Master Thesis
Financial Performance of Sustainable Mutual Funds

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Abstract

This thesis aims to examine the financial performance of Scandinavian sustainable mutual funds. The risk-adjusted returns of sustainable funds are compared on a portfolio level with selected conventional funds utilizing a "matched pair" approach.

Sustainable investment is a growing market due to an increasing concern of environmental, social and governance issues. There is not a universal definition of sustainable investment, therefore, the fund managers are making subjective decisions in the practical screening process. However, this study applies a pragmatic definition of sustainable investment and totally 80 sustainable funds were collected and matched with 80 conventional funds on portfolio levels.

This thesis is based on two contradictory theories that sustainable funds either outperform conventional funds by considering the interests of stakeholders or underperform by investing in a more restricted investment universe.

The collected data have been modelled in three regression analysis. The results obtained suggest that there is not a significant difference in risk-adjusted returns between sustainable and conventional mutual funds. An exception is the Norwegian funds, where significant outperformance of sustainable funds in comparison to conventional funds have been detected.

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Contents

Chapter 1. Introduction

Today, both individual and institutional investors consider the impact of their investments in addition to the financial returns. More people care about the consequences of climate change and gender equity. As a result, sustainable investment has received greater attention of investors.

There is not a universal definition of sustainable investment, the term of sustainable investment can be interpreted differently as something that is viewed as unsustainable by a group of people might not be so unsustainable for other people. In general, sustainable investment incorporates the environmental, social, and governance factors alongside the financial factors in the investment process. Sustainable investment aims to provides a more sustainable future by limiting the risks and harms to people and society today.

However, it is questionable whether sustainable investment also deliver a reasonable financial return. Supporters of sustainable investment argue that ethical investment would lead to a better financial return by focusing on long-term issues and going through a more extensive screening process.

On the other hand, critics of sustainable investment counter with the argument that ethical mutual funds would underperform because they operate in a more constricted investment universe.

This thesis therefore wants to examine whether ethical mutual funds deliver financial returns alongside impact creating.

1.1. Research Question

This study aims to answer the following research question:

"Is there a significant difference of risk-adjusted returns between sustainable and conventional mutual funds?"

1.2. Delimitations

This study is limited to examine the financial performance of sustainable mutual funds domiciled in Scandinavia. Therefore, the findings of this thesis may not fully reveal the performance of sustainable mutual funds and may not be applicable to other geographical counties.

Besides that, this thesis applies a pragmatic definition of sustainable investment, and the terms such as ethical investment, socially responsible investment, and ESG investment are used interchangeably. Therefore, the results of this study may differ from other studies that applied different definitions of sustainable investment.

In addition to this, this study follows a "matched pair approach" to compare the financial performance between ethical and conventional mutual funds. Four matched criteria were applied: fund age, investment holdings, country of domicile, and investment style/category. These criteria were matched manually and subjectively, which may not be 100% precise due to the fact that there is not an exact doubleganger of fund.

Last but not least, the reader should keep in mind that the financial performance of mutual funds is influenced on the fund manager's stock picking ability. This bias should be evened out given the large size of data used in this study. However, the Danish dataset is small due to the limited number of ethical funds in the Danish market.

1.3. Structure and Chapter content

This section gives a detailed description of the content of each chapter included in this thesis.

Chapter 1: The first chapter introduces to this study by presenting the topic, delimitation and research question.
Chapter 2: This chapter provides an overview of the definitions and terms frequently used in sustainable investing and gives a background knowledge of ethical investment. Different types of ethical funds and a historical market development of sustainable investment are presented.

Chapter 3: This chapter reviews previous studies in financial performance of sustainable investment. The key findings and methodology are presented.

Chapter 4: This chapter discusses a theoretical background of sustainable investment, including the debate of the consequences of ethical investment.

Chapter 5: This chapter discusses the measurement of fund performance.

Chapter 6: This chapter shows the collection of data and the chosen factors and proxies for this study are presented.

Chapter 7: This chapter analyses and discusses the obtained results.

Chapter 8: The final chapter provides a conclusion of this study and some suggestions for future research.

Chapter 2 Sustainable investment

Sustainable investment does not have a universal definition. This is because something that is viewed as sustainable by a group of people may not be considered in the same way by other people. The specific views of sustainability depend on the investor's culture and background. Consequently, the screening process varies for each investor due to this difference of sustainable views.

Therefore, in this study, ethical investment, ESG investment, and socially responsible investment are used interchangeably with sustainable investment.

This chapter provides firstly an overview of the definitions and terms frequently used in the sustainable investment industry, secondly the different types of sustainable funds are presented, and lastly the historical development of sustainable investment will be discussed.

2.1. Definition and terms

Sustainable investing is a growing investment area under development, therefore, there is not yet a uniform definition of sustainable investment. This section will present the general definition and frequently used terms in the ethical investing market.

2.1.1. ESG integration and factors

ESG integration is when a company takes the ESG factors into consideration alongside the financial factors. ESG is the performance metrics of sustainability that incorporates environmental, social and governance factors into the investment process. Many investors see ESG factors as an opportunity to future returns by minimizing harms to people and planet today and providing capital to companies that deploy it towards productive and sustainable outcomes (Nordea, 2018). The breakdown of ESG factors is presented below.

Environment

Environment is about a company's actions towards climate change, water consumption, waste management, noise handling, and use of raw materials. Additional issues such as animal welfare, food consumption and land security also belong to the environmental factor. (Nordea, 2018)

Social

The social factor looks at human rights, labour rights, gender quality, employee satisfaction, consumer protection, and personal data safety. The social factor ensures that the company operates in a responsible way with its stakeholders. (Nordea, 2018)

Governance

The governance factor focuses on company board issues and executive pay. This factor makes sure that the company has a transparent accounting and governance policy, and issues such as bribery and corruption are avoided.

2.1.2. Sustainable investing

Sustainable investment fund managers take the above presented ESG factors into consideration while making investment decisions.

The Global Sustainable Investment Review (2012) provided seven strategies on how ESG factors could be implemented, and it later suggested a global standard in the classification of sustainable investment. These seven strategies are:

1. ” Negative/exclusionary screening: the exclusion from a fund or portfolio of certain sectors, companies or practices based on specific ESG criteria;
2. Positive/best-in-class screening: investment in sectors, companies or projects selected for positive ESG performance relative to industry peers;
3. Norms-based screening: screening of investments against minimum standards of business practice based on international norms;
4. ESG integration: the systematic and explicit inclusion by investment managers of environmental, social and governance factors into financial analysis;
5. Sustainability themed investing: investment in themes or assets specifically related to sustainability (for example clean energy, green technology or sustainable agriculture);
6. Impact/community investing: targeted investments, typically made in private markets, aimed at solving social or environmental problems, and including community investing, where capital is specifically directed to traditionally underserved individuals or communities, as well as financing that is provided to businesses with a clear social or environmental purpose;
7. Corporate engagement and shareholder action: the use of shareholder power to influence corporate behaviour, including through direct corporate engagement (i.e., communicating with senior management and/or boards of companies), filing or co-filing shareholder proposals, and proxy voting that is guided by comprehensive ESG guidelines.” (Global Sustainable Investment Review, 2012)

In later year, 17 Sustainable Development Goals have been introduced by the United Nations General Assembly in 2015.

The 17 Sustainable Development Goals are (United Nations, 2018):

1. No Poverty
2. Zero Hunger
3. Good Health and Well-being
4. Quality Education
5. Gender Equality
6. Clean Water and Sanitation
7. Affordable and Clean Energy
8. Decent Work and Economic Growth
9. Industry, Innovation, and Infrastructure
10. Reducing Inequality
11. Sustainable Cities and Communities
12. Responsible Consumption and Production
13. Climate Action
14. Life Below Water
15. Life on Land
16. Peace, Justice, and Strong Institutions
17. Partnerships for the Goals

In the recent years, sustainable investment aims to result all these sustainable development goals through investments. (Nordea, 2018)

2.1.3. Ethical investment and Socially responsible investment

Ethical investment and Socially responsible investment (SRI) are two old terms that were frequently used in the sustainable investing industry. Both consider ESG factors in portfolio selection and management, however, ethical investment was more frequently used by ethical funds, and SRI was more commonly used by social funds. (Renneboog et al., 2008a)

2.2. Different Types of Sustainable Funds

In general, all sustainable funds today incorporate ESG factors into their investment process. However, as the ethical investment market is becoming increasingly popular, different types of sustainable funds have emerged in order to meet more specific needs and requirements of ethical investors.

This section will present the different types of sustainable funds and the corresponding screening techniques applied.

2.2.1. Transverse ESG funds

Sustainable funds that invest in cross-sectorial companies. This type of funds is most popular in the ethical investing industry and many new-established ESG funds tend to start as a transverse fund and they might specify their investment focus and later transform into another type of ethical fund. (Renneboog et al., 2008a)

Cross-sectorial ethical funds often use two screening strategies: negative and positive screening. Historically, positive screening was more frequently used by fund managers, while in the later years, both screening techniques are regularly applied. A breakdown of these two screening strategies are presented below. (Renneboog et al., 2008a)

2.2.1.1. Negative screening

Negative screening is conducted by fund managers to exclude investments in certain companies or industries that are involved in activities of non-environmental, antisocial and unethical matters (Renneboog et al., 2008a). The process of negative screening is absolute and subjective. Only the ESG factors are considered while making the screening decision while other qualities, e.g. financial performance, are not considered at all. Therefore, companies that do not meet the screening criteria are automatically excluded.

The exclusion of companies consists of two types, behaviour-based or business-based exclusion. Behaviour-based negative screening excludes companies that involve in corruption, violate human rights, neglect employee welfare and safety. While business-based negative screening excludes companies that operating in tobacco, alcohol, mining and weapon industries (Robins & Krosinsky, 2008)

Despite the fact that negative screening is an effective way for fund managers to exclude companies operating in unethical matters, this process has been criticised for being too subjective. The negative screening criteria are decided by fund managers and there is not a universal cut-off point. Therefore, without a universal standard for ethical investment, fund managers in different cultures may have different screening criteria. (Renneboog et al., 2008a)

In addition to this, the negative screening process is critiqued for being too absolute. Schepers and Prakash Sethi (2013) argue that the negative exclusion overlooks the potential changes in the companies that have been excluded. For instance, a firm that causing environmental damage today might be able and willing to change their way of handing waste water later. From a long-time perspective, the negative screening might be too brutal. Therefore, investors might prefer to funds with positive screening.

An example of negative screening is presented below:

Excluded companies:

A. Controversial Behavior

1.	Oil and Natural Gas Corporation (ONGC)[1]	UNGC breach
2.	Vale SA[2]	UNGC breach
3.	G4S	UNGC breach
4.	Bumitama Agri	palm oil
5.	First Pacific	palm oil
6.	Sampoerna Agro	palm oil
7.	First Resources	palm oil
8.	POSCO Daewoo	palm oil
9.	Noble Group	palm oil
10.	QL Resources	palm oil
11.	Astra Agro Lestari	palm oil
12.	IJM Plantations	palm oil

B. Controversial Weapons:

1.	Hanwha Corp.	cluster munition[3]
2.	Northrop Grumman	depleted uranium
3.	Poongsan Corp.	cluster munition[3]
4.	S&T Dynamics Corp.	anti-personnel mines
5.	Walchandnagar	nuclear weapons
6.	Aerojet	depleted uranium
7.	General Dynamics	depleted uranium
8.	Premier Explosives	nuclear weapons
9.	Larsen & Toubro	nuclear weapons
10.	Tata Power Company Ltd	nuclear weapons
11.	Elbit Systems	cluster munition[3]
12.	Bharat Dynamics	nuclear weapons
13.	Anhui GreatWall Military Ltd	cluster munition[3]
14.	LIG Nex1 Co., Ltd	cluster munition[3]

C. Tobacco[4]:

1.	22nd Century Group	producer
2.	Altria Group Inc.	producer
3.	B.A.T Capital Corporation	producer
4.	B.A.T. International Finance p.l.c.	producer
16.	LT Group, Inc.	producer
17.	Philip Morris International Inc.	producer
18.	PT Gudang Garam Tbk	producer
19.	PT Hanjaya Mandala Sampoerna Tbk	producer
20.	Reinet Investments SCA	producer
21.	Reynolds American Inc.	producer
22.	Shanghai Industrial Holdings Limited	producer
23.	Souza Cruz SA	producer
24.	Swedish Match AB (publ)	producer
25.	Turning Point Brands, Inc.	producer
26.	Vector Group Ltd.	producer
27.	Pyxus International, Inc (formerly known as Alliance One International, Inc.)	supplier
28.	Huabao International Holdings Ltd.	supplier
29.	Schweitzer-Mauduit International, Inc.	supplier
30.	Universal Corporation	supplier

Excluded Countries/Sovereign debt:

1. Afghanistan
2. Burundi
3. Central African Republic
4. Congo (Kinshasa)
5. Eritrea
6. Iraq
7. Libya
8. Myanmar
9. North Korea
10. Somalia
11. South Sudan
12. Sudan
13. Syria
14. Yemen
15. Zimbabwe

[1] In line with item 3.B. of the Robeco Exclusion Policy an exception has been granted on product specific grounds to Robeco CGF Indian Equities to not exclude this company.
[2] In line with item 3.B. of the Robeco Exclusion Policy an exception has been

Table 2.1. Exclusion policy and list provided by Robeco Asset Management (2018, p 4.)

2.2.1.2. Positive screening

Positive screening is another approach frequently used by ethical fund managers to find stocks meeting their investment standard. Positive screening aims to find companies with remarkable performance on some desirable sustainable activities. For instance, firms that have extraordinary green technologies, in depth involvement with local communities, and companies that provide great employee welfares.

Supporters for positive screening argue that this is a more proactive way of choosing investment targets than negative screening. Instead of excluding companies with unethical business or behaviours, positive screening would encourage companies to take more ethical actions (Robins & Krosinsky, 2008). Michelson et al. (2014) agree and claim that positive

screening would incentivize firms to focus more on the ethical part of their businesses and potentially lower their cost of equity.

2.2.1.2.1. Best in class

Best in class screening is a sub-approach under positive screening. The key difference is best in class screening measures the ESG factors of companies in relation to their industrial peers (Robins & Krosinsky, 2008). For instance, a cosmetics company might not be considered through the positive screening process due to the use of animal testing, but it might be included using the best in class approach if they have superior treatment to the animals than their industrial peers.

In this way, companies would be encouraged to focus even more on ethical activities than their counterparts. The nature of the business is not considered in the best in class approach, the company might be a potential investment target if they outperform their peers in ethical matters.

However, in practice, many mutual funds apply both negative and positive/best in class screening. Usually, negative screening is used to filter all investment targets and then positive or best in class approach is utilized to make a further selection. (Robins & Krosinsky, 2008)

2.2.2. Sustainable Funds with Strong Environment Focus

Sustainable funds with strong environment focus are also known as green funds or environment funds. This type of ethical funds invests exclusively on companies with environment-friendly activities. For instance, firms that provides alternative energy, green waste management, and sustainable living. (Renneboog et al., 2008a)

Green funds receive an increasing popularity as there is a growing concern of global warming and a cumulative need for cleaner energy.

Sustainable funds with strong environment focus can be further divided into three subgroups as presented below.

2.2.2.1. Ecological funds

Ecological fund is a subgroup under Green funds, where the fund has more than 80% of their holding invested in stocks of companies that actively incorporate green and environmental business activities. (KPMG, 2017)

2.2.2.2. Climate funds

Climate funds operate in a more restricted investment universe than ecological funds. Climate funds have a strong requirement on the nature of business activities. Most climate funds only invest in the renewable energy sector, consists of wind power, solar energy, and green energy technology. This type of fund aims to reduce the CO_2 emissions and strongly promote the use of green energy. Similar to ecological funds, climate funds have more than 80% holding in equities of companies listed in the alternative energy sector. (KPMG, 2017)

2.2.2.3. Water funds

Besides the above two types of green funds, there is an increasing number of new funds that invest exclusively in water related sectors. For instance, water supply and technology, water scarcity and mineral water. (KPMG, 2017)

2.2.3. Governance

Governance funds have strong focus on company engagement. They observe mainly on how companies incorporate the ESG factors and whether a transparent internal control exists. Governance fund managers use these additional engagement criteria alongside ESG factors in their screening process. (Renneboog et al., 2008a)

2.2.4. Social

Social funds are a niche category in the sustainable investment universe, which only accounts for less than 5% of the total number of ethical funds (Renneboog et al., 2008a). Social funds can be separated into two subgroups as presented below.

2.2.4.1. Microfinance/social impact investing funds

Microfinance or social impact funds aims to create a positive social impact, especially in developing countries through investment. As the name suggests, a social impact fund focuses to improve the living conditions and education opportunities. It could be done by providing microfinance opportunities to local capital markets. This type of fund is rapidly growing and very popular in Western countries. (KPMG, 2017)

2.2.4.2. Solidarity funds

Solidarity funds invest mainly in solidarity projects or work closely with charity organisations. This type of fund often donates directly to non-profitable associations and/or invest directly in social entrepreneurships. (KPMG, 2017)

2.2.5. Ethics

Ethics funds are often religious based and can be divided into two subgroups as presented below.

2.2.5.1. Shariah-Compliant Funds

Shariah-compliant funds are one of the main categories of ethics funds. This type of fund incorporates the ESG criteria and apply additional screening based on the teaching from the Muslim religion.

This type of funds is mostly located in Islamic counties and it has significantly developed in the last decade. According to the Malaysia Islamic International Financial Center (2017), the global total assets under management of Shariah-compliant funds grown from 47 billion dollar in 2008 to 70.8 billion dollars in 2017.

2.2.5.2. Faith based funds

Unlike the Shariah-compliant funds, faith-based funds utilize screening strategies based on the catholic or Christian beliefs. This type of fund is mostly domiciled in the Anglo-Saxon countries. (KPMG, 2017)

2.3. History and Market Development of Sustainable Investment

This section will present the history or ethical investment and the current market development of sustainable investment in Scandinavian counties.

2.3.1. Historical outline

The pioneer concept of ethical investment originates from religions. In the Jewish and Christian traditions based on the teaching from the Tanakh and the New Testament, sinful investments were avoided. For instance, tobacco, alcohol, pornography and gambling, these industries are viewed as taking financial advantage from misusing human weaknesses. (Renneboog et al., 2008a) Later in time, stocks from these industries have been categorized as “sin stocks” (Neher et al., 2016). Sustainable or ethical investing originating from Islamic tradition is based on the Koran, in which investments on pork consumption, gambling and pornography were prohibited. The first modern mutual fund utilizing religious screening process was founded in 1928 (Renneboog et al., 2008a).

Differently from the early religious-based ethical investing, the modern form is more broadly based on the investor’s convictions. The beliefs in ethical and social issues have developed

alongside with the political, economic and social evolutions. The pioneer awareness for social issues started in the 1970s in relation to the Vietnam War. Many investors questioned the war itself and therefore The Pax World Fund as the first modern mutual fund applying negative weapon screening was found in 1971. (Renneboog et al., 2008a)

One decade later, the apartheid movement in South Africa in the 1980s raised more attention in social ethics. As a consequence, many companies stopped doing business in or with South African firms. (Renneboog et al., 2008a)

In later years, sustainability got greater attention due to the Exxon Valdez oil spill occurred in Alaska and the increasing debate regarding global warming. These events increased the general awareness and considerations among people for climate change and the consequences of modern industrial activities environment. (Hammenfors and Hafskjær, 2016)

Due to these concerns, many sustainable mutual funds and indices were established in the 1990s. The MSCI KLD 400 Social Index, previously known as the UK Domini 400 Social Index was the first sustainable index found in 1990. This establishment provided investment opportunities to all investors and lead to a growing popularity in ethical investment. As a result, many ethical indices were found in the European and American market, such as the Dow Jones Sustainability Index. In 1999, the UK Social Investment Forum took an initiative together with many European countries to encourage all European pension funds include sustainable and ethical screens in their investment process. This initiative later became the European Social Investment Forum in 2001. (Hammenfors and Hafskjær, 2016)

Overall, the concern and interest for ESG factors have increased significantly since the 1980s. Investors are willing to pay a premium for sustainable business and an abnormal return of sustainable investment is not always required (Renneboog et al., 2008a).

2.3.2. Market development in Scandinavia

The current sustainable investments in Scandinavia are dominated by the Swedish, Norwegian and Danish markets.

Historically, the Scandinavian countries have solid welfare systems created on democratic philosophy. The corporate governance of companies has been in healthy conditions through the years due to the fact that the Scandinavian countries are the least corrupted area in the world. Besides that, the employee satisfaction, gender quality, and education level are considered to

be higher than the global average. Based on these factors, in general, there is a greater awareness towards sustainability in Scandinavian countries.

The first Scandinavian ethical fund was originated from religious beliefs and established in Sweden in 1965. The Swedish church promoted ethical investing based on Christian teachings and humanitarian values. However, in the later years, the focus of ethical investment shifted towards social and environmental sustainability. (Hammenfors and Hafskjær, 2016)

Today, all major banks in Scandinavia have founded their own ethical or sustainable funds. For instance, the Nordea Stars funds and SEB Ethical Funds. Norway is the largest player in this field by the size of asset under management, while Sweden is in a leading place by the number of established sustainable funds. The Norwegian ethical fund market is enormous mainly due to the existence of the Government Pension Fund of Norway, which has over US$1 trillion asset under management. (Hammenfors and Hafskjær, 2016)

This thesis decided to only include mutual funds with Scandinavian domicile because the Scandinavian sustainable investing market is more developed than other counties and there is limited research in this geographic area.

Chapter 3 Literature Review

This chapter is divided into two sections. The first section gives an overview of previous research in sustainable investment, while the second section provides a summary of the Literature review and the results' allocation and validity will be presented.

3.1. Overview of previous studies

This section provides an overview of 17 previous most cited and most recent studies on the financial performance of sustainable funds. The studies are presented in chronological order according to the year of publication.

3.1.1. Moskowitz (1972)

Moskowitz (1972) conducted the first study on the relationship between corporate sustainable activities and financial performance. The author identified the concept of ethical or socially responsible investment and investigated the financial performance of 14 American companies with social awareness. Despite the disappointing results in which no superior returns were detected in relation to ethical corporate activities, the author strongly believes that such a positive relationship between social awareness and positive financial performance does exist.

3.1.2. Hamilton et al. (1994)

Hamilton et al. (1993) conducted one of the initial studies of American ethical mutual funds' financial performance. The study consisted of 32 ethical funds and 320 conventional funds, which both have been separated into two subgroups. The 32 ethical funds were divided into two subgroups based on their inception dates. The first subgroup consisted 17 ethical funds established after 1985, while the second subgroup is made by 15 ethical funds established in or earlier than 1985.

On the other hand, the 320 conventional funds were also divided based on their fund age in the same procedure as the ethical funds. The first subgroup consisted of 150 conventional funds, while the second subgroup was made by 170 conventional funds. The financial performance of ethical funds was compared to the conventional mutual funds for the same period.

The authors applied the single-factor model to compare the financial performance between ethical and conventional funds. The results showed that there is no significant difference in excess returns between sustainable funds and their conventional peers. The authors suggested that the ethical investors should therefore not expect additional returns from sustainable investments.

3.1.3. Grinblatt and Titman (1994)

Grinblatt and Titman (1994) investigated the financial performance of mutual funds through a quadratic regression model introduced by Treynor and Mazuy (1966). The study consisted of 109 passive portfolios and 279 mutual funds. The authors concluded that the results of financial performance are depended on the measurements and benchmarks used for mutual funds. Grinblatt and Titman (1994) found that size effects is one of the misleading reasons to false conclusions. The results showed that fund characteristics such as turnover and net asset value are significantly positively related to the capability of fund managers to yield abnormal returns.

3.1.4. Mallin et al. (1995)

Mallin et al. (1995) introduced a ”matched pair approach” based on the previous framework developed by Hamilton et al. (1993). The “matched pair approach” is conducted by comparing a sustainable fund to a matched conventional fund. The mutual funds were matched individually by its inception date and size. These two fund characteristics were selected because the authors believe that they might have an impact on the financial performance of mutual funds.

This study consisted of 29 sustainable funds domiciled in the UK during the time period of 1986 to 1993. The data of sustainable funds were selected through negative and positive screening process. The 3-month treasury bill severed as the risk-free rates while the Financial Times All-Share Index was utilized as the market index. Monthly net asset values of mutual funds were collected, and the fund performance was measured by risk-adjusted single-factor model, Sharpe and Treynor ratios. Unlike the study made by Hamilton et al. (1993), Mallin et al. (1995) compared the financial performance of ethical and conventional funds on matched pair basis instead of on portfolio levels.

The authors found that both ethical and conventional funds underperformed the market. However, there was a tendency that the ethical funds outperform their conventional peers, yet these results were not statistically significant.

3.1.5. Gregory et al. (1997)

Gregory et al (1997) extended the “matched pair approach” by Mallin et al. (1995) by adding two more matching criteria, namely, fund’s investment area and fund types. This study consisted of 18 ethical funds during a time period of 1986 to 1994. The fund performance was measured by Jensen’s alpha. However, the authors argue that the results providing by the

single-factor model might be biased due to several limitations. These limitations are further discussed in Chapter 5 of this thesis.

The authors took consideration to the previous finding of Grinblatt and Titman (1994), where the size effect was concluded as a misleading factor for fund performance. Gregory et al (1997) therefore solved the size effect issue by applying the Fama French 3 factor model. The results indicated that there is no significant difference in performance between ethical and conventional mutual funds.

In addition to this, the authors also conducted two cross-sectional regressions to examine the impact of "size effect" on fund performance. The findings suggest that there is no correlation between fund size and fund performance.

3.1.6. Schröder (2004)

Schröder (2004) studied the financial performance of American, German, and Swiss socially responsible funds and indices in relation to the market. Their study consisted of 46 mutual funds and 10 sustainable indices. Overall, no statistically significant difference in returns between sustainable funds/indices and their conventional peers were found.

3.1.7. Bauer et al. (2005)

Bauer et al. (2015) studied the financial performance and investment style of 103 American, or British or German sustainable funds in the period from 1990 to 2001. The authors applied the Carhart four-factor model to examine the fund performance and benchmarked the results to matched conventional funds. The study concluded that after an adjustment for investment style, the ethical and conventional funds performed at similar levels.

Most importantly, the Bauer et al. (2015) introduced a hypothesis that a learning phase might exist for new-established sustainable funds. The authors examined this hypothesis by separating the data into three non-overlapping samples and they compared the financial performance of sustainable funds with their conventional peers at different time stages of the industry. Bauer et al. (2015) highlighted that the ethical funds underperformed their conventional counterparts and went through a learning phase in the beginning of the period. Later in time, when the ethical fund and sustainable market matured, the SRI funds performed on similar levels as their conventional peers.

3.1.8. Kreander et al. (2005)

Kreander et al. (2015) conducted their study based on the "matched pair approach" introduced by Mallin et al. (1995). The authors examined the financial performance of 60 European ethical funds during the time of 1995 to 2001. The findings suggest that there is no significant performance difference between ethical and conventional mutual funds.

Besides that, the authors also studied the market timing ability of mutual fund managers. Market timing is an investment strategy aims to yield abnormal returns by forecasting market movements. According to the results of Kreander et al. (2015), Neither ethical nor conventional fund managers achieved higher financial performance through market timing.

3.1.9. Bauer et al. (2006)

Bauer et al. (2006) investigated the financial performance and investment style of 25 Australian sustainable funds during a period of 1992 to 2003. The authors utilized the Carhart four-factor model to examine the difference in risk-adjusted returns of ethical funds and their conventional peers. The findings showed that the sustainable funds significantly underperformed their peers in 1992 to 1996, while the ethical funds and conventional funds yielded similar returns in 1996 to 2003. The authors explained the finding by indicating that there is a learning phase for new-established ethical funds until they "catch up" the performance level as their conventional peers. Overall, taking the entire estimation period into calculation, there is no significant difference in risk-adjusted returns for sustainable and conventional mutual funds.

3.1.10. Bauer et al. (2007)

Bauer et al. (2017) conducted another research on sustainable mutual funds' financial performance in relation to their conventional peers. The authors compared the financial performance of 8 ethical funds to a benchmark made by 267 conventional mutual funds. Similar to previous studies, the fund performance was evaluated utilizing the Carhart four-factor model. However, this study focused exclusively on the Canadian market and they concluded that there is not a statistically significant difference in risk-adjusted returns between sustainable funds and their conventional counterparts.

3.1.11. Renneboog et al. (2008a)

Reeneboog et al. (2008a) conducted a review of previous studies of ethical funds' financial performance. The authors provided an overview of the development of sustainable investment, findings of mutual funds' performance and money-flows of ethical mutual funds. The results showed that the conventional funds have higher money-flows and volatility than ethical funds.

3.1.12. Renneboog et al. (2008b)

Renneboog et al. (2008b) examined the financial performance of mutual funds during a period of 1991 to 2003. This study consists almost all mutual funds during the timeframe. The authors collected data of 440 ethical funds and 16036 conventional funds, both existing and dead ones.

The Carhart four-factor model was applied to investigate the risk-adjusted returns between ethical and conventional funds. The findings indicated that American, British and several European and Asia-pacific ethical funds underperformed their domestic benchmarks. However, those ethical funds had risk-adjusted returns at similar levels as their conventional peers. In contrast, the France, Swedish, Japanese, and Irish ethical funds significantly underperformed their conventional counterparts.

Besides that, the authors also investigated the impact of screening strategies on mutual funds' financial performance. This study concluded that there is a significant relationship between the screening process and the fund performance, where mutual funds with one additional screening process results 1% less in risk-adjusted return, ceteris paribus.

3.1.13. Leite and Cortez (2014)

Leite and Cortez (2014) made a study on the financial performance and investment styles of global mutual funds based on Mallin et al (1995)'s "matched pair approach". The authors utilized multi-factor models to compare the risk-adjusted performance between SRI funds and their conventional peers. The study was made on European mutual funds with both global and European holdings during a period of 2000 to 2008. Leite and Cortez (2014) chose to use international mutual funds because they wanted to investigate whether the performance of sustainable funds was exposed to the less-diversified effect. As a result, no significant difference in returns have been detected between ethical and conventional funds.

Furthermore, the authors concluded that conventional funds are better benchmarks than sustainable indices while examining the performance of ethical mutual funds.

In addition to this, the authors examined the performance difference between ethical funds that using different investment strategies. The results indicated that the traditional ethical funds with negative and/or positive screening process are more exposed to small caps and momentum strategies than ethical funds utilizing "best-in-class" screening.

3.1.14. Revelli and Viviani (2015)

Revilli and Viviani (2015) conducted a systematic review of previous research on the relationship between socially responsible investment (SRI) and financial performance. They reviewed previous 190 experiments and 85 studies during a time period of 1972 to 2012. The authors found that no significant linkage between SRI and positive financial performance exists. Revilli and Viviani (2015) concluded that including ethical corporate activities may not lead to superior financial performance for companies in comparison to firms that only aim for profit maximization. This finding is contractive and challenging to the beliefs of SRI. Moreover, the authors pointed out that findings on previous studies depended on the methodology applied by the researches and the stock picking ability of fund managers.

3.1.15. Leite et al. (2017)

Leite et al. (2017) conducted a study of Swedish socially responsible funds' financial performance on both aggregate and individual fund levels during a period of 2002 to 2012. The authors found that on the aggregate level, sustainable funds with global holdings underperformed their conventional peers, while sustainable funds with Swedish and European holdings had similar returns as their conventional counterparts. Leite et al. (2017) implied that the underperformance of ethical funds was mainly caused by poor stock picking ability of fund managers. On the individual funds' level, there is no significant difference in risk-adjusted returns between ethical and conventional funds.

3.1.16. Ibikunle and Steffen (2017)

Ibikunle and Steffen (2017) performed a comparative analysis of the financial performance of European green, conventional, and black mutual funds. The black mutual funds are funds that invest exclusively in natural resource and fossil energy business. This study consisted of 976 conventional, 175 green, and 259 black mutual funds during a time period of 1991 to 2014.

The authors found that over the entire estimation period, there is no significant difference in risk-adjusted returns of green and black mutual funds, while both types of funds significantly underperformed the conventional funds.

However, the authors identified that a learning period existed for green funds. The financial performance of green funds in the beginning of the estimation period underperformed their conventional peers and eventually performed at similar levels as their conventional

counterparts at the end of the period. In addition to this, the green funds significantly outperformed the black funds during the last three years of the estimation period.

3.1.17. Matallín-Sáez et al. (2019)

Matallín-Sáez et al. (2019) conducted a comprehensive study of financial performance of ESG funds. This study consisted of 3920 sustainable mutual funds across the globe, and the fund performance was measured by the Carhart four-factor model. The authors found that the stock selecting ability is essential for ethical funds to yield greater financial returns. The ethical investors can receive higher returns by investing in the previous best-performing ethical funds.

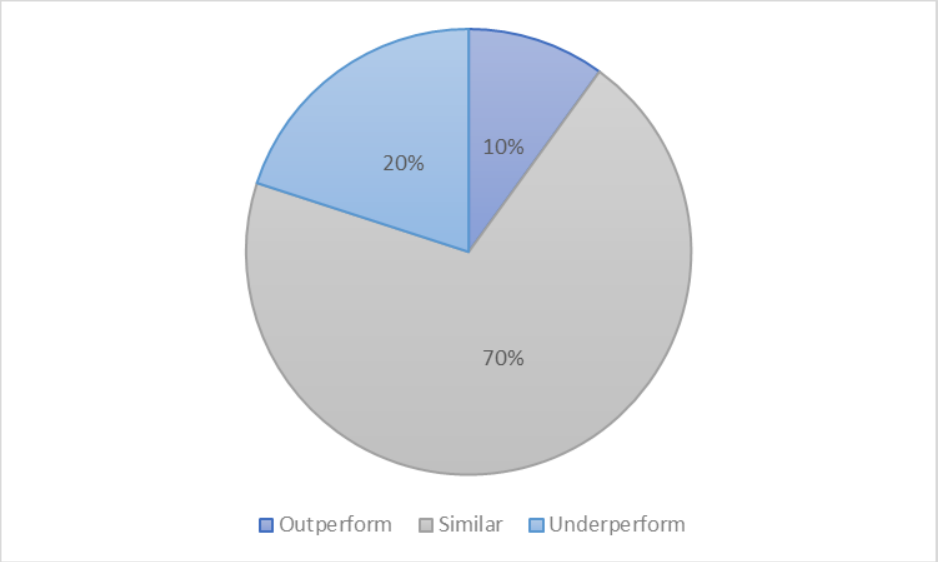
3.2. Summary of Literature Review

There has been an increasing interest towards sustainable investment since the 1970s and therefore many researches have been conducted in the last three decades. This thesis provided an overview of 17 most cited and recent studies in this field published between 1972 and 2019. This section will give a summary of previous finding of ethical fund performance and the applied methodology.

3.2.1. Findings on Sustainable fund performance

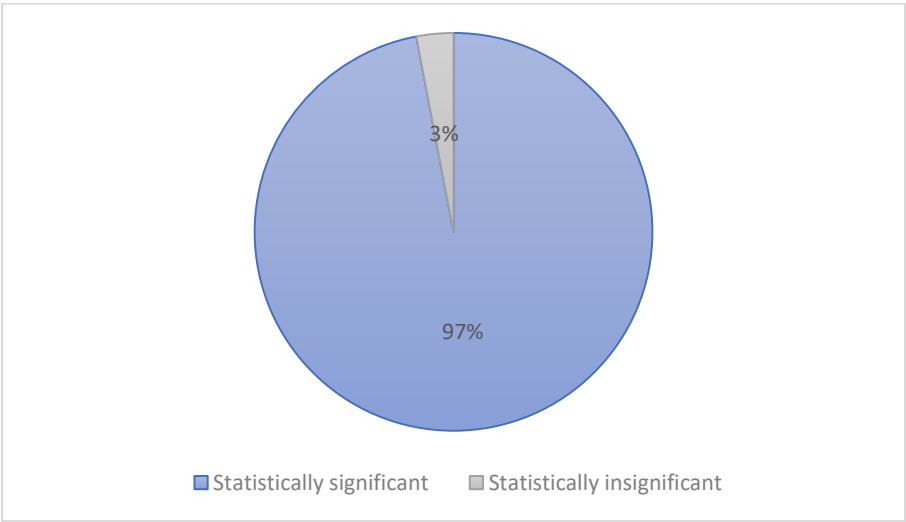
Previous studies compared the financial performance of ethical mutual funds to either conventional funds or benchmarks. In sum, most previous studies suggest that there is not a statistically significant difference in risk-adjusted returns between sustainable funds and the applied benchmarks. The majority of previous researches imply that the ethical and conventional mutual funds perform at similar levels.

Among the selected 17 studies in Literature review, four studies: Moskowitz (1972), Grinblatt and Titman (1994), Renneboog et al. (2008a) and Revelli and Viviani (2015) are critical reviews of earlier studies, and three studies: Hamilton et al. (1994), Schröder (2004) and Matallín-Sáez et al. (2019), are not comparing the financial performance of ethical funds with conventional funds. Taking this into consideration, the results of previous studies are allocated below:



The allocations of previous findings are divided into three categories: similar performance levels between sustainable and conventional funds, the ethical funds out- or underperform their conventional peers. 70% of previous studies found that ethical and conventional funds perform at similar levels, while 20% studies concluded that sustainable funds outperform their peers, and 10% researches suggested that ESG funds underperform in relation to their conventional counterparts. Overall, the findings are inconclusive with an indication of the ethical and conventional mutual funds perform at similar levels.

The statistical validity of previous research is presented below:



As illustrated graphically, 97% of previous findings were statistically significant, which are considered to be a reliable reference.

3.2.2. Applied Methodology

Throughout the studies listed in the Literature review, all researches mentioned the issue that there is not a standard or universal definition of sustainable investment. Different studies have applied different interpretations of the concept and therefore affected the data included in the research, which makes it difficult to compare the results across studies.

In terms of the applied methodology, previous studies generally built on two approaches to evaluate the financial performance of mutual funds. The first approach is to compare the financial performance of a sustainable fund to a benchmark consist of conventional funds as in Bauer et al. (2007). The second approach is the "matched pair" method introduced by Mallin et al. (1995), where a sustainable fund is matched to one or more conventional funds based on different criteria. The "matched pair approach" is determined by the matching criteria chosen by the researchers.

In addition to this, the majority of previous studies were focused on the American or British markets, because these geographic areas have historically been active for ethical investments. There is only a limited number of studies undertaken on the Scandinavian market, which is also the reason why this thesis decided to investigate on ethical fund performance in the Nordic counties.

Besides that, in the earlier years, the studies were conducted utilizing the single-factor model, while in the later years multi-factor models have been more frequently used. In the most recent studies, there is a tendency of shifting the research focus from ethical/conventional funds comparison to investigating the performance of sustainable funds with similar characteristics, i.e. what factors caused the under/overperformance of sustainable funds. However, the field of studying performance difference between ethical and conventional funds is still under a growing popularity.

The table below summarises the methodologies applied of the studies included in the Literature Review. Four studies: Moskowitz (1972), Grinblatt and Titman (1994), Renneboog et al. (2008a) and Revelli and Viviani (2015) are not included in the table because they are reviews of earlier studies. In addition to this, three studies: Hamilton et al. (1994), Schröder (2004) and Matallín-Sáez et al. (2019), are included in the table but they did not have a conventional benchmark, because either they focused to investigate the financial performance of sustainable funds itself than comparing the returns with conventional funds. However, all studies included

in the Literature Review are considered to be useful and provided great insights towards sustainable investment and the measurement of fund performance.

Study	Publication Year	Country	Timeframe	Number of funds	Performance Measures	Market indices	Conventional benchmark
Hamilton et al	1994	US	1982-1990	32	CAPM	Value-weighted NYSE index	N/A
Mallin et al	1995	UK	1986-1993	29	CAPM, Sharpe, Treynor	FT All Share Index	29 matched conventional funds based on fund age and size
Gregory et al	1997	UK	1986-1994	18	Two-factor model with two incices	FT All Share Index and Hoare Govett Small-cap Index	18 matched conventional funds based on fund age, size, type and investment area
Schröder	2004	US, Germany, Switzerland	1990-2002	46	Two-factor model with two incices	10 SRI indices	N/A
Bauer et al	2005	UK, US, Germany	1990-2011	103	CAPM and Carhart four-factor model	For international funds: DJ Sustainablity Global index or MSCI World Index; For US domestic funds: S&P 500 or DSI 400; For UK domestic funds: FT All Share Index or EIRIS Ethical Balance	Random selected conventional funds
Kreander et al	2005	Belgium, Germany, Netherlands, Scandinavia, Switzerland, UK	1996/1998	40	CAPM	MSCI World Index	40 matched conventional funds by fund size, age, country and investment area
Bauer et al	2006	Australia	1992-2003	25	CAPM	Value-weighted Worldscope Equity Index	281 randomly selected conventional funds
Bauer et al	2007	Canada	1994-2003	8	CAPM and Carhart four-factor model	S&P/TSX composite	267 randomly selected conventional funds

Renneboog et al	2008	Global	1991-2003	440	CAPM and Carhart four-factor model	Value-weighted Worldscope Equity Index	12624 randomly selected conventional funds
Leite and Cortez	2014	Europe	2001-2012	40	CAPM and Carhart four-factor model	MSCI Europe Total Return	120 randomly selected conventional funds
Leite et al	2017	Sweden	2002-2012	33	CAPM and Carhart four-factor model	MSCI World Index, MSCI Europe Index, MSCI Sweden Index	3 conventional indices
Ibikunle and Steffen	2017	Europe	1991-2014	175	CAPM and Carhart four-factor model	FTSE Global Small Cap Index, S&P Global Alternative Energy Index, S&P Global Natural Resources Index	976 conventional funds and 259 black funds
Matallín-Sáez et al	2019	Global	2000-2018	3920	Carhart four-factor model	FTSE World Index, DJ Sustain World NR USD, FTSE Emerging TR USD	N/A

Chapter 4 Theory and opinions of sustainable investment

The theoretical framework and opinions behind the concept of sustainable investment is discussed in this chapter.

4.1 Stakeholder theory

Freeman introduced the Stakeholder theory in 1984 by challenging the traditional view of shareholder whom only focus on profit generation and maximisation. Freeman (1984) argues that besides profit generation, a company should also consider the relations with other parties that have any interests in the company. Such a stakeholder could be social or environmental parties outside the company. Barnett and Salmon (2006) claim that companies that care about their stakeholders will generate superior stock returns.

A general goal of sustainable investing is to both generating financial returns and creating a positive impact on the society. Sustainable investors believe that investing in companies with good ESG performance can mitigate and limit future risks, both financially and socially. (Nordea, 2018). Heal (2005) suggests that companies with an effectively implemented management of stakeholders will save costs for handing potential social and environmental risks in the future.

4.2. Modern portfolio theory

Modern portfolio theory (MPT) was first introduced by Markowitz (1952). In the developed securities market, Markowitz's portfolio theory has proven to be effective in practice and is widely used in portfolio selection and asset allocation.

The modern portfolio theory contains two important elements: the mean-variance analysis method and the efficient frontier.

To begin with, the mean-variance analysis suggests that in nature, people invest by choosing among uncertain returns and risks. The MPT uses the mean-variance to characterize these two key factors. The so-called mean value refers to the expected rate of return of the portfolio, which is the weighted average of the expected rate of return of single securities including in the portfolio. On the other hand, the so-called variance refers to the variance of the rate of return of the portfolio. In other words, the standard deviation or the volatility of the rate of return, which portrays the risk of the portfolio. (Bodie et al., 2014)

Furthermore, the MPT highlights that the assets included in a portfolio should be selected based on the covariance of the expected return and the risk of these assets. Because securities with low covariance to each other are desired to eliminate the systematic risk (Markowitz, 1952).

Besides that, MPT implies that there is "no free lunches" and the investors must take a higher risk in order to generate a higher return. This is also known as the risk-return trade-off. (Bodie et al., 2014). Markowitz (1952) believes that riskier assets are associated with higher expected returns than lower-risk assets.

The Modern Portfolio Theory studies how "rational investors" choose to optimize their portfolios. APT suggests that a so-called rational investor will choose an optimal portfolio that maximizes the expected return at a given level of expected risk or minimizes the expected risk at a given expected level of return (Bodie et al., 2014). This bought up the concept of the Efficient Frontier, where the optimal portfolio is formed as a curve depicted in a two-dimensional plane with volatility on the abscissa.

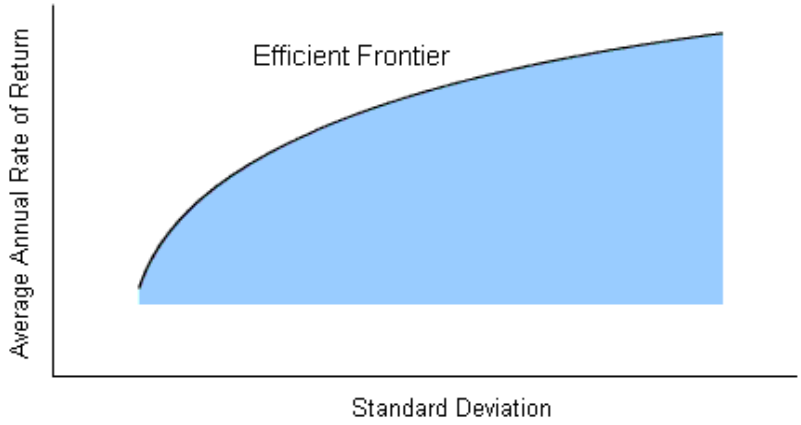


Figure 4.1. The Efficient Frontier (Bodie et al., 2014)

All optimal portfolios are positioned on the efficient frontier. Investors with different risk aversion and preferences of expected return will choose different optimal portfolios on the efficient frontier.

As discussed earlier in Chapter 2, the sustainable screening process might reduce the diversification effect because sustainable funds are investing in a restricted universe. Certain industries might be excluded in order to meet the sustainable investing criteria. Therefore, according to the Modern Portfolio Theory, the ESG funds are expected to underperform their conventional peers because the risk-return trade-off is not optimized (Barnett and Salomon, 2006)

4.3. The Efficient Market Theory

According to the efficient market theory, the security price fully reflects all the information available to investors. In other words, at any time the actual price of a security is a good estimate of its intrinsic value as all available information about the security has been immediately processed by the financial markets (Roberts, 1967).

The notion that stock prices reflect all information is called the Efficient Market Hypothesis (EMH), in which random price changes indicate an efficient market. (Bodie et al., 2014).

The efficient market hypothesis is contradictive to active portfolio management. If the EMH is true, then the actively managed portfolios will never be able to outperform the market. However, in an entirely efficient market, the purpose of portfolio managers will be eliminating the non-systematic risks and providing well-diversified portfolios based on the individual investors' preferences. (Bodie et al., 2014)

4.4. Debate of ESG investment

There are different views for ESG investment based on the above discussed theories and there is a continuous debate on whether sustainable investing increase company value.

To begin with, supporters of sustainable investing believe that ESG factors increase value. As presented in the Literature Review in Chapter 3, several previous studies have found outperformance of sustainable funds in relation to their conventional peers and the market. This finding is contradictive to the Modern Portfolio Theory.

The supporters for sustainable investing argue that the ESG funds are more actively managed and better selected in comparison to the conventional ones, because the selection of ESG stocks require longer time and effort to find stocks that meet the ESG screening criteria (Barnett and Salomon, 2006).

Barnett and Salomon (2006) also argue that companies who are able to take ESG factors and their stakeholders' interests into consideration proves that they have a financial ability to do so. Furthermore, these companies can eliminate potential future risks by performing sustainably today. By investing sustainable funds, the consequence of being less-diversified can be offset by the expected outperformance of the selected ESG stocks in the long run (Barnett and Salomon, 2006).

In addition to this, Porter and Kramer (2007) propose that companies that operating sustainably will have better competitive advantages than other firms. Not coincidentally, Porter and Linde (1995) suggest that financial performance of companies can be improved by taking sustainable actions. For instance, proper waste management could build a better reputation of the company and in turn increase the firm's competitive advantage and leads to better financial performance. Therefore, there is a positive correlation between sustainable investments and financial performance.

On the other hand, criticisers of ESG investment claim that high costs will be created by sustainable investment. To begin with, the long screening process for sustainable funds is associated with high administrative costs and management fees, while the outperformance of ESG funds is still questionable. Secondly, Walley and Whitehead (1994) disagree the arguments presented by the supporters of sustainable investing. Walley and Whitehead (1994) argue that ESG actions are proven to be costly and complicated, so the financial payback might not be large enough to cover the initial costs and therefore create a financial loss for the company. Overall, the opponents of sustainable investment suggest that there is a negative correlative between ESG actions and financial performance.

4.6. Hypotheses

This study formed two hypotheses based on the theories and opinions behind sustainable investing and the previous findings presented in the literature review in Chapter 3.

Hypothesis 1: Sustainable fund portfolios outperform their conventional counterparts.

As previously discuss in this chapter, according to the stakeholder theory, companies that take their stakeholders' interest into consideration will generate superior returns than other firms. By including these companies in an investment portfolio, the less-diversified effect will be eliminated, and higher returns are expected in the long run.

Hypothesis 2: Sustainable fund portfolios underperform their conventional counterparts.

According to the Modern Portfolio Theory, the sustainable portfolios will underperform their conventional peers because they are investing in a restricted universe while implementing the ethical screening criteria.

Chapter 5 Measurement of fund performance

This chapter will discuss the tools and models used for the measurement of mutual funds' financial performance in this study.

The traditional performance measures such as the Capital Asset Pricing Model (CAPM), the Sharpe and Treynor ratio, and Jensen's alpha will be presented. Moreover, the two multi-factor models and econometrics will also be discussed in this section.

This study aims to evaluate if any significant differences in risk-adjusted returns between sustainable funds and conventional mutual funds exist. The analysis following a "matched pair approach" and the financial performance of sustainable funds and their conventional counterparts are compared on a portfolio level. The data and proxies applied in this study will be further elaborated in Chapter 6.

5.1. Return properties

The return rate from investments in the mutual fund is calculated as the change over a holding period in the value of net assets plus income distributions, such as dividends. Such return is also known as the Holding Period Return (HPR). The net asset value (NAV) represents the total value of portfolio holdings of the fund minus the value of its liabilities, divided by the number of outstanding fund shares. In other words, the NAV is the price per share of a mutual fund. At the start of the period, the net asset value is denoted as NAV_0 and NAV_1 at the end of the period.

$$R_t = \frac{NAV_1 - NAV_0 + D_t}{NAV_0}$$

Where:

R_t is the Holding Period Return (HPR);

D_t is the income and capital gain distributions, e.g. dividends, received at time t;

NAV0 and NAV1 is the Net Asset Value of the fund at the beginning and the end of the holding period.

This thesis gathered monthly NAV of mutual funds from the Bloomberg database, which incorporates the dividends at the time they were distributed, and assumed they are reinvested. The income distribution component of the HPR is therefore incorporated in the NAV_1 variable, therefore, the rate of return is calculated as:

$$R_t = \frac{NAV_1 - NAV_0}{NAV_0}$$

This way of calculating returns is called simple returns, alternatively, returns can also be calculated using natural logarithm. The logarithmic returns are calculated in the following way:

$$r_t = \ln(\frac{NAV_1}{NAV_0})$$

Where ln is the natural logarithm.

For several reasons, logarithmic returns are commonly used in finance. First, logarithmic returns are normally distributed when calculating returns over more than one period, but simply returns are not. This is because logarithmic returns are time-additive, which means that the return over the entire holding period can be simply calculated by adding up the logarithmic returns for the subperiods. If returns indeed follows the normal distribution, then the logarithmic returns will also be normally distributed when they are added together. Secondly, logarithmic returns are symmetric. According to Bodie et al. (2014), logarithmic returns are more "stable" because they are equally likely to have a positive, as a negative deviation from the mean.

However, logarithmic returns are not asset-additive, or multiplicative, like simple returns. The multiplicative characteristic of simple return simplifies the calculation of portfolio returns by taking the weighted average of the stocks returns included in the portfolio (Bodie et al., 2014).

Given that there are both advantages and disadvantages of logarithmic and simple returns, this study uses the same method as Fama and French's study (1992), namely simple returns.

5.2. Capital Asset Pricing Model (CAPM)

The Capital Asset Pricing Model (CAPM) is a frequently used model for mutual fund performance evaluation. The CAPM shows the relationship between the portfolio return and the risk. It assumes that only the systemic risk (beta) of the portfolio can bring the portfolio a profit beyond the risk-free rate (Bodie et al., 2014).

The formula of CAPM is:

$$R_i = R_f + \beta_i (R_m - R_f)$$

Where:
R_i is the expected return on asset i;
R_f is the risk-free rate;
β_i is the risk of asset i relative to the market, the asset beta;
R_m is the expected return of the market portfolio.

As the mathematical expression illustrates, when the market portfolio returns outperform the risk-free rate, the portfolio can only yield a higher level of return by increasing its systemic risk.

The Security Market Line (SML) is the graphical representation of the CAPM. The expected return on any securities can be defined by the SML line, where the x-axis represents the systematic risk (beta), and the y-axis shows the expected return of the security. The so-called systematic risk (beta) is risks that cannot be eliminated through diversification, and it measures its contribution to the market portfolio's variance (Sharpe, 1964).

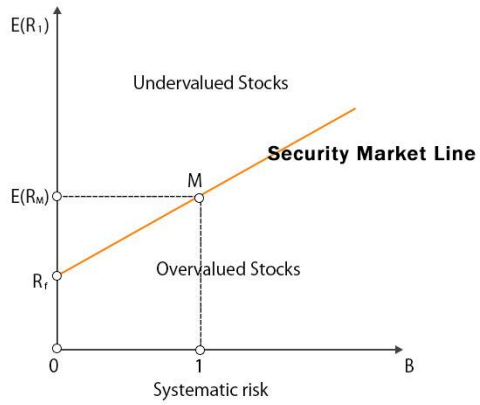


Figure 5.1. The Security Market Line. (Bodie et al., 2014)

5.2.1. Sharpe ratio

Sharpe ratio, also known as the reward-to-volatility ratio is a standardized indicator of fund performance introduced by William F. Sharpe in 1966. The study of Sharpe ratio utilizing the Modern Portfolio Theory shows that the magnitude of risk plays a fundamental role in determining the performance of a portfolio. The Sharpe ratio is the slope of the Capital Market Line and it is a comprehensive indicator that enables an investor to evaluate the investment return compared to its risk (Sharpe, 1966).

The formula for Sharpe ratio of a stock portfolio is:

$$\text{Sharpe ratio} = \frac{R_p - R_f}{\sigma_p}$$

Where:
R_p is the portfolio's return;
R_f is the risk-free rate;
σ_p is the standard deviation of the portfolio's excess return.

The rule of thumb is that the larger value of the Sharpe ratio, the more attractive risk-adjusted return (Bodie et al., 2014).

5.2.2. Treynor ratio

In similarity to the Sharpe ratio, Treynor ratio is a risk-adjusted measure that is frequently used to evaluate the performance of mutual funds. However, the key difference between Treynor ratio and Sharpe ratio is that Treynor ratio uses beta as the measurement of volatility that only incorporates the systematic risk of investment, while Sharpe ratios covers the total risk of investment (Treynor, 1965).

The formula for Treynor ratio is:

$$Treynor\ ratio = \frac{R_i - R_f}{\beta_i}$$

Where:

R_i is the portfolio return;

R_f is the risk-free rate;

β_i is the systematic risk of the portfolio.

Graphically, Treynor ratio is the slope of the Security Market Line (Treynor, 1965). The Treynor ratio relies on the same assumption as the Sharpe ratio that an investor can adjust the investment risk by borrowing and lending at the risk-free rate (Bodie et al., 2014).

5.2.3. Jensen's alpha

Unlike CAPM, in which systematic risk of the portfolio is assumed to be the only factor that bring excess return to the security, later research (Lintner, 1965) found that the individual risk of the stocks in the portfolio can also affect the portfolio returns. Such an individual risk is called non-systematic risk, and this risk can be diversified away. In other words, a good portfolio manager can yield higher return beyond the market portfolio through good stock picking ability. Therefore, Jensen (1969) added the excess return factor α on the basis on the CAPM model.

All securities would lie on the Security Market Line in perfect capital markets, and in such a case the alpha value will be zero. However, when the CAPM model does not hold, the

difference between the market returns and portfolio returns is presented utilizing Jensen's alpha, also known as the single factor model.

The formula for Jensen's alpha is:

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

Where:
α_p is the excess return of CAPM;
r_p is the expected total portfolio return;
β_p is the beta of the portfolio;
r_f is the risk-free rate;
r_m is the expected market return.

In terms of the graphic representation, all securities lying above the SML have a positive value of Jensen's alpha and overperform the market, whereas the securities positioned below the SML underperform the market and have a negative alpha.

5.2.4. Limitations of single-factor models

Despite the fact that single-factor models as CAPM have been extensively used to evaluate the financial performance of mutual funds, there are several difficulties or weakness related to these models.

To begin with, the underlying assumptions of CAPM have been criticized by many scholars. The CAPM assumes that all investors are rational and have the same investment preference, same information, and hold the same portfolio. These assumptions are unlikely to be true which arises questions of the reliability of the single-factor model (Bauer et al., 2005).

Furthermore, Bauer et al. (2005) among others, question the comparability of CAPM. The CAPM model does not always include the same assets as the benchmark. For instance, a mutual fund might only invest in small-cap funds in certain countries, while another fund might contain stocks from only one industry in a single country. It is therefore difficult to compare the two funds with each other utilizing the CAPM model. The one-factor models cannot explain whether the excess returns of the fund relative to the market depends on the stock's performance that are not included in the benchmark or are caused by the stock selection ability of fund managers (Brealey et al. 2014).

In addition to this, unlike multi-factor models, CAPM only consider the market portfolio. The additional factors than the market index have a stronger explanation power on the portfolio

return and might capture risk premiums (Bauer et al., 2005). Therefore, one-factor models like CAPM might not fully estimate the expected returns by only considering the market index (Bodie et al., 2014).

5.3. Multi factor models

Due to the above-mentioned limitations of the one-factor model, multi-factor models have been increasingly utilized to evaluate mutual funds' financial performance. The notion behind multi-factor models is that the asset pricing will be more accurate by including more risk factors to the model.

However, the selection of factors should be done with care. Elton (2011) argues that the results of multi-factor models could be misleading if irrelevant factors have been included in the model. This potential risk is treated with careful consideration while selecting the additional factors used in this study.

5.3.1. Arbitrage Pricing Theory (APT)

Arbitrage Pricing Theory (APT) is an extension of CAPM and the core notion behind multi-factor models. The APT was introduced in the 1970s by Stephen Ross. In similarity to the CAPM model, APT relates the expected return of all assets to its risk through a predicted security market line.

Ross (1970) created three underlying assumptions that the theory relies on:

1. Factor model can be used to explain asset returns.
2. The idiosyncratic/ unsystematic risk can be diversified away.
3. The security market is efficient and persisting arbitrage opportunities are not allowed.

The mathematical expression of APT is:

$$R_i = \alpha_i + \sum_{j=1}^{j} \beta_{ij} F_j + \epsilon_i$$

Where:
R_i is the return on security i;
α_i is the expected return on security i if all factors equal to zero;
β_{ij} is the sensitivity of security i to a change in factor j;
F_j is the value of factor j that affect the return on security i;
ϵ_i is the random error term.

The arbitrage pricing theory believes that arbitrage behaviour is a determining factor in the formation of modern efficient markets (i.e., market equilibrium prices). If the market does not reach equilibrium, there will be risk-free arbitrage opportunities in the market.
Using multi-factors to explain the asset returns and according to the APT, there is an approximate linear relationship between risky asset equilibrium returns and multiple factors. While the previous CAPM model predicts that there is a linear relationship between the returns of all securities and the return of the only common factor (market portfolio). (Bodie et al., 2014)

5.3.2. Fama and French Three Factor Model

One of the most frequently used multi-factor model for fund performance measurement is the Fama and French three factor model. Fama and French (1992) conducted a study of factors that determine the difference in returns between stocks in the US market. In their study, they discovered that the beta of the stock market cannot fully explain the difference in stock returns. Therefore, the accurateness of CAPM were criticized by Fama and French. The unexplained difference in stock returns were called anomalies.

Fama and French (1996) later found that the anomalies could be explained by the company's market capitalization, book-to-market ratio, and price-to-earnings ratio. They constructed a multi-factor model based on the CAPM, which is argued to be a better model to explain stock returns. Two additional factors, size and book value, were included in the three-factor model. This model considers the fact that small-cap and value stocks consistently outperform markets.

The formula for the Fama French three-factor model is:

$$R_{it} - R_{ft} = \alpha_{it} + \beta_1(R_{Mt} - R_{ft}) + \beta_2 SM\beta_t + \beta_3 HML_t + \epsilon_{it}$$

Where:
R_{it} is the total return of a stock or a portfolio, at time t;
R_{ft} is the risk free rate of return at time t;
R_{Mt} is the total market portfolio return at time t;
$R_{Mt} - R_{ft}$ is the excess return of the market index;
$R_{it} - R_{ft}$ is the expected excess return of the stock or portfolio:
$SM\beta_t$ is the size premium, the difference in return between small-cap and large-cap portfolio at time t;
HML_t is the value premium, the difference in return between value and growth portfolio at time t;
$\beta_{1,2,3}$ are the factor coefficients.

As the name implies, the Fama French Three-factor model is constructed to explain the excess return on a portfolio by the sensitivity of its return to three factors. To begin with, the excess return on a market index/portfolio is the first factor. The second factor is the SMB (Small minus Big) factor, which represents the difference in return between a small-cap and a large-cap

portfolio at time t. This factor is also known as the size premium and it is added to the model because historically stocks of small capitalization companies tend to yield higher returns than stocks of large capitalization companies, while ceteris paribus (Bodie et al., 2014). A positive SMB coefficient indicates that the portfolio has higher expected returns if small-cap stocks outperformed the large-cap stocks during the estimation period, which means that the portfolio is predominantly small-cap stocks. On the other hand, a negative SMB beta suggests that the portfolio has higher expected returns if small-cap stocks underperformed the large-cap stocks, and the portfolio is predominantly large-cap stocks. (Bodie et al., 2014).

The third and final factor is the HML (High minus Low) factor, which is the difference in return between a portfolio of value stocks and a portfolio of growth stocks. Value stocks are stocks of companies with high book-to-market ratios, while growth stocks are stocks of companies with low book-to-market ratios. Moreover, value stocks have historically generated higher average returns than growth stocks (Bodie et al., 2014). Similar to the SMB factor, a positive HML coefficient indicates that value stocks (high book-to-market ratios) have outperformed the growth stocks (low book-to-market ratios) during the estimation period, and the portfolio is predominantly value stocks. It is vice versa for the negative HML coefficient. (Bodie et al., 2014).

In general, the SMB and HML factors suggest the exposure of portfolio returns to the size and value factors, which provides a better understanding of the dynamics of the portfolio returns.

5.3.4. Carhart four factor model

Carhart (1997) further extended the Fama French Three factor model (1993) by including a monthly momentum factor (MOM).

Carhart (1997) found that the three-factor model cannot effectively explain the momentum effect in the stock market. This is based on the previous findings of Jegadeesh and Titman (1993). The momentum effect implies that stocks with higher gains in the previous period of investment often also yield higher returns in the next investment period (Bodie et al., 2014). Carhart's study (1997) confirmed this discovery and concluded that an investor who follows the "buy winner, sell losers" investment rule will generate an abnormal return around 8% per year. Therefore, an additional momentum factor was added to the Fama French three factor model and aims to correct the market anomaly.

The formula of Carhart four factor model is:

$$R_{it} - R_{ft} = \alpha_{it} + \beta_1(R_{Mt} - R_{ft}) + \beta_2 SM\beta_t + \beta_3 HML_t + \beta_4 MOM_t + \epsilon_{it}$$

Where:
R_{it} is the total return of a stock or a portfolio, at time t;
R_{ft} is the risk free rate of return at time t;
R_{Mt} is the total market portfolio return at time t;
$R_{Mt} - R_{ft}$ is the excess return of the market index;
$R_{it} - R_{ft}$ is the expected excess return of the stock or portfolio:
$SM\beta_t$ is the size premium, the difference in return between small-cap and large-cap portfolio at time t;
HML_t is the value premium, the difference in return between value and growth portfolio at time t;
MOM_t is the difference in return between last investment period's winner stock and return of loser stock at time t;
$\beta_{1,2,3,4}$ are the factor coefficients.

A positive MOM coefficient suggests that there is a momentum effect in the market and for this timeframe the winner stocks of the last period are also the winners in this period. It is vice versa for a negative MOM coefficient.

5.4. Econometrics

In regard to this study, three selected regression models will be used to evaluate the financial performance of mutual funds. The fund return is the dependent variable in the regression analysis, and the different factors are the independent variables.

The following section will present several statistical concepts in order to provide a better understanding of the regression results.

5.4.1. Ordinary Least Squares

The Ordinary Least Squares (OLS) is a mathematical optimization technique. It is commonly used in linear regression model to find the unknown parameters. As the name suggest, the OLS method minimises the sum of the squares of the errors, in other words, the sum of squared residuals. OLS is utilized in linear regression models to estimate the intercept and different coefficient parameters.

In this study, three regression models are used to evaluate the financial performance of mutual funds. Take the one-factor CAPM model as an example, the α and β are the estimated OLS values that return the smallest sum of squared residuals.

The OLS estimates must fulfil several assumptions to be valid (Plackett 1950):

- Linearity: the estimating parameters in the OLS method must be linear.
- Randomness: The data must have been randomly collected from the population.

- Non-Collinearity: the variables being calculated are not perfectly correlated with each other.
- Exogeneity: the variables are not correlated with the error term.
- Homoscedasticity: The error of the variance is constant.

If all the above assumptions are fulfilled, the OLS estimate is considered to be the best linear unbiased estimator (BLUE). (Wooldridge, 2013)

However, in regard to this study, not all these assumptions are critical. The assumptions of non-collinearity and homoscedasticity are essential for further investigation. If these two assumptions do not hold, the results of the regression models utilized in this study might be misleading. Statistical tests for both assumptions have been tested using the software RStudio and the procedure have been further elaborated in Chapter 6.

5.4.2. Homoscedasticity

Homoscedasticity is a key assumption to hold for the OLS estimate to be valid. It assumes that no matter how the independent variable change in the regression, the variance in the error term should be constant, or homoscedastic. If the variance fails being homoscedastic, an econometric issue of heteroscedasticity occurs.

However, only the standard errors will be influenced in the case of heteroscedasticity, not the OLS estimators of β. The biased values of standard errors lead to inaccurate conclusions regarding the significance of the regression coefficients (Wooldridge, 2013).

5.4.3. Multicollinearity

Multicollinearity is an econometric problem when two or more independent variables are highly correlated (Wooldridge, 2013). The OLS coefficients will not be accurate if perfect multicollinearity, in other words, perfect correlation between the independent variables occurs in the regression model. However, the independent variables could be moderated correlated without significantly affect the results.

5.4.4. Goodness of fit

R^2 is the coefficient of determination, which evaluates the proportion of variation that is explained by the independent variable in the regression model. The value of R^2 lies between 0 and 1. If the R^2 is zero, it means that the model fits perfectly to the data (Wooldridge, 2013).

The formula for R^2 is:

$$R^2 = 1 - \frac{SS_{RES}}{SS_{TOT}} = \frac{\sum_i (y_i - \hat{y}_i)^2}{\sum_i (y_i - \bar{y})^2}$$

Where:
SS_{RES} is the sum of squared residuals;
SS_{TOT} is the total sum of squares;

y_i is the actual value of y;
$\hat{y}_i$ is the predicted value of y;
$\bar{y}$ is the mean value of y.

This study uses the adjusted R^2 to detect which one of the independent variables adds value to the explanation of the dependent variable. The adjusted R^2 will be decreased if the new added variable does not have an additional explanatory power to the dependent variable.

The formula for the adjusted R^2 is:

$$R^2\ adjusted = 1 - \frac{(1 - R^2)(N - 1)}{N - k - 1}$$

Where:
R^2 is sample R squared;
k is the number of independent variables;
N is the sample size.

A higher value of adjusted R^2 indicates a better fit of the model. Nevertheless, the best model is not only chosen relying on the value of $adjusted\ R^2$, as the best model should also include many statistically significant coefficients.

Chapter 6 Data

The appropriate models and performance measures for fund analysis have been identified in the previous chapter. Therefore, the subsequent step is to select the relevant data for the models. This chapter will discuss the data selection process and the motives behind it, including the construction of the ESG and conventional fund portfolios, the choice of market indexes, risk-free rate and how the different factor data were identified and gathered for the analysis. Furthermore, possible econometric problems and biases which might affect the analysis result will be discussed.

6.1. Data selection

6.1.1. ESG Screening Criteria

As previous discussed in Chapter 2, there is not a universal definition of ESG or sustainable investment. The term of sustainable investment can be interpreted differently as something that is viewed as unsustainable by a group of people might not be so unsustainable for other people. Consequently, different funds use dissimilar screening methods in their investment selection process, which might create diverse investment styles and financial performance. The various approaches in the ESG screening process were presented in Chapter 2. However, the study of the relationship between different ESG screening approaches and financial performance is beyond the scope of this thesis.

For the sake of simplicity, a pragmatic definition of ESG or sustainable investment has been selected for this paper. In other words, all equity funds that proclaim themselves to be considerate of environmental, social and governance factors alongside financial factors in the investment decision–making process are included in this thesis.

6.1.2. ESG funds

The ESG funds chosen for this study are domiciled in Sweden, or Norway, or Denmark, and they are further divided into two subgroups based on their investment focus: funds that have global holdings, and funds that are exclusively investing in Scandinavia. The estimation period of Swedish and Norwegian funds starts from January 2005 to December 2018, while the Danish observation period ranges from April 2010 to December 2018 because there were no earlier data available. The reader should take the smaller dataset of Denmark into consideration when comparing the financial performance of the Danish funds with the others.

The monthly Net Asset Values (NAVs) of each fund have been collected for the estimation period. As previously presented in Chapter 5, the NAV is the total value of portfolio holdings of the fund minus the value of its liabilities, divided by the number of outstanding fund shares. In other words, the NAV is the price per share of a mutual fund. It has been manually scanned through all funds to identify the funds with dividend payments. For those funds, historical daily data on dividends have been collected and adjusted for in the calculation for fund returns. This method of collecting NAVs and adjusting dividend payments aligns with a previous research of Renneboog et al. (2008b). In similarity to Renneboog et al. (2008b), this study restricted to include funds with minimum 75% equity holdings and that are directly accessible to individual investors. As a result, balanced funds, money market funds, and fixed income funds have been excluded.

6.2. Possible econometric problems

As presented in Chapter 5, this study applies cross-sectional data through multiple regression analysis. Consequently, Ordinary Least Squares (OLS) is used to minimize the sum of squared residuals. Five assumptions that a regression needs to fulfil for providing valid OLS estimates have been presented in Chapter 5. This section will further evaluate two of the assumptions that are considered critical for this thesis. In addition to this, the presence of outliners will also be checked in this study.

6.2.1. Heteroscedasticity

Heteroscedasticity is an econometric issue if the error term variance is not constant over time with any values of the independent variables. In other words, heteroscedasticity occurs when the assumption of the variance being homoscedastic violates (Wooldridge, 2013). However, only the standard errors will be influenced in the case of heteroscedasticity, not the OLS estimators of β. The biased values of standard errors lead to inaccurate conclusions regarding the significance of the regression coefficients (Wooldridge, 2013).

In regard to this paper, the data are adjusted for heteroscedasticity using the "sandwich" library in RStudio. As a result, all statistical results presented in this study are robust to the issue of heteroscedasticity.

6.2.2. Multicollinearity

Recall from Chapter 5, multicollinearity is an econometric problem when two or more independent variables are highly correlated (Wooldridge, 2013).

The first step of detecting multicollinearity is to examine the correlations between pairs of the individual independent variables of models used in this study. All pairs have a smaller correlation than 0.58, which should be seen as a reasonable level of correlation.

The next step is to examine the Variance Inflation Factors (VIF) in this study. As the name suggests, VIF measures how much the variance of the regression coefficient is increased because of multicollinearity (Wooldridge, 2013). The lowest VIF value is 1, when VIF = 1, it indicates that no multicollinearity occurs, and multicollinearity exists if VIF value is greater than 1. However, the existence of multicollinearity is only critical when the VIF value is too high. A rule of thumb is that if VIF > 5, then the multicollinearity is high and considered to be a problem (Wooldridge, 2013).

In regard to this study, package 'car' in the statistical software RStudio was used for the examination of multicollinearity. As a result, all VIF values were close to 1, indicate no existence of multicollinearity in this study.

6.2.3. Outliers detection

Outliers are data points that are distant from and do not follow the pattern of the other observations, which might lead to a non-identical distribution in the dataset. The presence of outliers may challenge the validity of the regression results (Wooldridge, 2013).

Regarding this study, anomalous values in the data have been checked through a histogram and no presence of outliners were found.

6.3. Data biases

It is important to address data biases as these can lead to a lower reliability and validity of the results. In this paper, the results are subject to three biases as presented below.

6.3.1. Management fees

It is reasonable to assume that an ESG fund has a more extensive screening process than a conventional fund due to the fact that screening for sustainable stocks is more time consuming. Therefore, ESG funds and conventional funds may have different size of management fees, which might affect the result of the funds' performance analysis.

However, Bauer et al. (2005) examined the difference in management fees between ESG and conventional funds. Their result presents that the size of management fees of ESG and conventional funds do not significantly differ. In addition to this, Renneboog et al. (2007) tested

the connection between the size of management fees and the fund performance. Their result demonstrated that even after the management fees adjustments, the difference in return between ESG and conventional funds were still statistically insignificant.

These previous studies suggest that there is not a significant difference between ESG and conventional funds after management fees adjustments. Therefore, this thesis does not adjust the management fees in the calculation for NAV.

6.3.2. Survivorship bias

As previous mentioned, the observation period is 13 and 8 years respectively for the Swedish & Norwegian, and Danish funds. Given the fact that the financial crisis occurred during this period and taking the length of the estimation period into consideration, survivorship bias is essential to be investigated in this study.

Survivorship bias was first identified by Brown et al. in 1992. They conducted financial performance analysis on dead funds, and they found a trend that those funds were badly performed. Brown et al. (1992) highlighted that those funds were closed mainly because of their poor performance. Malkiel (1995) studied the effect of excluding dead funds in performance, and their result demonstrates that the average performance is overestimated if non-surviving funds are omitted.

The dataset of this study contains of funds that have survived through the entire estimation period until 31 December 2018. Therefore, this study is subject to survivorship bias, which means that the result may be overestimated by excluding dead funds according to previous studies.

There are several possible solutions to mitigate the survivorship bias, namely, by including the non-survived funds, or to investigate where the closed funds ended up with.

To begin with, the most obvious solution to correct the survivorship bias is to include the non-survived funds. However, there is no such a list of "dead funds". As the financial crisis occurred during the estimation period, the dramatic changes in financial markets caused a large number of fund liquidations (Bodie et al., 2014). It has been proved impossible to track all non-surviving funds over the entire observation period.

Another possible solution to mitigate the survivorship bias was suggested by Elton (2011) by investigating where the closed funds ended up. Elton (2011) highlighted in their study that a disappeared fund is often merged into another fund, rather than dissolved. Therefore, they

include the non-survived fund until the merger with a new fund, then the risk-adjusted return in the month of the merge was calculated, and finally the risk-adjusted return of the combined fund after the merger was computed. This method gives a dataset that is free from survivorship bias and the dead fund's performance has been accounted instead of being left over. The authors further examined the effect of excluding dead funds by comparing their survivorship bias free funds with funds subject to survivorship bias. They found that the survivorship bias does exist and by excluding dead funds overestimate the fund manager's ability.

However, the method introduced by Elton (2011) require an identification of all funds over the observation period. Bloomberg's fund screening tool does not incorporate such a function to identify dead funds and which fund they merged into. Furthermore, even if such a list of dead fund exists, Bloomberg does not include all historical information about non-survived funds. On this basis on these factors, unfortunately, this study excludes all dead funds and therefore is subject to the survivorship bias.

The actual effect of excluding dead funds have been studied in various studies before. Bauer et al (2005) conducted analysis of fund performance ranges from 1990 to 2001 and they found "a substantial overestimation of average returns, namely be 0.14% (Germany), 0.17% (United Kingdom) and 0.31% (United States) per year." In addition to this, Malkiel (1995)'s study found 1.5% overestimation of average annual returns for funds that are subject to survivorship bias. The reader should therefore keep in mind of the survivorship bias while reading the results of thesis.

6.3.3. Incubation bias

Incubation bias, also known as a self-selection bias, was first explained by Heckman (1979). It is a possible bias that might exist when an investment firm gives capital to only a small number of funds managers to set up a fund. Several years later, the fund with best financial performance among all constructed funds will be chosen to be public for all investors, while the other funds will dissolve.

Bodie et al., (2014) further illustrated this concept by imagining a person who has an investing strategy that could make billions of dollars. That person has two choices: publish that brilliant investment technique and receive fame for the new finding; or keep the investment strategy secret and use it to be wealthy. Since most people have a "greedy" nature, the majority of people would make the latter choice, which leads to the self-selection bias. As all reports of

investment techniques are made by investors who discover strategy that cannot generate abnormal return.

In regard to this thesis, the dataset is restricted to funds that are directly available to individual investors, and therefore is subject to the incubation bias as the result may not fully reveal the financial performance of ESG funds. Because there might be some outperforming funds that are exclusively available for a group of investors and not revealed to the public. However, the self-selection bias is extremely difficult to detect and correct for as I do not have enough recourses to identify the cases where it might occur.

6.4. Data collection

Bloomberg was used as the primary source to collect monthly Net Asset Values (NAVs) for each individual fund.

6.4.1. Sustainable funds

SRI Services, a British independent company devoted to proceeding retail Sustainable and Responsible Investment (SRI) provides a "Fund EcoMarket" database as a supplementary resource for investors to identify ESG funds in Europe. The "Fund EcoMarket" database provides information of more than 600 European sustainable funds. This database enables investors to search for a specific fund by filtering different screening criteria and the investment focus of the fund. However, it is not possible to search for an ESG fund according to its country of domicile. In order to simplify the process and to make sure all qualified funds were included; Bloomberg's Mutual Fund Screening Tool was used instead of the "Fund EcoMarket" database.

Bloomberg's Mutual Fund Screening Tool provides searching function for mutual fund according to their investment universe (holdings), fund age, country of domicile. Even though keywords such as 'ethical', 'ESG' and 'impact' etc. could be used while searching for sustainable funds through Bloomberg, I wanted to make sure that no ESG funds will be missed out, so I manually checked all listed funds by reading through their asset description on Bloomberg.

As mentioned previously in this paper, there is not a universal definition of sustainable investing, and terms such as 'ESG', 'impact investing', 'sustainable investing' and 'ethical investing' will be used interchangeably. Therefore, all funds whom proclaim themselves doing ESG investments in their Bloomberg asset description are included in the dataset. However, it is essential for the funds to mention keywords that indicating their ESG focus in order to be

included in the dataset. Funds that did not have any information of their investment approach in the Bloomberg asset description were therefore excluded in this study. For instance, the Danish Jyske Invest Globale Aktier fund with the following description were excluded as an ESG fund in this study:

"Jyske Invest Globale Aktier is an open-end fund registered in Denmark. The Fund invests in a globally compound portfolio of equities. Investments are spread over a large number of companies in various sectors and countries." (Bloomberg, 2018)

In addition to this, many funds did not include keywords such as 'ESG' and 'Sustainability' etc. in their Bloomberg description, but stated that they do not invest in certain industries, for instance, alcohol, and tobacco etc. This is considered to be negative screening as presented previously in Chapter 2, and therefore such a fund has been included in the ethical fund portfolio. Appendix provides a complete list of all funds included for each country.

6.4.2 Conventional funds

Since this study aims to analyse the financial performance of sustainable funds comparative to their counterparts, it is therefore essential to decide the relevant counterpart or benchmark that sustainable funds are comparing with.

Leite and Cortez (2014) conducted a comparative analysis of international ESG funds. The authors assumed that sustainable equity indices could be superior to conventional equity indices when examine variation in the sustainable fund performance. However, Leite and Cortez (2014) tested this and conducted that conventional benchmarks have a higher explanatory power of sustainable fund returns than SRI benchmarks. Their findings consist with previous studies of Bauer et al. (2007) and Cortez et al. (2012), where other researchers also found that the returns of sustainable fund are better explained by conventional equity indices in comparison to ethical equity indices.

In addition to this, Mallin et al (1995) presented an alternative approach to examine and compare ethical funds' financial performance. In Mallin et al.'s study (1995), the authors matched each ESG fund to a conventional peer based on criteria e.g. fund age, investment universe, and fund size etc. This method is also known as the matched pair approach.

There are three different ways to compare the financial performance of sustainable funds, namely using either conventional indices or sustainability indices as benchmarks, or the match pair approach to find the conventional counterparts. Chegut et al. (2011) found that the matched

pair approach has been mainly used among researchers in this field and it is still a popular method to use today.

This study therefore uses the matched pair approach to find the conventional funds and use them as a benchmark for the assessment of ethical funds' financial performance. However, it is essential to decide on the matching criteria for constructing the conventional funds' portfolios.

Previous studies, such as Bauer et al. (2007) stressed the geographic area, or the country of domicile being one of the most important criteria when matching ethical funds with their conventional counterparts. This suggestion was based on the finding by Schröder (2004), where culturally motivated SRI polices had been found.

On the other hand, the size of fund has been proven to be insignificant for fund performance. For instance, Kreander et al (2005) and Girard et al. (2007), among others concluded that fund size does not have an influence of sustainable fund performance at all. Therefore, the fund size is not one of the matching criteria for choosing the conventional peers in this study.

This paper follows the same matching criteria presented by Leite and Cortez (2014). The criteria for the conventional fund selection are:

- Fund age
- Fund investment universe, global holdings or investing exclusively in Scandinavia
- Country of domicile
- Investment style/category, e.g. value or growth, small-cap or mixed

Bloomberg fund screening tool was utilized to find the initial list of all conventional funds in the three countries. The list of conventional funds for each country was then manually checked through in order to find the funds that match all the above criteria for each sustainable fund.

It is a time-consuming process of matching the ethical funds with their conventional peers. In regard to this paper, I matched the features of each of the ethical funds with the characteristics of the conventional funds as far as possible. However, an exact doubleganger of each sustainable fund does not exist, there is no another fund with the absolute same characteristics. In terms of the fund age, the initiation date of a conventional fund needs to be as close as possible to the corresponding ethical fund. All conventional funds selected for this study have an inception date within one year of the launch date of the matched ESG fund.

Some previous studies have matched one ESG fund with multiple conventional funds and the average returns of those matched conventional funds were calculated and then used to compare the ethical fund against. However, it is not possible in this study since there are limited number of funds available that match with the sustainable funds on all above criteria in the Nordic countries. Therefore, this study has matched each ESG fund with only one conventional fund, that qualifies for all the matching criteria. Appendix presents a complete list of the matched conventional peers in this thesis.

After an extensive research, the following number of funds were identified and used in this study.

Global investment universe	No. Of funds		**Regional investment universe**	No. Of funds	
	Sustainable	Conventional		Sustainable	Conventional
Denmark	6	6	Denmark	0	0
Sweden	29	29	Sweden	18	18
Norway	15	15	Norway	12	12

After the selection of convention funds, this thesis follows the same procedure of Bauer et al. (2005) for the comparison between funds. This study constructs two portfolios, one consists of the selected ESG funds, and another portfolio of the matched conventional funds. Both portfolios are equally weighted of the funds included in the portfolio, and they are rebalanced each time when a new fund launched to the market.

6.5. Proxies and Factor Data

This section presents the process of selection and assortment of the proxies and factor data used in the fund performance analysis. The identification of the factors is based on previous studies.

6.5.1. The Market Risk Premium

The market risk premium factor is the difference between the expected return on a market portfolio and the risk-free rate (Bodie et al., 2014). In this study, the value of the expected return on a market portfolio (the market) and the risk-free rates changes accordingly to the funds' geographic location.

6.5.2. The Market Index

Different market indices were used as proxies depending on the funds' holdings. In short, a fund with global holdings is benchmarked against a global equity index, whereas a fund with regional investment universe is benchmarked against a regional equity index. Both indices applied in this study are market-value-weighted and consider dividend payments reinvested.

MSCI All Countries World Index (ACWI) is employed as the market index for the funds with an international investment universe. This is because Chegut et al (2011) reviewed all previous fund performance studies and they concluded that MSCI All Countries World Index (ACWI) is the most appropriate and frequently used World Index. One could argue that the Worldscope indices should be applied as it provides 98% coverage of the market capitalization, which is 13% higher than the MSCI's indices. However, the famous Morningstar uses the MSCI's indices for fund performance analysis and most importantly, Bauer et al. (2005) concluded that the Worldscope indices and MSCI's indices would provide same results.

For the funds with only Scandinavian holdings, the MSCI Nordic Countries Index is utilized as market index. This is because this index covers 'approximately 85% of the free float-adjusted market capitalization' in Sweden, Norway, Denmark and Finland (MSCI, 2019).

6.5.3. Risk free rates

Risk-free rate is the theoretical rate of return of a zero-risk investment, e.g. a risk-free bond. However, such a risk-free rate does not exist in practice, because all investments come with an amount of risk. Therefore, zero-coupon treasury securities, which are believed to be the safest investment with minimum risk is usually chosen as the proxy for the risk-free rate. For instance, the three-month U.S. Treasury bill and other government bonds are commonly used as the risk-free rate in finance books (Bodie et al., 2014).

On the other hand, numerous previous studies of fund performance use the Inter Bank Offered Rate as proxy for the risk-free rate (Wooldridge, 2013). In this study, the proxies for risk-free rate vary depending on the funds' geographic location.

The local three-month Inter Bank Rate are used as risk-free rate for funds with regional investment focus domiciled in the three countries. The Stockholm Interbank Offered Rate (STIBOR) is applied for Swedish funds, the Norwegian Interbank Offered Rate (NIBOR) is used for Norway, and the Copenhagen Interbank Offered Rate (CIBOR) for funds domiciled

in Denmark. These Inter Bank Rates are also utilized as proxies for the risk-free rate in the calculation of fund excess returns, Jensen's alphas.

Besides that, the market risk premium factor provided by Kenneth R. French's Data Library is used for funds with a global investment universe.

6.5.4. The Small Minus Big (SMB) factor

The SMB factor applied in this thesis vary depending on the mutual funds' investment universe. To begin with, for the mutual funds with global investment universe, this study uses the "Global SMB factor" data provided by Kenneth R. French Data Library.

On the other hand, the process of deciding the proxy for SMB factors for the mutual funds with regional investment universe was more challenging. In similarity to the "Global SMB factor" data, Kenneth R. French Data Library also provides data of SMB factor for the funds with sole US. holdings. However, the library does not have SMB factor data for funds with Scandinavia concentrated holdings.

The data of SMB factor for both global and US funds provided by Kenneth R. French Data Library is calculated through composed stock portfolios. French (1993) listed all stocks in each investment universe (e.g. the US) and filtered the stocks by market value. The stocks are divided into two portfolios: a mid-cap portfolio, which consists of 50% of the stocks with largest market value; and a small cap portfolio constructed by the remaining 50% stocks. The SMB factor is then calculated by subtracting the mid-cap portfolio from the small cap portfolio. In previous studies of fund performance, Carhart (1997) and Bauer et al. (2005) calculated their SMB factor data in the same method as described above.

However, an alternative procedure was introduced by Faff in 2004, where market indices replaced the composed stock portfolios in the calculation of the SMB factor. Faff (2004) calculated the differences between average returns of small cap indices and average returns of large cap growth indices by utilizing the Australian S&P/ASX and Russell indices. In addition to this, the procedure introduced by Faff (2004) provides the same findings as French (1993)'s original results.

The method presented by Faff (2004) simplifies the calculation for the SMB factor. French (1993)'s procedure is too problematic to duplicate because all stocks information in each investment universe need to be acquired. Due to the time and resource limit, this study constructs the SMB factors utilizing a similar method as Faff (2004). Instead of using indices

averages, I obtained the SMB factors for funds with Scandinavian holdings by subtracting a large cap growth index from a small cap index. To specify, the total returns of the MSCI AC Nordic Small Cap Index is used as the proxy for a small cap index. According to Faff (2004), the difference between the small-cap and large-cap should be calculated using the corresponding indices. However, the corresponding MSCI AC Nordic Large Cap started in 2007 which does not cover the entire observation period. Thus, the S&P Nordic Large Cap Index is used as a replaced proxy for the large-cap index. Bloomberg was used to obtain the monthly data.

6.5.5. The High Minus Low (HML) factor

In similarly to the SMB factor, the Kenneth R. French Data Library only provides the HML factor data for the US market. French (1993) calculated the HML factor for the US market by ranking all NASDAQ, the New York Stock Exchange (NYSE) and the American Stock Exchange (AMEX) equities based on their book-to market ratios. The HML factor is the difference between the return on a portfolio consists of the 30% highest book-to market ratio stocks, and the return on a low book-to-market portfolio made by stocks with the 30% lowest book-to market ratio. However, this method for calculating the HML factor is difficult to follow since the data for market-to-book ratios is extremely hard to acquire.

Therefore, this paper uses a substitute approach introduced by Faff (2004). For mutual funds with a global investment universe, the HML factors will be calculated as the difference between the returns of MSCI AC World Growth index and the returns of the corresponding Value index. On the other hand, the HML factor for the funds with Scandinavian holdings will be calculated by subtracting the returns of MSCI Nordic Growth index from the returns of the MSCI Nordic Value index. Bloomberg was used to obtain the monthly data.

6.5.6. The Monthly Momentum Factor (MOM) factor

Similar to the SMB factor, the Kenneth R. French Data Library only provides the MOM factor data for the US and global market. It was therefore easy to apply the Global MOM factor data for mutual funds with international holdings.

On the other hand, the process of constructing the MOM factor for funds with Scandinavian holdings is one of the biggest challenges in this paper. Carhart (1997) calculated the MOM

factor by ranking all stocks of NASDAQ, the New York Stock Exchange (NYSE) and the American Stock Exchange (AMEX) on their performance. The MOM factor is calculated by taking the difference between the 30% of stocks with the highest return in the last 11 months lagged one month, and the 30% worst-performing stocks over the last 11 months lagged one month.

Many previous studies confirm that it is very complex to acquire the individual rolling momentum factor given the fact that the difference between the two portfolios need to be rebalanced every month. In regard to this study, the longest estimation period ranges from January 2005 to December 2018, which covers 168 months. Therefore, it has been a great challenge to decide the process of obtaining the HML factor. In order to avoid significant errors and taking the time limit into consideration, I have decided to use the Europe MOM factor data provided by the Kenneth R. French Data Library instead of replicating the MOM factor on my own.

The Europe MOM factor data in the Kenneth R. French Data Library covers the Scandinavian countries, but also other European countries. As a result, the Europe MOM factor might deviate from the factual rolling momentum in the Nordic market. The reader should therefore keep in mind that the excess return, Jensen's alphas, of funds with regional investment focus might be under of overvalued.

6.5.7. Overview

In sum, the used proxies and data factors in this study are presented below:

Global holdings			
	Sweden	**Norway**	**Denmark**
Estimation period	Jan. 2005 - Dec. 2018	Jan. 2005 - Dec. 2018	Apr. 2010 - Dec. 2018
Market index	MSCI All Countries World Index		
Risk-free rate	Provided by Kenneth R. French Data Library		
SMB	"Global SMB factor" data provided by Kenneth R. French Data Library		
HML	Total returns (monthly) of MSCI AC World Value Index -MSCI AC World Growth Index		
MOM	"Global MOM factor" data provided by Kenneth R. French Data Library		

Regional holdings			
	Sweden	**Norway**	**Denmark**
Estimation period	Jan. 2005 - Dec. 2018	Jan. 2005 - Dec. 2018	Apr. 2010 - Dec. 2018
Market index	MSCI Nordic Countries Index		
Risk-free rate	STIBOR	NIBOR	CIBOR
SMB	Total returns (monthly) of MSCI AC Nordic Small Cap Index - S&P Nordic Large Cap Index		
HML	Total returns (monthly) of MSCI Nordic Value Index - MSCI Nordic Growth Index		
MOM	"Europe MOM factor" data provided by Kenneth R. French Data Library		

Chapter 7 Analysis

This chapter presents the results from the conducted analysis of the data using the previous selected models. Firstly, the reward-to-variability/volatility ratios will give an overview of the data used in this thesis. The performance of ESG funds are compared to the corresponding conventional funds. Secondly, the outcomes of the three selected models for financial performance analysis of funds on a portfolio level will be presented and discussed in the following section.

7.1. Reward-to- variability/volatility ratios

Recall from Chapter 4, beta is used as a measure of volatility, or systematic risk, pertaining to security or portfolio. This measure's significance emanates from its application in the capital asset pricing model (CAPM)—a model that estimates expected returns based on the expected return and risk of the market. In addition to this, the Sharpe ratio measures the excess return per unit of total risk, while the Treynor ratio measures the return relative to the market risk. The beta, annualized Sharpe and Treynor ratios are presented in the table below to evaluate the relation between risk and return of the data.

Global investment universe	**Beta**	**Sharpe ratio**	**Treynor ratio**
Sweden			
ESG	0.68	0.19	0.06
Conventional	0.66	0.29	0.07
Norway			
ESG	0.76	0.41	0.13
Conventional	0.75	0.47	0.08
Denmark			
ESG	0.38	0.37	0.14
Conventional	0.48	0.44	0.14
Regional investment universe			
Sweden			
ESG	0.94	0.22	0.05
Conventional	0.87	0.28	0.07
Norway			
ESG	0.91	1.43	0.29
Conventional	1.04	0.35	0.08

Table 7.1. Reward-to- variability/volatility ratios

In terms of beta, the results show that when it comes to funds with global holdings, Danish mutual funds (both ESG and conventional) are least volatile to the market in comparison to other funds in this region. However, both Swedish and Norwegian ethical funds have higher systematic risk than their conventional peers, which is contradictive to the Danish ESG funds. This presents a preliminary outlook on how the funds are perceived in the market (Fama & French, 2011). With regards to the funds that invest exclusively in Scandinavia, Norwegian conventional funds stand out as the most volatile, relative to the market. Therefore, the funds may present a challenge to risk-averse investors who prefer low to moderate volatility.

The results of Sharpe ratio show that, the Norwegian regional investing ethical funds have the highest Sharpe ratio among funds in both investing universe, indicating that it has the best risk-adjusted return profile (Sharpe, 1964). All the remaining ethical funds have a lower Sharpe ratio than their conventional counterparts, which is in the opposite of Kreander et al. (2005)'s results. However, their findings were statistically insignificant.

In terms of the Treynor ratio, as expected, the Norwegian ESG funds have the highest Treynor ratios among all funds, which deduce that it is a more suitable portfolio to invest in. However, it is worth to keep in mind that Treynor ratio values are based on past performance that may not be repeated in future performance (Bodie et al., 2014).

7.2. Fund performance on a portfolio level

Similar to a previous study conducted by Bauer et al. (2005), this thesis has built ESG and conventional funds' portfolios based on the domiciles and investment universe of the funds. Recall from Chapter 6, an extensive screening of mutual funds provided the following number of funds in each country.

Global investment universe	No. Of funds		**Regional investment universe**	No. Of funds	
	ESG	Conventional		ESG	Conventional
Denmark	6	6	Denmark	0	0
Sweden	29	29	Sweden	18	18
Norway	15	15	Norway	12	12

Table 7.2. Number of funds

The estimation period for Danish funds starts in April 2010 to December 2018 because of the lack of data available for a longer time. The Swedish and Norwegian observation period range

from January 2005 to December 2018. In total, five portfolios have been constructed on the basis of the fund's investment universe and country of domicile. Each portfolio return is equally weighted of the number of funds included in the subgroup. All portfolios are rebalanced each time when a new fund initiates on the market. In other words, new funds with a later inception date than January 2005 are continuously added into the funds' subgroup portfolio.

The descriptive statistics suggest that conventional funds are mostly more return spinning to invest than ESG funds. However, it is not enough to draw any conclusions yet. It is generally believed that investment returns are driven by exposure to certain factors (Bodie et al., 2014). Therefore, this study utilizes three different models to further investigate the financial performance of mutual funds. The monthly portfolio returns of each subgroup portfolio are used as the dependent variable in all models applied.

7.2.1. CAPM & Jensen's alpha

CAPM is the first model applied in this study. Recall from Chapter 4, CAPM is a single factor model which assumes that the market exposure is the only systematic risk.

Jensen's alpha is a measurement of abnormal returns of the mutual fund portfolios over the theoretical expected returns. Jensen's alpha is calculated for each funds' portfolios by country and investment focus.

The theoretical expected returns were calculated by applying the Capital Asset Pricing Model (CAPM). Different market premium factors have been used in the CAPM depending on the mutual fund portfolio's investment universe and domicile. For funds' portfolios with a global investment focus, the CAPM was computed using the Global Market Premium Factor provided by Kenneth French Data Library. On the other hand, excess return on the local MSCI indices were calculated as the differences between the index returns and the local risk-free rates, which were later computed for the calculation of regional-investing funds.

In similarity to the market premium factor, the risk-free rate and market indices vary depending on the fund's investment universe and country of domicile. The different proxies have been discussed and presented in Chapter 6.

Jensen's alpha is the intercept obtained from the CAPM calculation and the alpha values represent the over- or underperformance of funds in relation to the market. The findings of CAPM are presented in table 7.3.

CAPM			
	α	B_1 Market	R^2 adj.
Global investment universe			
Sweden			
ESG	-20.28***	0.57***	0.57
Conventional	-19.78***	0.49***	0.55
Norway			
ESG	-9.48***	0.70***	0.75
Conventional	-27.30***	0.67***	0.64
Denmark			
ESG	-5.13	0.44***	0.32
Conventional	-4.57	0.48***	0.43
Regional investment universe			
Sweden			
ESG	-1.57	0.94***	0.93
Conventional	-2.02	0.85***	0.92
Norway			
ESG	20.37***	0.86***	0.79
Conventional	0.58	0.98***	0.83

Table 7.3. Results of Jensen's alpha

Where:

α, is the annualized monthly Jensen's alpha in percentages

β_1 is the Market Factor indicates the average exposure to the market factor

R^2 adj. is the adjusted R-squared representing how much of the variability in the returns that is explained by the model.

**** indicates significance on a 1% confidence level*

*** indicates significance on a 5% confidence level*

** indicates significance on a 10% confidence level*

7.2.1.1 Mutual funds with a global investment universe

The results present that both ESG and conventional portfolios have negative Jensen's alpha, which demonstrates that all mutual funds underperform the market. All portfolio alphas except the Danish ones are statistically significant. All portfolio betas are statistically highly significant and less than 1, which indicates that all funds are less volatile than the market.

Furthermore, the alphas for Danish ESG and conventional portfolios are less negative than the Swedish and Norwegian ones. In the meanwhile, the Danish fund portfolios also have the

lowest betas, which imply that the Danish mutual funds are less volatile in relation to the market than the other funds to the market. However, the reader should keep in mind that the alphas of Danish funds are not statistically significant.

In addition to this, the alphas for Norwegian ESG funds are less negative than the conventional fund ones, while both Norwegian ESG and conventional fund portfolios have similar level of exposure to the market factor. This suggests that the Norwegian sustainable funds may have a better risk-return trade-off than their peers.

On the other hand, the betas show that the Swedish mutual funds tend to be less sensitive to fluctuations on the market than the Norwegian funds. However, both the Swedish and Norwegian ESG funds are more volatile in relation to the market than their conventional peers.

Adjusted R_2 is a reasonable measurement of the goodness of the model as discussed in Chapter 5. Overall, the results show that the model has a moderate explanatory power around 63% for the Swedish and Norwegian market. On the other hand, only an average of 37% of the variation in the Danish funds' returns are explained by the model, which considered to be a poor fit.

However, the findings on the CAPM show that the criticism of low explanatory power may not necessarily hold. The analysis shows that the CAPM is applicable in this market, albeit yielding low explanatory power in Denmark's case. The CAPM offer the ability to predict portfolio returns in a better way as compared to techniques such as technical analysis. Thus, the CAPM does work in the market but may exhibit low explanatory power in markets that are still growing (Fama and French, 1992).

In addition to this, the global-investing mutual funds have overall lower explanatory power in comparing to the funds with regional investment universe. This indicates that the Scandinavian factors are in a better fit and measure a higher proportion of the variation in the CAPM model. This is likely caused by the factors obtained from the Kenneth French Data Library. The global factors in the Data Library include all global markets, while the global-investing mutual funds does not take all countries into consideration. In other words, those mutual funds with global holdings are investing globally but each of them has their own focus markets around the globe.

In regard to this study, all funds that contain more than half global holdings have been considered as a global fund and have been regressed against global factors collected from the Kenneth French Data Library for the CAPM analysis. A better fit of the model might be attained by examine the holdings of each fund and construct factors for each fund based on

their holdings' domicile. However, mutual funds do not disclose their exact holdings and therefore it was not possible to investigate and further construct the factors using this method.

7.2.1.2. Mutual funds with a regional investment universe

All mutual funds with a regional investment universe have statistically significant betas for the market factor at 1% level. The Norwegian conventional funds are more sensitive to market frustrations than the ESG funds. On the contrary, the Swedish ESG funds have lower beta than their conventional peers. However, all betas are less than 1, indicate that all mutual funds are less volatile than the market.

In terms of Jensen's alpha, only the Norwegian sustainable funds have statistically significant alphas. Impressively, the ESG funds in the Norwegian market significantly outperform their conventional counterparts and both Swedish funds.

The alpha of Norwegian conventional funds is very close to zero, which implies the conventional funds' performance almost fully replicate the market. On the other hand, the Swedish ESG funds have less negative alpha than their peers. However, the alphas of both Swedish sustainable and conventional funds are close to zero, indicate those funds only marginally underperform the market.

All mutual fund portfolios have a high adjusted R^2, which indicates a good fit of the model.

7.2.1.3. Partial conclusion

In sum, no statically proven differences in financial performance of ESG funds and their conventional peers have been found utilizing the single-factor CAPM model. This result confirmed the outcomes of most previous research e.g. Bauer et al. (2005), Renneboog et al. (2008b), and Leite and Cortez (2014).

However, the superior performance of the Norwegian sustainable funds is an exception. This result is in line with the findings of Statman (2000), where the scholar found ESG funds tend to outperform their conventional peers. Statman's results were though not statistically significant. The outperformance of Norwegian ESG funds is contradictive to the Modern Portfolio Theory, which suggests investing in a restricted universe would have negative impact on the portfolio diversification.

However, it is hard to identify the number of stocks required to make portfolio fully diversified. Bauer et al. (2005) argues that a well-diversified portfolio should consist of minimum 50 stocks.

But there will still be some specific risk remains given this number of stocks. On the other hand, many finance books suggest that a portfolio of 25 to 30 randomly selected stocks is usually considered as well-diversified (Bodie et al., 2014).

This study found an overall underperformance of all ESG and conventional funds in comparison to the market. This result is in line with the findings of Renneboog et al. (2008) and confirms the Efficient Market Theory.

The global-investing Norwegian and Swedish sustainable funds are more sensitive to market fluctuations than their conventional peers. However, the results show that the Danish and regionally operating Norwegian ESG funds are less exposed to the market volatility than their conventional counterparts. This finding is in line with Mallin et al. (1995), Bauer et al. (2005), and Leite and Cortez (2014), where several scholars concluded that ethical funds are less risky than the conventional ones.

However, as previously discussed in Chapter 5, there are several limitations of the CAPM model. Therefore, two multi-factor models have been applied to further investigate the financial performance of ESG funds in relation to their conventional peers.

7.2.2. Fama French 3 factor model

The second model applied in this thesis is the Fama-French three factor model. This model computes the same method as the single index model but with two additional firm-characteristic variables to the CAPM analysis. The two extra factors are Small-minus-Big (SMB) and High-minus-Low (HML). In similarity to the CAPM analysis, different factors are used for each mutual funds' portfolio as discussed in Chapter 6.

Each subgroup portfolio return is regressed against the three factors of Fama-French model, and the tables below present the sensitivity of fund returns to each of these factors, the excess returns of fund portfolios and the goodness of the model.

7.2.2.1 Mutual funds with a global investment universe

7.2.2.1.1 Sweden

	α	β_1 **market**	β_2 **SMB**	β_3 **HML**	R^2 **adj.**
Global investment universe					
Sweden					
ESG	-20.003***	0.673***	0.130	-0.453**	0.591

Conventional	-19.613***	0.674***	-0.062*	-0.5092**	0.567

Table 7.4.

Where:

α, is the annualized monthly Jensen's alpha in percentages

β_1 is the Market Factor indicates the average exposure to the market factor

β_2 SMB is the average exposure to the size factor

β_3 HML is the average exposure to the value factor

R^2 adj. is the adjusted R-squared representing how much of the variability in the returns that is explained by the model.

**** indicates significance on a 1% confidence level*

*** indicates significance on a 5% confidence level*

** indicates significance on a 10% confidence level*

The estimation period is from January 1st 2005 until December 31 2018.

The results for Swedish mutual funds with global holdings show both the sustainable and conventional funds have statistically significant negative alphas, which indicates both fund portfolios underperform the market. The ESG funds have a more negative alpha than the conventional funds, implying that the conventional funds are performing slightly better than the ESG funds. These findings are in line with the results of the single factor model.

The exposures to the market factor are also statistically significant at 1% level and are at the similar levels with the findings utilizing CAPM model.

In terms of the SMB factor, the positive beta of Swedish ESG funds shows that the sustainable funds have a greater exposure to the small-cap stocks. While, in contrast, the Swedish conventional funds with negative coefficient for the SMB factor suggest the funds are predominantly large-cap stocks, however, this result was not statistically significant.

In addition to this, both ESG and conventional funds have negative and statistically significant exposure to the HML factor. This finding indicates both portfolios have greater exposure towards growth-oriented stocks. However, there is not a significant difference of the exposure to the HML factor between sustainable funds and their conventional counterparts.

The adjusted R^2 has been slightly improved compared to the CAPM model, which means that additional two factors add extra value in the explanation of the funds' excess returns.

7.2.2.1.2 Norway

	α	$\beta_1$market	β_2 SMB	β_3 HML	R^2 adj.
Global investment universe					
Norway					
ESG	-9.777***	0.713***	0.238*	-0.3209*	0.766
Conventional	-27.703***	0.703***	0.058	-0.281	0.653

Table 7.5.

Where:

α, is the annualized monthly Jensen's alpha in percentages;

β_1 is the Market Factor indicates the average exposure to the market factor;

β_2 SMB is the average exposure to the size factor;

β_3 HML is the average exposure to the value factor

R^2 adj. is the adjusted R-squared representing how much of the variability in the returns that is explained by the model.

**** indicates significance on a 1% confidence level*

*** indicates significance on a 5% confidence level*

** indicates significance on a 10% confidence level*

The estimation period is from January 1st 2005 until December 31st 2018.

Similar to the Swedish market, the Norwegian global-investing funds have both statistically significant alphas and the market coefficients at 1% level. However, unlike the Swedish funds, the results of the Fama French three factor model give more negative alphas of Norwegian funds in comparison to the findings from CAPM model. Yet, these are marginally derivations.

The beta coefficients also changed marginally compared to the one factor model. However, the results are in the line with CAPM where both funds underperform in relation to the market, and the alphas of ESG funds are less negative than their conventional peers. In the same time, the results confirm the findings from the CAPM model that the Norwegian global-investing funds are more sensitive to market frustrations than their peers.

In terms of the two additional factors added in the model, only the sustainable fund portfolios have statistically significant coefficients for the SMB and HML factors. However, the positive SMB betas and negative HML coefficients of global-investing Norwegian funds indicate that both fund portfolios consist predominantly small-cap growth stocks.

In similarity to the Swedish funds with global investment universe. the adjusted R^2 has been improved in the Fama French three factor model, which implies the relevance of including the two additional factors.

7.2.2.1.3 Denmark

	α	$\beta_1$market	β_2 SMB	β_3 HML	R^2 adj.
Global investment universe					
Denmark					
ESG	-9.943***	0.531***	0.074	-0.552**	0.396
Conventional	-7.226	0.523***	0.028	-0.463**	0.456

Table 7.6.

Where:

α, is the annualized monthly Jensen's alpha in percentages

β_1 is the Market Factor indicates the average exposure to the market factor

β_2 SMB is the average exposure to the size factor

β_3 HML is the average exposure to the value factor

R^2 adj. is the adjusted R-squared representing how much of the variability in the returns that is explained by the model.

**** indicates significance on a 1% confidence level*

*** indicates significance on a 5% confidence level*

** indicates significance on a 10% confidence level*

The estimation period is from April 1st 2010 until December 31 2018.

The alphas of the Danish mutual funds are expressively more negative than the findings from CAPM, but only the alpha value for Danish global-investing ESG funds is statistically significant. The beta values for both the ethical and conventional funds only change marginally compared to the single factor model.

The Danish mutual funds have positive yet non-statistically significant SMB betas, which suggest a greater exposure towards small-cap companies.

Furthermore, both Danish global-investing ESG and conventional fund portfolios have statistically important negative HML coefficients. This finding indicates that the Danish funds have a tendency to invest in growth stocks. However, there is not a significant difference of the exposure to value or growth stocks between the Danish international-investing ESG funds and their conventional counterparts.

Like the other two markets, the adjusted R^2 for the Danish global-investing funds have been significantly improved utilizing the Fama French factor model.

7.2.2.2 Mutual funds investing exclusively in Scandinavia

7.2.2.2.1 Sweden

	α	$\beta_1$market	β_2 SMB	β_3 HML	R^2 adj.
Regional investment universe					
Sweden					
ESG	-2.123	0.932***	0.04**	0.086*	0.965
Conventional	-2.673	0.835***	0.08**	0.0778*	0.955

Table 7.7.
Where:
α, is the annualized monthly Jensen's alpha in percentages
β_1 is the Market Factor indicates the average exposure to the market factor
β_2 SMB is the average exposure to the size factor
β_3 HML is the average exposure to the value factor
R^2 adj. is the adjusted R-squared representing how much of the variability in the returns that is explained by the model.
**** indicates significance on a 1% confidence level*
*** indicates significance on a 5% confidence level*
** indicates significance on a 10% confidence level*
The estimation period is from January 1st 2005 until December 31st 2018.

The alpha values for Swedish funds that invest exclusively in Scandinavia are more negative compared to the results from the CAPM model. The results are in line with the single factor model indicate that both ESG and conventional funds underperform the market, and the conventional funds have more negative alphas than the ethical fund portfolio. Yet, the alphas are not statistically significant. In addition to this, the beta values are at the similar level as the CAPM model.

Furthermore, the Swedish funds with a regional investment universe have statistically significant SMB and HML betas. Given both coefficients being positive, the result indicates a greater exposure to small-cap and value companies. However, a significant difference of the exposure to the small-cap or large-cap and value or growth stocks have not been detected between the Swedish ethical and conventional funds.

The adjusted R^2 have been improved and suggest a good fit of the model.

7.2.2.2.2 Norway

	α	$\beta_1$market	β_2 SMB	β_3 HML	R^2 adj.
Regional investment universe					
Norway					
ESG	17.697***	0.822***	0.277***	-0.1438*	0.834
Conventional	-2.072	0.956***	0.330***	-0.093	0.915

Table 7.8.
Where:
α, is the annualized monthly Jensen's alpha in percentages
β_1 is the Market Factor indicates the average exposure to the market factor
β_2 SMB is the average exposure to the size factor
β_3 HML is the average exposure to the value factor
R^2 adj. is the adjusted R-squared representing how much of the variability in the returns that is explained by the model.
**** indicates significance on a 1% confidence level*
*** indicates significance on a 5% confidence level*
** indicates significance on a 10% confidence level*
The estimation period is from January 1st 2005 until December 31st 2018.

The statistically significant positive alpha of Norwegian ESG funds confirmed the superior performance of ethical funds found by the CAPM model. The beta values of regional-investing Norwegian funds are at similar levels as the single factor model's results.

In terms of the value and size factors, the Norwegian regional-investing funds have statistically significant positive SMB values, which suggest the funds consist predominantly small-cap stock. On the other hand, the Norwegian sustainable funds with regional holdings have statistically significant negative HML beta at 10% level. The regional-investing Norwegian conventional funds also have a negative HML coefficient, yet, this value is not statistically significant. However, the results imply the Norwegian funds have great exposure to growth-oriented companies.

The adjusted R^2 has been improved marginally indicate that the two additional factors are relevant and give a better fit of the model.

7.2.2.3. Partial conclusion

Overall, the alphas only changed marginally for all fund portfolios, and all the alpha values are more negative in comparison to the CAPM model. An exception from this is the Danish funds where the alpha values are significantly more negative than the results from CAPM. However,

the alpha for Danish ESG fund portfolio is now statistically significant at 10% level compared to the statistically insignificant result of CAPM.

In addition to this, all global-investing fund portfolios except the Swedish conventional funds have a greater exposure to small-cap and growth stocks. The Swedish conventional funds with global holdings are predominantly large-cap and growth stocks.

For funds with regional investment universe, the Swedish fund portfolios, both ethical and conventional, have a greater exposure to small-cap and value stocks, while the Norwegian portfolios consist more of small-cap and growth stocks.

The adjusted R^2 have been significantly improved for all fund portfolios by including two additional factors. Especially for the Danish, and regionally investing fund portfolios where the adjusted R^2 have been expressively improved indicates that it is relevant to include the two additional factors to explain fund performance.

7.2.3. Carhart four-factor model

Carhart four-factor model is the third and last model applied in this paper. Recall from Chapter 5, Carhart (1997) extends the three-factor model by including a fourth factor, which captures the momentum anomaly denoted as MOM. In similarity to the previous two models, the portfolio returns are regressed against four factors and the results represent the fund portfolios' alphas and sensitivity to each of the four factors.

	α	$\beta_1$market	β_2 SMB	β_3 HML	β_4 MOM	R^2 adj.
Global investment universe						
Sweden						
ESG	-20.04***	0.68***	0.15	-0.441**	-0.11	0.60
Conventional	-19.65***	0.68***	-0.04	-0.501**	-0.11	0.57
Norway						
ESG	-9.81***	0.72***	0.249**	-0.311*	-0.01	0.77
Conventional	-27.71***	0.71***	0.08	-0.27	0.02	0.66
Denmark						
ESG	-9.98***	0.54***	0.09	-0.541**	0.319*	0.40
Conventional	-7.24	0.53***	0.01	-0.451**	0.10	0.46

Regional investment universe						
Sweden						
ESG	-2.13*	0.94***	0.069**	0.099*	-0.01	0.97
Conventional	-2.71**	0.84***	0.089***	0.089*	0.01	0.96
Norway						
ESG	17.71***	0.83***	0.30***	-0.13*	-0.02	0.84
Conventional	-2.08	0.96***	0.35***	-0.11	-0.02	0.92

Table 7.9.

Where:

α, is the annualized monthly Jensen's alpha in percentages
β_1 is the Market Factor indicates the average exposure to the market factor
β_2 SMB is the average exposure to the size factor
β_3 HML is the average exposure to the value factor
β_4 MOM is the average exposure to the momentum factor
R^2 adj. is the adjusted R-squared representing how much of the variability in the returns that is explained by the model.
**** indicates significance on a 1% confidence level*
*** indicates significance on a 5% confidence level*
** indicates significance on a 10% confidence level*

7.2.3.1. Mutual funds with a global investment universe

The alpha values only change marginally when adding the additional MOM factor to the Fama French 3 factor model. Similar to the Fama French three factor model, the alpha values are more negative utilizing the four-factor model.

The adjusted R^2 increases marginally for all portfolios, indicates a weak relevance of considering the momentum factor.

For the Swedish global-investing funds, the betas of the market, SMB and HML factors are at similar levels as the results from the three-factor model. Noticeable, the SMB coefficients of both fund portfolios are no longer statistically significant. The results indicate Swedish funds have statistically proven tendency of investing in growth stocks. However, no significant difference of the exposure to value or growth companies between the ESG funds and their conventional peers have been found. The MOM factor for both funds are negative yet statistically insignificant.

On the other hand, the Norwegian funds with international holdings have similar alpha values and SMB and HML betas as the findings from the Fama French three factor model. The

statistical significance of the SMB coefficient increased from 10% to 5% compared to the 3-factor model, which further confirmed that the Norwegian global-investing funds consist predominantly small-cap stocks. Furthermore, the Norwegian ESG funds have a positive MOM coefficient implies an exposure to the momentum effect while their conventional peers are showing a negative momentum. However, none of the MOM betas are statistically significant.

An analysis of the Danish globally investing funds shows that the alphas and beta coefficients of SMB and HML factors change marginally in comparison to the three-factor model. However, the statistically significant positive MOM beta suggests that the Danish ESG funds are exposed to the momentum effect. Their conventional peers also show a sign of the momentum effect, but the beta is not statistically significant.

7.2.3.2. Mutual funds with a regional investment universe

For the regional-investing Swedish funds, the alpha values are more negative but statistically significant. This confirmed previous results that both funds underperform the market, and the sustainable funds perform marginally better than their conventional peers. The betas of the SMB and HML factors slightly increased in comparison to the 3-factor model which further verified that the Swedish funds consist mainly small-cap value stocks. The MOM betas are not statistically significant.

On the other hand, the Norwegian funds show similar results. They are significantly proven to have an exposure to small-cap growth stocks, which is in line with the findings of the three-factor model. The MOM coefficients for both funds are negative indicate the portfolios returns are not exposed to the momentum effect, however, these results are not statistically significant.

7.2.3.3. Partial conclusion

Similar to the Fama French three-factor model, all alpha values are more negative utilizing the Carhart four-factor model. The results are in line with previous results of CAPM and 3-factor model that the Norwegian ESG fund is significantly outperforming their conventional peers and other funds in all markets. In addition to this, the Swedish ESG funds continuously have less-negative alphas than their conventional peers, however, this result is still statistically insignificant by including the MOM factor.

In terms of the MOM factor, the regional-investing Swedish conventional funds, and the global-investing Norwegian and Danish ESG and conventional funds have positive coefficients of the momentum factor, which confirm that the momentum effect exist in certain markets. However, only the Danish ESG fund portfolio has statistically significant exposure to the momentum factor.

The adjusted R^2 increases for all regressions in comparison to the results of the two previous models. This implies that the MOM factor is relevant to be included in order to better explain the fund performance, however, the increase of the adjusted R^2 was marginal and might indicate a weak explaining power of the momentum factor.

Chapter 8 Conclusion and future research

This thesis aimed to study the financial performance of Scandinavian sustainable mutual funds in comparison to their matched conventional peers by answering the research question: "Is there a significant difference of risk-adjusted returns between sustainable and conventional mutual funds?"

Two hypotheses were formulated in this study, the first hypothesis states that sustainable mutual fund portfolios outperform their conventional counterparts, because superior returns are expected for companies that incorporate with their stakeholders, in line with the Stakeholder theory. On the hand, the second hypothesis states that the ethical fund portfolios underperform their peers due to the fact of investing in a restricted universe supported by the Modern Portfolio Theory.

In addition to this, this thesis pointed out the fact that there is not a universal definition of sustainable or ethical investment, and excess financial returns are not always requested by ethical investors.

The two hypotheses were tested by analysing the monthly financial performance on portfolio level for Danish mutual funds during 1 April 2010 and 31 December 2018, and for Swedish and Norwegian equity funds during 1 January 2005 to 31 December.

Three regression models were applied in this study. Firstly, the results from a single-factor model show that there is not any significant difference between the ethical fund portfolios and their conventional peers. Most fund portfolios, both sustainable and conventional underperform in relation to the market. The global-investing Norwegian ESG funds significantly outperform their conventional peers. The regional-investing Norwegian funds outperform the market and the Norwegian ESG fund portfolio expressively outperform their conventional counterpart.

Secondly, the Fama French three-factor model was utilized to test the funds' exposure to the size and value factors. The findings indicate that the additional two factors provided higher explanatory power than the single-factor model. The alphas have slightly changed towards more negative values. The majority of fund portfolios have a greater exposure to small-cap and growth companies indicated by having positive SMB coefficients and a negative HML betas.

Thirdly, the Carhart four-factor model was used to control the funds' exposure to stock price momentum. The results of Carhart four-factor model demonstrated marginally higher explanatory power than the 3-factor model by including the extra momentum factor. Similar to

the Fama French model, the alphas changed marginally to more negative values. Overall, the majority of fund portfolios have a vague exposure to the stock price momentum.

In conclusion, there is not any significant difference in risk-adjusted returns between sustainable and conventional funds for the majority fund portfolios. The overall result show that both sustainable and conventional funds underperform the market.

However, the outperformance of regional-investing Norwegian ESG funds was not expected and all three models imply that the Norwegian local-investing ethical funds have better risk-adjusted returns and less sensitivity to the market fluctuations than their conventional peers. This finding signal that the Norwegian sustainable portfolio has better risk-return trade-off and it is contradictive to the Modern Portfolio Theory. On the other hand, the superior performance of the Norwegian ethical fund portfolio supports the first hypothesis and confirm that extensive screening process can lead to better financial returns. It further backing the Stakeholder Theory that taking the interests of stakeholders into considerations can result superior financial performance and the less-diversified effect could be balanced through sustainable activities.

Nevertheless, the reason behind the superior performance of the Norwegian ethical market could not be found and therefore suggested for future search. Moreover, it would be interesting to further investigative whether a learning phase for new sustainable mutual funds exist in order to achieve to the same financial level as their conventional peers.

Given the overall inconclusive performance of sustainable mutual funds, the key question would be why many individual and institutional investors still invest in this and if the lower return worth it? Backwards looking, the financial crisis in 2008 might be unique but it was not unpreventable, and it shares common factors with earlier market bursting, e.g. the Internet bubble in 2001 and the Asian financial crisis in 1997. In each previous market upheavals, market crashes were caused by short-term thinking and greed investors. Therefore, taking a long-term view, I personally think sustainable mutual funds are worth to invest. Because there are indeed many climate and social issues that need to be solved for a more sustainable future. Besides that, long-term sustainable investing might be able to prevent short-term bubbles and potentially the next financial crisis. For the sake of our next generation, sustainable mutual funds are positively contributing to a better world and therefore should be selected by more investors.

List of References

Barnett, M. and Salomon, R. (2006). Beyond dichotomy: the curvilinear relationship between social responsibility and financial performance. *Strategic Management Journal*, 27(11), pp.1101-1122.

Bauer, R., Derwall, J. and Otten, R. (2007). The Ethical Mutual Fund Performance Debate: New Evidence from Canada. *Journal of Business Ethics*, 70(2), pp.111-124.

Bauer, R., Koedijk, K. and Otten, R. (2005). International evidence on ethical mutual fund performance and investment style. *Journal of Banking & Finance*, 29(7), pp.1751-1767.

Bauer, R., Otten, R. and Rad, A. (2006). Ethical investing in Australia: Is there a financial penalty?. *Pacific-Basin Finance Journal*, 14(1), pp.33-48.

Bloomberg. (2018). *Jyske Invest Globale Aktier* [online]. Available at: https://www.bloomberg.com/quote/JYIE:DC [Accessed 11 May 2019].

Bodie, Z. (2004). *Investments*. Boston: McGraw-Hill/Irwin.

Brealey, R., Myers, S. and Allen, F. (2014). *Principles of corporate finance, concise edition*. Boston: McGraw-Hill.

Brown, S., Goetzmann, W., Ibbotson, R. and Ross, S. (1992). Survivorship Bias in Performance Studies. *Review of Financial Studies*, 5(4), pp.553-580.

Carhart, M. (1997). On Persistence in Mutual Fund Performance. *The Journal of Finance*, 52(1), p.57.

Ceu Cortez, M., Silva, F. and Areal, N. (2012). Socially Responsible Investing in the Global Market: The Performance of US and European Funds. *SSRN Electronic Journal*, 17(3), pp.254-272.

Chegut, A., Schenk, H. and Scholtens, B. (2011). Assessing SRI fund performance research: Best practices in empirical analysis. *Sustainable Development*, 19(2), pp.77-94.

Elton, E., Gruber, M., Brown, S. and Goetzmann, W. (2011). *Modern portfolio theory and investment analysis*.

Faff, R. (2004). A simple test of the Fama and French model using daily data: Australian evidence. *Applied Financial Economics*, 14(2), pp.83-92.

Fama, E. and French, K. (1992). The Cross-Section of Expected Stock Returns. *The Journal of Finance*, 47(2), p.427.

Fama, E. and French, K. (1993). Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics*, 33(1), pp.3-56.

Fama, E. and FrencH, K. (1996). Multifactor Explanations of Asset Pricing Anomalies. *The Journal of Finance*, 51(1), p.55.

Fama, E. and French, K. (2012). Size, Value, and Momentum in International Stock Returns. *SSRN Electronic Journal*.

Freeman, R. (1984). Stakeholder Theory. *Business Ethics Quarterly*, 12(3), pp.331-349.

Girard, E., Rahman, H. and Stone, B. (2007). Socially Responsible Investments. *The Journal of Investing*, 16(1), pp.96-110.

Global Sustainable Investment Review (2012). *ESG screening in fixed income investing*. [online] PRI. Available at: https://www.unpri.org/fixed-income/esg-screening-in-fixed-income-investing/36.article [Accessed 11 May 2019].

Gregory, A., Matatko, J. and Luther, R. (1997). Ethical unit trust financial performance: Small company effects and fund size effects. *Journal of Business Finance & Accounting*, 24(5), pp.705-725.

Grinblatt, M. and Titman, S. (1994). A Study of Monthly Mutual Fund Returns and Performance Evaluation Techniques. *The Journal of Financial and Quantitative Analysis*, 29(3), p.419.

Hamilton, S., Jo, H. and Statman, M. (1994). Doing Well While Doing Good? The Investment Performance of Socially Responsible Mutual Funds. *Financial Analysts Journal*, 49(6), pp.62-66.

Hammenfors, I. and Hafskjær, R. (2016). *Financial Performance of Ethical Investments*. Master. Copenhagen Business School.

Heal, G. (2005). Corporate Social Responsibility: An Economic and Financial Framework. *The Geneva Papers on Risk and Insurance - Issues and Practice*, 30(3), pp.387-409.

Heckman, J. (1979). Sample Selection Bias as a Specification Error. *Econometrica*, 47(1), p.153.

Ibikunle, G. and Steffen, T. (2017). European Green Mutual Fund Performance: A Comparative Analysis with their Conventional and Black Peers. *Journal of Business Ethics*, 145(2), pp.337-355.

Jensen, M. (1969). Risk, The Pricing of Capital Assets, and The Evaluation of Investment Portfolios. *The Journal of Business*, 42(2), p.167.

KPMG (2017). *European responsible investing fund market 2016*. [online] Available at: https://assets.kpmg/content/dam/kpmg/lu/pdf/lu-en-european-responsible-investment-fund.pdf [Accessed 11 May 2019].

Kreander, N., Gray, R., Power, D. and Sinclair,, C. (2015). Evaluating the performance of ethical and non-ethical funds: A matched pair analysis. *Journal of Business Finance & Accounting*, 32(7), pp.1465-1493.

Leite, C., Cortez, M. and Silva, F. (2017). The Performance of Swedish Socially Responsible Mutual Funds.

Leite, P. and Cortez, M. (2014). Style and performance of international socially responsible funds in Europe. *Research in International Business and Finance*, 30(C), pp.248-267.

Lintner, J. (1965). Security Prices, Risk, and Maximal Gains From Diversification. *The Journal of Finance*, 20(4), p.587.

Malaysia Islamic International Financial Center (2017). *Islamic funds, asset management sector poised for growth*. [online] Bangkok. Available at: https://www.gulf-

times.com/story/573720/Islamic-funds-asset-management-sector-poised-for-g [Accessed 11 May 2019].

Malkiel, B. (1995). Returns from Investing in Equity Mutual Funds 1971 to 1991. *The Journal of Finance*, 50(2), p.549.

Mallin, C., Saadouni, B. and Briston, R. (1995). The Financial Performance Of Ethical Investment Funds. *Journal of Business Finance & Accounting*, 22(4), pp.483-496.

Matallín-Sáez, J., Soler-Domínguez, A., Tortosa-Ausina, E. and de Mingo-López, D. (2019). Ethical strategy focus and mutual fund management: Performance and persistence. *Journal of Cleaner Production*, 213, pp.618-633.

Michelson, G., Wailes, N., Van Der Laan, S. and Frost, G. (2004). Ethical Investment Processes and Outcomes. *Journal of Business Ethics*, 52(1), pp.1-10.

Moskowitz, H. (1952). Portfolio selection. *Journal of Finance*, 7(1), pp.77-91.

MSCI (2019). Nordic Countries Index. (2019).

Nordea (2018). *ESG at Nordea - Environmental Social Governance*. [online] pp.1-8. Available at: https://www.nordea.com/Images/33-262854/Folder_ESG%20at%20Nordea.pdf [Accessed 11 May 2019].

Plackett, R. (1950). Some Theorems in Least Squares. *Biometrika*, 37(1/2), p.149.

Porter, M. and Kramer, M. (2007). Strategy and society: the link between competitive advantage and corporate social responsibility. *Strategic Direction*, 23(5).

Porter, M. and Linde, C. (1995). Toward a New Conception of the Environment-Competitiveness Relationship. *Journal of Economic Perspectives*, 9(4), pp.97-118.

Renneboog, L. Ter Horst, (2007). Socially Responsible Investments: Methodology, Risk and Performance. *SSRN Electronic Journal*.

Renneboog, L., Ter Horst, J. and Zhang, C. (2008a). Socially responsible investments: Institutional aspects, performance, and investor behavior. *Journal of Banking & Finance*, 32(9), pp.1723-1742.

Renneboog, L., ter Horst, J. and Zhang, C. (2008b). The Price of Ethics and Stakeholder Governance: The Performance of Socially Responsible Mutual Funds. *SSRN Electronic Journal*.

Revelli, C. and Viviani, J. (2015). Financial performance of socially responsible investing (SRI): what have we learned? A meta-analysis. *Business Ethics: A European Review*, 24(2), pp.158-185.

Robeco Asset Management (2018). *Exclusion Policy Robeco*. [online] p.4. Available at: https://www.robeco.com/docm/docu-exclusion-policy-and-list.pdf [Accessed 11 May 2019].

Roberts, H. (1967). Statistical versus clinical prediction of the stock market. *Unpublished manuscript*.

Robins, N. And Krosinsky, C. (2008). *Sustainable investing*. London: Earthscan.

Schepers, D. and Prakash Sethi, S. (2003). Do Socially Responsible Funds Actually Deliver What They Promise?. Bridging the Gap Between the Promise and Performance of Socially Responsible Funds. *Business and Society Review*, 108(1), pp.11-32.

Schröder, M. (2004). The performance of socially responsible investments: Investment funds and indices. *Financial Markets and Portfolio Management*, 18(2), pp.122-142.

Sharpe, W. (1964). Risk-Aversion in the Stock Market: Some Empirical Evidence. *The Journal of Finance*, 20(3), p.416.

Sharpe, W. (1966). Mutual Fund Performance. *The Journal of Business*, 39(S1), p.119.

Statman, M. (2000). Socially Responsible Mutual Funds (corrected). *Financial Analysts Journal*, 56(3), pp.30-39.

Treynor, J. (1965). How to rate management of investment funds. *Harvard Business Review*, 43(1), pp.63-75.

Treynor, J. and Mazuy, K. (1966). Can Mutual Funds Outguess the Market?. *Harvard Business Review*, 44(1), pp.131-136.

United Nations (2018). *About the Sustainable Development Goals - United Nations Sustainable Development*. [online] United Nations Sustainable Development. Available at: https://www.un.org/sustainabledevelopment/sustainable-development-goals/ [Accessed 11 May 2019].

Walley, N. and Whitehead, B. (1994). It's Not Easy Being Green. *Harvard Business Review*, [online] 72(May), p.12. Available at: https://hbr.org/1994/05/its-not-easy-being-green [Accessed 11 May 2019].

Wooldridge, J. (2013). *Introductory econometrics*. Boston, MA: Cengage Learning, Inc.

Appendix - List of mutual funds

Global holdings - Sweden

Sustainable funds		Matched Conventional Funds	
Fund name	**Launch date**	**Fund name**	**Launch date**
Ohman Utlandsfond A	01/01/1995	Swedbank Robur Access USA	01/04/1994
SEB Hallbarhetsfond Global	01/10/1991	Länsforsakringar Global Aktiv	01/12/1990
SPP Aktiefond Global A	01/05/2000	Danske Invest Global Index	01/09/2000
SEB Stifelsefond Utland	20/02/1999	Swedbank Robur Europa Mega	01/04/2000
Swedbank Robur Talenten Aktiefond Mega	01/11/1995	Skandia SMART Offensiv	01/08/1995
SPP Emerging Markets SRI	01/11/2010	SEB Emerging Maketsfond	01/02/2010
Didner and Gerge Global	01/09/2011	Ciceno Peabfonden	01/07/2010
SPP Global Topp 100	01/10/2012	Solidar Flex 100 Plus	20/09/2012
SPP Generation 60-tal	01/01/1996	Ohman Global Hallbar	01/12/1998
SPP Generation 70-tal	01/01/1996	Swedbank Robur Aktiefond Pension	01/03/1999
Lararfond 21-44 år	01/04/1994	Gustavia Blakan SEK	10/10/2003
Ohman Ethisk Index Pacific	10/10/1999	Handelsbanken Asienfond	01/04/1989
SPP Globale Solutions B	01/04/2009	Navigera Aktier 2	01/01/2010
Ohman Etisk Index Japan	10/10/1999	Swedbank Robur Access Japan	01/12/1992
SPP Generation 80-tal	01/09/2000	Nordea Generationsfond 80-tal	01/09/2000
Aktie-Ansvar Europa	01/06/2000	Banco Russia SEK	01/08/1998
East Capital Rysslandsfonden	01/05/1998	AMF Aktiefond Global	01/11/2001
Danske Invest SRI Global	01/08/2001	AMF Aktiefond Varlden	01/12/1998
KPA Etisk Aktiefond	01/03/1993	Lansforskringar USA Aktiv	01/01/1996
East Capital Balkanfonden	01/10/2004	Simplicity Asien	01/01/2006
Ohman Etisk Index Europa	10/10/1999	Danske Invest Europa	10/06/1999
East Capital Turkiefonden	01/03/2006	AMF Aktie Ud	12/12/2006
SPP Aktiefond Japan	31/12/1998	Swedbank Robur Global fond A	12/12/1998
Folksam LO Varlden	01/03/1993	SEB Stiftelsefond Utland	01/12/1999
Nordea Inst Aktier Stabil icke-ud	01/05/2010	Navigera Aktier 1	01/08/2008
AP7 Aktiefond	01/05/2010	IF Tillvaxtmaknad Indexnara	01/07/2010
Ohman Utlandsfond B	01/05/2013	SEB Dynamisk Aktiefond	01/05/2012
Danske Invest SRI Global utd	01/05/2013	SEB Dynamisk Aktiefond Inst	01/03/2013

Regional holdings - Sweden

Sustainable funds		Matched Conventional Funds	
Fund name	**Launch date**	**Fund name**	**Launch date**
Skandia Norden	01/04/2012	Nordea Indexfond Sverige Utd	01/03/2012
Skandia Varldsnaturfonden	01/06/1988	Handelsbanken Sverigefond	25/04/1988
Nordea Swedish Stars icke-ud	01/10/1999	Lannebo Sverige	01/08/2000
SPP Aktiefond Sverige A	01/12/1998	AMF Aktiefond Sverige	02/10/1998
Ohman Sweden Micro Cap	01/05/1997	Catella Smabolag	16/12/1998
Folksam LO Vastfonden	01/03/1999	Enter Sverige	30/11/1999

Global holdings - Norway

Sustainable funds		Matched Conventional Funds	
Fund name	**Launch date**	**Fund name**	**Launch date**
Delphi Europa	01/01/1993	Odin Europa C	15/11/1995
KLP Aksje Verden Indeks	01/08/2011	Forte Global	01/03/2011
KLP Aksje Global Indeks IV	01/08/2005	KLP AksjeGlobal Indeks II	01/12/2004
Odin Emerging Markets	01/11/1999	DNB Global Emerging Market	01/12/1999
Holberg Rurik	01/12/2000	Holberg Global A	20/09/2004
Odin Energi C	01/08/2000	Fondsfinas Energi	01/12/2000
DNB Nordic Technology	01/08/2001	DNB Telecom	01/05/2000
Nordea Stabile Aksjer Global Etisk	11/11/2008	Norse TrendEn	01/10/2009
DNB Nor Global Etisk V	01/12/2001	Eika Global	01/06/2001
Skagen Vekst A	01/12/1993	PLUSS Utland Aksje	30/05/1994
Holberg Global	01/12/2000	Carnegie Worldwide	01/02/2000
Storebrand Global Verdi	01/11/1997	Odin Global D	01/11/1999
DNB Aktiv 100	01/09/2005	DNB Global IV	01/09/2004
Skagen Kon-tiki A	01/04/2002	Holberg Global B	01/11/2005
Delphi Global	01/05/2006	Skagen Global B	01/12/2000

Regional holdings - Norway

Sustainable funds		Matched Conventional Funds	
Fund name	**Launch date**	**Fund name**	**Launch date**
DNB Norge Indeks	01/08/2010	Forte Norge	01/03/2011
DNB Nor Gront Norden	01/11/1989	DNB Norden III	01/01/1989
Delphi Norden	01/03/1991	Odin Norden	01/06/1990
DNB SMB	01/03/2001	Odin Norge B	19/12/2001
KLP Aksje Norden	01/03/1999	Eika Norden	01/11/1998
Storebrand Norge	01/09/1983	Pareto Investment Fund A	01/01/1985
Alfred Berg Humanfond	01/12/1999	Holberg Norge	01/01/2000
KLP Aksje Norge	01/12/1999	Atlas Norge	20/02/1998
Storebrand Verdi	01/12/1997	DNB Barnefond	01/02/1997
Delphi Noerge	01/06/1994	Alfred Berg Aktiv	01/12/1995
Storebrand Vekst	01/10/1992	Odin Norge D	01/06/1992
Alfred Berg Gambak	01/11/1990	Alfred Berg Norge Classic	01/10/1990

Global holdings - Denmark

Sustainable Funds		Matched Conventional Funds	
Fund name	**Launch date**	**Fund name**	**Launch date**
Carnegie Worldwide Globale Aktier SRI	31/12/2000	LPI Aktier Globale	29/06/2005
Jyske Invest Globale Aktier Special	01/03/2010	Danske Invest Engros Aktier	07/05/2010
Maj Invest Globale Sundhed	10/11/2008	BankInvest Udbytte Aktier	01/05/2011
Nordea Klima og Miljo	01/06/2011	PFA Invest Danske Aktier	03/07/2011
Nykredit Invest Klima Miljoe SRI	30/11/2011	BLS Invest Globale Aktier	30/09/2008
Nordea Invest Engros Global Stable Etisk Tilvag	15/11/2009	Jyste Invest Globale Aktier	01/03/2010