Ida Vehviläinen

Does it actually pay off to be bad rather than good?

Sin stocks, socially responsible investing, and the EU taxonomy

School of Accounting and Finance
Master's thesis in Finance
Finance

Vaasa 2021

VAASAN YLIOPISTO
Laskentatoimen ja rahoituksen akateeminen yksikkö
Tekijä: Ida Vehviläinen
Tutkielman nimi: Does it actually pay off to be bad rather than good? Sin stocks, socially responsible investing, and the EU taxonomy
Tutkinto: Kauppatieteiden maisteri
Oppiaine: Rahoitus
Työn ohjaaja: Nebojsa Dimic
Valmistumisvuosi: 2021 **Sivumäärä:** 94

TIIVISTELMÄ:
Sijoittajien kiinnostus vastuullista sijoittamista kohtaan on kasvanut huomattavasti viime vuosien aikana. Taustalla on mm. se, että ilmastonmuutos ja vastuullisuus ovat yhä enemmän puheenaiheina kansainvälisen politiikan tasolla. Myös sijoittajien kasvaneella tiedon ja kouluttautumisen määrällä on ollut vaikutusta vastuullisen sijoittamisen suosioon. Tämän myötä tutkijat ovat kiinnostuneet myös syntiosakkeiden, eli paheellisina pidetyillä toimialoilla toimivien yritysten osakkeiden tuotoista. Eräs suosittu vastuullisen sijoittamisen strategia on ns. negatiivinen seulonta, jossa portfoliosta jätetään pois juuri syntiosakkeet. Monet tutkimukset ovat kuitenkin osoittaneet syntiosakkeiden tuottavan markkinoita paremmin, mikä on synnyttänyt keskustelua siitä, joutuvatko vastuulliset sijoittajat tyytymään matalampiin tuottoihin kuin syntiosakkeisiin sijoittavat. Keskustelua on aiheuttanut myös vuonna 2020 julkaistu Euroopan unionin kestävän rahoituksen luokittelujärjestelmä, EU-taksonomia, sekä sen mahdolliset vaikutukset tuottoihin.

Tämän tutkielman tavoitteena on vastata edellä mainittuun keskusteluun ja selvittää, voiko syntiosakkeisiin sijoittamalla saada korkeampia tuottoja kuin vastuullisiin sijoituskohteisiin sijoittamalla. Toinen tavoite on tutkia, tuottavatko syntiosakkeet vastuullisia sijoituskohteita paremmin myös rahoitusmarkkinoiden kriisitilanteissa. Kolmas tavoite on selvittää, onko EU-taksonomian piiriin kuuluvien yhtiöiden poissulkemisella vaikutusta vastuullisen sijoittajan tuottoihin. Tutkielmassa avataan vastuullisen sijoittamisen, EU-taksonomian ja syntiosakkeen käsitteitä sekä ominaisuuksia. Lisäksi tutkielmassa esitellään aikaisempia aiheeseen liittyviä tieteellisiä tutkimustuloksia sekä tutkimuksen kannalta tärkeimmät rahoitusteorian mallit ja työkalut riskikorjattujen tuottojen mittaamiseen.

Tutkimus suoritetaan kvantitatiivisena tutkimuksena analysoimalla STOXX Europe 600 -indeksiin marraskuussa 2020 kuuluvista osakkeista muodostettujen portfolioiden tuottoja kolmen eri hinnoittelumallin avulla vuosien 2003 ja 2019 välillä. Empiiriset tulokset osoittavat, että sekä syntiosakkeilla että vastuullisilla osakkeilla voi saavuttaa epänormaaleja tuottoja, mutta syntiosakkeet eivät tuota tilastollisesti merkittävästi vastuullisia osakkeita paremmin. Lisäksi tulokset viittaavat siihen, etteivät syntiosakkeet tuota vastuullisia osakkeita paremmin myöskään taloudellisen kriisin aikana. Voittoa tavoitteleva sijoittaja voi siis sisällyttää molempia osakkeita portfolioonsa. Kolmas tutkimustulos viittaa siihen, että EU-taksonomian piirissä olevien yhtiöiden poissulkeminen heikentää vastuullisen sijoittajan tuottoja pitkällä aikavälillä. Tämän perusteella voidaan todeta, että sijoittajien on syytä analysoida tarkoin täyttävätkö taksonomian piirissä olevat yhtiöt annetut kestävyyskriteerit ollakseen taksonomian mukaisia vastuullisia sijoituskohteita. EU-taksonomian vaikutus tuottoihin vaatii kuitenkin lisää tutkimusta tulevaisuudessa, kun tarvittavaa dataa on riittävästi saatavilla.

AVAINSANAT: socially responsible investing, SRI, sin stocks, EU taxonomy, climate change, ESG, stock returns, investment performance, financial crisis, market downturn

Contents

Figures

Tables

Abbreviations

ATT	Arms Trade Treaty
BIC	Best-in-Class
CAGR	Compound Annual Growth Rate
CAPM	Capital Asset Pricing Model
CSR	Corporate Social Responsibility
DNSH	Do no significant harm
DSEFX	Domini Social Equity Fund
EMCDDA	European Monitoring Centre for Drugs and Drug Addiction
EMH	Efficient Market Hypothesis
ESG	Environmental, Social, Governance
EU	European Union
FSWF	Foundation for a Smoke-Free World
GSIA	Global Sustainable Investment Alliance
ILO	International Labor Organization
NFRD	Non-Financial Reporting Directive
SDGs	Sustainable Development Goals
SIPRI	Stockholm International Peace Research Institute
SRI	Socially Responsible Investing
TEG	Technical Expert Group
UN	United Nations
STOXX600	STOXX Europe 600 index
VICEX	The Vice Fund
WHO	World Health Organization

1 Introduction

Over the past years, investors' interest in socially responsible investing (SRI) has increased considerably. According to a survey conducted by Morgan Stanley Institute for Sustainable Investing (2017), 75 percent of individual investors are interested in responsible investing. The interest is even higher among the millennials, of which 86 percent show interest in it. However, 53 percent of individual investors believe that investing in socially responsible instruments requires a financial trade-off. Also, according to the same survey, over half of those surveyed consider an investor's main task to be to maximize profits. (Morgan Stanley Institute of Sustainable Investing, 2017.)

SRI functions by screening portfolios based on certain non-financial qualities. Positive screening includes companies that have desirable characteristics, such as good labor relations, to the portfolio, whereas negative screening intentionally excludes companies associated with so-called sin industries, such as alcohol industry, tobacco industry, and gambling industry. (Humphrey & Tan, 2014.) Multiple previous studies suggest that the returns of SRI funds and traditional funds do not differ from each other's (Benson, Brailsford, & Humphrey, 2006; Mollet & Ziegler, 2014; Humphrey & Tan, 2014). However, Humphrey and Tan (2014) note that it has been argued that negative screening results in increased risk and lower returns. Investors are unable to fully diversify their portfolios due to the diminished investment universe caused by exclusion (Barnett & Salomon, 2006). Therefore, unsystematic risk cannot be eliminated completely, leading to increased total risk. Returns are reduced because investors avoid investing in potentially profitable stocks based on non-financial motives. (Fabozzi, Ma, & Oliphant, 2008; Adler & Kritzman, 2008.) Indeed, previous literature provides evidence that these excluded stocks, sin stocks, outperform the market (Fabozzi et al., 2008; Richey, 2016).

Furthermore, discussion has been revolving around the performance of sin stocks and SRI funds during crisis periods. For example, Chatjuthamard, Wongboonsin, Kongsompong, and Jiraporn (2018) find in their study that controversial companies have a stronger performance than non-controversial companies during a financial crisis.

However, when it comes to socially responsible investing, previous studies have differing results whether responsible investments provide abnormal returns during a crisis period or not (Nofsinger & Varma, 2014; Trinks & Scholtens, 2017).

All this is contradicting to the efficient market hypothesis, which indicates that there should not be a chance for making abnormal returns (Bodie, Kane, & Marcus, 2014: 355). Therefore, a question that arises is: Does it actually pay off to be bad rather than good?

The increased interest in sustainability is visible at an international policy level as well, as several international commitments have been developed in order to achieve a more sustainable future. For instance, Sustainable Development Goals (SDGs) were adopted by all United Nations (UN) Member States in 2015 to take unified actions in order to end poverty, protect the planet and ensure peace and prosperity by 2030 (UNDP, 2021). Moreover, as the climate change is one of the greatest challenges faced by our world, hundreds of states have signed the Paris Agreement which aims to mitigate climate change by setting common goals for slowing down the global warming (UNFCCC, 2021).

When it comes to implementing the Paris agreement commitment to slow down the global warming, Europe is in a leading position. According to Valdis Dombrovskis, a member of the European Commission, the European Union has already achieved a 22 percent reduction of carbon emissions compared to 1990. However, this is not adequate, and further policies and actions are required which, in turn, requires capital. In order to reach the EU climate and energy targets by 2030, Europe needs to fill a yearly investment gap of nearly 180 billion euros. (Eurosif, 2018; European Commission, 2018.)

In an effort to fill this gap, the EU aims to allocate private capital towards sustainable growth by creating a classification system for sustainable activities. As a result, the EU taxonomy regulation was published in June 2020. The taxonomy sets thresholds and detailed screening criteria which help investors to identify which activities are

environmentally friendly and which are not, aiming to grow low-carbon sectors and de-carbonize ones with high carbon emissions. (TEG, 2020a; European Commission, 2018.)

However, since it is often argued that investing in a socially responsible manner requires a financial trade-off, investors may wonder whether adding more sustainability-linked criteria to their investment decisions directly results in lower returns. For example, if investments previously considered as sustainable do not fulfill the taxonomy's criteria, they would be excluded by socially responsible investors regardless of their returns. Therefore, this thesis aims to bring more insight of the relationship between the EU taxonomy and returns by empirically testing whether the following question is true: Does excluding stocks that are in the scope of the EU taxonomy have a negative impact on returns?

1.1 Purpose of the study

The purpose of this study is to determine if it actually pays off to be bad rather than good. In other words, the aim is to examine if sin stocks provide higher returns than socially responsible stocks and, in addition, whether excluding the companies in the scope of EU taxonomy has an impact on returns.

To support investors' belief of SRI requiring a financial trade-off, multiple studies show evidence that SRI funds either underperform the conventional funds or that their returns do not significantly differ from each other's (Benson et al., 2006; Renneboog, Ter Horst, & Zhang, 2008a; Mollet & Ziegler, 2014; Humphrey & Tan, 2014). In other words, it is not possible to make abnormal returns by SRI. However, this seems not to be the case for sin stocks as literature suggests that sin stocks outperform the markets (Fabozzi et al., 2008; Hong & Kacperczyk, 2009). Based on the prior literature, the first hypothesis in this study is following:

H_1*: Sin stocks provide higher returns than socially responsible stocks.*

Another objective is to examine how market downturn affects the performance of sin stocks and socially responsible stocks. However, there are only few prior studies investigating the effect of economic crisis on sin stocks. According to Chatjuthamard et al. (2018) the demand for controversial products, such as alcohol and tobacco, remains rather stable even during crisis periods. This is consistent with their finding of superior sin stock performance during an economic crisis. The number of studies considering the performance of SRI during a stressful time is broader but incoherent (Nofsinger & Varma, 2014; Trinks & Scholtens, 2017). Therefore, aligning with the insight of Chatjuthamard et al. (2018), the second hypothesis is:

H_2*: Sin stocks perform better than socially responsible stocks during an economic crisis.*

In order to reach its climate targets, the EU seeks to allocate private capital towards sustainable finance by creating a classification system for sustainable activities, that is, the EU taxonomy (European Commission, 2018). Therefore, it is appealing for investors to determine whether investing in a manner that meets the taxonomy's criteria has an impact on returns. As the taxonomy regulation entered into force in July 2020 and the implementation of the taxonomy is gradual, there is not yet enough required data available to fully follow the steps in the taxonomy to analyze whether certain investments can be considered sustainable or not. Therefore, this thesis focuses on all of the companies that are in the scope of the EU taxonomy.

As there are no previous academic papers on the impact of the EU taxonomy on returns as of this writing, the third hypothesis is derived from the literature regarding the effects of exclusion. As Barnett and Salomon (2006) note, excluding certain stocks diminishes the investment universe resulting in lower diversification. Furthermore, unsystematic risk increases, and risk-adjusted returns decrease. Therefore, the third hypothesis is the following:

H_3: Excluding stocks in the scope of the EU taxonomy negatively affects returns.

This study builds on the previous literature regarding SRI and sin stock returns and on an empirical analysis of portfolios constructed manually. Multiple prior studies on SRI analyze returns by focusing on SRI funds or indices. As noted by Lobe and Walkshäusl (2016), the methodological advantage of analyzing SRI indices or SRI stock portfolios instead of SRI mutual funds is that no filtering of transaction costs, management skills or fund managers' timing activities is required. Therefore, in this thesis, SRI portfolios are constructed by selecting stocks from the underlying data by using two different SRI strategies. Similarly, a traditional sin stock portfolio is constructed by employing a negative screen. In addition, four more portfolios are constructed. As it is in the interest of this paper to study the impact of the EU taxonomy on returns, this thesis focuses on the European stock market. The sample covers stocks included in the STOXX Europe 600 index as of November 2020, and the sample period begins in January 2003 and ends in December 2019.

Furthermore, this thesis contributes to the existing literature in the following manners: First, it utilizes recent data which may enable differing results from the prior studies. Second, as multiple previous studies examine either sin stock returns or SRI returns, this study aims to compare the returns directly as inspired by Lobe and Walkshäusl (2016), thus bringing more new insight to previous literature. Third, this thesis examines the effect of the EU taxonomy on returns. As of this writing, there are no previous academic papers on the matter due to the novelty of the EU taxonomy, indicating that there is a need for empirical evidence.

1.2 Structure of the thesis

The structure of this thesis is as follows. In the second chapter, the background regarding SRI and SRI strategies is introduced. Furthermore, the EU taxonomy and the concepts of sin stocks and sin industries are explained. In addition, the sin industries that often occur

in the literature are shortly presented. The third chapter present prior literature regarding sin stock returns and returns of SRI and the fourth chapter discusses the theoretical framework for measuring stock returns. The fifth chapter presents the data sources and data as well as the methodology of this study. In the sixth chapter, the results obtained from the empirical analysis are explained and discussed. Finally, in the seventh chapter, I present my conclusions.

2 Background

In this section of the thesis, the background of socially responsible investing and ESG factors are introduced. Also, SRI strategies are presented as well as some of the most common criticism against socially responsible investing. Furthermore, the background and purpose of EU taxonomy is discussed. Lastly, this chapter introduces the background of sin stocks and provides deeper insight on the sin industries that occur frequently in the literature related to sin stocks.

2.1 Socially responsible investing

Socially responsible investing (SRI), where investment decisions are made based on both financial and non-financial information, is not a new concept, but dates hundreds of years back. According to Schueth (2003), Jewish law instructed how to invest in an ethical manner already in early biblical times. The modern SRI stems from the 1960s when the political atmosphere was affected by the anti-Vietnam war movement and concerns about the cold war, civil rights, and equality for women. These themes raised awareness towards social responsibility. (Schueth, 2003.)

Investors' interest in SRI has grown considerably over the past years. A report published by the Global Sustainable Investment Alliance estimates that the global SRI assets have increased 34 percent from 2016 to 2018 while in Europe, the total assets committed to SRI strategies have grown by 11 percent (GSIA, 2018). According to the European SRI study, the compound annual growth rate (CAGR) of sustainability-themed investments over the past eight years is 25 percent (see Figure 1) (Eurosif, 2018). A similar study conducted by the US SIF Foundation (2018) shows that the CAGR of sustainable and responsible investments in the United States since 1995 is 13.6 percent (see Figure 2.).

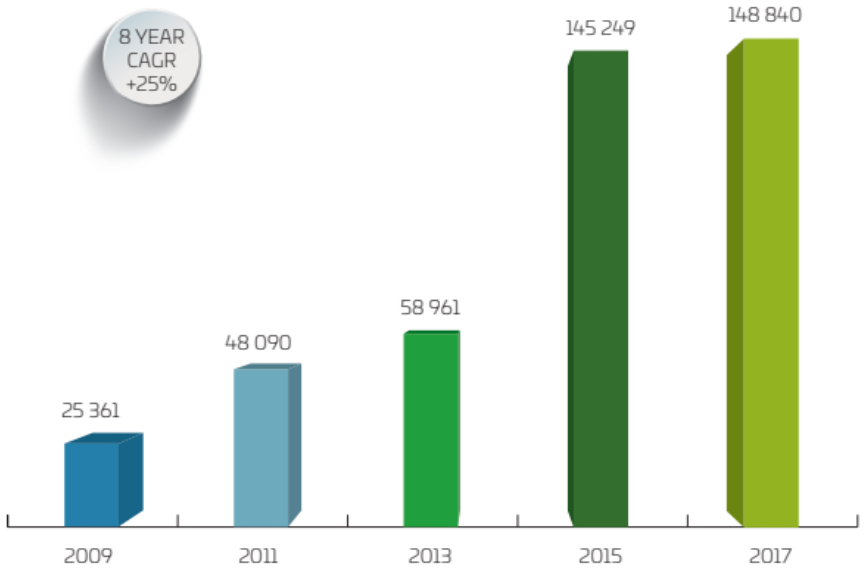

Figure 1. Growth of sustainability themed investments in Europe (Eurosif, 2018).

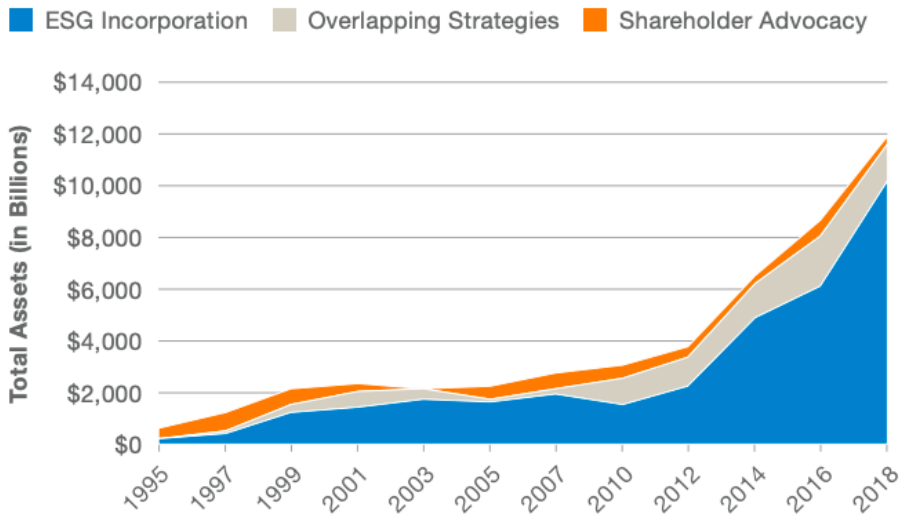

Figure 2. Sustainable and responsible investing in the US (US SIF Foundation, 2018).

According to Schueth (2003), the growth of SRI is driven by consumers, which has urged investment management firms to change their services to meet their customers' demand for sustainable options. Schueth (2003) also defines three reasons behind the growth, the first of which is the rising amount of information and education that investors have. The second reason is women's natural engagement in SRI. Some evidence suggests that out of social investors, 60 percent are women. The third reason is the growing

number of studies implying that SRI does not require a financial trade-off and can be profitable, instead. (Schueth, 2003.)

Other explanations behind the growth of SRI are advanced social media, reputational risks, growing demands of investors and regulations regarding responsibility (Tinelli, 2015, p. 365). Eurosif (2018), in turn, believes the growing popularity of sustainability-themed investments is a result of discussion at the international policy level where climate change and sustainability topics have increasing importance. Other drivers for SRI demand are legislative changes, and possibility to combine sustainability targets with financial outcomes (Eurosif, 2018).

There are no explicit definitions for SRI, which results in difficulties to determine what is "sustainability" and what is "sustainability-related" (Eurosif, 2018). In order to outline a high-level framework of what is meant by SRI, Eurosif (2016) defines SRI as follows: "SRI is a long-term oriented investment approach, which integrates ESG factors in the research, analysis and selection process of securities within an investment portfolio". Its purpose is to generate long-term returns for investors while simultaneously benefiting society. The means for this is in-depth analysis combined with evaluating ESG factors. (Eurosif, 2016.) In other words, SRI takes ESG (environmental, social, governance) factors into consideration when it comes to making investment decisions (Hebb, Hawley, Hoepner, Neher, & Wood, 2015, p. 3). Thus, investors pursue both financial and social goals (Renneboog, Ter Horst, & Zhang, 2008b). SRI can also be referred to with the terms 'ethical investing', 'social investing', 'responsible investing' and 'green investing' (Eccles & Viviers, 2011).

An interesting feature of the SRI market is the characteristics of investors. At the forefront of SRI are institutional investors such as pension funds. However, as retail investors, also called as individual investors, increasingly aim to invest in a sustainable manner, their share of SRI assets has expanded. In fact, retail sector's demand has increased by over 800% between 2013 and 2017 (see Figure 3). (Eurosif, 2018.)

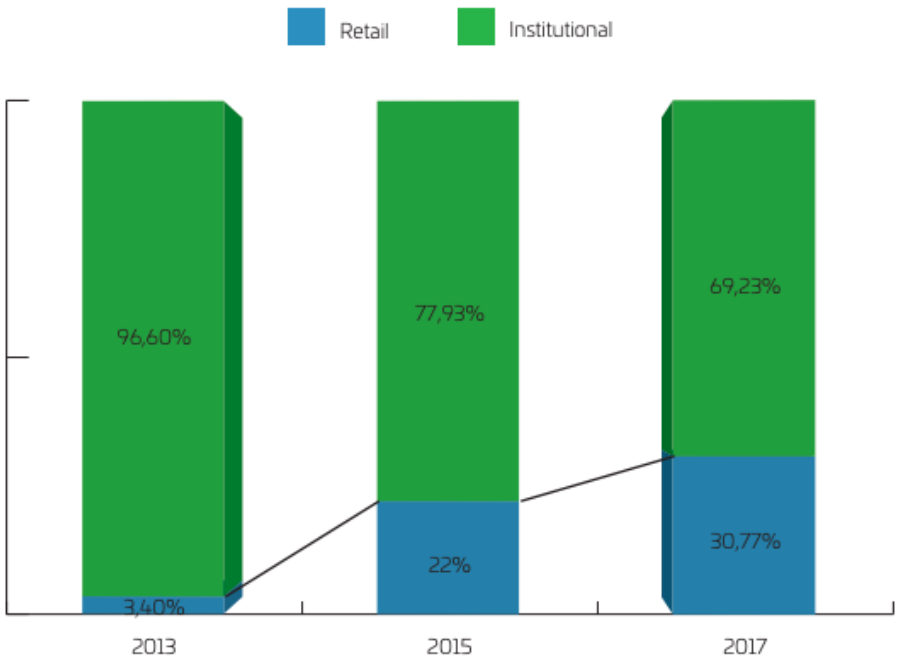

Figure 3. SRI asset breakdown by type of investor (Eurosif, 2018).

Despite some studies suggest that SRI generates negative returns over time, Nofsinger and Varma (2014) argue that SRI funds perform well during market crisis periods. According to them, this comes as a result of SRI and ESG dampening the downside risk. Therefore, the companies that are engaged in environmental, social, and governance areas don't suffer from large, negative ESG related incidents during economic crisis periods. For example, if a company is engaged with environmental responsibility and strong green programs, it is less likely to encounter scandals related to pollution, for instance. Nofsinger and Varma (2014) also note that even though these factors of lower risk exist during all market situations, people tend to pay more attention to them during crisis periods.

2.1.1 ESG factors

The ESG factors that are used to analyze socially responsible investments stand for environmental, social, and governance factors, that refer to numerous and constantly

changing issues. According to the Principles of Responsible Investment (PRI) (2019), the environmental factor invokes issues such as climate change, greenhouse gas emissions, waste, and pollution. The social factor refers to matters related to health and safety, local communities, employee relations and diversity, and working conditions including child labor and slavery, for example. The governance factors, in turn, include issues such as executive salary, bribery and corruption, board diversity and structure, and tax strategy. (UNPRI, 2019.)

According to Hebb et al. (2015, p. 3), these three factors weren't considered to be relevant concerns for finance in the past, because it was assumed that the stock price included all known information about the company. Over time, ESG information and the risks and possible returns relating to it became more evident. This led to the current mindset, in which ESG factors have a clear impact on companies' future revenues, which is why it is paramount to distribute ESG related information for shareholders in annual reports. (Hebb et al., 2015, p. 3.)

Wood (2015, p. 553) describes ESG as the tool for making a responsible investment. In order to realize such investments, investors can select to invest in companies with high ESG ratings. Responsible investors believe that high ESG standards are associated with decreasing risk in the long run and possible outperformance. ESG ratings are provided by third-party rating agencies, such as Morningstar and MSCI. (Hebb et al., 2015, p. 5.)

2.1.2 SRI strategies

Schueth (2003) presents two main motivations for responsible investors. The first group is simply motivated by the desire to invest in a manner that reflects their personal values and priorities. The other group on the other hand, experiences a need to put their money on assets that actually have an impact on society. In other words, they are more motivated by what kind of an impact their money can have.

To reach their goals and invest ethically, investors can execute different strategies. Schueth (2003) divides them into three different categories: shareholder advocacy, community investing and screening. Shareholder advocacy refers to actions taken by socially responsible investors who utilize their role as owners to influence the management of the company. This includes, for example, voting in shareholders' meetings and engaging in dialogue with the company in order to affect the corporate behavior positively. Community investing provides capital to low-income societies with troubles to access it through the conventional channels. It helps to create jobs and affordable housing, for example. (Schueth, 2003.)

The most common strategy for SRI is screening. In practice, screening means excluding or including companies from portfolios based on ESG factors (Schueth, 2003). The oldest SRI strategy is based on exclusion of companies, also known as negative screening. A typical negative screen is applied to a pool of assets, from which the companies operating in sin industries, such as alcohol, gambling, tobacco, weapon, and adult entertainment industry, are excluded. Other negative screens can be environment and labor relations and workplace conditions, which actualize as excluding companies contributing to global warming or exploiting their workforce, for example. (Renneboog et al., 2008b.)

As time has passed, the investment screens have evolved. Today, positive screens are often used to select shares of companies that have superior standards in corporate social responsibility (CSR). The most common positive screens relate to corporate governance, labor relations and environment. In practice, it means including companies that display, for example, "best practices" in management compensation and board independence, employee empowerment and recycling and waste reduction. (Renneboog et al., 2008b.)

Positive screening is often associated with a best-in-class (BIC) approach. Within an industry or market sector, companies are ranked based on their CSR or ESG ratings, and only the leading companies in each industry are selected to invest in. This results in diversification across industries, because best-in-class portfolio includes even tobacco

firms, but only the ones that have superior ESG practices compared to the industry (Humphrey, 2015, p. 667-668). However, it is common to use several screens together when making responsible investment decisions. (Renneboog et al., 2008b.)

European SRI study (2018) identifies seven categories for SRI strategies. The categories are exclusion, norms-based screening, best-in-class selection, sustainability themed investment, ESG integration, engagement and voting, and impact investing, which closely align with other frameworks (see Table 1). According to the study, the most popular strategy is exclusions. However, the fastest growing strategy is ESG integration, which suggests that integrating sustainability criteria into investment decisions is increasingly the norm among investors. Other strategies exhibiting growth are best-in-class together with engagement and voting. (Eurosif, 2018.)

Table 1. Different SRI strategies (Eurosif, 2018).

Eurosif	GSIA-equivalent	PRI-equivalent	EFAMA-equivalent
Exclusion of holdings from investment universe	Negative/ exclusionary screening	Negative/ exclusionary screening	Negative screening or Exclusion
Norms-based screening	Norms-based screening	Norms-based screening	Norms based approach (type of screening)
Best-in-Class investment selection	Positive/ best-in-class screening	Positive/ best-in-class screening	Best-in-Class policy (type of screening)
Sustainability themed investment	Sustainability-themed investing	Sustainability themed investing	Thematic investment (type of screening)
ESG integration	ESG integration	Integration of ESG issues	-
Engagement and voting on sustainability matters	Corporate engagement and shareholder action	Active ownership and engagement (three types): Active ownership Engagement (Proxy) voting and shareholder resolutions	Engagement (voting)
Impact investing	Impact/community investing	-	-

2.1.3 SRI and diversification

Perhaps one of the most popular reasons for criticism towards SRI stems from its effects on diversification (Lee, Humphrey, Benson, & Ahn, 2010). Screening may result in

excluding not only certain companies, but also complete industries. For example, the whole tobacco industry or weapon industry may be excluded from an SRI fund due to negative screening. According to the modern portfolio theory, investments bear two types of risk: systematic risk, which is also called market risk or non-diversifiable risk, and unsystematic risk, which is also known as firm-specific risk and can be eliminated by diversification (Bodie et al., 2014). (Barnett & Salomon, 2006.)

SRI and negative screening cause responsible portfolios to lack a proper diversification. It also results in diminishing investment universe, which keeps diminishing the more selectivity increases (see Figure 4). This implies that due to negative screening, SRI funds tend to carry more unsystematic risk, which should lead to decreased risk-adjusted returns. (Barnett & Salomon, 2006.)

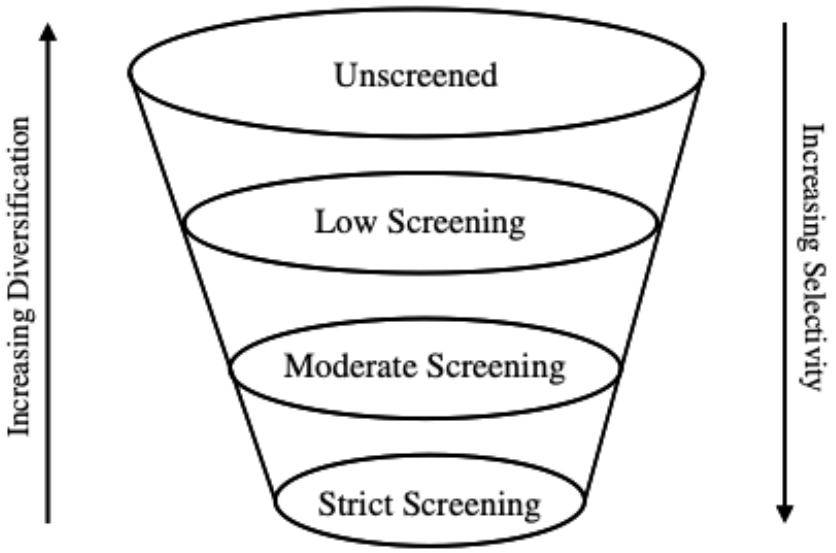

Figure 4. The effects of screening on the investment universe (Barnett & Salomon, 2006).

However, Lee et al. (2010) study the effect of screening intensity on risk and find no evidence on its effect on unsystematic risk. But, when the number of screens increases, they find that the fund's total risk decreases. They believe that this is a result of SRI managers being aware of the criticism of the lack of diversification and increased risk, which is why they intentionally choose stocks with lower beta (systematic risk). Lee et al. (2010)

also discover that the type of the screen may impact on fund's total risk. Therefore, they note that investors should invest in funds that only use screens they find necessary. (Lee et al., 2010.)

2.2 EU taxonomy

According to the Global Sustainable Investment Alliance (GSIA), 49 percent of European professionally managed assets were committed to SRI strategies in 2018. Furthermore, together with the United States and Japan, Europe is the largest region based on the value of assets invested sustainably. In 2018, Europe accounted for 46 percent of global sustainable investing assets, reflecting that SRI has for long been broadly practiced and accepted in the region. (GSIA, 2018.)

However, the debate over definitions of SRI and the lack of clear metrics is considered to hinder the SRI industry. For example, the discussions around SRI definitions have amplified the concerns over issues such as greenwashing, which may be considered as a barrier to SRI in general. In order to overcome these challenges, European Commission (hereafter "Commission") published an action plan on sustainable finance in March 2018. The three objectives of the action plan are reorientating cash flows towards financing sustainable growth, managing risks related to environmental and social factors such as climate change and social issues, and increasing transparency and long-term approach when it comes to financial and economic activity. (Eurosif, 2018; European Commission, 2018.)

The first action of the action plan involves the establishment of a classification system for sustainable activities, in other words, the EU taxonomy. The taxonomy has been developed by a Technical Expert Group (TEG) that was mandated by the Commission in July 2018. The TEG published its first technical report in June 2019. In March 2020, building on the report of 2019, a final report on the EU taxonomy was published, accompanied with a technical annex. (European Commission, 2020.) This subchapter presents the

purpose, benefits, and the structure of the taxonomy based on the reports of the TEG. It is important to note that the EU taxonomy is very detailed and therefore, this thesis presents only the main ideas and key points of the taxonomy. Hence, it is recommendable to see the TEG reports for deeper insight on the topic.

2.2.1 Purpose and benefits

Reaching the Sustainable Development Goals (SDGs) and the climate-related goals through the Paris agreement requires substantial amounts of capital. In order to meet the climate change mitigation objectives alone, Europe needs to fill a yearly investment gap of nearly 180 billion euros. Sources from the public sector are not adequate to meet this challenge, and therefore, in an effort to fill the gap, the EU aims to allocate institutional and private capital towards sustainable growth. This, on the other hand, requires clarity regarding what comprises a sustainable investment. Therefore, the EU has developed the classification system for sustainable activities, the EU taxonomy. (European Commission, 2018; TEG, 2019a; TEG, 2020a.)

The taxonomy sets thresholds and detailed screening criteria which help investors to identify which activities are environmentally friendly and which are not, aiming to grow low-carbon sectors and decarbonize ones with high carbon emissions. Therefore, as investors are able to identify the investment opportunities that support the environmental policy objectives, their investment decision can make an important contribution to the climate goals and SDGs. (TEG, 2019a; TEG, 2020a.)

In addition, TEG (2019b) lists multiple other benefits stemming from the EU taxonomy. For instance, it provides a common language for investors, issuers, policymakers, and regulators. In addition, the taxonomy can be applied by companies to raise financing, and it can be used to avoid greenwashing. Also, the taxonomy may save time and money for investors and issuers as well as decrease reputational risks. Lastly, the taxonomy

supports different investment styles and strategies, puts environmental data in context, and rewards companies. (TEG, 2019b.)

2.2.2 Structure of the EU taxonomy

Instead of simply ranking companies to good or bad ones, the taxonomy provides a list of economic activities that need to meet the screening criteria to be included in the taxonomy (TEG, 2019b). To meet the definition of a sustainable activity, the economic activities need to make a substantial contribution to at least one of six environmental objectives, which are the following (TEG, 2019a):

1. Climate change mitigation,
2. Climate change adaptation,
3. Sustainable use and protection of water and marine resources,
4. Transition to a circular economy, waste prevention and recycling,
5. Pollution prevention and control, and
6. Protection of healthy ecosystems.

In addition, the economic activities must do no significant harm (DNSH) to the other five environmental objectives and comply with minimum social safeguards (TEG, 2019a). The taxonomy also sets technical screening criteria for each economic activity (TEG, 2020a).

The TEG describes the universe of economic activities by using NACE (Nomenclature des Activités Économiques dans la Communauté Européenne) which is a European industry standard classification system. Based on NACE classifications, the TEG identifies 21 broad economic sectors, from which it has chosen the priority sectors for mitigating climate change. (TEG, 2019b.) Currently, the TEG identifies that economic activities in the following sectors can make a considerable contribution to climate change mitigation or climate change adaptation:

- Agriculture and forestry,
- Manufacturing,

- Electricity, gas, steaming and air conditioning supply,
- Water, sewerage, waste and remediation,
- Transport,
- Information and Communication Technologies (ICT), and
- Buildings.

The aforementioned sectors have large greenhouse gas emissions footprints, and hence they have been prioritized by the TEG in the development of technical screening criteria (TEG, 2020a.)

The screening criteria for the EU taxonomy will be developed in two phases through delegated acts. To this point, the TEG has focused on creating screening criteria for the economic activities that make a substantial contribution to the first two environmental objectives, climate change mitigation and adaptation. According to TEG, the first phase will be adopted by the end of 2020 and enter into application by the end of 2021. The second phase includes screening criteria for the other four objectives and will be adopted in 2021 and enter into application by the end of 2022. (TEG, 2020a.) Therefore, only the first two objectives are discussed in more detail below.

Climate change mitigation

The TEG (2020a) has identified the climate change mitigation objectives to mean the following: net-zero emissions by 2050 and a reduction of emissions by 50-55 percent by 2030. In order to reach these goals, the sectors that are already close to zero emissions need to be expanded, whereas the sectors with high emissions need to be decarbonized. (TEG, 2020a.)

In order to understand which activities make a substantial contribution to climate change mitigation, the TEG considers three kinds of activities. The first type of activity refers to activities that are already low carbon and consistent with the net-zero objective of 2050,

such as zero emissions transport. The second type of activity, in turn, represents the activities that are committed to the transition to a net-zero emission economy, but are not yet at that level. Finally, the third type refers to the activities that enable the aforementioned two types of activities, such as manufacturing of wind turbines. Moreover, for an economic activity to be considered as substantially contributing to climate change mitigation, it must show consistency in its medium- and long-term climate goals. (TEG, 2019b; TEG, 2020a.)

Climate change adaption

In order to understand which activities can make a substantial contribution to climate change adaptation, the TEG considers two types of activities. The first type refers to "activities that are made more climate resilient by integrating measures to perform well under a changing climate". The second type covers "activities that enable adaptation in other economic activities". The TEG also notes that the adaptation to climate change is location and context specific, which essentially is the key difference between climate change mitigation and adaptation. (TEG, 2019b.)

Moreover, according to the TEG (2019b), investors should look for the implementation of three principles in order to determine if an activity makes a substantial contribution to climate change adaption. According to the first principle, the activity needs to "reduce all material physical climate risks to the extent possible and on a best effort basis". The second principle points out that the activity cannot "adversely affect adaptation efforts by others". Finally, according to the third principle, the economic activity needs to have "adaptation-related outcomes that can be measured using adequate indicators". (TEG, 2019b.)

Do no significant harm (DNSH)

In order to be taxonomy-compliant, an economic activity making a substantial contribution to climate change mitigation or adaptation must do no significant harm to any of the other environmental objectives. This emphasizes the relationship between the objectives and ensures that the EU taxonomy does not include activities that undermine any of the six objectives. The majority of the DNSH criteria stem from the existing EU regulations, which is why it should be rather straightforward for companies and issuers to prove that they fill these requirements, assuming that they have, for example, compliance functions in place. The additional DNSH criteria refer to both quantitative and qualitative thresholds. (TEG, 2019b.)

Minimum safeguards

To meet the definition of a sustainable activity, economic activities also need to comply with minimum social safeguards. This brings attention to the social aspect of the investments as well, as the main focus of the taxonomy's screening criteria is currently on the environmental aspects. Complying with minimum safeguards signifies that the taxonomy-compliant activities need to be carried out "in alignment with the OECD Guidelines for Multinational Enterprises and UN Guiding Principles on Business and Human Rights, including the International Labor Organization's (ILO) declaration on Fundamental Rights and Principles at Work, the eight ILO core conventions and the International Bill of Human Rights", as established by the European Parliament and the Council. Moreover, the TEG notes that the more rigorous requirements in EU law still apply, where applicable. (TEG, 2020a.)

Disclosure

The taxonomy regulation identifies three groups of taxonomy users. The first group covers the financial market participants offering financial products in the EU, including occupational pension providers, while the second group contains certain large companies.

The third group refers to the EU and its member states when setting public measures or standards for green financial products. (TEG, 2020a.)

It is required by the EU taxonomy that financial market participants offering products in the EU, including occupational pension providers, make taxonomy disclosures. More specifically, those who market or manufacture products such as UCITS funds, alternative investment funds (AIFs), insurance-based investment products (IBIP), pension products and pension schemes as environmentally sustainable in the EU, are required to state how and to what extent they have used the EU taxonomy in determining how sustainable the underlying investments are. Moreover, they need to disclose what are the environmental objectives that the investments contribute to, and finally, the taxonomy-aligned proportion of the underlying investments. The disclosure against the EU taxonomy is a part of a broader sustainability-related disclosure regime concerning financial market participants. These obligations stem from the Regulation on Sustainability-Related Disclosures in the Financial Services Sector (SDR). (TEG, 2019b; TEG, 2020a.)

In addition to the financial market participants, the EU taxonomy also requires that large companies that are already required to provide non-financial statement under the Non-Financial Reporting Directive (NFRD) make taxonomy disclosures. There are national differences with the implementation of the NFRD, but it covers at least large public-interest companies with more than 500 employees, including listed companies, banks, and insurance companies. The requirements differ between financial and non-financial companies, but all relevant companies need to disclose how and to what extent their activities are associated with taxonomy-aligned activities. For non-financial companies, the disclosure needs to include the proportion of turnover aligned with the EU taxonomy as well as capex and, if relevant, opex aligned with the taxonomy. (TEG, 2020a.)

With regards to the timetable of the EU taxonomy and its disclosure requirements, financial market participants are required to make their first taxonomy disclosures about activities that substantially contribute to climate change mitigation or adaptation by the

31st of December 2021. Companies, in turn, are required to make taxonomy disclosures during the following year, in 2022 (TEG, 2020a.)

2.2.3 Practical implications

The EU taxonomy can be used for multiple purposes, such as expressing investment preferences, selecting holdings, designing green financial products, or measuring the environmental performance of an equity or a bond, for example. However, it is important to note that the EU taxonomy is not mandatory for investment decisions. (TEG, 2019b.)

In order to facilitate the identification of sustainable investments, companies are encouraged to provide taxonomy-related data, such as revenue breakdown based on the taxonomy's classifications, to investors. However, investors' key challenge regarding the EU taxonomy is the limited data. For example, companies that are not in the scope of the NFRD may not disclose against the taxonomy. The same goes with non-EU countries. Hence, the TEG (2020a) recommends that investors follow a five-step approach. The first step is to identify the activities conducted by the company or activities that are covered by the financial product that could be qualified. Second, it needs to be considered whether the company meets the relevant criteria for having a substantial contribution. The third step is to verify that the DNSH criteria are met by conducting due diligence. The fourth step is to conduct due diligence with regards to the minimum social safeguards, and finally, the fifth step is to calculate the alignment of investments with the EU taxonomy. (TEG, 2020a.)

2.3 Sin stocks

Stocks of the companies that profit from human vices are called sin stocks. This refers to companies operating in, for instance, alcohol, tobacco, gambling, and weapons industries, which are often seen as unethical or immoral in the eyes of society. (Blitz & Fabozzi,

2017.) Hence, they are typically excluded from SRI portfolios based on negative screening criteria. In their paper, Blitz and Fabozzi (2017) refer to a website called Sin Stocks Report, that is fully dedicated to sin stocks. According to this website, the three most common sin stock categories are alcohol, tobacco, and gambling. The other categories are weapons, adult entertainment, and cannabis as the latest addition to the list. (Blitz & Fabozzi, 2017; Sin Stocks Report, 2015.)

However, it is not always easy to draw a line between what is considered sin and what is not. For example, if cannabis is used for medical purposes, it may not be as straightforward to determine whether it is sinful or not. Moreover, investors need to evaluate if they want to invest in companies that are only partly involved in activities regarded as vices, such as retail corporations that earn 10 percent or less of their revenues from selling alcohol or tobacco. (Trinks & Scholtens, 2017.) This depends greatly on individual investors' values, which again are rather subjective and stem from social norms. Fauver and McDonald (2014) find in their paper that sin stocks are looked upon differently among different countries based on the social norms present in the country. Therefore, what is considered as sin varies geographically. As a solution to this, De Colle and York (2009) suggest that socially responsible investors should evaluate the company's social responsibility instead of only focusing on the fact that the company produces goods that may be seen as unethical.

The notion of what is considered as a sin stock may also change over time (Blitz & Fabozzi, 2017). This can result from a change in a company's product portfolio and source of revenue or from a shift in social norms. For example, due to the rising trend of SRI, institutional investors avoid investing in companies with high carbon emissions. Blitz and Fabozzi (2017) also suggest that in the future, some blue-chip companies such as Coca-Cola and McDonald's may be categorized as sin stocks, since sugar and fat are increasingly considered as vices. (Blitz & Fabozzi, 2017.)

In their article, Hong and Kacperczyk (2009) study how social norms affect stock markets. They find that sin stocks are neglected by large institutional investors, such as pension funds and insurance companies. This is due to the public nature of their investments and their exposure to the public eye. In addition, there are social norms against investing in operations associated with human vice. Hong and Kacperczyk (2009) also find that sin stocks are less followed by analysts than their counterparts with otherwise similar characteristics. Another important finding is that the sin stocks have higher expected returns and relatively cheaper prices than their counterparts. (Hong & Kacperczyk, 2009.)

The Vitium Global Fund (formerly known as the Vice Fund and the Barrier Fund) is a fund established in 2002 and managed by USA Mutuals, investing purely in sin stocks. In fact, it is the only mutual fund which follows explicitly this strategy (Lobe & Walkshäusl, 2016). It is intended for investors that seek for better long-term risk-adjusted returns than the S&P 500 Index. The Vitium Global Fund believes that demand in sin industries is resilient during market cycles. (USA Mutuals, 2019.) Similarly, Chatjuthamard et al. (2018) note that the demand for controversial products, such as alcohol and tobacco, remains rather stable even during crisis periods, which affects in sin stocks performing well during those times.

The Vitium Global Fund managers also state that sin industries benefit from high entry barriers resulted by government regulation and high costs of research and development. Other sin industry features are strong brand loyalty, economies of scale, low production costs and pricing power, which is why these companies often operate in an oligopoly. Especially alcohol and tobacco industries still remain government monopolies in many countries. Companies operating in sin industries are also expected to generate strong free cash-flows, which can be either reinvested in the business or distributed to shareholders as dividends. The global nature of sin industries allows the Vitium Global Fund to diversify its assets across international markets. Lastly, the fund believes that since governments benefit from the taxation of sin industries, they should ensure that these businesses do well. (Fabozzi et al., 2008; USA Mutuals, 2019.)

Fabozzi et al. (2008) note that sin industries are prone to both headline risk and litigation risk. Headline risk refers to the risk of a company's stock value being affected by a major news story about the company. Companies operating in sin industries are under the pressure of society's judgment, which is why the news headlines are often related to scandals or other negative incidents. Therefore, controversial firms tend to have only negative headline risk. Litigation risk refers to the possibility of being sued. According to Fabozzi et al. (2008), due to these risks the stocks of companies operating in sin industries are undervalued. (Fabozzi et al., 2008.)

2.3.1 Alcohol industry

The alcohol industry consists of distiller industry, vintner industry, and brewing industry. The actors within these industries are distillers, vintners, blenders, manufacturers, and shippers of spirits, wine, and malt products. (Lobe & Walkshäusl, 2016.) In addition, some studies, such as Trinks and Scholtens (2017), include alcoholic beverage stores and drinking places, such as bars, to the list.

European countries have an important role in the beverage markets, since spirits industry in Europe is the largest in the world (Spirits Europe, 2020a). In 2019, Europe's main spirit export destination countries were the United States, Singapore, China, Russia, and Japan (Spirits Europe, 2020b). When it comes to the wine markets, Europe is again the leader in production by accounting for 68 percent of global production, which is 27.4 billion liters of wine per year. North and South America together account for 19 percent of the production while Oceania, Africa and Asia account for the last 13 percent. The global wine trade is worth 28.3 billion euros and the main export markets for European wine are the United States, China, Canada, Japan, Hong Kong, and Russia. (Comité Européen des Entreprises Vins, 2016.) With regards to brewing, China is undeniably the largest beer-brewing country in the world by producing over 38,927 million liters of beer

in 2018. In Europe, Germany is the leading beer producing country by producing 9,365 million liters of beer in 2018. (The Brewers of Europe, 2017; Kirin Beer University, 2019).

The greatest challenges for alcohol industry are high import tariffs, discriminatory taxation and legislation, counterfeit trade and complexity of custom procedures, each of which impact on the global trade of alcohol (Spirits Europe, 2019c). Some countries impose very high tariffs for imported alcohol beverages, which leads to diminishing market shares, for example. The same goes with tax policies; high taxation raises retail prices, which again effects on consumer behavior. Discriminatory legislation and complex custom procedures might lead to high entry barriers for companies importing alcohol. (Spirits Europe, 2019c.)

According to World Health Organization (WHO) (2018a) more than half of the population in three WHO regions, that are the Americas, Europe, and the Western Pacific, consume alcohol. Europe has the world's highest per capita consumption, even if it has decreased during the past years. However, the global alcohol per capita consumption is expected to increase during the next ten years. (WHO, 2018a.) The harmful use of alcohol generates economic and social losses both to individuals and society. It is associated with the risk of developing health problems, such as mental illnesses, liver cirrhosis, some cancers and cardiovascular diseases. It is also associated with unintentional or intentional injuries caused by violence and traffic accidents. The harmful use of alcohol causes 3 million deaths every year. (WHO, 2018b.)

2.3.2 Gambling industry

The gambling industry has grown considerably during the past years. It has also drawn attention from academia and policymakers. Therefore, the previous literature considering gambling is rather extensive. The structure of gambling businesses varies across countries due to differences in legislation. (Brochado, Santos, Oliveira & Esperança, 2018.) For example, in some European countries, such as Finland and Sweden, gambling

business is operated by state-owned monopolies, whereas in France the majority of its 200 casinos operate under the control of four large groups (European Casino Association, 2019). In the United States, on the other hand, online gaming is mainly illegal (Fang & Mowen, 2009). The actors in gambling industry are defined to be the manufacturers, owners, and operators of gambling machines, equipment, casinos, and racetracks, for example (Lobe & Walkshäusl, 2016; Trinks & Scholtens, 2017).

Online gambling is a fast-growing part of the gaming industry (Fang & Mowen, 2009). In 2017, the market value of global online gambling industry reached 47,036 million dollars. The largest segment was sports betting that accounted for 48 percent of the total market value (see Figure 5). The casino segment accounted for further 24 percent and poker for 8 percent. Geographically, Europe accounted for almost a half of the global online gambling industry value with 47.6 percent, while Asia-Pacific accounted for 24.9 percent. (MarketLine, 2017.)

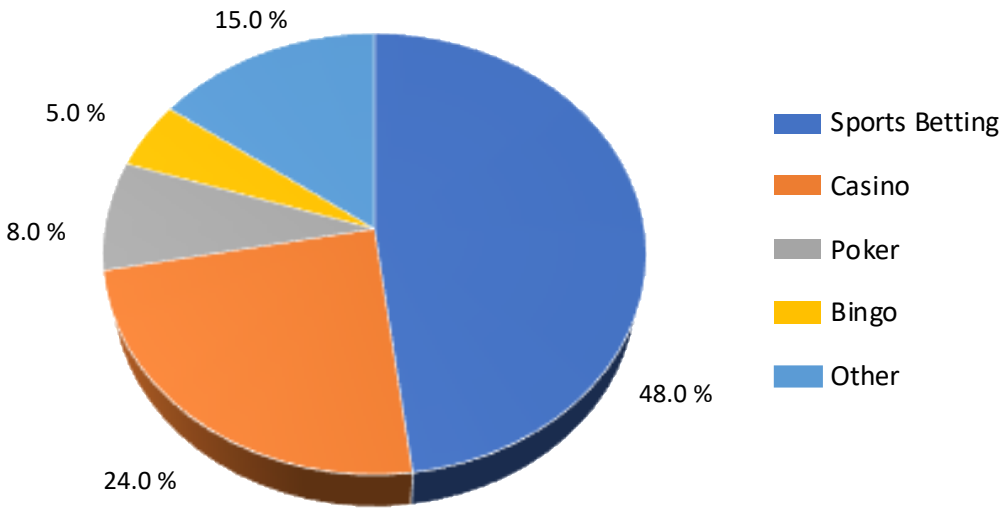

Figure 5. Global online gambling industry category segmentation (MarketLine, 2017).

As gaming is a part of the entertainment sector, it is widely considered as a recreational activity. According to Brochado et al. (2018) there are five motives for gambling. The first

one is monetary reasons, which includes winning money, prizes or other rewards, and the second one is social reasons. This implies that gambling is a way of socializing and spending time with friends, as well as gaining affection in the eyes of others. The third motive is coping and escaping and the fourth one is recreation, which means that gambling is simply considered fun, entertaining and relaxing. The last motive refers to enhancement, meaning that people gamble in order to challenge themselves or to learn something new. However, the motives seem to vary depending on the preferred gambling activity. (Brochado et al., 2018.)

Despite gambling generates revenues for governments in the form of taxes, for example, it also has various harmful social consequences, especially when its practice reaches pathological levels (Fang & Mowen, 2009). Pathological gaming can be defined as persistent gaming behavior that disrupts personal and family life, as well as professional pursuits. Some of the issues that are often associated with problem gaming are bankruptcy, divorce, suicide, and crime, such as embezzlement and theft. These issues can be caused by the debt resulting from excessive gambling, which again might lead to problems with relationships, personal economy and even mental health. (Goss & Morse, 2007, p. 68-69, 75.)

2.3.3 Tobacco industry

Smoking has a long history, since it quickly started to spread across the world due to expeditions in the 15th century. During the First and the Second World War, tobacco companies sent a large amount of cigarette pack's to soldiers on the first line, which resulted in loyal and addicted consumers. Despite the first reports on the hazards of smoking emerged already in the 17th century, the consumption kept on growing. (Tobacco-Free Life, 2019.) Today, the overall consumption of tobacco has started to decrease, even though it is still increasing in some parts of the world (Drope et al., 2018, p. 10).

Each year, tobacco kills more than 8 million people, of which more than 7 million deaths are caused by the direct tobacco use and around 1.2 million deaths are due to non-smokers being exposed to second-hand smoke (WHO, 2019a). While most people know that tobacco causes cancer and lung disease, they are not aware that it also causes cardiovascular diseases, such as heart attacks and stroke (WHO, 2018c). According to the WHO (2019b), the economic cost of smoking, arising from health care related expenses and productivity losses, is 1.4 trillion US dollars per year. Nearly 40 percent of this cost comes from developing countries, where also most of the tobacco-related deaths occur (WHO, 2019b).

Manufacturers and distributors of cigarettes and other tobacco products, including tobacco cultivation, represent the actors in the tobacco industry (Lobe & Walkshäusl, 2016). The largest tobacco leaf producing countries are China, Brazil, India and the United States. Cultivation of tobacco leaf has multiple issues, such as degradation of environment, health hazards for farmers, and child labor. (Drope et al., 2018., p. 14-15.) When it comes to health impacts, the global decrease in smoking is considered as a positive matter. However, it has a negative economic effect on tobacco farmers, many of whom are in developing nations. (Foundation for a Smoke-Free World, 2019.)

The tobacco industry has faced a large amount of regulation in order to decrease the demand of tobacco and make it less attractive. For example, graphic health warnings of tobacco product packs are proved to increase the awareness of tobacco related harms. In addition, different regulations have been set for the tobacco advertising. The regulations include bans for both direct advertising, such as advertising on television, and indirect advertising, such as price discounts. Yet only 48 countries have banned all forms of tobacco advertising, promotion and sponsorship. Other restrictions are, for example, bans on indicating flavors and limiting the amount of nicotine (Drope et al., 2018, p. 16). (WHO, 2019a.)

Perhaps the most efficient way of changing the consumer behavior is the taxation of tobacco products. High taxes raise tobacco product prices, which reduces demand and smoking rates. This method is effective especially among young and lower-income people, since they are more sensitive to price changes. However, only a few countries have placed high taxes for tobacco products. Many governments are reluctant to do this because they worry about declining tax revenues and illicit trade of tobacco products. (Drope et al., 2018, p. 38; WHO, 2019b.)

2.3.4 Weapon industry

According to the Stockholm International Peace Research Institute (SIPRI) (2020), world military expenditure was estimated to be 1,917 billion dollars in 2019. The five countries spending the most money on military were the United States, China, India, Russia, and Saudi Arabia. The United States and China together accounted for over half of the world's military spending. In European context, France spends the most on military. The volume of international transfers of major arms has been growing steadily since the early 2000s. The United States, Russia, France, Germany, and China have been the largest arms suppliers between 2015 and 2019, together accounting for 76 percent of the global total volume of exports. (SIPRI, 2020.)

The trade of weapons is controlled globally. For example, the UN General Assembly adopted the Arms Trade Treaty (ATT) in 2013 to regulate the trade of conventional arms and prevent illegal trade. It is a treaty that "contributes to international and regional peace, security and stability, reducing human suffering, and promoting cooperation, transparency and responsible action among the international community". Currently, it has 110 state parties that have approved and agreed to the treaty. (ATT, 2020.)

Weapon industry typically has high research and development costs, which results in a high entry barrier, meaning that it is hard for new firms to enter the market (Fabozzi et al., 2008). Fabozzi et al. (2008) also note that the weapon industry is closely associated

with politics and is therefore sensitive to shifts in political positions on willingness to go to war, for example. Some of the future prospects for the defense industry are the growing internationalization of weapons production, the importance of information technology companies and privatization of some services that were once produced by the military. (Dunne, 2015.)

Weapon industry is often excluded from the previous research considering sin stock returns. This is due to the varying opinions on whether the weapon industry is regarded as a sin or not (Fabozzi et al., 2008). For example, Liston-Perez and Gutierrez (2018) mention that in the United States defending the nation is seldom seen as a vice. In fact, even the American Constitution reflects their more tolerant attitude towards weapons. According to the Council on Foreign Relations, Americans have 120 civilian-owned guns per 100 people, which is multiple times the amount than in some other countries of the world. However, the large number of mass shootings in the United States has sparked more discussion over gun control. (Masters, 2019.)

2.3.5 Other sin industries

Adult entertainment industry is often excluded from research considering sin stocks (Lobe & Walkshäusl, 2016). According to Fabozzi et al. (2008), a reason behind this is the lack of industry classifications. They detected that many adult entertainment companies are classified as a part of restaurant industry, since they usually offer food and drinks as well. Lobe and Walkshäusl (2016) also mention that most of the companies in adult entertainment industry are private companies. However, when adult entertainment is included in the previous studies, the selected companies operate in the production or distribution of sexual products and services, such as X-rated films, printed materials, productions studios, TV or radio programs, and adult clubs (Trinks & Scholtens, 2017).

Cannabis industry, in turn, is a relatively new sin industry since it's only recently legalized, including for recreational use, in some countries, such as Canada and a number of states

in the US (Ponthus, 2019). Still, in many countries cannabis is only allowed for medical purposes and the possession of cannabis for personal use is criminalized (EMCDDA, 2019). There were no empirical studies on sin stocks including cannabis industry found as of this writing. It can also be debated if cannabis stocks can be regarded as sin stocks, if cannabis is used for medical purposes.

Multiple other industries may be regarded as sin industries as well. For example, there is an ongoing debate around whether nuclear power is sustainable due to its low carbon emissions or if it is one of the sin industries. In this thesis, only the four sin industries presented in the previous chapters are analyzed due to limitations in data accessibility.

3 Literature review

This chapter presents previous literature on the performance of SRI and sin stocks. The EU taxonomy is not considered in this chapter as there are no previous academic papers found on the impact of the EU taxonomy on returns as of this writing. The chapter is divided into subchapters that discuss the performance from three different perspectives. In the first subchapter, I present previous literature on the performance of SRI. The second subchapter focuses on literature regarding sin stock performance. Lastly, the third subchapter covers literature on the performance of sin investing compared to the performance of SRI.

3.1 SRI performance

A wave of studies on SRI emerged after the study of Moskowitz in 1972 (Brzeszczyński & McIntosh, 2014). Therefore, the number of previous studies about SRI is more extensive than the one about sin stocks. Moreover, multiple prior studies on SRI analyze returns by focusing on SRI funds or indices instead of simple stocks of socially responsible companies. However, by examining the returns of stock portfolios, Kempf and Osthoff (2007) find that buying stocks with high socially responsible ratings and selling stocks with low socially responsible ratings generates positive abnormal returns of up to 8.7 percent per year. According to the authors, the highest abnormal returns are achieved by applying the BIC approach and a combination of several screens, and by choosing stocks of companies with superior socially responsible ratings. To measure the performance of their sample portfolios between 1992 and 2004, Kempf and Osthoff (2007) use the Carhart four-factor model. Brzeszczyński and McIntosh (2014) also find a positive connection between returns and SRI stocks. They study portfolios constructed of SRI stocks in the UK market from 2000 to 2010 and find that SRI portfolios outperformed the market indices on a risk-adjusted basis using the modified Sharpe ratio and the certainty equivalent. According to Brzeszczyński and McIntosh (2014), the returns of SRI portfolios cannot be

explained by other factors than the market factor in the Fama-French three-factor model and Carhart four-factor model.

Cortez, Silva, and Areal (2009) study the performance of European SRI funds in comparison with conventional portfolios within a time period of 1996-2007. They find that the returns of SRI funds do not differ from the returns of conventional portfolios. Therefore, the authors suggest that investors can invest ethically without sacrificing financial performance. In line with the finding of Cortez et al. (2009), Humphrey and Tan (2014) find no difference in returns of SRI portfolios and non-SRI portfolios. According to their findings, neither negative nor positive screening has an impact on a portfolio's performance. The authors study negatively and positively screened portfolios that have been constructed to imitate the typical equity mutual funds' holdings. The sample of returns in their study is from 1996 to 2010 and they employ Jensen's alpha and Carhart four-factor model to measure the portfolio performance. Similarly, Mollet and Ziegler (2014) find that SRI does not provide any excess stock returns. They study the impact of SRI on stock returns considering both the US stock market and the European stock market. By using the Carhart four-factor model, Mollet and Ziegler (2014) find no significant abnormal risk-adjusted returns for socially responsible stocks.

On the other hand, Adler and Kritzman (2008) argue that SRI does require a cost. They use the Monte Carlo simulation technique in order to compute the average cost for SRI. The evidence in their study shows that excluding "bad" companies from a portfolio based on SRI criteria results in lower returns. Furthermore, Renneboog et al. (2008a) find that SRI funds do not provide abnormal excess returns for investors. According to their study, SRI funds in the US, the UK and in many European and Asia-Pacific countries underperform their domestic benchmarks, which is consistent with the result of Adler and Kritzman (2008). However, in some countries such as France, Japan, and Sweden, the risk-adjusted returns of SRI funds are not statistically different from the performance of their benchmarks. The sample of Renneboog et al. (2008a) consists of SRI funds in 17 different countries over a time period of 1991-2003.

As sin stocks are often considered as “recession-proof” (see Trinks & Scholtens, 2017), there are studies that argue that also socially responsible investments outperform the markets during crisis periods. Nofsinger and Varma (2014) examine the performance of SRI funds during crisis periods by computing alphas from the Carhart four-factor model. They find that during crisis periods, SRI funds significantly outperform the markets, but with the cost of underperforming during non-crisis periods. However, the authors point out that the outperformance in crisis periods comes as a result of using shareholder advocacy and positive screens as an investment strategy. They note that the funds applying negative screens do not outperform. In accordance with the results of Nofsinger and Varma (2014), Tripathi and Bhandari (2016) find that socially responsible stock portfolios outperformed general and market portfolios on a risk-adjusted basis during the crisis period in 2008-2009, while their sample period is from 2005 to 2013.

When it comes to the number of screens applied in SRI portfolios, Barnett and Salomon (2006) find a curvilinear relationship between screening intensity and fund performance in their study of 61 SRI funds from 1971 to 2000. In accordance with this finding, the risk-adjusted return of an SRI fund declines until the screening intensity reaches the amount of seven screens. When more screens are applied, the risk-adjusted return starts to increase until the screening intensity of the maximum of twelve screens. (Barnett & Salomon, 2006.) Also, Lee et al. (2010) study the effect of screening intensity on SRI fund performance. They find no impact on unadjusted performance, but on a risk-adjusted basis, performance decreases the more intense the screening is. Thus, their result partly differs from the one of Barnett and Salomon (2006). The sample of Lee et al. (2010) consists of 61 funds in the US market over a time period of 1989-2006.

3.2 Sin stock performance

While the studies on SRI increased considerably in the 1970s, the academic papers on sin stocks have not emerged until the early 21st century (Fabozzi et al., 2008;

Brzeszczyński & McIntosh, 2014). Therefore, the number of academic papers on sin stock returns is rather limited. However, the academic evidence on sin stock returns is not as incoherent as the academic evidence on SRI returns.

In their paper, Fabozzi et al. (2008) study stock returns from alcohol, gaming, tobacco, defense, biotech, and adult services industries using data from 21 countries from 1970 to 2007. They include the companies whose revenue obtained from sin products exceeds 30 percent of total revenue. All of the sin industries exhibited positive risk-adjusted excess returns ranging from 1.40 percent for adult services to 49.15 percent for gaming. Therefore, Fabozzi et al. (2008) conclude that sin stocks outperform the markets on a risk-adjusted basis.

Hong and Kacperczyk (2009) examine the effects of social norms on markets by studying sin stocks and their returns. They use data of sin stocks (alcohol, tobacco, gaming) from the US within a time period of 1965-2006. They further expand their analysis to Canada, Germany, Italy, Netherlands, Spain, Switzerland, and the United Kingdom. Consistently with Fabozzi et al. (2008), Hong and Kacperczyk (2009) find that sin stocks outperform their benchmarks even by 29 basis points a month after adjusting for the Carhart four-factor model. They show that the excess returns are generated because large institutional investors avoid investing in sin stocks, which results in sin stocks being undervalued.

Fauver and McDonald (2014) examine how sin stock returns are affected when different attitudes within different nations are taken into consideration. Their sample consists of sin stocks (alcohol, gambling, and tobacco) in the G20 countries from 1995 to 2009. Using a four-factor model, they find that sin stocks provide abnormal returns of about 1-2 percent annually in the countries where the stocks are considered sinful. However, if social norms are not biased against such stocks, they are generally comparable to other conventional stocks. Fauver and McDonald (2014) also note that excess returns are arbitraged away if the country has no investment controls.

Richey (2016) examines the risk-adjusted performance of a portfolio constructed of 41 sin stocks (alcohol, gambling, tobacco, and defense) from the US with data consisting of daily returns from 1995 to 2015. In accordance with the previous studies, he finds that the portfolio yields significant abnormal excess returns compared to the market benchmark S&P 500 using the Carhart four-factor model and Sortino ratio. There are only a few previous studies about the performance of sin stocks during crisis periods. Richey (2016) finds in his study that during the market downturn his portfolio of sin stocks provides negative, yet insignificant alpha. Despite the insignificance, the author notes that the finding may bring a contrary insight to literature since sin stocks are often considered resilient to market downturns (Richey, 2016).

In contrast, Trinks and Scholtens (2017) find that sin stocks outperform the market even during a recessionary period. In fact, the outperformance of sin stocks is higher during the crisis period. Trinks and Scholtens (2017) estimate the risk-adjusted returns by using the Carhart four-factor model and their study consists of 1,600 sin stocks regarding fourteen controversial issues such as abortion, adult entertainment, alcohol, animal testing, controversial weapons, gambling, nuclear power, and tobacco.

Moreover, Liston-Perez and Gutierrez (2018) study the influence of both individual and institutional investor sentiment on sin stock (alcohol, gaming, and tobacco) returns. They find that a portfolio of sin stocks is less sensitive than the S&P 500 or comparable portfolio to waves of rational or irrational sentiment. Therefore, Liston-Perez and Gutierrez (2018) state that sin stocks could be used to hedging “during periods of extreme optimism or pessimism by investors”. This finding is important for financial economists to understand especially after the Great Recession.

In addition, Chatjuthamard et al. (2018) find in their study that controversial companies have a stronger performance than non-controversial companies during a financial crisis. Therefore, consistent with Liston-Perez and Gutierrez (2018), they suggest that sin stocks

can be used to protect a portfolio from negative impacts of economic crisis periods. Their sample consists of observations from 1995 to 2009 including companies operating in alcohol, firearms, gambling, military, nuclear, and tobacco industries.

3.3 Sin stocks versus SRI

There are few academic papers on comparing the returns of sin stocks and socially responsible stocks with each other. This subchapter presents four studies that compare both investment strategies. The first paper is one of Shank, Manullang, and Hill (2005) who compare a portfolio consisting of stocks widely recognized as socially responsible and a portfolio of sin stocks with the benchmark S&P 500 by using Jensen's alpha. They find that neither of the portfolios provide significantly different risk-adjusted returns compared to the markets within a time period of three years. For a five-year-period and a ten-year-period, they find that the SRI portfolio outperforms the markets while sin portfolio's returns do not differ from the markets. Therefore, according to Shank et al. (2005) investing in socially responsible stocks is more profitable than investing in sin.

In their study, Lobe and Walkshäusl (2016) assess sin stocks (adult entertainment, alcohol, gambling, nuclear power, tobacco, and weapons) and socially responsible stocks against market benchmarks. To measure performance, they apply the Sharpe ratio, CAPM, two different three-factor models, and the Carhart four-factor model. When it comes to sin stocks, their findings are coherent with Shank et al. (2005) since they find no evidence that sin stocks would provide returns that differ from the markets. However, according to Lobe and Walkshäusl (2016), socially responsible stocks do not outperform or underperform the markets, either.

The study of Chong, Her, and Phillips (2006) brings forth contrary results with the results of Shank et al. (2005) and Lobe and Walkshäusl (2016). Chong et al. (2006) investigate the performance of SRI and socially irresponsible investing by comparing the Domini Social Equity Fund (DSEFX) and the Vice Fund (VICEX) using the S&P500 Index as a

benchmark. They find that the VICEX outperforms both the DSEFX and the S&P 500, while the DSEFX underperforms the S&P 500 during a time period of 2002-2005. This indicates that sin investing is more profitable than SRI.

As mentioned in the subchapter 3.2, Trinks and Scholtens (2017) show evidence that sin stocks outperform the markets even during crisis periods. They also find that during a crisis period, negatively screened socially responsible investments do not show any significant abnormal returns. However, during the pre-crisis period, these investments significantly underperform the markets. (Trinks & Scholtens, 2017.) This result is in line with the findings of Chong et al. (2006).

4 Theoretical framework

In order to analyze stock returns, it is important to understand how stocks are priced, which factors effect on stock prices, and what is the role of information on the financial markets. Hence, this chapter provides theoretical background for important financial models, the efficient market hypothesis and the modern portfolio theory. I also present the theoretical framework for measuring stock portfolio performance.

4.1 Efficient market hypothesis

The efficient market hypothesis (EMH) refers to the concept that security prices reflect all information that is available and relevant for the investors. If the markets respond to new information efficiently, security prices adjust quickly to the level of a market consensus estimate of the value of the security. This implies that securities can be neither undervalued nor overvalued if markets are efficient. Hence, according to EMH, it is not possible to 'beat' the market by making abnormal returns. (Fama, 1970; Bodie et al., 2014, p. 351-355.)

Fama (1970) makes three different assumptions about market conditions in his study of market efficiency. The first assumption is that trading securities does not require any transaction costs. The second assumption implies that all available information is costless, and all market participants equally have access to it. According to the third assumption, all market participants agree on the effect the available information has on security's current price and future prices. (Fama, 1970.)

In his study, Fama (1970) introduced the three forms of the hypothesis: weak-form, semi-strong form, and strong-form. The difference between these forms is the notion of the information reflected in the security price. In the weak form, the information indicates available historical prices and returns. According to Bodie et al. (2014, p. 353), the weak form indicates that trend analysis is pointless. In the semi-strong form, the information

refers to publicly available information, such as announcements of acquisitions and mergers or new security issues, as well as historical information. The strong form, in turn, considers all available and relevant information for the firm, even the information that requires monopolistic access to it. (Fama, 1970.)

However, it can be argued whether markets really are efficient. For example, it is rather evident that Fama's three assumptions do not hold in the real world. Also, according to EMH, it is impossible to outperform the markets, but several anomalies have been discovered (Bodie et al., 2014, p. 381). For example, multiple studies indicate that sin stocks outperform the market (Fabozzi et al., 2008; Richey, 2016). Nonetheless, it is still a matter of debate if anomalies represent market inefficiencies or misunderstood risk premiums (Bodie et al., 2014, p. 381).

4.2 Modern portfolio theory

The modern portfolio theory developed by Harry Markowitz (1952) is an investment theory focusing on identifying a set of efficient portfolios. In other words, it aims to find portfolios that minimize the variance at any targeted expected return. The theory is based on an idea of investors seeking for maximized expected returns. (Markowitz, 1952; Bodie et al., 2014, p. 220.)

Diversification of investments leads to higher expected returns and decreased risk. Figure 5 illustrates the minimum-variance frontier of risky assets, which summarizes the risk-return options for an investor. It is combined by the lowest possible variances of portfolios at given expected returns. (Bodie et al., 2014, p. 220-222.)

The set of portfolios with optimal risk-return combinations are represented on the efficient frontier of risky assets. The efficient frontier is the upper section of the minimum-variance frontier (see Figure 6). The lower section of the minimum variance frontier is

irrelevant because the portfolios it represents have the same level of risk but lower returns than their counterparts positioned directly above them. (Bodie et al., 2014, p. 220.)

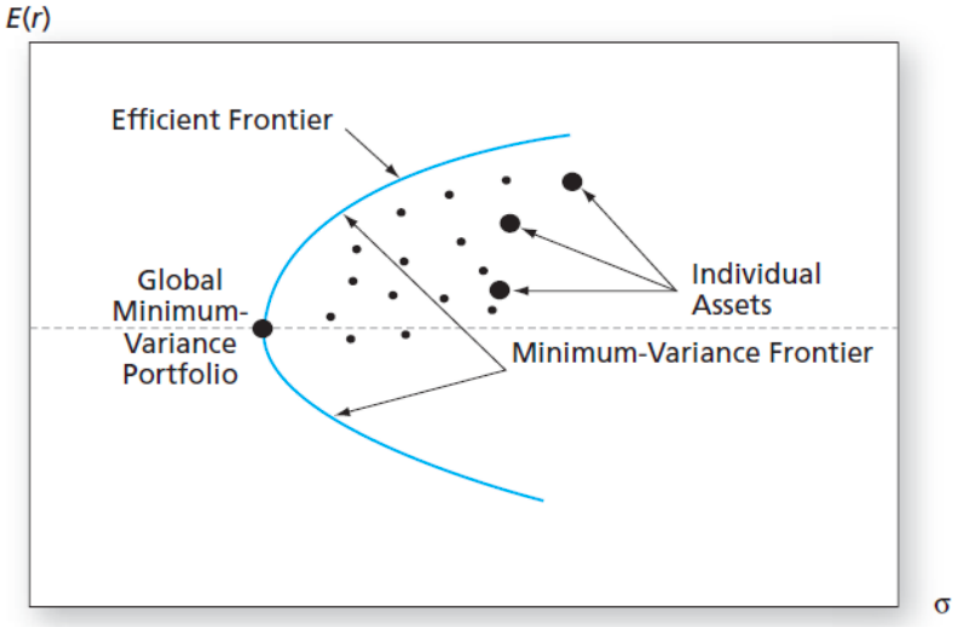

Figure 6. The minimum-variance frontier and efficient frontier (Bodie et al., 2014, p. 220).

As mentioned in chapter 2, socially responsible portfolios cannot be properly diversified, which is due to the smaller pool of investment opportunities. Therefore, they may not lie on the efficient frontier and thus be perfectly efficient. On the other hand, portfolios that are not screened and therefore may include sin stocks, have a larger investment universe, which allows a broader diversification. Based on this, they may be regarded as more efficient than socially responsible portfolios.

4.3 Capital asset pricing model

The Capital Asset Pricing Model (CAPM) is widely used for pricing risky securities and estimating the cost of capital. It was developed in the 1960s by three economists – William Sharpe, John Lintner, and Jack Treynor. However, it is based on the portfolio theory by Markowitz. (Brealey, Myers, & Allen, 2011, p. 220-222, 224.)

The CAPM is a measure of performance that considers both average returns and risk (Sharpe, 1966). According to the model, risk premium, which is the expected additional return for making a risky investment, is in direct proportion to beta, which is a measure of the market risk. Therefore, market risk has a great impact on the expected return of an asset, unlike firm-specific risk that can be eliminated with diversification. (Brealey et al., 2011, p. 221.) The formula of the CAPM is as follows:

$$E(r) = r_f + \beta(r_m - r_f)\,, \tag{1}$$

where: $E(r)$ = Expected return on asset

r_f = Risk-free rate

β = Beta of the asset

r_m = Expected return on market.

Beta of the asset can be calculated as follows:

$$\beta = \frac{Cov(r_i, r_M)}{\sigma_M^2}\,, \tag{2}$$

where: $Cov(r_i, r_M)$ = Covariance of the asset with the market portfolio

σ_M^2 = Variance of the market portfolio.

The CAPM can be criticized for its simplicity and the multiple assumptions it relies on. The assumptions are that all investors are rational, they have a single-period time horizon and similar expectations on the markets, all securities are publicly traded, all information is publicly available, there are no taxes nor transaction costs, and market participants can lend and borrow at the same risk-free rate. However, simplifying is required to render the model explainable. Besides, the use of assumptions is a part of the characteristics of science. (Bodie et al., 2014, p. 303.)

Critics have also pointed out that expected returns haven't been rising with beta during the past years, in contrast to what the CAPM proposes. The CAPM also argues that returns only depend on beta. However, a connection has been found between returns and company size, value stocks and growth stocks. (Brealey et al. 2011, p. 226.)

4.4 Fama-French three-factor model

The Fama-French three-factor model is an asset pricing model that was designed to expand the CAPM by adding two factors. These factors include size and value variables that aim to explain stock returns better and respond to the issues of the CAPM. (Fama & French, 1993.) The equation for the model is as follows:

$$R_{it} - R_{Ft} = \alpha_i + b_i(R_{Mt} - R_{Ft}) + s_i SMB_t + h_i HML_t + e_{it}\ , \tag{3}$$

where: R_{it} = Return on a portfolio i

R_{Ft} = Risk-free return

$R_{it} - R_{Ft}$ = Excess return of a portfolio

$R_{Mt} - R_{Ft}$ = Excess return of a market portfolio

α_i = Abnormal return

SMB_t = Size premium (small minus big)

HML_t = Value premium (high minus low)

b_i, s_i, h_i = Factor sensitivities.

The size factor describes the difference in returns between portfolios of small stocks and portfolios of large stocks (SMB, small minus big). According to Fama and French (1993), companies with a smaller market capitalization tend to underperform companies with larger market capitalization. The value factor describes the difference in returns between portfolios of high book-to-market stocks and portfolios of low book-to-market stocks (HML, high minus low). Fama and French (1993) remark that growth companies with a

low book-to-market ratio provide lower returns than value companies with a high book-to-market ratio. (Fama & French, 1996.)

It has been argued that the value premium is only a product of market irrationality. This implies that investors tend to overestimate the future performance of companies based on their recent good performance. (Bodie et al., 2014, p. 431.) A study conducted by Jegadeesh and Titman (1993) brings evidence to this phenomenon, as they found that the recent good or bad performance of stocks is likely to continue for several months. This is called the momentum effect (Bodie et al., 2014, p. 364).

4.5 Carhart four-factor model

Mark Carhart (1997) combined the Fama-French three-factor model (1993) with Jegadeesh and Titman's (1993) momentum factor. The momentum factor could explain some of the abnormal returns measured by alpha in the three-factor model. As such, the four-factor model is often used to measure the abnormal performance of a portfolio. (Bodie et al., 2014, p. 432-433.) The formula is represented as follows:

$$R_{it} - R_{Ft} = \alpha_i + b_i(R_{Mt} - R_{Ft}) + s_i SMB_t + h_i HML_t + p_i WML_t + e_{it}, \quad (4)$$

where: WML_t = One-year momentum factor (winners minus losers)

p_i = Factor sensitivity.

The formula remains the same as in the Fama-French three-factor model (equation 3) apart from the added momentum factor. The momentum factor represents the difference in returns from the previous twelve months between winner stock portfolios and loser stock portfolios (WML, winners minus losers) (Carhart, 1997).

5 Data and methodology

This chapter presents the data and methodology used in this thesis. The first subchapter explains the data sources and makes an overall description of the data employed in the study. The second chapter describes in detail how the six different portfolios are constructed. Moreover, the descriptive statistics are presented. The third subchapter explains the methodology and lastly, the expected results for this paper are discussed.

5.1 Data sources and data description

The prior research on SRI utilizes ESG data from a variety of different data sources, but perhaps the most used databases are those of KLD Research & Analytics and later MSCI ESG Research. Also, Bloomberg and Thomson Reuters appear often in the academic literature on SRI performance. Therefore, in this thesis, most of the data is collected from Refinitiv database, formerly known as the Thomson Reuters database. Jointly owned by Thomson Reuters and Blackstone, Refinitiv offers one of the most comprehensive ESG databases in the industry, as it covers over 70 percent of the global market capitalization and has history going back to 2002 (Refinitiv, 2020). Refinitiv ESG scores are formerly known as Thomson Reuters ASSET4 ratings.

Refinitiv ESG scores measure company's relative ESG performance based on verified and publicly reported data retrieved from multiple sources, such as corporate websites, annual reports, ESG reports and codes of conduct. The scores are presented as percentile rank scores. Scores ranging between 75 and 100 percent indicate excellent relative ESG performance and high degree of transparency. Moreover, scores between 50 and 75 percent and between 25 and 50 percent imply good relative ESG performance and satisfactory relative ESG performance, respectively. Finally, scores under 25 percent suggest poor relative ESG performance. (Refinitiv, 2020.)

The construction of Refinitiv's ESG scores begins by collecting and calculating over 450 company-level ESG measures. From the 450 measures, a subset of 186 of the most comparable and material measures per industry are selected for the company scoring process. Subsequently, these measures are divided into 10 categories (see Figure 7) that represent the three pillar scores (environmental, social, governance) and eventually, the final ESG score. The overall ESG score is derived from the weighted average of the underlying 10 category scores. The weights for Environmental and Social categories vary across industries. To illustrate, the formation of the Refinitiv ESG scores is presented in the Figure 7 (Refinitiv, 2020.)

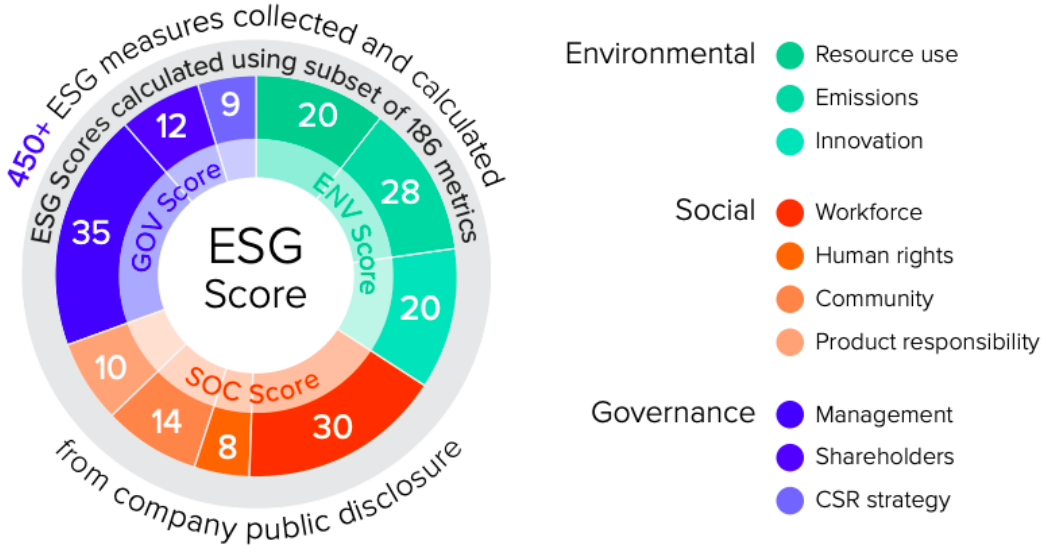

Figure 7. Formation of Refinitiv ESG scores (Refinitiv, 2020).

To obtain a comprehensive European sample, the data consists of the 600 stocks included in the STOXX Europe 600 index (hereafter "STOXX600") as of November 2020. STOXX600 represents the large, mid and small capitalization companies across 17 European countries (Qontigo, 2020). The country allocation of the 600 stocks is presented in the Table 2. The United Kingdom represents the largest portion of the sample by accounting for 24.0 percent of the stocks. France and Germany account for 13.8 and 12.2 percent of the stocks, respectively. Despite the third hypothesis of this study is related to the EU taxonomy, the three countries that are not EU member states - Norway,

Switzerland, and the United Kingdom – are included in the sample. The reason for this is that if the companies outside of the EU do not disclose the data specific for the EU taxonomy criteria, investors that follow the EU taxonomy will exclude them from their portfolios even though they could be compliant. Hence, as it is of interest in this thesis to study how investing in accordance with the EU taxonomy and excluding the companies in its scope affects returns, also the companies operating in Norway, Switzerland, and the United Kingdom are included in the portfolios.

Table 2. Country allocation of the whole sample

Country	# of stocks	% of the sample
Austria	8	1.33 %
Belgium	17	2.83 %
Denmark	23	3.83 %
Finland	17	2.83 %
France	83	13.83 %
Germany	73	12.17 %
Ireland	8	1.33 %
Italy	30	5.00 %
Luxembourg	3	0.50 %
Netherlands	30	5.00 %
Norway	17	2.83 %
Poland	8	1.33 %
Portugal	3	0.50 %
Spain	26	4.33 %
Sweden	58	9.67 %
Switzerland	52	8.67 %
United Kingdom	144	24.00 %

The data collection can be divided into four sections. The first section covers yearly, year-end, ESG scores for all stocks in the STOXX600. As the earliest ESG data from Refinitiv is from 2002, and the year-end score is used for portfolio construction in the beginning of the following year, the sample period begins in January 2003 and ends in December 2019. In total, the sample consists of 6,826 ESG scores. The average ESG score in the sample is 55.20 while the median is 57.20, both indicating a good relative ESG performance. The descriptive statistics for the ESG scores are presented in Table 3. The Figure 8 illustrates

the frequency distribution of the ESG scores. The Y-axis presents the frequency of the percentile rank scores and the X-axis demonstrates the distribution of scores between 0 and 100. The histogram indicates that companies in the sample often exhibit good (50-75 percentile) or excellent (75-100 percentile) relative ESG performance. However, superior scores above 90 percentiles are not as common within the sample.

Table 3. Descriptive statistics for the ESG scores.

	Mean	Median	S.D.	Min	Max	n
ESG score	55.20	57.20	20.74	2.19	95.01	6,826

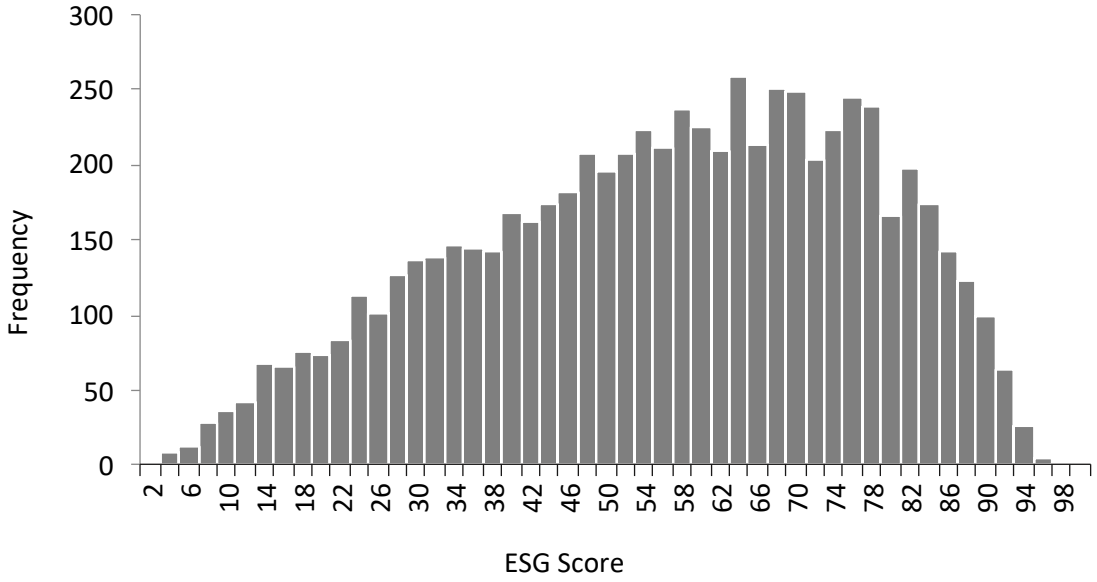

Figure 8. The frequency distribution of the ESG scores in the sample.

The second part of the data collection covers industry classifications for each company in the sample. Retrieved from the Refinitiv database, this study employs both SIC codes and I/B/E/S industry classifications in order to form sin portfolios. In addition, NACE Rev. 2 industry classifications are retrieved from Orbis database in order to determine the companies that are in the scope of the EU taxonomy.

The third section of the data collection covers information on each company's product responsibility. Retrieved from Refinitiv, the data includes yearly "Yes" and "No" scores

on whether a company produces alcoholic beverages, tobacco, or vehicles, planes, armaments, or any combat materials used by the military, or whether a company generates returns from gambling. With respect to alcohol stocks, only producers and pure distributors of alcoholic beverages are scored “Yes”, but companies that simply retail alcohol are scored “No”. As for tobacco stocks, only producers of tobacco are scored “Yes” and companies that only retail tobacco are scored “No”. With regards to weapon (defense) stocks, companies designing, engineering and producing products or services specifically for the use in weapons systems and combat materials, such as electronic systems designed for military aircraft, bombs and combat devices, are scored “Yes”. Finally, regarding gambling stocks, a company is scored “Yes” if it generates revenue from gambling activities like operating a casino or receiving royalty from manufactured gambling machines. Similarly, the score is “Yes” if a company has a stake, for example, in casinos or any other business which generates revenue from gambling.

Lastly, the fourth section of the data is collected from Refinitiv database and it covers monthly return index data for all of the 600 stocks included in the STOXX600. Also, in order to compare the portfolio returns with a market benchmark, we obtain return index of the STOXX600. Calculating returns from the return index ensures that potential dividends are taken into account. Furthermore, monthly, month-end stock prices are retrieved to be able to form portfolio weights.

The companies that do not have any ESG score during the whole sample period are excluded from this study. In addition, companies that do not have SIC or NACE classifications are excluded. Similarly, if a company has return data only after January 2019, it is excluded from the sample due to the nature of SRI portfolio construction. After cleaning the data, the sample consists of 579 stocks. As the sample period covers 204 months over a 17-year period from January 2003 until the end of December 2019, the sample contains 103,518 monthly return observations in total.

In addition to the aforementioned data from the Refinitiv and Orbis databases, the necessary factor data for the regression analyses is retrieved from the Kenneth R. French (2020) database. That is, in order to implement the CAPM, Fama-French three-factor model and Carhart four-factor model, the market risk factor, size factor (SMB_t), value factor (HML_t), and the momentum factor (WML_t) are gathered from the database. Also, the risk-free rate of return is collected, which in this case is the U.S. one-month T-bill rate. The data consists of monthly European factor values.

5.2 Portfolio construction and descriptive statistics

As the purpose of this study is to examine if sin stocks provide higher returns than SRI and whether excluding the companies in the scope of EU taxonomy has an impact on returns, suitable stock portfolios need to be formed. This subchapter presents how each of the portfolios is constructed and presents descriptive statistics for them. Each portfolio contains one share of each company included, and the monthly portfolio returns are calculated as weighted average returns.

Sin portfolio

The sin portfolio is constructed by utilizing the negative screening criteria by selecting companies operating in industries that are considered unethical. According to Eurosif (2018), the four industries presented in chapter 2.3 – alcohol, gambling, tobacco, and weapon industry – are among the eight most commonly used negative screens. Therefore, the companies operating in these sin industries are included in the sin portfolio. As mentioned in chapter 2.3.5, companies operating in adult entertainment and cannabis industries are excluded from this study due to limitations in data accessibility. To find the companies involved in the selected sin industries, SIC codes and I/B/E/S industry classifications are employed. SIC codes are utilized instead of NACE codes because the SIC classification provides more suitable categorization for the purpose of selecting sin stocks.

The identification of sin stocks partly follows the method of Humphrey and Tan (2014). First, the initial investible universe of 579 stocks is negatively screened based on SIC codes. Specifically, alcohol stocks are identified as those with SIC codes 2082-2085, 5181, 5182, or 5921. Tobacco stocks have SIC codes 2111, 2121, 2131, 2141, 5194, or 5993. Weapon industry, in turn, has SIC codes 3482-3489, 3761, 3764, or 3769. Gambling industry does not have any specific SIC code and hence cannot be identified with this method. (SICCODE.com, 2020.) Using this criterion, only 11 stocks are identified as sin stocks, and all of them are associated with either alcohol or tobacco industries.

In order to find more sin stocks, especially from gambling and weapon industries, the initial stock universe is screened once more based on I/B/E/S classifications. Companies classified under the following industry groups are selected: Aerospace and Defense, Brewers, Casinos and Gaming, Distillers and Wineries, and Tobacco. With this criterion, 16 additional stocks are identified, five of which are associated with gambling industry and 10 with Aerospace and defense industries. Most of the casinos and gaming companies can be found under the SIC code 7999. Since the I/B/E/S classification combines Aerospace and defense industries, the 10 companies need to be examined in more detail to determine if they are involved in weapon or defense industries in particular. As noted by Fabozzi et al. (2008), it is indeed challenging to identify stocks in weapon or defense industries because most companies in such industries manufacture, for example, commercial passenger airplanes or aircraft engines in addition to weapons.

Also, as Humphrey and Tan (2014) point out, classifying sin stocks with SIC codes and I/B/E/S categories enables to identify only those stocks whose predominant business is in a sin industry. The involvement in a sin industry may be more indirect, and especially Trinks and Scholtens (2017) draw attention to this in their study. Due to limitations in data accessibility, this thesis is not able to provide a specific percentage threshold of revenues which, if exceeded, determines if a company is included in the sin portfolio, as Fabozzi et al. (2008) and Lobe and Walkshäusl (2016) do in their study. Instead, this thesis

employs companies' product responsibility data from Refinitiv, and selects any firm that is identified as being involved in alcohol, gambling, tobacco, or weapon industry by "Yes" scores during the sample period. As the product responsibility data is in a yearly format, companies are included in the portfolio starting from the year the data refers to involvement in a sin industry. This takes into account possible changes in the companies' revenue sources. According to the data, all of the 10 companies in Aerospace and defense industry are involved in weapon or defense industry and hence included in the portfolio. Also, 11 more companies involved in sin industries are identified with this method. Finally, the total number of stocks in the sin portfolio is 38.

The portfolio includes multiple well-known companies, such as Anheuser-Busch, Diageo, Heineken, Carlsberg, Pernod Ricard, British American Tobacco, and Dassault Aviation. As presented in Figure 9, the majority of companies in the sin portfolio operate in weapon industry or generate revenues from products or services produced for the use in weapons systems and combat materials. Furthermore, a third of the companies operate in or are involved with the alcohol industry.

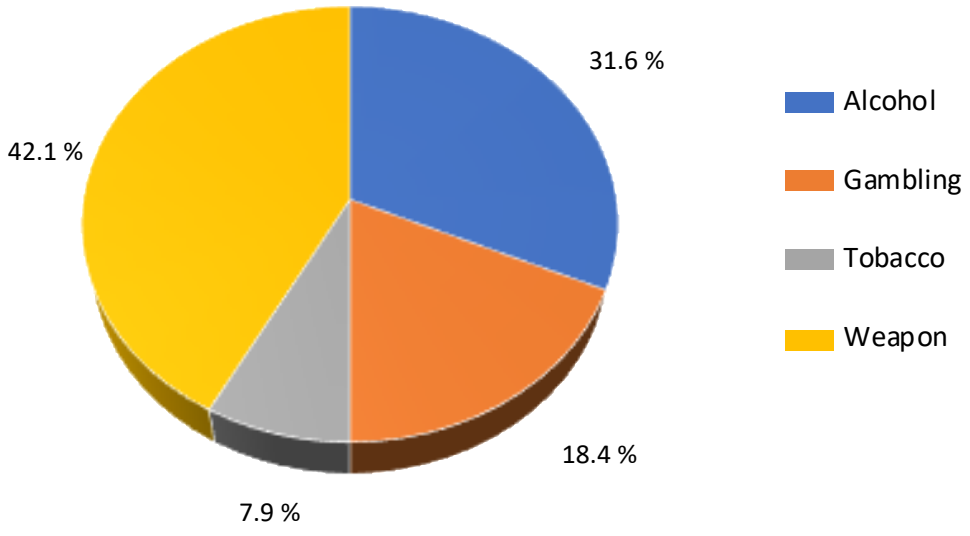

Figure 9. Industry allocation of the sin portfolio based on number of shares.

SRI portfolio

As mentioned in chapter 2.1.2, socially responsible investors typically consider several SRI strategies together when making responsible investment decisions (Renneboog et al., 2008b). Further, Humphrey and Tan (2014), note that several SRI funds employ a combination of negative and positive screening in investment decision making. Therefore, the SRI portfolio in this thesis will be constructed by using both negative and positive screens. When a negative screen is applied to a pool of assets, the companies operating in sin industries, such as alcohol, gambling, tobacco, weapon, and adult entertainment industry, are excluded. In other words, all stocks included in the sin portfolio are excluded from the SRI portfolio. The positive screen, in turn, is employed to select shares of companies with superior standards in ESG-related matters. In other words, the companies with the highest ESG ratings are included in the portfolio.

As the data consists of yearly, year-end ESG scores, the SRI portfolio is reallocated in the beginning of each year with the ESG scores of the previous year. In other words, in the beginning of year t, the companies are ranked based on their ESG scores of year $t-1$, and the companies with superior scores are selected to be held until the beginning of the year $t+1$ when the portfolio is reallocated again. This method is in line with the approach of Kempf and Osthoff (2007). Further, complying with their study and that of Halbritter and Dorfleitner (2015), each year, 20 percent of the companies with superior ESG ratings are selected to the portfolio. As the number of companies with ESG scores increases over the sample period, the SRI portfolio consists of 41 stocks in 2003 and 108 stocks in 2019. Few companies such as ABB, Philips, and Unilever are included in the portfolio each year during the sample period.

Portfolio of stocks in the scope of the EU taxonomy

As presented in chapter 2.2, the EU taxonomy does not rank companies to good or bad ones. Instead, the taxonomy provides a list of economic activities that need to meet the

screening criteria to be included in the taxonomy (TEG, 2019b). To meet the definition of a sustainable activity, the economic activities need to make a substantive contribution to at least one of six environmental objectives. In addition, the economic activities must do no significant harm (DNSH) to the other five environmental objectives and comply with minimum safeguards. (TEG, 2019a.) The taxonomy also sets detailed technical screening criteria for each economic activity (TEG, 2020a). Due to the novelty of the taxonomy and its disclosure guidelines, there is not yet enough required data available to fully follow the steps in the taxonomy to analyze whether certain investments can be considered sustainable or not. Therefore, this thesis focuses on all of the companies that are in the scope of the EU taxonomy.

Based on NACE classifications, the TEG identifies economic sectors that are primary for mitigating climate change and which are currently in the scope of the taxonomy. Therefore, the initial investible universe of 579 stocks is screened based on NACE codes. Agriculture, forestry and fishing sector is defined by NACE codes 0111-0322, and manufacturing sector is defined by NACE codes 1011-3320. Companies operating in electricity, gas, steaming and air conditioning supply sector are identified as those with NACE codes 3511-3530. Water, sewerage, waste and remediation sector, in turn, has NACE codes 3600-3900. Stocks of companies in transportation and storage sector are identified with NACE codes 4910-5320, while ICT sector has NACE codes 5811-6399. Lastly, buildings sector has NACE codes 4110-4399 and 6810-6832. (Eurostat, 2008; TEG, 2019b.)

The 368 stocks identified with this method are all included in the portfolio of stocks in the scope of the EU taxonomy. Figure 10 presents how the stocks in the portfolio are allocated between the different sectors based on NACE classifications. The manufacturing sector clearly dominates the portfolio by accounting for 61.1 percent of the shares in the portfolio. By analyzing the performance of this portfolio, it is possible to determine what kind of returns socially responsible investors might lose when investing in accordance with the EU taxonomy if the companies need to be excluded. The exclusion might stem from two reasons. Firstly, if the companies do not disclose the information that is

specific for the EU taxonomy criteria, they are excluded even if they could potentially be compliant. The second reason is that the companies simply do not fulfill the criteria in order to be regarded as sustainable investments.

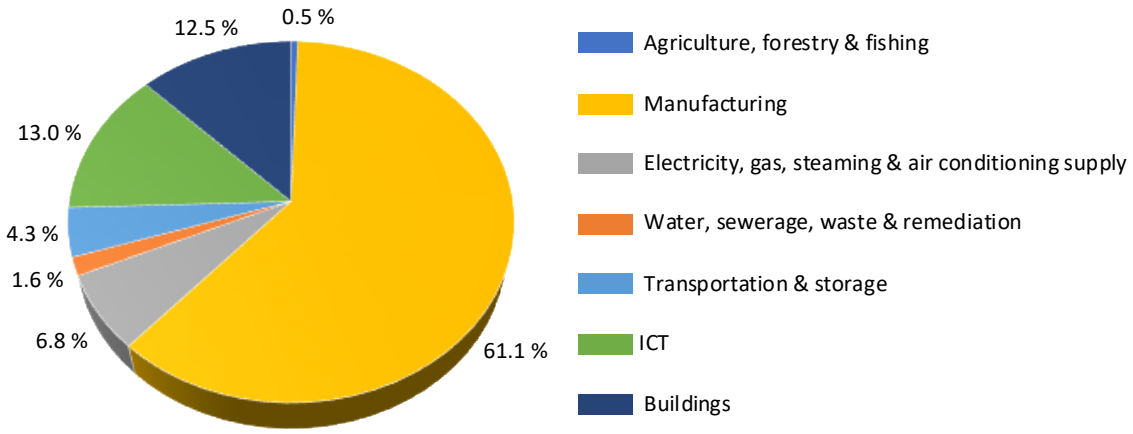

Figure 10. Sector allocation of the portfolio of stocks in the scope of the EU taxonomy based on number of shares.

Taxonomy-adjusted SRI portfolio

In order to determine whether excluding the companies in the scope of EU taxonomy has an impact on the returns of a socially responsible investor, a taxonomy-adjusted SRI portfolio is constructed as well. The construction of this portfolio is in line with the construction of the so-called traditional SRI portfolio. Instead of only excluding the companies operating in sin industries, all stocks selected for the portfolio of stocks in the scope of the EU taxonomy, presented above, are also excluded. As a result, the investible universe for the portfolio consists of 203 stocks. A positive screen is applied in a similar manner as in the construction of the traditional SRI portfolio. In other words, the portfolio is reallocated in the beginning of each year t with the ESG scores of the previous year $t-1$ and each year 20 percent of the companies with superior ESG ratings are selected to the portfolio. (Kempf & Osthoff, 2007; Halbritter & Dorfleitner, 2015.)

With this method, the taxonomy-adjusted SRI portfolio consists of 14 stocks in 2003 and 41 stocks in 2019. It is worthwhile to note that several companies that are included in the traditional SRI portfolio are excluded from this portfolio, such as ABB and Unilever. On the other hand, companies like Royal Dutch Shell, UBS, and Sodexo are included in the portfolio almost each year when the portfolio is reallocated.

Hedge portfolios

As mentioned in the paper of Lobe and Walkshäusl (2016), Fama and French (2007) argue from a theoretical asset pricing perspective that socially responsible investors overweight socially responsible stocks in their portfolios thereby increasing their prices and lowering expected returns. However, Lobe and Walkshäusl (2016) suggest that the reverse would then be the case for vice investors, as they would underweight socially responsible stocks and overweight sin stocks. They argue that the net effect on returns needs to be empirically examined. Therefore, they study both investment styles directly by forming a hedge portfolio long in sin stocks and short in socially responsible stocks. This method is also used in the paper of Kempf and Osthoff (2007), as they form hedge portfolios long in stocks with the highest ESG scores and short in stocks with the lowest ESG scores. In their study, the long-short portfolio return is the return difference between the high-rated and the low-rated portfolio. They also consider transaction costs by subtracting them, but no transaction costs are taken into account in this thesis.

Thus, following the example of Kempf and Osthoff (2007) and Lobe and Walkshäusl (2016), two hedge portfolios are formed, one of which is long in sin stocks and short in socially responsible stocks, and another which is long in stocks in the EU taxonomy's scope and short in taxonomy-adjusted socially responsible stocks. This method enables a direct comparison whether sin stocks provide higher returns than socially responsible stocks and whether the stocks in the scope of the EU taxonomy provide higher returns than a socially responsible stock portfolio that excludes such stocks. Positive abnormal returns provided by a hedge portfolio would indicate the outperformance of the stocks

held in a long position. On the other hand, if a hedge portfolio does not provide statistically significant abnormal returns, sin investing and SRI might compensate each other, as suggested based on the theory of Fama and French (2007).

Descriptive statistics

To obtain more profound insight of the characteristics of the sample data, the descriptive statistics of the monthly excess returns over the whole sample period from 2003 to 2019 are presented in Table 4. The summary statistics are displayed for each portfolio: the sin portfolio ("Sin"), the SRI portfolio ("SRI"), the portfolio of stocks in the scope of the EU taxonomy ("Tax. Scope"), the taxonomy-adjusted SRI portfolio ("Tax. Adj. SRI"), the hedge portfolio long in sin and short in SRI ("Long Short"), the hedge portfolio long in portfolio of stocks in the scope of the taxonomy and short in taxonomy-adjusted SRI portfolio ("Tax. Long Short"), and finally, the market benchmark index (STOXX600). The excess returns are calculated with the risk-free rate retrieved from the Kenneth R. French (2020) database.

Table 4. Descriptive statistics of the monthly excess returns over the whole sample period.

	Mean	Median	Max.	Min.	Std. Dev.	Skew-ness	Kurtosis
Sin	0.012	0.012	0.155	-0.161	0.043	-0.531	4.500
SRI	0.009	0.012	0.165	-0.183	0.044	-0.580	5.561
Tax. Scope	0.014	0.017	0.188	-0.155	0.045	-0.289	5.154
Tax. Adj. SRI	0.008	0.007	0.215	-0.223	0.053	-0.098	5.970
Long Short	0.002	0.002	0.103	-0.100	0.026	0.100	4.650
Tax. Long Short	0.005	0.005	0.119	-0.231	0.047	-0.814	6.651
STOXX600	0.006	0.013	0.145	-0.133	0.040	-0.474	4.570

As presented in Table 4, the descriptive statistics indicate that the mean excess return for the sin portfolio is higher than for the so-called traditional SRI portfolio on a monthly basis. The mean monthly excess return for the sin portfolio is 1.2 percent whereas it is 0.9 percent for the SRI portfolio. This observation may be the first indication that the hypothesis "*Sin stocks provide higher returns than socially responsible stocks"* is true.

Similarly, the stocks in the scope of the EU taxonomy provide higher monthly excess returns on average than the taxonomy-adjusted SRI portfolio, as the mean return for the former is 1.4 percent and 0.8 percent for the latter. Furthermore, the mean excess return for the taxonomy-adjusted SRI portfolio is lower than for the "traditional" SRI portfolio. This, in turn, might indicate that the third hypothesis is also true: "*Excluding stocks in the scope of the EU taxonomy negatively affects returns".* Moreover, the aforementioned four portfolios all provide higher mean monthly excess returns than the market benchmark STOXX600 with a mean return of 0.6 percent. The average monthly excess returns of the hedge portfolios are more moderate, and lower than the average excess return of the market benchmark. However, since both of the hedge portfolios generate positive mean monthly excess returns, it may indicate that the stocks held in long position outperform the stocks held in short position. The excess return distributions are negatively skewed for all of the portfolios except the "Long Short" portfolio, which has a positively skewed excess return distribution. Moreover, all of the portfolios have a rather high kurtosis.

Since another objective of this thesis is to examine how market downturn affects the performance of the observed stocks, it is essential to analyze the performance during crisis periods. Therefore, the sample period from January 2003 to December 2019 is cut down into a shorter sample period based on market movements. Regarding the time span of the data, it is only natural to study the performance of the portfolios during the financial crisis of 2008. In line with Lins, Servaes and Tamayo (2017), the financial crisis is defined as a period starting from August 2008 and ending in March 2009. This definition is based on the bankruptcy of Lehman Brothers in September 2008 and S&P500 index hitting its lowest point during the crisis (Lins et al., 2017). The descriptive statistics of the monthly excess returns over the crisis period from August 2008 to March 2009 are presented in Table 5.

Table 5. Descriptive statistics of the monthly excess returns over the crisis period.

	Mean	Median	Max.	Min.	Std. Dev.	Skew-ness	Kurtosis
Sin	-0.029	-0.034	0.085	-0.161	0.087	0.023	1.879
SRI	-0.044	-0.060	0.084	-0.183	0.087	-0.003	2.058
Tax. Scope	-0.045	-0.035	0.044	-0.155	0.070	-0.152	1.937
Tax. Adj. SRI	-0.049	-0.070	0.135	-0.223	0.114	0.158	2.148
Long Short	0.015	0.032	0.073	-0.100	0.057	-1.023	3.137
Tax. Long Short	0.004	0.058	0.119	-0.231	0.139	-0.910	2.162
STOXX600	-0.054	-0.053	0.024	-0.133	0.057	0.109	1.734

Not surprisingly, the monthly mean excess return is negative for most of the portfolios during the financial crisis of 2008. However, both of the hedge portfolios have a positive monthly mean excess return, which indicates that the stocks held long in the portfolio generate higher returns on average than the stocks held short. In other words, sin stocks and stocks in the scope of the EU taxonomy might provide better returns than the socially responsible stocks and the taxonomy-adjusted SRI stocks. Indeed, when observing the mean monthly excess returns of "Sin", "SRI", "Tax. Scope" and "Tax. Adj. SRI" portfolios, the sin portfolio generates better negative returns than the SRI portfolio and the stocks in the scope of the EU taxonomy provide better negative returns than the taxonomy-adjusted SRI stocks. This might indictate that the second hypothesis "*Sin stocks perform better than socially responsible stocks during an economic crisis"* is true. The market benchmark yields the most negative returns on average, as the mean excess return for STOXX600 is -5.4 percent over the crisis period. Both of the hedge portfolios are the most negatively skewed whereas "Tax. Adj. SRI" portfolio and "STOXX600" are the most positively skewed. Kurtosis, in turn, is much lower for all portfolios and the benchmark index in the subsample period than in the whole sample period.

5.3 Methodology

The methodology of this thesis closely follows the one of Lobe and Walkshäusl (2016). After forming the portfolios as described in the previous chapter, it is of interest to

measure the performance of each portfolio with several methods. Inspired by Lobe and Walkshäusl (2016), factor regressions are ran based on three alternative asset pricing models, which are the CAPM (1), the Fama-French three-factor model (3), and finally, the Carhart four-factor model (4). This ensures that interpretations are not driven by a specific model. Especially the Carhart four-factor model is often used in the previous studies to measure the performance of SRI and sin stocks (Kempf & Osthoff, 2007; Hong & Kacperczyk, 2009; Humphrey & Tan, 2014; Nofsinger & Varma, 2014; Richey, 2016; Trinks & Scholtens, 2017). The three asset pricing models are presented in more detail in the chapter 4. The equations for each model are as follows:

$$E(r) = r_f + \beta(r_m - r_f) \quad (1)$$

$$R_{it} - R_{Ft} = \alpha_i + b_i(R_{Mt} - R_{Ft}) + s_i SMB_t + h_i HML_t + e_{it}\ , \quad (3)$$

$$R_{it} - R_{Ft} = \alpha_i + b_i(R_{Mt} - R_{Ft}) + s_i SMB_t + h_i HML_t + p_i WML_t + e_{it}, \quad (4)$$

The returns of the constructed portfolios are analyzed over the whole sample period from January 2003 until December 2019. In addition, to determine the effect of market downturn on the returns of the observed stocks, the returns are examined over the financial crisis period starting in August 2008 and ending in March 2009, as defined by Lins et al. (2017) and presented in the previous subchapter.

5.4 Expected results

As presented in the chapter 3, literature on sin stock returns strongly suggests that sin stocks outperform their conventional counterparts (e.g. Fabozzi et al., 2008). However, the literature on the performance of socially responsible investments is rather incoherent. Many of the studies imply that the returns between socially responsible investments and conventional investments do not differ from each other (e.g. Humphrey & Tan, 2014) or that socially responsible investments underperform the markets and therefore bear a cost (e.g. Adler & Kritzman, 2008). The studies comparing sin stocks and SRI with each other also show incoherent evidence on their performance. Therefore, deriving from the

prior studies and the information obtained from the descriptive statistics, I expect that the empirical results suggest my first hypothesis to be true, implying that sin stocks do provide higher returns than SRI. Nevertheless, based on the descriptive statistics, I expect that both sin stocks and socially responsible stocks are able to provide abnormal returns.

The literature on the performance of sin stocks and SRI during market crisis is not very extensive and the studies presented in this thesis show contradictory results with each other. Some evidence suggests that sin stocks are recession-proof investments (see Liston-Perez & Gutierrez, 2018; Chatjuthamard et al. 2018), but also socially responsible investments can outperform the markets during crisis periods, especially if BIC approach, shareholder advocacy, and positive screening is applied (see Kempf & Osthoff, 2007; Nofsinger & Varma, 2014). Due to the incoherent results from the previous literature, I am unable to form expectations for empirical results regarding the second hypothesis of this thesis simply based on prior research. However, as mentioned in chapter 5.2, the descriptive statistics indicate that the second hypothesis may be true implying that sin stocks perform better than SRI during an economic crisis. Therefore, I excpect that the empirical results support the second hypothesis.

As to my knowledge, there is no previous literature on the effects of EU taxonomy on stock returns as of this writing. However, the descriptive statistics provide indication that the companies in the scope of the EU taxonomy provide higher returns on average than either one of the SRI portfolios, and that the taxonomy-adjusted SRI portfolio yields lower excess returns on average than the so-called traditional SRI portfolio. Therefore, I expect that my third hypothesis is true, signifying that excluding companies in the scope of EU taxonomy has a negative impact on responsible investor's returns. Also, as Barnett and Salomon (2006) note, the diminished investment universe resulting from screening leads to lower diversification and further, increased unsystematic risk and lower risk-adjusted returns.

6 Empirical results

This chapter presents the empirical results of the analysis. The empirical results are obtained by running the regressions using OLS regression analysis with Newey-West HAC standard errors, in line with several academic papers, such as those of Kempf and Osthoff (2007), Hong and Kacperczyk (2009), Nofsinger and Varma (2014), Lobe and Walkshäusl (2016), and Trinks and Scholtens (2017). All of these papers use a similar methodology in the analysis of financial returns, as each of the papers employ Carhart four-factor model. As previously stated, this thesis closely follows the methodology of Lobe and Walkshäusl (2016), which utilizes the CAPM and Fama-French three-factor model as well. Chapter 6.1 presents the empirical results over the whole sample period from 2003 until 2019, whereas chapter 6.2 presents the results over the crisis period from 2008 until 2009. Finally, chapter 6.3 discusses the results and chapter 6.4 presents possible limitations for the study.

When it comes to the terminology and abbreviations of the tables of results, “Alpha” refers to the estimated coefficient, in other words, the abnormal return generated by the portfolio that cannot be explained by the beta coefficients of the explanatory variables. The explanatory variables of the asset pricing models are presented by “Mkt-rf” that is the market risk factor, “SMB” that is the size factor, “HML” that is the value factor, and “WML” that is the momentum factor. Moreover, R-squared is referred to by “R2”, which is the measure of goodness-of-fit, that is, the coefficient of determination. More specifically, R-squared measures the proportion of the variation in the dependent variable that is explained by the variation in the independent variables of a regression model. Therefore, the greater the R-squared, the better the model.

6.1 Whole sample period

Table 6 below presents the regression results obtained by applying the CAPM and the Fama-French three-factor model to the whole sample period between 2003 and 2019.

The results seem to be rather well aligned with the expected results presented in chapter 5.4 and thereby support the first and the third hypothesis of this thesis.

Table 6. The OLS regression results for the whole sample period using the CAPM (1) and the Fama-French three-factor model (2). Alpha signifies the estimated coefficient. Mkt-rf, SMB, HML, and WML are the beta coefficients. R2 indicates the goodness-of-fit. The p-values are marked inside the parentheses below the results. Asterisks *, **, and *** indicate the statistical significance at 10%, 5%, and 1% level, respectively.

		Alpha	Mkt-rf	SMB	HML	R2
Sin	(1)	0.008***	0.613***			0.521
		(0.000)	(0.000)			
	(2)	0.007***	0.680***	0.025	-0.340**	0.542
		(0.001)	(0.000)	(0.858)	(0.014)	
SRI	(1)	0.004**	0.716***			0.683
		(0.030)	(0.000)			
	(2)	0.004**	0.716***	-0.230***	-0.010	0.700
		(0.022)	(0.000)	(0.007)	(0.934)	
Tax. Scope	(1)	0.011***	0.437***			0.250
		(0.000)	(0.000)			
	(2)	0.010***	0.506***	0.192	-0.343**	0.277
		(0.000)	(0.000)	(0.210)	(0.046)	
Tax. Adj. SRI	(1)	0.002	0.840***			0.666
		(0.429)	(0.000)			
	(2)	0.002	0.795***	-0.292*	0.215	0.682
		(0.318)	(0.000)	(0.054)	(0.192)	
Long Short	(1)	0.003*	-0.104***			0.043
		(0.085)	(0.004)			
	(2)	0.002	-0.035	0.326***	-0.336***	0.158
		(0.210)	(0.274)	(0.002)	(0.000)	
Tax. Long Short	(1)	0.008***	-0.403***			0.193
		(0.002)	(0.000)			
	(2)	0.007**	-0.288***	0.490***	-0.564***	0.281
		(0.022)	(0.001)	(0.008)	(0.000)	
STOXX600	(1)	0.001	0.639***			0.677
		(0.371)	(0.000)			
	(2)	0.002	0.648***	-0.249**	-0.056	0.690
		(0.282)	(0.000)	(0.022)	(0.592)	

When investigating the CAPM specification, five out of six portfolios are observed to have a statistically significant and positive alpha. Only the taxonomy-adjusted SRI portfolio does not generate a statistically significant alpha, similarly to the market benchmark STOXX600. The results obtained by the CAPM show evidence that sin stocks provide positive abnormal returns, as the sin portfolio has a statistically significant alpha of 0.8% at 1% level. The SRI portfolio also provides alpha, which however, is lower at 0.4% and statistically significant at 5% level. Furthermore, the "Long Short" portfolio has a positive alpha of 0.3% at 10% level, which indicates that a hedging strategy long in sin and short in SRI provides positive abnormal returns. In other words, the results suggest that sin stocks outperform socially responsible stocks as proposed by the first hypothesis. The "Tax. Scope" portfolio, in turn, provides the highest significant alpha of 1.1% and therefore outperforms all of the other portfolios based on the CAPM. The "Tax. Adj. SRI" portfolio, on the other hand, does not provide significant abnormal returns. Moreover, the "Tax. Long Short" portfolio has a statistically significant alpha of 0.8%, which supports the overperformance of stocks that are in the scope of the EU taxonomy. Also, as the taxonomy-adjusted SRI portfolio does not provide significant abnormal returns, but the traditional SRI portfolio does, the third hypothesis can be considered to be true. In other words, excluding the companies in the scope of the EU taxonomy negatively affects returns.

With regards to the factor loadings of the CAPM results, the returns of the portfolios and the market benchmark are statistically significantly related to the market risk factor ("Mkt-rf"). All of the portfolios except the long-short portfolios exhibit a positive beta that is smaller than one, ranging from 0.44 to 0.84, which indicates that they are less volatile than the market. The "Tax. Scope" portfolio has the lowest beta while the "Tax. Adj. SRI" portfolio has the highest beta. Both of the long-short portfolios, on the other hand, have a negative beta, which indicates that the portfolios move to the opposite direction from the market implying that, indeed, the portfolios are suitable hedges against market risk. What comes to the R-squared measures of the CAPM model and the Fama-French three-factor models, the goodness-of-fit improves when more explanatory

factors are incorporated to the model. Thus, the results by the Fama-French model need to be investigated.

When investigating the Fama-French three-factor model specification, four out of six portfolios are observed to have a statistically significant and positive alpha. Sin stocks provide an alpha of 0.7% at 1% significance level even after controlling for size and value factors. Also, the statistically significant alpha of 0.4% generated by the SRI portfolio is unchanged. This again seems to support the first hypothesis "*Sin stocks provide higher returns than socially responsible stocks*". However, the abnormal return of 0.2% of the "Long Short" portfolio is statistically insignificant, which might indicate that sin investing does not overperform SRI on a risk-adjusted basis as the investing styles may compensate each other. When it comes to the third hypothesis "*Excluding stocks in the scope of the EU taxonomy negatively affects returns*", the Fama-French three-factor model results seem to provide supporting evidence. The stocks in the scope of the EU taxonomy provide a statistically significant alpha of 1.0%, which is the highest compared to the other portfolios and STOXX600. Moreover, taxonomy-adjusted SRI portfolio does not provide statistically significant abnormal returns. "Tax. Long Short" portfolio, in turn, has an alpha of 0.07% at the 5% significance level, which also supports the third hypothesis implying that the stocks in the scope of the taxonomy yield positive abnormal returns from which socially responsible investors miss out if the companies are excluded from their portfolios for not being compliant, for example.

In line with the CAPM findings, the portfolio returns are positively and statistically significantly related to market risk except for the hedge portfolios. The positive betas are smaller than one ranging from 0.51 to 0.80 implying that the portfolios are less sensitive to market risk. The "Tax. Long Short" portfolio has a negative but significant market risk factor loading, but there is no significant evidence for the "Long Short" portfolio returns to be driven by the markets. With regards to the size factor loadings in the Fama-French three-factor specification, both SRI portfolios and the market benchmark STOXX600 have statistically significant negative size loadings, indicating that they exhibit a big cap tilt.

Moreover, both hedge portfolios have significant but positive size factor loadings. While SRI portfolios and STOXX600 have statistically significant size factor loadings, sin stocks and stocks in the scope of the EU taxonomy exhibit negative value factor loadings at the 5% significance level, implying that they are tilted towards growth.

Finally, Table 7 presents the regression results obtained by applying the Carhart four-factor model to the whole sample period between 2003 and 2019. The results seem to comply rather well with the findings obtained by the CAPM and the Fama-French three factor model. Regarding the goodness-of-fit of the models, the R-squared measures improve constantly when new factors are incorporated to the models. Hence, the inferences of this thesis are based on the Carhart four-factor model that is the most conservative specification of the models with the highest coefficients of determination.

Table 7. The OLS regression results for the whole sample period using the Carhart four-factor model. Alpha signifies the estimated coefficient. Mkt-rf, SMB, HML, and WML are the beta coefficients. R2 indicates the goodness-of-fit. The p-values are marked inside the parentheses below the results. Asterisks *, **, and *** indicate the statistical significance at 10%, 5%, and 1% level, respectively.

	Alpha	Mkt-rf	SMB	HML	WML	R2
Sin	0.009***	0.655***	0.029	-0.402***	-0.121	0.550
	(0.000)	(0.000)	(0.838)	(0.003)	(0.116)	
SRI	0.006***	0.690***	-0.292***	-0.074	-0.125*	0.705
	(0.005)	(0.000)	(0.007)	(0.520)	(0.064)	
Tax. Scope	0.011***	0.489***	0.194	-0.389**	-0.088	0.281
	(0.000)	(0.000)	(0.201)	(0.024)	(0.423)	
Tax. Adj. SRI	0.005**	0.736***	-0.285*	0.071	-0.281***	0.710
	(0.033)	(0.000)	(0.055)	(0.627)	(0.001)	
Long Short	0.002	-0.035	0.326***	-0.336***	0.000	0.158
	(0.221)	(0.268)	(0.002)	(0.000)	(0.999)	
Tax. Long Short	0.005*	-0.248***	0.485***	-0.468***	0.189**	0.297
	(0.090)	(0.004)	(0.009)	(0.001)	(0.022)	
STOXX600	0.003*	0.624***	-0.246**	-0.115	-0.114**	0.699
	(0.099)	(0.000)	(0.021)	(0.267)	(0.0152)	

When investigating the Carhart four-factor specification, five out of six portfolios are observed to have a statistically significant and positive alpha. Also, STOXX600 has a statistically significant positive alpha. The alphas range from 0.3% to 1.1%, with STOXX600 generating the lowest alpha and “Tax. Scope” portfolio the highest. Sin stocks have an alpha of 0.9% at 1% significance level, whereas socially responsible stocks have an alpha of 0.6% at 1% significance level. This indicates that in isolation, sin investing provides higher returns than SRI, which suggests that the first hypothesis is true. However, when comparing the investment styles directly, the Carhart model provides mixed results as the “Long Short” portfolio does not have a statistically significant alpha. This suggests that the investment styles, in fact, might compensate each other and therefore, neither of them outperforms the other. The portfolio of stocks in the scope of the EU taxonomy outperforms the taxonomy-adjusted SRI portfolio when comparing the portfolios in isolation, as their alphas are 1.1% and 0.5%, respectively. Moreover, when compared directly, the positive alpha of the “Tax. Long Short” portfolio supports the outperformance of the stocks in the taxonomy’s scope. In addition, the traditional SRI portfolio has a higher alpha than the taxonomy-adjusted SRI portfolio. Hence, it is possible to conclude that the third hypothesis is true, implying that excluding stocks in the scope of the EU taxonomy negatively affects returns.

With regards to the factor loadings of the Carhart four-factor specification, the results persist the same as in the Fama-French three factor specification when it comes to the market risk factor, size factor, and value factor. In other words, all of the portfolios except the hedge portfolios have a statistically significant and positive beta less than one, implying that the portfolios are less sensitive to market risk. The “Tax. Long Short” portfolio, in turn, has a significant negative beta. Both SRI portfolios and the STOXX600 are negatively tilted towards size, while “Sin” and “Tax. Scope” portfolios are negatively tilted towards value. When it comes to the momentum factor, the market benchmark and all portfolios expect the hedge portfolios have a negative factor loading, of which three loadings are statistically significant. Moreover, the ”Tax. Long Short” portfolio has a statistically significant and positive momentum factor loading.

6.2 Crisis period

The empirical results for the crisis period (see Table 8) are discussed in more detail below.

Table 8. The OLS regression results for the crisis period from 2008 to 2009 using the CAPM (1) and Fama-French three-factor model (2). Alpha signifies the estimated coefficient. Mkt-rf, SMB, HML, and WML are the beta coefficients. R2 indicates the goodness-of-fit. The p-values are marked inside the parentheses below the results. Asterisks *, **, and *** indicate the statistical significance at 10%, 5%, and 1% level, respectively.

		Alpha	Mkt-rf	SMB	HML	R2
Sin	(1)	0.016	0.639**			0.539
		(0.605)	(0.039)			
	(2)	0.026	0.387	1.457**	1.456	0.733
		(0.432)	(0.173)	(0.024)	(0.165)	
SRI	(1)	0.012	0.799***			0.845
		(0.575)	(0.000)			
	(2)	0.017	0.636**	0.453	0.992	0.876
		(0.476)	(0.014)	(0.221)	(0.143)	
Tax. Scope	(1)	-0.059*	-0.196			0.080
		(0.059)	(0.482)			
	(2)	-0.056	-0.218	0.757	0.061	0.217
		(0.229)	(0.467)	(0.479)	(0.977)	
Tax. Adj. SRI	(1)	0.026	1.071***			0.879
		(0.343)	(0.001)			
	(2)	0.031	0.930**	0.460	0.853	0.893
		(0.339)	(0.017)	(0.286)	(0.155)	
Long Short	(1)	0.004	-0.157			0.077
		(0.916)	(0.609)			
	(2)	0.009	-0.242	1.003*	0.440	0.359
		(0.836)	(0.456)	(0.065)	(0.503)	
Tax. Long Short	(1)	-0.085***	-1.265***			0.831
		(0.008)	(0.001)			
	(2)	-0.087**	-1.142**	0.295	-0.815	0.863
		(0.039)	(0.034)	(0.774)	(0.691)	
STOXX600	(1)	-0.023	0.450**			0.622
		(0.228)	(0.013)			
	(2)	-0.020	0.375	0.440	0.438	0.663
		(0.384)	(0.106)	(0.283)	(0.458)	

In order to observe the stock performance under the second hypothesis of this thesis "*Sin stocks perform better than socially responsible stocks during an economic crisis"*, the empirical results of the crisis period presented in Table 8 need to be analyzed. When it comes to the CAPM specification, four out of six portfolios have positive alphas, whereas two portfolios have negative alphas during the crisis period. However, all of the positive alphas are statistically insignificant while the two negative alphas for the "Tax. Scope" and "Tax. Long Short" portfolios are significant. These findings suggest that the second hypothesis cannot be accepted as such, since neither sin stocks nor socially responsible stocks provide abnormal returns and hence, underperform or outperform the other during a crisis period. However, the "Tax. Scope" portfolio has a statistically significant negative alpha referring to additional costs for investors. The negative alpha of the "Tax. Long Short" portfolio supports the underperformance of the stocks in the scope of the EU taxonomy, as the investing strategy long in stocks in the taxonomy's scope and short in the taxonomy-adjusted SRI portfolio also creates additional costs for investors.

With regards to the factor loadings of the CAPM specification, the sin portfolio, both SRI portfolios, and the market benchmark have statistically significant positive market risk factor loadings. The sin portfolio, the traditional SRI portfolio, and STOXX600 have positive betas less than one, implying that they are less sensitive for market volatility. The taxonomy-adjusted SRI portfolio, in turn, has a beta of 1.07, implying that the portfolio is prone to market risk during a crisis period.

The R-squared measures improve for all portfolios when the Fama-French three-factor model is applied in the analysis. Moreover, the statistically significant negative alpha of the "Tax. Scope" portfolio disappears. Otherwise the results persist the same regarding the alphas. In other words, only the "Tax. Long Short" portfolio has a statistically significant negative alpha, according to which the investing strategy long in stocks in the scope of the taxonomy and short in the taxonomy-adjusted SRI portfolio provides abnormal negative returns for investors during an economic crisis.

When it comes to the factor loadings of the Fama-French specification, the statistical significance of the betas of the sin portfolio and the STOXX600 disappear. Also, the beta of the "Tax. Adj. SRI" portfolio decreases from 1.07 to 0.93, which implies that the portfolio is less sensitive to market risk according to the Fama-French three-factor model. Only two portfolios have statistically significant size factor loadings, as the sin portfolio and "Long Short" portfolio exhibit a small cap tilt. None of the portfolios have a statistically significant value factor loading.

Finally, Table 9 presents the regression results obtained by applying the Carhart four-factor model to the crisis sample period. The findings are discussed below.

Table 9. The OLS regression results for the crisis period from 2008 to 2009 using the Carhart four-factor model. Alpha signifies the estimated coefficient. Mkt-rf, SMB, HML, and WML are the beta coefficients. R2 indicates the goodness-of-fit. The p-values are marked inside the parentheses below the results. Asterisks *, **, and *** indicate the statistical significance at 10%, 5%, and 1% level, respectively.

	Alpha	Mkt-rf	SMB	HML	WML	R2
Sin	0.028	0.411	1.472*	1.509	0.061	0.734
	(0.432)	(0.355)	(0.052)	(0.361)	(0.955)	
SRI	-0.013	0.269*	0.234	0.179	-0.934**	0.980
	(0.206)	(0.086)	(0.140)	(0.604)	(0.031)	
Tax. Scope	-0.097**	-0.724	0.456	-1.058	-1.285	0.527
	(0.013)	(0.161)	(0.673)	(0.634)	(0.127)	
Tax. Adj. SRI	-0.007	0.464***	0.183	-0.178	-1.184***	0.991
	(0.450)	(0.002)	(0.401)	(0.687)	(0.005)	
Long Short	0.040	0.152	1.237**	1.311	1.001	0.644
	(0.186)	(0.614)	(0.045)	(0.335)	(0.281)	
Tax. Long Short	-0.090**	-1.179**	0.273	-0.898	-0.096	0.864
	(0.025)	(0.049)	(0.825)	(0.721)	(0.878)	
STOXX600	-0.049**	0.010	0.223	-0.370	-0.928**	0.902
	(0.031)	(0.926)	(0.443)	(0.548)	(0.044)	

As in the analysis of the whole sample period, the R-squared measures improve constantly when new factors are incorporated to the models. Hence, the inferences of this

thesis are based on the Carhart four-factor model that is the most conservative specification of the models with the highest coefficients of determination ranging from 0.53 to 0.99. In line with the results of the CAPM and Fama-French three-factor model specification, the alphas of the sin portfolio and the "Long Short" portfolio are positive but insignificant. The alpha for the SRI portfolio is negative but also insignificant. These findings suggest that the second hypothesis cannot be accepted since neither sin stocks nor socially responsible stocks provide abnormal returns and hence, neither underperforms nor outperforms the other during a crisis period. Therefore, it is possible to conclude that sin stocks do not perform better than socially responsible stocks during an economic crisis. However, "Tax. Scope" and "Tax. Long Short" portfolios and the market benchmark all have negative alphas at 5% significance level implying that these investments generate additional costs for investors. Therefore, it is possible to draw an additional conclusion that the stocks in the scope of the EU taxonomy and the benchmark index STOXX600 perform worse than the other stocks in the sample during an economic crisis.

Finally, in the Carhart four-factor model specification, the market risk factor loadings are in line with the Fama-French three-factor model specification. Both SRI portfolios have statistically significant positive betas, according to which the portfolios are less sensitive to market risk. The "Tax. Long Short" portfolio, on the other hand, has a statistically significant negative beta, implying that the hedge portfolio moves to the opposite direction from the market during a crisis period. With regards to the size factor loadings, the sin portfolio has a small cap tilt at 10% significance level. Moreover, none of the portfolios offer statistically significant value factor loadings. On the other hand, both SRI portfolios and the benchmark index offer a statistically significant negative momentum tilt.

6.3 Discussion

This chapter summarizes the results and presents the key findings for this thesis. To review, the results are obtained by running the OLS regression analysis for two sample periods, the whole sample period and the crisis period, by applying three different asset

pricing models: the CAPM, the Fama-French three-factor model, and the Carhart four-factor model. The R-squared figures improve notably when more factors are incorporated to the model, in other words, when moving from the CAPM to the Carhart four-factor model. Therefore, the interpretations of this thesis are based on the Carhart four-factor model that is the most conservative specification of the models, as previously stated. Furthermore, the results obtained by the model comply rather well with the findings obtained by the CAPM and the Fama-French three factor model.

When observing the portfolio returns under the first hypothesis "*Sin stocks provide higher returns than socially responsible stocks"*, the sin portfolio provides an alpha that is 0.3 percentage points higher than the alpha of the SRI portfolio. This refers to the outperformance of the sin portfolio, even though both of the portfolios yield abnormal returns. However, when following the example of Lobe and Walkshäusl (2016) and comparing the returns directly, the hedge portfolio long in vice and short in virtue does not provide statistically significant alpha. This implies that the investing styles compensate each other and, as a result, neither of the portfolios outperform the other. Therefore, the first hypothesis is rejected, as sin stocks do not provide statistically significantly higher returns than socially responsible stocks.

With regards to the second hypothesis "*Sin stocks perform better than socially responsible stocks during an economic crisis"*, the findings suggest that neither sin stocks nor socially responsible stocks can yield statistically significant abnormal returns during an economic downturn. Therefore, also the second hypothesis must be rejected, which signifies that sin stocks do not perform better than socially responsible stocks during an economic crisis.

Finally, when observing the results under the third hypothesis "*Excluding stocks in the scope of the EU taxonomy negatively affects returns*", the findings suggest that indeed, the SRI portfolio from which the stocks in the EU taxonomy's scope are excluded, underperforms both the so-called traditional SRI portfolio and the portfolio constructed from

the stocks that are in the scope of the taxonomy, whose alphas are 0.1 and 0.6 percentage points higher, respectively. In addition, the statistically significant and positive alpha of the taxonomy-related hedge portfolio supports these findings. Therefore, the third hypothesis is accepted meaning that excluding the stocks in the scope of the EU taxonomy lowers the returns for a socially responsible investor. However, the crisis period regression results suggest the opposite, as the stocks in the scope of the EU taxonomy generate additional costs for investors by providing abnormal negative returns during an economic crisis. Therefore, it is worthy to exclude these stocks from a portfolio during an economic downturn.

6.4 Limitations

It is important to note that there are possible limitations for the empirical research of this paper due to availability of the data, for example. These limitations offer room for improvement in the future studies.

Firstly, as the EU taxonomy has only recently been put into effect, there is not enough data available to follow all the steps in the classification system and determine which of the companies in the data sample may be regarded as sustainable investments. Therefore, this thesis examines only the stocks that are currently in the focus of the EU taxonomy based on their NACE classifications. As a consequence, this thesis is unable to form explicit conclusions about the taxonomy's effect on returns and the topic requires further empirical analysis in the future when the relevant data is available.

Secondly, the sample consists of stocks that are included in the STOXX Europe 600 index as of November 2020. Therefore, the stocks that have been removed from the index before November 2020 are not taken into account. Consequently, only active stocks are included in the sample since there are no delisted stocks in the base data. This might result in survivorship bias.

Thirdly, different data providers offer differing ESG scores. In other words, the companies in the sample of this thesis might have different ESG scores if the ESG data is retrieved from some other database than Refinitiv. This, in turn, could result in different empirical results as different companies could be included in the SRI portfolios.

The fourth possible limitation stems from the rather short time span of the crisis period. As this thesis employs monthly return data, the regression results for the crisis period consists of only eight monthly observations per portfolio, which may be the reason for the results regarding the second hypothesis to be mainly statistically insignificant. The significance of the results may be improved by utilizing daily or weekly return data.

7 Conclusions

Although investors' interest in SRI has been growing considerably over the past years, SRI is often believed to bear a financial cost (see e.g. Adler & Kritzman, 2008). On the other hand, previous literature suggests that sin investing might outperform the market (Fabozzi et al., 2008; Richey, 2016). Therefore, it is important to study if it actually pays off to be bad rather than good – in other words, if vice investing is more profitable than virtue investing. Hence, the purpose of this thesis has been to study whether sin stocks provide higher returns than socially responsible stocks. Moreover, another objective has been to examine the performance of these investments during an economic crisis. Finally, as the EU taxonomy on sustainable finance is a broadly discussed and current topic in the financial markets, the third objective has been to study whether excluding the stocks in the scope of the EU taxonomy negatively affects returns.

It is not always easy to draw a line between what is considered a sin and what is not. Essentially, the notion of sin is greatly affected by social norms that vary geographically and change over time (Fauver & McDonald, 2014; Blitz & Fabozzi, 2017). Therefore, it is not unambiguous to identify which industries are actually sin industries. For example, climate change and environmental issues have increased in importance in people's values over the past years (Eurosif, 2018). As a result, industries with large greenhouse gas emissions footprints are increasingly acknowledged as sin industries, and even international regulation such as the EU taxonomy has been put into place with the purpose to decarbonize the industries with high carbon emissions (TEG, 2019a).

As social norms are in the center of sin investing and SRI, some aspects of behavioral finance need to be considered as well. For example, according to Hong and Kacperczyk (2009), sin stocks are neglected by large institutional investors and less followed by analysts, which is why they are underpriced in the financial markets resulting in abnormal excess returns. This, in turn, implies that the markets are inefficient since according to the efficient market hypothesis, it is impossible to outperform the market. Therefore,

social norms impose limits to arbitrage and as a consequence, the prices of sin stocks may stay in a non-equilibrium state.

In order to examine whether this may be true, the monthly returns of 579 stocks included in the STOXX Europe 600 index as of November 2020 are empirically analyzed in this thesis over two different time periods, the whole sample period from 2003 to 2019 and the financial crisis period from 2008 to 2009. Inspired by Lobe and Walkshäusl (2016), three alternative asset pricing models, the CAPM, the Fama-French three-factor model, and the Carhart four-factor model, are applied in the factor regressions ensuring that the interpretations are not driven by a specific model.

The findings of the empirical analysis suggest that the first hypothesis of this thesis needs to be rejected, as sin stocks do not provide statistically significant higher returns than socially responsible stocks in the long run. While both of the investing styles do provide statistically significant abnormal returns, they tend to compensate each other with respect to profits and as a result, neither of the portfolios outperform the other. This outcome is in line with the paper of Lobe and Walkshäusl (2016), despite they do not find evidence that either of the investing styles would offer abnormal returns. The findings of this thesis indicate that profit-seeking investors could include both sin stocks and socially responsible stocks to their portfolios. However, if an investor prioritizes ethicality over profits, SRI is an obvious choice. Therefore, it eventually depends on investors' tastes whether to invest in vice or virtue, as suggested by Lobe and Walkshäusl (2016). As Fabozzi et al. (2008) note, sin investing is for those who can bear its social costs. On the other hand, investors who choose to invest in responsible companies just because they expect them to outperform sinful companies, simply practice active management and not SRI, as pointed out by Adler and Kritzman (2008). Genuinely responsible investors exclude sinful companies even if they would expect them to outperform responsible investments (Adler & Kritzman, 2008).

Moreover, the second hypothesis of this study must be rejected as well, since neither sin stocks nor socially responsible stocks provide abnormal returns during an economic crisis. Hence, it is possible to conclude that sin stocks do not perform better than socially responsible stocks during an economic crisis. This result is contradicting to the findings of Chong et al. (2006) and Trinks and Scholtens (2017). However, as mentioned in the discussion of limitations in the prior chapter, this thesis employs monthly return data, which is why the regression results for the crisis period consists of only eight monthly observations per portfolio. This, in turn, may be the reason for the results regarding the second hypothesis to be mainly statistically insignificant. The results may be differing if the analysis is performed by utilizing daily or weekly return data.

Finally, the empirical results show evidence that the third hypothesis of this study can be accepted. This implies that indeed, excluding stocks that are currently in the scope of the EU taxonomy negatively affects socially responsible investors' returns in the long run. The stocks in the scope of the taxonomy, that is, the companies operating in sectors that can make a considerable contribution to climate change mitigation or climate change adaptation, provide higher abnormal returns than either of the SRI portfolios in this study. Moreover, the SRI portfolio that excludes the stocks in the scope of the EU taxonomy offers lower abnormal returns than the SRI portfolio that does not exclude these stocks. It is profitable to exclude the stocks in the scope of the EU taxonomy only during an economic crisis, as the results suggests that they generate additional costs for investors by providing abnormal negative returns during an economic crisis. However, as SRI is essentially a long-term oriented investment approach (Eurosif, 2016), the results obtained for the whole sample period are emphasized.

The findings related to the EU taxonomy provide a direction for socially responsible investors, as it suggests that the stocks in the scope of the taxonomy potentially provide high abnormal long-term returns. Therefore, it is important for investors to carefully analyze whether the stocks could be compliant to the EU taxonomy according to the technical screening criteria and hence be included in the portfolio as sustainable investments.

If the companies do not fulfill the taxonomy criteria, they cannot be classified as sustainable investments and need to be excluded. As a result, sustainable investors miss out from their returns, which would indicate that it actually does pay off to be bad rather than good. However, it is still too early to tell whether this is the case, as there is not yet enough taxonomy-aligned disclosure from companies to conduct screening based on the EU taxonomy's criteria. Therefore, the topic requires further empirical research.

To conclude, this thesis finds no compelling evidence that it would pay off to be bad rather than good. In fact, it seems to be equally profitable to invest in sin stocks and in socially responsible stocks and hence, it is eventually up to investors' personal values to make a choice between the two. However, especially the EU taxonomy's impact on returns requires more empirical research in the future.

References

ATT. (2020). *Treaty Status.* Retrieved 2020-12-01 from https://thearmstradetreaty.org/treaty-status.html?templateId=209883

Adler, T., & Kritzman, M. (2008). The Cost of Socially Responsible Investing. *Journal of Portfolio Management*, 35(1), 52-56. https://doi.org/10.3905/JPM.2008.35.1.52

Barnett, M. L., & Salomon, R. M. (2006). Beyond dichotomy: The curvilinear relationship between social responsibility and financial performance. *Strategic Management Journal*, 27(11), 1101-1122. https://doi-org.proxy.uwasa.fi/10.1002/smj.557

Benson, K. L., Brailsford, T. J., & Humphrey, J. E. (2006). Do socially responsible fund managers really invest differently? *Journal of Business Ethics*, 65(4), 337. https://doi.org/10.1007/s10551-006-0003-8

Blitz, D., & Fabozzi, F. J. (2017). Sin Stocks Revisited: Resolving the Sin Stock Anomaly. *Journal of Portfolio Management*, 44(1), 105-111. http://dx.doi.org.proxy.uwasa.fi/10.3905/jpm.2017.44.1.105

Bodie, Z., Kane, A., & Marcus, A. J. (2014). *Investments* (10th edition). New York: McGraw-Hill Education.

Brealey, R. A., Myers, S. C., & Allen, F. (2011). *Principles of Corporate Finance* (10th edition). New York: McGraw-Hill/Irwin.

Brzeszczyński, J., & McIntosh, G. (2014). Performance of Portfolios Composed of British SRI Stocks. *Journal of Business Ethics*, 120(3), 335-362. https://doi.org/10.1007/s10551-012-1541-x

Brochado, A., Santos, M., Oliveira, F., & Esperança, J. (2018). Gambling behavior: Instant versus traditional lotteries. *Journal of Business Research*, 88, 560-567. https://doi-org.proxy.uwasa.fi/10.1016/j.jbusres.2018.01.001

Carhart, M. (1997). On Persistence in Mutual Fund Performance. *The Journal of Finance*, 52(1), 57-82. https://doi.org/10.2307/2329556

Comité Européen des Entreprises Vins. (2016). *European wine: a solid pillar of the European Union economy*. Retrieved 2019-11-15 from https://www.ceev.eu/images/documents/press_releases/2016/Brochure_CEEV_-_High_resolution.pdf

Cortez, M., Silva, F. & Areal, N. (2009). The Performance of European Socially Responsible Funds. *Journal of Business Ethics*, 87(4), 573-588. http://dx.doi.org.proxy.uwasa.fi/10.1007/s10551-008-9959-x

Chatjuthamard, P., Wongboonsin, P., Kongsompong, K., & Jiraporn, P. (2018). How do socially controversial companies do during a stressful time? Evidence from the Great Recession. *The North American Journal of Economics and Finance*. https://doi.org/10.1016/j.najef.2018.12.010

Chong, J., Her, M. & Phillips, G. M. (2006). To sin or not to sin? Now that's the question. *Journal of Asset Management*, 6(6), 406-417. https://doi.org/10.1057/palgrave.jam.2240191

de Colle, S., & York, J. G. (2009). Why Wine is not Glue? The Unresolved Problem of Negative Screening in Socially Responsible Investing. *Journal of Business and Ethics*, 85,83-95. http://dx.doi.org.proxy.uwasa.fi/10.1007/s10551-008-9949-z

Drope, J., Schluger, N., Cahn, Z., Drope, J., Hamill, S., Islami, F., Liber, A., Nargis, N., & Stoklosa, M. (2018). *The Tobacco Atlas* (6th edition). Atlanta: American Cancer Society and Vital Strategies.

Dunne, P. (2015). Sector futures: Defence industry. *Eurofound, Observatories, EMCC*. Retrieved 2019-11-21 from https://www.eurofound.europa.eu/observatories/emcc/articles/business/sector-futures-defence-industry

Eccles, N. S., & Viviers, S. (2011). The Origins and Meanings of Names Describing Investment Practices that Integrate a Consideration of ESG Issues in the Academic Literature. *Journal of Business Ethics*, 104(3), 389-402. https://doi-org.proxy.uwasa.fi/10.1007/s10551-011-0917-7

European Casino Association. (2019). *Country-by-country report*. Retrieved 2019-11-19 from https://www.europeancasinoassociation.org/country-by-country-report/

European Commission. (2018). *Action Plan: Financing Sustainable Growth*. Retrieved 2020-11-30 from https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52018DC0097

European Commission. (2020). *EU taxonomy for sustainable activities*. Retrieved 2020-11-27 from https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance/eu-taxonomy-sustainable-activities_en

European Monitoring Centre for Drugs and Drug Addiction. (2019). *Cannabis policy: status and recent developments*. Retrieved 2020-01-09 from http://www.emcdda.europa.eu/publications/topic-overviews/cannabis-policy/html_en

Eurosif. (2016). *European SRI study 2016*. Retrieved 2019-11-02 from http://www.eurosif.org/wp-content/uploads/2016/11/SRI-study-2016-HR.pdf

Eurosif. (2018). *European SRI study 2018*. Retrieved 2019-11-02 from http://www.eurosif.org/wp-content/uploads/2018/11/European-SRI-2018-Study.pdf

Eurostat. (2008). *NACE Rev. 2 – Statistical classification of economic activities in the European Community.* Retrieved 2020-12-04 from https://ec.europa.eu/eurostat/documents/3859598/5902521/KS-RA-07-015-EN.PDF

Fabozzi, F. J., Ma, K. C., & Oliphant, B. J. (2008). Sin stock returns. *Journal of Portfolio Management,* 35(1), 82-94,8.

Fama, E. F. (1970). Efficient capital markets: A review of theory and empirical work. *The Journal of Finance*, 25(2), 383–417. https://doi.org/10.1111/j.1540-6261.1970.tb00518.x

Fama, E. F., & French, K. R. (1993). Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics*, 33(1), 3-56. https://doi.org/10.1016/0304-405X(93)90023-5

Fama, E. F., & French, K. R. (1996). Multifactor Explanations of Asset Pricing Anomalies. *The Journal of Finance*, 51(1), 55-84. https://doi.org/10.1111/j.1540-6261.1996.tb05202.x

Fama, E. F., & French, K. R. (2007). Disagreement, tastes, and asset prices. *Journal of Financial Economics*, 83(3), 667-689. https://doi.org/10.1016/j.jfineco.2006.01.003

Fang, X., & Mowen, J. C. (2009). Examining the trait and functional motive antecedents of four gambling activities: slot machines, skilled card games, sports betting, and promotional games. *Journal of Consumer Marketing*, 26(2), 121-131. http://dx.doi.org.proxy.uwasa.fi/10.1108/07363760910940483

Fauver, L., & McDonald, M. B. (2014). International variation in sin stocks and its effects on equity valuation. *Journal of Corporate Finance*, 25, 173-187. https://doi-org.proxy.uwasa.fi/10.1016/j.jcorpfin.2013.11.017

Foundation for a Smoke-Free World. (2019). *Agriculture and Livelihoods*. Retrieved 2019-11-20 from https://www.smokefreeworld.org/agriculture-livelihoods/

Goss, E. P., & Morse, E. A. (2007). *Governing fortune: Casino gambling in America*. Michigan: The University of Michigan Press. Retrieved 2019-11-19 from https://ebookcentral-proquest-com.proxy.uwasa.fi

GSIA. (2018). *Global Sustainable Investment Review 2018.* Retrieved 2020-11-11 from http://www.gsi-alliance.org/trends-report-2018/

Halbritter, G. & Dorfleitner, G. (2015). The wages of social responsibility — where are they? A critical review of ESG investing. *Review of Financial Economics*, 26(1), 25-35. https://doi-org.proxy.uwasa.fi/10.1016/j.rfe.2015.03.004

Hebb, T., Hawley, J. P., Hoepner, A. G., Neher, A. L., & Wood, D. (2015). Introduction. In T. Hebb, J. P. Hawley, A. G. Hoepner, A. L. Neher, & D. Wood (Ed.), *The Routledge Handbook of Responsible Investment* (1st edition, p. 3-5). New York: Routledge.

Hong, H., & Kacperczyk, M. (2009). The price of sin: The effects of social norms on markets. *Journal of Financial Economics*, 93(1), 15-36. https://doi.org/10.1016/j.jfineco.2008.09.001

Humphrey, J. E., & Tan, D. T. (2014). Does it Really Hurt to be Responsible? *Journal of Business Ethics*, 122(3), 375-386. https://doi-org.proxy.uwasa.fi/10.1007/s10551-013-1741-z

Humphrey, J. (2015). Socially responsible screening in mutual funds. In T. Hebb, J. P. Hawley, A. G. Hoepner, A. L. Neher, & D. Wood (Ed.), The Routledge Handbook of Responsible Investment (1st edition). New York: Routledge. (p. 667-668).

Jegadeesh, N., & Titman, S. (1993). Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency. *The Journal of Finance*, 48(1), 65-91. https://doi.org/10.2307/2328882

Kempf, A. & Osthoff, P. (2007). The Effect of Socially Responsible Investing on Portfolio Performance. *European Financial Management*, 13(5), 908-922. https://doi.org/10.1111/j.1468-036X.2007.00402.x

Kenneth R. French. (2020). *Data Library. Developed Markets Factors and Returns*. Retrieved 2020-11-18 from http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

Kirin Beer University. (2019). *Global Beer Production by Country in 2018*. Retrieved 2019-11-15 from https://www.kirinholdings.co.jp/english/news/2019/1003_01.html

Lee, D., Humphrey, J., Benson, K., & Ahn, J. (2010). Socially responsible investment fund performance: the impact of screening intensity. *Accounting & Finance*, 50(2), 351-370. https://doi.org/10.1111/j.1467-629X.2009.00336.x

Lins, K. V., Servaes, H. & Tamayo, A. (2017). Social Capital, Trust, and Firm Performance: The Value of Corporate Social Responsibility during the Financial Crisis. *Journal of Finance*, 72(4), 1785-1824. https://doi-org.proxy.uwasa.fi/10.1111/jofi.12505

Liston-Perez, D., & Gutierrez, J. P. (2018). Dynamic analysis of sin stocks and investor sentiment. *International Journal of Managerial Finance*, 14(5), 558-573. http://dx.doi.org.proxy.uwasa.fi/10.1108/IJMF-01-2018-0001

Lobe, S., & Walkshäusl, C. (2016). Vice versus virtue investing around the world. *Review of Managerial Science*, 10(2), 303-344. https://doi-org.proxy.uwasa.fi/10.1007/s11846-014-0147-3

Malkiel, B. G., & Fama, E. F. (1970). Efficient capital markets: A review of theory and empirical work. *The Journal of Finance*, 25(2), 383-417. https://doi.org/10.1111/j.1540-6261.1970.tb00518.x

MarketLine. (2017). *Industry Profile: Global Online Gambling*. Retrieved 2019-11-19 from http://search.ebscohost.com.proxy.uwasa.fi/login.aspx?direct=true&db=buh&AN=128143785&site=ehost-live

Markowitz, H. (1952). Portfolio selection. *The Journal of Finance*, 7(1), 77-91. https://doi.org/10.1111/j.1540-6261.1952.tb01525.x

Masters, J. (2019). U.S. Gun Policy: Global Comparisons*. Council on Foreign Relations*. Retrieved 2019-11-21 from https://www.cfr.org/backgrounder/us-gun-policy-global-comparisons

Mollet, J. C., & Ziegler, A. (2014). Socially responsible investing and stock performance: New empirical evidence for the US and European stock markets. *Review of Financial Economics*, 23(4), 208-216. https://doi.org/10.1016/j.rfe.2014.08.003

Morgan Stanley Institute of Sustainable Investing. (2017). *Sustainable Signals: New Data from the individual Investor*. Retrieved 2019-10-25 from https://www.morganstanley.com/pub/content/dam/msdotcom/ideas/sustainable-signals/pdf/Sustainable_Signals_Whitepaper.pdf

Nofsinger, J., & Varma, A. (2014). Socially responsible funds and market crises. *Journal of Banking & Finance*, 48, 180-193. https://doi.org/10.1016/j.jbankfin.2013.12.016

Ponthus, J. (2019). Wave of European Cannabis firms to list in 2020, analyst says. *Reuters*. Retrieved 2020-01-09 from https://www.reuters.com/article/us-cannabis-stocks-europe/wave-of-european-cannabis-firms-to-list-in-2020-analyst-says-idUSKBN1Y21WS

Qontigo. (2020). *STOXX Europe 600.* Retrieved 2020-11-28 from https://www.stoxx.com/index-details?symbol=SXXP

Refinitiv. (2020). Environmental, Social and Governance (ESG) scores from Refinitiv. Retrieved 2020-11-28 from https://www.refinitiv.com/content/dam/marketing/en_us/documents/methodology/esg-scores-methodology.pdf

Renneboog, L., Ter Horst, J., & Zhang, C. (2008a). The price of ethics and stakeholder governance: The performance of socially responsible mutual funds.

Journal of Corporate Finance, 14(3), 302-322. https://doi.org/10.1016/j.jcorpfin.2008.03.009

Renneboog, L., Ter Horst, J., & Zhang, C. (2008b). Socially responsible investments: Institutional aspects, performance, and investor behavior. *Journal of Banking & Finance*, 32(9), 1723-1742. https://doi.org/10.1016/j.jbankfin.2007.12.039

Richey, G. M. (2016). Sin is in: An alternative to socially responsible investing? *Journal of Investing,* 25(2), 136-143. http://dx.doi.org.proxy.uwasa.fi/10.3905/joi.2016.25.2.136

Schueth, S. (2003). Socially responsible investing in the United States. *Journal of Business Ethics*, 43(3), 189. http://dx.doi.org.proxy.uwasa.fi/10.1023/A:1022981828869

Shank, T., Manullang, D., & Hill, R. (2005). Is it Better to be Naughty or Nice? *Journal of Investing*, 14(3), 82-87. https://doi.org/10.3905/joi.2005.580553

SICCODES.com. (2020). *SIC Codes – Standard Industrial Classification*. Retrieved 2020-12-16 from https://siccode.com/sic-code-lookup-directory

Sin Stocks Reports. (2015). *What Are Sin Stocks?* Retrieved 2019-11-02 from https://sinstocksreport.com/what-are-sin-stocks/

SIPRI. (2020). *SIPRI Yearbook 2020 - Armaments, Disarmament and International Security: Summary*. Retrieved 2020-12-01 from https://www.sipri.org/yearbook/2020

Spirits Europe. (2020a). *A Spirit of Growth*. Retrieved 2020-11-02 from https://spirits.eu/spirits/a-spirit-of-growth/premiumisation-of-spirits-sales

Spirits Europe. (2020b). *Priority Markets for the Spirits Sector*. Retrieved 2020-11-02 from https://spirits.eu/policies/external-trade/priority-markets-for-the-spirits-sector

Spirits Europe. (2019c). *Challenges facing the industry.* Retrieved 2019-11-02 from https://spirits.eu/external-trade/challenges-facing-the-industry

TEG. (2019a). *Taxonomy Technical Report*. Retrieved 2020-12-01 from https://ec.europa.eu/info/sites/info/files/business_economy_euro/banking_and_finance/documents/190618-sustainable-finance-teg-report-taxonomy_en.pdf

TEG. (2019b). *Using the Taxonomy: Supplementary Report 2019 by the Technical Expert Group on Sustainable Finance*. Retrieved 2020-12-02 from https://ec.europa.eu/info/sites/info/files/business_economy_euro/banking_and_finance/documents/190618-sustainable-finance-teg-report-using-the-taxonomy_en.pdf

TEG. (2020a). *Taxonomy: Final report of the Technical Expert Group on Sustainable Finance.* Retrieved 2020-12-01 from https://ec.europa.eu/info/sites/info/files/business_economy_euro/banking_and_finance/documents/200309-sustainable-finance-teg-final-report-taxonomy_en.pdf

TEG. (2020b). *Taxonomy Report: Technical Annex.* Retrieved 2020-12-01 from https://ec.europa.eu/info/sites/info/files/business_economy_euro/banking_and_finance/documents/200309-sustainable-finance-teg-final-report-taxonomy-annexes_en.pdf

The Brewers of Europe. (2017). *Beer statistics.* Retrieved 2019-11-15 from https://brewersofeurope.org/uploads/mycms-files/documents/publications/2017/Statistics-201712-001.pdf

Tinelli, M. L. (2015). Reflection: Responsible investment around the world. In T. Hebb, J. P. Hawley, A. G. Hoepner, A. L. Neher, & D. Wood (Ed.), *The Routledge Handbook of Responsible Investment* (1st edition, p. 365). New York: Routledge.

Tobacco-Free Life. (2019). *History of Tobacco*. Retrieved 2019-11-02 from https://tobaccofreelife.org/tobacco/tobacco-history/

Trinks, P. J., & Scholtens, B. (2017). The Opportunity Cost of Negative Screening in Socially Responsible Investing. *Journal of Business Ethics*, 140(2), 193-208. https://doi.org/10.1007/s10551-015-2684-3

Tripathi, V., & Bhandari, V. (2016). Performance of Socially Responsible Stocks Portfolios – The Impact of Global Financial Crisis. *Journal of Economics and Business Research*, 1, 42-68. Retrieved 2020-01-09 from https://uav.ro/jour/index.php/jebr/article/view/692

UNDP. (2021). *Sustainable Development Goals.* Retrieved 2021-01-03 from https://www.undp.org/content/undp/en/home/sustainable-development-goals.html

UNFCCC. (2021). *The Paris Agreement.* Retrieved 2021-01-03 from https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement

UNPRI. (2019). *Principles for Responsible Investment. An investor initiative in partnership with UNEP Finance Initiative and the UN Global Compact*. Retrieved 2019-11-22 from https://www.unpri.org/download?ac=6303

USA Mutuals. (2019). *Vitium Global Fund*. Retrieved 2019-11-02 from https://usamutuals.com/vitium-global-fund/

US SIF Foundation. (2018). *Report on US Sustainable, Responsible and Impact Investing Trends 2018*. Retrieved 2019-11-02 from https://www.ussif.org/files/Trends/Trends%202018%20executive%20summary%20FINAL.pdf

Wood, D. (2015). What do we mean by the S in ESG? In T. Hebb, J. P. Hawley, A. G. Hoepner, A. L. Neher, & D. Wood (Ed.), *The Routledge Handbook of Responsible Investment* (1st edition, p. 553). New York: Routledge.

World Health Organization. (2018a). *Harmful use of alcohol kills more than 3 million people each year, most of them men*. Retrieved 2019-11-01 from https://www.who.int/news-room/detail/21-09-2018-harmful-use-of-alcohol-kills-more-than-3-million-people-each-year-most-of-them-men

World Health Organization. (2018b). *Alcohol.* Retrieved 2019-11-01 from https://www.who.int/news-room/fact-sheets/detail/alcohol

World Health Organization. (2018c). *Tobacco use is falling, but not fast enough*. Retrieved 2019-11-20 from https://www.who.int/news-room/detail/31-05-2018-world-no-tobacco-day-tobacco-and-heart-disease

World Health Organization. (2019a). *Tobacco.* Retrieved 2019-11-20 from https://www.who.int/news-room/fact-sheets/detail/tobacco

World Health Organization. (2019b). *Tobacco: Overview*. Retrieved 2019-11-20 from https://www.who.int/health-topics/tobacco