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**PERFORMANCE OF THE ESG MOMENTUM STRATEGY**

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**ABSTRACT**

The popularity of socially responsible investing has been growing rapidly during the past decades and the discipline has gained a firm foothold within the financial industry. Emerging demand for information about how companies incorporate social responsibility in their operations has been responded by specialized agencies providing an extensive amount of information of companies' corporate social responsibility profiles. The financial performance of portfolios investing in companies that are ranked based on the three dimensions of sustainability has been studied profoundly. As many studies show that a correlation exists between high ESG rating and financial performance (Gunnar et al. 2019), investors are constantly emerging new strategies to take advantage of this. The ESG momentum strategy is one of the recently developed strategies showing promising results, yet it is still to be found by the greater public. This thesis contributes for that by studying the performance of ESG momentum portfolios in developed and emerging markets over the sample period from 2010 to 2018. Additionally, the positive and negative trend in the change of the ESG rating of a company are studied separately to perceive whether one is superior to the other.

Using ESG ratings and financial data provided by Refinitiv, six different portfolios are constructed from companies included in US and BRICS. The financial performance of these portfolios is then studied by applying CAPM single-factor model, Fama-French 3-factor and 5-factor models and Carhart 4-factor model with the factor data obtained from Kenneth R. French database. This thesis approaches the portfolio construction in a more practical level by restricting the amount of companies in the portfolios to top 10% and bottom 10% based on the change of the ESG rating during the past fiscal year.

The findings of this thesis are not aligned with the previous studies. Empirical analysis show that the ESG momentum portfolios do not gain statistically significant alpha in neither of the investment universes over the sample period. The contradiction in the findings is supposedly due to the different approach to portfolio construction and more restricted investment universe. A possible bias also arises from the lack of standardization and regulation between the ESG ratings from different agencies. However, the results of the separate portfolios for the positive and negative change in the ESG rating motivate to combine the ESG momentum based screening with other SRI strategies in future research.

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**KEYWORDS:** Socially Responsible Investing, ESG, ESG Momentum, Fama-French 3-factor model, Fama-French 5-factor model, Carhart 4-factor model



## 1. INTRODUCTION

Climate change, wars, terrorist attacks, racism, inequality, child labour and other related issues are a popular topic in today's public discussion, news and politics. Emerged worry about these issues has spread to the business world as the stakeholders are requiring companies to contribute for the common good and to incorporate social responsibility as part of their operations. Even the financial industry which has traditionally been understood as a "hard" industry, with money being the one and only measure has witnessed a formation of a totally new industry around these issues, Social Responsibility Investing (SRI).

Such terms like sustainability, corporate social responsibility, ESG, etc., are without a doubt the megatrend of today amongst the academics and practitioners in finance and investing. Investors today are prioritizing sustainability and responsibility in the investment process more than ever, and a demand and supply for products and services supporting the trend has surged during the past decades. The Forum for Sustainable and Responsible Investment (US SIF) which is one of the leading non-profit associations supporting the development of socially responsible investing industry reports the amount of professionally managed funds following SRI principles in the US as 12 trillion US dollars in 2018 – while in 2013 the same amount was around 3 trillion US dollars and before the 21th century it was under a trillion US dollars (US SIF 2018). The European investment industry is aligned with the development in the US as Eurosif (2018) reports that over 60% of the professionally managed assets in Europe are incorporating some form of SRI practises.

For many decades the finance theory was primarily based on Harry Markowitz's (1952) famous modern portfolio theory. The theory assumes that all investors behave homogenously and rationally constructing the portfolios by only focusing on two components which are risk and expected rate of return. The investment universe of the modern portfolio theory cannot be restricted so that the investors are able to build well diversified portfolios and therefore minimize the unsystematic (firm-specific) risk in the portfolios offering the same rate of return as riskier portfolio (Markowitz 1952). A

mismatch between Markowitz's modern portfolio theory and socially responsible investing arises.

Socially responsible investing is not easily defined as the concept is multisectoral and has evolved during its long history from the early biblical times. The issue is also that the concept can be approached from many different points of views as people have different motives and personal values. Many researchers have contributed for the definition of the term and not a single definition exists in the related literature, thus some idioms have formed that show up often in related discussions. Eurosif (2016) defines SRI as follows:

*“Sustainable and responsible investing is a long-term oriented investment approach which integrates ESG factors in the research, analysis and selection process of securities within an investment portfolio. It combines fundamental analysis and engagement with an evaluation of ESG factor in order to better capture long term returns for investors, and to benefit society by influencing the behaviour of companies.”*

If investors behaved like Markowitz's theory assumes, no investor would reject a profitable investment opportunity because of the company operates in wrong industry or does not incorporate socially responsible practises (Beal & Phillips 2005). Yet the popularity of SRI is surging, and the industry challenges the traditional philosophies of finance.

The relationship between companies' social responsibility practises and other characteristics like financial performance, risk, cost of capital, etc. has been a great interest of academic studies during the past decades. The evidence about the connection between the corporate social responsibility and companies' financial performance as well as the performance of SRI remains fragmented. A meta study conducted by Fulton et al. (2012) studied the results of over 100 studies in the topic and find that all the studies find that good social responsibility practises lead to superior financial performance of the company. The meta study finds mixed results about the efficiency of SRI as an investment strategy, however, no evidence for underperformance exists and majority of the studies present positive connection between SRI and financial returns (Fulton et al 2012).

Different strategies for practising SRI have evolved along the history of the concept, from the earliest approaches of simple exclusion of “sinful” companies to the modern combinations of different strategies. This thesis will contribute to the growing body of SRI studies by focusing on SRI strategy which is relatively new and has not yet received extensive amount of academic attention. This so called “ESG momentum” strategy is a combination of the trending concept of SRI and ancient finance theorem of momentum and differs significantly from the other SRI strategies by focusing on the changes in the ESG scores instead of absolute scores. A few very recent academic studies about the strategy have been conducted (Nagy et al. 2013, Nagy et al. 2016, Verheyden et al. 2016, Giese et al. 2019.) presenting promising results about the profitability of the ESG momentum strategy. The findings of this thesis are questioning the previous studies and the possibility of an investor to successfully implement the strategy into practise remains uncertain as discussed in this thesis. The methodology conducted in the previous studies (see e.g. Nagy et al. 2016) is a very academic approach to investing. If a similar portfolio to Nagy et al. (2016) including over 1,600 companies would be formed in actual markets the net performance of an investor would suffer significantly due to different transaction costs faced. The illusionary performance of momentum strategies has been criticized by academics (see e.g. Lesmond et al. 2004) as the strategies require frequent buying and selling and are exposed to huge transaction costs. The same critique applies to the previous ESG momentum studies and a portfolio of 1,600 companies (Nagy et al. 2016) would result in increased marginal costs impacting the portfolio performance significantly. Thus, an investor considering the ESG momentum strategy in actual markets should approach carefully the findings of the previous studies.

The critical approach to the results in related literature does not however overturn the possibilities the ESG momentum offers. A more practical approach to the ESG momentum is implemented in this study restricting the investment universe with a cut-off point of 20% similarly to many studies in the traditional cross-sectional momentum focusing on the past returns of stocks (Jegadeesh & Titman 1993, Chordia & Shivakumar 2002, Cooper et al. 2004 Griffin et al. 2003, Hong et al. 2003). In addition to the ESG momentum, this thesis extends the study by observing the positive and negative trend in the ESG ratings separately. The motivation for this is to find out whether the positive or

negative trend is superior to the other and could this create an opportunity to combine the trend following of the ESG ratings with other SRI strategies. As Renneboog et al. (2008b) present, funds conducting SRI usually combine different strategies rather than implementing just one approach. Negative screens are often applied to exclude certain industries from a larger pool of companies such as a major index and positive screens are often used to identify companies with superior performance on corporate governance practices (Renneboog et al. 2008b). Positive screening strategy is also often combined with a strategy called “best-in-class” where companies are ranked separately within the industries and the positive screening is applied to identify the best performers in terms of the desired dimension of ESG. Similarly, to the foregoing combinations of SRI strategies, the positive or negative trend in the ESG rating could be combined successfully with other strategies creating a new profitable approach to SRI.

This thesis addresses to answer the questions raised above about the practical implementation of the ESG momentum and the possible value of combining the positive or negative trend in the ESG rating with other SRI strategies. The empirical findings of this thesis contribute to the narrow literature studying the correlation between the portfolio returns and changes in the ESG ratings. Especially the portfolio including only short positions in companies in bottom ten decile based on the change in the ESG rating performed statistically well earning positive excess returns in both, developed markets and emerging markets, of 2.6% and 4.4% respectively. The findings of this thesis create an interesting opportunity for further research in a profitability of an SRI strategy combining ESG rating trend following and other strategies.

### 1.1. Research Question and Hypothesis

The research question arises as the investors continuously are trying to develop new ways to gain superior financial returns. As Fulton et al. (2012) present, extensive amount of studies has been conducted with varying approaches. However, the ESG momentum in which this thesis is focusing on is yet to be profoundly studied, even though it has been discussed in few studies and white papers. The main question obviously is whether

constructing portfolios aligned with the strategy could offer superior financial performance that could be utilized by the investors. In addition to this, I am interested in whether the ESG momentum strategy will perform better in developed markets or emerging markets.

The hypotheses of the study are formed as follows:

$H_0$  = Positive excess returns are not gained with ESG momentum strategy.

$H_0$  is the one I try to reject and find positive excess returns by forming portfolios according to the ESG momentum strategy. It is possible that the strategy does not gain positive excess returns and the  $H_0$  holds. Rejecting the  $H_0$  would support the assumption that the strategy offers a possibility to gain significant excess returns supporting the  $H_1$ , which is written as follows:

$H_1$  = Positive excess returns are gained with ESG momentum strategy.

According to the extensive related literature about the SRI and financial performance, as well as the few recent studies about the performance of the ESG momentum, it is possible that the  $H_1$  is supported in this thesis. However, as the data set, portfolio construction, methodology and time period used in this thesis differs from the other studies, the results may be significantly different.

A possibility that the strategy will result in negative excess returns also exists. Thus, the earlier studies find positive excess returns for the ESG momentum strategy, they form the portfolios differently using more unrealistic methods for real life implementation. Earlier studies also use different data providers for the studies and study different investment universes.

The second hypotheses of the thesis focus on studying the difference in the performance of the strategy between developed and emerging markets and is written as follows:

$H_2$  = ESG momentum strategy offers higher return in emerging markets than in developed markets.

Sustainable development and ESG related issues and practises are not a new thing in developed markets. The CSR profiles of the companies have been followed in developed markets by the company stakeholders for long and investors have relatively good access to the information about company's CSR practises. However, the emerging markets have been behind the developed markets in this matter. For example, Odell & Ali (2016) report a greater variability in companies CSR practises exists in emerging markets, which would offer a possibility for the investors to utilize this and achieve abnormal returns. The focus on sustainable development is extremely crucial in the emerging markets as their population is growing significantly bringing all the environmental issues along with it. Other issues like human rights, inequality and corruption have been more and more under the discussion during the recent years regarding the emerging markets. These foregoing issues are signs that companies and investors in emerging markets will move their focus more than earlier to the ESG from solely focusing on companies' fundamentals. One sign from this is for example that the Thomson Reuters ASSET4 ESG rating database, which is used in this study, included its first emerging market indices in 2011 even though it was launched already in 2003. Also, in 2018 they added 180 new companies from emerging markets. (Refinitiv 2019) This evidence supports especially the ESG momentum strategy. As the ESG becomes more trending among the investors in emerging markets, companies start to allocate more resources into the CSR practises and the ESG rating agencies start to rate the companies operating in emerging markets, one could expect that the ESG ratings will experience stronger changes in emerging markets supporting the ESG momentum strategy. Comparing this with the developed markets where the ESG profiles of the companies are relatively well known and followed, one could expect that less changes occurs in ESG ratings in the developed markets and that the ESG momentum would not be as successful strategy in these markets as in the emerging markets.

## 1.2. Structure of the Study

The thesis is structured as follows: The chapter 2 will discuss profoundly the topic of SRI. Starting from the history of the SRI the chapter discusses the concepts that are closely related to SRI. The chapter also contributes to the fragmented field of defining SRI and discusses the most common SRI strategies, as well as the ESG momentum strategy. The chapter 3 presents the theoretical framework required to being able to conduct and understand the empirical part of the thesis. Third chapter also discusses how the SRI is in contrast with the modern portfolio theory. Chapter 4 presents the narrow literature about the ESG momentum strategy. Chapter 5 presents the data and methodology that is used in the thesis to conduct the empirical part. Chapter 6 then presents and discusses the results obtained from the empirical analysis. Chapter 7 concludes the findings of the empirical analysis and includes a discussion about the results. Chapter 8 then concludes the findings and contribution of the thesis.

## 2. SOCIALLY RESPONSIBLE INVESTING

The emerging popularity of socially responsible investing (SRI), and a formation of a totally new investment industry around the practises and issues related to environmental, social and governance (ESG) has enjoyed great attention amongst finance professionals and academic researchers (Schueth 2003). This chapter will shed light to the concept of socially responsible investing and provides an overall understanding of the existing wide-ranging interpretation of the concept. The chapter will also discuss the origins and development of SRI as well as the most popular strategies used in practise by the investors. In addition to these most commonly used strategies, I will discuss the ESG momentum strategy, which is relatively unknown and recently found strategy, and will be the main strategy of interest in this thesis. A concept of Corporate Social Responsibility (CSR) which is closely related to SRI and often appears in the related literature together with SRI will be also superficially discussed.

### 2.1. Development of Socially Responsible Investing

The origins of investing ethically or on a socially responsible way can be traced back hundreds of years to the early Jewish laws and religious practises. In the early days, the responsibility was visible through the things like teaching people how to use money wisely or restricting the amount of interest demanded from loaning money. Already in 1920s, the first forms of SRI screening strategies were used when the Methodist Church decided not to invest in industries like tobacco, alcohol, militarism or gambling (Renneboog et al. 2008a, Schueth 2003). This form of SRI is still today well known as avoiding the “sin stocks”. Especially the tragic wars during the history have been shaping the development of SRI industry. During the Vietnam War in 1960s, the anti-war movements started to raise popularity, and this was also visible in the investors demand for the kind of investments that would make them feel sure not to support the war through companies doing business like for example in weapon industry. In 1971 the first fund started to use SRI criteria in its portfolio construction and guaranteed that the investments

would not be made in companies doing business related to the weapons or militarism in general. (Renneboog et al. 2008a).

Later on during the past decades, all the different military conflicts, crisis and scandals the humanity has experienced, the rise of different movements for fighting for the issues like inequality, racism, labour issues, mass shootings, climate change, healthy working conditions and food production, have been influencing to the creation of the SRI culture which plays a significant role in today's finance. According to Renneboog et al. (2008a), one important key driver which has been shaping the development of SRI is the change in consumer behaviour during the past couple decades. In this so-called ethical consumerism, the consumers act based on their personal values and are willing to pay more for products that meet their ethical values. Also, the tightening regulatory environment has for one's part been shaping the SRI industry. For example, the required disclosures for how the companies are considering all the environmental, social and governance (ESG) issues, exists in some form in many regions. (Renneboog et al. 2008a) Another important concept that is closely related to SRI and needs to be acknowledged while discussing about companies' long-term strategic interest to incorporate ESG in their business model is corporate social responsibility (CSR) (Albuquerque, Koskinen, and Zhang 2018).

#### 2.1.1. Corporate Social Responsibility

As the complexity of finding the exact definition for the term of SRI will become clear for the reader in the next chapter, the concept of CSR is without a doubt as multisectoral. This thesis does not focus on studying CSR, but it is beneficial for the reader to understand the main idea behind the concept as companies with good CSR profiles are those that the investors practising SRI strategies are looking for (Visser, Matten, Pohl, & Tolhurst, 2010).

CSR started to gain attention and awareness of the great public in 1970s when Milton Friedman stated in his famous New York Times article that: "Corporate social responsibility is to conduct the business in accordance with shareholders' desires, which

generally will be to make as much money as possible while conforming to the basic rules of society, both those embodied in law and those embodied in ethical custom.” Since the 1970s the concept has been evolving greatly and nowadays it is not only that the company is responsible for its shareholders and not for the society in general (Friedman 1970) but CSR is also seen as company’s contribution to the sustainable development in their business practices in addition to the financial performance. (Cruz & Boehe 2010).

As the SRI has been increasing its popularity among investors, so is CSR and these two terms are often closely linked to each other. Investors practicing SRI are actively looking for companies with strong CSR profiles and therefore companies are allocating more and more resources to improve their corporate social responsibility. Investors these days have access to multiple different ranking systems tracking companies CSR profiles which are provided by independent agencies like KLD, Bloomberg and Refinitiv. These CSR profiles are evaluated by scoring the company’s performance with respect to the three dimensions of sustainability which are environmental, social and governance. ESG will be discussed in the next subchapter.

How beneficial for investors it is to invest in companies that have good CSR profiles has been a great interest of academic research during the recent years. Yet related results remain fragmented. According to Margolish and Walsh (2003) one reason for diversified results is the difficulty of measuring the CSR and the variety of different research methodologies used. However, they also end up in conclusion that in terms of financial performance it is generally beneficial for companies to invest in CSR practices than to ignore CSR. This is also supported by Jeong et. al. (2018), especially when firms consistently focus on improving their CSR profile. The other viewpoint in related literature is that CSR does not improve firm’s performance as it is costly to allocate resources in CSR practices and this capital could be invested in other more profitable investments (Harjoto & Laksmana 2018). Especially on a short-term when firms start to implement CSR practices into their business model the profitability does not increase along the new responsible strategy (Jeong et al. 2018). Despite the fragmented results in the field, most of the studies support the point of view that firms with good CSR profiles

create better value and financial results (see e.g. Arx & Ziegler 2008, Shank et al. 2005, Jeong et. al. 2018).

### 2.1.2. ESG

Environmental, social and governance information has been an important extension to the portfolio management, which has traditionally been based on two basic pillars, fundamental information and technical analysis. The first one consists of company's financial information which is shared in financial statements or other related publications and used by market participants to analyze the financial state of the company and its intrinsic value. The latter means in short analyzing the past performance of the stock price and reflect this to the future with an idea that the investors will act in future as they have been acting in the past. (Verheyden et al. 2016) ESG information offers the investors a chance to invest in accordance with their personal values and morals aiming to achieve both financial and non-financial gains (Auer 2016). Schueth (2003) defines this process as "double bottom line analysis" which results in investment portfolios including companies exceling in areas like employee relations, environmental practices as well as sustainable and safe manufacturing which respects human rights.

ESG focuses on three different dimensions which are related to environmental, social and governance practices of the companies. The environmental viewpoint is focused on how firms approach issues like climate change, scarcity of resources, pollution, etc. Social aspect of ESG is related to employer-employee relationship, racism and child labor, safeness and healthiness of the working environment, etc. The final component, governance, is about the methods of administration of the firm, e.g. bribery and corruption, ratio of men and women in the member of board, excessive executive compensation, etc. ESG ratings are provided by large number of independent agencies and are not standardized by any means, and it relies upon the provider of the ESG rating what they consider in each of the dimensions and categories onwards. Therefore, these ratings are not straightforwardly comparable with each other and the factors considered in each scoring system vary. (Dorfleitner et al. 2015)

As an example, the Table 1 on the next page presents how Refinitiv (previously Thomson Reuters), which is one of the major ESG rating providers, categorizes the different factors within the ESG dimensions and analyzes company's performance within the underlying category. The ASSET4 ESG ratings are the ones that are used also in the empirical part of this thesis and will be discussed more profoundly in chapter 5.

The following subchapter after the Table 1 will focus on the fragmented and ambiguous field of the definition of SRI, which has evolved during the history of the concept yet still divides different opinions in the related literature.

## Refinitiv ASSET4 ESG

Dimension	Category	Definition
<b>Environmental</b>	Resource use	Company's efforts to reduce the use of materials, energy and water, and to find eco-efficient supply chain management processes
	Emissions	Company's efforts and performance in reducing emissions followed from the operations
	Innovation	How innovatively the company is able to create new market opportunities through environmental technologies and eco-friendly products and services
<b>Social</b>	Workforce	Measures employee satisfaction, safeness and healthiness of the workplace, equality and development opportunities of the employees
	Human rights	How the company respects the globally conventional human rights
	Community	Company's contribution to good citizenship, public health and respecting of business ethics
	Product responsibility	Quality, healthiness and safeness of the company's products and services, and good control of customer information and data
<b>Governance</b>	Management	Company's approach to well administrated governance practises
	Shareholders	How equally and effectively the company treats its all shareholders
	CSR strategy	How effectively the company expresses its consideration for both financial and ESG in its strategy and operations

**Table 1.** Refinitiv ASSET4 categories and definitions. (Refinitiv 2019)

## 2.2. Defining Socially Responsible Investing

Despite the rapid growth and huge interest in SRI, the definition of the term remains fragmented and a constant debate amongst the academics exists between the different terminology related to the concept. One that is reading the underlying literature will come across with terms such as corporate social responsibility, ethical investing, impact investing, responsible investing, socially responsible investing, ESG investing, etc. The debate whether these terms are all the same or should be treated separately is discussed in many researches. For example, Sparks (2001) debates on behalf of differentiating SRI from the term of ethical investing as the ethical investing should not focus on profit making at all, which SRI does. However, multiple researches (Cowton 1994, Scheuth 2003, Hellsten and Malling 2006, Strong 2010, Cowton 2004) are discussing about the different aspects of the existing terminology, but eventually end up using them synonymously. In this thesis as I discuss about the SRI, one can expect that the term includes all the forms of investing on a responsible and ethical way, yet some examples of defining SRI is still presented below for the reader to have a better understanding of the concept.

As I will discuss about the sustainable financial system, the meaning of term sustainability itself needs to be acknowledged first. Sustainable development was famously defined by the World Commission on Environment and Development in 1987 as follows: “Development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (World Commission on Environment and Development 1987: 43). This goal of sustainable development can be considered as something that investors practising SRI strategies and companies considering CSR in their business strategy are trying to improve and achieve, in addition to aiming for financial returns.

Concepts like CSR and SRI are good examples that ethics are present also in the business world. Ethics in business can however be seen as informing guidelines based on values and principles by which the companies should be doing business. Business ethics has been topic for multiple different books and articles from different point of views during

the history, yet the concept has the same conclusion as CSR and SRI have, one general theory does not exist and the interpretation always depends on the point of view of the definer. (Brenkert 2019)

Above mentioned issue with the interpretation of the concept of ethics arises also when trying to define SRI. Whether the definer is individual, firm or an institutional investor, and from what country, culture or social class the definer is from, responsibility may have a different meaning. Below are some examples of how the socially responsible investing is defined in the underlying literature and how the definition has evolved during the past decades:

*“A way for individual investors to integrate money into one’s self and into the self, one wishes to become.” (Hamilton et al. 1993)*

*“The exercise of ethical and social criteria in the selection and management of investment portfolios.” (Cowton 1994)*

*“All kinds of investments that mix ethical with ordinary financial motivations or objectives.” (Mackenzie and Lewis 1999)*

*“The process of integrating personal values and societal concerns into investment decision-making.” (Schueth 2003)*

*“Socially responsible investors select stocks or mutual funds that are consonant with their core values, hoping to send a positive signal to amenable organizations and a distress signal to companies out of compliance.” (Shank et al. 2005)*

*“The use of non-financial normative criteria by investors in the choice of securities for their portfolios.” (Hudson 2005)*

*“Those investment strategies that consistently and explicitly consider social factors as part of the investment process.” (Budde 2008)*

*“Sustainable and responsible investing is a long-term oriented investment approach which integrates ESG factors in the research, analysis and selection process of securities within an investment portfolio. It combines fundamental analysis and engagement with an evaluation of ESG factor in order to better capture long term returns for investors, and to benefit society by influencing the behaviour of companies.” (Eurosif 2016)*

Especially the last one cited from the SRI report of the Eurosif organization, which is a European association promoting sustainable and responsible investing, describes well the concept of SRI and considers the integration of ESG factors as a part of SRI, which is what I do in this thesis as well. By interpreting these definitions, one can conclude that SRI is not only about the financial performance but also about the long-term consequences caused for the society and environment when doing investment decisions. From the definitions above, one can also notice how the definition of the term has changed during the decades. From the first definitions requiring a socially responsible investor to use specific criteria or invest on a specific investment, to the more recent definitions which are more flexible and only encourage for including consideration for the social, environmental and ethical factors. The development of the term has also been a topic of academic research. Kinder (2005) approaches the change in the definition through the change in the actor. He finds that the early definitions of the term were including a specific actor, while the later forms of definitions were moreover describing the process or investment philosophy without defining a specific actor. Kinder (2005) also points out that the development of the term is an outcome of the increased number of players in the field of SRI with totally different motives and ways of practising SRI.

At this point one already can notice the broad range of different ways to approach SRI and the difficulty of defining it on a one homogenous way. It is also clear that the concept has been evolving greatly from the early days of the concept to the current flexible and diverse definition. One interesting approach to the complexity of the term is presented by O’Rourke (2003) who finds that the reason for the diversified ways to explain SRI and the abundant range of different terms is due to the fund managers attempt to differentiate their funds from each other by inventing new investment philosophies.

A big step towards a common understanding about sustainable financial system and actions required by companies to support the sustainable development was taken in 2006 as initiative of the United Nations, when Principles of Responsible Investment (PRI) were launched. PRI aims to benefit the environment and society and create value on a long-term by improving the efficiency and the sustainability of the global economy and the financial system. PRI (2019) defines the responsible investing as a strategy and practise which incorporates environmental, social and governance (ESG) factors in investing processes. Responsible investing does not mean same as the socially responsible investing as responsible investing is a practise which does not combine moral or ethical considerations with the financial performance, but it works as a good framework to understand the basic idea behind the context. Simultaneously with the founding of the PRI, also the six principles for responsible investments were launched as a guideline to help the participants on the financial sector for being able to incorporate responsibility into their actions and give their contribution for more sustainable financial system in future. By signing up to follow the six principles for responsible investment the investors need to commit to the following: (Principles for Responsible Investment 2019)

**Principle 1.** Incorporate ESG issues into investment analysis and decision-making processes.

**Principle 2.** Actively control the investments and incorporate ESG issues into the ownership policies and practises

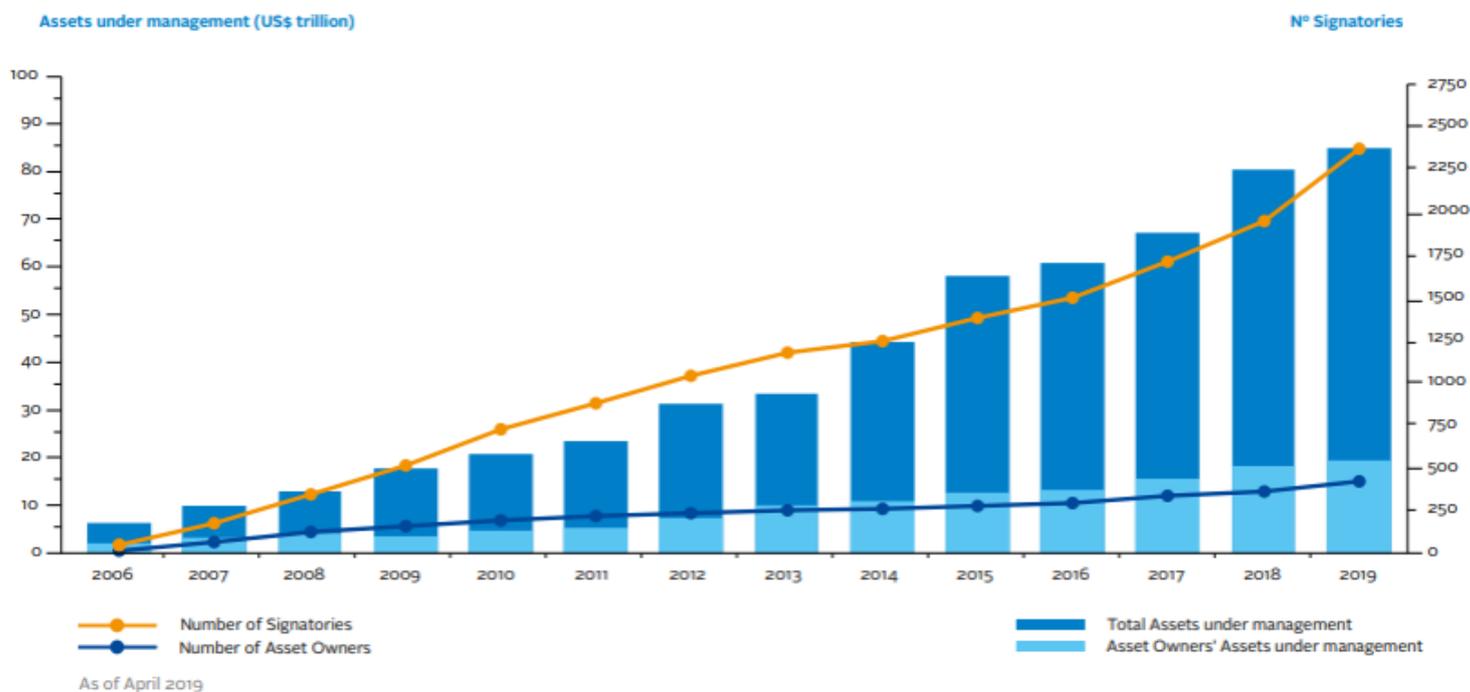
**Principle 3.** Seek appropriate disclosure on ESG issues by the entities in which they invest.

**Principle 4.** Promote acceptance and implementation of the principles within the investment industry.

**Principle 5.** Work together to enhance the effectiveness in implementing the principles.

**Principle 6.** Each investor will report their activities and progress towards implementing the principles.

Increased awareness about the risks and opportunities in responsible investing has been growing rapidly during the past decades. Global investors and their clients demand for responsible investment products has led to massive popularity in the above-mentioned principles since they were launched in 2006. This increase in investors demand for the SRI strategies has also been recognized by the academic research e.g. Nofsinger, J. & Abhishek Varma (2014). The Figure 1 below illustrates the increase of the number of signatories assigned to follow the principles and the total amount of assets under the management of these signatories. The total number of the signatories assigned to follow the principles has grown from the 0 in 2006 to 2400 in 2019. Only during the last five years, the number of signatories has grown over 90%. The total assets under management of the signatories in 2019 is nearly 90 billion USD. (PRI 2019)



**Figure 1.** PRI signatories and assets under management. (PRI 2019)

Another organization supporting the change towards more sustainable and responsible financial system is the US Forum for Sustainable and Responsible Investment (US SIF). According to the US SIF Foundation, only in US the amount of assets under professional management that are incorporating SRI strategies as part of their investment process has increased to nearly 12 trillion USD in 2018 which compared to the 8.7 trillion USD in year 2016 is 38 percentage more. The 12 trillion USD invested using SRI strategies represents 1 in each 4 dollars which is invested professionally in US. US SIF also reports that the individual investors in US are showing increasing interest in sustainable investing options and financial advisors have responded to this demand from the investors who want to make positive impact on society in terms of their investment decisions. (US SIF Foundation 2018).

### 2.3. Motivation for SRI

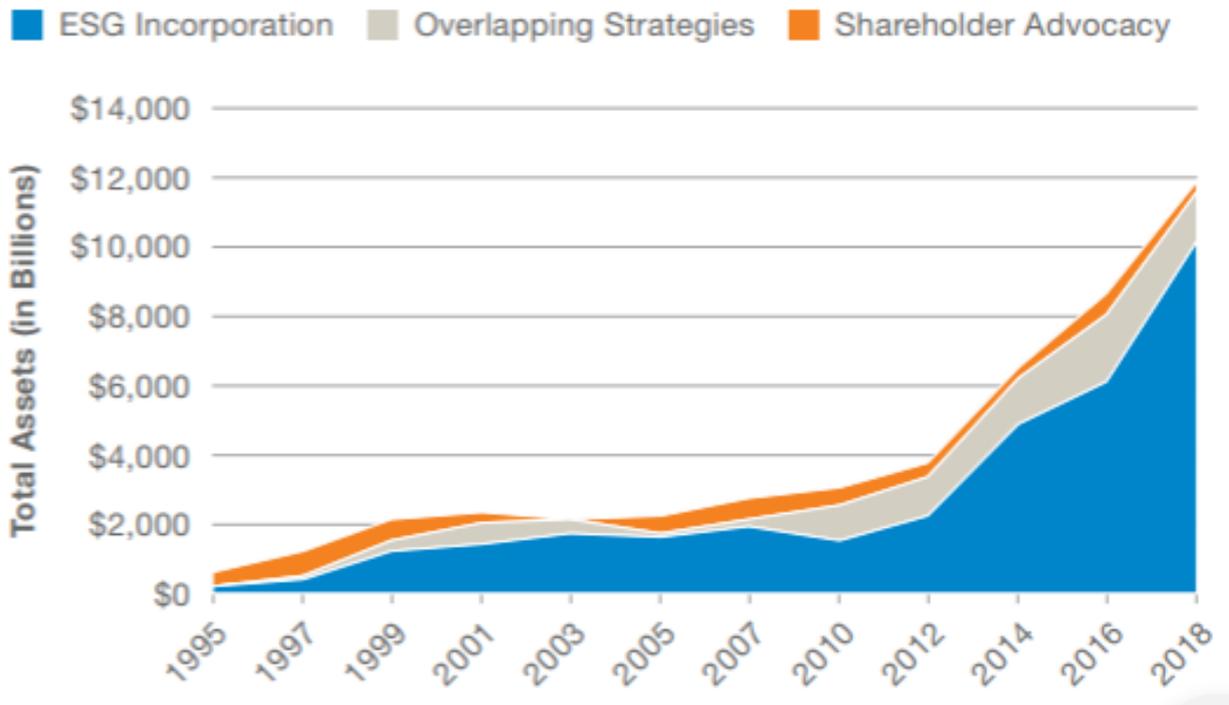
Practical implementation of SRI can be done through multiple different investing strategies (Colle & Jeffery 2009). Investment decision is always a combination of two components which are required rate of return and the level of risk the investor is willing to accept. This theoretical and famous framework is also known as modern portfolio theory which was developed by Harry M. Markowitz in 1952. (Markowitz 1952). In case of SRI, the investment decision is also dependent on which kind of social, environmental and ethical impact the investor desires to achieve (Sparkes 2001). Schueth (2003) lists two different categories of motives that usually drive the investors attracted to SRI. The first group of investors are those who want to sleep their nights well and feel good about their investments. These investors incorporate social responsibility into their investment process so that they can have the feeling of creating something good in the society and especially feel good about themselves by doing so. The other group of investors differs from the first one as they are more interested in the positive social change they can create and how they can contribute the quality of the life of the entire society. (Schueth 2003) Later Beal & Phillips (2005) categorize the motives similarly to Schueth, but into three different types of reasons people have when investing responsibly:

1. Opportunity to outperform financially
2. Opportunity to gain non-financial returns
3. Opportunity to contribute for the overall social improvement

The motives for SRI are not limited to the ones listed by Schueth (2003) and Beal & Phillips (2005) but these work as a starting point to understand the ideology of socially responsible investors and the development of the socially responsible investment style and industry.

#### 2.4. Socially Responsible Investing Strategies

The heterogeneity of the dimensions of SRI continues when discussing about the different investing strategies. The investment strategies in SRI includes the decisions about how the chosen non-financial criteria should be implemented in the investing process or in other words what kind of strategy of incorporating the criteria should be used. (Sanberg et al. 2008). US SIF (2018) lists three different SRI strategies which are ESG incorporation, community investing and shareholder advocacy. These same three strategies are also recognized by Schueth (2003). ESG incorporation, commonly known as screening, is by far the most used one of these three strategy categories, and is implemented by incorporating different screening processes when choosing the assets in the portfolio. Figure 2 below illustrates the distribution between the different SRI strategies from the total assets under responsible management in the US (US SIF 2018). One can observe that over 90% of the total assets are invested by incorporating ESG.



**Figure 2.** Distribution between the ESG strategies in the US. (US SIF 2018)

Sandberg et al. (2009) find that big differences in the terminology of SRI strategies exists in the related literature. Although the three basic strategies mentioned above (US SIF 2018, Schueth 2003) are the ones that appear the most, related studies include multiple other terms for the SRI strategies like avoidance, supportive, incentive, guideline etc. This heteroscedasticity raises the debate over the different strategies whether all of them truly are SRI (Sanberg et al. 2009, Sparkes 2002).

It is worth of mentioning at this point that the traditional screening strategies presented in the following subchapters are all based on absolute ESG scores. In other words, whether it is a negative or a positive screen or a combination of these, the investor always looks at whether the ESG score of the company is absolutely high or absolutely low, and then makes investment decisions according to the chosen strategy. This is where the ESG momentum strategy differs significantly from the others. The strategy is yet relatively unknown in the SRI industry but has gained some interest of academic research and industry publications which show positive evidence about the correlation between the strategy and possibility to generate superior returns.

#### 2.4.1. Community Investing

US SIF (2018) presents community investing as one of the three basic strategies used in SRI, even though the community investing institutions were managing significant minority of the total assets under SRI management in 2018. According to Schueth (2003) community investing is based on providing access to capital for people who cannot have the capital through conventional channels. Investors practising community investing usually allocate their assets on Community Development Financial Institutions (CDFI) which are focused on supporting low-income people and small businesses at risky communities with a difficulty to access capital.

However, Sparks (2001) presents an interesting argument on behalf of distinguishing community investing from SRI, and calls community investing as socially directed investing (SDI). The first difference between the two is that SRI is generally based on equity investing and investors are trying to impact the behaviour of businesses as shareholders. SDI as for is debt-based strategy, which can be also called as ethical banking, as the CDFIs are transmitting the capital from the investors to the people in need for it. Secondly, in order to help others, investors practising SDI are accepting lower returns than the market returns and this is against the main idea of SRI which certainly is about pursuing financial returns. (Sparkes 2001)

#### 2.4.2. Shareholder Advocacy

By its name, the strategy describes the power and role of the investors as a shareholder of the companies. By using their voting rights and expressing their concern on the company operations the investors are trying to improve the behaviour of the company in terms of CSR. The possibility to have an influence depends on the number of shares owned by the investor as the voting rights are tied upon the shares, and the investors are seeking to be in direct interaction with the management and the board of directors of the company. This means that for the strategy to work successfully and for the investors to have a realistic possibility to influence the company operations, a significant ownership is required.

(Renneboog et al. 2008a, Colle & York 2009) Eventually this positive influencing will improve the financial performance of the company (Schueth 2003).

As the community investing was questioned for being part of SRI, so is shareholder advocacy. According to Sparkes (2001), in addition to financial objectives the shareholder activism is also used to claim e.g. political objectives. The political form of shareholder activism appears for example when non-governmental organizations (NGO) take advantage of the annual meetings and push through their political campaigns by discussing some certain public issues or raising the public profile of certain activities of the company. Sparkes describes this kind of shareholder activism as advocacy campaigning and as it has no intention to gain subordinary financial returns, or at its worst it causes financial damage for the company, it should not be included in term of SRI. (Sparkes 2001)

#### 2.4.3. Negative Screening

Negative screening is the oldest form of SRI and Schueth (2003) traces its origins back to biblical times when religious investors were excluding companies from their portfolios which could be related to gambling, wars or slavery, or producing of sinful products like tobacco and alcohol. This traditional investing style is still to date the most used one among the SRI funds in US, and it is also commonly known as avoidance of *sin stocks*, named by its religious roots. (Humphrey & Tan 2014).

In general, negative screening means analysing the potential investments with a consideration to certain selected ethical criteria and each investment that does not meet the ethical criteria will be excluded from the investment universe. In other words, investors invest accordingly to their own morals and exclude all the companies that they find unethical (Hofmann et al. 2009). In addition to the traditional sinful industries mentioned above, the most favoured screening criteria among the SRI investors today are related to climate change, terrorism, human rights, transparency and corruption and board issues and executive compensation (US SIF 2018).

Auer (2016) studies the performance of selecting stocks on SRI basis in Europe and finds that screening out the stocks that are missing ESG ratings scores in European stock universe outperforms the passive market portfolio significantly. Contrary, some studies find that negative screening strategy reduces potential returns and increases risk as the investors exclude part of the investment universe therefore missing some potentially profitable companies and not being able to fully diversify their portfolios (Adler & Kritzman 2008, Fabozzi 2008, Barnett & Salomon 2006). In practise the vast majority of the SRI funds however rarely use only one screening strategy but a strategy combining multiple different screens (Humphrey & Tan 2014).

#### 2.4.4. Positive Screening

Positive screening is relatively newer strategy which has grown its' popularity during the past decade and is opposite to negative screening (Colle & York 2009). In practise the investors are seeking for companies that fulfil certain standards in terms of CSR and overweight those companies in their portfolios simultaneously underweighting or fully excluding the companies with poor CSR profiles. According to (Renneboog et al. 2008a) these standards are commonly related to corporate governance, labour relations, environmental improvements, cultural diversity and sustainability like renewable energy usage.

The level of CSR that is required from the portfolio companies depends on the investors underlying criteria and can potentially limit the possible investment universe greatly. For the investors the positive screening strategy is not as easy to implement as negative screening is. However, according to previous studies this may pay off for the investors especially during abnormal market conditions when the uncertainty causes the markets to be especially cautious for bad businesses. Nofsinger & Varma (2014) study the performance of the screening strategies under the crisis periods and find that especially the positive screening strategies can generate abnormal positive returns during the crisis.

In practise the investors usually have multiple different social and responsible objectives that they need to into consideration, thus it is common to combine different screening

strategies. Positive screening is often combined with the best in class screening strategy, which is discussed next. (Renneboog et al. 2011)

#### 2.4.5. Best-In Class

Best-in-class strategy is more conservative approach to SRI as it's not based on restricting the possible investment universe as the positive and negative screens do, and the strategy allows the investors to search for potential investments among all the companies from all industries. Investors utilizing best-in-class screens can analyse all the potential enterprises and then invest in the ones that have best practises in terms of CSR, even though the company would be operating in an industry, like in alcohol, tobacco or gambling business, that would be screened out in other strategies. (Renneboog et al. 2011)

According to O'Rourke (2003), SRI investors using best-in-class strategies contribute the most for the eco-friendly corporate practises as the strategy directly rewards the companies which are performing best within their industries in terms of CSR. This encourages enterprises to improve their CSR practises compared to competitors in the industry for being considered to best-in-class portfolios, furthermore, especially improving the environmental management systems and cleaner production of the companies (O'Rourke 2003). From the point of view of investors, finding undervalued companies might be more difficult when using best-in-class strategy as the investors search for the leaders of the industries, and so do all other investors utilizing the same strategy approach meaning that the investors need to find some hidden value-drives which are yet to be found by the other investors (O'Rourke 2003).

##### 2.4.5.1. Problematic Nature of Screening Strategies

Before looking into the ESG momentum strategy, which is at our greatest interest in this thesis, I want to highlight an interesting critical viewpoint regarding the increased disclosure published by the companies about their CSR practises. The quantity and quality of the information shared by the companies about their policies has increased along the increased popularity of SRI industry. Generally, this can be considered as beneficial for the overall transparency and development of the sustainable financial system. The greater

access the investors have to companies ESG policies the better they can invest in accordance to SRI. O'Rourke (2003) argues for the negative side of the increased disclosure. As the SRI industry has risen sharply, companies have started to receive extensive amounts of requests from SRI fund managers for information about their CSR practises. This effect is testing the resources of the companies and according to the studies some companies are declining all the additional requests about their policies (O'Rourke 2003). Therefore, a part of the companies is screened out from the SRI portfolios only because of the lack of the information, narrowing the potential investment universe greatly. Furthermore, usually the companies that have enough resources to response to the needs of the investors are large corporations with specified employees and sophisticated practises for this kind of issues, causing the SRI portfolios to consist less smaller companies. (O'Rourke 2003).

#### 2.4.6. ESG Momentum

The investment theorem called momentum is one of the oldest ones known in the finance theory and its roots can be traced back to 1800s when David Ricardo, an English economist, was following an investment philosophy similar to which momentum represents (Grant 1838). Despite the long history of momentum, the strategy started to gain more publicity later in 1980s when Richard Driehaus, also characterized as a father of momentum investing, invested extremely successfully using the momentum strategy and positioned himself to the group of most known investment professionals in the history (AAII 2000). In practise the momentum strategy is implemented by buying stocks that have performed well during the certain period of time in the past and simultaneously selling short stocks that have performed poorly during the same period of time (Jegdadeesh & Titman 1993). The theory behind the traditional momentum will be discussed in subchapter 3.2.

ESG momentum is relatively new term in SRI. Yet, during the recent years it has gained some attention in academic studies (Nagy et al. 2013, Nagy et al. 2016, Verheyden et al. 2016, Pollard et al. 2018, Roselle 2016, Clark et al. 2015, Bansal et al.) and in a few white papers (see e.g. PRI 2018, Societe Generale 2019, Truevalue Labs 2018, Lyxor ETF 2019,

UBS 2018) as the investors practising SRI are actively searching for new ways to outperform the market. The strategy combines the idea behind the traditional momentum strategy that was discussed above, with the ESG screening and draws the attention of the investors to the changes in the ESG scores instead of looking at the ESG scores on absolute basis. Gunnar et al. (2015) study through over 2000 empirical studies about the correlation between ESG scores and financial performance of the corporations (CFP). They find that the majority of the studies come up with positive connection between the ESG and CFP and the connection stays relatively stable over the time period of the studies since the mid-1990s (Gunnar et al. 2019). The extensive literature expressing the connection between ESG and CFP makes the foundation for the ESG momentum strategy.

By following the changes in ESG ratings, the ESG momentum strategy aims to find the future winners and losers in terms of ESG before the market identifies the companies absolute ESG profiles and prices them accordingly. The companies that are indicating promising trend in their ESG practises are not essentially leaders yet and therefore strategies like positive screening and best-in-class may exclude them from the investment universe. Negative screening as for may screen these companies out from the investment universe if their absolute ESG scores are too low even though the ESG score of the company would have been improving significantly. The ESG momentum strategy is assuming that improvement in ESG score is a signal for a company being able to better avoid the ESG related risks in future, which is eventually recognized by the investors and positively reflected to the stock price. This approach to ESG based investing is more short-term than the other strategies, and as it is built on the basis of changes in the ESG ratings, it does not necessarily result in a portfolio with a good overall ESG rating because the best ESG improvers might as well turn out to be companies with low ESG profiles (Nagy et al. 2016).

A white paper by UBS (2018) discussing the key elements of momentum strategy raises an important question about identifying the companies with a positive ESG rating trend when building the portfolios. From the point of view to successfully implementing the strategy it is important for the investor to clearly state the requirements for the change to be identified as improving or decreasing ESG score. One common guideline does not

exist for the strategy and the related studies build their portfolios differently. The methodology that will be implemented in this thesis will be discussed later. UBS (2018) also discusses the key risks related to the strategy. One key risk according to them is that when considering the strategy in practise the investor needs to be aware about the small amount of studies compared to other SRI strategies, questioning the positive connection between ESG momentum and financial performance. Other risks are related to the timing of choosing the ESG improvers and underperformers into the portfolio and to the possible decreased diversification between the regions and sectors as the strategy only focuses on finding the biggest changes in the ESG ratings regardless other factors. In practise the ESG momentum should be combined with other strategies, like best-in-class, to minimize the exposure to these risks. (UBS 2018) However, the small but growing research about the performance of the ESG momentum strategy is presenting promising evidence about the strategy outperforming other strategies and overall market.

### 3. THEORETICAL FRAMEWORK

In order to conduct the empirical analysis later on in this study and to successfully interpret the results, this chapter will present the theoretical framework in which the methodology in the empirical part will be based on. The empirical study is performed by constructing ESG momentum portfolios and measuring the performance of the portfolios, thus the theoretical framework of measuring portfolio performance needs to be examined. The field of performance measures consists of multiple different measures. In 2009 Cogneau & Hübner studied all the performance measures proposed in academic studies and found hundred and one different kind of portfolio performance measures. Despite the huge number of different measures found by Cogneau & Hübner (2009) only the most famous and commonly used ones will be discussed in this thesis. Based on the discussion in this chapter, and the previous research in this topic, I will then choose the optimal methods to measure the performance of the ESG momentum portfolios in the empirical part.

#### 3.1. Modern Portfolio Theory and SRI

Traditionally the finance theory assumes that investors behave homogeneously and rationally and maximize their returns by focusing on two factors which are risk and expected return. This assumption of the finance theory does not leave any space for the possibility that investors incorporate feelings or their personal values and social motives into the investment process, which SRI theory assumes. A rationally behaving investor would never reject a profitable investment opportunity because the firm operates on an “sinful” industry or does not show good CSR practices. (Beal & Phillips 2005)

As discussed in the subchapter 2.3 about the motives for SRI, the famous modern portfolio theory, also called as mean-variance theory, was developed by Harry Markowitz in 1952 and it has worked as a basis for many other extensions of finance theory during the past decades. Modern portfolio theory itself has served as a topic for extensive amount

of academic studies from different point of views, however we leave the profound discussion of the theory out of this thesis and investigate how SRI challenges the modern portfolio theory.

Modern portfolio theory was developed on the idea that all investors choose their portfolio by striving for highest possible return with respect to the level of risk they are willing to tolerate. Important in the theorem is that by considering the interaction between all of the securities in the universe and not only focusing on the characteristics of individual securities, the investors are able to build a well-diversified portfolio which minimizes the unsystematic risk in the portfolio offering the same return than a riskier portfolio. (Elton & Gruber 1998). As in the chapter 2 the different strategies investors are using for SRI were discussed, one can notice that the majority of these are restricting the possible investment universe as the investors cannot invest in companies or industries which do not fill the criteria of the chosen strategy. Foregoing contradicts with the Markowitz's theorem (1952 & 1959) as restricting the possible investment universe would decrease the benefits of the diversification in the portfolio and result in smaller returns on a risk-adjusted basis. The monetary portfolio theory was only minorly challenged until in 1970s when Moskowitz (1972) studied the connection between CSR and companies' financial performance and presented positive findings which inspired a large number of other studies in the field and boosted the formation of SRI. Moskowitz (1972) suggested that the Markowitz's (1952) belief that only the trade-off of risk and return should be considered was defective and that consideration of factors regarding CSR leads to higher returns.

### 3.2. Momentum

In 1970 the theory of efficient market hypotheses (EMH) introduced by Eugene Fama suggested that the stock market is fully efficient, and the stock prices reflect all the information available about the company itself and the market in general (Malkiel & Fama 1970). Efficient market hypotheses support the theory of "random walk" suggesting that the price change of a stock today is independent from the change in the stock price

yesterday. Finding undervalued stocks in a fully efficient markets would not be possible neither using technical or fundamental analysis as the stock prices would fully and quickly reflect any new information arising (Malkiel 1999). Since introduced in 1970 the EMH has become one of the most questioned and tested theory amongst academics in finance and is especially questioned by the school of behavioral finance believing that the investors systematically act irrationally making the stock market inefficient and creating opportunities to benefit financially (Yen & Lee 2008). During the past decades academic studies have presented hundreds of different ways to predict the stock market returns and benefit from the stock market inefficiency. These theories against the EMH and relying on the theory of behavioral finance about the irrationality of the market participants are called “anomalies” in finance (Frankfurter 2001). One of the most well-known anomalies is called “momentum”, and an extensive amount of evidence about earning positive abnormal returns by conducting momentum strategy exists (Lesmond et al. 2004).

The philosophy behind the momentum strategy is that the past trend in stock returns tends to continue in future and investors can benefit from this by buying stocks with positive returns and selling short stocks with negative returns in the past. This is based on the idea that investors do not respond rationally to the past performance and the stock prices either overreact or underreact to the new information received by the investors. The past trend of the stock is usually followed over a time period of 3 to 12 months and the profitability of the strategy has been proved by many researchers studying different time periods, markets and asset classes. (Daniel & Moskowitz 2016)

One of the studies inspiring many others afterwards was conducted in 1993 by Jegadeesh & Titman. They studied the performance of the momentum strategy in US markets over a sample period from 1965 to 1989 following the relative strength of stocks during the past 3 to 12 months and form portfolios to include the past winners and losers of 1, 2, 3 and 4 quarters with holding periods accordingly. The best performance of abnormal return of 12.01% was obtained with a portfolio following the past 6-months performance with a holding period of 6-months. In 2001 Jegadeesh and Titman retested the performance of the strategy over a different sample period from 1990 to 1998 to prove that the profitability of the strategy is not due to the sample period. They (Jegadeesh & Titman

2001) find similar results in the former study supporting their suggestions that the investors have not changed their irrational behavior and the anomaly still exists.

The momentum strategy conducted by Jegadeesh & Titman (1993 & 2001) is also called as the cross-sectional momentum which is used in most of the related studies. Cross-sectional momentum is formed as described above. Stocks are selected based on their relative performance over a certain period of time, meaning that the stocks are ranked based on the past trend and a certain cut-off point is selected for the investment universe, for example 20% (Jegadeesh and Titman 1993). The cut-off point of 20% implies that top ten decile and bottom ten decile of the companies are included in the portfolio with long and short position respectively (Bird et al. 2017). The alternative and more recent method to conduct the momentum strategy is called as the time-series momentum and it uses a different method to the selection of the stocks in the portfolio. Time-series momentum approaches the stock selection on absolute basis. The absolute performance approach to the momentum means that instead of choosing the cut-off point for the investment universe, investor chooses stocks based on solely on the own performance of the stock and not relatively to the other stocks in the investment universe. The identification of the winners and losers is conducted by choosing an absolute limit for the past performance, for example positive 5% and negative 5%, and all the stocks above and below of this absolute performance limit is identified as a winner or a loser respectively (Bird et al. 2017). Moskowitz et al. (2012) studied the performance of the time-series across multiple different asset classes and found that the strategy earned significant abnormal returns over the sample period of 25 years in equities and bonds as well as in currencies and commodities. The evidence proves that both cross-sectional and time-sectional momentums have been profitable strategies since the early days of the strategy, yet Bird et al. (2017) concludes in their study comparing the two strategies that the time-series momentum outperforms the cross-sectional momentum over the sample period from 1992 to 2012.

The ESG momentum strategy conducted in this thesis is similar to the cross-sectional way of conducting the momentum strategy. However, it is not straightforwardly comparable to the momentum strategies presented in this chapter as the ESG momentum leaves the

past stock trend out of the stock selection process in the portfolio construction and focuses solely on the change in the ESG rating of a company. The ESG momentum strategy and the portfolio construction are discussed in subchapters 2.4.6. and 5.2.1. respectively.

### 3.3. Return

The return of any asset can be calculated as the sum of the cash flows it has provided and the difference in the price of the asset between two dates. This return that the investor gains by holding the asset over the time period is more commonly known as holding period return (HPR). Academic studies and practitioners often trust in Jensen performance measure which considers the returns as continuous and not as discrete. This means that the returns are calculated as log returns making it possible to adjust the returns for timing and compare daily, monthly and yearly returns as well as to reduce any skewness in the distribution of the returns (Jensen 1968, Kreander et al. 2005, Gregory et al. 1997). HPR for the logged returns can be written as follows:

$$(1) \quad HPR = \ln \left( \frac{P_t + D_t}{P_{t-1}} \right)$$

Where  $P_t$  and  $P_{t-1}$  are the value of the asset at time  $t$  and  $t - 1$  respectively,  $D_t$  is the cashflows i.e. dividends received at time  $t$ ,  $\ln$  is natural logarithm.

### 3.4. Single-Factor Portfolio Measures

The most commonly used single factor, or one-dimensional, portfolio performance measures are based on the widely known and often used capital asset pricing model (CAPM) which was introduced by Sharpe (1964) and Linter (1965). CAPM itself builds on the modern portfolio theory (Markowitz 1952) which was discussed earlier in this thesis. The performance measures which are based on CAPM and are often used in SRI studies are Sharpe ratio, Treynor ratio and Jensen's alpha. Differing with the CAPM which is so called ex-ante measure focusing on future expectations, the foregoing three

performance ratios do not estimate the future performance of the assets or portfolios but are being calculated from the past performance. Therefore, in the related literature these measures are often referred to as ex-post measures (Jagric et al. 2007).

### 3.4.1. Capital Asset Pricing Model

CAPM is based on the philosophy behind the modern portfolio theory and since it was introduced it has gained a great popularity among finance practitioners as one of the most commonly used models for pricing assets and estimating the expected return of an investment. In accordance with the Markowitz's theory, CAPM expects that the investors act rationally and choose their portfolios so that the variance of the portfolio is minimized for the expected return or that the expected return is maximized for the given variance. In short, the model measures the relation between the risk and return. As below the CAPM is presented in a form of an equation (equation 2), one can interpret that the CAPM assumes that the expected return of an asset can be estimated as the sum of the risk free rate of return (which is an theoretical assumption) and market premium multiplied with the beta of the asset (Sharpe 1964). The beta describes the non-systematic risk of an asset, or in other words it measures the variation of the asset return with respect to the variation of the market return, and it is calculated by dividing the covariance of the asset return and the market return with the variance of the market return (see equation 3) (Bollerslev et al. 1998). If the asset or portfolio has a higher Beta than the market Beta ( $\text{Beta} > 1$ ), it means that the asset or the portfolio is more volatile to changes and the returns variate more than the market return. If the Beta is less than the market Beta ( $\text{Beta} < 1$ ), it is vice versa. The assumption about an asset that has a zero beta, meaning that it its totally risk-free is unrealistic (Fama & French 2004), but in practice the investors usually refer to government bond yields as a risk-free investment. In a form of an equation the CAPM is written as follows:

$$(2) \quad E(R_i) = R_f + \beta_i(\bar{R}_m - R_f)$$

*Where:*

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

$R_f$  = Risk-free rate of return

$\beta_i = \text{Beta of the asset } i$

$\bar{R}_m = \text{Expected return of market portfolio}$

Source: (Sharpe 1964).

Beta can be written as follows:

$$(3) \quad \beta_i = \frac{\text{Cov}(R_i - R_m)}{\sigma^2(R_m)}$$

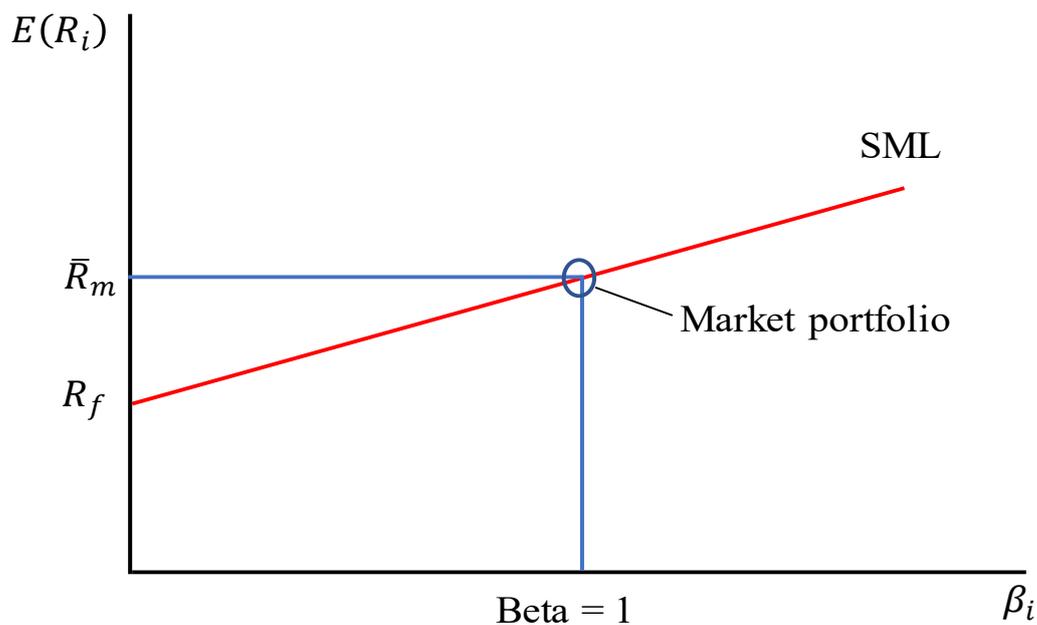
Where:

$\beta_i = \text{Beta of asset } i$

$\text{Cov}(R_i - R_m) = \text{Covariance of the asset return with the market return}$

$\sigma^2(R_m) = \text{Variance of the market return}$

The CAPM can also be expressed graphically in a form of a security market line (SML):



**Figure 3.** Graphical expression of CAPM. (Roll 1978)

As seen in the figure 3 on the previous page, we have the same components that are defined in the CAPM equation (2). The red line is the security market line which is the graphical representation of the equation (2). If the relation of the risk and expected return of all the securities in the investment universe is represented graphically, they will lie on SML. Any security that lies above the SML is underpriced as it offers a greater expected return for the same level of risk as other securities in the market, and vice versa any

security that lies below the SML is overpriced as it offers lower expected return with the same risk as the other securities in the market. (Roll 1978)

### 3.4.2. Sharpe Ratio

From the performance measures that are related to the CAPM, I will firstly discuss the Sharpe ratio. After emerging the CAPM in 1964, William F. Sharpe continued his contribution to the theory of finance and two years later presented another, later iconic, concept to measure the portfolio performance called Sharpe ratio, or as Sharpe (1966) proposed “reward-to-variability ratio”. Sharpe (1975) himself defines the ratio as follows: *“The reward-to-variability ratio is simply the ratio of reward (which is good) to variability (which is bad). It indicates the reward per unit of risk borne. The larger the ratio, the better the performance.”*. With the reward Sharpe (1975) is meaning the excess return of the asset or the portfolio over the risk-free rate of return. The risk is measured as the standard deviation of these excess returns of the asset or the portfolio. In practice the ratio can be compared with other portfolios or with a market portfolio that does not require investment skills to obtain, and thus establish how good the return of the asset or portfolio really gained with respect to the risk taken (Sharpe 1975).

Sharpe ratio can be written as follows:

$$(4) \quad \text{Sharpe ratio} = \frac{R_i - R_f}{\sigma_{(R_i - R_f)}}$$

*Where:*

$R_i$  = Return of the asset  $i$

$R_f$  = Risk-free rate of return

$\sigma_{(R_i - R_f)}$  = Standard deviation of the excess return over the risk-free rate of return

In the equation (4) on previous page, the same definitions for the components apply as when discussing about the CAPM. In the Sharpe ratio, the numerator expresses the excess return of the asset or the portfolio over the risk-free rate of return, and the denominator

expresses the standard deviation, i.e. variability, of these excess returns of the asset or the portfolio. (Sharpe 1975). Sharpe (1994) himself lists some drawbacks of the reward-to-variability ratio. As discussed above, the ratio takes into consideration only the excess return over the risk-free rate of return, disregarding totally any current liabilities and the correlation with the other assets in the portfolio or investment universe. Instead of focusing on the total standard deviation of the asset or portfolio, which Sharpe ratio does, the next measure extends the portfolio performance measurement by focusing only on the systematic risk of the asset or portfolio, or in other words Beta.

#### 3.4.2.1. Appraisal Ratio

Researchers have been emerging many other measures for the portfolio performance during the past years and some of them are closely related to the most commonly used ones. Appraisal ratio, also called as information ratio, is one that is closely related to the Sharpe ratio and shows up often in the related literature. (Sharpe 1994) It is discussed here to prevent any confusion between the ratios.

Jensen's alpha which is discussed below measures the excess return of the actual returns of the asset or portfolio compared to the expected return calculated with CAPM. As the CAPM was already presented above, the equation (2) shows that the CAPM includes the Beta of the asset or portfolio, thus the Jensen's alpha also incorporates the systematic risk but not the unsystematic risk. The appraisal ratio, or information ratio, measures the excess return in accordance to the volatility, i.e. standard deviation. In other words, the ratio adjusts the Jensen's alpha, which only takes the systematic risk into account, and incorporates the unsystematic risk into the performance measurement. (Goodwin 1998, Jagric et al. 2007)

The equation of the appraisal ratio can be written as follows: (Goodwin 1998)

$$(5) \quad \textit{Appraisal ratio} = \frac{\textit{Jensen's alpha } (\alpha)}{\sigma_{(\alpha)}}$$

*Where:*

*Jensen's alpha* ( $\alpha$ ) = See equation (7)

$\sigma_{(\alpha)}$  = *Standard deviation of the Jensen's alpha*

### 3.4.3. Treynor Ratio

During the same year as Sharpe ratio was developed, also Treynor and Mazuy (1966) studied the performance of the mutual funds compared to the performance of the overall market with a slightly different approach compared to Sharpe, resulting in the development of another widely used portfolio performance measure, Treynor ratio. Similarly, to the Sharpe ratio, also Treynor ratio is based on the philosophy of the CAPM. Instead of proportioning the excess return to the total standard deviation as Sharpe ratio does, Treynor ratio uses the same approach by focusing on the excess return of the asset or the portfolio yet substituting the standard deviation, i.e. total variability, with the volatility, i.e. Beta. (Treynor & Mazuy 1966)

As the CAPM implies that if the capital markets were fully efficient and no securities would be priced incorrectly, the construction of a portfolio would be only a decision of the desired diversification and level of risk. In a case of the fully efficient markets, all the correctly diversified portfolios would move along the market, offering the same return as the market portfolio. (Sharpe 1966). This foregoing argument by Sharpe is the philosophy behind the Treynor ratio. By substituting the standard deviation to the Beta in the denominator of the Sharpe ratio, Treynor ratio explains the portion of the excess returns of the asset or the portfolio explained by the riskiness of the asset or the portfolio compared to the riskiness of the market. (Sharpe 1966). Simply said, Treynor ratio measures how much return the asset or the portfolio has gained with respect to the risk taken over the risk of the market portfolio. The Treynor ratio can be written as follows:

$$(6) \quad \text{Treynor ratio} = \frac{R_i - R_f}{\beta_i}$$

*Where:*

$R_i$  = *Return of the asset i*

$R_f$  = *Risk-free rate of return*

$\beta_i$  = *Beta of asset i*

#### 3.4.4. Jensen's Measure

The final extension to the theory of the CAPM based portfolio performance measurement models is Jensen's measure, also referred as Jensen's alpha or alpha. It is one of the most commonly used portfolio performance measures and is used in many SRI studies (see e.g. Hamilton et. al. 1993, Statman 2000, Gil-Bazo et al. 2010). By its simplest, Jensen's alpha measures the difference between the actual return of the asset or portfolio and the expected return of the asset or portfolio, with the given level of risk for the asset or the portfolio. In other words, Jensen's alpha measures the superiority of the investor or portfolio manager to gain excess returns over the market return with the selection of assets (Jagric 2007). The expected return, where the actual return is being compared to, is calculated according to CAPM. This excess return over the expected return is also called abnormal rate return (Jensen 1968). One can illustrate this abnormal rate of return through the SML (Figure 2). The security or portfolio which has gained positive abnormal return lies above the SML offering higher expected return with the same level of risk as the market portfolio. A security or portfolio which has gained negative abnormal return is vice versa. The equation of the Jensen's alpha can be written as follows:

$$(7) \quad \text{Alpha}_i = R_i - \left( R_f + \beta_i (\bar{R}_m - R_f) \right)$$

*Where:*

$R_i$  = Return of the asset  $i$

$R_f + \beta_i (\bar{R}_m - R_f)$  = Expected return of the asset  $i$

#### 3.5. Multi-Factor Models

Despite the wide use of CAPM, it has received lot of critique about its weaknesses and empirical shortcomings. For example, Groenewold and Fraser (1997) criticize the CAPM for the multiple unrealistic assumptions (see Lintner 1965) it requires. CAPM also tends to overestimate the risk-free rate and underestimates the market risk premium, offers empirically weak explanatory power and tends to overestimate the returns of high-beta stocks and vice versa for the low-beta stocks. (Groenewold and Fraser 1997) Many

studies (see e.g. Blume & Friend 1973, Elton 1993, Fama & Macbeth 1997, Shanken 1985) have tested the explanatory power of CAPM, and find that the CAPM lacks the power to explain the returns because it focuses only on the market factor (Beta), yet the returns are explanatory for many other factors as Fama and French (1992) show. Multi-factor models were developed to cover the weaknesses of the single-factor models and try to explain the returns by incorporating macroeconomic and explicit risk factors (Cogneau & Hübner 2009)

### 3.5.1. Arbitrage Pricing Theory

To overcome the weaknesses of CAPM Ross (1976) introduced the arbitrage pricing theory (APT), which has been the philosophy behind the development of more famous multi-factor models like Fama-French 3-factor model and Carhart 4-factor model. APT was developed to work as a substitute for CAPM and according to the theory the explanatory power of APT should be better as it approaches the returns through multiple factors and does not require such amount of assumptions as CAPM. ATP in a form of equation is written as follows: (Greonewold & Fraser 1997)

$$(8) \quad R_i = b_{i0} + b_{i1}F_1 + \dots + b_{ij}F_j + e_i$$

*Where:*

$R_i$  = Return of the asset  $i$

$b_{ij}$  = Loading or sensitivity of the asset  $I$  to a change in factor  $j$

$e_i$  = Random error variable

$F_j$  = Value of the factor  $j$

$I = 1, 2, 3, \dots, i$

$j = 1, 2, 3, \dots, j$

Based on the equation (8) one can notice now the difference between the CAPM and ATP as the latter offers the possibility to explain the returns by adding as many factors as desired, while the CAPM explains the returns only by the market factor. As the possibility to include multiple explanatory factors into the model is its strength, it is also its

weakness. According to Greonewold & Fraser (1997) APT works well in academic studies as the researchers are able to artificially generate any factors they desire to test their theories, but in real practice this is a weakness as the ATP does not tell what or how many factors should be included, like CAPM does. The theory has been tested widely by many researchers in different markets and they come up with different macroeconomic factors that the CAPM misses to consider (for more information see e.g. Chen et al. 1986, Hamao 1988, Roll & Ross 1980, Greonewold & Fraser 1997, Reinganum 1981).

### 3.5.2. Fama-French 3-factor Model

In 1980s, some researchers (Reinganum 1981, Lakonishko & Shapiro 1986) presented results about the weakening explanatory power of the market Beta in CAPM. Inspired by this, in 1992 Fama & French introduced their new asset pricing model which is an expansion to the CAPM incorporating two more factors that explain the abnormal returns. The first factor added by Fama & French (1992) is “size factor”. The findings of Banz (1981), which are also supported by Reinganum (1981), show that on average companies with lower market capitalizations tend to offer higher returns than companies with high market capitalizations. The market capitalization is calculated by multiplying the share price of the company with the number of shares outstanding. The second factor Fama & French (1992) include is “value factor”. Value factor refers to company’s book-to-market ratio, which is calculated by dividing the book value of equity with the market value of equity. Studies find that companies with high book-to-market ratios outperform companies with lower ratios (Stattman 1980, Rosenberg et al. 1985). In their study, Fama & French (1992) test the relation between stock returns and size, book-to-market, leverage and earnings-to-price and find that the factors for size and book-to-market explain the most variation during their sample period. The three-factor model extends the CAPM to the following form:

$$(9) \quad R_{it} - R_{ft} = a_i + \beta_i(\bar{R}_{mt} - R_{ft}) + S_iSMB_t + h_iHML_t + e_{it}$$

*Where:*

$R_{it}$  = Return of the asset  $i$  for time  $t$

$R_{ft}$  = Risk-free rate of return for time  $t$

$a_i$  = Jensen's alpha for asset  $i$  for time  $t$

$\bar{R}_m$  = Expected return of market portfolio for time  $t$

$\beta_i, S_i, h_i$  = Loading or sensitivity of the asset  $i$  to a change in factor

$SMB_t$  = Difference in the return of diversified portfolios, other consisting small cap stocks and the other large caps stocks

$HML_t$  = Difference in the return of diversified portfolios, other consisting high book-to-market value stocks and the other low book-to-market value stocks

$e_i$  = Random error variable

### 3.5.3. Carhart 4-factor Model

Carhart (1997) improves the explanatory power of the portfolio performance measuring even further from Fama-French 3-factor model by adding one more explanatory factor, which is momentum. (For the theory of momentum see subchapter 2.4.6.). The inspiration for Carhart's study (1997) came from several studies presenting that the recent winners in the stock market tend to continue as good investments and the recent losers tend to continue losing. Jegadeesh and Titman (1993) study the performance of an investment strategy based on the relative strength and build their sample portfolios by buying companies that have performed well during the past 3 to 12 months and selling companies that have performed poorly during the same time period. They report significant abnormal returns over the sample period. Similar results are presented already a couple decades before Jegadeesh and Titman (1993) by Levy (1967) who builds a strategy based on the difference between the current share price and the average share price of a company. Carhart (1997) adds the momentum factor into the Fama-French 3-factor model based on the findings of the superiority of momentum by Jegadeesh and Titman (1993). In a form of an equation the Carhart model is written as follows:

$$(10) \quad R_{it} - R_{ft} = a_i + \beta_i(\bar{R}_{mt} - R_{ft}) + S_iSMB_t + h_iHML_t + p_iWML_t + e_{it}$$

Where:

See equation (9)

$p_i$  = Loading or sensitivity of the asset  $i$  to a change in factor

$WML_t = \text{Difference in the return of momentum versus contrarian portfolio at past year from time } t$

#### 3.5.4. Fama-French 5-factor Model

In 2015 Fama and French extended their 3-factor model and introduced two additional factors explaining the asset prices. As Fama and French (2015) present, several studies (Titman et al. 2004, Novy-Marx 2013) criticized the 3-factor model for being too narrow to measure the expected returns of an asset and that the model misses important explanatory factors. As a result of these findings, Fama and French (2015) introduced the profitability and investment factors and found that the 5-factor model performed better than their earlier model. The 5-factor can be written as follows:

$$(11) \quad R_{it} - R_{ft} = a_i + \beta_i(\bar{R}_{mt} - R_{ft}) + S_iSMB_t + h_iHML_t + r_iRMW_t + c_iCMA_t + e_{it}$$

Where:

$R_{it}$  = Return of the asset  $i$  for time  $t$

$R_{ft}$  = Risk-free rate of return for time  $t$

$a_i$  = Jensen's alpha for asset  $i$  for time  $t$

$\bar{R}_m$  = Expected return of market portfolio for time  $t$

$\beta_i, S_i, h_i$  = Loading or sensitivity of the asset  $i$  to a change in factor

$SMB_t$  = Difference in the return of diversified portfolios, the other consisting small cap stocks and the other large caps stocks

$HML_t$  = Difference in the return of diversified portfolios, the other consisting high book-to-market value stocks and the other low book-to-market value stocks

$RMW_t$  = Difference in the return of diversified portfolios, the other with a robust profitability and the other with weak profitability

$CMA_t$  = Difference in the return of diversified portfolios, the other consisting low investment firms and the other high investment firms

$e_i$  = Random error variable

The profitability factor  $RMW_t$ , which Fama and French (2015) name as operative profit, is calculated by deducting the interest expenses and sales, general and administration expenses from the gross profit of the company and dividing this with the book value of the equity. This factor assumes that companies operating with high profitability perform better than companies with lower operating profitability by taking the capital structure into account as the interest expenses are deducted. The second new factor  $CMA_t$ , which is called the investment factor, considers for the level of investments of the companies and assumes that companies with higher growth of assets perform better than companies with less growth in total assets. (Fama & French 2015)

## 4. PREVIOUS STUDIES

This chapter will shed light into the previous studies about the ESG momentum strategy. The concept is relatively new in SRI, and the earlier academic evidence about the performance of strategy is narrow. Thus, this thesis will contribute for the growing empirical work in the topic. However, a few very recent academic studies in the topic can be found with promising results, and these are discussed below. In addition to this, a few white papers has been written by the companies and organizations which are actively supporting the industry growth. These papers are testing the performance of the strategy and therefore will be presented below for more extensive evidence to study the strategy further. Discussion about the previous studies implementing other SRI strategies is left out from this chapter as some results are presented along the main strategies in subchapter 2.4.

### *4.1. Nagy, Cogan & Sinnreich 2013*

ESG momentum appears first time in academic literature in 2013 when Nagy et al. study the performance of three different ESG strategies between the time period of 2008 to 2012. Nagy et al. use IVA ratings and BARRA global equity model (GEM3) in their study, which are provided from MSCI, and compare the performance of their strategies to MSCI world index. The model they use is a specific multi-factor model including factors for value, size, momentum, volatility, quality, etc. (MSCI 2016). The strategies Nagy et al. (2013) implemented were worst-in-class exclusion, simple ESG tilt (overweighting companies with high ESG rating and underweighting companies with poor ESG rating) and ESG momentum. During the sample period all the strategies gained positive abnormal returns, however the ESG momentum strategy performed significantly better than the other strategies. ESG momentum gained abnormal positive annual return compared to the benchmark of 0.35% and information ratio (see subchapter 3.3.2.1.) of 0.97. ESG exclusion and ESG tilt gained abnormal positive return of 0.10% and 0.05% and information ratio of 0.23 and 0.10 respectively.

For the construction of the ESG momentum strategy Nagy et al. (2013) rebalance the portfolio according to the change in ESG ratings every 12 months. The positive abnormal return in the ESG momentum portfolio was mostly explained by company specific factors instead of style, industry or country factors. They also find that the market tends to be more sensitive and react stronger to the downgrades in the ESG ratings instead of upgrades, implying that the investors give more attention for short term risks than for long-term possibilities in terms of ESG.

#### *4.2. Nagy, Kassam & Lee 2016*

In 2016, Nagy continues to study the performance of the ESG tilt and momentum strategies with Kassam & Lee. They leave the worst-in-class exclusion out of the study and extend the sample period by two years compared to the earlier study (Nagy et al. 2013). They also allow greater weightings for the companies exposing the portfolios for greater risk, as they set up the study with alpha seeking goals compared to the earlier study (Nagy et al 2013) which was more of a test of the strategies. Again, for the regressions they use the same MSCI rating system and GEM3 multi-factor regression model. The results are aligned with the first study, however the abnormal returns improved during the additional two years in the new sample period. The tilt strategy gained annually 1.1% abnormal positive return compared to the benchmark, while the ESG momentum gained an abnormal return of 2.2% annually. Nagy et al. (2016) also find that the abnormal returns are much more stable in the ESG momentum strategy while the tilt strategy gainer relatively flat returns until the two last years of the sample period. Both strategies also resulted in significantly higher average portfolio ESG scores than the benchmark, however momentum strategy had slightly lower average ESG score as the strategy focuses on only on the change of the ESG scores regardless whether they are absolutely low or high. From the 2.2% abnormal annual return gained by the momentum strategy, 1.32% contributed from the firm specific factors. From the firm-specific factors, the mid-cap and momentum factors contributed most to the abnormal returns.

#### *4.3. Verheyden, Eccles, Feiner 2016*

Verheyden et al. (2016) conduct a different study in ESG momentum dividing the investment universe to portfolios consisting globally countries and consisting only developed countries. For the regressions Verheyden et al. (2016) use the Carhart (1997) 4-factor model. They form six different portfolios for the sample period of 2010 to 2015 and find that the portfolios where the ESG momentum criteria is included gained the most significant abnormal returns. They do not study the momentum separately from the others but include all the criteria in same portfolios. They find that the portfolios consisting only companies from developed markets outperformed the global portfolios on annualized returns as well as on risk adjusted basis (Verheyden et al. 2016).

#### *4.4. Giese, Lee, Melas, Nagy & Nishikawa 2019*

The most recent study in the topic was conducted in July 2019 by Giese et al. They do not focus solely on ESG momentum but include the it as a part of the study, and their main findings regarding the strategy is that the changes in ESG rating may indicate the financial performance of the company. Their ESG momentum portfolio significantly outperforms the benchmark during the sample period from 2009 to 2017. They present results that companies which have improved their ESG profiles will eventually have higher valuations than the ones that have not. Their findings are statistically significant. The data, the benchmark and the multi factor model used in the study are same as in studies conducted by Nagy et al. (2013 & 2016).

#### *4.5. Other Studies*

PRI (2018) widens the scope of the underlying research by comparing the performance of the ESG momentum portfolio in US, Europe and Japan. As a data set, they use the same MSCI ESG rating data as the studies discussed above with a sample period from 2008 to 2017. They present interesting findings about the differences in the portfolio

performances between the different regions. According to their study, portfolios in World, Japan and US were the ones that gained best performance with the ESG momentum strategy, whereas in the Europe the ESG momentum did not gain as high returns as the portfolio using ESG tilt strategy. They find abnormal annual return of 1.75% in global portfolio, 1.97% in US portfolio. They do not present the abnormal annual returns for the Europe and Japan portfolios but instead they present the information ratios for all portfolios. Information ratios for the portfolios are as follows: Global 0.72, US 0.69, Japan 0.65 and Europe 0.44. These results would support the hypotheses that the ESG momentum strategy performs better in regions where the companies have not yet contributed as much to the CSR practises and the ESG ratings are far from optimal. (PRI 2018).

Bansal et al. (2016) do not study directly the ESG momentum strategy but the reaction of stock prices to short-term negative changes in ESG ratings. They find that negative changes in company ESG ratings caused by unexpected shocks related to the CSR practises of the company are connected to significantly negative cumulative abnormal returns. Negative cumulative abnormal results after the change in ESG rating were -2.19 percentage on the first year and -3.21 percentage on the second year. The negative returns persist on average for two years after the unexpected shock, starting to recover after that back to normal if no new information has emerged. (Bansal et al. 2016).

## 5. DATA AND METHODOLOGY

The chapter will present the data and the methodology used in the empirical part of the thesis. As justified in the subchapter 1.2. discussing the hypotheses for the thesis, the empirical study will be conducted for developed and emerging markets. From the several agencies providing ESG ratings, Refinitiv (previously Thomson Reuters) ESG ratings are used in this study. Share price data for the companies chosen for the study are drawn from the Datastream database. The data and the indices will be discussed more profoundly below.

### 5.1. Data

As a result of the emerging popularity of the SRI, many firms providing financial data have responded to the needs of the investors and started to provide their own ESG rating data. These ratings have a crucial role in both academic studies and when practicing SRI. In the studies related to the topic one can come across with ESG data provided by such companies as Refinitiv, Ethical Investment Research Service (EIRIS), Morgan Stanley Capital International (MSCI), Bloomberg, Sustainalytics etc. Without a doubt the access to the ESG data and the quality of the data is not an issue for the investors anymore, yet a potential bias arises when the results of the studies utilizing different ESG databases are compared together. The ESG ratings are built individually by each agency and any form of standardization or regulation in how to measure the different dimensions of ESG or how to approach the companies CSR practices does not exist. This is recognized by Dorfleitner et al. (2015) in their study comparing three different and widely used ESG rating databases. They find that all the three ESG data ratings use similar criteria when approaching the different dimensions of ESG, but the issue arises as the weightings and composition for the criteria are used resulting in significantly varying final ESG scores. Dorfleitner et al. (2015) also find the same bias as O'Rourke (2003) that the large corporations which have more resources for the CSR practices and can sufficiently share the information with the company stakeholders tend to have higher ESG scores.

This thesis utilizes the data provided by Refinitiv. The same database was formerly provided by Thomson Reuters but has been renamed since the Blackstone Group LP bought a major stake from the Thomson Reuters Financial & Risk data business (Reuters 2019). The ESG scores provided by Refinitiv are one of the most commonly used ones in related studies (Dorfleitner et al. 2015), however all the studies about the ESG momentum strategy use other ESG databases and indices, thus this thesis will have a different approach to the strategy. Refinitiv has been providing ESG ratings since 2002 and is currently following the CSR profiles of over 7,000 companies around the globe, covering over 70% of the global markets. The formation of a company's ESG score includes going through over 400 different company-level measures for the three ESG dimensions, or pillars as Refinitiv implies, from which they select 178 most relevant criteria depending on the information available from the company and based on the industry. Companies are given an ESG score in scale from 0.00 to 1. The ESG data for the companies is updated once a year, therefore also the portfolio construction in this thesis is done once in a year. The environmental, social and governance dimensions are divided into 10 different categories which each evaluate the company's ESG profile with a different approach. The categories and definitions can be seen in table 1 in chapter 2. (Refinitiv 2019)

In addition to the ESG data, the share price data for the same companies will be collected to calculate the returns for the companies over the sample period and to compare the portfolios with the benchmark indices. As presented above, the study will be conducted to emerging markets and developed markets, and therefore appropriate indices need to be selected from the broad selection available. The selection of the indices needs to be done through the Refinitiv ESG database to make sure that all the companies have the ESG score provided in the database. To compare the performance of the strategy between developed markets and emerging markets I will form the portfolios for two different investment universes including six different indices in total. The first investment universe for the developed markets portfolio will be constructed from the companies included in S&P 500 index. Earlier studies (see e.g. Nagy et al. 2016, Verheyden et al. 2016) do not separate the developed and emerging markets but use indices for global investment universe including both markets. The investment universe for the emerging markets will be formed from 5 different countries similarly to Carcia et al. (2017). They form the ESG

portfolio for the emerging markets from the “BRICS” countries which is an abbreviation for the countries of Brazil, Russia, India, China and South-Africa. As discussed earlier, the popularity around the ESG has not been present in emerging countries as long as in developed countries and the Refinitiv ESG database started to report ESG data for the “BRICS” countries in 2007, thus the sample period in this thesis starts from the year 2010. The table 2 below presents the indices used with the number of companies included in each index. As seen, the investment universe formed from the “BRICS” consists nearly the same amount of companies in total as the S&P 500 index, with largest indices from the emerging markets being JSE South-Africa and SSE 180 China.

	Country	Number of Companies
<i>Developed Markets</i>		
S&P 500	USA	505
<i>Developing Markets</i>		
IBOVESPA	Brazil	68
JSE	South-Africa	159
MOEX	Russia	41
NIFTY 500	India	50
Shanghai SE 180	China	180
<b>Total Developing Markets</b>		<b>498</b>

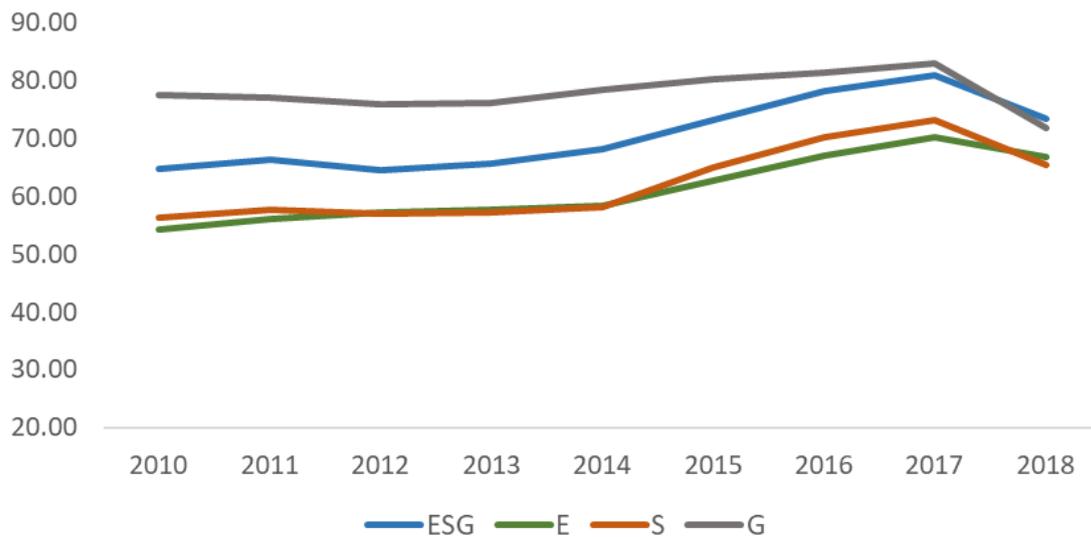
**Table 2.** Stock market data.

The data set from the Datastream consists of share price data for each company in above mentioned stock exchanges between years 2010 and 2018. The ESG data set for the same sample period and set of companies consists of scores for each of the ESG dimensions individually and an equally weighted overall ESG score. The ESG scores vary between the range from 0 to 100, lowest to highest respectively. The table 3 below presents the descriptive statistics for the developed markets investment universe. One can observe that the governance dimension has the mean and median significantly above the other dimensions, which are relatively close to each other.

Score	ESG	E	S	G
Mean	70.66	61.20	62.32	78.23
Median	81.48	73.54	68.41	82.52
Standard Deviation	25.64	31.48	26.98	15.80
Minimum	4.38	8.15	3.56	2.99
Maximum	97.41	95.56	97.47	98.09
Number of Observations	4150	4150	4150	4150

**Table 3.** ESG statistics - developed markets.

The figure 4 below presents the development of the mean of the ratings over the sample period from 2010 to 2018 and all the individual dimensions as well as the overall ESG score have similar trend over the period.



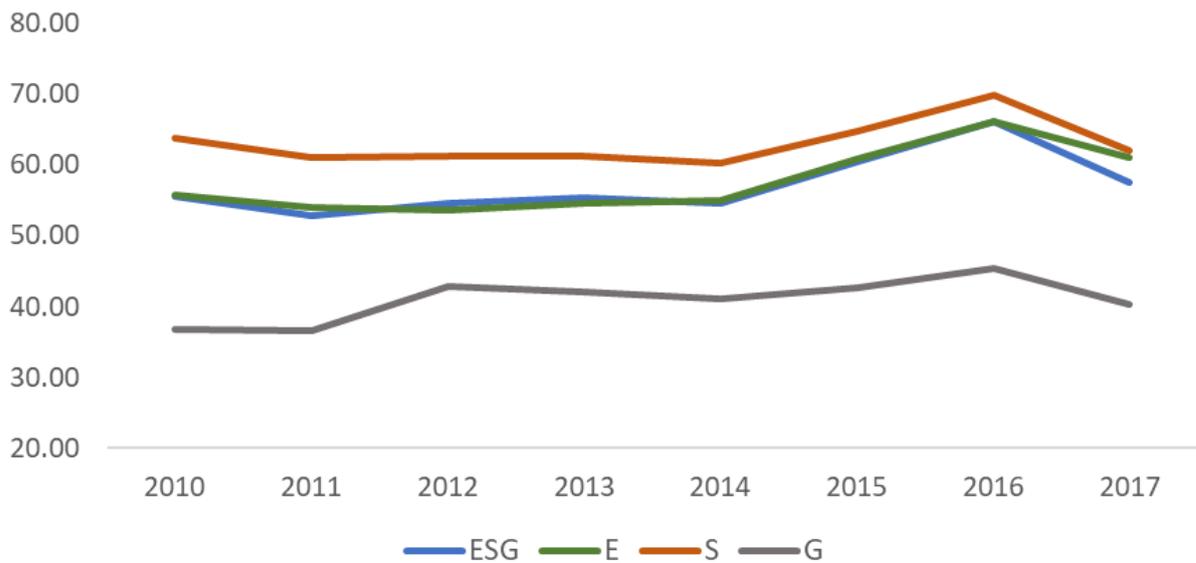
**Figure 4.** Graphical representation of the ESG statistics - developed markets

The table 4 below presents the same statistics for the emerging markets as presented above for the developed markets. One can instantly notice that the overall ESG score, environmental dimension and governance dimensions have significantly lower means in emerging markets compared to the developed markets. However, interestingly the social dimension has higher mean in emerging markets. The standard deviations are higher for all dimensions except for the environmental in the emerging markets.

Score	ESG	E	S	G
Mean	57.26	58.49	62.95	41.02
Median	66.28	64.45	71.41	37.62
Standard Deviation	29.26	27.45	28.29	26.14
Minimum	3.12	8.89	4.16	1.52
Maximum	96.54	95.46	97.27	97.08
Number of Observations	2925	2925	2925	2925

**Table 4.** ESG statistics - emerging markets.

Figure 5 presents graphically the development of the scores for the emerging markets. The trend in emerging markets looks similar to the developed markets except the decrease in scores during the couple last years is relatively stronger in emerging markets.



**Figure 5.** Graphical representation of the ESG statistics - emerging markets

## 5.2. Methodology

This subchapter makes the foundation for the empirical analysis. The construction of the tested portfolios is discussed, and the chosen portfolios are justified based on the performance of the portfolios during the sample period. Additionally, I will discuss the

methodology used for the empirical analysis, which will be based on the different models presented in the chapter 3.

### 5.2.1. Portfolio Construction

The main portfolios in this thesis are the two long-short portfolios which are constructed based on the changes on the overall equal weighted ESG scores by Refinitiv. The portfolios will consist of companies from the six different stock exchanges presented above. The previous studies about the ESG momentum that are discussed earlier in this thesis form their portfolios globally and do not focus on comparing developed and emerging markets, which will be done in this thesis. Additionally, the earlier studies form their portfolios by buying all the companies with a positive change in the ESG score and sell short all the companies showing negative change in the ESG score, resulting in extensive amount of companies in the portfolios. The decision about the amount of stocks included in the momentum portfolio is called as the “cut-off point”, and it is used to identify the stocks as winners or losers in the portfolio (Bird et al. 2017). Previous studies in the momentum investing show that choosing the cut-off point for the portfolio is a crucial part of constructing the strategy in terms of the portfolio performance. The groundbreaking momentum investing study conducted by Jegadeesh & Titman (1993) provides evidence that the informational signal of the past performance of the stocks decreases as the cut-off points are increased and the portfolio consists of more stocks, and they end up forming portfolios that equally weight stocks that are included in the top ten and bottom ten decile in the sample. The same negative relationship between the portfolio returns and higher cut-off points is also reported from Bird et al. (2017) as they test the performance of the momentum strategy under different cut-off points and lose all the statistically significant returns when moving from low cut-off point towards including all the stocks available in the investment universe. Since Jegadeesh & Titman (1993) presented that the use of top and bottom ten deciles in identifying the winners and losers in the portfolio construction provided more information about the momentum the same methodology has been used by many other momentum investing studies (e.g. Chordia & Shivakumar 2002, Cooper et al. 2004,), or extended to larger cut-off points if the investment universes under study are too small for the common 20% cut-off rate (Griffin

et al. 2003, Hong et al. 2003). In this study I follow Jegadeesh & Titman (1993) and use the fixed 20% cut-off point with portfolios including top ten decile and bottom ten decile of the companies based on the changes in the ESG ratings. In addition to the findings about the weakening informational signal when increasing the cut-off point, I choose to use the top 10% and bottom 10% screening in order to restrict the amount of the companies in the portfolios and to form a strategy that would be realistic to implement into practice. When investors are trading in practice, they are exposed to transaction costs which are an important factor impacting the net performance of an investor. These costs that investors face in stock trading are for example bid-ask spreads, commission fees, taxes, short sale costs and the price impact (Lesmond et al. 2004). Lesmond et al. (2004) present evidence that the superior financial performance of momentum strategies is illusionary as the strategies require frequent buying and selling and are exposed to high transaction costs. The benefits of diversification are based on a theory that the idiosyncratic risk of single stocks can be removed from the portfolio which limits the overall risk of a portfolio to consist only market risk. However, the benefit of the diversification is limited to the point where the marginal costs caused by the above-mentioned transaction costs increase faster than the marginal risk decreases (Statman 1987). Jagannathan and Ma (2003) compare the annualized standard deviation and Sharpe ratio of a mean variance portfolio based on MPT (Markowitz 1952) consisting 24 – 40 stocks to an equally weighted portfolio consisting all 500 stocks of the investment universe and find that the mean variance portfolio has smaller standard deviation and higher Sharpe ratio. Above mentioned evidence supports the restriction of the size of the portfolios to the cut-off point of 20% of the developed and emerging markets investment universes instead of including the whole investment universe similarly to for example Nagy et al. (2016).

After deciding the cut-off point for the portfolios as discussed above, the portfolio construction continues by ranking the companies every year during the sample period for both investment universes in descending order based on the change in the ESG rating from the previous year. For example, the portfolios for year 2008 are formed based on the change in the ESG score between the years 2007 and 2008, and the return of this portfolio is calculated from the annual returns of the year 2008. Once the companies are

ranked by their changes in the ESG rating, top 10% and bottom 10% are chosen to be included in the portfolios with long positions and short positions respectively. As done in several momentum studies (Jegadeesh & Titman 1993 & 2001, Griffin et al. 2003, Lesmond et al. 2004, Stivers & Sun 2010, Chui et al. 2010) the portfolios are equally weighted with respect to the number of companies in the portfolio each year. The returns for the companies are calculated according to Equation 1.

The table 5 below presents the performance of the ESG momentum portfolio constructed from the developed markets. The fourth column presents the excess return of the portfolio over the risk-free rate of return. Over the sample period the portfolio gained cumulative rate of return of 30.40%. On the fifth column is presented the number of companies included in the portfolio during that year. On average the portfolio consisted 86 companies over the sample period.

Developed Markets - ESG Momentum Portfolio				
Year	Annual Portfolio Return	Risk Free Rate of Return	Excess Return Over Risk Free Rate	Number of Companies
2010	0.76%	0.12%	0.64%	86
2011	-2.54%	0.04%	-2.58%	90
2012	2.38%	0.06%	2.32%	90
2013	13.37%	0.02%	13.35%	90
2014	1.41%	0.02%	1.39%	92
2015	8.44%	0.02%	8.42%	94
2016	6.71%	0.20%	6.51%	98
2017	4.61%	0.80%	3.81%	98
2018	-6.80%	1.81%	-8.61%	70
Cumulative Return	30.40%			

**Table 5.** ESG momentum portfolio returns - developed markets.

Below is presented the same statistics for the emerging markets portfolio. One can observe that the portfolio performed poorly with being able to gain a cumulative rate of return of only 0.56% over the sample period. This performance is due to the short

positions in the portfolio. During five years from the sample period the short positions gained significant loss as the companies with significant declines in the overall ESG scores gained positive returns. On average the emerging markets portfolio consisted of 57 companies with 28 long positions and 28 short positions.

Emerging Markets - ESG Momentum Portfolio				
Year	Annual Portfolio Return	Risk Free Rate of Return	Excess Return Over Risk Free Rate	Number of Companies
2010	8.17%	0.12%	8.05%	26
2011	-3.51%	0.04%	-3.55%	44
2012	-1.29%	0.06%	-1.35%	52
2013	-2.77%	0.02%	-2.79%	60
2014	0.43%	0.02%	0.41%	64
2015	0.28%	0.02%	0.26%	66
2016	-2.04%	0.20%	-2.24%	70
2017	1.29%	0.80%	0.49%	70
2018	0.45%	1.81%	-1.36%	60
Cumulative Return	0.56%			

**Table 6.** ESG momentum portfolio returns - emerging markets.

In addition to the long short portfolio which is constructed according to the ESG momentum strategy, I want to analyze whether a better portfolio performance would be achieved by investing only in companies that show positive trend in ESG ratings or only investing short in companies that show negative trend in ESG scores. Therefore, I will construct four additional portfolios out of which two consist only companies showing improvement in ESG ratings and two portfolios consisting only companies showing negative change in the ESG ratings and are sold short in the portfolio, separately for the developed and emerging markets. The annual and cumulative performance of these “Top 10% Long portfolio” and “Bottom 10% short portfolio” portfolios for the developed and emerging markets are presented on the following pages. As one can notice in the developed markets, when the companies showing positive change in ESG ratings were included in their own portfolio with only long positions, the annual returns over the

sample period were significantly higher compared to the ESG momentum portfolio which includes both long and short positions according to the changes in the scores. The “Bottom 10% Short” portfolio in developed markets performed extremely poorly over the sample period which implies that the companies with the worst changes in the ESG ratings performed well in terms of share prices over the sample period, as the short positions were unprofitable. The significant negative return of the “Bottom 10% Short” portfolio explains the poor returns of the ESG Momentum portfolio compared to the “Top 10% Long” portfolio.

Developed Markets - Top 10% Long Portfolio				
Year	Annual Portfolio Return	Risk Free Rate of Return	Excess Return Over Risk Free Rate	Number of Companies
2010	21.64%	0.12%	21.52%	43
2011	22.27%	0.04%	22.23%	45
2012	22.27%	0.06%	22.21%	45
2013	43.02%	0.02%	43.00%	45
2014	15.18%	0.02%	15.16%	46
2015	4.58%	0.02%	4.56%	47
2016	10.99%	0.20%	10.79%	49
2017	18.61%	0.80%	17.81%	49
2018	-10.80%	1.81%	-12.61%	35
Cumulative Return	267.83%			

**Table 7.** Top 10% Long portfolio returns - developed markets.

Developed Markets - Bottom 10% Short Portfolio				
Year	Annual Portfolio Return	Risk Free Rate of Return	Excess Return Over Risk Free Rate	Number of Companies
2010	-20.88%	0.12%	-21.00%	43
2011	-1.75%	0.04%	-1.79%	45
2012	-19.89%	0.06%	-19.95%	45
2013	-29.65%	0.02%	-29.67%	45
2014	-13.76%	0.02%	-13.78%	46
2015	3.87%	0.02%	3.85%	47
2016	-4.28%	0.20%	-4.48%	49
2017	-14.00%	0.80%	-14.80%	49
2018	4.00%	1.81%	2.19%	35
Cumulative Return	-138.62%			

**Table 8.** Bottom 10% Short portfolio returns - developed markets.

When observing the same portfolios for the emerging markets the performance of the portfolios is vice versa compared to the developed markets. In emerging markets, the “Bottom 10% Short Portfolio” performed better than the “Top 10% Long Portfolio”. However, the returns are significantly less than the similar portfolios gained in the developed markets.

Emerging Markets - Top 10% Long Portfolio				
Year	Annual Portfolio Return	Risk Free Rate of Return	Excess Return Over Risk Free Rate	Number of Companies
2010	0.08%	0.12%	-0.04%	13
2011	6.74%	0.04%	6.70%	22
2012	3.07%	0.06%	3.01%	26
2013	-7.95%	0.02%	-7.97%	30
2014	2.31%	0.02%	2.29%	32
2015	-11.82%	0.02%	-11.84%	33
2016	4.46%	0.20%	4.26%	35
2017	0.61%	0.80%	-0.19%	35
2018	2.34%	1.81%	0.53%	30
Cumulative Return	-1.67%			

**Table 9.** Top 10% Long portfolio returns - emerging markets.

Emerging Markets - Bottom 10% Short Portfolio				
Year	Annual Portfolio Return	Risk Free Rate of Return	Excess Return Over Risk Free Rate	Number of Companies
2010	8.09%	0.12%	7.97%	13
2011	-10.25%	0.04%	-10.29%	22
2012	-4.36%	0.06%	-4.42%	26
2013	5.18%	0.02%	5.16%	30
2014	-1.87%	0.02%	-1.89%	32
2015	12.10%	0.02%	12.08%	33
2016	-6.50%	0.20%	-6.70%	35
2017	0.68%	0.80%	-0.12%	35
2018	-1.89%	1.81%	-3.70%	30
Cumulative Return	3.25%			

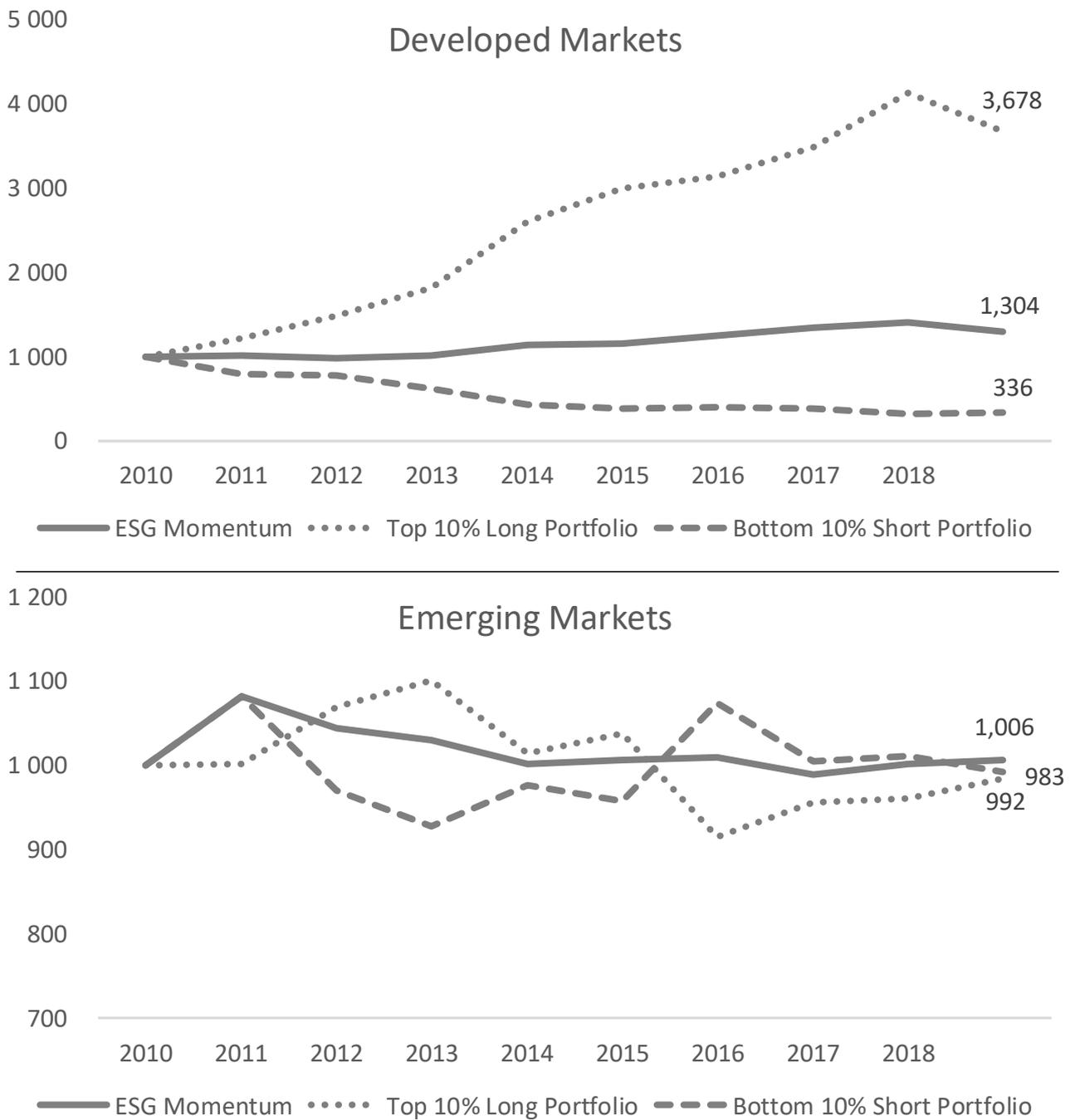
**Table 10.** Bottom 10% Short portfolio returns - emerging markets.

The table 11 below presents the descriptive statistics for the returns of the six portfolios constructed for the empirical analysis. Panel A consists the portfolios for the developed markets investment universe and the Panel B consists the portfolios for the emerging markets investment universe.

Portfolio	Mean	Median	Standard Deviation	Variance
<b>Panel A: Developed Markets</b>				
ESG Momentum	0.0315	0.0238	0.0566	0.0036
Top 10% Long	0.1642	0.1861	0.1466	0.0215
Bottom 10% Short	-0.0876	-0.0428	0.1182	0.0140
<b>Panel B: Developing Markets</b>				
ESG Momentum	0.0011	0.0020	0.0324	0.0011
Top 10% Long	-0.0002	0.0231	0.0601	0.0036
Bottom 10% Short	0.0013	-0.0187	0.0718	0.0052

**Table 11.** Descriptive statistics.

Descriptive statistics present the mean, median, STD and variance for the annual portfolio returns covering the whole sample period from 2010 to 2018. These annual portfolio returns are presented for each individual portfolio in the second column of Tables 5, 6, 7, 8, 9 and 10 above. Descriptive statistics show that the ESG momentum portfolio performed superiorly in developed markets during the sample period. In emerging markets all portfolios performed poorly with relatively low volatility. The volatilities of the portfolios formed in developed markets were higher for all portfolios and the highest mean return during the sample period was achieved with the portfolio only buying companies that were improving their ESG ratings.



**Figure 6.** Graphical representation of the performance of the portfolios

Figure 6 on the previous page is a graphical representation of 1,000\$ invested separately over the sample period in the six different portfolios for the both investment universes. The difference in the performance of the portfolios in developed markets is much greater than in emerging markets. In developed markets the ESG momentum portfolio achieves cumulative return of 30.4% over the sample period, when in emerging markets the strategy yields only 0.6% cumulative return. The best performing strategy over the sample period is the Top 10% long -portfolio in developed markets which gains significantly higher returns than the other portfolios resulting in cumulative return of 268% over the sample period. In emerging markets, the ESG momentum portfolio is the only strategy gaining positive returns while the Top 10%- and Bottom 10% -portfolios both have slightly negative returns. However, if an investor invested in the Bottom 10% -portfolio in developed markets, she would have gained a negative 139% return over the sample period, whereas none of the portfolios in emerging markets investment universe would have resulted in such a severe loss in the investment.

### 5.2.2. Empirical Methods

The methodology used to explain the abnormal returns of different ESG strategies varies between the related studies. However, the most common models used in the related literature are the ones that are discussed in the chapter 3. Majority of the ESG momentum studies utilize only one regression model for the analysis, i.e. Nagy et al. (2013 & 2016) and Giese et al. (2019) use GEM3 multi regression model, Verheyden et al. (2016) obtain the Carhart 4-factor model in their study and Truevalue Labs (2018) also obtain the Carhart 4-factor model with two additional risk factors which are volatility and short-term reversal. Carhart 4-factor model is one of the most used ones in other SRI studies as well (See e.g. Kempf & Osthoff 2007, Bauer et al. 2005, Schröder 2007, Climent & Soriano 2011).

Inspired by a study conducted by Fama & French (2018) where they study the selection of different factors and test the explanatory capability of the different multi-factor models I will obtain four different regression models in this thesis, which are CAPM, Fama-French 3-factor model, Carhart 4-factor model and Fama-French 5-factor model. For the

discussion of these models see the chapter 3 in this thesis. The empirical analysis will be conducted in the next chapter.

## 6. EMPIRICAL RESULTS

This chapter will discuss the results of the empirical analysis conducted in this study to observe the relation between the ESG momentum and financial performance. Differing from previous studies, this thesis utilizes four different factor models to explain the returns. These regression models are chosen based on the discussion of the theoretical framework and previous related studies, presented in chapter 3 and chapter 4 respectively. Ordinary Least Squares (OLS) regression is used to form the results presented in the following tables. Each table includes the results for each factor model chosen with three different portfolios and with two separate panels for developed markets (Panel A) and emerging markets (Panel B). Firstly, the table 12 presents the alphas for the portfolios calculated with CAPM and Jensen's measure as well as the portfolio performance measures Sharpe and Treynor. Following with the results of the Fama-French 3-factor model, Carhart 4-factor model and Fama-French 5-factor model, in table 13, table 14 and table 15 respectively.

### 6.1. CAPM and Portfolio Performance Measures

Starting the discussion from the results of the table 12. Firstly, I run the CAPM single-factor regression which explains the returns only with the market factor, or in other words Beta. As seen below, the CAPM alpha for the ESG momentum portfolio is negative in both investment universes. However, these are statistically insignificant. Utilizing the CAPM, only the portfolio investing long in the top 10% of companies improving their ESG scores generates positive alpha, again being statistically insignificant. The Jensen's alpha portfolio performance measures, which are calculated as the difference between the actual returns of the portfolio and the returns calculated by the CAPM show positive 4.6% return for the ESG momentum in developed markets and 0.7% positive return in emerging markets. The highest Jensen's alpha of 12.3% is gained by the top 10% long portfolio in the developed markets. Comparison of the risk adjusted returns between the two investment universes is not reasonable here as the portfolios in the emerging markets

performed so poorly that the Sharpe and Treynor measures are negative implying that the portfolio gained less returns than the risk-free asset. However, investor would have gained relatively good Treynor ratios by investing in ESG momentum portfolio and especially in top 10% long portfolio in emerging markets. This implies that by investing only long in companies with significantly strong improvement in ESG ratings rewards the investor with respect to the portfolio Beta. ESG momentum portfolio in developed markets has a Sharpe ratio of 0.44 which is not relatively that good, yet the top 10% portfolio in developed markets has a Sharpe ratio of 1.07 that can be considered as good.

**Table 12.**

CAPM single-factor regression alpha and portfolio performance measures.

The results are presented for the whole sample period from 2010 to 2018 for two investment universes. Panel A includes companies from USA. Panel B includes companies from “BRICS” countries. CAPM Alpha represents the results for the single-factor regression  $E(R_i) = R_f + \beta_i(\bar{R}_m - R_f)$ . Jensen’s alpha, Sharpe ratio and Treynor ratio are portfolio performance measures which presented in equations 7, 4 & 6 respectively. ESG momentum portfolio consists long positions in top 10% of the companies improving ESG ratings during the past year and short positions in bottom 10% of the companies with decreasing ESG ratings during the past year. Top 10% Long portfolio consists only the top 10% of the companies improving ESG ratings. Bottom 10% Short portfolio consists only the bottom 10% of the companies with decreasing ESG ratings. Table on the next page.

	ESG Momentum	Top 10% Long Portfolio	Bottom 10% Short Portfolio
<b>Panel A: Developed Markets</b>			
CAPM Alpha	-0.014 (0.556)	0.041 (0.353)	-0.010 (0.673)
Jensen's Alpha	0.046	0.123	-0.097
Sharpe Ratio	0.44	1.07	-0.95
Treynor Ratio	0.025	0.284	-0.134
<b>Panel B: Developing Markets</b>			
CAPM Alpha	-0.006 (0.744)	0.007 (0.818)	-0.019 (0.616)
Jensen's Alpha	0.007	-0.007	0.020
Sharpe Ratio	-0.067	-0.061	-0.029
Treynor Ratio	-0.001	-0.009	-0.006

## 6.2. Fama-French 3-Factor Model

As Fama & French (2015) presented, also other factors are affecting the stock returns than the Beta. The 3-factor model extends the CAPM regression by adding the risk factors for size and value. The alphas for the ESG momentum portfolios remain negative yet approach the level of zero return. Again, these alphas remain statistically insignificant. The top 10% portfolio generates positive alpha in both investment markets, however not even close to being statistically significant. Surprisingly the market factor is statistically significant only for the top and bottom 10% portfolios in developed markets implying that the returns are driven by other factors. However, for the ESG momentum as well as for all the portfolios in emerging markets none of the factor loadings are statistically significant. The strong positive market factor loading for the top 10% portfolio and the strong negative market factor loading for the bottom 10% portfolio make sense as when

the markets perform well, also the companies improving most their ESG ratings perform extremely well. On the other hand, when the markets are performing well, the short positions tend to fail easily as the majority of the stocks have positive returns. The ESG momentum portfolio results in positive relation with the value factor in developed markets and positive value with the size factor in emerging markets. However, neither of these are statistically significant. The SMB factor implies that amongst the companies in the ESG momentum portfolio, in developed markets large companies outperform the smaller ones and in emerging markets it is vice versa. R-squared measure at the bottom of the panel A and B is the determination coefficient of the regression and presents how well the underlying model explains the results of the regression for each portfolio. Based on the R-squared, the 3-factor model seems to fit best to explain the returns of the bottom 10% short portfolio in developed markets with the value of 84.7% for R-squared.

The results of the first regression suggest that the ESG momentum portfolio does not lead to positive alphas in the investment universes used. As the results differ from the earlier studies in the topic which use significantly different data sets, I would suggest that the selection of the data for the study impacts the results of the analysis in this thesis. The data used in this thesis is narrower in terms of the investment universes as the majority of other studies utilize global indices and form their portfolios by including all the companies in the indices, which is not that practical approach to investing in real life.

**Table 13.**

Fama-French 3-factor regression results.

Table 13 summarizes the results of the Fama-French 3-factor model whole sample period from 2010 to 2018 for two investment universes. The regression is calculated as follows:  $R_{it} - R_{ft} = a_i + \beta_i(\bar{R}_{mt} - R_{ft}) + S_iSMB_t + h_iHML_t + e_{it}$ .  $\beta$ , SMB and HML are the loading coefficients for each factor. R-squared measures how well the model fits to explain the results. Panel A includes companies from USA. Panel B includes companies from “BRICS” countries. ESG momentum portfolio consists long positions in top 10% of the companies improving ESG ratings during the past year and short positions in bottom 10% of the companies with decreasing ESG ratings during the past year. Top 10% Long portfolio consists only the top 10% of the companies improving ESG ratings. Bottom 10% Short portfolio consists only the bottom 10% of the companies with decreasing ESG ratings. Table on the next page.

## Fama-French 3-Factor

	ESG Momentum	Top 10% Long Portfolio	Bottom 10% Short Portfolio
<b>Panel A: Developed Markets</b>			
Alpha	-0.012 (0.686)	0.034 (0.548)	-0.010 (0.753)
Rm - Rf	-0.070 (0.113)	1.038 ** (0.025)	-0.819 *** (0.006)
SMB	-0.070 (0.840)	-0.108 (0.862)	-0.117 (0.741)
HML	0.090 (0.654)	-0.060 (0.866)	0.101 (0.622)
R-squared	0.514	0.714	0.847
<b>Panel B: Developing Markets</b>			
Alpha	-0.001 (0.975)	0.012 (0.753)	-0.018 (0.653)
Rm - Rf	-0.034 (0.746)	-0.098 (0.670)	0.082 (0.733)
SMB	0.351 (0.110)	-0.159 (0.702)	0.501 (0.278)
HML	-0.158 (0.190)	0.222 (0.369)	-0.366 (0.184)
R-squared	0.488	0.194	0.408

The significance levels at the 1%, 5% & 10% are indicated as \*\*\*, \*\*, \* respectively.

### 6.3. Carhart 4-Factor Model

Following Carhart (1997), I extend the 3-factor model by adding one explanatory variable (WML) for momentum factor. In the table 14 below, one can notice that the R-squared for all the portfolios increase significantly when using the 4-factor regression model implying that the model fits better to explain the returns of the portfolios. When adding the momentum factor to the regression, the alpha of the ESG momentum portfolio in

emerging markets turns out to be positive, yet this is far from statistically significant. In developed markets the negative alpha of the ESG momentum portfolio deepens even further. As in the 3-factor regression, the loadings of the market factor for top 10% long and bottom 10% short portfolios remain statistically significant with similar relationship to the returns. The market factor for the ESG momentum portfolio in developed market is almost statistically significant at the 10% significance level. The additional momentum factor is statistically significant in top 10% long portfolio in emerging markets. The momentum factor loads on negative for the portfolio which implies that in the top 10% long portfolio, the companies showing negative trend in share prices do not continue to outperform from one period to the other. Comparing the HML factor for the developed markets in 3-factor model and 4-factor model, one can notice that in the 4-factor model the loading for the factor in ESG momentum portfolio and top 10% long portfolio increases significantly suggesting that the value companies outperform in these portfolios over the sample period. These results however remain insignificant.

Interestingly the factor loadings for the developed markets in panel A seem to be opposite to the factor loading for the emerging markets in panel B. For example, in the ESG momentum portfolios all the factor loadings are opposite to each other between the two investment universes. This implies that the markets from which the data is taken for the two investment universes differ greatly from each other, which is reasonable if thinking the overall differences between the economies in developed markets and emerging markets.

As the results of the regression remain mostly insignificant after adding the factor for the momentum, I extend further the regression analysis by implementing another multi-factor model introduced by Fama & French in 2015 as their respond to the received critique received from the 3-factor model being insufficient in explaining the returns. The 5-factor model introduces factors for operating profitability and investments of the company.

**Table 14.**

Carhart 4-factor regression results.

Table 14 summarizes the results of the Carhart 4-factor model whole sample period from 2010 to 2018 for two investment universes. The regression is calculated as follows:  $R_{it} - R_{ft} = a_i + \beta_i(\bar{R}_{mt} - R_{ft}) + S_iSMB_t + h_iHML_t + p_iWML_t + e_{it}$ .  $\beta$ , SMB, HML and WML are the loading coefficients for each factor. R-squared measures how well the model fits to explain the results. Panel A includes companies from USA. Panel B includes companies from “BRICS” countries. ESG momentum portfolio consists long positions in top 10% of the companies improving ESG ratings during the past year and short positions in bottom 10% of the companies with decreasing ESG ratings during the past year. Top 10% Long portfolio consists only the top 10% of the companies improving ESG ratings. Bottom 10% Short portfolio consists only the bottom 10% of the companies with decreasing ESG ratings.

Carhart 4-Factor			
	ESG Momentum	Top 10% Long Portfolio	Bottom 10% Short Portfolio
Panel A: Developed Markets			
Alpha	-0.026 (0.420)	0.021 (0.749)	-0.005 (0.888)
Rm - Rf	0.357 (0.102)	1.048 ** (0.040)	-0.822 ** (0.015)
SMB	-0.101 (0.759)	-0.138 (0.839)	-0.106 (0.787)
HML	0.397 (0.248)	0.237 (0.717)	-0.003 (0.993)
WML	0.004 (0.261)	0.004 (0.575)	-0.001 (0.732)
R-squared	0.659	0.738	0.852
Panel B: Developing Markets			
Alpha	0.002 (0.917)	0.034 (0.301)	-0.038 (0.318)
Rm - Rf	-0.036 (0.758)	-0.115 (0.523)	0.098 (0.639)
SMB	0.356 (0.148)	-0.109 (0.734)	0.455 (0.266)
HML	-0.216 (0.321)	-0.272 (0.395)	0.095 (0.792)
WML	-0.001 (0.721)	-0.006 * (0.097)	0.006 (0.162)
R-squared	0.506	0.628	0.658

The significance levels at the 1%, 5% & 10% are indicated as \*\*\*, \*\*, \* respectively.

#### 6.4. Fama-French 5-Factor Model

Table 15 on the next page presents the results of the 5-factor model in same form as the results of the other regression models are presented earlier. One can again observe that the R-square measures increase further from the earlier 4-factor model and for the bottom 10% short portfolio in developed markets the 5-factor model explains nearly 100% of the returns. Adding two more factors into the regression model also generates most statistically significant factor loadings. However, none of these are for the ESG momentum portfolios. Starting from the alphas of the ESG momentum portfolios for the developed markets in panel A and emerging markets in panel B, one can observe that the highest alpha for the ESG momentum portfolio in developed markets is resulted in the 5-factor model. The alphas for the ESG momentum portfolio in emerging markets do not vary between the different regression models and the portfolio performs poorly in general. Interestingly, the loading of the market factor does not turn out to be statistically significant for the ESG momentum portfolios in neither of the investment universes, implying that the returns are not explained by the overall market return. Differing from the results of the 4-factor model the ESG momentum portfolios are now positively tilted towards the small companies outperforming the large companies in both investment universes, yet not on a statistically significant level. Loadings for the HML do not differ significantly between the 4-factor and 5-factor models for the ESG momentum portfolios. However, for the bottom 10% short portfolio the 5-factor regression results turn out to be statistically significant in the developed markets, with all factor loadings being statistically significant from 1% to 10% significance level. Also, the alpha of the bottom 10% short portfolio in the developed markets is the first statistically significant alpha of the analysis. Yet this alpha is only 2.6%.

The two additional factors of the 5-factor model, RMW and CMA, are not statistically significant for the ESG momentum portfolios in neither of the investment universes. Loadings on the investment factor presents that the ESG momentum portfolio in emerging markets is strongly tilted towards companies that have high investments, and in emerging markets the result is vice versa. The RMW factor for the operating profitability has statistically insignificant negative loads for the ESG momentum portfolios in both

investment universes. However, for the bottom 10% short portfolio in developed markets and for the top 10% long portfolio in emerging markets the loading of the CMA factor is statistically significant. In developed markets the CMA factor is highly statistically significant with a loading of -1.087, implying that the bottom 10% short portfolio consists companies that are investing aggressively. In emerging markets, the CMA factor is significant at the level of 5% with a factor loading of 1.145 implying that the top 10% long portfolio consists companies that have low investments.

**Table 15.**

Fama-French 5-factor regression results.

Table 14 summarizes the results of the Fama-French 5-factor model whole sample period from 2010 to 2018 for two investment universes. The regression is calculated as follows:  $R_{it} - R_{ft} = a_i + \beta_i(\bar{R}_{mt} - R_{ft}) + S_iSMB_t + h_iHML_t + r_iRMW_t + c_iCMA_t + e_{it}$ .  $\beta$ , SMB, HML, RMW and CMA are the loading coefficients for each factor. R-squared measures how well the model fits to explain the results. Panel A includes companies from USA. Panel B includes companies from “BRICS” countries. ESG momentum portfolio consists long positions in top 10% of the companies improving ESG ratings during the past year and short positions in bottom 10% of the companies with decreasing ESG ratings during the past year. Top 10% Long portfolio consists only the top 10% of the companies improving ESG ratings. Bottom 10% Short portfolio consists only the bottom 10% of the companies with decreasing ESG ratings. Table on the next page.

## Fama-French 5-Factor

	ESG Momentum	Top 10% Long Portfolio	Bottom 10% Short Portfolio
<b>Panel A: Developed Markets</b>			
Alpha	0.030 (0.414)	-0.023 (0.781)	0.026 ** (0.018)
Rm - Rf	0.142 (0.481)	1.288 (0.058) *	-1.010 *** (0.000)
SMB	0.485 (0.286)	-0.542 (0.597)	0.588 (0.002) ***
HML	0.404 (0.150)	-0.373 (0.522)	0.463 (0.001) ***
RMW	-0.243 (0.509)	0.801 (0.388)	0.172 (0.056) *
CMA	-0.972 (0.114)	1.007 (0.418)	-1.087 (0.001) ***
R-squared	0.817	0.804	0.998
<b>Panel B: Developing Markets</b>			
Alpha	-0.002 (0.951)	-0.052 (0.119)	0.044 (0.310)
Rm - Rf	-0.027 (0.873)	0.189 (0.259)	-0.193 (0.412)
SMB	0.266 (0.477)	-0.705 (0.093) *	0.961 (0.112)
HML	-0.231 (0.298)	-0.119 (0.515)	-0.102 (0.702)
RMW	-0.090 (0.773)	0.820 ** (0.046)	-0.883 (0.098)
CMA	0.111 (0.791)	1.145 ** (0.043)	-1.020 (0.136)
R-squared	0.515	0.874	0.815

The significance levels at the 1%, 5% & 10% are indicated as \*\*\*, \*\*, \* respectively.

## 7. DISCUSSION AND SUMMARY OF THE EMPIRICAL RESULTS

This chapter will summarize the results of the regression analysis and reflect the results to the research question and hypotheses. I will also discuss the reasons that may have caused the results to be as they turned out to be, unable to reject the first hypotheses. In addition to this I will discuss what differentiates the results of this thesis from the previous studies in the topic and what could be done differently in order to gain on different results.

In order to explain the risk adjusted returns of the ESG momentum portfolios and two additional portfolios I run CAPM single-factor model, Fama-French 3-factor and 5-factor models and Carhart 4-factor model. The motivation for adding more explanatory factors to the 3-factor model is based on the evidence suggesting that the model unsuccessfully explains the variation in the returns and much of it is caused by factors not taken into account in the 3-factor model (Fama & French 2015). As the factors are added into the multi-factor models the explanatory power of the underlying model increases and the model results in less errors when explaining the returns (Chiah et al. 2016). During the history of multi-factor models the explanatory power of 3-factor model has been criticized by studies identifying stock market anomalies questioning the explanatory power of the model and are behind the addition of explanatory factors for value, investment and momentum (Stambaugh & Yuan 2016). Observing the empirical results presented in the previous chapter one can see that adding factors to explain the returns does not increase much the statistical significance of the results. However, according to Griffin (2002), adding useful factors in the model should increase the R-squared measure of the regressions. One can notice that the R-squared measures on the last row in the tables presenting the regression results increase steadily with the additional factors for most of the portfolios. For example, the R-squared for the ESG momentum portfolio in developed markets has an R-squared of 0.514 in 3-factor model and 0.817 in 5-factor model. In other words, the 5-factor model explains 82% of the variation in the portfolio returns. Especially the Top 10%- and Bottom 10% -portfolios for the emerging markets have significantly higher R-squared measures in 5-factor model compared to the 3-factor model. However, despite that the 5-factor model captures most of the variance for all the portfolios and is more useful for explaining the portfolio returns than the other regression

models, all the regression models lack robustness as the results remain or become statistically insignificant when adding explanatory factors.

Continuing the discussion to the obtained results from the regression models I conclude that the results are not aligned with the previous studies in the topic. The results were also discordant with the research hypotheses. The main hypotheses under the study in this thesis is stated as follows:

$H_0$  = Positive excess returns are not gained with ESG momentum strategy.

As presented in the regression tables in previous chapter, all the alphas for the ESG momentum portfolios in developed and emerging markets are not statistically significant. Adding more explanatory factors from the Fama-French 3-factor model through the Carhart 4-factor model finally to the Fama-French 5-factor model, did not improve the statistical significance of the ESG momentum portfolio results. As the result of these findings, I reject the  $H_1$  and the  $H_0$  holds meaning that the ESG momentum strategy does not offer significant excess returns over the sample period in the chosen investment universes. Despite the rejection of the first hypotheses of the thesis, the empirical results show that the ESG momentum portfolios do not yield in statistically significant negative excess returns.

The results of the thesis are different from the ones by Nagy et. Al. (2013 & 2016), Verheyden et al. (2016) and Giese et al. (2019). Three of these studies use the same IVA ESG ratings and GEM3 equity model for the regressions, which explains the returns with 16 different explanatory factors. The data set used in their studies is different from the one used in this thesis and the portfolio construction differs significantly. For example, Nagy et al. 2016 form their portfolios using the MSCI World Index which consists of 1,651 constituents (MSCI 2019), and they include all the companies in the portfolio. Comparing this with the more practical approach used in this study, where I form the ESG momentum portfolio by calculating the top 10% of the companies improving ESG ratings and the bottom 10% of the companies with decreasing ESG ratings which results on average of 86 companies in developed markets and 57 companies in emerging markets

over the sample period. As a real-life application, constructing a portfolio similar to the one of Nagy et al. (2016) including around 1,600 would not be convenient and due to the transaction costs, which are not taken into consideration in these studies, would probably gain negative excess returns as well. The ESG momentum portfolios constructed in this thesis with under 100 companies in both investment universes is much closer to a practical approach which I tried to replicate in this thesis. However, as the results show, at least constructing the portfolios from the investment universes used in this thesis and with the sample period from 2010 to 2018 do not offer significant excess returns for the investors.

Continuing with the second hypotheses of the study, which is stated at the beginning as follows:

$H_2$  = ESG momentum strategy offers higher return in emerging markets than in developed markets.

The second hypotheses of the thesis is to study whether the ESG momentum portfolio gains superior returns in emerging markets compared to the developed markets. A profound background for the  $H_2$  is discussed in chapter 1.1. As stated before, the alphas for the both markets were not statistically significant in any of the regression results. However, if observing the results of the regressions, one can notice that the ESG momentum portfolio in emerging markets actually has a better alpha in Fama-French 3-factor and Carhart 4-factor models. The alphas explained by the Fama-French 5-factor is significantly higher for the developed markets portfolio, thus not being statistically significant.

In addition to studying the performance of the ESG momentum strategy, which was the main interest in this thesis, I constructed four additional portfolios. These portfolios were formed so that two of them consisted only long positions in the top 10% of companies improving their ESG ratings and two of the portfolios consisted the bottom 10% of the companies with decreasing ESG ratings. With this foregoing approach I was interested in observing whether the impact of positive trend in the ESG ratings to the returns of the company is stronger than the impact of the negative trend in the ESG ratings and vice

versa. These results would contribute to the existing SRI literature as it has not been studied before, yet it replicates the traditional positive and negative screening strategies discussed earlier in this thesis, only focusing on the change in the ESG rating. The only statistically significant alpha of the study is explained by the Fama-French 5-factor regression for the bottom 10% short portfolio. The results suggest that by selling short stocks that have the strongest decrease in ESG ratings would gain positive 2.6% excess returns in developed markets. The alpha is even higher in the emerging markets with positive 4.4% excess return, yet this is not statistically significant result. These findings suggest that this kind of approach of negative screening focusing on the change in the ESG score instead of focusing on the absolute ESG score as the traditional negative screening strategy would potentially offer the investors positive excess returns and could be used for example as a combination with other SRI strategies.

To summarize the findings of the thesis I confirm that the results do not support the previous studies in the ESG momentum. However, this is probably due to the different and more practical approach to the portfolio construction and selection of the investment universes. The results can also be partly affected by the different data set and regression methodology. As a contribution to the limited previous studies in ESG momentum, this study was the first one to separate the positive trend and the negative trend into separate portfolios replicating the traditional positive and negative screening yet focusing solely on the change in the ESG rating. The results of these portfolios suggest that the approach could serve the SRI investors as additional screening procedure to combine with other SRI strategies and potentially yield in higher excess returns, thus this should be studied further.

## 8. CONCLUSION

Socially responsible investing has been one of the most trending topics during the recent years and the correlation between the financial performance and SRI has been studied extensively by the academics (Revelli & Viviani 2014). This study contributes to the profound existing literature, however utilizing a relatively new SRI strategy which is yet to be found by the majority of the academics and practitioners. The main purpose of the study is to examine whether the ESG momentum strategy would offer the investors a new way to gain positive excess returns. Additionally, the study is conducted separately for the developed markets and emerging markets to interpret whether the performance of the strategy depends on the investment universe. This thesis also approaches the SRI with more practical approach by constructing portfolios restricting the amount of the companies held in portfolio, so that the strategy would be close to a one that could be realistically implemented into the real life. The methods used in this study replicate closely the previous studies, however motivated by Fama & French (2018) this study applies multiple different multi-factor models to explain the alphas of the portfolios. The topic is fascinating as the investors are constantly trying to find new ways to gain superior returns and the ESG momentum strategy has not yet been found by the great public even though a few studies have been conducted about the strategy.

The study uses ESG ratings and share price data provided by Refinitiv (previously Thomson Reuters). The developed markets investment universe is formed from S&P 500 index in the US and the emerging markets investment universe is formed from the main indices of so-called “BRICS” countries. Six portfolios are constructed in total in the empirical part of the study. Performance of the ESG momentum portfolios is the main motivation for the study, however four additional portfolios are constructed as I found it interesting to study whether the positive or negative change in the ESG rating has more significant impact on the returns and whether separating the companies in portfolios consisting only strong positive change in ESG rating or strong negative change in ESG rating could be beneficial for the investors and possibly could be combined with other SRI strategies in future studies.

The results of the study are not aligned with the ones presented in previous studies about ESG momentum by Nagy et al. (2013 & 2016), Verheyden et al. (2016) and Giese et al. (2019). Even though the results of this study do not support the results of the previous studies, several reasons can be found to impact the results and to cause the mismatch

between the previous findings. Firstly, the approach to the portfolio construction is different in this study compared to the previous ones. The ESG momentum portfolios are restricted to consist only the top and bottom 10% companies showing positive or negative momentum, instead of including hundreds or even over thousand companies in the portfolios. Secondly, the investment universes constructed in the study differ from the previous ones as this thesis focuses on only US markets as a developed market and in “BRICS” as a emerging market. Thirdly, all the previous studies in ESG momentum use ESG ratings other than the ones provided by Refinitiv which are used in this thesis. As discussed in this thesis, the industry is missing the universal standardization and regulation regarding how to measure the dimensions of ESG, which arises a potential bias in all SRI studies as the results of the researches using different ESG databases are compared together (Dorfleitner et al. 2015).

The empirical analysis does not find statistically significant alpha for the ESG momentum portfolios in neither of the investment universe over the sample period. The ESG momentum portfolios perform so poorly in general, that four out of six alphas explained by the different multi-factor models are negative, yet not statistically significant. Fama-French 5-factor model explains the best positive alpha of 3% (not statistically significant) for the ESG momentum portfolio. A significant difference between the alphas in the developed markets and emerging markets is not found, yet two out of the three multi-factor models explain higher alphas for the emerging markets. Fascinated by the idea of extending the methodology used in ESG momentum studies, I replicate the traditional positive and negative screening strategies, yet focusing on the changes in the ESG ratings and construct four additional portfolios for the both investment universes. Statistically significant alpha is found amongst these portfolios as the “bottom 10% short” portfolio has 2.6% statistically significant alpha explained by the Fama-French 5-factor model.

Based on the results of this thesis, an investor should critically approach the findings of the previous studies in the ESG momentum strategy as these studies do not approach the strategy on a way that could be conveniently implemented into practice. However, the results of this thesis are a valuable contribution to the existing literature, as when separately studying the positive and negative trend in the ESG ratings, a statistically significant alpha is found in this thesis. This raises a suggestion for the future studies as it would be interesting and worthwhile to test the performance of portfolios combining other SRI strategies with a screening that is based on the positive or negative trend in changes in the company's ESG ratings. This kind of partial combination of the ESG momentum could possibly offer the investors an opportunity to build a superior SRI strategy and be ahead of others in terms of the financial performance as well as contributing for the common good and sustainable development.

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