Eetu Tuominen

ESG Momentum in the Nordic stock markets

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Author: Eetu Tuominen
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ABSTRACT:

Today, decision-making process is guided by understanding, internalizing and implementing all dimensions of responsibility aspects in the daily activities of both individuals and institutions. This has led to the change in the way think and act, and is driving companies, private investors and institutional investors to put ESG criteria in the core of their decision-making process. When ESG criteria are integrated into business operations, the question is whether internalizing ESG criteria into business operations will deliver positive results for shareholders. And if there is a positive correlation between ESG score development and stock price.

This thesis aims to review recent literature of ESG investing and conduct an empirical study that focuses to investigate whether the ESG Momentum strategy has been profitable in the Nordic stock markets from 2009 to 2020. The empirical testing with Nordic data will add an additional contribution to the existing research related to ESG Momentum.

In portfolio creation, similar methods are used as in Giese et al. (2019) and Nagy et al. (2016). Using the annual changes in ESG scores and Nordic stock market data, three different ESG Momentum portfolios are created. This thesis will also study different thresholds for including stocks in portfolios. Out of winners-minus-losers portfolios the performance of top ESG score improvers long-only portfolio and portfolio of companies with worst ESG score development short-only are also examined.

The findings with chosen data set suggest that ESG Momentum premium does not exist in the Nordic stock markets nor that the strategy produces statistically significant positive abnormal returns during the sample period. Portfolios generated negative or only slightly positive risk-adjusted returns. However, the results indicate that the higher threshold for stock inclusion improves portfolios risk-adjusted return measured with Sharpe ratio. Fama and French three-factor model and five-factor model were used to analyze portfolio returns, as well as the four-factor model developed by Mark Carhart. Based on the empirical analysis using the factor models, none of the ESG Momentum portfolios built with Nordic data set achieved statistically significant positive abnormal returns over the sample period considered.

KEYWORDS: Social responsibility, ESG investing, ESG momentum, winners minus losers

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TIIVISTELMÄ:

Sijoittajien päätöksentekoprosessia ohjaa yhä enenevissä määrin vastuullisuuden kaikkien ulottuvuuksien ymmärtäminen, sisäistäminen ja toteuttaminen. Tämä on johtanut ajattelun ja toimintatapojen muutokseen ja saa niin yritykset, institutionaaliset sijoittajat kuin yksityissijoittajatkin laittamaan ESG-kriteerit päätöksentekoprosessinsa keskiöön. Kun ESG-kriteerit sisällytetään liiketoimintaan, herää kysymys, tuottaako ESG-kriteerien sisällyttäminen liiketoimintaan myönteisiä tuloksia osakkeenomistajille. Ja onko ESG-pistearvon kehityksen ja osakekurssin välillä positiivinen korrelaatio.

Tämän tutkielman tavoitteena on tarkastella ESG-sijoittamista koskevaa viimeaikaista kirjallisuutta ja toteuttaa empiirinen tutkimus, jossa keskitytään tutkimaan, onko ESG Momentum -strategia ollut kannattava pohjoismaisilla osakemarkkinoilla vuosina 2009–2020. Empiirinen tutkimus on tehty Pohjoismaisella aineistoilla tuoden uuden näkökulman olemassa olevaan ESG Momentum -sijoitusstrategiaan liittyvään tutkimukseen.

Portfolioiden luomisessa käytetään samankaltaisia menetelmiä kuin Giesen ym. (2019) ja Nagyn ym. (2016) tekemissä ESG Momentum tutkimuksissa. ESG-pisteiden vuosittaisten muutosten ja pohjoismaisen pörssidatan avulla luodaan kolme erilaista ESG Momentum -portfoliota. Tässä tutkielmassa tutkitaan myös erilaisia kynnysarvoja osakkeiden sisällyttämiselle portfolioihin. ESG Momentum portfolioiden lisäksi tutkitaan erikseen myös eniten ESG-pistearvoaan parantaneiden yhtiöiden long-only portfolioita ja huonoimpien ESG-pistearvon kehityksen yhtiöiden short-only portfolioita.

Valitulla aineistolla tehdyt havainnot viittaavat siihen, että ESG Momentum anomaliaa ei ole pohjoismaisilla osakemarkkinoilla, eikä strategia tuota tilastollisesti merkitseviä positiivisia epänormaaleja tuottoja otantajakson aikana. Tutkimuksessa muodostetut portfoliot tuottivat negatiivisia tai vain lievästi positiivisia riskikorjattuja tuottoja Sharpen luvulla mitattuna. Tulokset osoittavat kuitenkin, että korkeampi kynnysarvo osakkeiden sisällyttämiselle parantaa portfolion riskikorjattua tuottoa Sharpen luvulla mitattuna. Portfolioiden tuottojen analysoinnissa käytettiin Eugene Faman ja Kenneth Frenchin faktorimalleja, sekä heidän mallinsa pohjalta Mark Carhartin muodostamaa neljän faktorin mallia. Faktorimalleilla tehdyn empiirisen analyysin perusteella yksinkään muodostettu ESG Momentum portfolio ei saavuttanut tilastollisesti merkittäviä positiivisia epänormaaleja tuottoja tarkastellun otantajakson aikana.

AVAINSANAT: Social responsibility, ESG investing, ESG momentum, winners minus losers

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1 Introduction

In 1970, Milton Friedman famously argued that corporations are only responsible for maximizing profits for their shareholders and should therefore not be held accountable to serve any other stakeholders' purposes or contributing to the welfare of the society. Today, however, the decision-making process is guided by an understanding, internalization and implementation of all dimensions of responsibility in the daily activities of both individuals and institutions. This has led to the change in the way we think and act, and is making companies, private and institutional investors to put ESG (*Environmental, Social and Governance*) criteria in the core of their decision-making process.

Many different indicators for corporate responsibility have been developed but the ESG score has emerged as a unifying measure that is nowadays widely used. When ESG criteria is taken under the consideration it is worthful to ask if there is a positive effect for corporate financial performance when implementing ESG criteria in business actions. Or whether there is a positive correlation when making socially responsible investment decisions based on ESG score of companies, i.e. investing in companies that consider ESG principles in their operations. As the ESG investing becomes more widespread, the financial research on ESG investing is also increasing. Friede, Busch and Bassen (2015) studied the relation between ESG criteria and corporate financial performance, and combined the results of more than 2000 studies, most of which found a positive relation between ESG and corporate financial performance, highlighting that the positive impact of ESG on corporate financial performance has been stable over time.

As the popularity of responsible investing has sparked so are the stock prices and valuations of companies with high ESG scores, which means that is not justified to invest in companies with high absolute ESG scores anymore. In the markets, institution and individual investors are constantly looking for opportunities to gain excess returns, which means trying to find deviations from the intrinsic values and exploiting anomalies. Since the high absolute ESG score premium is already added in stock prices and is seen as a higher valuation, it is worthful to look elsewhere.

An interesting approach to this is to investigate companies that have improved their ESG score the most through improvements in their corporate social responsibility actions. The strategy that focuses on ESG score development of companies has shown promising results in earlier literature. Many studies have shown that ESG Momentum strategy can provide significant positive excess returns, suggesting a clear co-movement between ESG score development and stock prices (Nagy, 2013; Nagy, Kassam & Lee, 2016; Verheyden, Eccles & Feiner, 2016; Giese, Lee, Melas, Nagy & Nishikawa, 2019).

1.1 Purpose and motivation for the study

ESG score criteria has been used in the literature by looking at the ESG score of the companies with major focus to purely invest in the companies with the highest ESG scores. This thesis aims to study a strategy that purely focuses on companies' ESG score development. ESG momentum is relatively new and unexplored compared to other socially responsible investing strategies. It seeks to find financial outperformance with ESG improvers, meaning that the hidden financial performance potential can be revealed by looking at the ESG score improvement. An investment is not made in the companies with the best absolute ESG score but to the ones that has shown their potential as an ESG score improver. Shifting the focus away from absolute ESG scores such as in the positive and negative screening methods to the ESG score improvement expands the potential investment universe. Nagy, Cognan and Sinnreich (2013) were first to study the performance of ESG momentum strategy showing promising results about its profitability, and as investors are constantly looking for new responsible investing methods which with outperform the markets, increasing number of studies such as Nagy et al. (2016), Verheyden et al. (2016), Pollard et al. (2018) and Giese et al. (2019) has since been published about the ESG momentum strategy.

In ESG Momentum strategy, the portfolio is constructed by longing the best ESG score improvers and shorting the ones with worst ESG score development. The purpose of this thesis is to analyze ESG Momentum similar as in the previous studies and try to find the

ideal portfolio implementation technique that will maximize the performance of ESG Momentum strategy. In addition to ESG Momentum, this paper examines the impact of positive and negative ESG score movements on portfolio returns separately.

Most of the previous studies have been made with U.S stock market data, which leaves room for further examination with international data set to which this thesis contributes. This thesis implements the ESG Momentum strategy with the Nordic stock market setting. Using a liquid set of Nordic stock market data provides significant addition to existing results that supports previous academic research. Nordic stock market has developed significantly in recent decades, and it has become more attractive for foreign owners to enter Nordic markets. Compared to U.S. stock markets Nordic stock market is very small but offers a great opportunity for investors and researchers as the dynamics are slightly different in the Nordics markets. Compared to emerging countries and their economies, Nordic countries are very low in corruption and can offer stable political environment with low credit risk. Nordic countries are also to some extend global frontrunners promoting sustainability and making socially responsible investment acts, both at the government and corporate level. As many studies have shown the results can be heavily affected by sample-specificity and therefore it is relevant to expand the sample universe outside U.S. and emerging market which have been the focus areas in most recent literature related to ESG Momentum.

The definition of socially responsible investing is highly fragmented and means different things for different investor. Some investors are willing to push social and environmental benefits with their investment decisions at risk to sacrifice their financial profits. However, this thesis will contribute socially responsible investing as practices that integrate a consideration of ESG issues with the primary purpose of delivering higher-risk-adjusted financial returns.

1.2 Research hypotheses

This thesis aims to study whether ESG Momentum anomaly exists in the Nordic stock market and if it is possible to earn excess returns by implementing the strategy with Nordic stocks. This thesis focuses on Nordic stock market setting contributing the four most liquid Nordic main markets, Helsinki, Stockholm, Oslo and Copenhagen.

The primary objective is to see whether this strategy works when the data is extended beyond the US stock market to the Nordic main markets. First is to find out whether ESG Momentum premium exists and if it is possible to earn excess returns with it. After establishing whether the ESG Momentum premium exists in the Nordic stock market, as measured with different portfolio evaluation metrices, the study will seek differences between constructed ESG Momentum portfolios by raising the thresholds of stock inclusion and to find out the most profitable technique to implement ESG Momentum. To reach the objectives of the thesis, the hypotheses are formed as follows:

H_0 = Statistically significant excess returns cannot be gained with ESG Momentum in Nordic stock markets.

H_1 = Statistically significant excess returns can be gained with ESG Momentum in Nordic stock markets.

H_2 = Higher threshold for stock inclusion in ESG Momentum portfolios increases positive returns.

The main hypothesis tries to confirm the findings of previous literature, but the data set is very different from prior studies, which will substantially increase the possibility of obtaining conflicting results. The second hypothesis works as an auxiliary to the main hypothesis to provide insight how portfolio composition affects returns. The motivation comes from the study of Giese et al. (2019) who studied the performance differential of the top ESG Momentum quintile versus the bottom ESG Momentum quintile.

1.3 Structure of the thesis

First this thesis will introduce Socially Responsible Investing, goes through some related terminology and introduces different responsible investment strategies. After that, the basic concepts, theoretical framework and performance measurement models used in the study will be introduced in chapter 3. The review of the literature strongly identifies ESG Momentum premium in US stock markets, and since it is relatively new phenomenon, the amount of relevant academic research is still relatively narrow but shows very promising results which will be discussed in the chapter 4. The data set and sample period are introduced in chapter 5 as well is the methodology. The empirical results will be discussed in chapters 6, and lastly chapter 7 summarizes the results and concludes the thesis. Chapter 7 also discusses the framework and motivation for further research on ESG Momentum in the Nordic stock markets.

2 Introduction to Responsible Investing

This chapter discusses Socially Responsible Investing (SRI), introducing the development and definition of it. This chapter also defines the corporate social responsibility (CSR) and the fundamentals and emergence of ESG. ESG Momentum investment strategy will be the strategy of main interest in this thesis, but the most popularly used SRI strategies such as Screening, Community Investing and Shareholder Advocacy will also be discussed in this chapter.

2.1 History and Development of Socially Responsible Investing

The first characteristics of Socially Responsible Investing can be tracked back hundreds of years to the time of Jewish, Christian, and Islamic traditions, teaching how to use money ethically, putting ethical restrictions on loans, and prohibiting usury. In the 1920s, the Methodist Church in the UK considered companies sinfulness in their investment decisions and avoided companies in the industries of tobacco, alcohol, weapons, and gambling. Same kind of company limitation was also included in the decisions of Islamic investors who decided to not invest in pork production companies, pornography, or gambling (Renneboog et al., 2008).

Ancient investing with ethical aspect was mostly based on religious convictions, but nowadays the focus and motivation is based more on investors' personal ethical and social beliefs (Renneboog et al., 2008). The modern form of Socially Responsible Investing can be dated to the 1960s, when chaotic times promoted the opposed attitude to the Vietnam war and militarism, raised concerns about equality of women and made investors more aware of the social consequences of their investments (Schueth, 2003). In 1971, created for investors opposed to the Vietnam War and militarism, the world first modern Socially Responsible Investing mutual fund, the Pax World Fund, was founded. The fund focused to not include weapon contractors or militarism related companies to their portfolio. In the 1980s, socially aware investors took a stand on the South Africa's racial

segregation by putting pressure on the US and European investors and mutual funds to exclude companies operating in South Africa from their investment portfolios (Sparkes, 2001; Renneboog et al., 2008).

In the late 1980s, Chernobyl nuclear power plant explosion in Ukraine and Exxon Valdez oil tanker aground run that caused one of the world's most dramatical environmental disaster spilling over 11 million gallons of crude oil, made investors more conscious about the negative environmental consequences of industrial development (Renneboog, 2008). Since 1990, according to Renneboog (2008), the key driver for shaping the development of SRI has been the change in consumer behavior as more and more people are willing to pay premium for products that meet their personal ethical values.

According to Brzeszczyński and McIntosh (2014), in Socially Responsible Investing also known as ethically investing and sustainable investing, investors are willing to push social and environmental benefits with their investment decisions at risk to sacrifice their financial profits. In the literature the use of socially responsible investing terminology is quite fragmented. Some literature seems to treat terms like sustainable investing, ethical investing, and socially responsible investing synonymously. Sparkes (2001) tries to clarify the difference between terms socially responsible investing and ethical investing, stating that ethical investing is an ancient phrase which is being replaced with the term socially responsible investing. Therefore, those terms can be seen used synonymous. Sparkes (2001) also offers a distinction that can be made between those terms, stating that when using the term ethical investing, the profit-making approach should not be the object of concentration at all. According to Sparkes and Cowton (2004) the two most used terms in SRI academic literature are socially responsible investment and ethical investment, but like their study, the vast majority of recent studies uses the term socially responsible investment. In this thesis, the use of term Socially Responsible investing will include all dimensions of social, environmental, ethical and governance aspects of financial investment activity.

As the history of SRI has developed over the years, so has the definition of it. The interpretation always depends on definer's perspective and how they emphasize and value ethicality (Brenkert, 2018). Researchers often have different approaches on defining SRI, and especially in the earlier studies, SRI can only be seen as an investment act that satisfies investors personal values. Schueth (2003) defined the socially responsible investing as "*the process of integrating personal values and societal concerns into investment decision-making"* (Schueth, 2003, p.190).

The study of Eccles and Viviers (2011) offered more expansive definition for socially responsible investing. They reviewed 190 academic papers from 1975 to 2009 to consider the origins and meanings of the use of names describing investment actions that integrate environmental, social, and corporate governance issues. They found that studies indicating deontological ethical position were more often associated with the name "Ethical Investment", and three different SRI investment strategies which were Positive Screening, Best-in-class, and Cause-based Investing, were associated with the name "Responsible Investing". Following the heuristic tradition of Sparkes' (2001) approach of defining SRI, Eccles and Viviers define the Responsible Investment as "*Investment practices that integrate a consideration of ESG issues with the primary purpose of delivering higher-risk-adjusted financial returns"* (Eccles & Viviers, 2011, p.389).

The SRI definition of Eccles and Viviers (2011) strongly considers the integration of ESG factors as a part of SRI. Similar to Eccles and Viviers (2011), one of the most recent and detailed definition for SRI is made by Eurosif which is the leading European sustainable and responsible investment membership organization with a mission to promote sustainability through European financial markets. Eurosif defines socially responsible investing as:

"*Sustainable and responsible investment ("SRI") 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, p.9).

The interest among Socially Responsible Investing keeps growing faster than ever and literature seems to emphasize the implementation of ESG criteria more and more when defining SRI. Emphasizing the consideration of ESG factors when defining Socially Responsible Investing will also be used as an approach in this thesis.

In 2005, United Nation's Secretary-General started to develop principles for responsible investing with the world's largest institutional investors in order to promote understanding and importance of corporate social responsibility in financial development. Six principles of responsible investment were launched in 2006. PRI, the UN-supported network of investors, introduces responsible investing (PRI, 2018): *"…as a strategy and practice to incorporate environmental, social and governance (ESG) factors in investment decisions and active ownership".* PRI's mission for better and more sustainable financial system requires companies committing their six principles for responsible investing. UNPRI Six Principles for Responsible Investment are:

1. *We will incorporate ESG issues into investment analysis and decision-making process.*
2. *We will be active owners and incorporate ESG issues into our ownership policies and practices.*
3. *We will seek appropriate disclosure on ESG issues by the entities in which we invest.*
4. *We will promote acceptance and implementation of the Principles within the investment industry.*
5. *We will work together to enhance our effectiveness in implementing the Principles.*
6. *We will each report on to our activities and progress towards implementing the Principles.*

When the PRI was launched in 2006, the organization had one hundred signatories, but as of 2021, the number of signatories has reached 3826. In 2019 and 2020, the growth rates for number of signatories were 28% and 26%, respectively, indicating that the number of companies committing the six principles of responsible investing continues to

grow strongly. In 2021, the total assets under management of these signatories were 121.3 trillion US dollars (PRI, 2021). The growth of signatories and assets under management is illustrated in more detail in the Figure 1.

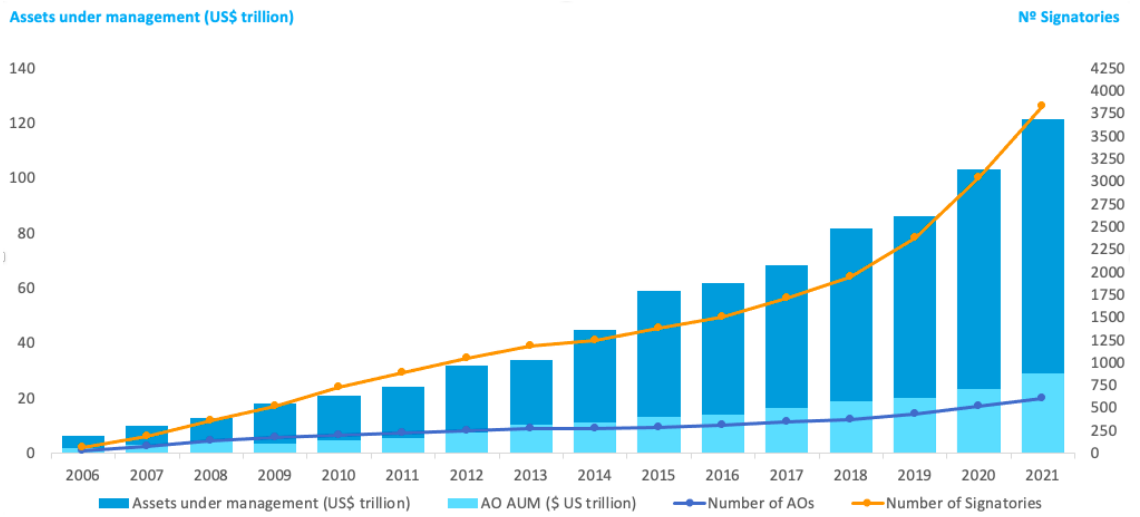

Figure 1. PRI Signatory growth 2006-2021 (Principles of Responsible Investment, 2021).

According to US SIF (the US Forum for Sustainable and Responsible Investment), in 2018 there were nearly 12 trillion US dollars being under professional management that actively incorporate SRI strategies in their investment decisions. This amount is remarkable because it represents that every fourth professionally invested dollar is invested using some SRI strategy.

United Nations' principles for responsible investment brought out the concept of ESG, which nowadays can be said to determine the whole markets of responsible investing (Puttonen & Puttonen, 2021). ESG is an abbreviation for the words *Environment, Social* and *Governance*. *Environmental* refers to companies' approach, for example, to the climate change and things causing it. According to Finsif (Finland's Sustainable Investment Forum), the relevant issues for the environmental dimension are standards and certificates, environmental programs, climate change work, energy efficiency, diversity of nature and circular economy. The second aspect of ESG, *Social*, relates to the employer-employee relationships, which covers things like personnel policy, human rights, children's rights, employment rights and product liability. The last one, *Governance*, refers

to the companies and institutions administrational aspects like independence of the board, renumeration of the board, incentive schemes, payment of taxes, corruption, and anti-bribery (Finsif, 2021).

In 2020, CFA Institute, the global association of investment professionals promoting standards in ethics, education, and professional excellence in the global investment industry, published a report showing that only 15% over 2 800 investigated members of association are not considering ESG matters in their investment analysis. Figure 2 shows the results of the survey questioning which of the ESG areas CFA members and/or their organizations consider in their investment analysis or decisions.

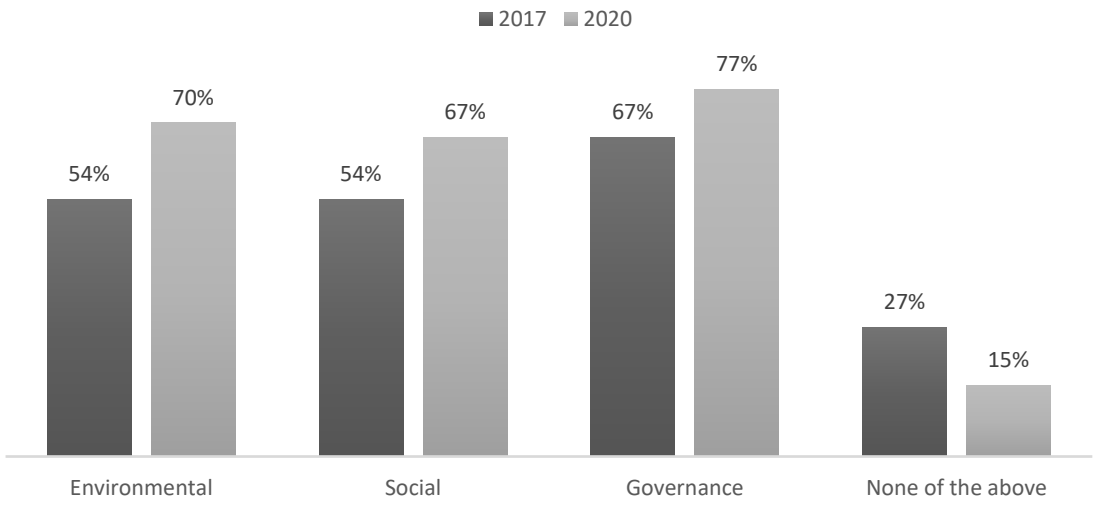

Figure 2. Which ESG areas do you or your organization take into account in your investment analysis or decisions? (CFA Institute, 2020).

In three years, the importance of taking ESG matters into account has grown significantly. In 2020, most of the focus was on the governance aspect. In 2019, one of the world's biggest asset managers JP Morgan & Chase underlines that according to their view, corporate governance issues have the most direct downward effect on the risk-reward profiles of portfolios and that is why the governance aspect is the area that is most integrated to their investment processes. According to JP Morgan's (2019) sustainable investing report, the social and environmental aspects are difficult to assess, and therefore

they are not doing company exclusion explicitly based on these metrics, even though they are considering social and environmental matters.

According to CFA's survey, the biggest reason for organizations to consider ESG issues in investment analysis is because it helps managing investment risks. Clients are also more aware of ESG aspects, and they require companies and asset managers to be accountable about how the responsibility matters are considered in their investments. According to CFA Institute (2020), respondents state that it is their fiduciary duty to take ESG issues into consideration. Asset managers and institutional investors are under pressure to answer clients' questions about the responsibility of investing and that has increased companies reporting requirements (Puttonen & Puttonen, 2021).

In addition to traditional credit rating agencies such as Standard & Poor's, Moody's, and Fitch Rating, an industry of responsibility rating agencies has emerged. Nowadays, various number of different independent agencies are offering ESG ratings for companies. In ESG rating system, companies' responsibility is evaluated through all three dimensions of responsible investing: environmental, social and governance. The way of rating companies with their ESG consideration is not standardized, and different ESG rating providers consider all three dimensions by their own way (Dorfleitner, Halbritter & Nguyen, 2015). This thesis will use ESG scores provided by Thomas Reuters Refinitiv. The definitions for all three dimensions are introduced in Table 1. In more detail, ESG scores will be discussed in the data section.

Table 1. Refinitiv ESG categories and definitions (Refinitiv, 2019).

Dimension	Category	Definition
Environmental	Emission	Company's effort towards reducing environmental emissions in its production and operational processes
	Innovation	Company's commitment towards reducing environmental emissions in its production and operational processes
	Resource use	Capacity to reduce the use of materials, energy or water, and to find more eco-efficient solutions by improving supply chain management
Social	Community	Commitment to being a good citizen, protecting public health and respecting business ethics
	Human rights	Effectiveness in terms of respecting fundamental human rights conventions
	Product responsibility	Capacity to produce quality goods and services, integrating the customer's health and safety, integrity, and data privacy
	Workforce	Effectiveness in terms of providing job satisfaction, a healthy and safe workplace, maintaining diversity and equal opportunities, and development opportunities for workforce
Governance	CSR Strategy	Practices to communicate that company integrates economic, social, and environmental dimensions into its daily decision-making processes
	Management	Commitment towards following best practice corporate governance principles
	Shareholders	Effectiveness towards equal treatment of shareholders and the use of anti-takeover devices

2.2 Corporate Social Responsibility

Corporate Social Responsibility, henceforth referred as CSR, is in addition to ESG, another important term to discuss briefly. For many ESG score providers CSR is included in the governance dimension. In table 2, CSR strategy is mentioned in governance dimension, and it is defined as a company's practice to communicate that it integrates economic, social and environmental dimensions into its daily decision-making process. But like the definition of SRI, neither has CSR one exact or correct definition. Although the ESG has very detailed guidelines of what it means and includes, the concept of CSR is more open to different interpretations.

In 1970, Milton Friedman published a famous article "The Social Responsibility of Business is to Increase Its Profits", which has since gained a great amount of attention. According to Friedman (1970), there is looseness and a lack of rigor in the discussions of social responsibilities of business. Friedman (1970) was against the thought that business has responsibilities saying that only people can have responsibilities, meaning that the presumably individual proprietors and corporate executives are the ones being in responsible. Those executives are employees for the owners of the businesses, and therefore their responsibility is to operate in accordance with owner's desires, which usually means making as much money as possible while conforming to the basic rules of the society, both those embodied in law and those embodied in ethical custom (Friedman, 1970).

The discussion of CSR has then developed from whether CSR should exist to why it does exist and what are the effects of it to the economy. The literature offers three viewpoints on CSR. According to Benabou and Tirole (2010), the first view, 'win-win' vision, considers that being good can also make a firm more profitable. Companies can achieve better financial performance with an inclusion of CSR. The criterion of "doing well by doing good" refers to indirect effect resulting that the firm value is not only going to the shareholders but is also distributed to other stakeholders. By doing unethical short-term moves for rapid profits, corporation might cause damage for their long-term ability to

perform profitable. The outcome of the first view is that CSR is about taking a long-term perspective to maximize profits even though it may cause costs in the short run (Benabou & Tirole, 2010).

The second viewpoint to CSR is called “delegated philanthropy” (Benabou & Tirole, 2010). It states that CSR is emerged as a response to individual societal demands and that CSR policies works as a channel for stakeholders’ fondness to form the society they want. In this view CSR should not take the profit-making approach into account almost at all because stakeholder will make their own decisions about how much increasing financial costs, they are willing to stand to improve their society. Basically, this means that stakeholders demand corporations to be philanthropist on their behalf because individuals do not have resources to create the change, they want by themselves alone (Hart & Zingales, 2017).

The third view interpretates CSR as an insider-initiated corporate philanthropy. According to this view, companies’ behavior is initiated by managements’ and board members’ own desires to act responsibly, rather than stakeholder’s willingness to sacrifice wealth for a good cause. Benabou and Tirole (2010) state that this kind of philanthropy is also highly controversial, as corporations are often giving charities to institutions which their own executives are board members of. To avoid companies to use their assets against the interests of stakeholders, the boards need to be constructed properly (Puttonen & Puttonen, 2021).

2.3 Socially Responsible Investing Strategies

Socially responsible investing has emerged different investment strategies that are used to an increasing extent among investors who desire to consider ESG matters in their investment decisions. Schueth (2003) recognizes three different SRI strategies which are Screening, Community Investing and Shareholder Advocacy. These three are the ones that previous literature generally identifies (Schueth, 2003; Renneboog et al., 2008).

Global Sustainable Investment Alliance (2020) lists seven different sustainable investing strategies which are listed in Figure 3. GSIA (2020) categorize strategies in more detail but basically, these seven different strategies can all be grouped under the three SRI strategies identified by Schueth (2003). Figure 3 also represents the growth of sustainable investing strategies from 2016 to 2020.

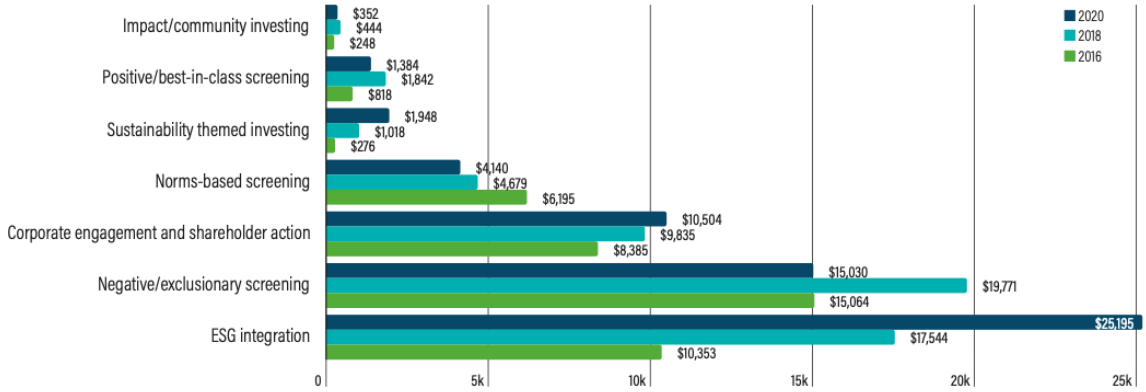

Figure 3. Global growth of sustainable investing strategies 2016-2020 (Global Sustainable Investment Alliance, 2020).

According to GSIA (2020), the most deployed sustainable investing strategy among institutional investors is EGS integration, commonly known as Screening. The second largest is Negative Screening, and third is the strategy that GSIA calls Corporate engagement and Shareholder action, also known as Shareholder Advocacy, a term used for example by Schueth (2003). Notably in Figure 3 the ESG integration strategy has surpassed the Negative Screening strategy in 2020. Among ESG integration and Corporate engagement, Sustainability-themed investing has also shown consistent growth during the whole sample period. In these sustainable investing strategies only Norms-based screening has clear bearish growth trend through the period. The regions that are included in the GSIA (2020) data are Europe, United States, Canada, Australia, New Zealand and Japan.

2.3.1 Screening

Negative screening is the simplest form of responsible investing (Puttonen & Puttonen, 2021). This investing style is also commonly known as avoidance of “sin stocks”, especially in the prior literature (Humphrey & Tan, 2014). Screening strategies are also the

oldest ones to invest responsibly. According to GSIA (2020), negative screening means exclusion of certain sectors, companies and countries whose activities are considered as not investable. Commonly the exclusion criteria refer to product categories such as tobacco, alcohol and weapons or practices like animal testing or violating human rights. Figure 3 also illustrates that negative screening was the most popular sustainable investment strategy in 2016 and 2018.

Auer (2016) finds that a strategy which leaves out all the stocks without ESG score ratings in European stock markets was able to outperform the passive market portfolio. However, the exclusion can create a problem where the returns are expected to decline, or the riskiness of the portfolio might increase as the number of potential investable companies decreases (Adler & Kritzman, 2008). Negative screening can cause undervaluation for excluded companies, and therefore investors could miss opportunities to invest in undervalued companies which could offer bigger profits (Puttonen & Puttonen, 2021).

The opposite to exclusionary screening is positive or inclusionary screening which in the simplest means preferring companies that operate in accordance with investors personal ethics and values. According to GSIA (2020), positive screening is the most common way to integrate ESG as a part of investing. GSIA (2020) defines positive screening as a strategy that picks industries and companies that achieve a positive ESG performance rating above the defined thresholds. GSIA (2020) strongly considers best-in-class as part of positive screening or them as one and same strategy, but according to Renneboog et al. (2011) positive screens are often used with best-in-class approach, which ranks companies within each industry based on chosen ESG criteria. This strategy does not exclude companies from industries that are commonly known as bad, as the best ranked companies from certain industry can be investable if it passes the minimum threshold (Renneboog, 2011).

As seen in the Figure 3 vast majority of investors are not focusing just on negative or positive screening, but rather doing systematic and explicit inclusion of ESG factors into

their decision-making process when doing investments (GSIA, 2020). Renneboog et al. (2008) defines negative screening as the first generation of socially responsible investing screens and positive screening as the second of generation of screens. The third generation of screens is ESG integration which according to Renneboog et al. (2008) means combining first and second generation of screening methods. Renneboog et al. (2008) calls this three-staged approach a sustainable investing approach or triple bottom line as it focuses on people, planet and profit. The fourth generation of sustainable investing involves shareholder activism, which will be introduced next, as a part of investment process (Renneboog et al., 2008).

2.3.2 Shareholder Advocacy

Shareholder advocacy also known as corporate engagement and shareholder action, or shareholder activism refers to strategy of employing the power and role of shareholders influence in companies' behaviour. Shareholder advocacy means participating in annual meetings, voting and communicating directly with managements and boards of directors about the desired changes in companies' policies and operations, with the goal of positively influencing companies' behaviour (Schueth, 2003). This strategy is problematic because proper implementation of shareholder advocacy strategy requires significant ownership in a company (de Colle & York, 2009).

2.3.3 Community Investing

According to Schueth (2003), community investing aims to offer capital to people with a low income or communities that have difficulty accessing it through traditional channels. According to GSIA (2020), in community investing capital can also be directed to businesses that has purpose to create positive social and environmental impact. De Colle and York (2009) state that community investing covers only 1% of socially responsible investing in US. GSIA (2020) reports that during the whole period of 2016- 2020, community investing was the least used socially responsible investing strategy.

Sparkes (2001) states that socially investing can be divided in two separate subclasses, among SRI the other subclass is SDI which means socially directed investment. According to Sparkes (2001), the idea of SDI is accepting unpredictable returns by offering capital for community development. The nature of SDI is controversial because when helping others by doing socially directed investment, investors accept below market returns. Even though the socially responsible investing aims to create more sustainable outcomes, accepting below market returns is not the intention of it, and therefore SDI cannot be seen as an SRI strategy (Sparkes, 2001).

2.3.4 ESG Momentum

ESG momentum is a combination of a traditional momentum trading strategy and ESG integration with attention in companies ESG score development. In finance, the term momentum refers to the phenomenon of stocks that have done well in the past will continue to do well, and respectively stocks that have perform poorly in the past will continue poor performance. The discovery of traditional momentum trading strategy can be attributed to Jegadeesh and Titman (1993) who find that shorting past losers and taking long positions to the top companies based on their past performance led to abnormal returns. Since the study of Jegadeesh and Titman (1993), traditional momentum trading strategy have been studied extensively. Traditional momentum trading strategy will be discussed more extensively in the section 3.3.

In ESG momentum strategy, the momentum perspective is utilized by looking at the companies past ESG score performance. This is where ESG momentum strategy drastically differs from traditional SRI strategies as they are sorting companies based on their absolute ESG scores. ESG momentum is relatively new and unexplored compared to SRI strategies introduced earlier. It seeks to find financial outperformance with ESG improvers, meaning that the hidden financial performance potential can be revealed by looking at the ESG score improvement. An investment is not made in the top ESG performers but to the ones that has shown their potential as an ESG score improver. Shifting the focus away from absolute ESG scores such as in the positive and negative screening methods,

to the ESG score improvement expands the potential investment universe (UBS, 2018). Nagy, Cognan and Sinnreich (2013) were first to study the performance of ESG momentum strategy showing promising results about its profitability, and as SRI investors are constantly looking for new responsible investing methods which with outperform the markets, several studies such as Nagy et al. (2016), Verheyden et al. (2016), Pollard et al. (2018), have since been made about the ESG momentum strategy. Those studies will be introduced in the literature review chapter.

The foundation of ESG Momentum is in the studies showing the positive correlation between ESG scores and corporations' financial performance. The study of Friede, Busch and Bassen (2015) observed 2200 studies about the correlation between ESG scores and corporations' financial performance (CFP). From 90% of studies observed, Friede et al. (2015) found nonnegative ESG-CFP relation while a vast majority of studies observed in the paper reports positive findings and since mid-1990s, the positive ESG-CFP-correlation in primary studies have been stable over time.

Sorting ESG improvers can be problematic because even if there are quite clear guidelines to determine ESG criteria, the ESG momentum indicators are not standardized and there is no one correct method of implementing ESG momentum strategy because different studies have their own approach to the implementation of ESG improvers and ESG weakeners as some studies weight losers and winners with fifty-fifty-ratio in portfolio while some studies are just focusing on the ESG improvers, eliminating the shorting element completely. It is also possible that improvement in the ESG scores is not solely due to real improvements in company's actions, but simply because of the changes in methodologies of weighting different criteria, or deterioration in industry comparable ESG performance. ESG momentum strategy is also disputable from the perspective of socially responsible investing since the strategy invests in the companies that can have relatively low absolute ESG score even if the improvement of the ESG score has been remarkable (USB, 2018). The implementation of ESG momentum strategy and portfolio construction of this thesis will be introduced in the chapter five.

3 Theoretical Framework

This chapter attempts to create a theoretical outline that can support the analysis of anomalies such as Momentum and ESG Momentum in stock markets. Standard finance theory will be introduced with the focus on the Efficient Market Hypothesis and different levels of efficiency. This chapter also covers the portfolio performance measurement metrics used in the study and introduces momentum trading strategy as it will be an essential part of the portfolio construction in this thesis.

3.1 Efficient Market Hypothesis

In 1970, Eugene Fama provided a platform to define efficient markets. In his paper "Efficient Capital Markets: A Review of Theory and Empirical Work", Fama (1970) described an efficient market as a situation where prices fully reflect all available information. Firms' stock prices react immediately and correctly after publishing new information. Efficient market hypothesis was supported by the Fama's (1965) random-walk theory which suggests that price changes are independent, identically distributed random variables, meaning that history cannot be used to predict the future in any significant way. Fama (1970) stated that investors are not able to make abnormal returns (unless by chance) at efficient markets by using existing information to guide their buying and selling decisions. Fama (1970) divided the empirical test of efficiency into three distinct forms of efficiency. These forms differ by their notions of what is denoted by the term "all available existing information" (Bodie, Kane & Marcus, 2014).

First, the weak form of efficiency assumes that stock prices reflect all information that is available. This information means historical data of prices, trading volume, and short interest rates. Since all data on prices is effectively available, technical analysis is useless. If something new comes to the market through this reliable information on future prices, investors would use it immediately (Bodie et al., 2014). According to Sharpe, Alexander and Bailey (1999) investors may be overreacting to certain kind of information, driving

security prices momentarily away from their fair values. Because of this, it may be possible to gain abnormal profits buying oversold securities and selling those whose prices have been bid up immoderately. A good example of this is the returns generated by using momentum strategies, which are based specifically on utilizing the past stock prices (Sharpe et al., 1999).

Then, the semi-strong form efficiency that states in addition to historical stock prices all publicly available information companies and their future prospects have, are already tied to stock prices. In addition to pricing information, semi-strong form efficiency includes information about products, management's quality, balance sheet structure, patents, accounting practices, and future revenue prospects (Bodie et al., 2014). Event studies are traditionally used to test the semi-strong efficiency. The purpose of event studies is to accurately locate and record events, such as earning announcements or stock splits, to see whether these events have direct impact on changes in stock prices (Fama, 1991). Usually, the semi-strong form of efficiency is the most supported subset of the concept of EMH.

Finally, the strong form of efficiency that contains information from the levels above but also includes the information that is available only to company insiders. The insiders have, at least in theory, access to information which is not yet publicly known and thus reflected in stock prices (Bodie et al., 2014). There are many inaccuracies in the strong form efficiency which also Fama mentioned in his paper in 1970. In 1991, Fama touched this subject again concluding that since there are positive information and trading costs, the strong form version of the market efficiency hypothesis is surely false. However, Fama (1991) emphasized that the Efficient Market Hypothesis will still be useful to serve as a benchmark for further studies.

Although the studies have shown that in the long-term markets are working at least at a semi-strong form of efficiency, in the 1980s there was some concern among researchers about the functioning of the market. There were doubts for example whether strong

stock price reactions in the market could only be the result of changing expectations, or whether there could still be pricing errors on the market that would allow sharp-eyed investors to generate abnormal returns. EMH was called into question through the existence of anomalous returns to assets when researchers were able to find different deviations from market efficiency.

Anomalies are an empirical results of long-time pricing behavior that contradicts the traditional efficient market hypothesis. According to Schwert (2002), these deviations indicate either market inefficiency or insufficiencies in the underlying asset pricing models. Anomalies can be divided into those analyzed through technical analysis, those based on fundamental analysis and to calendar anomalies (Pompian, 2012). However, the attitude towards anomalies is ambiguous and according to Schwert (2002), anomalies tend to weaken or even disappear after they are publicly presented. The transience of most anomalies implies that their existence is more apparent than real. However, even if Schwert (2002) emphasizes the transience of anomalies such as the company size effect, the weekend effect, and the value effect, he was unable to demonstrate the same transience in the case of the momentum effect. An explanation for the persistence of the momentum over time may be the yet unidentified risk premium that explains the abnormal returns. The momentum anomaly has attracted considerable attention because the consistent profitability of the strategy poses a strong challenge to the efficient market hypothesis, and it will be discussed in more depth in the next section.

3.2 Momentum anomaly

Jegadeesh and Titman (1993) documented that a trading strategy that buys past winners and sells past losers produced outstanding abnormal returns. Past winners refer to stocks whose price have been increasing most during 3 – 12 months. Whereas past losers refer to stocks whose price have been decreasing most during a similar time period. In their trading strategy Jegadeesh and Titman (1993) used data from the U.S. stock market from 1965 to 1989, forming sixteen strategies of portfolio formation periods from 3 to

12 months with holding periods between 3 and 12 months. Based on their past returns, stocks were divided into deciles. Stocks in the best performing decile were bought, and the stocks in the worst performing decile were sold. The same set of sixteen strategies were then tested again leaving out a week between the portfolio formation period and the holding period to avoid the bid-ask spread, price pressure and lagged effect of reactions that could belie the evidence. In each month, securities were sorted in ascending order based on their past month's performance. Based on these rankings, Jegadeesh and Titman (1993) divided companies into equal weight decile portfolios and bought the winner portfolio and sold the loser portfolio each month.

The most examined strategy, where selected stocks were based on their past six month returns and held for six months, realizes an excess return of 12.01% per year on average. Jegadeesh and Titman (1993) found that the strategy with 12-month formation period and three-month holding period was the most successful, obtaining 1,49% return in a month. To explain the results of the study Jegadeesh and Titman (1993) stated that it is possible that the market underreacts to information about the firms' short-term prospects, while long-term prospects may be overreacted. The results were also interpreted that transactions of momentum trading strategy would lead the stocks temporary shifting away from their long-term values and thereby causing the overreaction of the prices. Jegadeesh and Titman (1993) also noted that there will be certainly better explanations for their results, and even if they were able to expose the momentum effect, they still left holes in their research on how to identify empirical regularities that allow the momentum trading strategy to gain abnormal returns.

Chan, Jegadeesh, and Lakonishok (1996) approached the existence of momentum to seek to find sources of the identifiable of the future stock returns based on past stock returns. According to them, the evidence of momentum in stock prices suggest that markets are underreacting to past earnings announcements. Like Jegadeesh and Titman (1993), also Chan et al. (1996) created a portfolio based on stocks past returns. That portfolio managed to generate 8.8% excess return during the first six months, and 15.40%

during 12 months. However, Chan et al. (1996) noticed that momentum profits were notable only at mid-long time periods, especially returns for the past winners were significant only in the first subsequent year. During the second and third years, the profits from the momentum strategy were not significant anymore. Chan et al. (1996) also found that the results cannot be explained by size and book-to-market effects. Their alternative explanation for the results of the study was that the market is gradually responding to new information. Market reaction and the effectiveness of reaction were reviewed at the time of earnings announcements and 41% of the returns during the momentum strategy's holding period came around the time of companies' earnings announcements. Chan et al. (1996) showed that the market tends to attach too much importance to past information. Investors are cautious about the information that is against their way of thinking and a gradual change of mindset causes a delayed reaction. And even though the study documented data favoring that momentum strategy is affected more or less by underreaction to some pieces of information, they failed to find a variable to predict returns for momentum.

Rouwenhorst (1999) examined the existence of momentum in emerging markets and gained further evidence that the global risk factor cannot justify the momentum returns. Rouwenhorst (1999) implemented the momentum strategy differently than Jegadeesh and Titman (1993). Stocks were ranked by their past six-month performance and instead of deciles, Rouwenhorst (1999) divided stocks into winners (top 30%), average (middle 30%) and losers (bottom 30%) after disregarding the top and bottom five percent. The stocks were then held for six months. Results from the emerging markets proved that the existence of momentum in emerging market is very similar to the developed market.

In 2001 Jegadeesh and Titman proved that momentum profits have continued into the 1990s. Although the 1993 study by Jegadeesh and Titman was remarkable and the first one to present the effectiveness of the momentum phenomenon as a profitable investment strategy, it also received criticism, and some argued that the results were a product of data mining. In 2001 Jegadeesh and Titman used a sample period from 1990 to 1998,

and documented results showing that momentum strategies have continued to be profitable from the years of an original Jegadeesh and Titman (1993) study. This finding also indicated that investors have not altered their investment strategies in a way that would eliminate the use of stock price predictability, which again added the belief that behavioral models can explain the momentum returns.

Momentum trading strategy implemented by Jegadeesh and Titman (1993) is also called cross-sectional momentum and it is used as the basis for stock selection in the majority of momentum studies. In cross-sectional momentum stocks are assigned to the winner and loser portfolio based on their relative performance (i.e., based on the performance against an index, sector or a defined peer group). Cross-sectional approach ranks all stocks based on their performance over the formation period with the best performing stocks forming the winner portfolio and the worst performing stocks forming the loser portfolio (Bird, Gao & Yeung, 2017).

Another approach to implement momentum strategy is with time series momentum which was introduced in 2012 by Moskowitz, Ooi and Pedersen. In time-series momentum stocks are assigned to winner and loser portfolios on absolute basis which means focusing solely on absolute return that a stock achieves over a specified time span but not against to the other stocks. In time series momentum's portfolio construction, the stocks in the universe are allocated to the winner and loser portfolios based on a specified threshold which means assigning, for example, stocks that recorded over 5% return over the formation period to the winner portfolio and stocks that recorded below -5% return to the loser portfolio. Moskowitz et al. (2012) found a significant abnormal returns with time series momentum in equity indexes, currencies, commodities and bond futures during 1965-2009. Bird et al., (2017) compared the performance of cross-sectional and time series momentum recording significant profits with both approaches but finding the time series approach the most profitable among these two during the sample period of 1992-2012.

3.3 Portfolio Evaluation Metrics

As the focus of this thesis will be to construct portfolios and evaluate their performance and factor exposures, the use of different asset pricing models will be essential. This section of theoretical background covers the asset pricing models from CAPM to Fama and French models and introduces the Carhart 4-factor-model.

3.3.1 CAPM

The Capital Asset Pricing Model (CAPM) is often considered as the centerpiece of modern financial economics as well as the world's most well-known pricing model for securities. The Capital Asset Pricing Model was formed independently by Sharpe (1964) and Lintner (1965) who based their research on the foundations of Harry Markowitz's (1952) portfolio theory. According to financial theory, the required rate of return should be forming on two parts. The first part comprises the risk-free return, and the second part contains a risk premium based on beta and the systematic risk. To determine the risk premium for a single portfolio, the market risk premium should be multiplied by the beta of the portfolio in question. The beta coefficient is the covariance between portfolio return and market portfolio yield, divided with the variance of the market portfolio. The formula for CAPM is denoted as follows:

(1) $$E(r_i) = r_f + \beta_i\left[E(r_m) - r_f\right]$$

where $E(r_i)$ is the expected return for portfolio i, r_f is the risk-free return, β_i is the systematic risk exposure for portfolio i, and $E(r_m)$ is the expected return of market portfolio (Sharpe, 1964). However, the functionality of the Capital Asset Pricing Model requires several assumptions when testing the practicality of the model. Under these assumptions all investors:

1. *Are mean-variance optimizers and rational.*
2. *Have the same holding period.*

3. *Have homogenous expectations.*
4. *Can lend or borrow at a common risk-free rate of interest.*
5. *Can trade without taxation and transaction costs.*
6. *Deal with publicly held assets and trade on the public exchange, while short positions are allowed.*
7. *Assume that all information is publicly available.* (Bodie et al., 2014.)

Despite being held at the center of financial theory through the years CAPM has also been the subject of much criticism. The feasibility of the model's assumptions has raised great concern among researchers. Most of the individual behavioral aspects of assumptions or the assumptions related to the market structure are not met in the real financial markets. Studies have shown the problematic nature of CAPM in empirical testing already at an early stage. Roll (1977), for example, stated that testing the model is way harder and complicated than thought. According to him, most of the CAPM tests may be invalid because the market portfolio of the model should contain all the securities worldwide which makes determining the correct market portfolio statistically elusive. Fama and French (2004), as well showed that the version of the CAPM developed by Sharpe and Lintner cannot withstand empirical testing. Nevertheless, according to Fama and French (2004), CAPM works as a useful introduction to understand the fundamental concept of asset pricing.

CAPM can also be presented graphically with security market line as seen in the Figure 4. In Figure 4, M denotes the point where the market portfolio positions on the security market line (SML). The beta of an asset is a measure of systematic risk, and for the market portfolio beta is considered as one. All the other components of SML are the same as in the capital asset pricing model itself and the assumptions for CAPM also hold for SML.

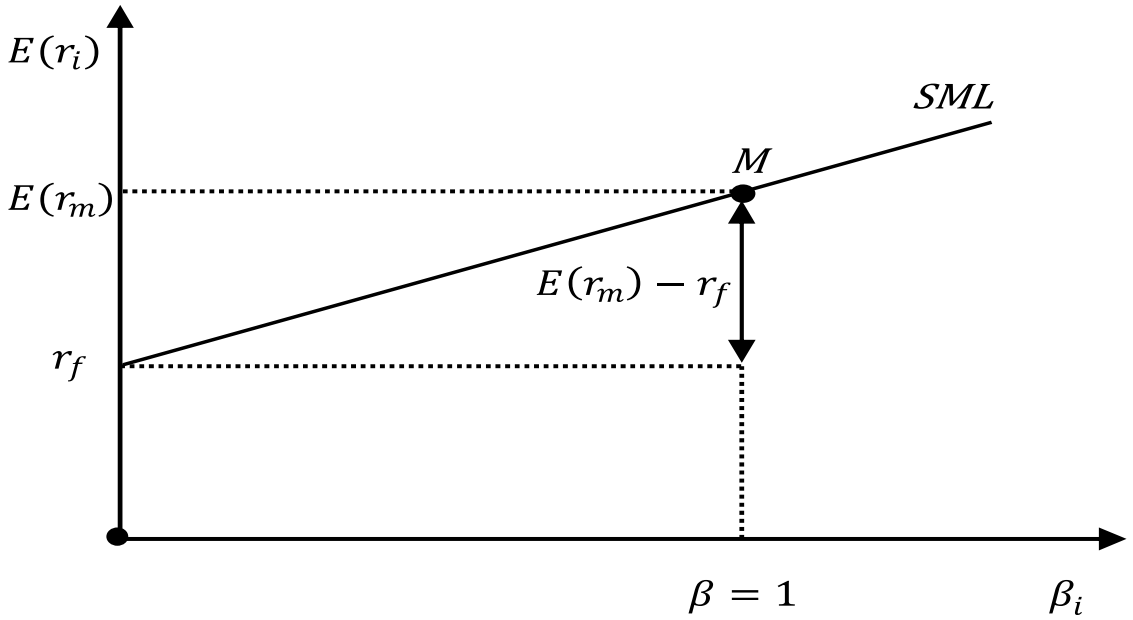

Figure 4. Security Market Line as a graphical presentation of CAPM (Roll, 1978).

The security market line is used to determine whether or not an asset offers a favorable expected return, given its level of systematic risk compared to the market portfolio. If an asset offers an expected return that is greater than the market's for given level of risk, it will be plotted above the SML and considered as underpriced. Assets that offer expected return lower than the markets for a given systematic risk level are plotted below the SML and therefore considered as overpriced.

3.3.2 Jensen's alpha

Jensen's alpha aims to measure whether the average return of the portfolio exceeds the theoretical expected return of the portfolio. In Jensen's alpha, the measure of return is based on the theoretical performance of the portfolio rather than the market index. When the alpha is positive, the portfolio's return exceeds the risk-adjusted return, meaning it generates abnormal return. When the alpha is less than zero, the portfolio's return is less than its risk-adjusted return. The ratio created in 1968 by Michael Jensen goes as follows:

(2) $$\alpha_p = r_p - [r_f + \beta_p(r_m - r_f)]$$

where: r_p = portfolio return

r_f = risk-free rate

β_p = beta of the portfolio

r_m = market return

3.3.3 Sharpe ratio

In 1966, William Sharpe created a well-known risk-adjusted performance measure called Sharpe ratio, which will be introduced below. Sharpe ratio compares the expected return on an investment with the volatility of its return, meaning how much additional percentage of return is achieved for each unit of risk. The ratio describes the amount of risk that must be taken to obtain a certain amount of return. Sharpe revised the ratio in 1994, and defined the formula for his measure as follows:

(3) $$SR = \frac{(r_p - r_f)}{\sigma_p}$$

where: r_p = portfolio return

r_f = risk-free rate

σ_p= standard deviation of the portfolio.

3.3.4 Sortino ratio

Sortino ratio is a variant of the Sharpe ratio. While Sharpe ratio penalizes both up- and downside volatility equally, the Sortino ratio accounts only for the downside risk. The ratio, created by Frank Sortino (1994) goes as follows:

(4) $$S = \frac{E(r_\alpha - r_f)}{\sigma_d}$$

where: $E(r_\alpha - r_f)$ = excess return over risk-free rate

σ_d= standard deviation of negative returns.

3.3.5 Fama-French three-factor model

Fama and French discovered that the CAPM's beta coefficient alone could not explain stock or bond returns because there are also other company-specific factors that affect returns. Due to CAPM's poor empirical test performance, Fama and French (1993) created The Fama and French Three Factor Model (FF3) that can be considered as the next evolution step in asset pricing.

This factor model expands the set of variables by adding the size (SMB) and book-to-market (HML) variables along with the excess market yield ($r_m - r_f$), to explain returns. Size variable describes the difference between the returns of small and large stock portfolios, capturing the size premium. Book-to-market variable shows the difference between the returns on high book-to-market and low book-to-market stock portfolios, which, according to Fama & French (1993) can be used to explain the value premium of returns. The regression for The Fama and French Three Factor Model goes as follows:

(5) $$R_i - R_f = \alpha_i + b_i(r_m - r_f) + s_i SMB + h_i HML + \varepsilon_i,$$

where:

R_i is the return on portfolio i,

R_f is the risk-free return,

α_i is the intercept of the regression for portfolio i,

b_i is the factor beta for market premium,

s_i is the factor beta for size premium,

h_i is the factor beta for book-to-market premium,

ε_i is the product of other factors affecting portfolio i.

The three-factor model received evidence of its robustness by capturing many of the cross-sectional variations in average stock returns. The model was also capable to capture most of the anomalies that caused problems with the functionality of the CAPM. Fama and French (1996) noticed that the model is favoring the returns on portfolios formed on size and book-to-market-equity.

3.3.6 Carhart four-factor model

Carhart (1997) found that the mutual fund managers' performance was not representing their skills in stock-picking, rather the performance was based on a few factors that then commonly used asset pricing models could not capture. In order to explain risk-adjusted returns better, Mark Carhart (1997) suggested to capture the effect of momentum anomaly by adding a fourth factor, winners-minus-losers (WML), to Fama and French three-factor model. According to Carhart four-factor model, the expected return on portfolio i is:

(6) $$R_i - R_f = \alpha_i + b_i(r_m - r_f) + s_i SMB + h_i HML + p_i WML + \varepsilon_i,$$

where:
R_i is the return on portfolio i,
R_f is the risk-free return,
α_i is the intercept of the regression for portfolio i,
b_i is the factor beta for market premium,
s_i is the factor beta for size premium,
h_i is the factor beta for book-to-market premium,
p_i is the factor beta for momentum premium.

3.3.7 Fama-French five-factor model

In 2015, Fama and French added profitability and investment factors to their three-factor model to explain variations in average returns that the previous model could not capture.

The three-factor model shown above was added by terms Robust minus Weak (RMW), which describes the difference between the returns on portfolios of stocks with robust and weak profitability, and Conservative minus Aggressive (CMA) which shows the difference in returns on portfolios between firms with low and high investment policies. Fama and French (2015) found that positive exposure to RMW and CMA capture the high average returns associated with low market beta, low stock return volatility and share purchase. The improved model was called The Fama and French five-factor model and goes as follows:

(7) $R_{it} - R_{Ft} = a_i + b_i(R_{Mt} - R_{Ft}) + s_i SMB_t + h_i HML_t + r_i RMW_t + c_i CMA_t + e_{it}$,

where:

R_{it} is the return on portfolio t,

R_{Ft} is the return on a risk-free rate,

a_i is the intercept of the multivariate regression,

$b_i(R_{Mt} - R_{Ft})$ is the factor beta for market returns multiplied by market return,

$s_i SMB_t$ is the factor beta for Small minus Big multiplied by returns on SMB,

$h_i HML_t$ is the factor beta for High minus Low multiplied by returns on HML,

$r_i RMW_t$ is the factor beta for Robust minus Weak multiplied by returns on RMW,

$c_i CMA_t$ is the factor beta for Conservative minus Aggressive multiplied by returns on CMA, and e_t is the product of factors affecting portfolio t.

3.3.8 Fama-French six-factor model

In 2018, Fama and French upgraded the model by adding a momentum factor to their five-factor model. The momentum factor UMD (up minus down) describes the momentum effect demonstrated by Jegadeesh and Titman in 1993. UMD factor shows the difference between portfolio with best recently performing stocks against the portfolio consisting of stocks with worst recent performance. With an UMD augmentation to the Fama & French 5-factor model the six-factor model is expressed as follows:

(8) $$R_{it} - R_{Ft} = a_i + b_i(R_{Mt} - R_{Ft}) + s_i SMB_t + h_i HML_t + r_i RMW_t + c_i CMA_t + m_i UMD_t + e_{it}$$

Fama and French (2018) found that among tested models the six-factor model won which suggest the use of six-factor model to explain excess returns over other multi-factor models. Competing models in the study were capital asset pricing model, three-factor model, five-factor model, and six-factor model.

4 Literature Review

Even if the academic evidence of the performance of ESG momentum strategy remains narrow and the strategy is relatively unknown, recent studies have provided very promising results. The ESG momentum strategy was first studied in 2013 by Nagy, Cognan and Sinnreich. They analyzed three different ESG-tilted strategies. The first one was ESG worst-in-class exclusion which excludes companies with the lowest ratings. The second ESG strategy was simple ESG tilt which emphasizes stocks with their absolute ESG score, without exclusion of any stocks based on their ESG rating. In ESG tilt, portfolio is overweighted with stocks that has high ESG rating and underweighted with stocks with low rating. The third studied strategy was ESG momentum. In ESG momentum approach, Nagy et al. (2013) overweighted stocks with the improvement in ESG rating during previous 12 months while underweighting stocks whose ESG rating has decreased over the same period. In their research Nagy et al. (2013) used Intangible Value Assessment (IVA) ratings and BARRA global equity model GEM3 from MSCI ESG Research to build optimized portfolios with improved ESG ratings. Their goal was to keep risk, performance, country, industry and style characteristics similar to MSCI world index which served as benchmark in their study. Portfolios were rebalanced in accordance with the change in ESG ratings every 12 months.

During the sample period of 2008-2012 all three tested strategies generated positive abnormal returns but the best returns were achieved with the ESG momentum strategy which gained 0.35% of positive annual abnormal return compared to the benchmark with information ratio of 0.97. ESG exclusion and ESG tilt strategies resulted 0.10% and 0.05% annual abnormal results with information ratios of 0.23 and 0.10 respectively. Nagy et al. (2013) also found that decreasing ESG rating tends to be reflected into the stock prices quicker and cause stronger react than ESG upgrades which implies that investors are emphasizing short term risk rather than focusing on long term ESG opportunities. For ESG momentum portfolio the positive abnormal returns were mostly explained by company specific factors.

In 2016, Nagy revisited the ESG momentum research with Kassam and Lee. In the new study the focus was purely on ESG tilt and ESG momentum strategies and the worst-in-class exclusion strategy was left out. Nagy et al. (2016) used MSCI ESG data as in the previous study and extended the time series by two more years in order to improve statistical confidence in the results. As the study of Nagy et al. in 2013 was more of a test of the ESG strategies, in the new study Nagy et al. (2016) treated ESG data as an alpha in the portfolio construction process. They also studied higher risk strategies allowing higher weightings, helping to reveal ESG rating relative to other factors.

The results of the new study were aligned with the first ESG momentum study. Annual abnormal return for ESG momentum strategy was 2.2% and the strategy performed well throughout the whole sample period compared to ESG tilt strategy which recorded 1.1% annual abnormal returns with far less consistent performance. Nagy et al. (2016) state that the ESG momentum strategy is more short-term focused strategy compared to ESG tilt. The performance of ESG momentum came mostly from the stock-specific return which contributed 1.32% of abnormal returns but style and industry factors also had significant effect. Most of the active risk in the ESG momentum came also from stock-specific factors. From firm-specific factors the mid-cap contributed most of the outperformance, but ESG momentum also had momentum as one of the explanatories for abnormal returns.

Differing from other studies Verheyden, Eccles and Feiner (2016) studied ESG momentum in developed countries using Carhart 4-factor model with the sample period of 2010 to 2015. The study was not purely focusing on ESG momentum as portfolios were tested with an inclusion of different ESG screening methods. Verheyden et al. (2016) constructed six portfolios with different thresholds, finding that all portfolios with ESG momentum criteria included outperformed their benchmark portfolios and additionally generated the most significant abnormal returns. Verheyden et al. (2016) also found that portfolios having companies only from developed countries recorded higher risk-adjusted and annualized returns than global portfolios.

In 2019, Giese, Lee, Melas, Nagy and Nishikawa studied ESG momentum briefly in one of most recent papers. The study used sample period of 2009 to 2017, with Morgan Stanley Capital International ESG ratings data and financial variables. To test the financial significancy of ESG momentum as an indicator and link to returns, Giese et al. (2019) studied historical performance between top ESG momentum quintile and bottom ESG quintile. The top ESG momentum quintile showed significant outperformance over bottom quintile, indicating that an improvement in ESG criteria leads to increasing valuations over time. ESG momentum portfolio also outperformed the benchmark which was MSCI world index. Results of these test were statistically significant and according to Giese et al. (2019), the significance could be improved with longer time series which will be needed for the future research. Giese et al. (2019) suggest that ESG momentum can be used as an individual financial indicator or with ESG tilt in portfolio construction.

PRI, the United Nations-supported network of responsible investors have also studied financial performance of ESG integration with ESG momentum approach. PRI (2018) analyzed ESG momentum and ESG tilt strategies across the world building USA, Europe and Japan focused portfolios. The results with data from 2008 to 2017 showed strong performance of ESG momentum over the ESG tilt strategy in three out of four tested regions. ESG momentum generated higher annual information ratios with World, USA and Japan portfolios over the comparable ESG tilt portfolios. The annual information ratios for ESG momentum in World, USA, Europe and Japan were 0.72, 0.69, 0.44 and 0.65 respectively, Europe being only region were the ESG tilt strategy outperformed ESG momentum with information ratio 1.00. According to PRI (2018) the main source for ESG momentum's performance over ESG tilt came from the specific factors which indicate the idiosyncratic risk and return. In the PRI (2018) study, the annual returns for World and USA portfolios were 1.75% and 1.97% for the ESG momentum strategies. Notably the ESG tilt strategy gained -0.15% annualized return in USA, which indicates significant outperformance of ESG momentum strategy. In the study, the annual returns for Europe and Japan portfolios were not introduced in detail. The active cumulative return during the sample period

for ESG momentum was 18.84% in USA and 16.82% with global portfolio. World and USA portfolios also had higher average ESG score in ESG momentum portfolios versus the average ESG score of the benchmarks which were MSCI World and MSCI USA.

Sustainability research provided by Société Générale (2019), offered results similar to PRI (2018). In Société Générale (2019) study, researchers found that during the sample period of 2013 to 2018, positive ESG momentum portfolio outperformed the performance of the top 30% ESG-rated stocks. Positive ESG momentum strategy that buys companies with at least 10% improvement in their ESG score year-over-year, outperformed the benchmark index STOXX600 by 23.5%. Countries that performed well in the study with positive ESG momentum were France, Germany, Netherlands, Norway, Portugal and Spain whereas Italy, Sweden and UK were the countries in which the top 30% companies with positive momentum underperformed against the benchmark in most years.

Even if not solely focusing on ESG momentum, there are several empirical studies showing that changes in ESG ratings have a statistically significant effect on cumulative returns. Bansal, Wu and Yaron (2016) found that reduction in companies ESG ratings leads to significantly lower returns. According to Bansal et al. (2016), the negative change that causes negative abnormal returns is related to unexpected shocks to the companies' CSR practices. In 2021, Bansal et al. found that especially during good economic times, the reduction in companies ESG ratings lead to lower abnormal returns. Bansal et al. (2021) also announce that positive abnormal returns are generated because of positive CSR-related news more likely during good economic times than during bad economic times.

5 Data and Methodology

This chapter presents the data set and methodology. The purpose of this section is to give a justification why the certain data is selected to be used and how the portfolios examined in this study are constructed.

5.1 Data

This study uses data from the Nordic stock market which is, compared to U.S equity market, relatively small and new equity market. Nordic stock market consists of five countries which are Denmark, Finland, Iceland, Norway and Sweden. In line with previous studies such as in Grobys & Huhta-Halkola (2019), this study does not include Iceland stocks because Iceland is the smallest stock market in terms of market capitalization and is therefore often omitted in empirical studies.

Nordic stock market has developed significantly in recent decades, and it has become more attractive for foreign owners to enter Nordic markets. Compared to U.S. stock markets Nordic stock market is very small but offers a great opportunity for investors and researchers as the dynamics are slightly different in the Nordics markets. Compared to emerging countries and their economies, Nordic countries are very low in corruption and can offer stable political environment with low credit risk. Nordic countries are also to some extend global frontrunners promoting sustainability and making socially responsible investment acts, both at the government and corporate level. As many studies have shown the results can be heavily affected by sample-specificity and therefore it is relevant to expand the sample universe outside U.S. and emerging market which have been the focus areas in most recent literature related to ESG Momentum.

The data for this thesis is collected from Refinitiv and the Thomson Reuters DataStream using data from OMXH, OMXSPI, OSEBX and OMXC main listed companies' historical returns and financials from December 2009 to December 2020. This study will exclude

Nordic First North listed stocks as they usually refer to the smallest companies in the stock exchange in terms of market capitalization and trading volume. The smallest companies also tend to not have a ESG rating which would cut them out anyway since this study includes only companies that have been granted with ESG rating. Due to the availability of ESG ratings the final sample size ranges from 104 companies in the year 2009 to 294 companies in the year 2020. The number of companies with ESG ratings increases gradually during the sample period, and therefore the number of companies which can be included to the investment universe also increases. Table 3 presents the descriptive statistics of companies in the sample.

Table 2. Descriptive statistics of companies in the sample

	Finland	Sweden	Denmark	Norway	Total
Max number of stocks	41	161	46	46	294
Min number of stocks	23	45	21	15	104
Number of stocks on average	27	73	29	22	151

As seen in the table 2, the clearest majority of stocks in the sample are Swedish. Swedish stock market is also the biggest marketplace of the above-mentioned and therefore it is natural that there will also be biggest number of companies with ESG ratings. This study does not exclude stocks of financial institutions. If the company has had two or more stock series listed, the one with higher liquidity is included. For companies whose shares are dual listed on a stock exchange outside their home country, only the shares listed in the company's home country are included in the sample. Stock returns are adjusted returns and they calculated by using the logarithmic return which formula goes as follows:

(9) $$R_t = ln\left(\frac{P_t}{P_{t-1}}\right)$$

where R_t is the monthly change in the stock price, P_t is the stock price at time t, $P_{t-1}$is the corresponding value month prior and ln is natural logarithm.

As a benchmark index for this study, the combination of Helsinki, Stockholm, Oslo and Copenhagen all share indices is used. The index is constructed in a way that it follows a similar country-specific weighting as in the data set used in the study, meaning that, for example, the Swedish all share index gets the biggest weighting. The returns of benchmark index are adjusted in similar manner as in portfolios in this study. As the constructed benchmark index is all-share index, it includes, unlike the portfolios in this study, also the returns of the smallest stocks on the stock exchange. This method makes the index returns high and makes it more difficult for the portfolios constructed in this study to generate alpha.

This study uses data set with ten-year time span since the ESG scoring is a relatively new factor and before 2009 there were very limited amount of ESG scores given for Nordic companies. ESG score ranges between 0 and 100, from lowest to highest respectively and their nature in this data set is presented in the table 3. The highest ESG score of companies included in the sample is 94.38 whereas the lowest is 1.31 meaning that there are significant differences between the values in ESG scores between different companies. The mean value for ESG score for the whole sample is 54.60.

Table 3. Descriptive statistics of ESG scores for companies in the sample

	Finland	Sweden	Denmark	Norway	Total
Mean	60.08	55.22	51.17	50.56	54.60
Median	62.59	56.86	53.12	52.27	56.44
Standard deviation	17.06	19.82	17.45	20.69	19.32
Minimum	13.39	2.97	1.31	11.07	1.31
Maximum	91.72	94.38	84.76	90.42	94.38

This thesis will investigate whether the ESG Momentum portfolios can generate excess returns, so determining correct risk-free rate is important. The risk-free rate used in this thesis is an average of 6-month Euribor, Stibor, Nibor and Cibor. Using a 6-month interbank rates will give higher risk-free rate than using 3-month interbank rates, which means that results of this study should be slightly more conservative. Using Nordic

interbank rates instead of US Treasury bill, which many studies consider as a risk-free rate, gives a more accurate picture of the risk-free rate when investing in Nordic stock market.

5.2 Methodology

Earlier studies have shown that the threshold of how companies are included to momentum portfolios has significant impact on portfolio performance. In 1993, when studying the momentum portfolios, Jegadeesh and Titman found that using only stocks in the top and bottom decile for long-short portfolio, yielded better than using lower threshold with all available stocks in the sample universe. Bird et al. (2017) also found that including more stocks to momentum portfolios with lower threshold ate up all statistically significant returns. In this study, ESG Momentum portfolios are created by considering different thresholds in the portfolios. Additionally, the performance of long-only and short-only portfolios will also be discussed in the chapter 6.

Using the above-described data set, three different long-short portfolios with different thresholds are created based on the development of ESG scores. Each year, the stock universe is ranked into winners and losers, depending on company's ESG score development. By winners this study refers to companies with the best positive development in their ESG score during the year while losers refer to companies with the worst development in ESG score during the year. With the described method, the portfolios are re-constructed after every year based on the change in the ESG score from the previous year. The portfolios for 2010 are constructed based on the ESG score development during years 2009–2010, and then the chosen stocks are held for a year and after a year the re-construction is done by ranking the stocks again with ESG score development.

The first examined ESG Momentum portfolio divides all the stocks in the investment universe to winners (Top 50 %) and losers (Bottom 50 %) taking a long position to winners i.e., the companies with best ESG score development and short position to losers i.e.,

the companies with worst ESG score development. With the identified set of winners and losers, the ESG Momentum portfolio can also be formed. ESG Momentum is an illustration of winners minus losers. All portfolios in this study are equally weighted according to the number of companies in the portfolios each year.

The second ESG Momentum (winners minus losers) portfolio raises the stock inclusion threshold by dividing the stock universe into thirds according to their ESG score development and takes a long position in the top third (winners) and short position in the bottom third (losers). This method decreases the number of stocks in the portfolios.

The third ESG Momentum portfolio only consider top and bottom decile i.e. the top ten percent and the bottom ten percent of the stocks ranked by their ESG score development, taking a long position in the companies in top decile (winners) and taking a short position to bottom decile (losers). Considering only top and bottom decile of stocks in the ranking decreases the number of companies in the portfolios drastically raising the company specific risk.

With only top and bottom deciles in the portfolio, the returns are sought only at the extreme ends of the stock universe, which means that companies in the middle of the ranking based on ESG score development, with very small development in their ESG score in one direction or the other, are excluded. Some earlier studies form portfolios by taking a long position to all companies with positive ESG score development and short position to all companies with negative ESG score development. This method would not be relevant to use with so recent Nordic data set since almost all companies are determined to improve their practices in a more responsible way and therefore there is huge number of companies with positive ESG score development and only few with negative long-term development.

The performance of aforementioned portfolios will be introduced in the next chapter and the analysis of portfolios with different performance measures will also be discussed

in detail. In addition to ESG Momentum portfolios, the performance of long-only and short-only portfolios will also be evaluated. Analyzing long and short parts individually the study can provide information whether better risk-adjusted returns can be achieved by investing only in companies that show best positive ESG score development or if better results can be achieved by shorting the companies with the worst ESG score development. The graphical representation of all portfolios' cumulative returns over sample period versus chosen benchmark index will also be presented in the chapter 6.

6 Results

This chapter will present the results of constructed portfolios and analyzes the performance of all portfolios, their risk-adjusted returns and capability against chosen benchmark. To analyze results three different factor models has been used in addition to Capital Asset Pricing model. Carhart four-factor model is one of the most used factor models in SRI studies and it has also been used in ESG Momentum paper by Verheyden et al. (2016). In addition to Carhart four-factor model, this study also tests formed portfolios with Fama & French three- and five-factor models.

6.1 Descriptive statistics of portfolio performance measures

The performance of all portfolios formed in this study will be presented in the below shown tables. In the tables portfolios' monthly raw returns, monthly alpha, standard deviation, Sharpe ratio, Treynor ratio and portfolio's beta will be presented, standard deviations shown in the table are not annualized. Table 4 shows the statistics for Top 50 % long-only, Bottom 50 % short-only, and Top 50 % minus Bottom 50 % ESG Momentum portfolios. T-statistics for monthly returns and alphas are shown in the parenthesis.

Table 4. Top and bottom half equally weighted

	Top 50 % Long	Bottom 50 % Short	ESG Momentum
Monthly return	0,51 % (1,22)	-0,45 % (-1,05)	0,06 % (0,61)
Monthly alpha	-0,154 % (-1,21)	-1,14 % (-6,77)	-0,62 % (-4,53)
Standard deviation	4,77 %	4,86 %	1,45 %
Sharpe ratio	-0,04	-0,23	-0,43
Treynor ratio	-0,001	0,01	-2,79
Portfolio beta	1,14	-1,09	0,01

None of the portfolios shown in the table 5 generated returns over their benchmark index as their monthly alpha was negative over the sample period. Bottom 50 % Short

and Top 50 % minus Bottom 50 % ESG Momentum had the worst performance of all portfolios with statistically significant negative monthly alphas. ESG Momentum has relatively low standard deviation but like no other portfolio neither was ESG Momentum able to generate positive risk-adjusted returns as the Sharpe ratios are slightly negative for all three portfolios meaning that the risk-free asset performed better than the portfolios on average. These results show that using the entire investment universe in an ESG Momentum strategy does not offer admirable investment opportunities. The graphical illustration in the figure 5 shows how clearly the benchmark index defeated all three portfolios. Out of formed portfolios, Top 50 % Long-only portfolio was the only one to achieve positive cumulative returns over the sample period. ESG Momentum and Bottom 50 % short strategy both cumulated negative returns over the sample period meaning there is a lot of companies with highly positive stock performance in the Bottom 50% even if their ESG score development was poor.

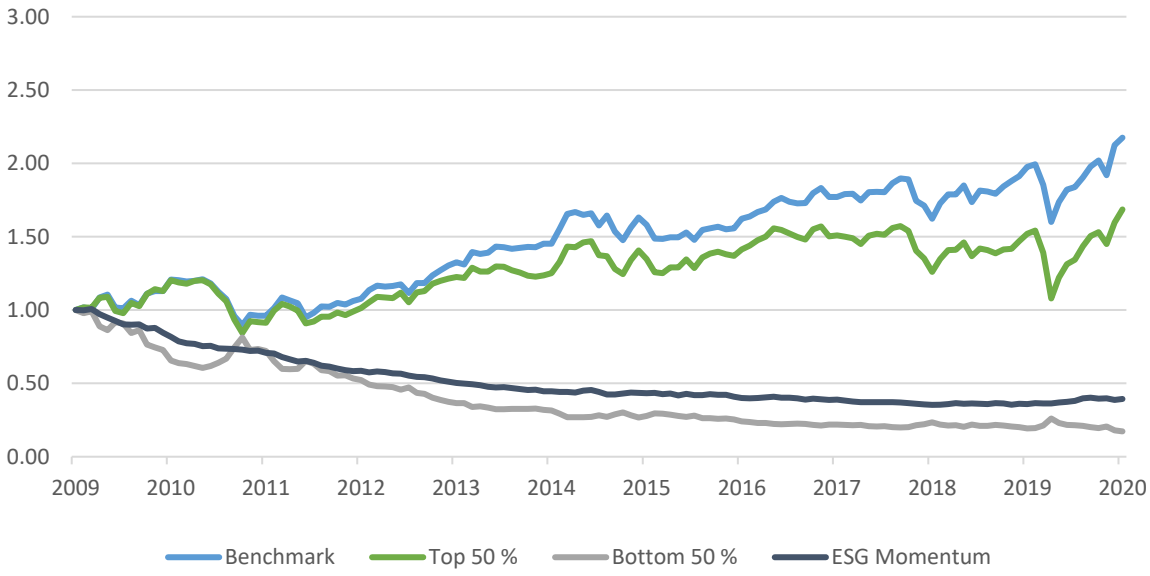

Figure 5. Cumulative returns of first set of portfolios vs. benchmark

The second implementation of ESG Momentum strategy divides the investment universe into thirds and focuses on top and bottom thirds. The results shown in the table 5 are very similar to first set of portfolios. Top third long and ESG Momentum has positive monthly raw returns, but the portfolios were not capable to generate alpha. Top third

long-only portfolio generated 0,63 % monthly raw returns which was more than the Top 50 % Long-only portfolio. Standard deviation for ESG Momentum portfolio was again relatively low but the Sharpe ratio is negative. For all portfolios, the return proportional to the risk measured by the portfolio's beta coefficient was also very poor as the Treynor ratios are negative or very at the very low level. Similar to all stock equally weighted portfolios, Bottom short strategy and ESG Momentum recorded statistically significant negative alphas.

Table 5. Top and bottom third equally weighted

	Top Third Long	Bottom Third Short	ESG Momentum
Monthly return	0,63 % (1,47)	-0,30 % (-0,67)	0,33 % (2,00)
Monthly alpha	-0,04 % (-0,30)	-0,99 % (-5,33)	-0,37 % (-2,12)
Standard deviation	4,84 %	5,06 %	1,89 %
Sharpe ratio	-0,01	-0,19	-0,19
Treynor ratio	-0,01	0,01	0,14
Portfolio beta	1,14	-1,12	-0,03

Figure 6 shows the cumulative performance of Top and Bottom thirds and ESG Momentum formed as Top third minus Bottom third. Top third long only and ESG Momentum both accumulated positive returns over the sample period, Top third long only portfolio showing very similar performance to benchmark index.

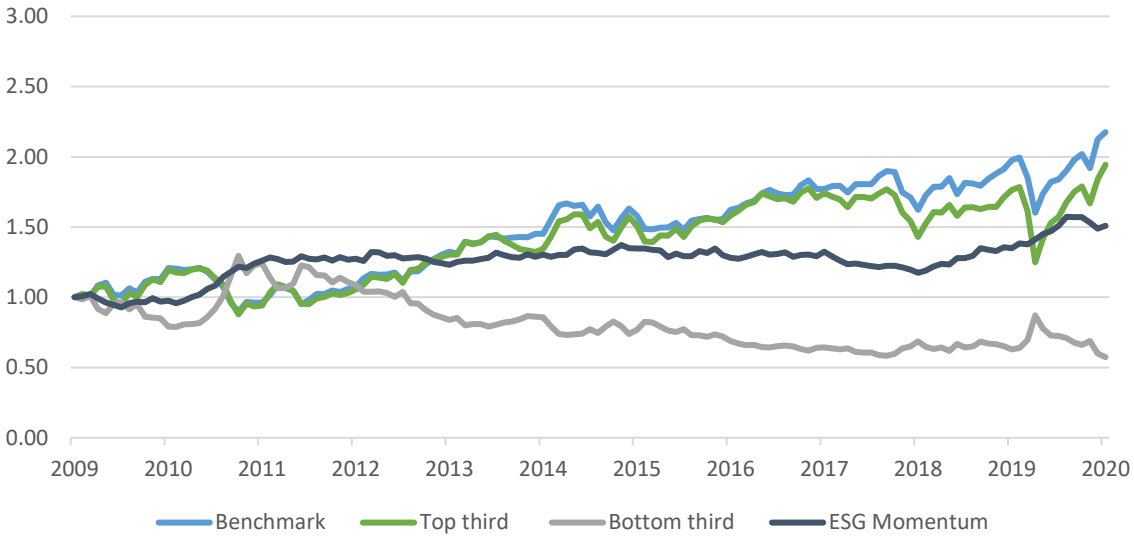

Figure 6. Cumulative returns of second set of portfolios vs. benchmark

The last set of portfolios only considers the top and bottom decile of the companies in the investment universe, decreasing the number of companies in the portfolios drastically. Table 6 shows the performance measures of Top decile long-only, Bottom decile short-only and Top minus Bottom ESG Momentum. ESG Momentum strategy of Top minus Bottom deciles showed the best performance over all formed portfolios. Monthly raw returns were positive for all three portfolios. Top decile long-only and ESG Momentum generated moderate amount of monthly alpha, 0,13 % and 0,17 % respectively, none the less these results were not statistically significant. The risk-adjusted returns were still not at satisfying level as the Sharpe ratio and Treynor ratios were only slightly positive for Top decile long-only and ESG Momentum portfolios.

Table 6. Top and bottom decile equally weighted

	Top decile long	Bottom decile short	ESG Momentum
Monthly return	0,80 % (1,77)	0,05 % (0,12)	0,85 % (2,80)
Monthly alpha	0,13 % (0,65)	-0,64 % (-2,05)	0,17 % (0,54)
Standard deviation	5,14 %	5,33 %	0,85 %
Sharpe ratio	0,02	-0,12	0,20
Treynor ratio	0,001	0,006	0,014
Portfolio beta	1,16	-0,99	0,12

Raising the threshold for stock inclusion from 100% to eventually 20% showed very good development for ESG Momentum strategy's performance. Even though the results were not statistically significant Top minus bottom decile ESG Momentum and Top decile long-only managed to beat the benchmark index during the sample period as seen in the figure 8. Portfolio's returns improved considerably as a result of the threshold increase. These results are showing similar nature to findings of Jegadeesh and Titman (1993) with momentum strategy. They found that using only stocks in the top and bottom decile for long-short momentum portfolio generated better results than implementing the strategy with all stocks available in the sample universe. Bird et al. (2017) also found that including more stocks to momentum portfolios with lower threshold ate up all statistically significant returns.

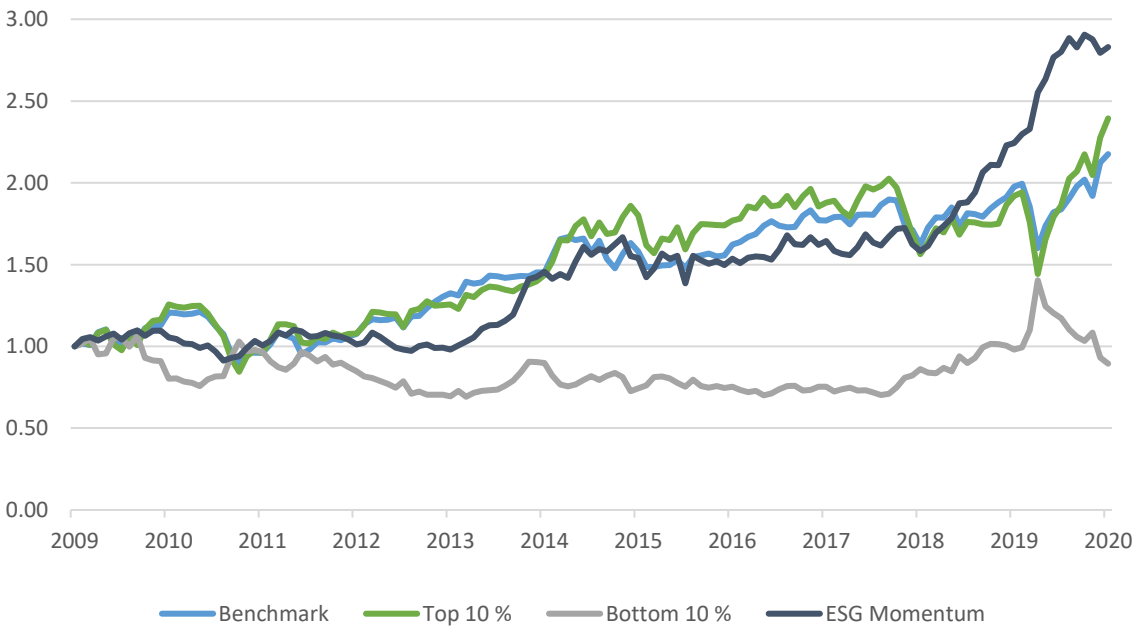

Figure 7. Cumulative returns of third set of portfolios vs. benchmark

6.2 Portfolio analysis with factor models

This section will discuss the results of regression runs with different factor models. Before going into the factor Fama & French and Carhart factor model, the results are evaluated with Capital Asset Pricing Model. After that the factor models will extend CAPM by regressing portfolio returns on several variables. Results of these regression will show the exposure of the portfolios to different factors.

First table (table 7) shows the results of portfolios exposures to market risk with CAPM. Adjusted R-squared is also calculated for all portfolios to measure the model's explanatory power. T-statistics are shown in the parenthesis in the tables. The table is divided into three groups showing the statistics for all nine portfolios. The first group is Top 50 %, Bottom 50 %, and Top 50 % minus Bottom 50 % ESG Momentum -portfolios. The second group is Top Third, Bottom Third, and Top Third minus Bottom Third ESG Momentum -portfolios. The last group is Top Decile, Bottom Decile, and Top Decile minus Bottom Decile ESG Momentum -portfolios. Out of the formed portfolios only two portfolios, Top Third portfolio and Top Decile minus Bottom decile ESG Momentum have positive alpha intercepts, but these are not statistically significant at any level. All ESG Momentum portfolios show negative exposure to market risk suggesting the returns of ESG Momentum portfolios negatively co-moved with the market during the sample period, but these results are not statistically significant. In the other hand, all Bottom portfolios had the negative coefficient for market risk and these results were significant at 1% level. All three Top portfolios had positive loadings for MKT-RF showing a positive co-movement with market returns, with statistically significant results at 1% level. Notably, the adjusted R-squared was very low for all three ESG Momentum portfolios and even negative for two ESG Momentum portfolios meaning that CAPM only explain one percent or less of ESG Momentum's returns. Even if the CAPM's explanatory power is very poor for ESG Momentum's returns, the model indicates that the research question of this thesis has been answered. However, further investigation with more comprehensive factor models will follow.

Table 7. Results of portfolio analysis with CAPM

	Alpha	MKT-RF	Adj. R^2
Top 50 %	-0,006 ** (-2,52)	0,008 *** (15,46)	0,645
Bottom 50 %	-0,006 *** (-2,70)	-0,008 *** (-17,03)	0,688
ESG Momentum	-0,006 *** (-4,41)	-0,002 (-0,82)	-0,003
Top third	0,001 (0,59)	0,008 *** (16,01)	0,661
Bottom third	-0,004 * (-1,87)	-0,008 *** (-16,30)	0,668
ESG Momentum	-0,003 ** (-1,98)	-0,001 (-1,07)	0,001
Top decile	-0,004 (-1,16)	0,008 *** (12,73)	0,552
Bottom decile	-0,001 (-0,45)	-0,007 *** (-12,47)	0,541
ESG Momentum	0,002 (0,56)	-0,001 (-0,267)	-0,007

*** Significant at the 0,01 level
** Significant at the 0,05 level
* Significant at the 0,10 level

After the CAPM, the portfolios are run with Fama and French three-factor model. When creating the factor models, Fama and French (1993) wanted to create a model that could increase the explanatory power of Capital asset pricing model. After receiving extremely poor adjusted R-squared values with CAPM it is reasonable the extent the regression analysis to factor models and at least see if the adjusted R-squared improves. The results of regression run with Fama and French three factors are shown in the table 8. MKT-RF refers to market return minus risk-free rate, SMB is the returns of small minus big stocks and the HML-factor indicates the returns of high book-to-market minus returns to low-book-market companies.

When moving from CAPM to Fama and French three-factor model, it can be noticed that there are even fewer positive alphas left after FF3 regression run. All the ESG Momentum portfolios have negative alphas and only the Bottom Decile portfolio is showing positive alpha, none the less that being statistically insignificant. All ESG Momentum portfolios show statistically significant negative loading on HML factor meaning that stocks in these portfolios behave more like a growth stock than value stocks. Top 50 % minus Bottom 50 % ESG Momentum has a slightly positive loading on SMB factor meaning that the portfolio behaves more like a small cap portfolio, this result was significant at 10 % level. All Bottom portfolios' return negatively co-move with the market, with statistical significance level of 1 % for Bottom 50 % and Bottom Decile portfolios. In contrary, all the Top portfolios seem to positively co-move with the market, results being statistically significant at 1 % level for all three Top portfolios with high t-statistics. For ESG Momentum portfolios the SMB and HML factor loadings are not statistically significant at any given significance level.

The CAPM model could not explain almost any of the ESG Momentum's returns and the poor adjusted R-squared also with Fama and French three-factor model indicates that two added factors could hardly add any explanatory power. Model's ability to explain returns is very low for all ESG Momentum portfolios but not negative any more. However, the adjusted R-squared readings still show that the Fama and French three factor model only managed to explain under ten percent of the ESG Momentum's returns. For the Top Decile minus Bottom Decile ESG Momentum the model managed to explain only 3,1 % of returns.

Table 8. Results of portfolio analysis with Fama & French three factor model

	Alpha	MKT-RF	SMB	HML	Adj. R^2
Top 50 %	-0,009 *** (-3,77)	0,008 *** (15,51)	0,005 *** (3,80)	-0,003 *** (-2,79)	0,693
Bottom 50 %	-0,005 ** (-2,08)	-0,008 *** (-15.27)	-0,003 * (-2,53)	0,001 (0,95)	0,700
ESG Momentum	-0,007 *** (-5,58)	0,001 (1,05)	0,001 * (-1,82)	-0,002 *** (-3,63)	0,098
Top third	-0,002 (-0,64)	0,008 *** (16,28)	0,005 *** (4,12)	-0,003 *** (-2,98)	0,714
Bottom third	-0,003 (-1,31)	-0,008 (-14.5)	-0,004 *** (-3,19)	0,001 (0,54)	0,668
ESG Momentum	-0,005 *** (-2,92)	0,001 (0,75)	0,001 (1,07)	-0,002 *** (-3,40)	0,077
Top decile	-0,007 *** (-2,59)	0,009 *** (13,7)	0,006 *** (3,56)	-0,005 *** (-3,77)	0,624
Bottom decile	0,001 (0,07)	-0,008*** (-11,22)	-0,004 * (-2,13)	0,001 (0,95)	0,553
ESG Momentum	-0,001 (-0,16)	0,001 (1,04)	0,001 (0,80)	-0,003 ** (-2,54)	0,031

*** Significant at the 0,01 level
** Significant at the 0,05 level
* Significant at the 0,10 level

Poor adjusted R-squared for all ESG Momentum portfolios motivates to add more explanatory variables to the regression. Table 9 shows the results for the regression run done with Carhart four-factor model. Carhart four-factor model extends the Fama and French three factor model with winners-minus-losers (WML) factor in order to capture the risk relating to momentum anomaly. The results of Carhart four-factor regression run are very similar to Fama and French three factor model, but adding the momentum-factor turns the alpha of Top decile minus Bottom decile ESG Momentum positive.

Unfortunately, the result is still not statistically significant at any given level. Carhart four-factor model makes six portfolios out of nine to have statistically significant alphas instead of five with Fama and French three factor model. However, the prefixes do not change, most of the alphas are negative as before, and all positive alphas are statistically insignificant. Similar to Fama and French three-factor results, all Top portfolios have statistically significant positive loading on SMB factor coefficient indicating that those portfolios include or behave like companies with smaller market capitalization. The results show that small companies are among the best improvers in terms of ESG score, but unfortunately, they are not able to add alpha for the investor, which means that a good development in ESG score does not have a positive impact on stock price development. The SMB factor is also slightly positive for Top 50 % minus Bottom 50 % ESG Momentum portfolio, that result being statistically significant at 10 % level. Portfolio's exposures to market risk with a Carhart four-factor model are almost identical to results of Fama and French three-factor regression. Top portfolios showing positive co-move with market and Bottom portfolios indicating to negatively co-move with the market, with 1 % statistical significance. At least for the readings of portfolios' exposure to the market risk, the addition of the momentum factor did not change anything. Momentum factor itself is positive, but not statistically significant, only for Top third and Top decile portfolios. Momentum factor is significant only for Bottom decile portfolio being statistically significant at 10 %. Momentum factor loadings are very close to zero for all portfolios, and very few are statistically significant.

Bland momentum factor readings indicate that adding the WML factor could not increase the robustness. Adjusted R squared also remained very low being at the same levels with Fama and French three factor's adjusted R squared. All tested models seem to have decent ability to explain returns on Top and Bottom portfolios, but they all struggle to explain over 10 % of the returns of ESG Momentum portfolios. Small development in adjusted R squared has happened since it was negative with CAPM and was 3,8 % at lowest with Carhart four-factor model. As the results remain mostly insignificant the regression analysis will be extended further to Fama and French five-factor model. It

should also be noted that conventional and widely used asset pricing models may not be the best test tools to explain empirical results with ESG scoring related investment portfolios although the returns on the portfolios in this thesis were very poor. Looking at the returns of portfolios that clearly outperform their benchmark index with significant alphas would have been more interesting. With significant results and more significant factor loadings the interpretation of factor models would have been more rewarding.

Table 9. Results of portfolio analysis with Carhart four factor model

	Alpha	MKT-RF	SMB	HML	WML	Adj. R^2
Top 50 %	-0,009 *** (-3,56)	0,008 *** (15,20)	0,005 *** (3,78)	-0,003 *** (-2,55)	-0,001 (-0,21)	0,691
Bottom 50 %	-0,005 * (-1,85)	-0,008 *** (-15,09)	-0,003 ** (-2,52)	0,001 (0,59)	-0,001 (-0,50)	0,699
ESG Momentum	-0,007 *** (-5,11)	0,001 (0,88)	0,001 * (1,82)	-0,002 *** (3.61)	-0,001 (-0,88)	0,097
Top third	-0,002 (-0,69)	0,008*** (16,04)	0,005 *** (4,10)	-0,003 ** (-2,46)	0,001 (0,30)	0,712
Bottom third	-0,003 (-1,10)	-0,008 *** (-14,37)	-0,005 *** (-3,10)	0,001 (0,21)	-0,001 (-0,57)	0,686
ESG Momentum	-0,004 *** (-2,68)	0,001 (0,66)	0,001 (1,06)	-0,003 *** (-3,19)	-0,001 (-0,44)	0,072
Top decile	-0,001 ** (-2,51)	0,009 *** (13,46)	0,005 *** (3,54)	-0,005 *** (-3,24)	0,001 (0,10)	0,621
Bottom decile	0,002 (0,53)	-0,008 *** (-11,42)	-0,004 ** (-2,15)	0,001 (0,03)	-0,002 * (-1,68)	0,559
ESG Momentum	0,001 (0,23)	0,001 (0,78)	0,001 (0,80)	-0,005 *** (-2,92)	-0,002 (-1,42)	0,038

*** Significant at the 0,01 level
** Significant at the 0,05 level
* Significant at the 0,10 level

Table 10 shows the results of Fama and French five-factor model which adds profitability (RMW) and investment (CMA) factors into the three-factor model. Fama and French (2015) stated that with addition of profitability and investment factor, value factor becomes redundant for describing average returns in their sample. The regression run shows that five-factor model has much less statistically significant loadings on the HML factor compared to three-factor model, indicating similar results as in Fama and French (2015) study. With five factor model there are only two portfolios with significant HML factor loadings while the HML factor loadings were significant for six out of nine portfolios with three factor model. Two new factors also seem to catch results better than the WML factor in the Carhart model. Both, RMW and CMA factor show bigger number of significant loadings even though the positive readings are not statistically significant. CMA factor shows the difference between the returns of firms that invest conservatively and firms that invest aggressively. This factor is positive for Bottom 50 % and Bottom Third portfolios, indicating that those companies with poor ESG score development has conservative investment policies. However, these results were not statistically significant and were exhibiting a negative loading when compared to their respective alphas which were 0,002 and 0,003 respectively.

Regarding to significance of alphas, five-factor model only provided slightly more significant readings than three-factor model. As with the previously tested models, the positive alphas obtained with five-factor model were also insignificant. The results are very similar to Fama and French three-factor model and Carhart four-factor model. Only Bottom Decile and Bottom Decile minus Top Decile ESG Momentum have positive alphas, but as stated, the results were not statistically significant. Five-factor mode shows negative alphas for six out of nine formed portfolios with statistical significance. When the portfolio obtains a negative significant alpha, the strategy generates abnormal negative results.

Adjusted R squared shows that the five-factor model is capable to explain 57–71 % of the returns on Bottom and Top portfolios, but for ESG Momentum portfolios the

adjusted R squared is still very poor, indicating that the five-factor model only explain 8–17 % of the returns on ESG Momentum portfolios. However, the explanatory power of five-factor was clearly the best among all tested models as the adjusted R squared readings gradually improved as more factors were added to the model.

Table 10. Results of portfolio analysis with Fama & French five factor model

	Alpha	MKT-RF	SMB	HML	RMW	CMA	Adj. R^2
Top 50 %	-0.01 *** (-3,95)	0.008 *** (13,57)	0.005 *** (3,35)	0.001 (0,52)	0.003 (1,27)	-0.006 ** (-2,39)	0,705
Bottom 50 %	-0,004 * (-1,68)	-0,008 *** (-13,78)	-0,003 ** (-2,37)	-0,002 (-1,20)	-0,005 ** (-2,00)	0,002 (0,90)	0,707
ESG Momentum	-0,007 *** (-5,35)	0,001 (0,26)	0,001 (1,42)	-0,001 (-1,27)	-0,005 (-0,42)	-0,003 * (-1,84)	0,110
Top third	-0,01 *** (-3,47)	0,01 *** (13,45)	0,005 *** (3,79)	0,001 (0,37)	0,003 (1,10)	-0,006 ** (-2,18)	0,702
Bottom third	-0,002 (-0,88)	-0,008 *** (-13,09)	-0,004 *** (-2,92)	-0,003 * (-1,74)	-0,006 ** (-2,30)	0,003 (1,13)	0,698
ESG Momentum	-0,004 *** (-2,60)	0,001 (0,39)	0,001 (0,86)	-0,003 ** (-2,13)	-0,002 (-1,15)	-0,001 (-0,81)	0,078
Top decile	-0,007 ** (-2,35)	0,008 *** (11,81)	0,005 *** (3,00)	-0,002 (-1,06)	-0,002 (-0,74)	-0,009 *** (-2,76)	0,642
Bottom decile	0,002 (0,65)	-0,008 *** (-11,00)	-0,005 ** (-2,45)	-0,001 (-0,49)	-0,009 *** (2,69)	-0,004 (-1.18)	0,576
ESG Momentum	0,002 (0,58)	-0,001 (-0,28)	0,001 (0,08)	-0,004 (-1,56)	-0,01 *** (-3,16)	-0,01 *** (-3,48)	0,167

*** Significant at the 0,01 level
** Significant at the 0,05 level
* Significant at the 0,10 level

In the light of statistical insignificancy of portfolios' positive alphas the research question has been answered. With any tested asset pricing model there was no statistically significant evidence found in order to advocate rejecting the null hypothesis of this thesis. The empirical testing, however, obtained some statistically significant results. Five-factor model, the model that offered most robustness to explain the returns of ESG Momentum portfolios, indicates that Top 50 % minus Bottom 50 % ESG Momentum and Top Third minus Bottom Third ESG Momentum portfolios generate negative alphas. These results are statistically significant at 1 % level and were not in contrary with other factor models used in the empirical testing.

In accordance with robust results advocating the poor performance of ESG Momentum portfolios, this study accepts the null hypothesis, but it is still worthful to consider the second hypothesis of the thesis which investigates whether raising the threshold for stock inclusion in ESG Momentum portfolios increases positive returns. Even though the positive alphas were not significant the comparison of the raw returns show that the portfolio with the highest threshold generated best results. With five-factor model Top 50 % minus Bottom 50 % ESG Momentum had alpha of -0,007 which was significant at 1 % level, Top Third minus Bottom Third ESG Momentum had alpha of -0,004 which was also significant at 1 % level, and the best performing portfolio Top Decile minus Bottom Decile ESG Momentum had positive alpha of 0,002 which was statistically insignificant. This result indicates that if the ESG Momentum premium existed, it would exist at both ends of the spectrum and the strategy would be implemented using only the lowest and highest deciles. Without significant results one could conjecture that if all stocks in the sample with an ESG score are included, companies ranked in middle in terms of ESG score development cannot show any correlation between their ESG score development and stock price performance, while stocks with the most extreme ESG score development show some changes in stock prices in line with ESG score development.

7 Conclusions

Responsible investing has been a trending topic for years and will increasingly be at the center of decision-making for corporations and institutional investors as well for individual non-professional investors. Socially responsible investing has emerged different investment strategies that are used to an increasing extent among investors who desire to consider ESG matters in their investment decisions. This thesis contributed to one of the most recent SRI strategies called ESG Momentum, to find out if the strategy could generate positive excess returns in the Nordic stock markets.

Inspired by Nagy et al. (2016), Verheyden et al. (2016) and Giese et al. (2019), this thesis studied ESG Momentum portfolios and adds a new geographical perspective to the research. Having significant positive returns in prior studies mainly implemented with US-based data set, this thesis extended the scope to the Nordic stock markets, which adds an additional contribution to the existing research related to ESG Momentum. This thesis investigated three ESG Momentum portfolios composed with stocks from the main lists of Helsinki, Stockholm, Oslo and Copenhagen exchange. The sample period for this study was from January 2009 to December 2020 and the number of companies in the portfolios varied from 104 to 294 from which about 48 % were Stockholm listed companies. The portfolios for the empirical analysis were formed on the winner-minus-losers basis. Three formed portfolios were Top 50 % minus Bottom 50 % ESG Momentum, Top Third minus Bottom Third ESG Momentum, and Top Decile minus Bottom Decile ESG Momentum. Three portfolios formed with different thresholds for stock inclusion, provided an opportunity to examine whether focusing on extreme ends instead of investing in the whole sample improves the portfolio's performance. In addition, this thesis also examined the performance of Top and Bottom parts of the portfolios separately.

This study measured the raw monthly returns, alphas, risk-adjusted returns of each portfolio with results indicating poor performance throughout the sample period. Empirical analysis with factor models found that none of the ESG Momentum portfolios generated statistically significant alphas over the sample period. Two ESG Momentum portfolio

were able to generate positive cumulative returns over the sample period, with only the Top Decile minus Bottom Decile ESG Momentum outperforming the benchmark index. Top Decile minus Bottom Decile ESG Momentum had slightly positive alpha with Fama and French model, that result being far from significant with p-value of 0,55. Empirical analysis also indicated that neither Carhart four-factor model or Fama and French factor models explained the returns on ESG Momentum well. The highest adjusted R squared reading for the best performing ESG Momentum portfolio was 0,167. Additionally, this thesis did not find any statistically significant positive alphas from individually examined Top and bottom portfolios.

Findings of this thesis are not in line with previous literature where for example Nagy et al. (2016), Verheyden et al. (2016) and Giese et al. (2019) found statistically significant results indicating that ESG Momentum strategies can generate positive abnormal returns for investors. The data sample of this thesis strongly differs from the previous studies which will definitely explain some of the differences in the results. This thesis uses relatively narrow data set with somewhat limited number of companies versus more extensive global data set in major studies. The sample period in this thesis was longer than in earlier studies which could also explain the contrasting results. While this thesis used data from 2009 to 2020, Nagy et al. (2016) only had seven-year review period from 2008 to 2015, Verheyden et al. (2016) used the data from 2010 to 2015, and Giese et al. had the sample period of 2009–2017. In the finance literature, a ten-year sample period to study the performance of a new strategy or a new anomaly is not long, but compared to previous ESG Momentum studies, the sample period of this thesis was extensive. The ESG scoring industry is also slightly unharmonized and lacks standardized frames on how different responsibility dimensions are interpreted by ESG scoring providers. Different ESG Momentum studies use ESG scoring statistics from different facilitators which slightly decreases the comparability of the results between studies. It has also been observed that legislation and historical traditions and practices differ across the world, and this is also reflected in responsibility values and hence ESG scores in different ways between countries and continents. Liang and Renneboog (2020) found that companies

located in common law countries have on average lower ESG scores than the companies in the civil law countries, with Nordic civil law companies having the highest ESG scores. Civil law companies are also more resilient to corporate social responsibility shocks than companies operating under common law policy.

The results definitely open an interesting touch point for ESG Momentum investing in the Nordics and leaves room for further investigation with different sample periods and bigger data set. As seen in this study, the number of companies with ESG scoring increased gradually and every year there were more companies to be included to the sample. When the Nordic market reaches the point when all the companies are granted with standardized ESG scoring, the sample size will be much larger, and the results can be different. In the coming years, companies will be required to consider and integrate ESG criteria more widely into their operations, and it will be interesting to see whether the willingness or unwillingness to improve ESG consideration is reflected more directly in stock prices in the future.

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