071	0,8273	96%
UK	-0,0028	0,1954	0,773	0,000*	-0,2377	0,0746	0,0352	0,7393	75%
EU	-0,0008	0,1234	0,976	0,000*	-0,0906	0,0012*	0,0056	0,7976	99%
World	0,0000	0,9863	1,051	0,000*	-0,0548	0,2661	0,2224	0,000*	97%

* means the p-value is statistically significant at the 5% level.

As explained above, the SMB and HML factors could take values near to zero or one, and this showed two different interpretations of the portfolio (here our indices).
For the SMB factor, the four values are negative, and near to zero (except for the UK index). This means that the portfolio does not suffer from a small cap risk. This is expected, since our SRI indices take into account the 50 or 100 companies showing the biggest capitalization (see section 4.1, page 29). Among the four values, only the US and EU value were statistically significative, showing a p-value lower than 0,05.
What concerns the HML factor, values are also close to zero. The only exception is the value of the World, which the only statistically significant value. The HML factor for the world shows a value of 0,2224. This means that the world SRI index has a higher book-to-market ratio risk than the other indices, but still has a low risk value.

The coefficient of determination does not change between the two different regressions, except for the EU index. For this one, a 99% value is obtained via the Fama and French 3 factor model compared to a 98% value for the CAPM regression. That means that adding

other factors to the analysis has slightly improved the approximation of the SRI excess return.

Table 8: Comparison alpha and beta of the two linear regressions

	CAPM				FF3			
	Alpha	**p-value**	**Beta**	**p-value**	**Alpha**	**p-value**	**Beta**	**p-value**
US	0,0010	0,2505	1,0192	0,000*	0,0013	0,1404	1,0318	0,000*
UK	-0,0026	0,2149	0,7799	0,000*	-0,0028	0,1954	0,7724	0,000*
EU	-0,0008	0,1543	0,9854	0,000*	-0,0008	0,1234	0,9758	0,000*
World	0,0000	0,9785	1,0617	0,000*	0,0000	0,9863	1,0509	0,000*

* means the p-value is statistically significant at the 5% level.

The two linear regression methods do not show many differences in their alpha and beta values.

Indeed, the World and EU alphas remained identical, while the US and UK alpha values increase and decrease respectively with 0,03 and 0,02 basis points.

All the betas are statistically significant in both linear regressions analysis, and few changes took place between the two linear regressions, while remaining in the similar range. The US beta gained 1,2 basis points in the FF3 analysis, the UK beta remained similar while the EU and the World beta values decrease both by 1 basis point in the FF3 analysis

In conclusion, our analysis results show that:

- Based on the Sharpe ratio performance measure, the SRI indices perform slightly better than the conventional benchmark indices.
- Based on the results of the linear regressions of the CAPM and the Fama and French 3 factor model, the slight outperformance of the SRI indices compared to their benchmark indices observed in the one factor analysis is confirmed but still not statistically significant. For the EU and UK, the linear regressions show an underperformance of the SRI indices, which is also statistically not significant.

The following explanation could be given for the EU results: the SRI index Sharpe ratio is higher than the benchmark thanks to the higher difference in standard deviation (SRI standard deviation quite higher than the benchmark; higher risk, higher reward, shown by the risk-adjusted measure).
The negative alpha obtained through the linear regression for the UK could be explained by the fact that the benchmark may be not the best benchmark to approximate the SRI index (coefficient of determination of 75%), as it will be discussed in the discussion part of this chapter.

4.4. Visual comparison

In this section, a visual comparison of the SRI indices versus the conventional benchmark has been carried out using the Bloomberg Terminal. Those visual analyses will, hopefully, confirm our results as detailed in the above section. The comparison graphs have been done.

Figure 4: FTSE4Good US 100 index versus FTSE USA index graph (Bloomberg Terminal, 2019)

On the above graph, the FTSE4Good US 100 index (in white) compared to its benchmark index, the FTSE USA index (in green). It can be clearly observe that the benchmark slightly outperforms or match the SRI index in the earlier years (2008-2014), and

became outperformed as of 2015 until now. This trend can be found back in the Sharpe ratio figures in the table 4.

Figure 5: FTSE4Good UK 50 index versus FTSE Local UK index graph (Bloomberg Terminal, 2019)

A similar comparison is shown in figure 5 for the UK indices, comparing the FTSE4Good UK 50 index and the FTSE Local UK index. The observed result differs significantly from the picture obtained with the US indices. In the first years of the analyzed period (2008-2009), the benchmark index (green line) performs badly compared to the SRI index. The SRI index (white line) decrease was slower than the one of the benchmark index. Although the level of the benchmark index is low, it does perform better than the SRI index in terms of growth and returns between 2012 and 2015. Since 2016, the SRI index has gently increased while the benchmark kept the same level before decreasing end 2017-beginning 2018. Those trends can also be confirmed with the Sharpe ratios figures in table 4.

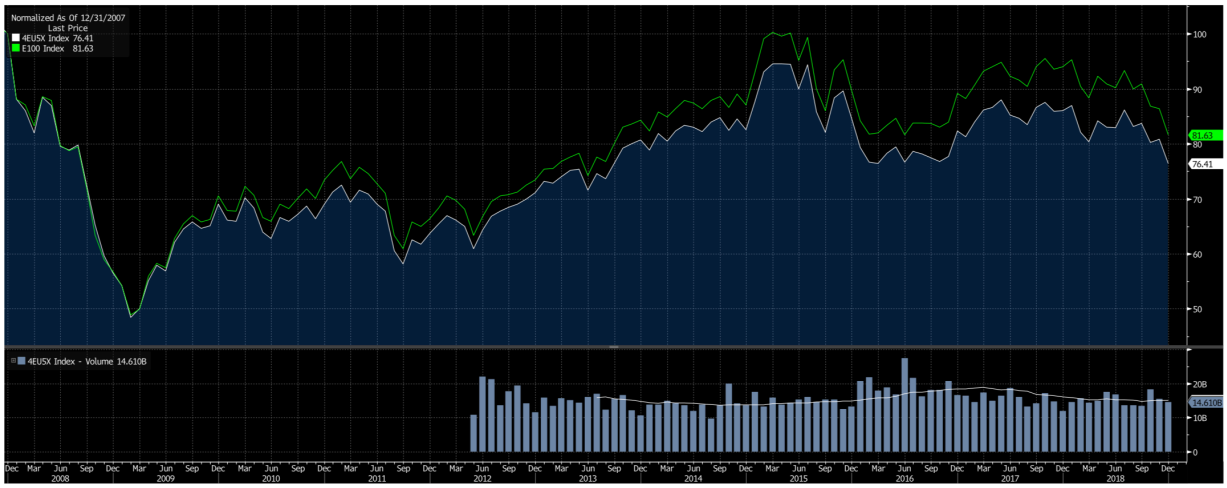

Figure 6: FTSE4Good Europe 50 index versus FTSE Eurotop 100 index (Bloomberg Terminal, 2019)

The comparison between the Euro-zone indices is illustrated in figure 6. The performance of the indices were similar for 2008, while the benchmark outperformed the SRI index in 2009, and kept growing faster than the SRI index between 2013 and 2017. In 2018, the gap between the two indices narrowed, which means that the SRI performed better than the benchmark that year.

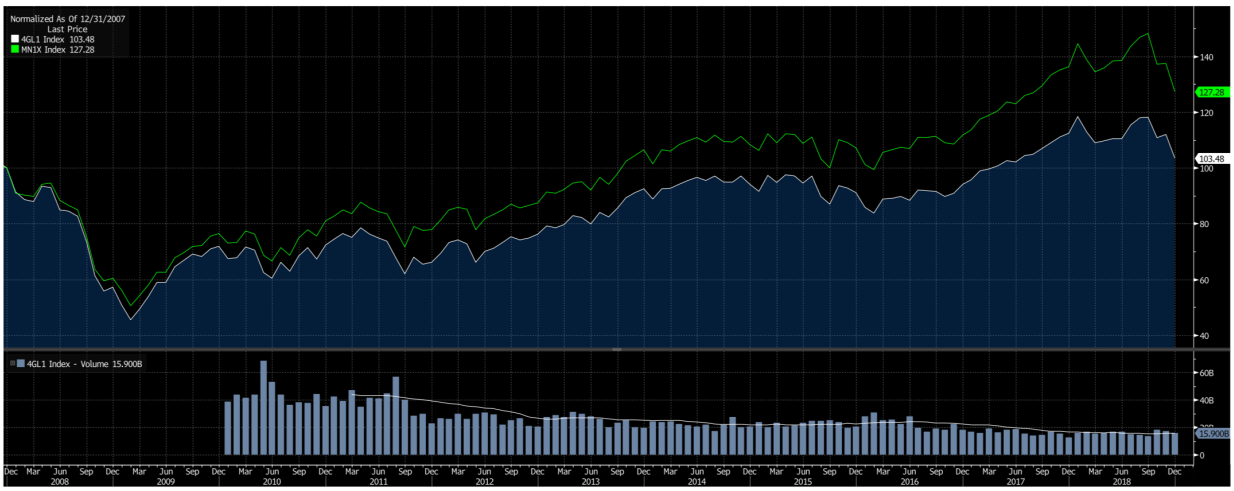

Figure 7: FTSE4Good Global 100 index versus FTSE Global 100 index (Bloomberg Terminal, 2019)

This last comparison shows the Global indices. As it has been shown for the UK indices comparison, the benchmark index outperformed the SRI index on the growth and prices. Both indices stayed close for the two first years, and the benchmark index then outperformed the SRI index for nearly every year, except in 2016 where the SRI returns were just above the ones of the benchmark.

In conclusion, those illustrations of the SRI and benchmark indices comparison are useful to understand the trends that both the indices have followed over the past eleven years. However those illustrations have to be analyzed with caution. Indeed, our performance measures focus on the risk-adjusted returns that take into account the risk-free rate and the standard deviation. In the EU and World cases, the benchmark did outperform the SRI indices in terms of prices. But the SRI indices outperformed the benchmark if we look at the Sharpe ratio performance measure.

4.5. Discussion

In this last section, some reflections challenging both the assumptions taken in our analysis and the analysis themselves will be discussed. Other analysis opportunities will also be suggested, opening new research questions for further analysis.

The first assumption of our discussion relates to the single index study. Indeed, other studies have been published with a similar objective, i.e. to analyze the performance of SRI indices versus conventional benchmark indices. However, these studies were based on multiple indices analysis (Statman et. al., 2006; Schröder, 2007). Statman studied four SRI indices (Domini 400 Social Index (DS 400 Index), the Calvert Social Index, the Citizens Index, and the U.S. portion of the Dow Jones Sustainability Index) while Schröder observed the returns of 29 SRI stock indices. In the case of this thesis, the goal was to analyze the same SRI index with regards to several geographic zones. The FTSE4Good index series was chosen for its completeness in terms of geographic covering and for its benchmarks. Trends per region have been observed, and thanks to the quality of the FSTE4Good index series, it can be said that the study reflects the reality, although studying only one benchmark could be considered as limiting factor.

The second challenged assumption is the choice of the benchmarks themselves. Indeed, those have been chosen to reflect in the best way possible the SRI index construction. However, some differences have been observed. For example, the UK benchmark may not be the best benchmark for the SRI index. Indeed, in the linear regression, the coefficient of determination is only 89%, which is lower than the other ones (99% for every other index). Belghitar, Clark and Deshmukh (2014) also observed the performances of the FTSE4Good index series. In their study they compare it with more common index (S&P- 100, STOXX – 50, Dow Jones Industry Average) as well as FTSE indices (Belghitar et. al., 2014). The idea behind the choice of FTSE index series was to take the indices built by the same index provider, which should accurately approximate the SRI ones since the SRI indices are supposed to be the responsible version of the FTSE indices.

For all analyzed data, the prices were computed as monthly prices i.e. taking the last price of each month. The chosen time period could have been different (daily, weekly, 3 month), but a monthly period was taken as there are already few periods in the studied years (132 in total) and seemed to be a common average choice.

Besides the indices data, the risk-free rate could also be discussed. For the 3 geographic zones US, UK and EU, the risk-free rate were extracted from Bloomberg and considered as accurate. However there were no specific data available for the "world risk-free rate". Therefore, the assumption was made to use the US risk-free rate. This choice is motivated by the fact that the US economy is one of the largest, and that the component of the World indices should in a large proportion be quoted in the US (FTSE Russell does not publicly disclose the exacts components of the index). This choice could generate some bias in the excess returns of the global indices and be a point of discussion in our analysis.

Finally, the tools used to measure the index performance could be discussed. The single-factor model Sharpe ratio has been used to determine the performance measures, while a linear regression estimated the alpha and Beta parameters. Those performance measures have been already used in several studies like the one of Michael Schröder in

2005. In their study, Belghitar, Clark and Deshmukh (2014) claimed that most of the studies only focuses on the two first moments of equity return distributions (mean and variance)**.** The objective of their paper was to fill the gap created by all the other studies that neglected to consider and to test all the moments that could impact the performance. The third and fourth moments, namely the skewness and kurtosis, have, among various studies, impact on the equity, since investors have a preference for positive skewness and an aversion to kurtosis (Kraus and Litzenberger, 1976; Fang and Lai, 1997; Dittmar, 2002)**.** Belghitar et al. used the Marginal Conditional Stochastic Dominance (MCSD) measure, which analyzes whether one index presents dominance over another through the Absolute Concentration Curves (ACC) (Belghitar et. al., 2014). They also performed a mean-variance testing using the Sharpe ratio, Jensen's alpha, Treynor ratio and Carhart four-factor model. Those performance measures are partly used in this thesis, and the others could be considered as new tools to provide results from other perspectives than the ones used in this study. We also used the Fama and French 3 factor model, which could bring us more details about the under- or outperformance of the SRI index. Unfortunately, we had to conclude that the new analyzed factors did not bring further information regarding of the performance. As explained earlier (see section 4.2, page 31), Schröder gave several reasons why a single factor model was enough when studying indices: we can conclude that our analysis comparing the one and several factor models confirm Schröder findings.

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Conclusion

The goal of this master thesis was to perform an analysis on the performance of SRI indices. As stated in the introduction, the aim is to analyze and answer the following research question:

Does Socially Responsible Investments show a significant difference in performance compared to conventional investments?

The total SRI Assets under Management (AUM) in 2018 reaches $30,7 trillion, which represents an increase of 34 percent since 2016. It is clear that seeking for both financial return and ethical benefit are important objectives for a lot of investors.
The aim of our thesis is to present a broad approach of the subject. In order to achieve this objective, the following topics have been developed: the status, the history, the screening methodologies used nowadays as well as all a literature review. The aim of the first theoretical section is to give the reader all the needed information to fully understand the second section, i.e. the performance analysis and its results.

Through the analysis using the Sharpe ratio and a linear regression on the excess returns as performance measuring tools, some conclusion can be drawn concerning the comparison between the FTSE4Good and FTSE indices.

Firstly, the Sharpe ratios were negative for both the SRI and benchmark indices in the four regions. Although those were negative, SRI's Sharpe ratios were always higher, which means that in terms of risk-adjusted measure, the SRI indices did outperform their conventional benchmark. But based on the slight differences, it can be said that the outperformance was not significant. The SRI's mean excess returns were also higher than the ones of the benchmark, except for the Euro-zone and the World: the SRI Sharpe ratios were still outperformed the benchmark's SR thanks to an higher standard deviation of the SRI index.

Secondly, the Jensen's alpha found using the linear regression give information on an additional return that is not directly related to the risk taken. The systematic risk of the SRI indices compared to the conventional indices was represented by the beta. The computed alphas were positive for the US and the World indices and negative for the UK and EU indices. In both cases, the values of the alphas were very low and statistically not significant. Concerning the Betas, there were close to 1 (meaning no additional risk) except for the UK that presented a Beta value of 0,75, which means that the SRI index was subject to lower risk than its benchmark index.

Thirdly, the Fama and French three factor model was applied through a regression, adding two other factors (HML and SMB) to the CAPM regression. The four SMB values were negative and near zero, which means that the indices do not suffer from small cap risk. Only the US and EU values were statistically significative. The HML values were also close to zero, except for the world value, which was the only significative value.
The difference between the CAPM and the FF3 model regressions were really small, although adding two new factors. The alphas presented a slight change for the US and UK, and the coefficient of determination presented a one percent change for the EU index.

To conclude this thesis, it can be said that although not really significant in this analysis, the SRI have the potential to present outperformance to the conventional investments. This outperformance has to be, obviously, added to the "good deed" done by the socially responsible investors.

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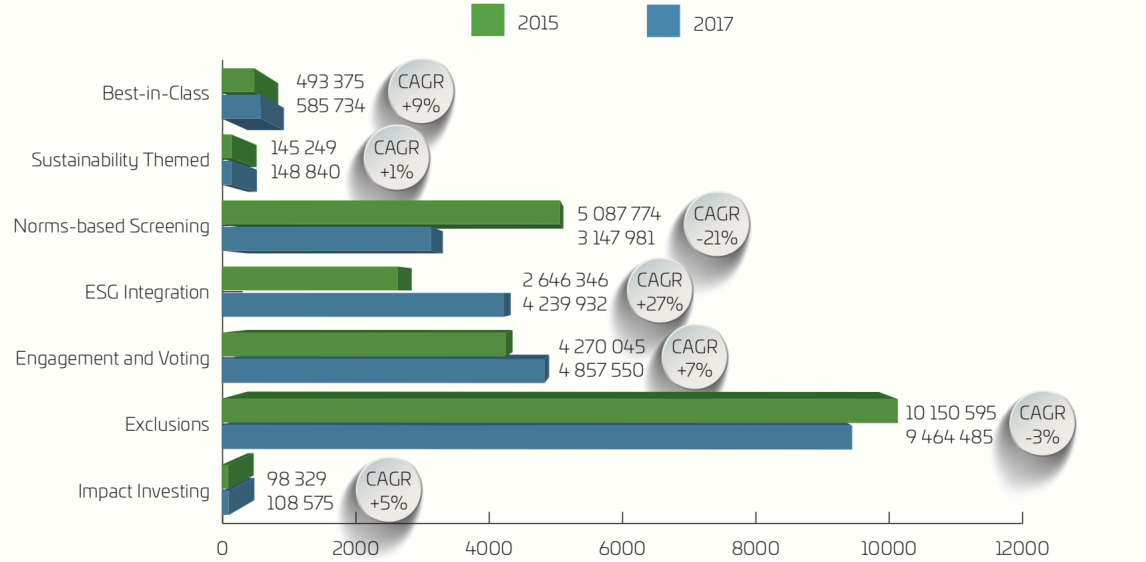
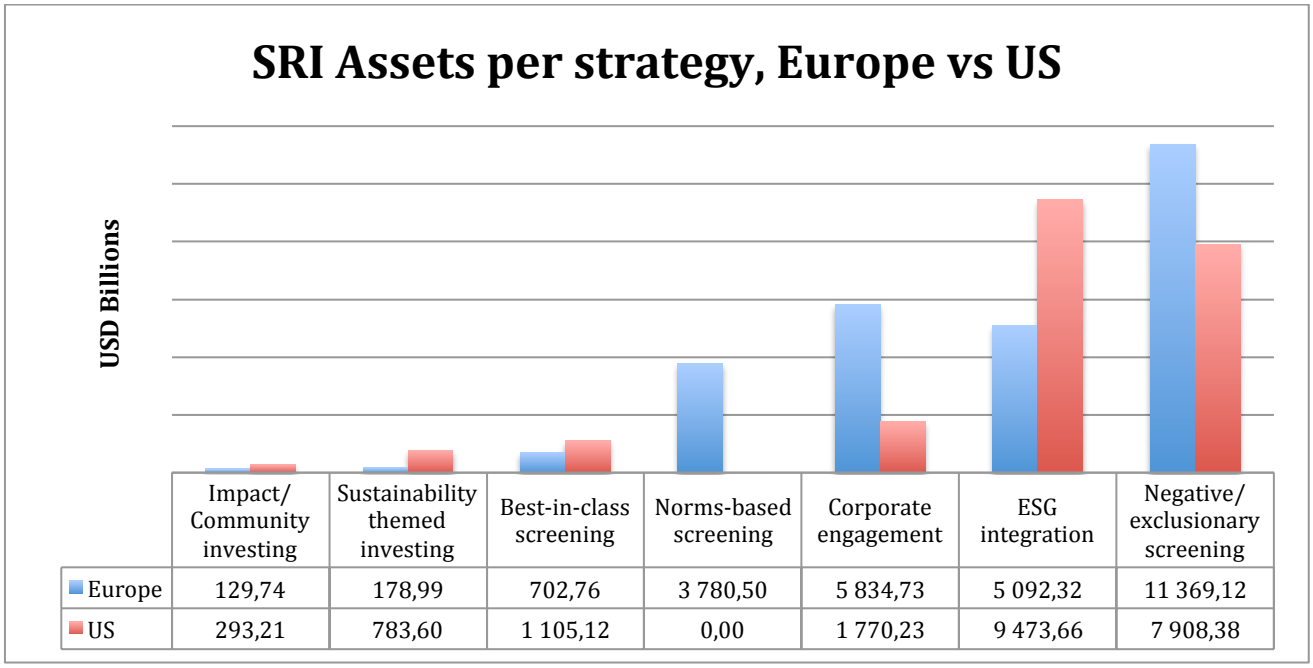
Appendixes

Appendix 1: SRI strategies



Appendix 2: SRI Assets proportion per strategy, Europe and US region (GSIA, 2018) (Eurosif, 2018)



	Impact/ Community investing	Sustainability themed investing	Best-in-class screening	Norms-based screening	Corporate engagement	ESG integration	Negative/ exclusionary screening
Europe	129,74	178,99	702,76	3 780,50	5 834,73	5 092,32	11 369,12
US	293,21	783,60	1 105,12	0,00	1 770,23	9 473,66	7 908,38

The figures of Europe come from the 2018 Eurosif report. Those have been **transformed** in USD with the 1/1/2018 EUR-USD exchange rate.

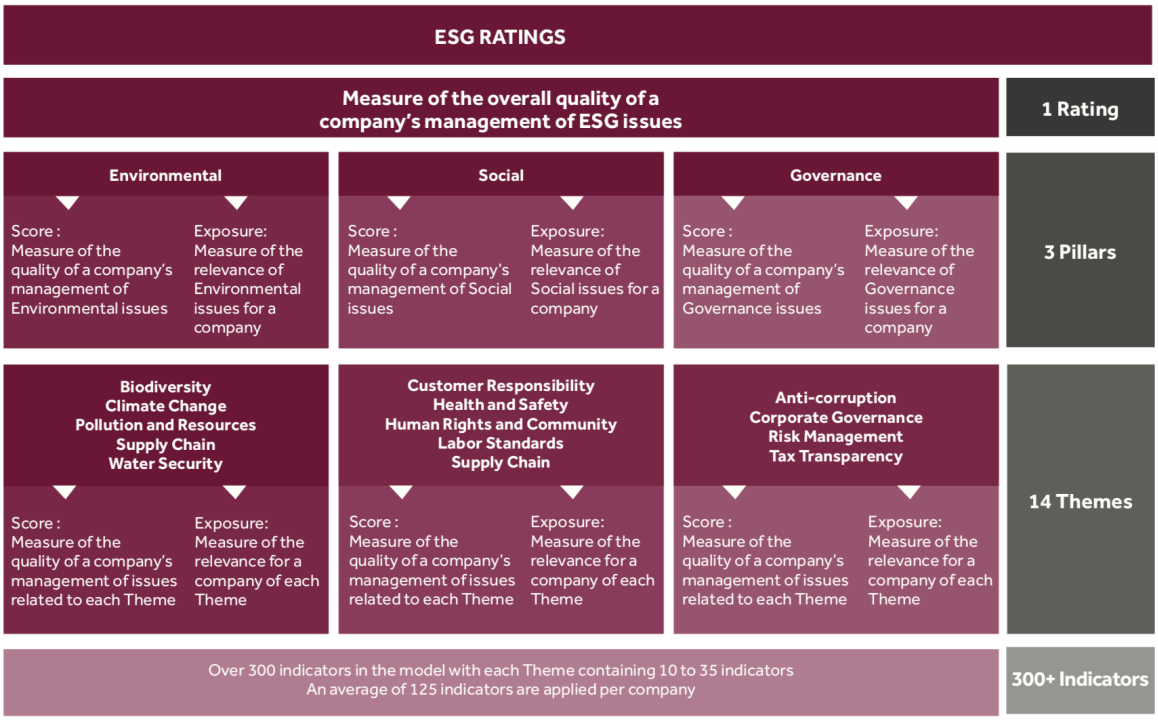
Appendix 3: Pillars, themes and ESG Key Issues (MSCI ESG ratings methodology, 2018, p. 4)

3 Pillars	10 Themes	37 ESG Key Issues	
Environment	Climate Change	Carbon Emissions	Financing Environmental Impact
		Product Carbon Footprint	Climate Change Vulnerability
	Natural Resources	Water Stress	Raw Material Sourcing
		Biodiversity & Land Use	
	Pollution & Waste	Toxic Emissions & Waste	Electronic Waste
		Packaging Material & Waste	
	Environmental Opportunities	Opportunities in Clean Tech	Opp's in Renewable Energy
		Opportunities in Green Building	
Social	Human Capital	Labor Management	Human Capital Development
		Health & Safety	Supply Chain Labor Standards
	Product Liability	Product Safety & Quality	Privacy & Data Security
		Chemical Safety	Responsible Investment
		Financial Product Safety	Health & Demographic Risk
	Stakeholder Opposition	Controversial Sourcing	
	Social Opportunities	Access to Communications	Access to Health Care
		Access to Finance	Opp's in Nutrition & Health
Governance	Corporate Governance*	Board*	Ownership*
		Pay*	Accounting*
	Corporate Behavior	Business Ethics	Corruption & Instability
		Anti-Competitive Practices	Financial System Instability
		Tax Transparency	

Appendix 4: Conversion Final Industry-Adjusted Company Score in Letter Rating (MSCI ESG ratings methodology, 2018, p. 11)

Letter Rating	Final Industry-Adjusted Company Score
AAA	8.6* - 10.0
AA	7.1 – 8.6
A	5.7 – 7.1
BBB	4.3 – 5.7
BB	2.9 – 4.3
B	1.4 – 2.9
CCC	0.0 – 1.4

Appendix 5: FTSE4Good ESG ratings composed of pillars, themes and indicators (FTSE4Good Brochure, 2018)



Appendix 6: Yearly results (Return, Excess return, Sharpe ratio and Cumulated return) per region

The US

	Return	Return BM	Excess Rt	Excess Rt BM	SR	SR BM	Cumulated return	Cumulated return BM
2008	-0,0397	**-0,0375**	-0,0754	**-0,0733**	**-0,9845**	-1,0113	-48%	-45%
2009	**0,0235**	0,0201	**-0,0092**	-0,0126	**-0,1317**	-0,2003	28%	24%
2010	0,0089	**0,0116**	-0,0223	**-0,0197**	-0,4018	**-0,3657**	11%	14%
2011	-0,0014	**0,0007**	-0,0287	**-0,0267**	-0,7399	**-0,5987**	-2%	1%
2012	**0,0137**	0,0112	**-0,0037**	-0,0061	**-0,1092**	-0,2052	16%	13%
2013	0,0216	**0,0224**	-0,0020	**-0,0011**	-0,0726	**-0,0386**	26%	27%
2014	**0,0124**	0,0090	**-0,0124**	-0,0158	**-0,5765**	-0,6839	15%	11%
2015	**0,0010**	-0,0002	**-0,0199**	-0,0211	**-0,4976**	-0,5588	1%	0%
2016	**0,0083**	0,0080	**-0,0099**	-0,0102	**-0,3317**	-0,3501	10%	10%
2017	**0,0168**	0,0152	**-0,0065**	-0,0081	**-0,4036**	-0,5587	20%	18%
2018	**-0,0024**	-0,0045	**-0,0313**	-0,0334	**-0,7080**	-0,7729	-3%	-5%

The United Kingdom

	Return	Return BM	Excess Rt	Excess Rt BM	SR	SR BM	Cumulated return	Cumulated return BM
2008	**-0,0278**	-0,0457	**-0,0720**	-0,0900	**-1,0952**	-1,1321	-33%	-55%
2009	**0,0174**	0,0110	**-0,0188**	-0,0253	**-0,3273**	-0,3878	21%	13%
2010	0,0060	**0,0076**	-0,0286	**-0,0269**	-0,6083	**-0,5863**	7%	9%
2011	**-0,0051**	-0,0072	**-0,0349**	-0,0370	**-0,9820**	-1,0001	-6%	-9%
2012	0,0063	**0,0091**	-0,0119	**-0,0091**	-0,4287	**-0,3372**	8%	11%
2013	0,0129	**0,0197**	-0,0106	**-0,0039**	-0,2921	**-0,1007**	16%	24%
2014	**-0,0017**	-0,0022	**-0,0262**	-0,0267	-0,9914	**-0,8689**	-2%	-3%
2015	-0,0039	**0,0036**	-0,0220	**-0,0145**	-0,6101	**-0,4230**	-5%	4%
2016	**0,0102**	-0,0049	**-0,0016**	-0,0168	**-0,0665**	-0,4082	12%	-6%
2017	**0,0057**	0,0054	**-0,0064**	-0,0068	**-0,2687**	-0,2842	7%	6%
2018	**-0,0075**	-0,0181	**-0,0214**	-0,0321	**-0,6617**	-0,9908	-9%	-22%

The Euro-zone

	Return	Return BM	Excess Rt	Excess Rt BM	SR	SR BM	Cumulated return	Cumulated return BM
2008	**-0,0449**	-0,0506	-0,0845	**-0,0842**	**-0,850**	-1,213	-54%	-53%
2009	0,0183	**0,0305**	-0,0143	**-0,0127**	-0,249	**-0,209**	22%	24%
2010	0,0008	**0,0060**	-0,0266	**-0,0233**	**-0,566**	-0,631	1%	5%
2011	**-0,0057**	-0,0130	**-0,0323**	-0,0339	**-0,588**	-0,746	-7%	-9%
2012	**0,0096**	0,0093	**-0,0054**	-0,0062	-0,190	-0,190	12%	11%
2013	0,0109	**0,0159**	-0,0053	**-0,0043**	-0,210	**-0,153**	13%	14%
2014	0,0021	**0,0028**	-0,0096	**-0,0087**	-0,425	**-0,408**	3%	4%
2015	**0,0036**	0,0018	-0,0015	**-0,0009**	-0,029	**-0,017**	4%	5%
2016	-0,0019	**0,0031**	-0,0036	**-0,0020**	-0,115	**-0,064**	-2%	0%
2017	0,0039	**0,0061**	0,0001	**0,0009**	0,004	**0,042**	5%	6%
2018	-0,0094	**-0,0120**	**-0,0137**	-0,0156	**-0,399**	-0,477	-11%	-13%

World

	Return	Return BM	Excess Rt	Excess Rt BM	SR	SR BM	Cumulated return	Cumulated return BM
2008	-0,0436	**-0,0393**	-0,0794	**-0,0751**	**-1,0381**	-1,0608	-52%	-47%
2009	0,0216	**0,0213**	**-0,0111**	-0,0114	**-0,1564**	-0,1927	26%	26%
2010	0,0027	**0,0065**	-0,0285	**-0,0248**	**-0,4351**	-0,4377	3%	8%
2011	-0,0063	**-0,0022**	-0,0336	**-0,0295**	-0,6626	**-0,6182**	-8%	-3%
2012	**0,0129**	0,0103	**-0,0045**	-0,0070	**-0,1113**	-0,1936	15%	12%
2013	0,0165	**0,0168**	-0,0071	**-0,0068**	-0,2352	**-0,2310**	20%	20%
2014	0,0018	0,0018	-0,0230	-0,0230	-1,0097	**-0,9150**	2%	2%
2015	-0,0020	**0,0001**	-0,0229	**-0,0208**	-0,5507	**-0,4778**	-2%	0%
2016	0,0033	**0,0038**	-0,0149	**-0,0144**	**-0,4857**	-0,4945	4%	5%
2017	0,0150	**0,0168**	-0,0083	**-0,0065**	-0,5077	**-0,3766**	18%	20%
2018	-0,0062	**-0,0049**	-0,0351	**-0,0338**	-0,9010	**-0,8282**	-7%	-6%

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