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DOES ESG SCORE HAVE AN IMPACT ON THE FINANCIAL PERFORMANCE OF ETFs

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ABSTRACT:

Socially responsible investing (SRI) is the inclusion of non-financial factors in the investment decision-making process. The SRI approach complements conventional investment portfolio optimization by considering environmental, social and governance factors (ESG). Responsible investing is a recent growing trend among Exchange-traded Funds (ETF). The popularity is explained by low management costs and a wide range of options. Investors can use ETFs to invest in equities, interest rates, real estate or commodities across a wide range of geographical areas and industries.

The purpose of this study is to contribute to the present literature by investigating whether the inclusion of ESG parameters in the process of creating ETF portfolios affects abnormal returns over the research period 1.1.2010-31.7.2020 in the U.S market. This study utilizes Morningstar's sustainability rating based on company-specific benchmarking data collected by Sustainalytics. Following this, sustainability ratings have been used to construct different portfolios.

Research is conducted by analyzing how substantially different sustainability ratings produce abnormal returns and differences between portfolios performances. For determining the alphas for the portfolios, factor models such as CAPM, Fama-French 3-factor, Carhart 4-factor, and Fama-French 5-factor are utilized. Furthermore, an analysis of risk-adjusted performance is extended by investigating the Sharpe ratio and Treynor ratio.

Empirical results reveal that during the research period, each portfolio yielded negative returns. However, both the unsustainable and the sustainable portfolios underperform compared to conventional portfolios, i.e., a portfolio that includes the average score ETFs. The results of this study indicate that there is an increased risk of loss when investing in widely unsustainable or sustainable portfolios.

KEYWORDS: Exchange-Traded Funds, Socially Responsible Investing, Factor Models, ESG, Alpha

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TIIVISTELMÄ:

Viimeisen vuosikymmenen aikana sosiaalisesti vastuullisesta sijoittamisesta on tullut nopeasti kasvava ilmiö rahoitusalalla. Ihmiset ovat aikaisempaa tietoisempia ympäristöasioista ja haluavat suosia vastuullisia vaihtoehtoja jokapäiväisessä elämässä, mutta myös sijoittamisessa. Vastuullisuuteen liittyvän kiinnostuksen takia on syntynyt useita sosiaalisesti vastuullisia rahastoja, indeksejä ja sijoitusstrategioita, mikä on antanut sijoittajille mahdollisuuden yhdistää henkilökohtaiset mieltymyksensä ja arvonsa sijoituspäätöksiinsä. Vastuullinen sijoittaminen onkin muodostunut viime aikoina kasvavaksi trendiksi pörssilistattujen rahastojen (ETF) keskuudessa. Rahastojen suosio selittyy alhaisilla hallintokustannuksilla ja laajalla valikoimalla. Sijoittajat voivat käyttää ETF-rahastoja sijoittaakseen osakkeisiin, korkoihin, kiinteistöihin tai hyödykkeisiin monilla eri maantieteellisillä alueilla ja toimialoilla.

Tämän Pro Gradu -tutkielman tarkoituksena on laajentaa nykyistä tutkimuskirjallisuutta ja tutkia ETF-rahastojen epänormaajeja tuottoja. Tutkielmassa selvitetään, vaikuttaako ESG-parametrien sisällyttäminen ETF-portfolioiden luomisprosessiin tutkimusjakson 1.1.2010-31.7.2020 aikana Yhdysvaltojen markkinoilla. Tutkielmassa hyödynnetään Morningstarin kestävyysluokitusta, joka perustuu Sustainalyticsin keräämiin yrityskohtaisiin vertailutietoihin.

Tutkielmassa analysoidaan, kuinka olennaisesti erilaiset kestävyysluokituksesta rakennetut portfoliot tuottavat epänormaalia tuottoa eli alfaa. Salkkujen alfojen määrittämiseen käytetään faktorimalleja, kuten CAPM, Fama-French 3-faktoria, Carhart 4-faktoria ja Fama-French 5-faktoria. Riskiin mukautetun suorituskyvyn analyysiä laajennetaan tutkimalla myös Sharpen ja Treynorin suhdelukuja.

Tämän tutkielman empiiriset tulokset paljastavat, että tutkimusjakson aikana jokainen portfolio on tuottanut negatiivistä alfaa. Sekä erittäin vastuulliset että vastuuttomat portfoliot ovat kuitenkin heikompia kuin portfolio, joka on rakennettu edellämainittujen väliltä. Tulokset osoittavat, että rahastojen tappioriski kasvaa, kun sijoitetaan erittäin vastullisiin tai vastuuttomiin ETF-portfolioihin.

AVAINSANAT: Exchange-Traded Funds, Socially Responsible Investing, Factor Models, ESG, Alpha

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Abbreviations

AMEX	American Stock Exchange
CAL	Capital allocation line
CAPM	Capital Asset Pricing Model
CRSP	Center for Research in Security Prices
CSR	Corporate Social Responsibility
ESG	Environmental, Social and Good Governance
ESRB	European Systemic Risk Board
ETF	Exchange Traded Fund
EUROSIF	European Sustainable Investment Forum
FINSIF	Finland's Sustainable Investment Forum
FSB	Financial Stability Board
IOSCO	International Organization of Securities Commissions
NASDAQ	National Association of Securities Dealers Automated
NAV	Net Asset Value
NYSE	New York Stock Exchange
OLS	The Ordinary Least Square
PRI	Principles for Responsible Investment
SIB	Social Impact Bond
SPDR	S&P Depositary Receipts Trust Series 1
SRI	Socially Responsible Investing

1 INTRODUCTION

Corporate responsibility and ethics have become mainstream in the business world. Sustainable economic development includes both ecological and social responsibility. The economy should be built as eco-efficient as possible for resource consumption, and welfare should be distributed evenly. The interest in the subject has been particularly increased by several unethical and irresponsible events that have become worldwide and have gained considerable publicity, for example, the financial scandal of Enron in 2001 and WorldCom in 2002. Valuing and pursuing socially responsible, sustainable, and environmentally friendly businesses have created a new market for the financial sector.

Corporate social responsibility is receiving increasing attention, and its value has also been recognized in investment activities. The modern perspective on responsible investment was born in the 1960s when companies that benefited from the Vietnam War were criticized. It is difficult to define and classify socially responsible investing as it involves many different factors. Ethical, social, responsible, and sustainable are all terms that are used when talking about socially responsible investing. Generally speaking, SRI combines environmental, social, and corporate governance factors in the investment process. (Sparkes 2008)

Practically implementing a strategy and following responsible investment principles can often be the most challenging part of responsible investment. Responsible investment is not a one-time operation that ends with the approval of the principles. Responsible investment is part of our daily operations. It gives the action a more significant direction, so it must follow the same systematic and operational implementation as the organization's other activities.

There is no one way to invest responsibly, but every investor chooses the right tools for their investment strategy. Investors may have different and often collateral reasons to invest responsibly. The motives for responsible investment are often related to

extensive risk management and providing a good return on investment. Besides, an investor may seek social acceptability by considering SRI factors. The expectations of stakeholders matter and most investors want to be concerned about their brand value and prepare for the authorities' future demands. Investors do not have to give up their financial goals to invest responsibly. Responsible Investment into Exchange Traded Funds (ETF) are designed to meet the characteristics of traditional investments while targeting specific social impact goals, such as improving the ESG (Environmental, Social, and Good Governance) rating in the portfolio.

Responsible investment has evolved from a limited set of investments into several solutions that focus on achieving sustainable results. Whether it is to reduce risk, comply with a regulation, or target thematic impacts, the requirement to take these approaches into account has increased considerably. The next generation of investors is looking for ways to invest responsibly, so investments should consider social and environmental concerns. The Sustainability Directives encourage investment in renewable energy and require reporting on its social and environmental aspects. Therefore, the company's way of managing its environmental and socially responsible aspects is the key to business efficiency and productivity. (Blackrock 2020)

The Limited-liability Companies Act states that the purpose of a limited liability company is to generate as much profit as possible to shareholders. Nevertheless, the law does not require companies to maximize profits in every way; on the contrary, maximizing profits is only essential when both the requirements of society and shareholders are taken into account. Investors gain a more extensive understanding of a company's operations and how its shareholders' money is used whenever a company is transparent about its operations. Investors with ethical standards can influence the development of a circular society by selecting the right companies. Ethical investors do not wish to increase their wealth at the expense of people and the environment, i.e., desire to increase wealth but to make investment decisions based on ethical values and supporting sustainable development.

Economic and social development issues are difficult to distinguish because the different problem areas are intertwined. All actors in society, i.e., individuals, companies, the public sector, and international actors, have a role to play in developing a sustainable economy. In addition to consumers and employees demanding companies to act responsibly, its importance has also grown significantly among investors. Applying privacy values to investment behavior is a common continuum. Especially when research shows responsible investing can achieve several benefits over other strategies. By investing responsibly, the investor is forced to become better acquainted with potential investment targets by analyzing the company's ESG factors. With increased monitoring of companies' activities, responsible investments have expanded and diversified in the 21st century. (GSIR 2018)

Sustainable investment assets continue to grow globally, with some regions demonstrating more robust growth than others within their local currencies. Sustainable and responsible investment assets are domiciled worldwide, and Europe continues to dominate, with nearly half of global sustainable investment assets.

				Growth Per Period		Compound Annual Growth Rate (CAGR) 2014–2018
	2014	2016	2018	Growth 2014–2016	Growth 2016–2018	
Europe	€ 9,885	€ 11,045	€ 12,306	12%	11%	6%
United States	$ 6,572	$ 8,723	$ 11,995	33%	38%	16%
Canada (in CAD)	$ 1,011	$ 1,505	$ 2,132	49%	42%	21%
Australia/New Zealand (in AUD)	$ 203	$ 707	$ 1,033	248%	46%	50%
Japan	¥ 840	¥57,056	¥231,952	6692%	307%	308%

Figure 1. Growth of sustainable investing assets by region in local currency 2014-2018 (GSIR 2018).

Some of the declines in the share of European investment markets may be due to an intense debate about defining a sustainable investment. There is evidence of market maturity in Europe, where socially responsible investment has been widely used and accepted. Sustainable investment assets grew in 2016-2018 at a modest pace, but not as fast as the global amount of professionally managed assets in Europe. Work to develop a taxonomy for sustainable development investments, the definition of a green bond, and the eco-label are examples of critical factors that influence and guide investors. At the beginning of March 2019, the European Parliament adopted its Sustainable Financing Action Plan rules that asset managers have to use a common reporting standard to publish how they keep the ESG factors and prevent them from "greenwashing," meaning their commitment to sustainable investment. (GSIR 2018)

1.1 Purpose of the Study, Research Questions and Hypotheses

Recent years have seen a substantial increase in the popularity of two trends in financial markets: sustainable and responsible investing and passive asset management. This thesis responds to a topic of interest that has arisen in recent decades. The purpose of this research is to analyze whether the inclusion of ESG parameters in the process of creating ETF portfolios has a significant impact on abnormal returns, i.e., positive or negative.

Markowitz's modern portfolio theory and CAP model are the central theories of modern financial theory that provide this research's theoretical frame of reference. One of the key findings of modern portfolio theory is that diversification reduces the riskiness of the investment portfolio. According to traditional financial theory, limiting the number of potential investments, such as ESG ratings or to a specific area generates an alternative cost that undermines the investor's risk-return ratio due to narrowing the diversification benefits.

For the purposes of collecting comparable data, this research establishes ETFs offered in the United States of America since the US has the largest selection. In addition, according to the Morningstar database, the thesis uses only equity ETFs that have been assigned a sustainability rating.

It seems rational to expect that this research will also discover abnormal returns because previous research into sustainable investments has found no evidence of extraordinary results, either positive or negative performance. According to previous research's, the performance of socially responsible investments is typically compared to traditional mutual funds in most studies. The purpose of this thesis is to determine whether incorporating ESG factors into portfolio construction results in significant abnormal returns. As a result, the following research questions can be formulated: Does sustainability level affect ETF return, and Does low sustainable ETFs underperform high sustainable ETFs?

Moreover, since we assume there to be no statistically significant relationship between ESG score and abnormal returns there, the null hypothesis of this study can be framed as follows:

H_0 = Inclusion of the ESG score criteria does not lead to abnormal returns

As long as no significant abnormal returns are observed between low and high ESG portfolios, the null hypothesis will hold. When the factor models generate positive or negative statistically significant alphas, the null hypothesis can be rejected provided that the abnormal return is statistically significant. To be more specific, since we want to establish whether ESG scores are associated with abnormal returns, we can propose the following alternative hypothesis:

H_1 = Negative abnormal returns are associated with ESG score portfolios

H_2 = Positive abnormal returns are associated with ESG score portfolios

H_3 = High ESG score portfolio has higher risk-adjusted returns than low ESG score portfolio

H_4 = Low ESG score portfolio has higher risk-adjusted returns than high ESG score portfolio

1.2 Structure of the thesis

The purpose of this chapter is to provide a deeper understanding of the thesis' structure. This thesis is organized into two sections: a theoretical and empirical part which are further subdivided into eight different main chapters. Initially, the topic was introduced by explaining today's role and contemporary nature of sustainable investments and its relevance today.

In section 2, the chapter introduces the Exchange Traded Fund (ETF) as the investment instrument examined in this thesis. The chapter discusses the characteristics, history, types, benefits and risks of the ETF as an investment tool. We will focus on sustainable and responsible investing in the third section; the framework for modern portfolio theory will be presented first, followed by a discussion of the context of SRI and An explanation of how investors can benefit from sustainability. Moreover, introduce the ESG framework, the most commonly used structure for socially responsible investments and explain how Morningstar's sustainability rating defines the score for sustainable ETFs. As final, previous research in this phenomenon is examined. Thus findings are analyzed and discussed under section 4.

A more detailed description of variables used in this study is presented in chapter 5 and is followed by analysis of a selection of the methodology. Moreover, descriptive

statistics of the portfolios are also presented in chapter 6 as it describes the data collection process and construction of the portfolios under analysis. Finally, chapter 8 presents the results of the thesis empirical part, while chapter 8 discusses and concludes the findings.

2 ETF – EXCHANGE TRADED FUND

This section illustrates Exchange Traded Funds (ETFs) as investment instruments for this study. Investing in an ETF is the same as buying and selling shares on a stock exchange and allows an investor to invest in virtually any asset class and anywhere in the world.

ETFs are an affordable and straightforward way to enter specific industries, such as the Brazilian, Russian, or Chinese stock markets. The financial crisis of 2008-2009 also contributed to the success of the ETF. In the darkest moments of the financial crisis, special funds had difficulty paying out the redemptions of the funds, resulting in a bad reputation for the funds. This contributed to the indexed products being traded. Where an actively managed mutual fund seeks to outperform its benchmark index and outperform the market in absolute terms, the ETF aims to achieve the return of the index it monitors as closely as possible (Cremers and Petajisto, 2009)

Investing in ETFs and index funds share the same goals: to provide investors with easy access to diversified portfolios by using economies of scale by accumulating large numbers of stocks at a low cost. However, the goal is achieved in two very different ways. Although ETFs are often referred to as funds, there are many differences. Both are created at the same basic idea; their differences make them significant. Both contain many different investment objects, and when investing in one such part of the share, get a piece of each investment in the share. In this case, it can be considered that it has acquired a diversified portfolio by investing in one product. A lot depends on the investment strategy and policy of the fund and the ETF, how well the diversification has been successful.

Gastineau (2001) determines that the ETF stock market works like the traditional stock market, and unlike traditional mutual funds, a shareholder can purchase or sell shares of an ETF at any time of the day. Daily NAV value is also calculated for the ETF based on all receivables and liabilities, but in principle, ETF units are acquired by purchasing on the stock exchange. The best offer to sell or buy on the stock exchange may not be at a reasonable level concerning the previous value calculation of the fund and the stock exchange movements of the shares in the fund. Therefore, the fund's indicative NAV (iNAV) should constantly be monitored. Intraday net worth is one method of determining this reference point. iNAV provides the ETF's intraday indicative value based on the market values of the underlying components

An ordinary mutual fund is subscribed by depositing money in the fund's account and redeemed by notifying the management company. The mutual fund accepts cash deposits from external investors and issues shares in exchange for the fund's NAV (net asset value). Subscriptions and redemptions will be made at the same NAV as the official valuation date of the exercise date, considering all the fund's liabilities and receivables. When redeeming a fund unit, the management company is obliged to redeem the units from the unitholder. Here, a so-called cut-off period is used, which means the day on which the NAV is redeemed. This period is indicated in the fund rules. (Kostovetsky 2003)

2.1 History of ETFs

As early as 1993, a trust called S&P Depositary Receipts Trust Series 1, or SPDR was listed on the American Stock Exchange, establishing the beginning of current exchange-traded funds. The ETF is an excellent example of how the efficiency of the financial world creates new products. In the academic world of finance, it was long ago realized that better-than-average results could be achieved with a portfolio that follows the index and nominal fees. (Puttonen and Repo, 2011)

With a few decades of development, ETFs have become among the most universal investment instruments for individual and institutional investors. ETFs originated at the turn of the growth of the index investment phenomenon in the 1960s and 1970s. The cornerstone of the indexing idea is considered to be Markowitz's (1952) study, which for the first time separated the risk of one stock from the risk of the entire portfolio.

The world's first ETF was the Canadian Toronto Index Participation Fund, established in 1989. It followed 35 of the most traded Canadian companies, the TSE-35 Index. In 1993, the first US ETF product was obtained; Standard & Poor's Depository Receipts, further generally known as Spider, which tracks the S&P 500 index.

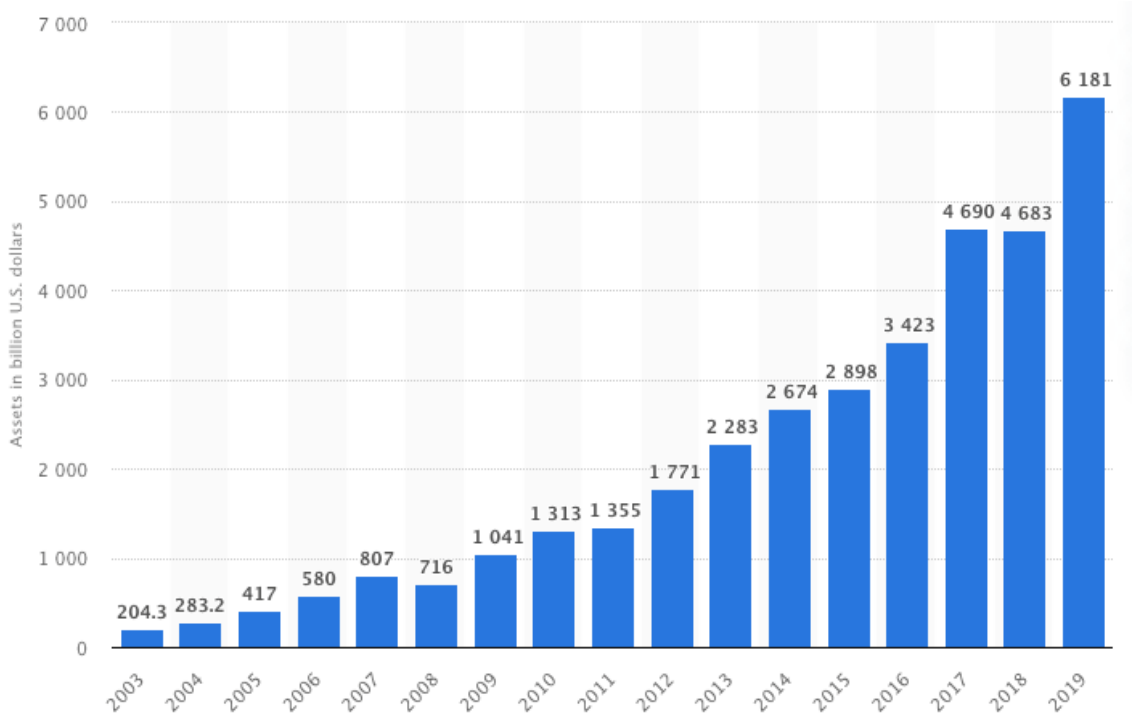

Figure 2. Development of assets of global Exchange Traded Funds (ETFs) from 2003 to 2019 (Statista, 2020).

The graph represents the latest available report between 2003 and 2019 on the development of ETF assets worldwide. Over the past decades, exchange-traded funds have been a leading financial innovation. Before the financial crisis, the market for ETFs

was very different from today. It is estimated that in 2009, less than 1000 participants were involved in the ETF market, which has around 1000 billion dollars under management. The growth has been explosively strong over the past decade. For instance, the value of ETF funds has increased by more than 750% from 2008 to 2019. There are currently around 6900 listed funds globally, with net assets of more than 6.1 trillion dollars. (Statista, 2020.)

The low-cost structure of ETFs will maintain market growth in the near future. Moody predicts the market share of ETF products will grow to a quarter of European fund markets by 2025. This growth will be driven by more sophisticated ETF products and the spread of ETF offerings to new market segments, such as responsible investing. For example, the Securities and Exchange Commission is currently reviewing more than 1,000 new ETF applications, according to ETF.com.

2.2 Types of ETFs

ETFs can be classified, for example, according to the replication method they use. The replication method refers to how the fund monitors the underlying security or portfolio of securities. For example, if a fund buys stocks directly from the market in order to build a portfolio that mimics the performance of the S&P 500 index, then talking about physical replication. However, if this same yield is sought to be achieved through different derivatives, then it is synthetic replication. (Jantunen 2020)

In the world of ETF products, there is enough supply for everyone. With the help of various ETFs, A retail investor has access to several markets, including the stock, fixed income and commodities markets. In addition to asset classes, ETFs are also suitable for investing in narrower markets, such as by country or industry. The main types of ETFs include equity funds, currency funds, real estate funds, fixed-income funds, specialty funds and commodity funds. (Blackrock 2020, Petrova 2016)

Investing in index ETFs means that the fund's portfolio will contain securities from the index, whether they repeat a specific index or the index as a whole. The assets of some indexed ETFs are allocated entirely to the securities underlying the index. Commodity exchange traded funds track the performance of underlying indexes of a particular asset or commodity. They do not trade stocks, i.e., metals and futures are the types of investments of commodities ETFs. Investors buy bond ETFs to generate regular income, which is determined by the performance of the bond underlying the ETF. When investors withdraw money from the stock market, it is more likely to purchase bonds that are considered stable during economic recessions. (Blackrock 2020, Petrova 2016)

2.2.1 Physical and synthetic replication

ETFs can be classified according to the replication method, strategy for reaching investment goals using physical- or synthetic instruments. The replication method refers to how the fund implements the tracking of the underlying asset. For instance, if a fund buys shares directly from the market to create an investment portfolio that imitates the performance of the S&P 500 index, it refers to physical replication. However, if the same return is retrieved through different derivatives, then it is a synthetic replication. (Naumenko & Chystiakova 2015.)

However, in all cases, complete replication is not possible. This may be due either to the high cost of replication or because it is not possible in a given time. Therefore, it is often decided to perform the physical replication in an optimized manner, i.e., by defining an index to be imitated based on a smaller sample. The cost of physical replication can generally be offset by efficient portfolio management techniques, such as generating additional returns through securities lending. Synthetic replication using derivatives may be necessary for situations where the underlying market is challenging to replicate physically. Synthetic replication usually occurs through total return swaps. In synthetic ETFs, the counterparty always provides collateral in return for the assets. The fund may

pay a cash return to a counterparty to the exchange for delivering a return on the underlying asset to the fund. Alternatively, the ETF may own the securities and deliver the return swaps to the counterparty in exchange for the return on the securities' underlying assets. (Naumenko & Chystiakova 2015; IOSCO 2013.)

Physical and synthetic ETFs have their sides. The practical differences between physical and synthetic ETFs arise from their ability to track their benchmark and other operational risks, tax treatment, and the resilience of structures in crises. The good side of physical ETFs is the near real-time transparency of the securities included, allowing investors to know where they have invested. Replication of synthetic ETFs index contents and weights are rarely available to private investors, which may make it difficult to compare investment targets. The advantage of synthetic replication over physical replication is its cost-effectiveness. (IOSCO 2013; Kosev & Williams 2011).

2.3 Benefits and risks of ETF investment

ETF investing offers easy diversification, a low-cost structure, and the tax efficiency of a standard index fund. From the investor's point of view, they are positioned between listed shares and mutual funds. ETFs are an increasingly popular investment vehicle. They have many benefits, but their risks also need to be identified. Because ETFs can provide broad diversification of stocks and bonds while costing a fraction of what other asset classes do, they are often considered much less risky. A number of ETFs are equivalent to traditional index funds, so there are actually thousands to choose from. Investing in ETFs involves fees and risks similar to any other type of investment. (ETF database, 2017b)

ETFs can be used to make suitable investments for both a core investment portfolio and a tactical investment. Open-end mutual fund shares are traditionally traded once a day following the close of the markets. The NAV (Net Asset Value) will not be released until the Fund's Announcement Date has ended in order for the investor to know the price

they paid for shares purchased that day and the price they will receive for shares that sold on that day.

While ETFs are traded on stock exchanges like shares. Buying and selling ETFs is easy whenever the market is open. The flexibility allows investors to be interested in being able to place orders in various ways and making timely investment decisions. The pricing of ETF shares is uninterrupted over the regular trading day. Prices fluctuate during the day so that it is primarily established on the variables intraday value of the fund's underlying assets. Investors know in an instant how much they will pay for the shares and how much they will receive after selling. (Foucher & Gray 2014.)

ETFs often have lower management fees than active funds, and their costs are easier to calculate. The management costs of ETFs are meager, the most expensive being less than one percent, the cheapest is one-hundredths of a percent. The average management costs in Europe and the United States are only 0.5 percent per year. However, the final total cost is increased by ongoing active trading, which incurs brokerage fees, spreads, and custody costs. Transparency tells you what securities the fund has at any given time. This way, the investor knows what he owns. Diversification: one investment yields returns on several different securities. Access: can be invested in international markets. (Abner 2016; Foucher & Gray 2014; Kostovetsky 2003.)

Fund investments always involve the risk of maintaining the return and capital of the investment. Moreover, they are ETF-specific idiosyncratic. They involve the same market uncertainty and risks related to the fund's value fluctuations when investing in individual securities. The quality and amount of risks vary depending on the ETF being invested in because each ETF has different risks based on the investments it incorporates. As a general rule, the risk can be considered the lowest in the ETFs following the interest rate index and the highest in the ones following the stock index.

Every investor is exposed to market risk. Market uncertainty is the most natural type of risk that investors suffer. Market risk, also called systematic risk, is related to the risk that affects all securities in the same way. This is affected by inflation, interest rates, employment situation, and other economic factors. Many ETFs aim to find securities least sensitive to market instability (Sullivan & Xiong 2012).

Although ETF trading is comparable to typical stock investment, it may be difficult to liquidate the investment. The liquidity of ETFs is two-tiered. It is based on secondary markets, which are usually quoted on a regulated public market but also for the creation and redemption of fund units in the primary market. Liquidity risk refers to the risk that arises from the risk associated with a trading asset. The easier it is to sell assets, the lower is the liquidity risk. However, liquidity cannot be guaranteed as the liquidity of the securities in the index monitored by the ETF may fluctuate in the primary market. At worst, this can prevent trading at the latest market price or the right price. Composition risk is reflected in international ETF investments. The fund's investments may not precisely match, for example, the name of the fund or the composition of the target market. ETFs that follow indices do not represent interchangeably. Therefore, there is composition risk involved. It is suitable for the investor to be aware that the index-weighting method of the ETF may lead to a price development that differs from the replicated asset benefit. For example, a balanced index weighting often leads to better price development than a market-weighted index in bull markets. Correspondingly, return development is weaker in the bear market. (Bank of Finland 2020; Blackrock 2020).

Trading risk indicates the total cost of owning an ETF portfolio. ETF is described to be tax-effective, transparent, and less expensive when compared to other classes of assets. Although ETFs do not acquire direct trading costs, they do obtain commissions, selling prices, market impact costs and bid-ask spreads, as well as management expenses. If the underlying asset of the product is listed in a foreign currency, then the investor is exposed to currency risk. This means that the value of a product may decrease even if

the value of the underlying asset quoted in a foreign currency increases, decreases, or remains unchanged. (ETF database 2017b; VFG 2020)

A fund may suffer a loss due to a counterparty risk, which is linked to the solvency of the counterparty contract and bankruptcy risk. In this case, the counterparty will not be able to repay the debt in the agreed way. (ETF database, 2017b.)

However, the rapid development of the ETF market has attracted the attention of supervisors. For example, the European Systemic Risk Board (ESRB), the International Organization of Securities Commissions (IOSCO), the Financial Stability Board (FSB) and the US Federal Reserve have considered what this widespread passive investment means for financial market stability and vulnerabilities. The biggest questions relate to three different issues. First, it is unclear how well investors are able to take into account the structural differences between these ETF products. Secondly, there is no clear idea of how well the two-tier liquidity of these funds works in extreme situations. Thirdly, it has also begun to consider whether these passive investment products may have other characteristics that affect the functioning of the market. (Jantunen 2020)

3 SOCIALLY RESPONSIBLE INVESTING

In this section, the concept of corporate social responsibility (CSR) must be defined before introducing responsible investing. CSR has been made to define and delimit through theories that seek to answer the question of what corporate responsibility is to society. It is challenging to determine the concept of CSR, as components may be challenging to separate from other actors of responsibilities due to the complex nature of the issue. Renewable habits and practices constantly shape corporate social responsibility. According to the definition of CSR, a business is accountable for its actions to the society in which it operates with other actors. Because social awareness and action are essential to a company's success, Brigham, Gapinski, and Ehrhard (1999) investigated the case through the question, "How do we balance social concerns against the need to create value for our shareholders?" The two primary options are to define CSR either internally or through a qualitative dimension. Through the qualitative dimension, CSR is all responsibility with some social character, regardless of the concreteness of the responsibility or the degree of commitment to CSR. Intervene working conditions for employees or polluting the environment are examples of internal definition. (Järvinen 2004).

3.1 Modern portfolio theory

Portfolio theory can be called one of the most central and essential theories in financial science. One of the key issues is how to allocate funds between alternative investment targets. Markowitz (1952, 1959) is a pioneer of modern portfolio theory. Markowitz defined portfolio challenges as a problem of portfolio mean and variance. The purpose of the theory is to optimize and maximize the expected return based on the desired market risk, emphasizing that the risk is an integral part of the higher return. Modern portfolio theory argues that the risk and return components of an investment should not be considered in relation to individual securities but should be assessed based on how the investment affects the risk and return of the entire portfolio. According to the

theory, it is possible to build an effective marginal range of an optimal portfolio that offers a maximum return for a given level of risk.

Portfolio theory shows that an investor can build multiple assets that maximize returns at a selected level of risk. At the same time, the portfolio can be built according to the desired return expectation with the lowest possible risk. Since statistical measures such as variance and correlation of return on individual investment are not as important as how the investment behavior is connected with the whole portfolio. (Markowitz 1959)

Markowitz's idea is based on investment diversification. The risk includes a long-term positive return expectation in the securities market, i.e., securities can be expected to rise on average. By diversifying investments into several different objects instead of investing all in one, the risk associated with the investment can be reduced. Thus, the portfolio's volatility is less than the weighted sum of the volatilities of the individual investments. To calculate the volatility of the portfolio, i.e., the standard deviation, in addition to the number of securities, the covariances between returns must be considered. Covariance measures how much the returns of two securities move simultaneously. A positive covariance means that the assets merge with each other, and a negative covariance means that they move inversely. When investments have high covariance with each other, they do not offer the benefit of diversification. (Bodie, Kane & Marcus 2005)

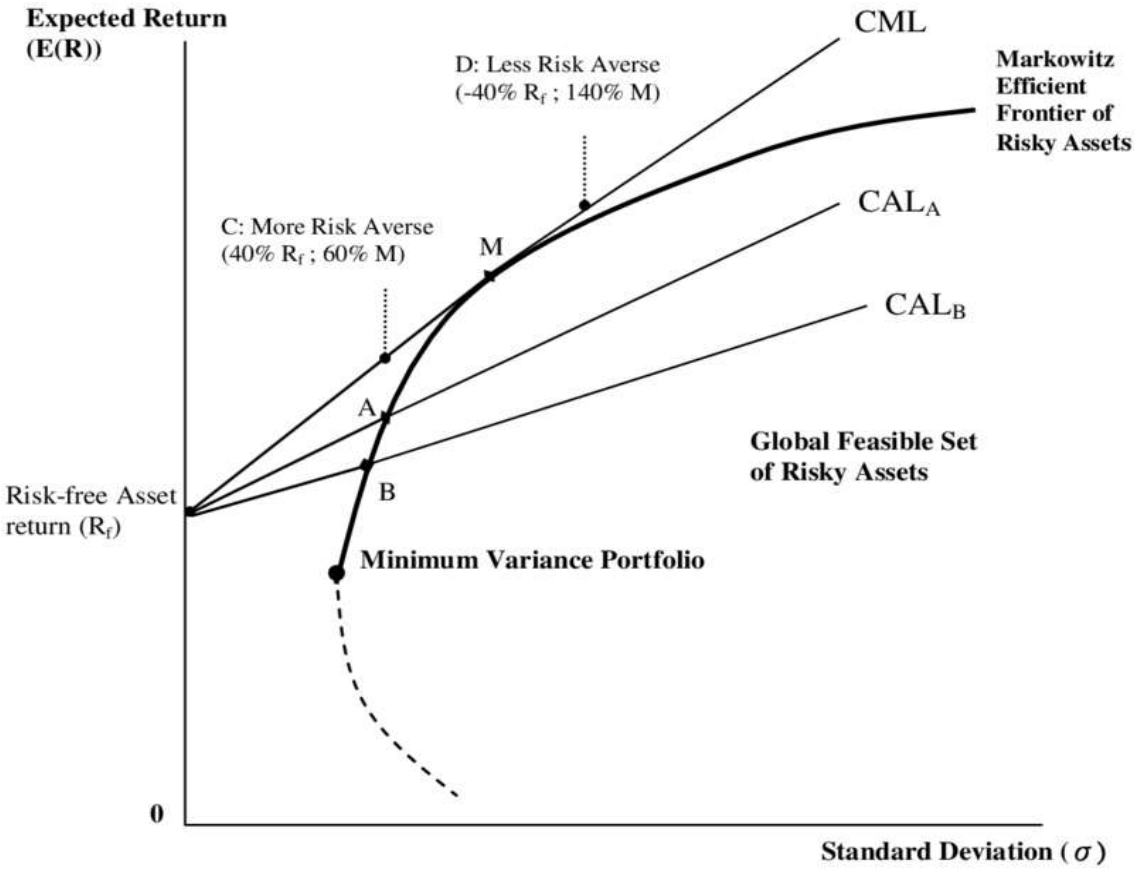

Figure 3. Markowitz Efficient Frontier of Risky Assets (Hodnett 2012).

Figure 3 illustrates the essential basics of modern portfolio theory. The X-axis describes the risk of the investment portfolio, and the Y-axis is the expected return. Thus, the capital allocation line (CAL) describes the risk-return ratio. An efficient front describes all those investment portfolios with an optimal return-to-risk ratio. If the investment portfolio's combination of return and risk is below the efficient frontier, the risk-return combination is not optimal. The return expectation of the portfolio may be the same as in the optimal investment portfolio of the efficient front, but the risk is higher. Alternatively, the risk of a portfolio may be as low as the risk of an efficient portfolio, but the return expectation is too low. A rational, profit-maximizing investor seeks a point where the capital allocation line tangents the efficient front and where the investor maximizes the expected return at a given level of risk. (Markowitz 1952; Omisore, Yusuf & Christopher 2011)

3.2 Definition of SRI

The idea of responsible investing is based on ethical investing. Ethical investing removes from its own investment activities companies and industries that conflict with moral perceptions or own values. The concept of responsible investing is very multidimensional and can be approached from several different perspectives. World Commission on Environment and Development (1987) states that sustainable development and responsibility mean doing business and using resources. Even if today's needs are achieved, the opportunities and resources of the future will not be reduced at the expense of the present. One individually appropriate explanation for this structure was acquired by the UK Investment Forum, which defines SRI as investments that support investors to unite financial purposes with their social values (Munoz-Torres, Fernandez-Izquierdo, and Balaguer-Franch 2004). According to Sparkes's (2008) definition, socially responsible investing involves rules and styles in which social and environmental issues can be considered in addition to the conventional risks and returns when defining the structure and function of the portfolio. Schueth (2003) incorporates personal values and social concerns into the investment process.

The popularity of responsible investing has grown steadily in the 21st century. The growth in popularity is due to changed consumption habits and the increased interest of the general public in corporate responsibility. When it comes to sustainable and responsible investment, there are numerous nominations, which are further related reciprocally and whose contents overlap in part. The terms cover; socially responsible investing, values-based investing, social investing, green investing, socially conscious investing, socially aware investing, mission-based investing, and ethical investing all connect to the same universal process and are often used correspondingly (Schueth 2003). In addition to striving to maximize profits, all prioritize ethical concerns, encompassing issues ranging from social to environmental concerns.

3.2.1 Principles for responsible investment and strategies

At the beginning of 2005, the process of developing the principles of responsible investment began audience of the world's largest institutional investors was invited to the event by Kofi Annan, UN Secretary-General. About a year later, in 2006, the principles were announced on the New York Stock Exchange. After all, the number of participants has grown from 100 to over 3000. The principles are at a very general level so that everyone can commit to them in a way that best suits their investment strategy. The goal of the PRI is to create a cost-effective but globally sustainable way of investing that rewards, in the long run, taking into account environmental, social, and corporate governance benefits. The Principles for Responsible Investment has contributed to public awareness and set six voluntary basic principles that provide a range of possible actions to integrate ESG issues into investment practice, as following way: (UN Principles for Responsible Investment 2020).

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

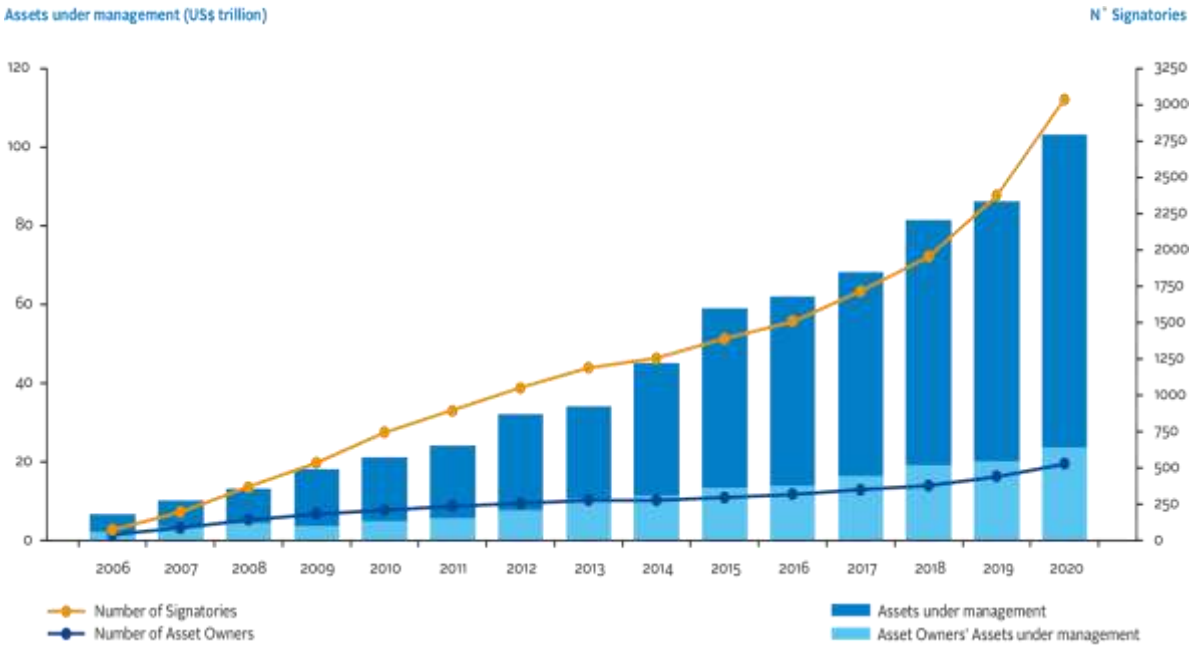

Figure 4. Growth of the PRI (UN Principles for Responsible Investment 2020).

However, for the purposes of this study, it is not relevant to classify the differences between the above terms and their diminutive differences when it comes to sustainable and responsible investment. The definition of socially responsible investing includes all of the above terms. The UN Principles for Responsible Investment are being utilized around the world. The development and introduction of worldwide practices make the diversity and uncertainty of past practices in responsible investment more comprehensible and transparent.

Thus, responsible investing has been determined, the indicators related to the applications of the different SRI strategies that The Forum for Sustainable and Responsible Investment has classified are presented below. (Eurosif 2018; Finsif 2020).

Exclusions

- Negative screening is the most traditional and oldest way to engage in responsible investing.
- This approach systematically excludes companies, sectors, or countries from the allowable investment opportunities if specific actions are based on specific guidelines.

- Avoid investing in particular products or industries (e.g., tobacco products, weapons, pornography) or companies whose practices are considered irresponsible (e.g., corruption, child labor, pollution, or human rights abuses).

Best-in-class

- The companies that have the best ESG score will be selected as investment targets. Investors can determine the principles, and the final score achieved will be combined with the weighting of the criteria, which may depend on the industry.
- Focusing on companies with better ESG ratings in one or all areas than in others. The selection may be based on investors' values, the information provided by indices, or independent provider of ESG ratings.

Sustainability Themed

- The investment decision is support for sustainable development.
- Renewable energy funds or green bonds are examples where an investor seeks to prevent climate change and the consumption of natural resources.

Norms-based screening

- Investment decisions are made taking into account international standards, norms, and guidelines for violations.
- The focus will be on international standards (e.g., EU, OECD, UN) on the environment, human rights, working conditions, the fight against corruption, and controversial weapons.

Engagement and voting

- The investor uses his ownership rights to promote a more responsible business and to ensure investment returns. Activities may also aim to influence industry market standards and practices, such as ESG reporting requirements.

- Influencing may include working with other investors in organizations such as PRI and SIF.

Impact investing

- In addition to investment returns, the goal of impact investment is to measure measurable change, for example, concerning social issues or the environment.
- Forms of investment related to impact investing include, for example, performance-based financing agreements (Social Impact Bond, SIB).

ESG integration

- ESG data is systematically used in making investment analyses and decisions, as it is expected to affect the investment's long-term return and risk profile.
- ESG factors can be related to the composition of a company's board, corruption, the environment, and employee safety.

The most appropriate approaches depend on various factors, such as the number of investment assets and the overall investment strategy, as well as the goals, principles, and resources available for responsible investment.

3.3 Value of sustainability

The effects of a company's sustainability are generally seen over a more extended period of time, which also complicates research into the value of sustainability. The critical challenge for companies is to find a balance between improving financial performance and developing sustainable impacts. One of the key concepts in corporate responsibility is value creation. There are many definitions of value creation. However, in the corporate world, it is primarily the creation of financial value for shareholders in the form of profits, dividends, and capital accumulation. The role of business leaders is to create financial value. That is what investors expect of them, and that is what their commission is based on. Any value, be it symbolic, functional, hedonic, or cost value,

must be created together by working with stakeholders and reaching the assumptions that companies undertake. (Lourenço, Branco, Curto & Eugénio 2012; Sarmah, Islam & Rahman 2015).

Artiach, Lee, Nelson & Walker (2010) concludes that the development of sustainable strategies is a crucial component of meeting the demands of current and future stakeholders through the most effective and efficient methods. As far as short-term implementation of contentious results is concerned, it implies preserving, improving, and supporting the human and natural resources required in the future. The internal strength of sustainable development is that the principle of sustainable development is a globally accepted goal. Information society with the fundamental strength imported by phenomena from the perspective of ecological sustainability is that the information society can provide such information, operating culture, and technology, which is suitable for growing ecological sustainability. The principle of sustainable performance is to run businesses and the economy profitably and productively. A loss-making business is not financially sustainable. (Barnett & Salomon 2006; Heinonen, Hietanen, Härkönen, Kiiskilä & Koskinen 2003).

The nature of competitiveness has mainly focused on production, materials, and cost control in the past. Thus today, these traditional sources of competitiveness are no longer effective on their own. Failure of a company to prove its sustainability actions to its stakeholders may result in a reduction in various business opportunities and competitiveness. Sustainability factors in a company's operations can vary in many ways, and there is no single correct path. Every company is unique, thus companies also operate differently in terms of sustainability. It is essential for each company to define what sustainability means and requires in its operations. By defining the most critical areas of sustainability for the business, the company can identify the relevant actions and perspectives. However, the truth is that sustainable development will be a critical determinant of success in the future. (Heinonen et al. 2003; Lourenço, et al. 2012; Waddock 2004)

3.4 ESG - Environmental, social and governance

When talking about responsibility and responsible investing, the term ESG comes to the fore, which incorporates the environmental, social, and administrative issues of companies. These ESG criteria provide standards for companies that investors analyze and thus utilized in investment decisions.

Environment (E) refers to, for example, climate change, resource and water scarcity, species diversity, emissions to land, water and air, and waste management. In the context of social responsibility (S), the analysis covers human rights, the aging of the population, the way a company treats and manages its employees, customers, and other stakeholders. Good governance (G) refers to the company's management, the salaries of the management team, auditing, and internal control, i.e., how the company's operations are managed. (Keva 2017; Kocmanová & Dočekalová 2013).

Figure 5. Environmental, social, and governance (ESG) factors (UNPRI).

Eurosif (2018) created a standard view definition after identifying the ambiguity surrounding the concept of responsible investment. It refers to a long-term investment approach that considers ESG factors at all stages of the investment process and aims to achieve better returns in the long term. Responsible investment is also seen as influencing the behavior of companies and thereby also benefiting society.

ESG factors are not individual economic drivers, but when a company takes them into account, these factors also have economic implications. Responsible investing also includes a perspective on long-term investment strategy rather than short-term returns. According to Duuren, Plantinga, and Scholtens (2016), the investor collects information on each of these three areas, which is analyzed and researched and used to estimate the potential investment target and emphasis on economic and non-economic factors.

Central to selecting investment targets are companies that consider issues relevant to environmental, social responsibility and good governance in all of their business areas. As investors adjust their principles underlying their own investment decisions in an increasingly responsible direction, the risk-return ratio alone is no longer the only investment criterion. However, responsible investing does not automatically mean giving up a higher income. On the contrary, the purpose of this study is to examine whether it leads to better returns.

3.5 The Morningstar Sustainability Rating

This thesis utilizes Morningstar's sustainability rating, which is presented next. Morningstar applies a sustainability rating to each fund with sufficient investment information. The rating thus meets the needs of investors: it provides a reliable and objective way to assess whether their investments represent the best ethical practices. The Morningstar Sustainability Rating determines how well the companies in the fund's portfolio manage the risks associated with responsibility and, on the other hand, take advantage of the opportunities that arise from it. The rating is based on company-

specific comparison data collected by Sustainalytics. (Morningstar sustainability rating 2016).

The fund's sustainability rating is performed in two steps: First, the portfolio is determined by a descriptive score of sustainability. It is based on a normalized and asset-weighted average ESG score of the investment portfolio, with deductions made for any company disputes. Sustainalytics' company-specific ESG ratings are then normalized to comparable industry peer groups, which is essential for scoring diversified portfolios. (Morningstar sustainability rating 2016, 2018)

Figure 6. A two-step process (Morningstar sustainability rating 2016).

Next, funds are divided into five groups representing the regular distribution by comparing the funds' sustainability score by using the Morningstar global category peer groups system. The score is typically distributed and based on the fund's investment performance relative to other global category funds in the same category. The top 10% (with the lowest average risk) will receive five globes. The next 22.5% will receive four globes, 35% to three globes, and 22.5% to two globes. The remaining 10% of the funds (with the highest average risk) will receive one globe. The methodology also includes limitations to ensure that the Sustainability Rating is fair and stable. One important limitation is that a global category must have at least 30 portfolios with a historical portfolio sustainability rating. In addition, have to set buffers to increase stability in the

assessment. Thus, funds with a score of 30 or above are considered to have a high ESG risk and therefore cannot receive a Morningstar Sustainability Rating higher than three globes. (Morningstar sustainability rating 2016, 2018)

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	

Figure 7. Distribution of sustainability rating (Morningstar sustainability rating, 2016).

The Morningstar sustainability rating values financially significant environmental, social, and governance (ESG) risks and compares similar portfolios based on these ESG factors. The rating is based on the portfolio's historical holdings and is based on company-specific ESG risk ratings from the leading ESG metrics research company Sustainalytics. The score is calculated for managed investments such as funds and indices using the Morningstar database. (Morningstar sustainability rating 2018)

With the guidance of the portfolio sustainability score, investors evaluate how completely the companies in a portfolio have managed responsibility concerning the peer group. Based on Morningstar's scores, this thesis can define ETFs as sustainable and non-sustainable. The score is based on the content of the portfolio, not the return. Thus it is used together with other models to measure the performance of sustainable and responsible ETF portfolios compared to the corresponding sample portfolio of unsustainable ETFs. The higher-than-average score for Morningstar sustainability rating

during the sampling period, as a minimum of four globes are expected as the sustainability criterion. ETFs with three globes are average in terms of sustainability and under three are classified as unsustainable.

4 Previous studies

This chapter reviews previous empirical studies on the performance of responsible funds, cash flows, and the impact of corporate social responsibility actions on a company's share value. The main aim of this chapter is to take a look at significant research and findings related to responsible investing and compare different research results.

According to previous research, the performance of socially responsible investments is typically compared to traditional mutual funds in most studies. Moreover, there is one disadvantage to these studies: fund managers largely influence the performance and success of mutual funds. Neither the performance of socially responsible mutual funds nor the manager's attribution to socially responsible investments can be attributed separately. Kempf and Osthoff (2007) state that more investors aim for socially responsible screens when creating their portfolios. Their research is based on KLD ratings, buying highly socially responsible stocks, and selling stocks with low ratings. Results point out that the strategy leads to 8,7 % annual abnormal returns. The highest abnormal returns achieve when investors use best-in-class screening. After considering transaction costs, abnormal returns remain significant.

The pressure of corporate responsibility is constantly increasing and public restrictions on social behavior are emphasized. This applies to social, moral, legal and economic aspects (Waddock 2004). Customers' requirements are also growing as market transparency increases. Besides, customers demand viable products (Gauthier 2005). The way companies appreciate their social responsibilities in their business is also becoming more critical to investors, in addition to the financial performance of the company (Barnett & Salomon 2006).

According to Galema et al. (2008), By lowering the ratio of book value to market value, responsible investing affects stock returns rather than by achieving positive alpha. The

research result is supported by theoretical work, which suggests differences in demand between responsible and irresponsible shares. The differences in demand also explain why so few studies are able to detect a link between alpha and responsible investing.

There is no harmony in terms of what organizations should be submitting as part of their social responsibility. Therefore, In organizations as well as outside of them, corporate social responsibility is a challenging concept to define. (Wood 1991; Griffin 2000). Davidson and Worrell (1990) give three reasons for the lack of unanimity: The operation of debatable social responsibility indexes. Weak estimation of financial performance and inappropriate sampling methods. According to regional findings, the US results are more positive across developing and developed markets than Europe and Asia/Australia. This can moderately be clarified by the lower share of portfolio studies within the sub-sample for the USA (Friede et al. 2015).

Auer (2015) uses a new European ESG score data set, portfolio creating technology, which can separate the earnings effects of investing in social screening, and the latest statistical methods. The results illustrate that Socially responsible investments align with the values and beliefs of investors. Without sacrificing efficiency, investors may actually achieve higher returns with moderately responsible investments. As seen before, researchers have not previously focused on sustainable and responsible ETFs performance but instead on mutual funds and companies that follow socially responsible investment practices.

Typically, SRI market participants strive to obtain financial returns and consider companies' environmental, social, and corporate governance profiles. Responsible investment refers to environmental issues, social responsibility factors, and governance issues, so-called ESG (Bialkowski & Starks 2016). In analyzing stock returns, several researchers have managed risks using Fama and French factors. Because responsibility leads to a lower book-to-market ratio, alphas say researchers are unable to explain the impact of responsibility on returns. In their study, Galema et al. (2008) showed that ESG

factors have a significant effect on stock returns. The impact was particularly noticeable in portfolios with a positive score on diversity, environmental issues and products. The research result differs from the research results presented earlier, according to which responsible investing does not significantly affect the returns of equity portfolios.

Environmental, social, and governance criteria have been studied as a relationship between financial performance and economic progress since the early 1970s. Since then, more than 2,000 empirical studies and reviews have been published by researchers. The results illustrate that the business of the ESG investment is empirically well established. Approximately 90% of studies prove a non-negative ESG-financial performance relation. (Friede, Busch & Bassen 2015)

The actual performance of the portfolios depends on the overlapping effects of market and idiosyncratic risk (Campbell, Lettau, Malkiel & Xu 2001; Luo and Bhattacharya 2009) on structure constraint (Clarke, de Silva, and Thorley 2002) and the cost of achieving the portfolio (Carhart 1997) which can misinterpret authentic ESG performance.

5 METHODOLOGY

Understanding the fluctuations in equity returns is essential for portfolio management. The correlation between risk and return is substantial in investing. Higher potential investment returns are typically associated with more significant risks. Thus, understanding and identifying risk factors that affect the fluctuation of equity returns benefits investors to make better decisions for their portfolios. The performance of the ETFs, as well as the factors affecting them, can be viewed from many different starting points and based on many different models. As stated, this study's ambition is to determine if sustainability can contribute to increasing or decreasing the value of an ETF investment.

This study follows the methods used by Bauer et al. (2005). The Ordinary Least Square (OLS) estimation technique performs regression analysis and produces the error terms predictions, as the sample contains time-series data

5.1 Performance measurement

The effective use of models and the interpretation of their results often require attention for the data. According to several studies, survivorship bias is an essential factor that should generally be taken into consideration when assessing the performance of ETFs. This refers to the bias that occurs when funds have ceased operations during the period and are not included in the examination. This could cause a significant skew for research which is reflected in higher-than-actual returns, as ceased funds are likely to have below-average returns. (Vanguard 2015).

By using linear regression models, this study compares the performance of three different levels of sustainable and responsible ETF portfolios. The preceding models have been selected based on their popularity in various studies and since their efficiency

has been well-proven in the actual measurement of performance. In all models, the time factor is described as T, which plays an essential role. In this research T=69 in, for the 69 months under observation. The methods used in this study to evaluate the performance of the ETF are presented below.

5.1.1 CAPM – Capital Asset Pricing Model

CAP model described in Sharpe (1964) is a mathematical model that allows you to calculate the return expectation of a share. CAP model is an integral part of modern portfolio theory, where the return on investment is expressed by the return of the market portfolio and the beta factor. According to the theory of the model, the return expectations of risky investments must be higher than the risk-free return (traditionally government bonds). The theory of the model is based on the idea that investors minimize the variance of the portfolio return with a given expected return or maximize the portfolio's expected return with a given variance.

(1) $R_{i,t} - R_{f,t} = \alpha_i + \beta_i\left(R_{M,t} - R_{f,t}\right) + \varepsilon_{i,t} \quad t = 1,2, \dots T$

Where, R_i= return of the portfolio in excess of the risk-free rate

α_i = risk-adjusted abnormal return (intercept)

β_i = systematic risk (market risk)

R_M = related market return

R_f = risk-free rate

ε_i = the error term

The return expected by the investor can thus be divided into two parts in the model, which are the risk-free return and the risk premium, which is reflected in the second part of the model. The model only prices systematic risk and unsystematic risk is decentralized. Systematic risk, i.e., beta measures the sensitivity of the return on an

individual share to the return on the market portfolio and the error term covering the idiosyncratic return coefficient. (Merton 1973)

5.2 Factor models

The multi-factor models deviate from the traditional CAP model, which assumes that stock fluctuations are linearly dependent on beta. The higher the beta share, the higher the expected return on the share. However, several studies have found that market risk explains poorly the fluctuations in equity returns. Studies have shown that by adding two or three risk factors to the model in addition to the traditional market risk, fluctuations in equity returns can be explained much better. (Carhart 1997)

As the composition of the funds often differs from the index, it is preferable to use the multi-factor model. The model can take into account other risks associated with the fund's return than fluctuations in market returns. Thus, multi-factor models also make it possible to take into account the use of different investment strategies.

Fama and French (1993) found that fluctuations in equity returns cannot be explained by market risk alone. Their results showed that equity returns did not rise linearly as the beta increased, but the curve was even flatter. With low beta shares, the returns could be even higher than those of high beta. The market risk was also unrealistically explained by variability in returns using traditional statistical tests because the explanation of the model was defective and could not explain the return on low market value. Based on these observations to explain the fluctuations in returns. Rather than using the CAPM's market beta, they find that size factor and book-to-market ratio best reflect cross-sectional variation in average stock returns.

In general, sustainable and responsible investing has been studied through the asset pricing model of Fama & French (1993) as well as the improved four-factor model presented by Carhart (1997). Examples of well-known studies using at least one of the

models as mentioned above for determining socially responsible performance are among others: Kempf & Osthoff (2007), Hong & Kacperczyk (2009), Derwall, Koedijk & Ter Horst (2011), Nofsinger & Varma (2014) and Henke (2016).

5.2.1 Fama-French three-factor model

The model is created to supplement the CAP-model deficiencies. In other words, asset pricing theory displays a decent capacity for explaining the cross-section of average returns with variables that do not have an exclusive purpose. Fama and French (1993) found a robust negative correlation between firm size and return in terms of market value. According to this observation, small businesses are often characterized by higher-than-average returns. According to the finding, small businesses typically have inherent higher average returns. The SMB factor is formed by dividing companies into small and large according to size. The difference between low market value companies and high market value companies. A positive correlation was found between returns and book value. Thus, high book value companies, i.e., companies with a high book value to market value ratio, appear to have higher returns. The HML factor is determined by dividing companies into low and high values according to their book value and market value. The following equation represents the four-factor model as specified by Fama and French (1993).

(2) $R_{it} - R_{ft} = \alpha_i + \beta_{1,i}(R_{mt} - R_{ft}) + \beta_{2,i}SMB_t + \beta_{3,i}HML_t + \varepsilon_{it}$

where the additions, $SMB_t =$ small minus big

$HML_t =$ high minus low

According to the study, the size (SMB) and book-to-market (HML) factors were able to explain together a large part of fluctuations in equity returns. However, these two factors could not fully explain the difference between the average return and the risk-

free investment. The equation also takes the market portfolio's expected return over the risk-free return as an explanatory variable, which in the research view explains the rest of the fluctuations in equity returns. The last key to describing the success of a regression model is the standard error of estimate, which indicates the standard deviation of the regression model error terms. The higher it is, the greater is the error terms decomposition and the explanation power of the model is lower. (Fama & French 1993)

5.2.2 Carhart four-factor model

According to Carhart (1997), the three-factor model significantly reduces errors in calculating the average return on stocks compared to the CAP model but still cannot fully explain the return on stocks. Furthermore, Jegadeesh and Titman (1993) illustrate the momentum anomaly as an important limitation of the three-factor model. Momentum factor, which attempts to explain the observed autocorrelation of past and future returns. The anomaly is due to the slow response of the market to information, i.e., the inefficiency of the market. It is possible to earn excess returns by buying previously well-performing (winners) shares and selling low-performing (losers) shares. The following equation represents the four-factor model as specified by Carhart (1997).

$$(3)\ R_{it} - R_{ft} = \alpha_i + \beta_{1,i}\left(R_{mt} - R_{ft}\right) + \beta_{2,i}SMB_t + \beta_{3,i}HML_t + \beta_{4,i}UMD_t + \varepsilon_{it}$$

where the addition, $UMD_t =$ momentum factor

Adding momentum to the equation helped reduce stock valuation errors compared to both the CAP model and the three-factor model. Otherwise, the model is the same as the three-factor model, but the formula has a momentum factor. Display the difference of returns between the last 12 months' winners' stocks and the stock of losers in the last 12 months. According to Carhart, Portfolio returns should be positively influenced by

the momentum factor. The error of the four-factor pricing model is only 0.14% per month, while the error of the three-factor model is 0.31% per month and the CAP model is 0.35% per month. (Carhart 1997).

5.2.3 Fama-French five-factor model

The latest significant multi-factor model is the five-factor model of Fama and French (2015). It is an extended model of a three-factor model, with new factors as a company's profitability and investment. The profitability factor is determined by dividing the companies according to profitability and taking into account the difference between the returns of the best and weakest performing companies. The investment factor describes the difference between the returns of companies that invest conservatively and aggressively. Conservative investment generally aims to keep the risks associated with investments to a minimum. They point out that while other variables are constant, higher profitability leads to higher returns, as well as higher investment levels lead to lower returns. The following equation represents the five-factor model as specified by Fama and French (2015).

(4) $$R_{it} - R_{ft} = \alpha_i + \beta_{1,i}(R_{mt} - R_{ft}) + \beta_{2,i}SMB_t + \beta_{3,i}HML_t + \beta_{4,i}RMW_t + \beta_{5,i}CMA_t + \varepsilon_{it}$$

Where the additions, $RMW_t =$ robust minus weak

$CMA_t =$ conservative minus weak

Fama and French (2015) state that the five-factor model is more effective in explaining average returns than the three-factor model. According to the study, it explains 71 to 94 percent of the variation in expected returns. Nevertheless, it is exceptional that the model cannot explain the returns on small companies, which invest heavily and have low profitability. The value factor turns out to be relatively insignificant in the model.

The other factors in the model together are able to explain the role of the value factor as an explanator of returns almost completely. Despite poor profitability, the Five-Factor model struggles to generate high average returns on small stocks. Instead, its returns resemble the returns of a company that invests heavily.

5.3 Jensen alpha

Jensen's alpha is a commonly used performance indicator for funds. The idea is to measure returns that exceed the returns predicted by the CAP model, i.e., risk-adjusted abnormal return on the investment. Alpha reflects the fund's market risk-adjusted over- or under-returns and whether the fund's returns have exceeded or fallen below the beta requirement of the CAP model. According to the theory, when a market portfolio is efficient, the returns of all securities should be determined by their beta factor relative to the market portfolio. The following equation represents Jensen's alpha. (Jensen 1968).

(5) $\alpha_p = \bar{R}_p + \beta_i(\bar{R}_m - \bar{R}_f)$

A positive and statistically significant alpha indicates that the fund has produced a better risk-adjusted return than the corresponding risk-bearing portfolio. A negative and statistically significant alpha indicates that the fund has performed less than a similar risk-weighted portfolio. Ashton (1990) criticizes whether alpha can identify the connection between better performance and information.

5.4 Sharpe ratio

The Sharpe figure is a commonly used measure of portfolio success based on a formula developed by William Sharpe (1966). The Sharpe ratio is obtained by subtracting the risk-free interest rate from the average return on the portfolio and dividing this by the

standard deviation of the return on the portfolio. It compares the portfolio's excess return to its volatility. The following equation represents the Sharpe ratio.

$$(6)\quad SR_p = \frac{\bar{R}_p - \bar{R}_f}{\sigma_p}$$

The higher the value of the Sharpe ratio, the better the portfolio has generated in proportion to its risk. The Sharpe figure is easily comparable, as the return is tied to the standard deviation of the return on the portfolio and not to a specific index. According to Kat (2004), the problem with the Sharpe is that the standard deviation does not take into account peak and skewness, so that risk is not fully taken into account, and the Sharpe ratio has been seen to be period dependent.

5.5 Treynor ratio

Treynorin shares similarities with Sharpe. When the Sharpe ratio uses standard deviation as a measure of risk, the Treynor ratio utilizes beta or market risk to measure volatility rather than absolute risk. In essence, the Treynor ratio is a measure of return based on systematic risk. It exploits the relationship between risk and annual risk-adjusted return and its use is only justified in a well-diversified portfolio. The following equation represents the Treynor ratio (Elton, Gruber, Brown & Goetzman 2003: 658–660)

$$(7)\quad TR_p = \frac{\bar{R}_p - \bar{R}_f}{B_p}$$

Treynor's figure depends on beta, i.e., the sensitivity of the investment to market movements, to assess risk. All this is based on the assumption that the risk represented by the whole market is constant because diversification does not eliminate it. As in Sharpe’s ratio, a higher value in Treynor’s ratio indicates better risk-adjusted

performance, i.e., a higher value indicates that investments generate high returns for each of their market risks. (Sharpe 1966; Bodie ym. 2005: 872-874)

5.6 Variables

Following the econometric models presented in the previous section, it is essential to understand how the variables are composed. Basically, the ETF return is measured as an excess return over the risk-free rate $R_{f,t}$. In the model, the dependent variable is the ETF return $R_{i,t}$. The risk-free interest rate is based on one month's U.S. Treasury bills as this paper focuses on the U.S. market. Prior studies have found that the government interest rate is the closest proxy to the real risk of debt obligations, demonstrating that debt obligations are not risk-free anymore.

Each of the applied models contains several explanatory variables. The market premium, R_m, is included in all models when calculating the risk-free interest rate since it reflects the excess return from the market. Additionally, the sensitivity of the return to the generally recognized risk factors described in the models is managed, and portfolios that simulate these factors are included. Size and value factors (SMB & HML) have been combined to the three-factor model. In contrast, the four-factor model incorporates a momentum (UMD) factor, and the five-factor model includes new profitability and investment factors (RMW & CMA). All those factors have been calculated on a monthly basis in US Dollars, established on the investigation by Fama and French (1993) and (2015) and Carhart (1997).

As I mentioned above, the risk-free market rate has been the one-month U.S. Treasury bill and the variables in the factor models are obtained from Kenneth French's database. Market excess return is formed from the value-weighted average return of NYSE, AMEX, and NASDAQ companies with a CRSP share code of 10 or 11 at the beginning of the month. The SMB factor for the three-factor model consists of the difference between

the average returns of three small and three large portfolios, as follows (Kenneth R. French database, A):

(1) $SMB = \frac{1}{3}(Small\ Value + Small\ Neutral + Small\ Growth) - \frac{1}{3}(Big\ Value + Big\ Neutral + Big\ Growth)$

The HML factor reflects the average return on the difference between two value portfolios and two growth portfolios, as follows:

(2) $HML = \frac{1}{2}(Small\ Value + Big\ Value) - \frac{1}{2}(Small\ Growth + Big\ Growth)$

In summary, factor coefficients are formed using six value-weighted portfolios that are created by size and book-to-market. Furthermore, the five-factor model includes the profitability and investment factor. The RMW factor consists of a difference between the average returns of two robust operating profitability and two weak operating profitability portfolios, as follows (Kenneth R. French database, B):

(3) $RMW = \frac{1}{2}(Small\ Robust + Big\ Robust) - \frac{1}{2}(Small\ Weak + Big\ Weak)$

The CMA factor reflects the average return on the difference between two conservative investment portfolios and two aggressive investment portfolios, as follows:

(4) $CMA = \frac{1}{2}(Small\ Conserative + Big\ Conservative) - \frac{1}{2}(Small\ Agressive + Big\ Aggressive)$

Furthermore, the relationship for the size factor varies in the five-factor model. The SMB factor consists of a difference between the average returns of nine small and nine big portfolios, as follows (Kenneth R. French database, B)
as follows:

(5) $SMB = \frac{1}{3}(SMB_{(B/M)} + SMB_{(OP)} + SMB_{(INV)})$

It can be additionally subdivided into three distinct parts: book-to-market (B/M), operating profitability (OP) and investments (INV), as follows:

$$SMB_{(B/M)} = \frac{1}{3}(Small\ Value + Small\ Neutral + Small\ Growth) - \frac{1}{3}(Big\ Value + Big\ Neutral + Big\ Growth)$$

$$SMB_{(OP)} = \frac{1}{3}(Small\ Robust + Small\ Neutral + Small\ Weak) - \frac{1}{3}(Big\ Robust + Big\ Neutral + Big\ Weak)$$

$$SMB_{(INV)} = \frac{1}{3}(Small\ Conservative + Small\ Neutral + Small\ Agressive) - \frac{1}{3}(Big\ Conservative + Big\ Neutral + Big\ Agressive)$$

In summary, factor coefficients are formed using six value-weighted portfolios that are created by size & book-to-market, size & operating profitability, and size and investment.

As a final part, the one-year momentum factor is established on the return over the last 11 months, which is lagged by one month. The highest 30% yield is decreased by the lowest 30% yield using equal weights, as follows (Kenneth R. French database, C)

(6) $UMD = \frac{1}{2}(Small\ High + Big\ High) - \frac{1}{2}(Small\ Low - Big\ Low)$

In summary, factor coefficients are formed on size and prior returns to compose momentum.

6 DATA AND DESCRIPTIVE STATISTICS

This chapter presents the data of empirical testing of this thesis and the method of portfolio creation, including the data collection process. Data for this thesis have been collected mainly from the Thomson Reuters Eikon database. In addition, the Morningstar database is used to determine the sustainability classes of the ETFs. In order to examine the performance of ETFs the investigation is limited to the most developed markets, i.e. the United States market to ensure that the data is qualitative and sufficiently comprehensive. As the data used in this study only contains equity ETFs, other kinds of ETFs, for instance bond ETFs, commodities ETFs, factor ETFs, and actively managed ETFs have been excluded. Because of their unique features, those mentioned above have unusual risks that can possibly affect performance. The funds less than one year are also excluded to preserve more robust data. The reference period of the study covers the period from January 2010 to July 2020. Therefore, the data contains observations for 69 months.

As a starting point, all ESG funds in the Morningstar database are integrated into this thesis. The Thomson Reuters Eikon database does not provide ETFs with sustainability levels. Therefore, a manual review of the sustainability levels for all ETFs was conducted during August 2021. If no sustainability rating was found, it was excluded from the study. All target equity ETFs have to capture from the Morningstar database and their monthly closing prices from Thomson Reuters Eikon's database.

6.1 Portfolio creation

First, a portfolio-level responsibility rating is calculated for each portfolio reported in the last 12 months. The rating is the weighted average of the Sustainalytics ESG risk ratings of the securities in the portfolio. Sustainalytics' ESG risk rating estimates the extent to which a company's financial value is at risk due to ESG risks. The ESG problem affecting the rating should have a potentially significant impact on the company's financial value

and thus also on the company's risk-return profile as an investment. Relevant ESG issues vary across industries and companies. However, the ESG risk rating estimates a company's uncontrolled exposure to ESG risks, considering the extent to which the risks can be managed. This rating is given on a scale of 0-100. The lower the rating, the better. A rating of 0 indicates that the company has no uncontrolled ESG risks at all, while 100 indicates the highest level of ESG risk. Sustainalytics has assessed the ESG risk ratings of more than 10,000 companies worldwide. (Morningstar sustainability rating 2018)

According to the Sustainability Score, portfolios with high, average and low ESG scores have been created. Total returns are compared based on monthly time series data for the period 1.1.2010-31.7.2020. Following the creation of a sustainability level for ETFs, three different portfolios were constructed based on Morningstar sustainable ratings. Portfolio 1 includes ETFs with an above-average ESG score. Among fund categories, ETFs with globe scores of 5 and 4 are considered to have low ESG risk. Based on Morningstar's measurement, ETF's overall exposure to ESG risk falls into the lowest 30% relative to category peers, i.e., the most sustainable. According to Morningstar indicators, ETFs with three globes are generally considered to have medium ESG risks, thus includes in Portfolio 2. Their overall exposure to ESG risk falls between the highest one-third and the lowest one-third relative to category. Portfolio 3 consists of two and one globe ETFs. The above-mentioned total exposure of the portfolio to ESG risk increases to the highest 30% compared to peers (the most unsustainable).

6.2 Descriptive statistics

Following the collection and categorization of the data, preliminary analyses were conducted and statistical results examined. In addition, the initial analysis indicated that some outliers were present in the data, which could potentially affect the results. The outliers were winsorized to improve statistical efficiency while avoiding too harsh adaptions to the data instead of removing troubled ETFs. A 90 % winoring level was used in this thesis. Observations above 95 percent gained the value of the 95^{th} percentile,

while observations below 5^{th} percentile was given the value of 5 percentage. Furthermore, ETFs less than one year old have been excluded from the data. The average returns and standard deviation are calculated based on equal-weighted portfolios of the ETFs, and the monthly data is annualized for presentation purposes. Following are the introduced summary statistics based on final data.

Table 1. The descriptive statistics of the portfolios over the sample period 1.1.2010-31.7.2020.

Descriptive statistic			
	Portfolio 1	Portfolio 2	Portfolio 3
Number of ETFs	328	473	463
Average Return (%)	10,78	9,58	5,71
Average Age (in years)	9,37	9,83	9,34
Skewness	-0,48	-0,25	-0,60
Kurtosis	1,59	0,89	2,70
Standard Deviation (%)	73,72	58,59	74,43

Table 1 above illustrates that Portfolio 1 includes 328 ETFs, Portfolio 2 includes 473 ETFs and Portfolio 3 includes 463 ETFs. The variation in ETF amounts in a portfolio is based on Morningstar sustainability scores and the data reveal that ETFs with the highest score were included the least. Statistics show that portfolios 1 and 2 have yielded about the same, while portfolio 3 (i.e., most unsustainable) has yielded significantly less. The average age of ETFs is fairly similar regardless of sustainability level. Portfolio ages were calculated using ETF formation date data.

Several studies on the robustness of the t statistic are extended in order to determine multivariate skew and kurtosis measures. It is shown that these measures have some desirable properties. A test for multivariate normality is proposed by deriving the asymptotic distributions for the measures for a multivariate normal population. (Mardia 1970)

Distribution skewness refers to the deviation of the distribution of observation values from the symmetric pattern of the normal distribution. When negative skew exists, the distribution's left side has a longer or fatter tail, and when positive skew occurs, it has a longer or fatter tail on the right side. All portfolios are slightly skewed to the left, according to Table 1. The variations between portfolios are fairly slight. Kurtosis describes the measure of the thickness of the tails of a distribution. Kurtosis varies from 0,89-2,70.

7 EMPIRICAL RESULTS

This study aims to find out the portfolio's risk-adjusted return. Portfolios are constructed based on ESG scores, and portfolios are compared to analyze if ESG factors influence return. The regression model estimation for portfolios was performed using three different models

As a start, this chapter illustrates an overview of the one-factor model: the capital asset pricing model. The study continues using multi-factor models to measure performance, particularly the Fama-French three-factor model, Carhart four-factor model, and the five-factor model based on the Fama-French.

7.1 Performance measured with Capital Asset Pricing Model

Table 2 below displays the CAPM regression results for the three constructed portfolios over the whole sample period 1.1.2010-31.7.2020. Portfolio 1 is comprised of ETFs with an above-average sustainability score, portfolio 2 is comprised of ETFs with an average sustainability score, and portfolio 3 is comprised of ETFs with a below-average sustainability score.

Table 2. CAPM single-factor regression. Results from OLS regressions are presented over the entire sample period from 1.1.2010 to 31.7.2020. Alpha expresses an estimated coefficient, which is the part of excess returns that cannot be explained by the beta coefficient, i.e., Rm-Rf factor. Alphas are annualized for presentation purposes and presented in percentages. The p-values are in the parenthesis, below the coefficient values. ***, ** and * represent 1%, 5% and 10% significance levels, respectively. For each variable, the T-ratio is displayed in brackets below the coefficients. R2 indicates the model's goodness of fit, i.e., describes the proportion of variation in a dependent variable explained by the independent variable/variables.

Results from the CAPM			
	Portfolio 1	Portfolio 2	Portfolio 3
Alpha	-4,481***	-3,069***	-8,702***
	(-3,938)	(-2,630)	(-5,675)
Rm-Rf	1,109***	0,911***	1,092***
	(48,881)	(39,402)	(34,992)
R-Square	0,950	0,925	0,907

The results show that alpha for each portfolio is statistically significant but negative. All alphas are significant at the 1 % level and it should be noted that portfolios 1 and 2 have much higher (less negative) alphas compared to portfolio 3, which includes most unsustainable ETFs. In general, it appears that ETFs that include the average scores in sustainability perform better than over- or under-screened portfolios. Accordingly, the null hypothesis that Inclusion of the ESG score criteria does not lead to abnormal returns can be rejected.

According to the market factor Rm-Rf, each portfolio's excess returns are positively correlated and statistically significant at the 1% significance level, suggesting that the market returns primarily drive portfolio excess returns. For each portfolio except Portfolio 2, the beta coefficients are over 1, indicating that overall, the returns for the Portfolio 2 investments are less volatile in comparison to the market returns. CAPM describes extremely well the returns of all portfolios, R-Square ranging from 0.907-9.50, meaning that all portfolios' returns can be explained well by CAPM.

7.2 Results for multi-factor models

This chapter examines the performance of ETFs using multi-factor models: the Fama-French 3-factor model, Carhart 4-factor model, and Fama-French 5-factor model. Continuing from the last section, Portfolio 1 is comprised of ETFs with an above-average sustainability score, portfolio 2 is comprised of ETFs with an average sustainability score, and portfolio 3 is comprised of ETFs with a below-average sustainability score.

7.2.1 Performance measured with Fama-French 3-factor model

A three-factor model takes the CAPM a step further by including size risk- (SMB) and value risk (HML) factors to the market risk factor. Table 3 below displays the 3-factor model regression results for the three constructed portfolios over the whole sample period 1.1.2010-31.7.2020.

Table 3. Fama French 3-factor regression. Results from OLS regressions are presented over the entire sample period from 1.1.2010 to 31.7.2020. Alpha expresses an estimated coefficient, which is the part of excess returns that cannot be explained by the beta coefficient, i.e., Rm-Rf, RMB and HML factors. Alphas are annualized for presentation purposes and presented in percentages. The p-values are in the parenthesis, below the coefficient values. ***, ** and * represent 1%, 5% and 10% significance levels, respectively. For each variable, the T-ratio is displayed in brackets below the coefficients. R2 indicates the model's goodness of fit, i.e., describes the proportion of variation in a dependent variable explained by the independent variable/variables.

Results from the 3-factor model			
	Portfolio 1	Portfolio 2	Portfolio 3
Alpha	-4,579***	-3,193***	-7,510***
	(-3,870)	(-2,672)	(-4,887)
Rm-Rf	1,110***	0,902***	1,046***
	(43,728)	(35,400)	(31,251)
SMB	0,002	0,073	0,128**
	(0,050)	(1,621)	(2,143)
HML	-0,015	-0,05	0,127**
	(-0396)	(-1,301)	(2,414)
R-Square	0,951	0,928	0,915

Comparing the results to CAPM, the results are considerably similar. The alphas of each portfolio are again negative and statistically significant at the 1 percent level. In general, it appears that ETFs that include the average scores in sustainability perform better than over- or under-screened portfolios.

According to the market factor Rm-Rf, each portfolio's excess returns are repeatedly positively correlated and statistically significant at the 1% significance level, suggesting that the market returns primarily drive portfolio excess returns. For each portfolio except Portfolio 2, the market beta coefficients are over 1, indicating that overall, the returns for the Portfolio 2 investments are less volatile in comparison to the market returns.

The size factor coefficient is positive for each portfolio. According to Portfolio 3, only its loadings on the SMB size factor are statistically significant at the 5 % level, suggesting that the portfolio is tilted towards small-cap ETFs. The value HML coefficients are negative for portfolios 1 and 2 but not statistically significant. On the other hand, Portfolio 3 gets a positive coefficient and is statistically significant at the 5 % level in Portfolio 3. According to Fama and French (1996), value companies are generally expected to produce higher returns than growth companies since value companies generally yield higher returns on average.

The Fama-French 3-factor model is remarkable at explaining the portfolio excess returns based on the R-Squared values of 0,915-0,951. Additionally, R-Squared developed for each portfolio, suggesting that the Fama-French 3-factor model is more advanced in exposing excess returns than the CAPM.

7.2.2 Performance measured with Carhart 4-factor model

Based on the 3-factor model, the Carhart model adds the momentum factor. Table 4 below displays the 4-factor model regression results for the three constructed portfolios over the whole sample period 1.1.2010-31.7.2020.

Table 4. Fama-French 4-factor regression. Results from OLS regressions are presented over the entire sample period from 1.1.2010 to 31.7.2020. Alpha expresses an estimated coefficient, which is the part of excess returns that cannot be explained by the beta coefficient, i.e., Rm-Rf, SMB, HML and UMD factors. Alphas are annualized for presentation purposes and presented in percentages. The p-values are in the parenthesis, below the coefficient values. ***, ** and * represent 1%, 5% and 10% significance levels, respectively. For each variable, the T-ratio is displayed in brackets below the coefficients. R2 indicates the model's goodness of fit, i.e., describes the proportion of variation in a dependent variable explained by the independent variable/variables.

Results from the 4-factor model			
	Portfolio 1	Portfolio 2	Portfolio 3
Alpha	-4,454***	-3,000**	-7,035***
	(-3,748)	(-2,516)	(-4,744)
Rm-Rf	1,106***	0,895***	1,028***
	(43,053)	(34,965)	(31,664)
SMB	0,001	0,071	0,122**
	(0,020)	(1,587)	(2,144)
HML	-0,033	-0,076*	0,047
	(-0,810)	(-1,886)	(0,922)
UMD	-0,036	-0,055*	-0,141***
	(1,115)	(-1,710)	(-3,455)
R-Square	0,951	0,930	0,923

Carhart's 4-factor model continues in the same pattern as the models described above. The alphas of each portfolio are again negative and statistically significant at the 1 % level. 4-Factor model also indicates that portfolios containing average score ETFs (Portfolio 2) perform better than deeply unsustainable or sustainable portfolios.

According to the market factor Rm-Rf, each portfolio's excess returns are repeatedly positively correlated and statistically significant at the 1% significance level, suggesting that the market returns primarily drive portfolio excess returns. For each portfolio except Portfolio 2, the market beta coefficients are over 1. Indicating that overall, the Portfolio 2 investments' returns are less volatile compared to the market returns.

The size factor coefficient is positive for each portfolio. Only Portfolio 3 loadings on the SMB size factor are statistically significant at the 5 % level, suggesting that the portfolio is tilted towards small-cap ETFs. In portfolios 1 and 2, the HML factor shows negative coefficients, while portfolio 3 shows a positive coefficient. HML value factors are only statistically significant at the 10 % level in Portfolio 2. Therefore, portfolio 2 appears to be growth-adjusted. Furthermore, the momentum UMD factor is negative for each portfolio. However insignificant only for Portfolio 1. Statistically significant at 10 % level in Portfolio 2 and at 1 % level in Portfolio 3. A negative beta coefficient suggests ETFs in the portfolio is more contrarian.

The Carhart 4-factor model is impressive at explaining the portfolio excess returns based on the R-Squared values varying between 0,923-0,951. Additionally, R-Squared developed for portfolios 2 and 3 against 3-factor model, suggesting that the Carhart 4-factor model is more advanced in exposing excess returns than the CAPM and 3-factor model.

7.2.3 Performance measured with Fama-French 5-factor model

There are two additional explanatory factors in the 5-factor model compared to the 3-factor model: the profitability (RMW) and investments (CMA) factors. Table 5 below displays the 4-factor model regression results for the three constructed portfolios over the whole sample period 1.1.2010-31.7.2020.

Table 5. Fama-French 5-factor regression. Results from OLS regressions are presented over the entire sample period from 1.1.2010 to 31.7.2020. Alpha expresses an estimated coefficient, which is the part of excess returns that cannot be explained by the beta coefficient, i.e., Rm-Rf, SMB, HML, RMW and CMA factors. Alphas are annualized for presentation purposes and presented in percentages. The p-values are in the parenthesis, below the coefficient values. ***, ** and * represent 1%, 5% and 10% significance levels, respectively. For each variable, the T-ratio is displayed in brackets below the coefficients. R2 indicates the model's goodness of fit, i.e., describes the proportion of variation in a dependent variable explained by the independent variable/variables.

Results from the 5-factor model			
	Portfolio 1	Portfolio 2	Portfolio 3
Alpha	-4,348***	-3,474**	-7,236***
	(-3,611)	(-2,920)	(-4,623)
Rm-Rf	1,104***	0,914***	1,037***
	(42,096)	(35,407)	(29,983)
SMB	-0,007	0,048	0,117*
	(-0,149)	(1,033)	(1,888)
HML	0,015	-0,113**	0,125**
	(0,326)	(-2,466)	(2,047)
RMW	-0,032	-0,094	-0,057
	(-0,479)	(-1,419)	(-0,642)
CMA	-0,086	0,180**	-0,074
	(-1,090)	(2,325)	(-0,718)
R-Square	0,951	0,931	0,916

Fama-French 5-factor model continues in the same pattern as all other models described above. The alphas of each portfolio are again negative and statistically significant at the 1 percent level. Factor model also displays that portfolios include average score ETFs (Portfolio 2) perform better than over-/under-screened portfolios.

According to the market factor Rm-Rf, each portfolio's excess returns are repeatedly positively correlated and statistically significant at the 1% significance level, suggesting that the market returns primarily drive portfolio excess returns. For each portfolio

except Portfolio 2, the market beta coefficients are over 1. Indicating, that overall the Portfolio 2 investments' returns are less volatile compared to the market returns.

The size factor coefficient is positive for portfolios 2 and 3 and negative for portfolio 1. Only Portfolio 3 loadings on the SMB size factor are statistically significant at the 10 % level, suggesting that the portfolio is tilted towards small-cap ETFs. The value HML coefficients are positive for portfolios 1 and 3 but only statistically significant at 5 % level in Portfolio 1. Referring to Fama and French (1996), value companies are generally expected to produce higher returns than growth companies since value companies generally yield higher returns on average. On the other hand, Portfolio 3 gets a negative coefficient and is statistically significant at the 5 % level in Portfolio 3. Portfolios 1 & 2 yields negative CMA coefficients, which are not statistically significant. In contrast, portfolio 3 has a positive CMA coefficient and is statistically significant at the 5% level. Furthermore, the beta coefficients for the additional profitability RMW factor do not provide any statistically significant evidence of explaining the excess returns of the portfolios.

The Fama-French 5-factor model is substantial at explaining the portfolio excess returns based on the R-Squared values varying between 0,916-0,951. Additionally, R-Squared developed for each portfolio comparing to 3-factor model, suggesting that the Fama-French 5-factor model is more advanced in exposing excess returns than the CAPM and 3-factor model. Compared to the 4-Factor model, the explanatory ratio of Portfolio 2 improved due to the explanatory power of the CMA factor. In turn, the Portfolio 3 explanatory ratio decreased due to the 4-factor Momentum factor.

7.3 Adjusted performance measures

For further investigation of the risk-adjusted performance of each portfolio, the Sharpe ratios, as well as the Treynor ratios, were calculated. The results are presented and compared with previously reported multi-factor alphas (Jensen alpha).

Table 6. Results are presented over the entire sample period from 1.1.2010 to 31.7.2020. Ratios and alphas are annualized for presentation purposes and presented in percentages.

Adjusted performance measures			
	Portfolio 1	Portfolio 2	Portfolio 3
Sharpe Ratio	13,826	15,349	6,971
Treynor Ratio	9,231	10,071	5,048
CAPM	-4,481	-3,069	-8,702
F&F 3-factor model	-4,579	-3,193	-7,510
Carhart 4-factor model	-4,454	-3,000	-7,035
F&F 5-factor model	-4,348	-3,474	-7,236

Table 6 show that Sharpe Ratios and Treynor Ratios seem to follow the same pattern. The highest Sharpe- and Treynor ratios are found in Portfolio 2 (average sustainable score), while the lowest are found in Portfolio 3, which includes the most unsustainable ETFs.

8 DISCUSSION AND CONCLUSIONS

New strategies and ways aimed at generating excess returns are constantly being sought by investors. Sustainable investments and passive asset management are two prominent trends in financial markets that have been examined in depth in this thesis. This thesis aimed to examine the effects of the ESG score on risk-adjusted returns. Conclusions and findings will be presented in this section. It will provide answers to the research questions: “Does sustainability level affect ETF return?”, and “Does low sustainable ETFs underperform high sustainable ETFs?”. Moreover, it determines whether the statistical hypothesis Inclusion of the ESG score criteria does not lead to abnormal returns can be rejected.

Recent years have seen an exponential increase in the size of both economic phenomena, which have become more popular with investors. Responsible investing and passive asset management have grown at a good pace for several years, and if the trend continues as in the past, growth will continue in the future. There is a debate currently about the effectiveness of sustainable investing, with some studies suggesting sustainability destroys value for investors, while others claim it adds value. Hamilton, Jo, and Statman (1993) investigated the actual relative returns of responsible funds and conventional funds. The risk-adjusted returns of the responsible equity fund were compared to ordinary equity funds and the S&P 500 index. The study found that responsible mutual funds do not generate statistically significant excess returns compared to conventional mutual funds. Kempf and Osthoff (2007) state that more investors aim for socially responsible screens when creating their portfolios and found that responsible investing can lead to up to 8.7% higher annual returns compared to conventional investing.

In this research, ETF responsibility was measured using Morningstar's sustainability data, which rates ETFs on a scale of 1 to 5. The scale reflects how well a company considers various responsibility factors in its operations. Sustainability factors refer, for

example, to how effectively companies reduce emissions and carbon footprints, employee safety and equal compensation for employees. Three different portfolios were constructed using the sustainability level developed for ETFs: Portfolio 1 includes ETFs with above-average ESG scores, Portfolio 2 includes those with the average score and Portfolio 3 includes the ETFs with under-average ESG scores. The asset pricing models, CAPM, Fama-French, and Carhart factor models were used to run all portfolios with different sustainability levels. In addition, risk-adjusted performance measures were calculated.

The results of this research do not allow direct conclusions to be drawn as to whether the ESG rating of ETFs affects returns. As stated in the research literature review, there are many different research results on the topic. In contrast, Stanley & Herb (2007) found that the return expectations of a portfolio built on ESG criteria are lower than those of other portfolios, regardless of the length of the time horizon. They justify the negative finding, according to modern portfolio theory, by the fact that the responsibility criterion limits the construction of an optimal portfolio, and thus returns are at a lower level than expected. The result is also based on the fact that the number of securities selected for the portfolio is more extensive if it is not a screened portfolio. According to Koh & Durand (2017), a responsible portfolio does not outperform market portfolio returns significantly.

The results of this study are a long line of these with the research mentioned above results. We can conclude that during the entire sampling period, from 1.1.2010 to 31.7.2020, each portfolio under consideration at a statistically significant level of 1 % has produced a negative abnormal return. It is proved that all factor models reject the null hypothesis that Inclusion of the ESG score criteria does not lead to abnormal returns. Based on these findings alternative hypothesis H1: “Negative abnormal returns are associated with ESG score portfolios” can be accepted.

The results from the high minus low ESG score returns are similar for all the used models. The monthly alphas are higher (less negative) for high sustainability ETFs. Based on these findings, H3: “High ESG score portfolio has higher risk-adjusted returns than low ESG score portfolio” can be accepted.

Continuing analysis of the results for the regression models, there are still no major cap between the high sustainability rating and the low sustainability rating in alpha, i.e., the level of sustainability seems to have a very minimal, almost neutral effect on portfolio abnormal returns. However, it was noteworthy that for each regression model, Portfolio 2 yielded the most (in this case, less negative). Although the empirical analysis of this thesis shows that each ETF portfolio has performed poorly, the result is in line with the success of other funds. Previous studies have found that funds generally underperform the market, even if they have not been screened for ESG factors.

Further confirmation of this result is provided by the Sharpe- and Treynor ratio, which gives Portfolio 2 the highest risk-to-reward ratio. Nofsinger & Varma (2014) and Henke (2016) research reveals that socially responsible funds with over-/under-screened are most likely underperform, moreover may achieve negative abnormal returns over time. However, isolating crisis and non-crisis periods indicate that socially responsible outperformance is more likely to appear during recessions and bear markets.

Despite other variables that might affect returns, this study established no significant diversity between the market betas of the portfolios. According to the empirical regression analysis of the thesis, all tested portfolios get significant results at the 1% significance level for the market factor. The betas of the portfolios fluctuated really close to one and only Portfolio 2 beta was less than one, indicating that returns for the Portfolio 2 investments are less volatile compared to the market returns. This finding is in line with the general research literature that the constructed portfolios based on the sustainability classification behave consistently with the movement of the market portfolio.

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