Differences in Risk-adjusted Return Between Conventional and Sustainable Funds

– a study of the Swedish Fund Market

Skillnader i riskjusterad avkastning mellan konventionella och hållbara fonder – en studie på den svenska fondmarknaden

Adrian Michaelsson & Edward Svensson

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Abstract

Sustainable investments have received increased interest all over the world amongst institutional and private investors. The number of funds investing in securities according to their ESG characteristics is a constantly growing part of the market. Because of this the in-flow of capital seem to be higher in sustainable funds which might help them counteract their limitations when it comes to risk-adjusted return. Previous studies on the subject have shown inconclusive results on how financial performance is affected by ESG factors. This study therefore aims to find differences between conventional and sustainable funds, in order to see what might affect the risk-adjusted return of funds on the Swedish fund market.

The aim of the study is to analyse if it is a difference in yield between sustainable and conventional funds during the market crisis caused by the Coronavirus in order to see how different ESG factors might minimise the total and systematic risk in a portfolio. In total 40 funds were sampled by using a purposive sampling method. The analysis was conducted during a two-year period 2019 to 2020, whereas in 2020 the COVID-19 pandemic started, which set off the market crisis. By using a quantitative study design the funds were analysed with different evaluation models such as Sharpe and Treynor ratios but also with a Wavelet Coherence Analysis. In the study the sustainable funds have experienced a lower systematic risk and a higher risk-adjusted return on average. The Wavelet Coherence Analysis also points to these results as there is a strong coherence between ESG and systematic risk with a negative correlation, i.e. a good Environmental Social Governance (ESG) score provide a lower beta (systematic risk). Differences in risk-adjusted return could be seen between funds profiled differently in the E, S and G segment. The sustainable funds profiled in “S” have performed the best risk-adjusted return, followed by the conventional funds profiled in “G”. The results also suggests that the spread in yield between conventional funds and sustainable funds increases throughout the sample period. Sustainable funds have recovered faster, leading to enhanced risk-adjusted returns both when measured through Sharpe and Treynor ratios. Seemingly, sustainable funds have managed this risk better, by utilising the information more efficiently and reacting to market changes. Therefore, investors can expect sustainable funds to provide a better risk-adjusted return than its conventional peers during a market crisis.

Keywords: Wavelet Coherence Analysis, *Risk-adjusted return, Sustainable funds, Conventional funds, ESG and COVID-19.*

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Abbreviations

AUM	Assets Under Management
CSP	Corporate Social Performance
EF	Equity Funds
ESG	Environmental Social Governance
MSR	Morningstar Sustainability Rating
NAV	Net Asset Value
SD	Standard Deviation
SDG	Sustainable Development Goals
UN	United Nations
WCA	Wavelet Coherence Analysis
WHO	World Health Organisation

1. Introduction

In the first chapter, the background of the thesis subject will be presented. The background of the study formulates the foundation of the problem statement. Based on the formulated problems of the study, the aim and research questions are presented. Subsequently, the outline of the thesis is described in order to give the reader a translucent picture of the study's content and process.

1.1. Background

Recent years' economic growth has enabled most of us to enhance our standard of living, but has simultaneously led to negative impacts such as environmental degradation, air pollution and depletion of natural resources (Mittal & Gupta, 2015). There is no doubt that society needs to address certain issues related to economic, social and environmental sustainability.

Sustainability as a concept has increasingly received more and more attention in research, as well as in media in recent years (Geissdoerfer et al., 2017). According to Johnston et al. (2007) there exists over 300 definitions of the concept sustainability. Nevertheless, perhaps one of the most common definitions of sustainable development is defined in the report by the Brundtland Commission (1987, p. 35):

> "Development which meets the needs of current generations without compromising the ability of future generations to meet their own needs" (p. 35).

To cope with the urgent issues of creating a more sustainable future the United Nations (UN) has developed 17 sustainable goals with underlying targets to be reached by the year of 2030 (United Nations, 2021). The Sustainable Development Goals (SDG) works as a blueprint for companies and countries to achieve a more sustainable future for all. The SDG's includes global challenges related to poverty, inequality, climate change, environmental degradation, as well as peace, justice and financial goals.

The financial market is not an exception when it comes to sustainable development and during the last ten years consciousness for sustainability has tremendously increased (Busch et al., 2016). The growth in asset value of sustainable investments

has been substantial – with an increase of 68 percent in the two-year-period between 2014 and 2016 (GSIA, 2017). Over these last years, financial market participants have gained a better understanding of the value proposition and how to incorporate environmental, social and governance (ESG) in investment decisions, resulting in an increased client demand for sustainable investments (IISD, 2020).

The main purpose of investing in the financial market is to gain economic return in the long run through value creation, while at the same time diversifying some degree of risk (Investopedia, 2020a). One possible way of investing money is by placing it into equity funds (EF). The savings are invested in a diverse portfolio of securities under the management of a group of experts. It is therefore considered to be diverse in a way which not only reduces risk but also ensures safety and stable returns of the investments over a longer period of time (Quershi et al., 2017). Private investors could choose between a range of different conventional funds or sustainable funds. Sustainable funds are one possible way for private investors to invest and interact with companies which will benefit our society in a more positive way, rather than negative manner, because of proactive work with Environmental, Social and Governance (ESG) practices. According to MSCI ESG Research (nd) ESG is defined as:

> "The consideration of environmental, social and governance factors alongside financial factors in the investment decision-making process."

The year of 2020 was nothing alike any other typical year – as of the 30th of January the Director-General of the World Health Organization (WHO) declared the outbreak of COVID-19 to be a public health emergency of international concern (WHO, 2020a). The first human cases of Coronavirus, which caused the disease of COVID-19, subsequently named SARS-CoV-2, were first reported by officials in Wuhan City, China, in December 2019 (WHO, 2020b). The outbreak of the Coronavirus proved to be a lot worse than anyone ever could have expected. In the beginning of March 2020, the number of cases of COVID-19 outside China had increased 13-fold and the number of countries affected had tripled – the crisis was consequently characterised as a pandemic (WHO, 2020c). The pandemic created widespread concern and economic hardship for consumers, companies and communities across the world.

The spread of the Coronavirus encouraged social distancing and a heightened uncertainty about how much worse the situation could become and therefore led to a flight to safety by consumers, investors and international trading partners (Peterson & Thankom, 2020). People across the globe were spending more time at home due to personal quarantines, which increased the intensity of climate discussions (Cadham, 2020). A global health crisis was soon turned into a global economic crisis. The Coronavirus led to a lockdown of the economy in most

industries, resulting in nosediving revenues and for many businesses even bankruptcy (Copenhagen Economics, 2020).

COVID-19 drastically affected the global financial market. In the equity market for instance, the S&P 500 index and OMXSGI experienced the steepest descent in living memory, as it lost 34 percent of its value in a five-week period between February 19th and March 23rd (Pástor, L. & Vorsatz, 2020; Nasdaq 2021; CNBC, 2020a). The focus of this study will lie on how the crisis have affected risk-adjusted return of sustainable and conventional funds on the Swedish EF market. This crisis is particularly suitable for this study since it happened so recently – making it relevant for private investors to fully understand how a global health crisis affects their fund savings, which enables investors to make reasoned investment decisions in the coming future.

1.2. Problem statement

During recent years there has been an explosive growth of funds managed by experts in the equity fund market and it has attracted much academic and public interest (Wang et al., 2015). This has led to a rapid increase of assets under management in EFs and that socially responsible investment (SRI) strategies have been implemented (Nofsinger & Varma, 2014). SRI strategies use measurements that incorporates Environmental, Social and Governance (ESG) factors in order to monitor the level of due diligence in the equities (TIAA-CREF, 2014). The three terms which ESG consists of is related to issues regarding climate change, social rights and business ethics. Funds could generally be categorised as sustainable or conventional based on the level of respect to their environmental and social impacts (Koellner et al., 2007). Sustainable funds are focused on striking a balance between different ESG factors, but it is yet unclear how these factors impact the volatility, risk and yield.

Previous research has presented contradicting results and gives mixed messages to whether risk-adjusted return is any different between conventional and sustainable funds (e.g. Chang et al., 2012; Climent & Soriano, 2011; Friede et al., 2015). Evan Papageorgiou, one of the authors of International Monetary Fund's (IMF) October 2019 Global Financial Stability Report claims:

> "There is no conclusive evidence in the literature that sustainable funds consistently out- or underperform conventional funds" (IMF, 2019, p.85).

At the same time Mallin et al. (1995) draws conclusions that increased interest and awareness for sustainability might have had a positive effect on sustainable funds in their study, but that it might be temporal. The study made by Friede et al. (2015),

shows that ESG investments outperform conventional peers in some markets and that there is a positive correlation pattern over time. In another study by Nofsinger and Varma (2014), it is presented how sustainably managed US EFs outperform conventional funds during periods of a market crisis, but that this dampening of downside risk comes at the cost of underperforming during non-crisis periods. They state that sustainable funds are better managed and therefore withstand financial crises better than conventional funds (ibid.). Further analysis performed shows that the outperformance of sustainable funds in periods of crisis is highly correlated with active work with ESG.

Most previous studies on sustainable and conventional funds have focused on comparing the two fund categories over cycles of steady development on a global or European level (e.g. Chang et al., 2012; Koellner et al., 2007; Fernandez Sanchez & Sotorrío, 2010; Kreander et al., 2005), but there is still a very limited number of studies of funds over a period of crisis and instability. Nofsinger and Varma (2014) has performed studies of fund performance over a period of crisis, but as in most of other studies of sustainable funds, this study has also been conducted on the US market. In the light of this, little or no research has been based solely on the Swedish fund market. Neither has prior research (Nofsinger & Varma, 2014; Wang et al., 2018) focused on how a global health crisis (like COVID-19) have affected the fund market, but rather other financial crises, which makes these sample periods outdated. These studies did also not focus on equity funds managed on the Swedish fund market and consequently results are not directly applicable to the Swedish market either. Thus, there is a gap in previous research, which generates a need for a study of how a global health crisis has affected funds on the Swedish fund market and how ESG factors affect the risk in different types of equity funds.

1.3. Aim and research questions

For the time being we do not yet know how the global health crisis will affect the fund market in the long run. It is however possible to examine the effects it has had during the last year (2020) and the outcome on the yield of both conventional and sustainable funds. Therefore, the aim of this thesis is to contribute to the understanding of how the Swedish fund market behaves during a global health crisis, COVID-19. The research aims to analyse the difference in yield between sustainable and conventional funds in order to see how ESG factors affect the volatility and risk-adjusted return *before* the crises, during the *recession* and the *recovery*. The research aims to answer the following three research questions:

- Did sustainable funds experience a difference in risk-adjusted return compared to conventional funds during the sample period? Were there differences during the different stages of the pandemic?
- How does ESG factors affect systematic risk in funds during the sample period?
- Did funds with different ESG-profiles experience significantly different patterns in risk-adjusted return over time?

1.4. Outline of the thesis

Down below in *Figure* 1, an overview is presented of how the thesis is structured and how each chapter of the study is outlined.

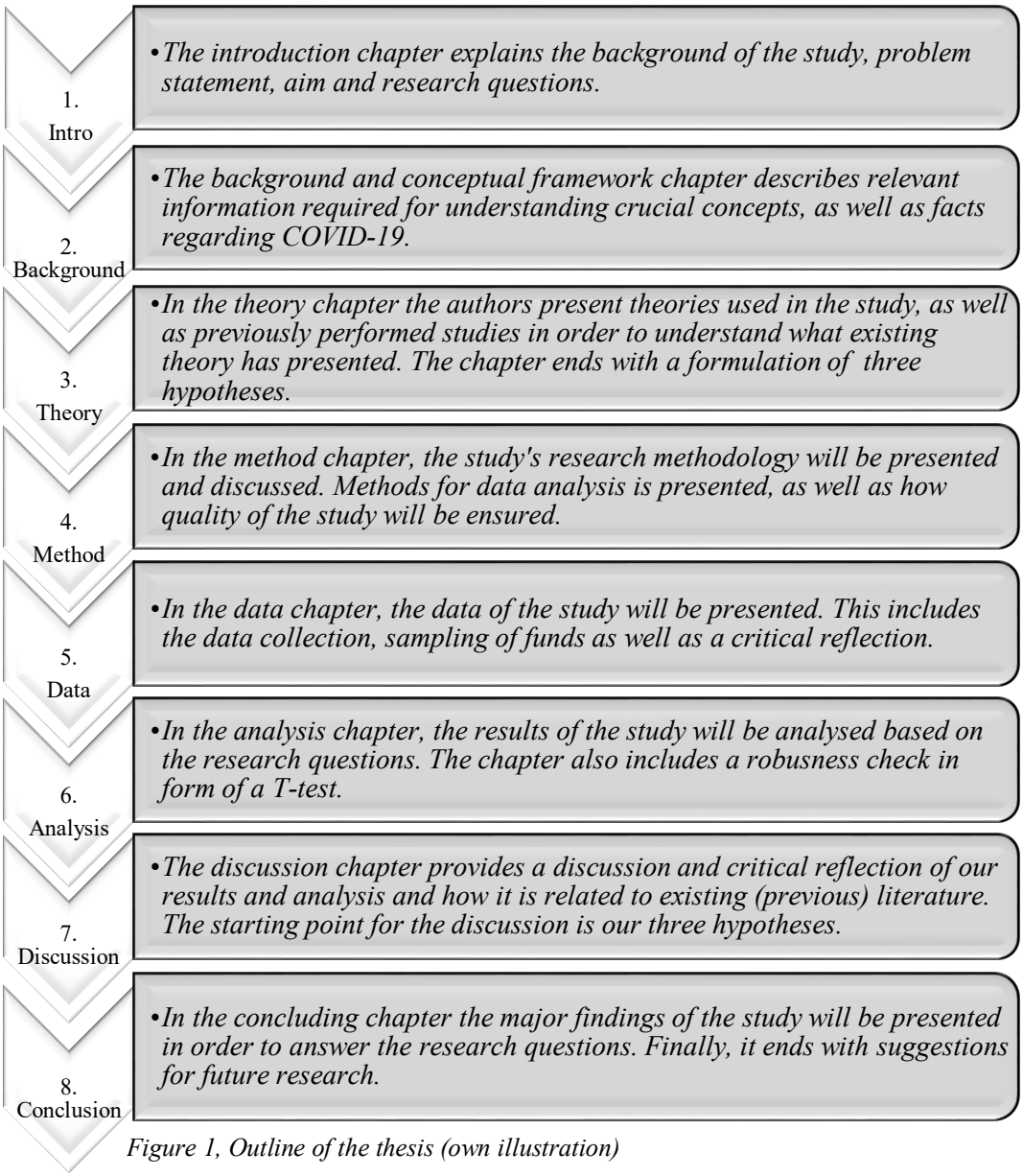

Figure 1, Outline of the thesis (own illustration)

2. Sustainable and Conventional Funds

The second chapter begins with an introduction to funds and how to define conventional and sustainable funds. This chapter aim to lay out the background of the thesis's conceptual framework and theory, where the authors will introduce the readers to ESG, MSR, the Swedish fund market and COVID-19.

2.1. Funds

Funds come in many forms and is described as a pool of money with a specific purpose. This study will be focused on equity funds (EF), which are investments managed by professionals into diverse portfolios that are expected to yield return in the long term (Quershi et al., 2017). Generally, EFs can be divided into two main categories – conventional and sustainable equity funds.

The pricing of EFs works differently from stocks, since it is not possible to directly purchase or sell a fund share as there is with stocks (Avanza, n.d.a; SEC, n.d.). Rather, funds use something called Net Asset Value (NAV) for the pricing and this price is updated every time the fund is being traded at the end of the day. The NAV for the Swedish fund market is set everyday usually at 16:00 or after 17:30, which is when the market closes (Avanza, n.d.a.). NAV for a fund is the total assets minus the various fees (fund liabilities), such as the management fee for the EF. The fund assets are thereafter divided by the total number of outstanding fund shares in the fund. NAV is therefore dependent on how the underlying assets are valued and the fees for managing the fund. The calculation for NAV looks as following:

$$\text{NAV} = \frac{Fund\ assets - Fund\ liabilities^{1/T}}{Outstanding\ shares}, \quad (1)$$

where: T = the number of NAV per year

Another important term when it comes to funds is Assets Under Management (AUM). AUM is a financial measurement used to describe the total market value that an entity manages on behalf of investors (Investopedia, 2020b). AUM fluctuates daily and there is no set standard for calculating it. This measurement is

used to indicate the size of how much a fund is managing for its investors and refers to total assets. In this study we will use AUM to measure fund-flow.

2.2. Conventional funds

Conventional funds can be seen as a sub-group of EFs. In research there is however no precise definition of what a conventional fund is. Despite this, it exists a common view of conventional funds among practitioners in the financial industry – which is that conventional funds are partly those that do not actively work with excluding certain industries. For instance, coal and other non-renewable energy industries and material sectors are overly weighted in conventional funds (Koellner, 2007). Traditional conventional fund managers are not actively performing a negative screening of securities that might have a negative effect. Neither does managers of conventional funds positively screen for securities that have a large focus on ESG to the same extent as in sustainable funds, such as including securities with good environmental records (ibid.). Thus, a common understanding of a conventional fund are funds that focus on the highest yield, rather than environmental or social values. In this study the term conventional funds are used to describe funds that have received 1 to 3 globes on the Morningstar Sustainability Rating as shown in *Appendix* B.

2.2.1. Sustainable funds

Sustainable funds, also known as sustainable and responsible investments (SRI), are for instance EFs that use several ESG criteria to evaluate the investments (Morningstar, 2018a). There is however no legal definition of what constitutes sustainable investments in Sweden, but it exists a common understanding in the industry of what the term means. At its core, sustainable investments enable investors to interact with companies that takes sustainability into consideration as they report details of their ESG work. The international organisation European Social Investment Forum (EUROSIF, n.d.) have elaborated a definition of a sustainable investment as:

> "A long-term oriented investment approach which integrates ESG [environment, social and governance] factors in the research, analysis and selection process of securities within an investment portfolio. It combines fundamental analysis and engagement with an evaluation of ESG factors in order to better capture long term returns for investors, and to benefit society by influencing the behaviour of companies."

ESG lays the foundation for improved risk management within the fund context and could potentially generate good long-term returns (Fondbolagen, n.d.). The

funds vary in performance depending on what type of ESG criteria one analyses and may receive different scores from an environmental, social or governmental perspective. Yet, what is equal between all sustainable funds is the pursued aim to yield return for investors while concurrently contribute to sustainable development (ibid.). There exist other types of funds that some may want to include into the category of sustainable funds but is more commonly referred to as value-based funds. Value-based funds exclude certain sin-investments such as tobacco, gambling, nuclear weapons etcetera as part of the negative screening. However, the difference is that a sustainable fund evaluates the societal impact of their investments according to the concept of ESG, rather than excluding certain products. This is done through positive screening of securities with good environmental, social or governmental records. In this study the term sustainable funds are used to describe the funds that have received 4 to 5 globes on the Morningstar Sustainability Rating, as shown in *Appendix* B.

2.2.2. Environmental, Social and Governance

Environmental, Social and Governance criteria (ESG) are a sort of indicators that can visualise the company's business model, risk management and the non-financial performance (Galbreath, 2012). It is a broad term that covers a variety of issues related to the environment (e.g. water pollution, climate change, greenhouse gas-emission), the social responsibility (e.g. human rights, safety, equality) and the governance (e.g. corruption, reporting, board independence). Morgan Stanley Capital International (MSCI, n.d.) has presented certain ESG-issues which is covered by the E, S, and G, which is presented in *Appendix* A.

The term ESG is used in various scenarios such as in sustainable funds and risk valuation and there is no general definition of the concept (Bassen & Kovacs, 2008). ESG-scoring can help to provide stakeholders with relevant information regarding previously mentioned areas and how the organisation manages these issues. Additionally, the ESG analysis could lead to an improved understanding for future trends that could affect the organisation and how to maintain competitive advantage. The ESG-scoring is a measurement used in Morningstar Sustainability Rating.

2.2.3. Morningstar Sustainability Rating

Morningstar is an independent American finance company that provides services for investment management firms and research (Morningstar, n.d.a). The company released their own sustainability rating system – Morningstar Sustainability Rating (MSR) – in 2016. The purpose of a sustainability rating system is to help investors find funds that are in line with their individual preferences and beliefs when it comes to sustainability. MSR is a widely used rating system for sustainability and

is used by different financial institutions to categorise funds around the globe and to help investors and investment professionals to make meaningful comparisons between certain fund categories (Chang et al., 2012). MSR is developed to present a sustainability score on the three different levels: environmental, social & governance (ESG-score). Morningstar collaborates with the company Sustainalytics, when evaluating portfolios from a perspective that measures companies ESG risk (Morningstar, 2019). Morningstar use this company-level data in order to make a portfolio score on an asset-weighted basis, where the lowest score is one and the highest score is five "globes" (Morningstar, 2020a) and is presented in *Table* 1. The rating shows the ESG-risk relative to the peers and helps investors to directly compare funds across industries. Since MSR and ESG-scores is the most common way to categorise funds in regard to sustainability characteristics, the intention is to use these measures when sampling our funds.

Table 1, Morningstar Sustainability Rating

Distribution	Score	Descriptive rank	Rating icon
Highest 10 %	5	High	
Next 22.5 %	4	Above average	
Next 35 %	3	Average	
Next 22.5 %	2	Below average	
Lowest 10 %	1	Low	

Source: (Morningstar, 2018b)

2.3. Swedish fund market

In Sweden, more than 70 percent of the citizens pool some of their private savings in EFs and it is the saving method which most people prefer in the long-term (Fondbolagen, 2020). To pool savings in EFs has increased in popularity during the recent years, and according to the survey performed by Fondbolagen (2020), 40 percent think that the sustainability aspect of funds is "highly important".

Johan Ede[1] (2021) Head of Institutional Clients and Distrubution at Öhman Fonder contributed to our understanding of the Swedish fund market. He sheds light on the issue that it is hard to compare sustainable funds against conventional funds because of their different nature. During the past year of 2020, people have been spending more time at home, and as a result of this have had more time to spend reading news (ibid.). Increased focus on environmental issues was seen during the year, leading to intensified climate discussions. This has become even more clear during the outbreak of COVID-19 and Johan Ede (2021) mentioned that this has led to an

[1] Johan Ede, Head of Institutional Clients and Distrubution, Öhman Fonder, Phone interview 2021-02-16

increase of net flow in sustainable funds. Furthermore, Johan Ede (2021) mentioned that on the bond-market green bonds have managed the fall better than conventional ones and that this makes it clear that green investments have a higher demand. It is also mentioned that it is up to each fund manging firm to classify their funds of being sustainable or not, which makes the process quite subjective. The new EU taxonomy for sustainable finance has the goal to reduce the differences and to work as a common standard.

Linnéa Forsell[2] (2021) sustainability analyst at Söderberg & Partners further developed our empirical background by providing her view of the past year and events that have occurred. Like Johan Ede she brings up the idea that the pandemic has worked as an alarm clock and added fuel to the debate regarding climate change. The pandemic has helped shed light on issues related to sustainability and during 2020 the number of ESG funds increased by roughly 100 percent worldwide. Certain types of ESG funds, often related to renewable energy, have performed exceptionally well (ibid.; Dagens Industri, 2021). Furthermore, Linnéa Forsell (2021) and the team she works in have found that sustainable funds have managed the downturn better which is also seen in the strategy report presented by Söderberg & Partners. In the report presented by Söderberg & Partners (2020) they present evidence of that companies' sustainability rating actually reflects funds inherent instability. By examining the COVID-19-pandemic we aim to see if this is true, and if sustainable funds have shown themselves to be most resilient during the crisis.

2.4. COVID-19

COVID-19 was brought to the world's attention in January 2020. COVID-19 is the disease associated with the coronavirus SARS-CoV-2 that quickly spread around the world after the first cases were reported by officials in Wuhan City, China in December 2019 (WHO, 2020b). When the year of 2020 was over, the global figures of COVID-19 cases had reached 84 million (Statista, 2021a) and had caused just over two million deaths globally by January 2021 (Statista, 2021b). The pandemic has had severe consequences on everyday life, leading to society disruption, limited movement capabilities and thus having a massive effect on the global economy, resulting in a significant downfall of GDP (Sanchez-Duque et al., 2020).

Various mitigation measures have been imposed by countries across the globe – such as closure of schools and non-essential businesses, lockdowns and travel restrictions – in order to limit the spread of COVID-19. Different types of support packages have been implemented throughout the world. In Sweden the authorities

[2] Linnéa Forsell, Sustainability analyst, Söderberg & Partners, Microsoft Teams interview 2021-03-03

have estimated fiscal measures for 2020; capital injections, liquidity support and guarantees to the amount of SEK 803 billion, which is comparable to 16 percent of Sweden's 2019 national GDP (IMF, 2021). According to forecasts made by the World Bank (2020) COVID-19 has plunged the global economy into the worst recession since the Second World War. Especially financial equity markets have been extremely volatile, causing a shock to the global economy. Both the recovery and downturn of the stock market have been faster and more severe than the financial crisis in 2008 (The Guardian, 2020; World Bank, 2020; Avanza, 2020).

3. Theory

The third chapter begins with a brief illustration how the thesis is positioned in the literature. The chapter continues with a presentation of existing theories and previous studies. Modern Portfolio Theory and Efficient Market Hypothesis which are used for understanding how fund markets work, as well as how risk affects yield is presented. The chapter is wrapped up with a formulation of three hypotheses.

In *Figure* 2, it is described how the different theoretical domains are related to each other. This develops an understanding for how we will use different theoretical concepts to build up a conceptual framework, which later in the thesis will be used for analysis.

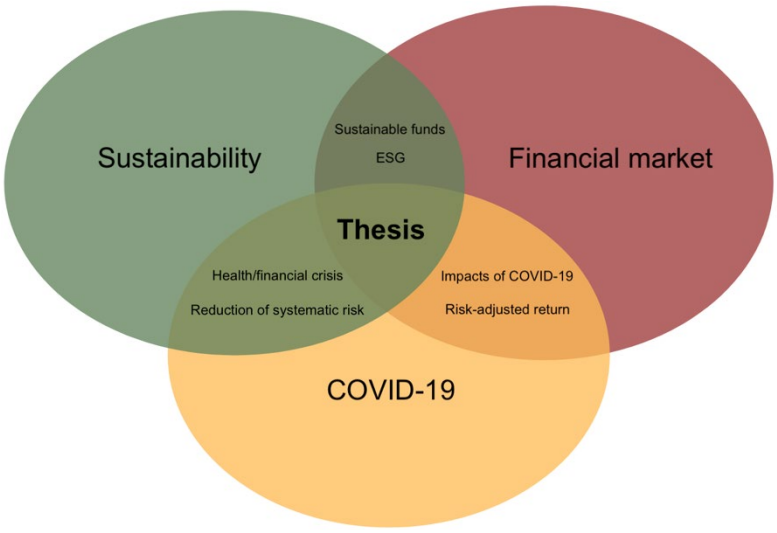

Figure 2, Thesis position in current literature (own illustration)

3.1. Previous studies

In the three following sub-sections, methods and results of previous comparative studies between conventional and sustainable funds will be presented. This section contributes with a theoretical understanding of how previous research concerning funds have been conducted and what was found. In the first sub-section of positive

performance, we present previous results where sustainable funds have outperformed conventional funds based on their level of respect to different ESG factors. In the second sub-section of neutral performance, we present previous results where sustainable and conventional funds have performed equally good and where ESG factors have had a neutral impact on yield. In the third sub-section of negative performance, we present previous results where sustainable funds have underperformed compared to conventional funds, i.e. where ESG factors have had a negative impact on yield.

3.1.1. Positive performance

Friede et al. (2015) conducted a study where the authors summarised results from over 2000 articles within the field of sustainable investments. The result of the study showed that around 90 percent of the summarised results pointed to a nonnegative relationship between ESG and corporate financial performance. However, there were also results showing a positive relationship between financial performance and ESG in 62.6 % of the analysis made on assets. The study both analysed vote-count and meta-analytic studies and both methods showed results that ESG investing could lead to profitable opportunities. The study generalises that ESG and Corporate Social Performance (CSP) have a positive correlation on average. Looking at "E", "S" and "G" the study concludes that "E" and "G" investments tend to more often show a positive relation than "S"-focused studies and investments. There is however a marginal difference between "E" and "S" studies with either positive or negative outcome.

In the article by Nofsinger and Varma (2014) they made a comparison between conventional funds and socially responsible funds on the US market between the period 2000-2011. The study used 240 Socially Responsible Investment (SRI) funds in order to analyse the risk-adjusted return. During this period there were two identified market crises, the technological bubble between March 2000 and October 2002 as well as the financial crisis between October 2007 and March 2009. The results showed that SRI funds outperformed the conventional ones during the market crises and that the outperformance was driven by funds that had a focus on ESG issues and shareholder advocacy. Part of this is thought to stem from that SRI funds have a higher focus on corporate behaviour, and this is something that is valued during poor economic states. The companies invested in tend to have good corporate governance and therefore are less likely to have negative outcomes within ESG-areas and thus avoid negative news regarding ESG issues.

In another article written by Nakai et al. (2015) the performance of SRI investments and conventional funds were compared with respect to the global financial crisis in 2008 on the Japanese fund market. The results of this study are similar to Nofsinger

& Varma (2014) that in a crisis period SRI funds managed this better and outperformed the market and that the SRI funds resisted the Lehman Brothers bankruptcy better the conventional peers. The study used a Fama-French three-factor model to analyse the data and looked at both international and domestic funds. In total the article analysed 2198 funds whereas 62 of them were SRI funds.

3.1.2. Neutral performance

A study by Kreander et al. (2005) compared the fund performance between ethical and conventional funds on four different markets: United Kingdom, Sweden, Netherlands and Germany. To sample the funds the authors used a matched pair analysis and came up with 60 funds in total. The study used different measurements in order to calculate the risk-adjusted return such as Sharpe and Treynor ratios. The results showed that ethical and conventional funds had the same risk-adjusted return during the period January 1995 – December 2001.

In another study conducted by Hamilton et al. (1993) comparisons were made between the performance of SRI funds and conventional funds traded on the New York Stock Exchange (NYSE). The funds were divided into two subgroups based on the age of the funds, where the oldest were established in 1986. The sample period was between January 1981 and December 1990. In this study the dataset was including 32 funds, whereas 17 were SRI funds and 15 conventional funds. In the study different criteria were set in order to include or exclude certain funds. The risk-adjusted performance was analysed by using Jensen's alpha and compared with benchmark index. The risk-free rate used in the Jensen's formula was set to the monthly return of the three-month U.S. Treasury bill. The results of the study indicated that the market does not price social responsibility characteristics and excess risk-adjusted return was similar. Thus, the study resulted in neutral financial performance between SRI and conventional funds.

Finally, in a study performed by Climent and Soriano (2011) the performance of environmental equity funds (EF) was compared to conventional funds on the US fund market. In total 49 funds were included in the study and were selected based on different screening criteria. For instance, they excluded bonds, balanced and guaranteed funds. They also excluded index funds, institutional funds and funds less than 12-months of age from their sample. In their study they applied a Capital asset pricing model-based methodology and a matched-pair analysis. In the study each environmental fund was matched against an equally weighted portfolio of four conventional funds based on age and AUM as a matching criterion. Measurement models like Sharpe and Treynor ratio was used to evaluate the risk-adjusted return of funds. Benchmarks were used for comparison, such as KLD400, which is the

first index constructed to using ESG factors. The study also used local risk-free rates for calculations. When focusing on the sample sub period of 2001-2009, the results indicated no significant difference in risk adjusted return between environmental funds and conventional funds. All in all, Climent and Soriano (2011, p. 285) summarises their conclusions with the statement:

> "One should take into account that past performance does not necessarily predict future performance." (p. 285)

3.1.3. Negative performance

In the study conducted by Chang et al. (2012) 131 green (sustainable) funds were compared to all conventional EFs within the same category. The study measured risk-adjusted return on the US market and used Sharpe ratio to compare this between the two different fund categories. The addressed question was if a green (sustainable) investment sacrifices possible return. The results were that green funds underperformed in comparison and that the management fees on these were higher. There were also results showing that green funds had similar risk as conventional funds and that the green investment constraint did not result in more risk. The study used data between 1997 to 2012 and mentioned that green funds might gain competitive advantage in the future, but that for now conventional funds outperformed them.

Furthermore, a study by Fernández Sánchez & Sotorrío (2010) analysed European EFs to see if socially responsible firms affect the financial performance of the funds. To do this the authors looked at a total of 178 SRI funds between the January 2003 – December 2007 and compared these to 178 conventional funds with similar traits. The results of the study were that the social factor of an investment lowers the performance and therefore diminishes the gross and net return to a greater extent since SRI funds tend to have higher management fees. Conventional funds performed better risk-adjusted return during the period compared to the SRI funds, due to this.

In a study by Koellner et al (2007) a total of 13 conventional and 13 sustainable funds were studied on their environmental impact assessment but also the risk-adjusted return between the period 2000-2004. Looking at the financial performance of these funds the sustainable ones performed worse in terms of risk-adjusted return. The study did however show that looking only at 2004 the sustainable funds outperformed the conventional ones. Moreover, the study also mentions that the sustainable funds are less diversified especially within certain sectors such as Material, Financials and Energy, which might affect the systematic risk.

3.2. Modern Portfolio Theory

Markowitz developed the Modern Portfolio Theory in 1952 (Markowitz, 1952). The idea is that investors can achieve a higher risk-adjusted return using diversification to their advantage. This is achieved by incorporating different assets from independent sectors and countries to reduce the risk. The managers of funds or the private investor can use the relation between risk and reward in order to optimise the portfolio given a specific risk. It is therefore of importance to understand the relation between different assets and how that relation can affect the risk. Markowitz (1952) also provides us with two assumptions that are key to the theory. The first assumption is that investors want to achieve a high return with a low risk and the second one is that investors are rational in an investment decision. Given these two assumptions if an investor is given two options the one chosen will be the one with the lower risk given the same yield. The Modern Portfolio Theory is used to help understand the need of risk awareness in combination with the return-rate, i.e. risk-adjusted return.

3.3. Efficient Market Hypothesis

The assumption that markets are efficient is a common assumption in financial literature. This assumption has its roots in the Efficient Market Hypothesis which is a theory that states that if market prices is efficient, they will fully reflect the available information (Fama, 1970). The implication of this is that it becomes impossible to beat the market given a risk-adjusted basis since the market will only react to the new information provided. It is because of this that we can observe differences in day-to-day pricing on the fund market. Funds that outperform the market, contains securities which includes “information” that investors value higher. The information can be accessed by the market through different channels, i.e. Fama’s (1970) three forms of efficiency: Weak, semi-strong and strong efficiency. The weak form of efficiency is information reflected in historical prices. Since the historical price is reflected in the share price of today, an investor will not gain any financial advantages. The semi-strong form of efficiency is tied to public information, such as annual reports. This means that an investor cannot gain a competitive advantage without having access to insider information. The strong form of efficiency is when all information is available both for the public and private investors (insider information). This shows that there is no possibility for investors to have an advantage over the market even with the private information since this should already be reflected in the price.

3.4. Hypotheses formulation

In this study we will try to answer research questions related to our formulated hypotheses, but why would we expect sustainable funds to be any different from conventional funds?

Firstly, increased awareness for environmental, social and governance by governments, companies and investors suggests that one could anticipate profitable opportunities for companies pursuing sustainability goals according to the SDG's. This would therefore imply that sustainable funds are different from conventional funds because of their higher inclusion of ESG values. Previous studies present results which support these claims by stating that sustainable funds include ESG aspects to a greater extent and that there is a nonnegative relationship between ESG factors and financial performance (Friede et al., 2015; Kumar et al., 2016; Orlitzky & Benjamin, 2001). It is also presented that each industry is affected differently by certain ESG factors. Screening of securities in sustainable funds are performed rather differently which leads to lowered ESG risk and lowered environmental impacts (Koellner et al., 2007). Conventional funds traditionally include a higher concentration of certain industries (i.e. oil and mining) which on the other hand might be excluded from sustainable funds. Due to the fact that the pandemic of COVID-19 has fuelled the climate discussions (Cadham, 2020) we expect that investors have increasingly begun to account for ESG-values in their investment decisions. Tied to this, results from previous studies implies that sustainable and conventional funds on the Swedish fund market will experience differences in return and that this return might differ during different stages of a crisis (Nofsinger & Varma, 2014; Nakai et al., 2015). Based on this, we expect sustainable funds to have lower volatility and therefore also a lower total and systematic risk because of higher inclusion of different ESG factors. Thus, we have formulated the **first** hypothesis: *Sustainable funds will have a higher risk-adjusted return compared to conventional funds.*

a. *There is a difference in risk-adjusted return depending on the stage of the pandemic.*

Secondly, sustainable funds are restricting their investment portfolio and therefore may reduce the ability to lower the systematic risk through diversification. In fact, this would according to the Modern Portfolio Theory (Markowitz, 1952) imply that the constraints of sustainable funds would suggest lower financial performance compared to conventional funds. Contrasting, Orlitzky and Benjamin (2001) meta-analysis suggests that the higher a company's Corporate Social Performance (CSP) is the lower the financial risk will be in the firm, thus resulting in reduced external market-based risk. Other studies shows that there is a lower systematic risk in

sustainable investments and consequently a sustainable investment generates a better risk-adjusted return than their conventional peers in high volatility markets (Yue et al., 2020; Kumar et al., 2016). We would therefore expect sustainable funds with good ESG-rating to experience similar correlation with systematic risk. Thus, the **second** hypothesis is: *ESG-score have a negative correlation with systematic risk (beta).*

Thirdly, we expect sustainable funds to be actively managed in a manner which will add value to investments and deliver superior results when investors need them the most (i.e. in poor economic cycles such as during the pandemic). Active managers pay greater attention to corporate behaviour than inactively managed funds, which will favour downside protection during falling markets. In the light of this, TIAA-CREF's (2014, p. 11) socially responsible investing report states:

> "We believe that the consideration of ESG factors by investors can enhance the long-term economic value of their investments and produce competitive, long-term financial returns" (p. 11)

Moreover, in Nofsinger and Varma's (2014) article they present how managers of sustainable funds employ positive ESG screens and thereby choose firms with good environmental records, good corporate governance, and good employee (social) relations. These firms are thereby less likely to experience negative outcomes in social areas and might lower the ESG risk and increase financial performance. Negative screens could avoid firms which is more likely to cause high-impact negative news concerning social issues. Thus, sustainable funds and conventional funds are differently managed and therefore different in nature. Since the ESG-screening is performed differently in sustainable and conventional funds, also the ESG-profiles will be different. Previous studies have shown that various focus on environmental, social and governance aspects in equity funds have affected the volatility and yield of these investments (Friede et al., 2015; Fernández Sánchez & Sotorrío, 2010; Kumar et al., 2016). Along with this, according to TIAA-CREF's report (2014) and previous studies we would also expect investments to increase in sustainable funds during poor economic cycles. The increased flow of capital in sustainable funds which is seen on a global level (Morningstar, 2020b; CNBC, 2020b) should have a positive correlation with yield in Sweden, especially during the market downturn. Thus, our **third** hypothesis is: *There is a difference in yield between different ESG-profiles.*

a. *The difference in yield is positively correlated with in-flow of capital.*

4. Method

In the fourth chapter, the study's research methodology will be presented and discussed. The chapter will start with a description of the study design, and its implications of the choice of methods. Furthermore, methods for performing literature review will be presented and how to ensure the quality of the study. The method chapter ends with a presentation of how the analysis will be conducted through risk-adjusted evaluation models and Wavelet Coherence Analysis.

4.1. Study design

The choice of methods should fit the problem statement and aim of the study (Bryman & Bell, 2015). When designing the research method, we have taken epistemological and ontological considerations to find suitable methods. This have enabled us to reach trustworthy results, by performing objective observations, and limiting these observations to the collected data, which goes hand in hand with positivism and objectivism. In positivistic studies the results tend to be quantifiable, and explanations must demonstrate causality (Business Research Methodology, n.d.). Since the aim of this study was to see how conventional and sustainable funds have performed on the Swedish fund during the market crisis caused by COVID-19, a quantitative research approach was chosen. A quantitative approach focuses on numbers instead of words (Bryman & Bell, 2015) and have enabled us to run several tests in order to test causality between different variables, which suits the purpose of this study. The chosen methodology also enabled us to analyse a large amount of historical data of funds' rolling returns and compare the risk-adjusted return by using different theories and evaluation models. By using the theoretical framework, we sought to test our hypotheses and answer the research questions.

Since the purpose of this study was to investigate if there were any differences in risk-adjusted return between sustainable funds and conventional funds a quantitative method fits better than a qualitative method. Thus, a quantitative method is best suited for examining these differences since the data will be in form of quantifiable numbers (Bryman & Bell, 2015). The unit of analysis is sampled funds on the Swedish fund market. Interviews and other more qualitative methods were not appropriate to use as a main source of data collection in this study, since all data needed to do calculations were gathered from historical returns. However, we proceed with two interviews in order gain information from experts in the

Swedish fund market, to further the understanding of the empirical background. The interview guide used for these interviews are presented in *Appendix* D. By using a quantitative research method and a deductive approach, we have developed three hypotheses based on existing theory and tested it in order to confirm or reject its truth. Previous research that has aimed to answer related questions have used a similar quantitative approach, where secondary data has been gathered and analysed by using different conceptual frameworks, where the unit of analysis has been reduced to its simplest form.

4.2. Literature review

The foundation of this study is built on a thorough literature review, something which was necessary in order to formulate a conceptual framework and define the boundaries of what issues to address. The conceptual framework is used for analysis and to identify the gap of existing research. Performing a literature review was an ongoing process throughout the research process. Hence, reviewing previous research is important in order to deepen the knowledge about complex issues of a phenomenon, such as sustainable investments and ESG (Given, 2008).

The theoretical framework has been carried out through an extensive narrative literature review and where different articles and internet sources have been used. The articles used in this study have been retrieved through various databases such as Google Scholar, Web of Science and Scopus by using different search keywords such as: *Sustainable funds, conventional funds, risk-adjusted return, ESG, portfolio theory and WCA*. To use keywords when searching for scientific articles is a good strategy to obtain relevant search results (Demiris et al., 2019). The aim has been to mainly use scientific articles in published journals which has been peer reviewed in order to ensure quality of sources. However, other sources have also been used in order to achieve knowledge breadth rather than depth, for example websites such as Investopedia. A narrative literature review is conducted with the purpose to find an overall background for specific problems or issues and might not be as structured as a systematic review. Unlike systematic literature reviews which have very narrowly defined criteria for inclusion or exclusion of literature, narrative reviews provide more flexibility (Allen, 2017). This provides more opportunities for individual insights than most quantitative reviews which was preferred in this study.

4.3. Quality assurance

It is important to ensure quality of the research, something which will be elaborated in the following subsections. Generalisability, causality, reliability and validity are

different quality measurements which could be used to increase the trustworthiness of quantitative studies.

4.3.1. Generalisability and causality

Within quantitative research there is an interest in measuring if the study's findings can be applied beyond the specific context in which the research was conducted (Bryman & Bell, 2015). Generalisability is a possible way to measure to what extent it could be generalised to other groups or populations. By using a large, randomised sample of respondents can provide some degree of generalisability, but it is hard to generalise beyond the sampled population. In our study, where a subjective purposive sampling has been made in order to find suitable funds for the study, it is important to keep in mind that the results of this might not apply to all markets, because there might be significant variations in different funds on different markets. However, the methods used in this study are described in a way which easily could be replicated on future studies of different markets, which makes it repeatable. Our personal values and biases have been reduced to a bare minimum, by always maintaining an objective approach when examining data. Therefore, the results of this research tend to be unaffected by our personal expectations because we have let the numbers speak for themself – which increases the possibility to reproduce the study and reach similar results.

Causality is a very strong concern in most quantitative research when it comes to explanation of results (Bryman & Bell, 2015). Thus, quantitative researchers are keen to describe why things are the way they are, rather than describing how things are. In quantitative reports one often stumbles upon the idea of independent and dependant variables, something which reflects terms of causes and effects. In this study the independent variable is the time period, as we cannot change that variable, but it might affect the dependent variables, such as the yield of funds and not the other way around. The time period, i.e. the pandemic of COVID-19 (independent variable) has a causal influence upon the financial performance of funds (dependent variable). By using independent and dependent variables we could ensure that results are demonstrating causality, as these causal claims will be tested in our hypothesis testing.

4.3.2. Reliability and validity

To ensure quality within a quantitative study such as this there is a need to control for reliability and validity. The study and the research approach need to be reliable (Bryman & Bell 2015). The term reliability is fundamentally about concerns of the measurement's reliability and consistency. In order to achieve a high reliability, the study needs to take three prominent factors into consideration: Stability, internal reliability and inter-observer consistency. This study's collected data is provided

directly from a database and comes in form of numbers and are therefore not open for interpretation because of its quantitative nature. Thus, the concern about inter-observer consistency is not a problem. Hence, the way data is collected in this study, neither is the internal reliability an issue that needs to be controlled for, as it is performed differently than studies which use quantitative questionnaires, where respondents' answers might lack coherence (ibid.). This study is however dependent on its stability. To ensure stability there was a need to study the data over a longer period and run the tests several times, to be sure that the results where reliable. The foundation of the study was also built upon previous research with well recognised theories and the secondary data was provided from institutes with high credibility. The data used in this study is possible to retrieve in the future, which makes the study easy to replicate and the used methods of measurements are frequently used in similar studies.

Validity in research is the question if the study actually measures what you intend to measure, according to the aim of the study (Bryman & Bell, 2015). This study's aim was to measure the differences in risk-adjusted performance between conventional and sustainable funds during the different stages of a market crisis (COVID-19). To ensure validity in this study we chose relevant funds and data with high credibility. The chosen evaluation models in this study are relevant and fits the specific purpose and aim to measure risk-adjusted return. Structural differences in the time and frequency domain were analysed in a Wavelet Coherence Analysis. Different measurements exists when it comes to validity, one of which is face validity (Bryman & Bell, 2015). Face validity is essentially an intuitive process, where a researcher must develop measures which fit the actual content of the concept in question. In this study face validity have been controlled for by conducting a thorough literature review and by asking people with expertise in the field to act as judges to determine if the face of the measurement's seems to reflect the concept concerned (ibid.).

4.4. Evaluation models

In the upcoming section we will present the different evaluation models used for measuring risk-adjusted return in the analysis. We will also explain how the risk-free rate have been determined.

4.4.1. Risk-adjusted return

Risk-adjusted return is a measurement showing the relation between total and systematic risk in a portfolio and the return on a certain investment (Corporate Finance Institute, n.d.). Given several options with the same return a rational

investor will choose the investment with the lowest deviation, thus the one with the highest risk-adjusted return (Markowitz, 1952). To evaluate the risk-adjusted return of a portfolio there are several measurements that can be used as evaluation models. In this section the models which are to be used as a method for analysis in the study will be elaborated further.

4.4.2. Risk-free rate

The risk-free rate is a measurement of return that an investor can achieve with zero risk in the investment. In practice, risk-free rate of return does not truly exist since investments always carries some degree of risk. Risk-free rate is used as a theoretical form of benchmark in studies and calculations. Given previous research the way to proxy for the risk-free rate can vary (Auer & Schuhmacher, 2016; Humphrey et al., 2012; Elton et al., 1996).

The risk-free rate in this study will be defined as the average yield given by the one-month, three-month and six-month treasury bills provided by Riksgälden (Sveriges Riksbank, 2021). The reason for this is that given previous research the risk-free rate chosen should be matched to the investment duration and location and should therefore be tied to the specific country's treasury bill, as in this case the Swedish treasury bill. If the yield of the treasury bill is negative, as in this case, the given risk-free rate will be set to zero. Because, when the risk-free rate is expected to be negative, an investor is assumed to act rationally and rather decide to keep its capital in form of liquidity instead of investing in an asset which has an expected negative flow.

4.4.3. Sharpe ratio

Sharpe ratio is a measurement developed in 1966 by William Sharpe (Sharpe, 1966). The measurement is used to calculate the risk-adjusted return in investments. The ratio is calculated using standard deviation and excess return in order to determine the return in relation to total risk (Dowd, 2000). Standard deviation (SD) is a measurement used in statistics to show the variation over a period (Chang, Nelson & Witte, 2012). SD can help to understand the likely range of returns for the future, by looking at historical yield. Funds with a high standard deviation implies that the fund is volatile and low standard deviation are less volatile. Less volatile funds will therefore have a small range in yield. SD is a measure of a fund's absolute volatility (Morningstar, n.d.b). The measurement depicts the total risk of an investment compared to the average return on the market (ibid.).

When looking at funds one need to use historical return in order to compute the Sharpe ratio given the formula provided below. The investment with the highest Sharpe ratio is the one with the highest risk-adjusted return (Dowd, 2000; Sharpe,

1966). The ratio increases given a better return rate or a smaller SD, thus providing a better risk-adjusted return. The measurement makes it possible to compare performance of funds and is one of the most used measurements in studies of fund performance.

The Sharpe ratio is calculated according to the following formula:

$$Sp = \frac{R_a - R_f}{\sigma_a} \quad (2)$$

Table 2, Sharpe ratio formula description

Component	Description
Sp	Sharpe ratio = Reward-to-variability ratio
R_a	Return of asset
R_f	Risk-free rate
σ_a	Standard deviation of asset

4.4.4. Treynor ratio

The Treynor ratio is an alternative risk-reward measurement similar to Sharpe ratio. Instead of looking at total risk, Treynor is a measurement of the systematic risk of a specific return (Pilotte & Sterbenz, 2006). The ratio was developed by Jack Treynor (1965) and is useful when analysing a diversified portfolio, as an EF. Treynor measures the excess return in relation to the unit of risk taken (Pilotte & Sterbenz, 2006; Treynor, 1965). Hence, it uses a fund's beta which is a measurement of the effect of return given that changes occur in the market.

Beta, β, is a measurement of risk and it gives an indication of volatility in a financial asset (Morningstar, n.d.b; Avanza, n.d.b). The purpose of this measurement is to see if the financial asset is volatile in comparison to the market. It is therefore an indication of the vulnerability to market risk and how sensible the fund is to market fluctuations. Beta is particularly appropriate to use when measuring the systematic risk of EFs. When calculating beta, there are three possible outcomes (Avanza, n.d.b):

1. Beta below 1.0 which is an indication that the asset has been less volatile than the actual market.
2. Beta equal to 1.0 shows that the asset has been identical to the actual market.
3. Beta above 1.0 is an indication that it has been more volatile than the actual market.

Thus, this means that the market beta per definition is 1.0 (Morningstar, n.d.b). A beta of 1.10 would therefore indicate that a fund has performed 10 percent better than its benchmark index in upturned markets and 10 percent worse in downturn markets, when assuming all other factors remain constant. On the contrary, a beta of 0.80 indicates that the fund return is expected to be 20 percent worse than market's excess return during an upturn market but 20 percent better during downturn markets. It is however essential to note that a low beta fund does not necessarily imply that the investigated fund has a low level of volatility, but rather signifies that the systematic market-related risk is low.

The β is calculated according to the following formula:

$$\frac{Covariance(R_a: R_b)}{Variance\ (R_b)} \quad (3)$$

Table 3, Beta formula description

Component	Description
R_a	Return of asset
R_b	Return of benchmark

The covariance is the measure of a fund's return relative to the return of the benchmark index. Furthermore, the variance is the measure of how the market moves relative to its mean. The market benchmark used in this study is the index OMXSGI. The reason for choosing this index is that it mirrors the expected return on the Stockholm stock market. Treynor is similar to Sharpe ratio where the highest Treynor ratio is the fund that has the highest risk-adjusted return.

The Treynor ratio is calculated according to the following formula:

$$Tp = \frac{R_a - R_f}{\beta_a} \quad (4)$$

Table 4, Treynor ratio formula description

Component	Description
Tp	Treynor ratio = Reward-to-volatility ratio
R_a	Return of asset
R_f	Risk-free rate
β_a	Market exposure of asset

4.5. Wavelet Coherence Analysis

In this section we aim to describe why Wavelet Coherence Analysis (WCA) is implemented as a tool for analysis. In financial markets people tend to operate

across different time horizons, such as traders speculating on assets multiple times per day, or investors and fund managers who looks at a long-term investment horizon. During different time periods, pricing of funds (NAV) could fluctuate up and down due to volatility which these wavelets aim to describe (Gençay et al., 2002). WCA is being implemented as a tool for analysis in order to allow us to work both in a time and frequency domain. The frequency in this analysis is referring to how large the spread is between the two measured variables. This type of analysis will visualise differences in yield of conventional and sustainable funds over time, on a day-to-day basis. WCA could therefore discover coherence patterns between different variables that change during different stages of the pandemic, in order to answer the research aim. Thus, this allows us to identify time periods with high coherence between different factors such as – ESG factors, beta, fund-flow and the yield of funds.

WCA has gained increased interest during the last decade and is a popular tool for analysis not only in natural science studies, but also in financial and economic studies (e.g. Samadi et al., 2020; Nix & Mcnevin, 2020; Abid & Kaffel, 2017; Aloui & Hikiri, 2014). In fact, wavelets are considered to be a strong mathematical tool which could provide more insights regarding the effect of the crisis on the Swedish fund market by decomposing time series into their time scale components.

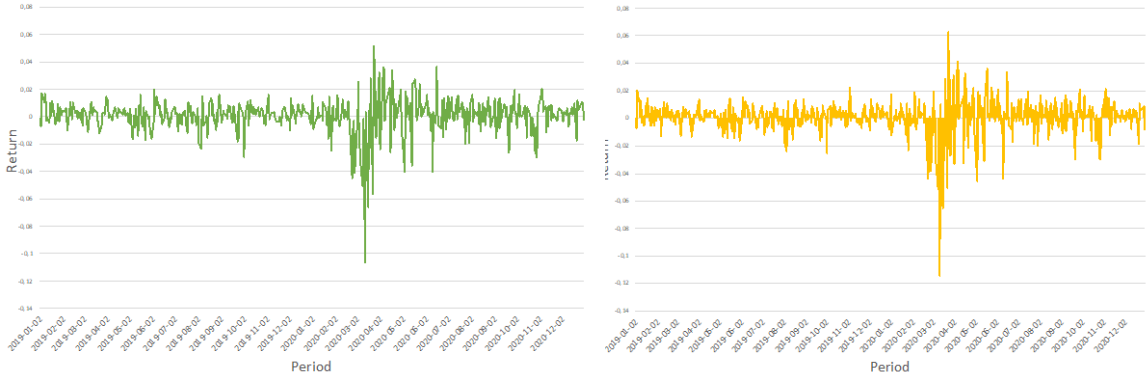

Figure 3, Sustainable funds aggregated log returns (left). Conventional funds aggregated log returns (right) (own illustration). Source: Thomas Reuters Datastream

The two plots in *Figure* 3 above display the logarithmic returns of the compounded sustainable funds and conventional funds used in this study. Looking at these two plots, the data seem to show that there are small structural differences in return over time between different fund categories and that something happened during the outbreak of COVID-19 to the volatility. To further analyse these variances, we intend to use WCA and more specifically a power spectrum to see the coherence between different fund characteristics and analyse the volatility over time.

4.6. Data analysis

In the upcoming sub-sections, it will be presented how the data analysis is performed. This includes a description for how WCA is conducted, as well as how we have standardised the data of rolling returns in order to make a comparison between yield of sustainable and conventional funds. The section will end with a summary of our data analysis.

4.6.1. How a Wavelet Coherence Analysis is conducted

In this thesis we will conduct the WCA by using the statistical programme *R*. *R* is a programming language and environment for statistical computing and graphics. It is a free data software with integrated facilities for data manipulation and open packages to install. For our specific analysis we have used the package *"biwavelet"* because it allows us to create a power spectrum plot. When performing a WCA, the coherence between two time-series x(t) and y(t) are compared. Coherence is therefore an indication of how strongly the correlation is between the variables and ranges from 0 (no correlation/completely incoherent) to 1,0 (perfect correlation/completely coherent). This will therefore be a useful tool for us to identify co-movement across the sampled funds on the Swedish fund market. We test the statistical significance of the wavelets in the power spectrum against a null hypothesis that our analysed time-series is generated by a white noise process. Statistically significant regions of our analysis that has a 5 percent significance level is bordered by a bold black line. In our analysis we will use the wavelet coherence power spectrum to get an understanding of these correlations.

In our power spectrum graphs, time will be displayed on the horizontal axis, while the vertical axis shows the frequency (the lower the frequency is, the higher the scale is). This analysis will locate regions in time-frequency where the two time-series co-vary. Warmer colours (red) represent significant coherence, while the colder colours (blue) represent periods of lower dependence between the two time-series. Arrows in the wavelet coherence power spectrum represents the lead (lag) phase relations between the analysed time-series. A zero-phase difference indicates that that the two time-series moves together on a particular scale. Arrows point to the right (left) if the two time-series are in phase (anti-phase). When the time-series are in phase it indicates that both variables move in the same direction (positively), for instance the daily rolling returns of two funds are increasing/decreasing. On the other hand, when the time-series are in anti-phase it means that they move in the opposite direction of each other (negatively). An arrow pointing left-up or right-down show that the first examined variable x(t) is leading, while an arrow pointing left-down or right-up indicate that the second variable y(t) is leading.

In this type of analysis, we use a cross wavelet transform of two time-series x(t) and y(t) in order to measure the coherence of two variables. The wavelet is defined as (Barunik et al., 2011):

$$W_{xy}(u,s) = W_x(u,s)W_y^*(u,s), \quad (5)$$

where u is the position index, s the scale component and the symbol * denotes a complex conjugate in the wavelet equation. The wavelet power spectrum can be used to uncover regions in the time-series with high coherence between x(t) and y(t) at each scale. When we analyse our financial time-series through the wavelet power spectrum, we are also interested in areas where the two variables comove, which will be indicated by the arrows described in the method chapter.

4.6.2. How the yield of sampled funds is calculated

When calculating the yield of the sampled funds we used the daily NAV-prices in order to calculate the rolling returns each day for every fund. The funds were divided into the two categories of sustainable and conventional funds as presented earlier. After this we ran the *=AVERAGE (...)* function on the daily prices for all funds in each category separately in Excel. This enabled us to realise the average growth in daily price. By subtracting yesterday's price from today's price and divide by yesterday's price we got the rolling returns in percentage.

Furthermore, we standardised the rolling returns with a unit of 100 which enabled us to visualise a comparison between the two fund categories and identify different market cycles during the sample period, which will be seen in the data chapter.

4.6.3. Summary of data analysis

A summary of all analysis that will be conducted is presented in *Table* 5 below.

Table 5, Summary of analysis

Tool for analysis	**1st unit of analysis**	**2nd unit of analysis**	**Time period**
Risk-adjusted return			
Sharpe ratio	All sustainable funds	All conventional funds	Full sample period
Treynor ratio	All sustainable funds	All conventional funds	Full sample period
ESG profiles			
Sharpe ratio	3 best ESG funds	3 worst ESG funds	Full sample period
Treynor ratio	3 best ESG funds	3 worst ESG funds	Full sample period
Fund-flow			
Change in AUM	All sustainable funds	All conventional funds	2019.02 to 2020.12
Wavelet Coherence			
ESG Beta	3 best ESG funds	3 worst ESG funds	
ESG "best practice"	3 sustainable funds	3 conventional funds	Full sample period
Fund-flow	10 highest in-flow	10 lowest in-flow	2019.02 to 2020.12

The use of evaluation models as a tool for analysis will allow us to measure the risk-adjusted return of the sampled funds. We calculate standard deviation, beta, Sharpe and Treynor ratios for both conventional and sustainable funds in order to answer the first research question and to see if hypothesis one is valid or not. Measurements will be done separately for each sub-period, to find differences between different stages of the pandemic. In addition to this we will further analyse the funds based on different level of ESG risk, to be able to see how ESG factors are correlated with systematic risk (beta) and yield, in order to answer the second research question and to test hypothesis two. We will through a Wavelet Coherence Analysis compare the three best and worst ESG-scored sustainable and conventional funds beta values, in order to see how ESG factors affect systematic risk (beta) throughout the time period. Finally, separate calculations using our evaluation models, fund-flow and Wavelet Coherence Analysis will be conducted with the aim of approving or rejecting hypothesis three. In this part of the analysis, we will analyse best practice funds in the different segments of E, S and G. By performing this analysis, we could make important aspects of ESG visible by comparing funds with different ESG-profiles. Unit of analysis for this part of the analysis is based on the aim of the study, in order to answer the third research question.

5. Data

In the fifth chapter the data collection and sampling of funds will be described, as well as a critical reflection of the dataset. This chapter aims to present all essential information regarding how data have been collected and how sampling have been performed, in order to understand the data of this study.

5.1. Data collection

This study focuses on EFs on the Swedish fund market mainly for two reasons. The first reason for considering EFs in this study, is because it is the most common saving method for the private investors in Sweden. 70 percent of the Swedish population pool their savings in EFs and has increased in the recent years according to a study by Kantar Sifo Prospera (Fondbolagen, 2020). Secondly, there is a lack of research on the Swedish fund market, where previous studies have focused on a global level, or other countries fund markets. Regarding the theoretical framework of this study, it has its main foundation in sustainability and ESG, portfolio theories, as well as different evaluation models for risk-adjusted return.

The authors have been using different databases for the collection of relevant data. The majority of the fund data were collected by using the database *Thomas Reuters Datastream*. Datastream is a financial database which provides 70 years of historical data of over 35 million individual indicators across all major asset classes, in 175 countries (Datastream, n.d.). The date for data collection was 2021-02-09. The collected data is specific for each of the selected funds and is based on the *Rolling Returns* instead of *Average Annual Returns* (AAR). The reason behind looking at rolling returns rather than AAR is because it provides a more comprehensive view of investment returns (Anspach, 2021). Looking at average returns of funds is like looking back on a road trip with the car – saying you averaged 60 km/h - but in reality, you sometimes went much faster, and other times much slower. This means that AAR will not provide accurate information of how the funds consistently have performed, but instead balance out poor periods with over-performing periods as an average does. Rolling returns on the other hand provides a more realistic view of the fund performance (ibid.). Instead of providing annual average NAV over a period, rolling returns use over-lapping cycles going

back to the first day of the month of the collected data. This will provide a frequency and magnitude of the funds good and bad performance periods at any point of date during the sample period, and it is therefore possible to isolate certain events (Morningstar, n.d.c.).

5.1.1. Sample of funds

A purposive sampling method is appropriate to use in this study. This sampling method enables the researcher to individually choose what funds to analyse and include in the research (Bryman & Bell, 2015). This is important since a fund must meet certain criteria in order to be classified as a sustainable fund or conventional fund and could not be randomised. To sample what funds to be included we have used Morningstar Sustainability Rating (MSR), where the sustainable funds are defined as those with the MSR of 4 or 5 globes and conventional funds with a rating of 1 to 3 globes.

The aim of this study was to examine eventual differences in risk-adjusted return between sustainable and conventional funds on the Swedish fund market during the COVID-19 pandemic. The chosen sample period of the study was therefore between 2019-01-02 to 2020-12-30. The reason for the selected research period is due to the need to isolate the time period of the pandemic but also to capture the year before in order to make a comparison. The study was divided in three sub-periods 2019-01-02 to 2020-02-19 (*steady development)*, 2020-02-19 to 2020-04-01 (*recession*) and 2020-04-01 to 2020-12-30 (*recovery*). These three sub-periods were identified based on the cycles seen in *Figure* 4, presented in the next subsection.

Because of the focus on the Swedish fund market, we needed to filter out the funds containing less than 70 percent Swedish assets. The percent of Swedish securities in the funds ranged between 72.35–96.92 percent. Funds that are less than two years old are also excluded from this study, due to the fact that they have not existed the entire sample period.

Funds were selected with the purpose to find funds with similar traits such as, placement strategy, sector, age and MSR. The reason why these traits were used in this research were because we wanted to sort out funds that were to deviant for the study and might otherwise compromise the results. In this study it is essential to isolate the effects associated to the systematic risk of the pandemic. To reduce the unique risk tied to sector specific behaviour of funds during the sample period, we have chosen to sample funds from the same sector. Hence, including funds containing a majority of securities from the industry sector could isolate the effect of ESG factors on the funds financial performance, rather than be comparing the portfolio selection (which itself is dynamic). The sampled funds were chosen if they

according to Avanza contained a "majority" percentage of the industry factor, where lowest percent of all funds were 20.80 and highest 56.97 percent. Spiltan Aktiefond Investmentbolag deviate from the high percentage invested in industries (7.95) and that is because it is invested in investment trust companies. However, these underlying investment trust companies are highly focused on the industry sector, whereas we argue that it could be matched with our other funds. These numbers might however change over time, as funds investing change, which means that in the future traits might look different.

The sampling criteria mentioned above provides the study with a total sample of 18 sustainable funds and 22 conventional funds. The complete screening of our data set and the distribution of MSR is presented in *Table* 6. The names of funds according to Datastream, are described in *Appendix* B.

Table 6, Summary of average distribution of funds

Fund	# of funds	Average age (years)	Average AUM (MSEK)
Sustainable	*18*	*16.67*	*9849.22*
	3	12.67	13154.67
	15	17.47	9188.13
Conventional	*22*	*11.84*	*4213.09*
	15	18.20	8894.27
	6	13.33	3601.00
	1	4.00	144.00

Source: Morningstar

Another parameter used for categorising funds during the sampling of the dataset was to use Morningstar's ESG-risk rating and sustainability score. These scores could be used to understand the level of ESG-risk and sustainability performance of different funds. The ESG and sustainability scores works differently from the MSR, where the lowest score, means the best performance in each segment. In *Table* 7, we have summarised an overview of the average ESG-risk and sustainability score for the sampled sustainable and conventional funds and in *Appendix* C, the individual fund scores are presented.

Table 7, Summary of average ESG and sustainability scores

Fund type	E	S	G	Sustainability Score
Sustainable	3.2555	7.0245	7.3464	20.3328
Conventional	3.7383	7.6944	6.7883	22.2214

Source: Morningstar

5.1.2. Yield of sampled funds

The following graph in *Figure* 4 shows the yield of conventional and sustainable funds during the full sample period. To present this graph we have used all data regarding rolling returns for both of the two fund categories. The data indicate that there was a cycle of *steady development* up until the 19th of February 2020, when the *recession* period starts until 1st of April 2020. The *recession* period is set between these dates because this was the period when the market started to decline up until when it hit the very bottom. After the 1st of April 2020, the data indicate that the *recovery* period starts and continues throughout the year, except from a minor dip in performance during October 2020.

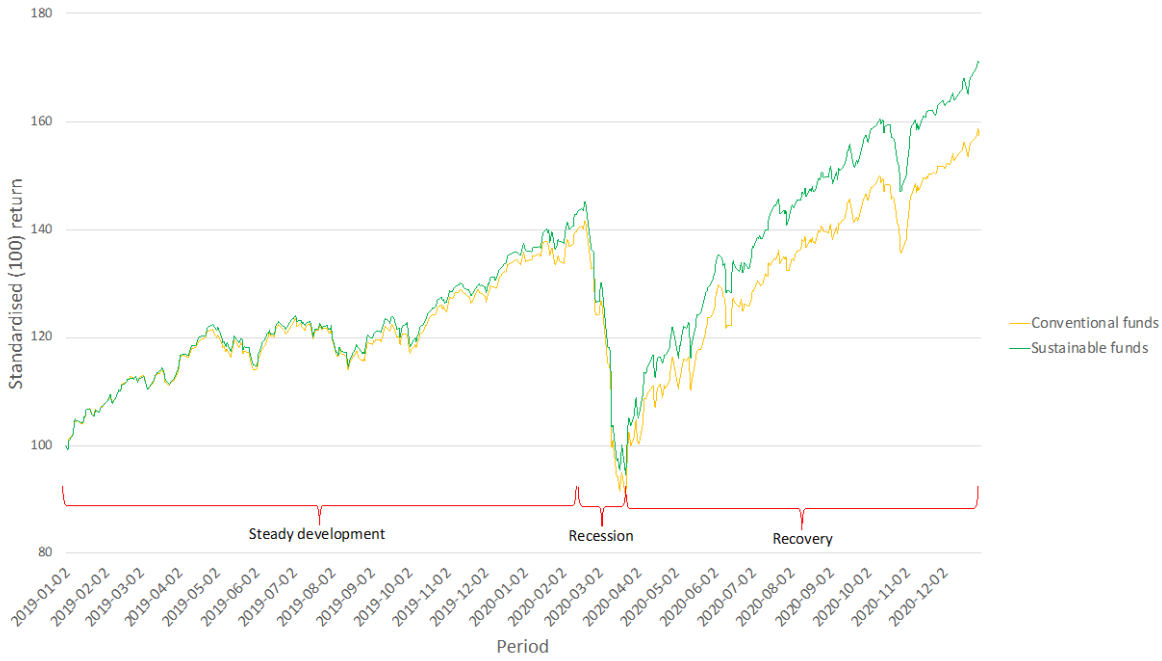

Figure 4, Yield of conventional and sustainable funds (own illustration). Source: Thomas Reuters Datastream

According to *Figure* 4, where the rolling returns of sampled funds are displayed for the full sample period, it can be seen how sustainable funds on average outperformed conventional funds. A trend is identified where the sustainable funds have surpassed the rolling returns of conventional funds as the sample period continues and the biggest variance between the two types of funds is seen in the last period of *recovery* after the period of *recession* when the fund market experienced a steep downturn.

5.1.3. Critics of data collection

There are several critics of the data collection that are needed to take into consideration. Starting with the short timeframe used of only two years. Similar

studies are often stretched over several years in order to obtain enough data to find statistically significant results (e.g. Kreander et al., 2005; Chang et al., 2012; Climent & Soriano, 2011). However, since this is a study with a focus on the pandemic COVID-19 there is a reasonable cause to only look at the specific year and the one year before that, in order to isolate the effects of the Coronavirus on the equity fund market. Further critique that can be directed to the study is that it has a focus solely on the Swedish fund market. The reason for only choosing funds on the Swedish market is that only a few studies have been performed solely on only this market. Sweden is also often seen as a frontrunner in sustainability (Strand et. al., 2015) which makes it particularly suitable for this study. Critique could also be addressed to the small sample size of 40 funds in total. Compared to previous research this study contains fewer funds on average and it is therefore questionable if the results are applicable to the whole population. However, the study is conducted on a smaller market (Sweden) and use all funds available that fit the delimitations. A robustness check will also be performed in order to confirm the significance level of the study.

As previously described, we have used a purposive sampling method when sampling the funds. The downside risks of purposive sampling in this study have been minimised through selecting the funds using MSR and a percentage level of investments in Sweden and the industry sector. The categorisation of the sustainable funds as those with 4-5 MSR globes and the conventional funds as those with 1-3 globes, can be considered as our own subjective opinion. However, several other studies have performed similar samplings **(**e.g. Christensson & Skagestad, 2017; Thelander, 2020). There is also the fact that the MSR ratings are continuously changing. In the light of this, when looking at the sampled funds in the future they might have a different rating. This is nothing that we can account for since there is no legal definition for sustainable funds, and it is was not possible to collect historical information regarding MSR ratings. Therefore, we have presented a date when the funds were selected and when we collected the data. Moreover, some fund managing companies define their own funds (which is included in our sample) as sustainable, but according to MSR they are not.

In addition to the critique of our dataset presented above, we also want to bring up eventual concerns regarding missing data. In this study we have tried to find all relevant data necessary to answer our research questions. However, there has been points in time when we have not been able to access all data or where the time frame of the thesis has limited our opportunity to do so. For example, data was missing regarding total assets under management (AUM) in some of the periods of the funds. By the looks the fund managers have not updated this information that frequent for some of the funds. In addition to this, we had to make some adjustments for the fund “Skandia Sverige Hållbar” since the fund were merged with “Skandia

Sverige" in 13th of June 2019 which resulted in a 348 percent in-flow of assets to the fund (Skandia Fonder, 2019). The month of June was therefore excluded in the fund-flow analysis since it would have compromised the results. Another example of missing data was regarding ESG specific scores for certain funds during our sampling period. We have tried to be transparent with this, where the missing data can be seen in *Appendix* C.

6. Analysis and results

In the sixth chapter we will present our analysis and results. The results will be analysed through various evaluation models. A robustness check is presented in order to show if the results were statistically significant. The chapter will continue with an analysis of the fund-flow, as well as how ESG factors affect risk-adjusted return. The chapter concludes with a Wavelet Coherence Analysis.

6.1. Empirical analysis

In this section the results of the study's analysis will be presented.

6.1.1. Risk-adjusted return of sampled funds

All sampled funds (aggregated level)

During this section we will analyse the risk-adjusted return of all sampled sustainable and conventional funds. We have also included OMXSGI as a benchmark index, in order to make a comparison to the market performance. We analysed the full sample period, as well as the three sub-periods: *Steady development*, *recession* and *recovery*.

The study had a full sample period of two years, from 2019-01-02 to 2020-12-30. A summary of the study's measurements on an aggregated level is presented in *Table* 8 and the individual funds' measurements is presented in *Appendix* E. During this whole period sustainable funds (on average) exceeded the daily rolling returns of its conventional peers, as well as the OMXSGI benchmark on the Swedish fund market. The market experienced a mean daily return of 0.08499 percent, while the conventional funds performed a mean daily return of 0.09626 percent and sustainable funds 0.10939 percent during the full sample. The results suggests that both fund categories outperformed OMXSGI benchmark index. The same pattern goes through all the three subperiods except the *recession* where the benchmark had a higher mean daily return than both the sustainable and conventional funds.

Table 8, Summary of evaluation models

Evaluation models	Sustainable funds	Conventional funds	Benchmark OMXSGI	T-test
Mean daily return				
Full sample	0.10939%	0.09626%	0.08499%	
Steady	0.13462%	0.12168%	0.11995%	
Recession	-0.91332%	-0.95703%	-0.89901%	
Recovery	0.23083%	0.22098%	0.18101%	
Standard deviation				
Full sample	1.34443%	1.35491%	1.35484%	
Steady	0.79612%	0.81207%	0.78001%	
Recession	3.44236%	3.42694%	3.50105%	
Recovery	1.32304%	1.33899%	1.36320%	
Beta				
Full sample	0.83500	0.85223	1.00000	
Steady	0.58073	0.59445	1.00000	
Recession	0.91702	0.91927	1.00000	
Recovery	0.84545	0.87883	1.00000	
Sharpe ratio				
Full sample	1.29766	1.12889	0.99584	0.84284
Steady	2.71775	2.40431	2.44125	0.81527
Recession	-4.22327	-4.43520	-4.07630	0.96789
Recovery	2.79818	2.63470	2.10789	0.89561
Treynor ratio				
Full sample	0.65763	0.55775	0.42749	0.82203
Steady	0.65835	0.57418	0.34186	0.78624
Recession	-0.30875	-0.32235	-0.27869	0.98585
Recovery	0.51602	0.46386	0.34211	0.86350

Robustness check

In order to check the robustness of our results from the empirical analysis, the Sharpe ratio and Treynor ratio was tested through a non-paired two-variable t-test for the full sample-period and sub-periods. The results of these t-tests are presented in *Table* 8. The t-test showed high p-values for the Sharpe and Treynor ratio which implies that there is no statistical significance at a five percent significance level and thus the null hypothesis cannot be rejected. The high p-values could be because of similar mean variance between the data and this kind of insignificant results are common to be seen for this type of studies (e.g. Bauer et al., 2007; Kreander et al., 2005; Thelander, 2020).

ESG-profile analysis – the three best ESG-scores

To further the understanding of how ESG impacts the yield and risk-adjusted return of funds, an additional analysis was performed. This analysis was based on the three best (Sustainable/Conventional best) and three worst (Sustainable/Conventional worst) funds within each ESG segment, where the funds were chosen according to ESG-score presented in Appendix C. The results of risk-adjusted return from this deeper analysis of different ESG-profiled funds are presented in *Table* 9-11.

The average rolling returns of the three best sustainable funds in each of the E, S and G segments were higher throughout all three sub-periods, compared to the worst sustainable funds. These results suggests that good ESG-scores in sustainable funds leads to higher returns, no matter of which stage of the pandemic one analyses. Looking at the conventional funds one sees similar results where the best funds in each ESG segment experienced higher mean daily return, except from the best "E"-funds and "G"-funds during the *recession* stage of the pandemic, where lower yield is seen. Additionally, the best conventional "E"-funds are also performing less yield than the worst "E"-funds during the *steady development* before the pandemic. Therefore, the correlation between ESG-score and rolling returns of conventional funds does not seem to be as clear-cut as within sustainable funds.

Table 9, Best and worst funds (Environment)

Evaluation models	Sustainable best	Sustainable worst	Conventional best	Conventional worst
Mean daily return				
Full sample	0.10793%	0.08273%	0.09051%	0.08743%
Steady	0.13794%	0.12173%	0.11207%	0.12652%
Recession	-0.81337%	-0.89676%	-0.93709%	-0.91598%
Recovery	0.20707%	0.17118%	0.21207%	0.18141%
Standard deviation				
Full sample	1.36591%	1.40814%	1.35701%	1.32126%
Steady	0.83517%	0.83872%	0.83444%	0.82392%
Recession	3.43791%	3.58323%	3.41404%	3.25810%
Recovery	1.35676%	1.41117%	1.34814%	1.31301%
Beta				
Full sample	0.86137	0.91819	0.87750	0.83415
Steady	0.62528	0.66341	0.63464	0.62813
Recession	0.92730	0.98165	0.93977	0.87845
Recovery	0.88538	0.96586	0.91499	0.86540
Sharpe ratio				
Full sample	1.24765	0.92957	1.05622	1.04965
Steady	2.61879	2.30878	2.12587	2.50387
Recession	-3.77661	-4.02512	-4.35394	-4.46098
Recovery	2.42611	1.93019	2.49850	2.20807
Treynor ratio				
Full sample	0.62901	0.45231	0.51782	0.52619
Steady	0.62653	0.52112	0.50152	0.57656
Recession	-0.27191	-0.28319	-0.30912	-0.32325
Recovery	0.44204	0.33496	0.43804	0.39618

Note: Best and worst practice in each ESG segment is based upon the funds individual ESG-rating, where best means lowest ESG score. The three best and worst funds could be found in *Appendix* C.

Table 10, Best and worst funds (Social)

Evaluation models	Sustainable best	Sustainable worst	Conventional best	Conventional worst
Mean daily return				
Full sample	0.11714%	0.07423%	0.11079%	0.06845%
Steady	0.14167%	0.11399%	0.13515%	0.10529%
Recession	-0.77622%	-0.94545%	-1.00296%	-1.00622%
Recovery	0.21924%	0.17145%	0.24302%	0.17807%
Standard deviation				
Full sample	1.31485%	1.37004%	1.36987%	1.36977%
Steady	0.78389%	0.84720%	0.81757%	0.76992%
Recession	3.36681%	3.31483%	3.52006%	3.33882%
Recovery	1.30370%	1.40147%	1.33591%	1.45249%
Beta				
Full sample	0.84214	0.86059	0.87561	0.89039
Steady	0.57118	0.66224	0.57927	0.60022
Recession	0.92751	0.88474	0.96276	0.91449
Recovery	0.86700	0.90905	0.90040	0.98291
Sharpe ratio				
Full sample	1.41910	0.86010	1.28514	0.79411
Steady	2.89513	2.13472	2.62967	2.20894
Recession	-3.67883	-4.53729	-4.52428	-4.78555
Recovery	2.68655	1.94809	2.90355	1.94066
Treynor ratio				
Full sample	0.69830	0.43302	0.63278	0.38594
Steady	1.02956	0.48883	0.66261	0.49818
Recession	-0.25943	-0.33127	-0.32294	-0.34109
Recovery	0.47703	0.35646	0.51012	0.34240

Note: Best and worst practice in each ESG segment is based upon the funds individual ESG-rating, where best means lowest ESG score. The three best and worst funds could be found in *Appendix* C.

Table 11, Best and worst funds (Governance)

Evaluation models	Sustainable best	Sustainable worst	Conventional best	Conventional worst
Mean daily return				
Full sample	0.10843%	0.09145%	0.11079%	0.08539%
Steady	0.13544%	0.12797%	0.13515%	0.12040%
Recession	-0.82559%	-0.84739%	-1.00296%	-0.87158%
Recovery	0.20985%	0.18056%	0.24303%	0.17980%
Standard deviation				
Full sample	1.32622%	1.39677%	1.36987%	1.33438%
Steady	0.77084%	0.85177%	0.81757%	0.84357%
Recession	3.51694%	3.43311%	3.52006%	3.27975%
Recovery	1.28521%	1.42966%	1.33591%	1.33184%
Beta				
Full sample	0.85856	0.90177	0.87561	0.84899
Steady	0.57830	0.65630	0.57927	0.63964
Recession	0.96724	0.94192	0.96276	0.88677
Recovery	0.86820	0.96466	0.90040	0.89144
Sharpe ratio				
Full sample	1.31435	1.03433	1.28514	1.01984
Steady	2.81872	2.38518	2.62967	2.27487
Recession	-3.75582	-3.94813	-4.52428	-4.22771
Recovery	2.61127	2.00547	2.90355	2.14752
Treynor ratio				
Full sample	0.63399	0.50906	0.66749	0.58109
Steady	0.61817	0.55375	0.66167	0.53457
Recession	-0.26460	-0.27889	-0.32772	-0.30469
Recovery	0.45683	0.45034	0.54984	0.38119

Note: Best and worst practice in each ESG segment is based upon the funds individual ESG-rating, where best means lowest ESG score. The three best and worst funds could be found in *Appendix* C.

Sharpe ratio

In the sampled funds the SD was lower in the sustainable funds over the full sample period (1.34443 percent), steady development (0.79612 percent) and the recovery (1.32304 percent) compared to the conventional funds as shown in Table 8. The only sub-period where the SD was higher in the sustainable funds were during the *recession,* where the sustainable funds experienced a SD of 3.44236 percent, whilst the conventional funds had 3.42694 percent. The differences between the two fund types are marginal, but this implies that the conventional funds have a higher total risk in the full sample period, steady development and the recovery period.

However, a lower total risk is seen in the recession period in comparison to the sustainable funds.

When narrowing down to the different ESG characteristics (*Table* 9-11), the SD is in most cases lower in the funds with the best scores over all periods, especially when looking at sustainable funds best and worst cases. This gives an indication that there is a connection between a good ESG score and the total risk in an asset. The exception of this is during the *recession* period, when the funds with the best scores in E, S and G had a higher SD than the funds scoring worst. There are also some exceptions when looking at the best conventional funds versus the funds with worst E, S and G. The conventional funds with worst ESG scores often have a lower SD, indicating that there is a lower total risk. Thus, the results are a bit contradictive since ESG proves to have a negative correlation with SD in sustainable funds, but not to the same extent in conventional funds. This might be explained by the marginal differences in ESG-scores seen between the best and worst conventional funds.

As shown in *Table* 8, the risk-adjusted return of sustainable funds when looking at the total risk is higher in both the full sample period as well as the sub-periods compared to the conventional funds. However, during the *recession* period the benchmark showed a higher risk-adjusted return, where the sustainable (conventional) funds had an annualised Sharpe ratio of -4.22327 (-4.43520) whilst the benchmark had a ratio of -4.07630. These results indicate that sustainable funds with lower SD as shown earlier, achieved a higher risk-adjusted return than conventional funds.

In our analysis where we compared sustainable and conventional funds based on their ESG profiles (*Table* 9-11), we found interesting results. The best sustainable and conventional funds within each of the ESG-segments performed a higher risk-adjusted return when measuring the Sharpe ratio. Higher Sharpe ratio were observed within the best ESG-funds during all three sub-periods when compared to the worst funds in the E, S and G segment. These results suggest that good ESG-scores have led to higher risk-adjusted return during our sample period for both conventional and sustainable funds. The highest risk-adjusted return (when measured by total risk) is seen in the funds profiled as best in "S" during the full sample period.

Treynor ratio

For the sampled sustainable funds, the systematic risk (beta) is lower in both the full sample period as well as all the sub periods compared to the conventional funds as shown in *Table* 8. The beta values of both the sustainable and conventional funds are below the benchmark index beta which shows that these investments are less volatile than the benchmark. The lower beta-values in sustainable funds implies that

the underlying funds in this category manages the systematic risk better than the conventional peers.

Zooming in on beta values in funds with different ESG-profiles (*Table* 9-11) there are similar results as with the other measurement of total risk, SD. The sustainable funds with the best score in E, S and G have a lower beta in comparison to the worst scoring, as well as a lower beta than both categories in the conventional funds. There are some exceptions to this and that is when looking at the "S" and "G" during the *recession* period, where the beta is higher in the best scoring sustainable and conventional funds. The conventional funds had more tendencies showing higher beta scores in the "best" conventional funds. The results indicate that there is a negative correlation between good ESG scores (especially within funds focused on "E") and the systematic risk in sustainable funds. As with SD, the results are not as clear-cut in conventional funds as with its sustainable peers. This could be a result of smaller differences in ESG-scores between the best and the worst conventional funds, which therefore does not lead to the same results as those seen between the two categories of sustainable funds.

The sustainable funds risk-adjusted return when looking at Treynor ratios on an aggregated level shows that there is an outperformance when looking at systematic risk during all sample periods, as shown in *Table* 8. These results support what Friede et. al. (2015) found in their meta-analysis study, that active ESG work reduces systematic risk, and therefore leads to better financial yield. However, as it was with the Sharpe ratio the sustainable funds experienced a lower Treynor ratio (-0.30875) and the conventional funds (-0.32235) had a lower risk-adjusted return than the benchmark index (-0.27869) during the *recession* period.

The analysis of sustainable and conventional funds based on their ESG-profiles (*Table* 9-11) shows that the Treynor ratio is overall higher in the best sustainable and best conventional funds within the different ESG-segments. There are some exceptions to this and that is in the "E"-funds during the full sample period and *steady development* sub-period, where the worst scoring conventional funds had a higher Treynor ratio than the conventional funds with the best scores. There was also a difference in Treynor ratio when looking at "G"-funds during the *recession*, where the worst scoring conventional funds had higher Treynor ratio than the best scoring conventional funds. The results seem more clear-cut in sustainable funds where the ESG-scores differs more between best and worst funds. The results of the Treynor ratio imply that the best "S"-profiled sustainable funds performed highest risk-adjusted return. When it comes to the conventional funds, the best "G"-profiled funds performed the best.

6.1.2. Fund-flow analysis

The *Thomas Reuters Datastream* database was used for data collection of the total assets in the sampled funds, which resulted in information of how fund-flow in the different funds increased or decreased during our sample period. This information is interesting, since it indicates that the fund-flow is different during various stages of the pandemic, as well as some variance observed between the fund categories. The AUM change in percentage is summarized in *Table* 12, and more thoroughly described for each month in *Appendix* F. These results suggests that the fund-flow into sustainable funds was higher than the fund-flow into conventional funds during the full sample period, as well as during the three sub-periods. During the period of *recession*, the decrease of AUM was higher in conventional funds (–13.4 percent) compared to sustainable peers (–10.6 percent). In the full sample period sustainable funds had an overall increase in AUM which was 0.75 percent units higher than the increase of AUM in conventional funds.

Table 12, Summary of fund-flow AUM

Period	Sustainable	Conventional
Full sample period	2.95618%	2.20134%
Steady development	3.93658%	3.31362%
Recession	-10.56728%	-13.40706%
Recovery	4.74392%	4.29599%

Source: Thomas Reuters Datastream

The results of fund-flow suggests that the average AUM increased at a higher rate in sustainable funds compared to the conventional funds during the first and third sub-period. During the *recession* cycle, the asset flow in funds decreased at a lower rate in sustainable funds. In *Appendix F* and *Figure* 5, it can be seen that there were some particular months where the fund flow differed especially much between the fund types. During the *steady development* period in July 2019, the AUM of sustainable funds on average increased 28.56 percent while the conventional funds only increased with 7.28 percent.

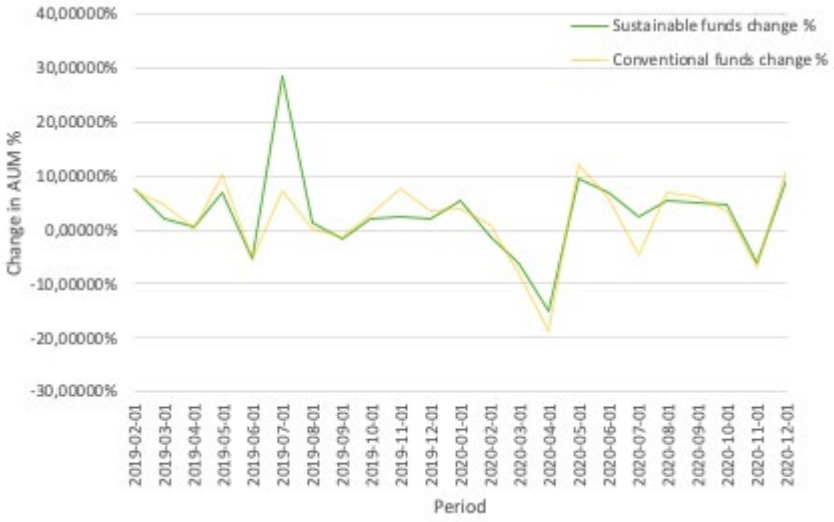

Figure 5, Fund-flow in funds (own illustration). Source: Thomas Reuters Datastream

Moreover, our results suggest interesting differences during the *recession* period as well. During March and April 2020, the average AUM of sustainable funds did not decrease as much as the conventional funds did. The decrease in AUM was 2 to 3.7 percent less in sustainable funds compared to its conventional peers. Looking at the results of the *recovery* period one could see the biggest difference in July 2020, where the average fund-flow in sustainable funds have increased, but the AUM in conventional funds has decreased. These results indicate that the average interest in sustainable funds have increased throughout the sample period leading to more assets being pooled in sustainable funds. These results seem to prove that the fund-flow in sustainable funds on the Swedish fund market has increased, just like previous studies and media has presented on a global level (Söderberg & Partners, 2020; Financial Times, 2020; Morningstar, 2020; CNBC, 2020b).

In addition to the overall higher fund-flow in sustainable funds, we also analysed individual fund-flows in the funds according to their ESG characteristics. This entailed interesting results, as the highest fund-flow during the full sample period was done into the funds with best ESG score in the environmental (E) segment compared to funds characterised with better score in social (S) and governance (G). This implies that the "E"-score is the most important for investors when choosing what funds to invest in during our sample period. This might be an effect of the intensified climate discussions during the outbreak of COVID-19. Further analysis if fund-flow is positively correlated with yield will be done in the WCA section.

6.1.3. Wavelet Coherence Analysis

Three best ESG funds beta values vs Three worst ESG funds beta values

To investigate how ESG factors affects systematic risk (beta) in funds we performed this WCA. We measured the coherence between the three best ESG-scored sustainable funds beta values with the three worst ESG-scored conventional funds beta values which resulted in the power spectrum plot shown in *Figure* 6. The beta values used for this analysis were calculated on a monthly basis, which is why the plot period ranges from 1-24 months. This analysis was performed in order to see if there exist coherence in systematic risk between funds with a low (sustainable) ESG score and a high (conventional) ESG score.

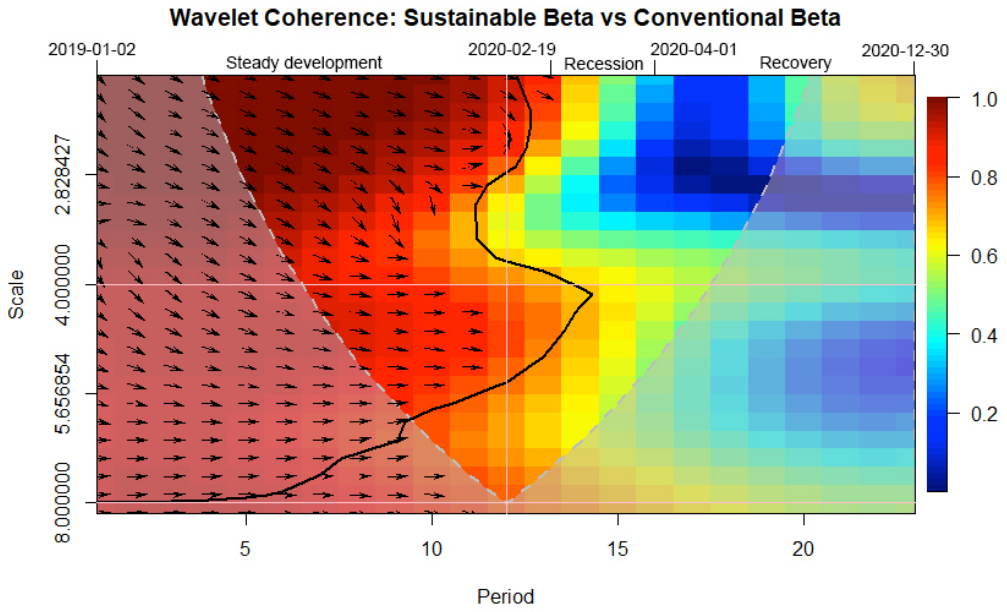

Figure 6, Three best (ESG-rating) sustainable funds beta values compared to the three worst (ESG-rating) conventional funds beta values (own illustration).

This plot shows a high correlation between the average beta values of the best and worst ESG funds during the first sub-period, which is during the *steady development*. Both beta variables are in phase, which the arrows indicate. This suggests that ESG values of the sustainable funds do not have a significant impact of lowering the systematic risk during the period of *steady development* on the Swedish fund market. However, something happens during the crisis period of COVID-19, 2020-02-19 and onwards, whereas we instead can see low coherence between the beta values at all scales. This imply that the active ESG work performed in the best ESG funds leads to a lowered systematic risk, compared to the funds with less ESG focus during the crisis. This is confirmed by the raw beta

values, which are lower in the sustainable funds than those seen in the conventional funds during the second and third sub-period.

Best practice funds in each ESG segment

For this part of our analysis, we have run several WCA's of the return of the "best practice" fund in each ESG (E, S and G) segment of both fund categories (sustainable and conventional) during the full sample-period. To decide what fund which was the best in the "E", "S" and "G" segment, we used the ESG scores presented in *Appendix* C. The "best" funds are summarised in *Table* 13 below, where best practice means lowest score in each segment. The two variables used in this analysis are the return of the best sustainable funds versus the return of the best conventional funds in each ESG segment.

Table 13, Best practice ESG

Sustainable	**Score**	**Difference**
E: Spiltan Aktiefond Investmentbolag	0.78	-1.88
S: Spiltan Aktiefond Investmentbolag	3.51	-2.49
G: Skandia Sverige Hållbar	5.66	+0.47
Conventional	**Score**	**Difference**
E: C Worldwide Sweden 1A	2.66	+1.88
S: CF Tillväxt Sverige A	6.00	+2.49
G: CF Tillväxt Sverige A	5.19	-0.47

Source: Morningstar

Note: The score is based on the individual ESG score for each fund in each segment and could be found in *Appendix* C. The difference in the table is the variance in ESG score between the best practice sustainable fund and the best practice conventional fund in each "E", "S" and "G" segment.

Environment (E)

Our analysis of *Figure* 7 shows significant low coherence areas, similar to "spikes", in the lower scale through the entire sample period. These "spikes" of lower dependence could be explained by short variances in return, where the sustainable fund has performed better yield (i.e. yield being positive while the conventional funds were negative). The lower dependence is seen in the lower scale because the changes in return has a higher frequency, where fluctuations in return is seen on a day-to-day basis, creating a larger spread between the two variables. It is also a significantly low coherence during 2019-01-02 to 2019-12-10 (day 10 to 240) in the mid-scale. This indicates that the performance of the two fund types differs significantly during the period of *steady developmen*t. The reason why lower dependence is observed in the mid-scale in addition to the "spikes" in the low scale, is because it indicates that there was a lower frequency (spread) in price fluctuations

over time, but between some particular days there was changes in return which created larger spreads between the return variables. Looking at the closing price of the funds during this entire period (day 10 to 240), the sustainable fund increased by 44 percent during this period, while the conventional fund only increased by 38 percent which explains the overall lower dependence.

As shown in *Figure* 7, there are a high coherence between the yield of the environmentally best practice sustainable and conventional fund, especially in the period 2020-01-02 to 2020-04-01 (day 250 to 320) at nearly all scales. This indicates that there were no significant differences between the yield of the best funds in "E" during the last part of the *steady development* period, as well as during the *recession*. The closing price of "Spiltan Aktiefond Investmentbolag" (sustainable) decreased by 2 percent during the period, which is quite similar to the 3 percent decrease of "C Worldwide Sweden 1A". This implies that during the *recession* period, one cannot observe any large differences in return when comparing the best practice funds in the environmental segment.

When the *recovery* period begins from 2020-04-01 (day 320) and onwards, areas of lower dependence start to appear again. During this period the spread between the return of the best practice "E"-profiled sustainable fund and best practice "E"-profiled conventional fund starts to increase. These results suggests that the sustainable fund with best practice in "E" recovered faster than its conventional peer.

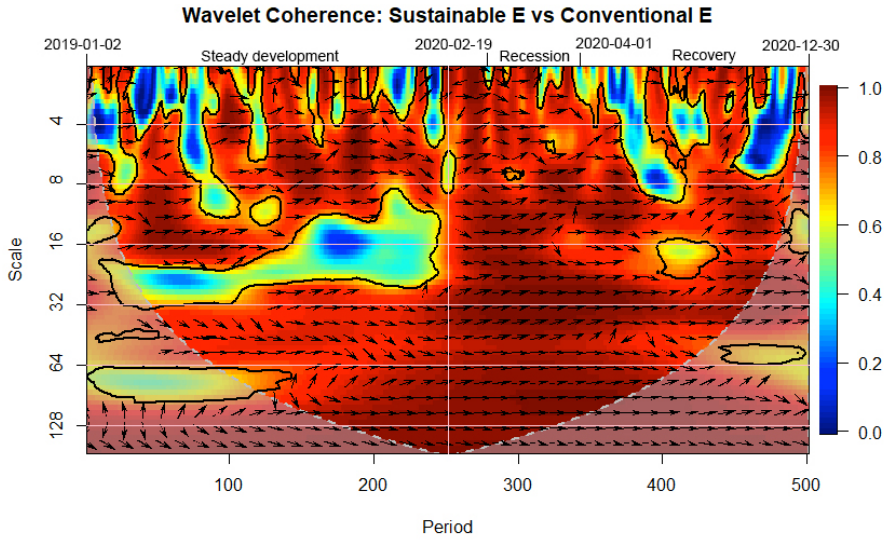

Figure 7, The best practice (environment) sustainable fund return compared to the best practice (environment) conventional fund return (own illustration).

Social (S)

When comparing the socially best funds to each other in a power spectrum graph as shown in *Figure* 8, there is overall a high coherence between yield of the best practice "S" sustainable and conventional fund. Within the period of *steady development* (day 1-280) there is a larger area of lower coherence in the midscale as well as several spikes in the lower scales. The "spikes" are the most visible during day 1 to 100 and 200 to 280. During these "spikes" the yield of the funds had a large variation (spread) which results in a higher frequency. The reason why the lower coherence in the midscale also is visible during the same period as the "spikes" is because even though there is a high variance in yield (high frequency) there are also a lower total variance over time (low frequency).

During the *recession* (day 280 to 320) the coherence between the two "S"-profiled funds were especially high, whereas there seems to be no significant differences in daily return. However, during this period, the sustainable fund has outperformed the conventional fund with almost 9 percentage units, which could be explained by the smaller spikes in the low scale, which indicates a large spread in yield as well as the last days in the *recession* period where a lower coherence starts to appear again.

The *recovery* period shows signs of lower coherence in the higher frequency scale, especially between day 320 to 400 and 450 to 490. The spread in yield between the sustainable and conventional funds is more continuous than in the *recession* period, leading to a larger gap between the yield as seen in *Figure* 4.

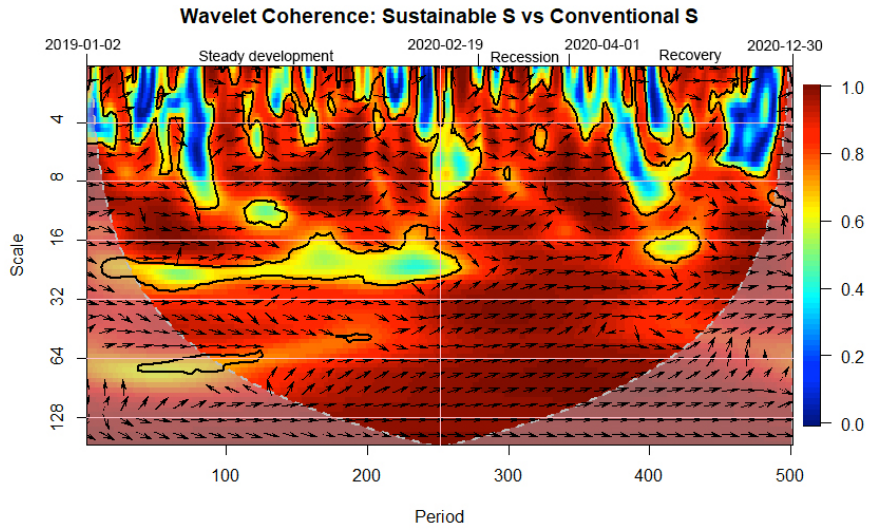

Figure 8, The best practice (social) sustainable fund return compared to the best practice (social) conventional fund return (own illustration).

Governance (G)

When comparing the best practice sustainable and conventional funds in the governance segment, one could observe high coherence throughout most of the sample period in *Figure* 9. This suggests that the two compared "G"-profiled funds have experienced similar yield. Despite this, there are some observable differences over the time period where the two funds "Skandia Sverige Hållbar" and "CF Tillväxt Sverige" have varied in terms of return. The lowest coherence level is seen during the *recovery* period in the lower scales. These results suggests that the variances in return between the two funds increased during the upturn cycle, where the sustainable fund performed better yield by recovering faster compared to the conventional fund.

There are also areas of medium-low coherence seen during 2019-01-16 to 2019-07-04 (day 10 to 125) and 2019-09-05 to 2019-12-10 (day 170 to 240) in the mid-scale of the power spectrum seen in *Figure* 9. These results imply that differences in terms of return could be seen over time between the two funds during some parts of the *steady development,* even though the differences were not as large as the ones observed during the *recovery.* The plot results suggests that during the downturn cycle of *recession* the two best practice funds in "G" performed similar yield and significant differences between the fund types cannot be observed.

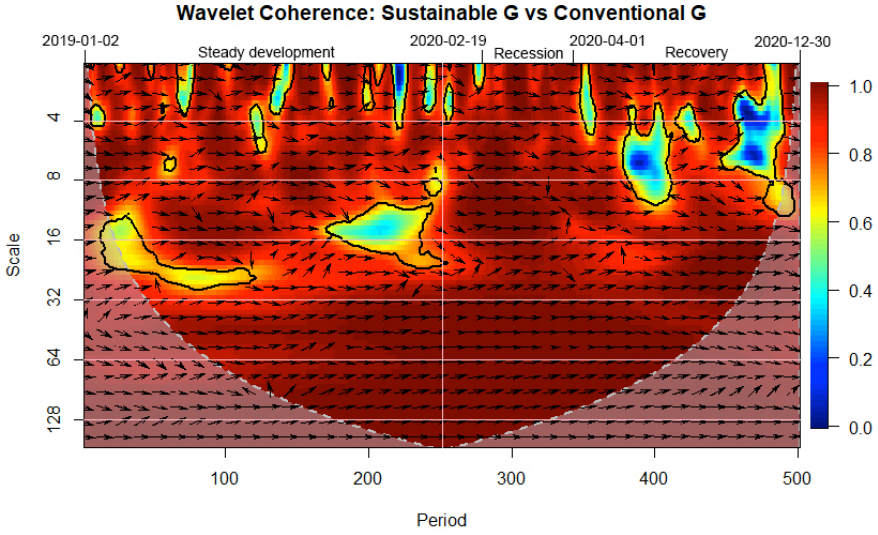

Figure 9, The best practice (governance) sustainable fund return compared to the best practice (governance) conventional fund return (own illustration).

Implications

The key takeaway from this analysis therefore seems to be that when the ESG score differs a lot between funds (i.e. E; 0.78 < 2.66 and S; 3.51 < 6.00) the yield also differs to a greater extent. This explains the larger areas of colder colours (low

coherence) between the funds, as the spread in yield were different during different stages of the pandemic. In the power spectrum shown in *Figure* 9, for the best governance funds, the ESG score does not differ as much (i.e. G; 5.66 > 5.19) which also results in lower difference in yield, shown by only smaller areas of low coherence compared to the other figures. This imply that there exist differences in yield between funds with different ESG-profiles. The observed results also implies that ESG factors has a positive effect on return, especially for the sustainable funds during the sub-period of *steady development* and *recovery*. On the other hand, the results do not prove any differences between the compared funds' yield during the *recession*.

Slight variance is seen between *Figure* 7 and *Figure* 8, where larger differences between funds' yield are seen in the "E" segment in mid-scale. This imply that the environmental score is highly explanatory for the differences between funds' yield and goes in line with previous findings that the risk-adjusted return (Sharpe and Treynor ratio) differs mostly between the sustainable and conventional funds profiled as best in the environmental segment.

Highest fund-flow vs Lowest fund-flow

In order to investigate if fund-flow is positively correlated with yield we performed this WCA. A comparison was made between the yield of the funds (five sustainable and five conventional) with highest in-flow of assets and the funds with the lowest in-flow on an aggregated level. The categorisation of the funds was made based on the fund-flow presented in *Appendix* F and the categorisation is presented in *Table* 14 below.

Table 14, Funds highest and lowest in-flow

Highest in-flow		**Lowest in-flow**	
Sustainable	*Conventional*	*Sustainable*	*Conventional*
Spiltan Aktiefond Investmentbolag	PriorNilsson Sverige Aktiv A	Carnegie Småbolagsfond A	Norron Active RC SEK
Spiltan Aktiefond Stabil	Skandia Småbolag Sverige	Humle Sverigefond	Didner & Gerge Aktiefond
C Worldwide Sweden Small Cap 1A	SPP Sverige PLUS A	Didner & Gerge Småbolag	Nordea Sverige Passiv Icke-utd
Handelsbanken Sverige Tema (A1 SEK)	Swedbank Robur Access Sverige A	Öhman Sverige Hållbar A	Lannebo Sverige
Swedbank Robur Sverigefond A	C Worldwide Sweden 1A	Nordea Swedish Stars icke-utd	Quesada Sverige

As shown in the power spectrum in *Figure* 10 below, there seem to be a high coherence between the yield of the highest in-flow funds and the funds experiencing

the lowest in-flow of capital. This suggests that there is not a significant positive correlation between in-flow of assets and yield, since the yield is similar no matter if there was a high or low in-flow of assets in the aggregated funds. The funds yield seems to co-vary (in phase), which is shown in the plot as arrows. There are however some smaller areas in the plot where one could see a significantly lower dependence in the lower scale. This is due to a higher yield in the lowest in-flow funds, compared to the yield in the highest in-flow funds. One example where the yield is different is during the near end of the *recovery* period 2020-11-12 to 2020-11-26 (day 470 to 480). Smaller "spikes" of similar lower dependence is seen throughout the full period as well, which are explained by the same differences in yield. These results therefore seem to prove a more neutral correlation between fund-flow and yield.

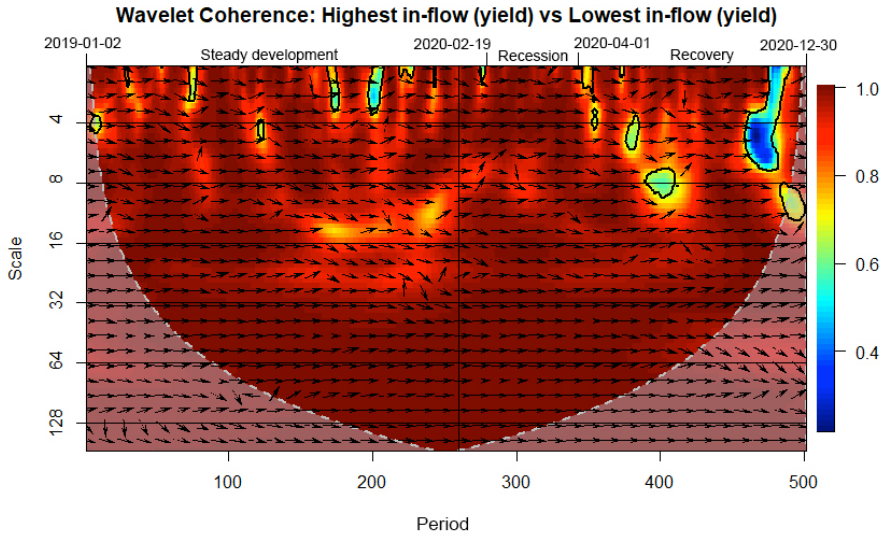

Figure 10, Return of the ten funds with highest in-flow of capital compared to the return of the ten funds with lowest in-flow of capital (own illustration).

7. Discussion

The seventh chapter provides a discussion and critical reflection of our results and analysis and how it is related to existing (previous) literature. The starting point for the discussion is our three hypotheses.

The aim of this study was to contribute to the understanding of how the Swedish fund market have behaved during a phase of the COVID-19 pandemic. We aimed to analyse the difference in risk-adjusted performance between sustainable and conventional funds, in order to see how ESG factors affect volatility and yield. The sample period was divided into three sub-periods based on cycle observations of the crisis: *steady development*, *recession* and *recovery*. To fulfil the aim of our study, three hypotheses were formulated:

- Hypothesis 1: Sustainable funds will have a higher risk-adjusted return compared to conventional funds.
    a. There is a difference in risk-adjusted return depending on the stage of the pandemic.
- Hypothesis 2: ESG-score have a negative correlation with systematic risk (Beta).
- Hypothesis 3: There is a difference in yield between different ESG-profiles.
    a. The difference in yield is positively correlated with in-flow of capital.

Hypothesis 1: The empirical findings show that sustainable funds during the sample period have a higher risk-adjusted return than the conventional peers. The results of outperformance from the sustainable funds are seen over all three sub-periods. Looking at the calculated ratios that describe risk-adjusted return – the difference between the two types of funds were largest during the *steady development* followed by the *recession* and *recovery*. However as shown in *Table* 8 the results from the analysis were not statistically significant according to the t-tests for any of the sample periods.

The outperformance of sustainable funds in a volatile market such as during a financial crisis and health crisis, is in line with the previous findings presented by Nakai et al. (2015) and Nofsinger & Varma (2014). Both of these studies found that sustainable funds outperformed conventional funds in a market crisis and that the outperformance was driven by a higher focus on ESG-related issues. The outperformance in the sustainable funds could be related to the efficient market hypothesis (Fama, 1970). Funds investing in companies that are working with ESG proactively utilise the information on the market in a more efficient way. Reacting to news faster and therefore positioning themselves better for changes. Previous studies also states that companies with a higher ESG rating in most cases are better equipped to bear the weather of a crisis period (Nofsinger & Varma, 2014; Nakai et al., 2015). Contrasting to the results of Fernández Sánchez & Sotorrío (2010) study, our results indicate that good work in the social domain does not lower the performance (rather strengthen performance) of the funds and neither is the management fees higher in the sustainable funds. As previously mentioned, the results point to how sustainable funds have performed better when focusing on a risk-adjusted level, however, because of the T-test results on Sharpe- and Treynor ratios the first hypothesis cannot be statistically confirmed.

When focusing on different stages of the pandemic that are categorised as *steady development, recession* and *recovery* in this study, there is a difference in spread in the risk-adjusted return as well as yield. The spread between sustainable and conventional funds risk-adjusted return seems to be largest during the *steady development* where the difference on average is 0.313439 when looking at Sharpe ratios for all funds. During the *recession,* the spread between the funds Sharpe ratio is 0.211935 and 0.163473 in the *recovery* period. The results indicate that the difference in yield on a risk-adjusted level when focusing on total risk is the highest during the *steady development* and decreasing throughout the sample period. There is also a difference in the measurement of Treynor ratios. During the three stages of the pandemic the spread in Treynor were 0.08418 (*steady development*), 0.01360 (*recession*) and 0.05216 (*recovery*). Looking at *Figure* 7-9 this difference is made visual as well, looking at the first period *steady development* there are large areas of colder colours that indicate a difference in yield. This implies that the spread between the fund categories' risk-adjusted return, when looking at systematic risk, were the highest during the *steady* development. We can therefore confirm hypothesis 1a by rejecting the null hypothesis, since there is a clear difference in yield when looking at risk-adjusted measurements, between the different stages of the pandemic.

Hypothesis 2: The results obtained from this study also states that the systematic risk (beta) in sustainable funds is lower than in the sampled conventional funds on the Swedish fund market during the full sample period according to the evaluation

models. The wavelet coherence plot in *Figure* 6 confirms the negative correlation between ESG and systematic risk – where good ESG scored funds perform better yield and experience lower systematic risk during the crisis period of COVID-19. We can therefore confirm hypothesis 2 by rejecting the null hypothesis, since the independent variable of ESG seem to impact the dependent variable of systematic risk during the crisis. The negative correlation between ESG factors and systematic risk suggested by the results in this study goes against the previous studies made by Markowitz (1952) and Chang, Nelson and Witte (2012). These studies found that sustainable funds experienced a lower diversification and therefore resulted in a higher systematic risk. However, our study's results show that the active ESG screening performed by managers of sustainable funds results in reduced systematic risk. Restricting certain "bad" securities in sustainable funds, rather seem to increase risk-adjusted return and actual return of these funds. Our results are therefore more in line with what Yue et al. (2020), Kumar et al. (2016) and Orlitzky & Benjamin (2001) previously presented in their research. In their studies they presented results stating that sustainable investments faced less systematic risk and generated higher risk-adjusted returns. This implies that active ESG-screening in the sustainable funds results in more efficient risk management during the crisis, thus better risk-adjusted return. The analysed results of the WCA are statistically significant at the five percent level, which means that the null hypothesis for hypothesis 2 could be rejected.

There are however some caveats which concern the validity of previous results, as well as ours. The difference in systematic risk, as well as ESG advantages (scores) between the two fund categories does not seem to be as clear-cut as investors might expect. The small differences in systematic risk could be explained by the fact that both of our investigated fund types have a considerable overlap when it comes to its underlying securities. Thus, we could see a great potential for sustainable fund managers in Sweden to change this situation and actively manage their portfolios, rather than passively adopt securities from a benchmark. The actual environmental, social and governmental advantages of sustainable funds must be mirrored in the ESG scores of these funds. From the perspective of this study, sustainable and conventional funds do not deviate from each other to the extent that one could expect, and it could be questioned if there is a huge difference when it comes to sustainable development.

Hypothesis 3: The pandemic caused by the Coronavirus have affected not only the people in Sweden but all across the globe. Our empirical results indicates that COVID-19 has fuelled the climate discussions and led to increased consciousness regarding sustainability, especially from an environmental standpoint. This was confirmed by the two respondents Johan Ede and Linnéa Forsell who states that increased fund-flow in sustainable funds could be partially explained by this. On a

global level, Morningstar (2020b) reports that investors continue to back ESG investments during the crisis and bucked the trend in the COVID-19 sell-off, by enjoying positive in-flow into ESG funds. Our results suggests that funds profiled as best in "E" have received the highest in-flow. Investors seems to reward companies that responds to the crisis by focusing on their long-term goals, rather than those companies which focus on their near-term profits. The results of the WCA of fund-flow does however not show a positive correlation between higher in-flow of assets and higher yield. Rather it seems like the yield of funds is not so dependent on the in-flow of assets, since both the highest and lowest in-flow funds performed similar yield. We must therefore reject hypothesis 3a., that funds with highest in-flow of capital should have experienced highest yield, since that is not shown in the results. Instead, periods of higher yield are seen in the funds with lowest in-flow of capital which rejects the hypothesis. In previous research presented by Busse et. al. (2014) they compared EFs on the U.S. fund market with small or big AUM. The large funds in their study seemed to underperform the small funds, since their stock holdings generate a lower premium. A higher rate of in-flow of capital does not necessarily lead to underperformance in our results, but rather the correlation between the two factors is neutral.

The differences in risk-adjusted return are rather explained by the different ESG factors seen in sustainable and conventional funds. Differences between ESG-profiles of funds is what seems to create the differences in systematic risk, and therefore also is what leads to the visible differences in yield. Higher returns are seen in the full sample period for both fund categories with the best scores across all ESG segments, which imply that ESG factors leads to increased yield. In the full sample period, the results suggest that the three-best sustainable "S"-profiled funds have performed the highest risk-adjusted yield, followed by the "G"-profiled conventional funds. The three best "E"-profiled sustainable and conventional funds have a lower risk-adjusted yield. These results go in line with the results of Kumar et al. (2016) were they found evidence that different industries and ESG factors affect the risk-adjusted return of these investments. We can therefore approve hypothesis 3, that there are differences in risk-adjusted yield between different ESG-profiled funds.

8. Conclusions

In the eighth and concluding chapter, the authors present major findings of the study in order to answer the research questions. The chapter ends with suggestions for future research.

The increasing demand in sustainable products within finance shows that the interest in sustainable investments and ESG are here to stay. The topic has been discussed over a long period of time and previous studies regarding risk-adjusted return between sustainable funds and conventional funds, have shown various results. Recent studies have focused on larger capital markets than Sweden, such as the UK and US markets and it is partially because of this our study have been conducted. The aim of this study was to fill the gap in research regarding differences in financial performance between different fund types during a high volatility market. The effects of ESG factors on volatility and risk were investigated. In order to answer the aim of the study the following questions were formed:

- Did sustainable funds experience a difference in risk-adjusted return compared to conventional funds during the sample period? Were there differences during the different stages of the pandemic?
- How does ESG factors affect systematic risk in funds during the sample period?
- Did funds with different ESG-profiles experience significantly different patterns in risk-adjusted return over time?

In order to answer these research questions, the 40 funds were divided into two categories, sustainable (18) or conventional (22), based on MSR and ESG-scores. The funds were chosen based on their investment strategy (e.g. majority in Swedish securities and focused on the industry sector). The sample period was between 2019-01-02 and 2020-12-30, which then were divided into three different sub-periods following the volatility in the market, which was recognized through the data collection. The results were analysed through various risk-adjusted evaluation models (i.e. Sharpe and Treynor), followed by a Wavelet Coherence Analysis in order to measure correlations between time-series in the time and frequency domain.

The study found differences between sustainable and conventional funds risk-adjusted return when looking at the Sharpe and Treynor ratios for the full sample period and the three sub-periods separately. The risk-adjusted return of sustainable funds was higher when measured through all of the evaluation models. However, the high p-values gained from our t-tests implies that it is not possible to statistically reject the null hypothesis that the fund categories were indifferent. Looking beyond statistical significance, the results of the full sample period, as well as the sub-periods imply that sustainable funds outperformed its conventional peers since the total risk (and systematic risk) were reduced. Differences in risk-adjusted return could be seen between different stages of the pandemic. The biggest difference in risk-adjusted return is seen in the *steady development* and *recovery* sub-period. In addition to the risk reduction, sustainable funds managed the negative effects of the market crisis by utilising information more efficiently and focusing on long-term goals, rather than short-term profits. This led to a faster recovery, as well as increased fund-flow in sustainable funds. The higher fund-flow in sustainable funds is however not what explains the higher return, but rather ESG factors have led to strengthened yield.

The results of this study implies that active ESG-screening in sustainable funds led to decreased systematic risk, which during the crisis led to better yield on the Swedish fund market. The risk-adjusted return varied between the different periods of the crisis, but always in favour of sustainable funds according to all evaluation models. The results of our WCA stipulate that there is a high coherence between ESG factors and beta, where funds experience negative correlation between ESG-score and systematic risk. The impact of working with ESG is especially clear during the second and third sub-period (after the outbreak of COVID-19), where significant reduction of systematic risk and elevated risk-adjusted return could be seen in sustainable funds with the best ESG-score. This led to increased yield and a faster recovery. The higher flow of assets in sustainable funds is supported by previous studies, where investors seem to continue to back sustainable funds even in times of a crisis. Our WCA's have visualised structural differences in terms of risk-adjusted return and yield over time between funds with different ESG-profiles. The biggest difference in the yield patterns is seen in the analysis of the funds with the best "E"-score, where the ESG scores differs the most in comparison. In terms of risk-adjusted return the biggest differences are seen between the best sustainable "S"-profiled funds and the best conventional "G"-funds. This implies that the ESG factors has a positive effect on financial performance of the funds, and that investors price sustainability higher during our sampling period. The conclusion of this study is that private investors on the Swedish fund market could expect higher risk-adjusted return if they choose to invest in sustainable funds during a crisis period, especially if they consider the ESG characteristics of these investment portfolios.

8.1. Future research

To further the understanding of the importance and growth of sustainable finance, it would be interesting to see how the new taxonomy in Europe have affected the financial market. This could be done through analysing the effects of the taxonomy on green and regular bonds. A possible method to use is to interview asset managers and/or banks whilst looking at inflow of capital into the different categories of bonds in order to see potential differences.

Furthermore, it would be interesting to see how the ongoing pandemic have affected other capital markets in order to see if the results are similar to the ones seen on the Swedish market. Perhaps an alternative study would be to compare this type of crisis (health crisis) more ingoing to other historical financial crises, such as the financial crisis or the IT-bubble.

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Appendix

Appendix A: ESG

Table 15, Issues related to ESG

(E) Environmental	**(S) Social**	**(G) Governance**
Climate Change	*Human capital*	Corporate governance
Carbon emissions	Labour management	Board diversity
Carbon footprint	Human capital management	Executive pay
Climate change volatility	Health and safety	Ownership & control
Natural Resources	*Product liability*	
Water stress	Responsible investment	
Biodiversity & land use	Health & demographic risk	
Raw material sourcing	Privacy & data security	
Pollution and waste	*Stakeholder opposition*	
Toxic emissions & waste	Controversial sourcing	
Package & material waste		
Electronic waste		
Environ. Opportunities	*Social opportunities*	
Clean tech	Access to communications	
Green buildings	Access to finance	
Renewable energy	Access to healthcare	

Source: https://www.msci.com/what-is-esg

Appendix B: Sample of funds

Table 16, List over conventional and sustainable funds

Conventional funds	Sustainable funds
PriorNilsson Sverige Aktiv A	Spiltan Aktiefond Investmentbolag
Norron Active RC SEK	Spiltan Aktiefond Stabil
CF Tillväxt Sverige A	Carnegie Småbolagsfond A
PLUS Mikrobolag Sverige Index	Swedbank Robur Sverigefond A
Swedbank Robur Exportfond A	Humle Sverigefond
BNP Paribas Nordic Small Cap Cl C	Handelsbanken Sverige 100 Ind Cri A1 SEK
Skandia Småbolag Sverige	Skandia Sverige Hållbar
Öhman Småbolagsfond A	C Worldwide Sweden Small Cap 1A
Enter Sverige Pro	Enter Småbolagsfond A
Enter Sverige A	Handelsbanken Sverige Tema (A1 SEK)
Didner & Gerge Aktiefond	Didner & Gerge Småbolag
Nordea Småbolagsfond Sverige	SEB Sverigefond Småbolag
SPP Sverige PLUS A	Öhman Sverige Hållbar A
C Worldwide Sweden 1A	AMF Aktiefond Sverige
Nordea Sverige Passiv Icke-utd	Nordea Swedish Stars icke-utd
Lannebo Sverige	Aktiespararna Topp Sverige
Danske Invest Sverige SA	SPP Aktiefond Sverige A
Swedbank Robur Access Sverige A	Länsförsäkringar Sverige Aktiv
SEB Sverige Expanderad	
Quesada Sverige	
Öhman Sverigefokus A	
SEB Sverigefond	

Names in Morningstar

Table 17, Information about sustainable funds

Sustainable funds	Start date	Age (#)	AUM (MSEK)	Industry factor (%)	Swedish securities (%)	Management fee	MSR
Spiltan Aktiefond Investmentbolag	2011-11-30	9	20359	7.65%	96.92%	0.20%	5
Spiltan Aktiefond Stabil	2002-12-02	18	9287	33.20%	95.94%	1.50%	5
Carnegie Småbolagsfond A	2012-01-31	9	2278	36.79%	82.90%	1.60%	4
Swedbank Robur Sverigefond A	2002-10-04	18	13257	34.60%	84.51%	1.25%	4
Humle Sverigefond	2008-01-01	13	380	42.47%	95.17%	1.00%	4
Handelsbanken Sverige 100 Index Criteria	2011-08-30	10	10839	38.28%	93.26%	0.20%	4
Skandia Sverige Hållbar	2017-12-14	3	5658	36.28%	93.23%	1.40%	4
C Worldwide Sweden Small Cap 1A	2010-02-02	11	9818	20.80%	96.50%	1.60%	5
Enter Småbolagsfond A	2015-09-01	5	2179	26.50%	92.77%	1.50%	4
Handelsbanken Sverige Tema (A1 SEK)	1988-04-25	33	19582	34.02%	96.24%	1.00%	4
Didner & Gerge Småbolag	2008-12-23	12	11583	38.51%	83.89%	1.40%	4
SEB Sverigefond Småbolag	1987-09-21	34	14951	32.53%	96.08%	1.50%	4
Öhman Sverige Hållbar A	2013-08-19	8	2854	42.05%	93.66%	1.25%	4
AMF Aktiefond Sverige	1998-12-30	22	4294	31.45%	94.87%	0.40%	4
Nordea Swedish Stars icke-utd	1999-10-26	21	11140	21.89%	72.35%	1.40%	4
Aktiespararna Topp Sverige	1999-11-25	21	3483	37.40%	92.32%	0.30%	4
SPP Aktiefond Sverige A	1998-12-23	22	21399	38.18%	93.21%	0.20%	4
Länsförsäkringar Sverige Aktiv	1990-12-10	31	13945	39.15%	88.83%	1.30%	4

Source: Avanza

Table 18, Information about conventional funds

Conventional funds	Start date	Age (#)	AUM (MSEK)	Industry factor (%)	Swedish securities (%)	Management fee	MSR
PriorNilsson Sverige Aktiv A	2012-10-01	9	2463	46.62%	83.25%	1.20%	2
Norron Active RC SEK	2011-09-02	10	2861	34.28%	81.64%	1.50%	2
CF Tillväxt Sverige A	2016-02-10	5	69	56.97%	92.72%	1.35%	2
PLUS Mikrobolag Sverige Index	2017-09-25	4	144	25.15%	95.76%	0.40%	1
Swedbank Robur Exportfond A	1993-02-01	28	13321	41.38%	87.50%	1.25%	2
BNP Paribas Nordic Small Cap CI C	2014-01-31	7	2407	20.08%	79.42%	1.75%	2
Skandia Småbolag Sverige	1998-12-09	22	5972	32.40%	93.81%	1.40%	3
Öhman Småbolagsfond A	1991-09-20	30	3307	32.98%	91.24%	1.50%	3
Enter Sverige Pro	1999-11-30	21	485	51.99%	96.17%	0.50%	2
Enter Sverige A	1999-11-30	21	1123	44.93%	100.00%	1.70%	3
Didner & Gerge Aktiefond	1994-10-21	26	37352	45.68%	91.25%	1.22%	3
Nordea Småbolagsfond Sverige	2011-02-14	10	7718	41.43%	94.56%	1.50%	3
SPP Sverige PLUS A	2016-09-26	5	6120	36.37%	89.58%	0.30%	3
C Worldwide Sweden 1A	2009-12-01	11	2525	40.03%	89.83%	1.20%	3
Nordea Sverige Passiv Icke-utd	2008-09-01	13	4172	34.82%	93.39%	0.40%	3
Lannebo Sverige	2000-08-04	21	2805	31.15%	84.40%	1.60%	3
Danske Invest Sverige SA	2017-11-10	3	5589	38.20%	88.42%	1.15%	3
Swedbank Robur Access Sverige A	2015-09-10	6	26840	37.19%	92.34%	0.20%	3
SEB Sverige Expanderad	1973-11-11	47	12099	42.73%	87.32%	1.25%	3
Quesada Sverige	2001-12-05	19	271	32.88%	88.81%	1.35%	3
Öhman Sverigefokus A	2017-12-08	3	1182	45.33%	96.42%	1.50%	3
SEB Sverigefond	1984-12-31	36	16339	38.55%	85.19%	1.30%	3

Source: Avanza

Appendix C: ESG and Sustainability Scores

Table 19, Sustainable funds ESG and Sustainability Scores

Sustainable funds	E	S	G	Sustainability score
Spiltan Aktiefond Investmentbolag	0.78	3.51	8.47	14.35
Spiltan Aktiefond Stabil	3.39	4.73	5.95	19.04
Swedbank Robur Småbolagsfond Sverige A	-	-	-	22.02
Carnegie Småbolagsfond A	-	-	-	21.29
Humle Sverigefond	3.79	6.78	7.02	20.07
Handelsbanken Sverige 100 Index Criteria	3.68	7.94	7.58	20.55
Skandia Sverige Hållbar	2.84	6.05	5.66	20.37
Enter Småbolagsfond A	-	-	-	21.60
C Worldwide Sweden Small Cap 1A	-	-	-	20.45
Handelsbanken Sverige Tema (A1 SEK)	-	-	-	20.27
Didner & Gerge Småbolag	-	-	-	22.48
SEB Sverigefond Småbolag	-	-	-	22.05
Öhman Sverige Hållbar A	3.34	7.28	7.28	20.57
AMF Aktiefond Sverige	3.17	7.21	7.33	19.64
Nordea Swedish Stars icke-utd	3.7	8.86	7.69	20.25
Aktiespararna Topp Sverige	3.71	8.77	8.21	20.7
SPP Aktiefond Sverige A	3.9	8.42	7.82	20.55
Länsförsäkringar Sverige Aktiv	3.51	7.72	7.8	19.74
Average	**3.2555**	**7.0245**	**7.3464**	**20.3328**

Source: Morningstar

= *3 best ESG-score*

= *3 worst ESG-score*

Table 20, Conventional funds ESG and Sustainability Scores

Conventional funds	E	S	G	Sustainability score
PriorNilsson Sverige Aktiv A	4.86	8.62	6.56	23.64
Norron Active RC SEK	3.26	7.48	6.89	22.87
CF Tillväxt Sverige A	3.47	6.00	5.19	22.7
PLUS Mikrobolag Sverige Index	-	-	-	27.83
Swedbank Robur Exportfond A	4.39	7.81	6.31	22.68
BNP Paribas Nordic Small Cap CI C	-	-	-	24.02
Skandia Småbolag Sverige	-	-	-	22.61
Öhman Småbolagsfond A	4.05	6.65	5.51	23.45
Enter Sverige Pro	3.36	6.62	5.85	21.86
Enter Sverige A	3.69	7.37	6.26	22.07
Didner & Gerge Aktiefond	4.05	8.11	6.67	21.75
Nordea Småbolagsfond Sverige	-	-	-	23.38
SPP Sverige PLUS A	3.39	7.45	7.03	20.87
C Worldwide Sweden 1A	2.66	6.76	5.76	21.31
Nordea Sverige Passiv Icke-utd	3.86	8.33	7.95	20.85
Lannebo Sverige	3.6	10.06	7.76	21.98
Danske Invest Sverige SA	3.38	7.08	6.43	20.39
Swedbank Robur Access Sverige A	3.6	8.17	7.68	20.14
SEB Sverige Expanderad	3.99	7.70	7.61	21.28
Quesada Sverige	3.6	8.77	7.09	20.79
Öhman Sverige Fokus A	3.99	7.57	7.77	20.84
SEB Sverigefond	4.09	7.95	7.87	21.56
Average	**3.7383**	**7.6944**	**6.7883**	**22.2214**

Source: Morningstar

= *3 best ESG-score*

= *3 worst ESG-score*

Appendix D: Interview guide

- Vad gör du i din nuvarande roll?
- Vad är dina reflektioner kring hur COVID-19 har påverkat börsen?
- Finns det en korrelation mellan virus-spridningen och hur börsen reagerat? Så som ökade dödsfall lett till fall på börsen?
- Efter vilka direktiv (ESG, morningstar MSR, etc.) klassificerar ni som fondförvaltare era fonder som hållbara och icke-hållbara?
    - Vilket kriterium: E, S eller G är "viktigast" när det kommer till hållbarhet i en klacificeringsbedömning?
- Är det någon särskild händelse under det gångna året (2020) som du minns kan ha påverkat hållbara eller konventionella fonder i Sverige?
- Finns det en rimlighet i att göra ett antagande att COVID-19 pandemin har givit bränsle till klimatdebatten, vilket i sin tur kan ha ökat intresset för hållbara fonder?
- Har inflödet av kapital i fonder ökat eller minskat i fonder under året? Finns det en märkbar skillnad mellan inflödet av kapital i hållbara, kontra konventionella fonder?
- Har hållbara fonder (som inkluderar företag med hög ESG prestanda) klarat börsfallet och återhämtat sig bättre under året?
- Hade det amerikanska presidentvalet i november 2020 en stor effekt på den svenska fondmarknaden tror du?

Appendix E: Risk-adjusted return

Table 21, Sustainable funds risk-adjusted return

Sustainable funds	Mean daily return	Standard deviation	Sharpe ratio	Annualised Sharpe ratio	Treynor ratio	Annualised Treynor ratio	Beta
Spiltan Aktiefond Investmentbolag	0.12493%	1.43657%	0.08697	1.38056	0.00133	0.02118	0.93625
Spiltan Aktiefond Stabil	0.10757%	1.14435%	0.09400	1.49222	0.00142	0.02256	0.75694
Carnegie Småbolagsfond A	0.15416%	1.37966%	0.11173	1.77373	0.00198	0.03135	0.78052
Swedbank Robur Sverigefond A	0.10401%	1.29936%	0.08005	1.27071	0.00144	0.02283	0.72320
Humle Sverigefond	0.09879%	1.47069%	0.06717	1.06631	0.00100	0.01591	0.98550
Handelsbanken Sverige 100 Index Criteria	0.08553%	1.32145%	0.06472	1.02745	0.00103	0.01640	0.82780
Skandia Sverige Hållbar	0.11893%	1.36363%	0.08722	1.38452	0.00143	0.02266	0.83322
C Worldwide Sweden Small Cap 1A	0.18942%	1.38772%	0.13650	2.16688	0.00225	0.03565	0.84359
Enter Småbolagsfond A	0.13698%	1.38473%	0.09892	1.57035	0.00178	0.02828	0.76905
Handelsbanken Sverige Tema (A1 SEK)	0.14136%	1.14435%	0.12352	1.96089	0.00183	0.02903	0.77285
Didner & Gerge Småbolag	0.10318%	1.31473%	0.07848	1.24580	0.00123	0.01956	0.83741
SEB Sverigefond Småbolag	0.14091%	1.41193%	0.09980	1.58427	0.00175	0.02784	0.80342
Öhman Sverige Hållbar A	0.07216%	1.43390%	0.05032	0.79883	0.00076	0.01203	0.95233
AMF Aktiefond Sverige	0.07993%	1.29754%	0.06160	0.97786	0.00098	0.01558	0.81465
Nordea Swedish Stars icke-utd	0.07330%	1.35637%	0.05404	0.85788	0.00090	0.01432	0.81271
Aktiespararna Topp Sverige	0.07330%	1.35637%	0.05404	0.85788	0.00088	0.01394	0.83460
SPP Aktiefond Sverige A	0.07610%	1.39738%	0.05446	0.86454	0.00081	0.01293	0.93446
Länsförsäkringar Sverige Aktiv	0.08840%	1.29533%	0.06825	1.08337	0.00109	0.01729	0.81153

Source: Thomas Reuters Datastream (own calculations)

Table 22, Conventional funds risk-adjusted return

Conventional funds	Mean daily return	Standard deviation	Sharpe ratio	Annualised Sharpe ratio	Treynor ratio	Annualised Treynor ratio	Beta
PriorNilsson Sverige Aktiv A	0.07002%	1.31927%	0.05307	0.84254	0.00079	0.01257	0.88432
Norron Active RC SEK	0.05885%	1.33191%	0.04419	0.70142	0.00066	0.01048	0.89107
CF Tillväxt Sverige A	0.11091%	1.33853%	0.08286	1.31541	0.00137	0.02169	0.81183
PLUS Mikrobolag Sverige Index	0.11226%	1.24833%	0.08993	1.42757	0.00158	0.02513	0.70904
Swedbank Robur Exportfond A	0.10196%	1.35887%	0.07503	1.19113	0.00124	0.01967	0.82279
BNP Paribas Nordic Small Cap CI C	0.12792%	1.53631%	0.08327	1.32179	0.00134	0.02123	0.95641
Skandia Småbolag Sverige	0.13436%	1.39854%	0.09607	1.52505	0.00164	0.02610	0.81706
Öhman Småbolagsfond A	0.11389%	1.35486%	0.08406	1.33442	0.00131	0.02086	0.86689
Enter Sverige Pro	0.10755%	1.41621%	0.07594	1.20559	0.00113	0.01801	0.94810
Enter Sverige A	0.11727%	1.39953%	0.08380	1.33021	0.00125	0.01992	0.93465
Didner & Gerge Aktiefond	0.08997%	1.48650%	0.06052	0.96075	0.00091	0.01447	0.98726
Nordea Småbolagsfond Sverige	0.12489%	1.28504%	0.09719	1.54286	0.00167	0.02651	0.74784
SPP Sverige PLUS A	0.09661%	1.30966%	0.07377	1.17102	0.00117	0.01858	0.82533
C Worldwide Sweden 1A	0.10514%	1.32290%	0.07948	1.26165	0.00133	0.02104	0.79333
Nordea Sverige Passiv Icke-utd	0.08625%	1.30273%	0.06621	1.05103	0.00106	0.01680	0.81490
Lannebo Sverige	0.06958%	1.41220%	0.04927	0.78218	0.00081	0.01287	0.85820
Danske Invest Sverige SA	0.08601%	1.31307%	0.06550	1.03978	0.00108	0.01712	0.79750
Swedbank Robur Access Sverige A	0.08221%	1.32266%	0.06216	0.98671	0.00099	0.01569	0.83179
SEB Sverige Expanderad	0.08646%	1.27267%	0.06793	1.07838	0.00109	0.01737	079011
Quesada Sverige	0.06576%	1.37785%	0.04773	0.75762	0.00071	0.01124	0.92864
Öhman Sverigefokus A	0.07961%	1.41480%	0.05627	0.89322	0.00085	0.01349	0.93675
SEB Sverigefond	0.09032%	1.28562%	0.07026	1.11527	0.00114	0.01803	0.79533

Source: Thomas Reuters Datastream (own calculations)

Appendix F: Fund-flow AUM

Table 23, Fund-flow AUM

Date	Sustainable funds change %	Conventional funds change %
2019-01-01	-	-
2019-02-01	7.51570%	7.23123%
2019-03-01	1.98755%	4.75530%
2019-04-01	0.78879%	0.36174%
2019-05-01	6.77490%	10.34478%
2019-06-01	-5.19930%	-5.28177%
2019-07-01	28.55511%	7.28007%
2019-08-01	1.50883%	0.41739%
2019-09-01	-1.52509%	-1.31821%
2019-10-01	1.96008%	2.87905%
2019-11-01	2.63634%	7.71913%
2019-12-01	2.21326%	3.71981%
2020-01-01	5.39496%	3.96264%
2020-02-01	-1.43563%	1.00585%
2020-03-01	-6.04841%	-8.02937%
2020-04-01	-15.08616%	-18.78476%
2020-05-01	9.61721%	12.15096%
2020-06-01	6.81272%	5.78293%
2020-07-01	2.40608%	-4.76147%
2020-08-01	5.52979%	6.76074%
2020-09-01	5.26107%	6.20384%
2020-10-01	4.79673%	3.51078%
2020-11-01	-5.92866%	-6.74695%
2020-12-01	9.45638%	11.46711%

Source: Thomas Reuters Datastream