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Is sinning winning?

An empirical analysis of sin stock returns in the Western world from 2000 to 2019

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Acknowledgements

This thesis was written as the final part of our Master's degree in Economics and Business Administration at The Norwegian School of Economics (NHH), with a specialization in Financial Economics.

Our main objective was to contribute with a relevant analysis to a field in finance with a lack of newer literature. With the increasing focus on ESG investing, we wanted to go in the opposite direction and explore the development of sin investing, a concept that is experiencing rapid changes. The process of completing this thesis has been challenging at times, yet highly educational and interesting. Thus, we believe and hope that our work is of value and interest for both investors and academics.

Throughout this process we have acquired valuable knowledge on the field of sin investing and sin stocks by applying financial theory and econometric analyses. Our research has also required skills in Microsoft Excel, LaTeX and R-studio, and our thesis gave us the opportunity to enhance these abilities further.

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Abstract

The purpose of this thesis is to investigate whether sin stocks outperform the market and comparable utility stocks. We focus on three categories of sin stocks: tobacco, alcohol and gambling. The constructed sin and comparable portfolios consist of stocks from the Western world and monthly returns from the last two decades. In the regressions, we apply the Fama-French three-factor, four-factor (Carhart) and five-factor model, with and without momentum, to control for possible differences in risk exposure between the portfolios. We estimate alphas using a long-short investment strategy 1) going long in the sin portfolio and short in the market and 2) going long in the sin portfolio and short in the comparable portfolio.

We find statistically significant and positive alphas for the total sin portfolio in excess of the market. I.e. our findings suggest that sin stocks outperform the market. Our results also indicate that the market risk factor and the profitability factor are important in explaining the abnormal returns of sin stocks. However, we do not detect any significant differences in abnormal returns for the sin portfolio between the continents nor the decades in our sample, and we only find a return premium for the alcohol portfolio in excess of the market when we examine the three sin industries separately. Moreover, our results show that the sin portfolio does not outperform the portfolio of comparable utility stocks, indicating that investors do not have to sin in order to achieve a return premium.

Keywords – Sin stocks, Utility stocks, Fama and French, Carhart, Abnormal returns

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1 Introduction

Throughout all of history, there have been stories about those that do good and those that do bad, and the dilemma of choosing between them. During the recent decades, this focus has also become an important part of the investment landscape, where sustainable and responsible investing is constantly gaining new followers around the world (US SIF, 2020). For instance, Emily Chasan stated on Bloomberg in 2019 that "global socially responsible investments grew by 34 percent to $30.7 trillion over the past two years". Thus, one can safely say that many of today's investors focus on doing good in their investments. However, this does not apply to *all* investors. On the opposite end of the investment spectrum from ethical and responsible investing, we find sin investing: An investment strategy where investors actively seek companies engaged in activities that they consider unethical or sinful in any other way (Kenton, 2020c). This form of investing, sin investing, is what we want to analyze further in this thesis.

As the investment landscape today is characterized by a particular focus on sustainability and ESG[1] (Ward & Wu, 2019), investors are not only emphasizing the financial performance of a company anymore (PwC, 2019). Consequently, companies operating within industries widely considered sinful might have experienced a change in investors' attitudes towards them. These rapid changes in the investment landscape and investor perspectives are the main reasons why we wanted to explore the return of stocks viewed as sinful. In addition, because of the speed of change, a paper written about sin investing even a decade ago might be considered outdated today. Our purpose is therefore to contribute to the existing literature on the topic with updated data and a more recent time span.

Those that engage in sin investing generally do so because they believe this investment strategy will provide them with a return premium (Kenton, 2020c). There are various theories about why sin stocks would provide such a premium. Some reasons are related to the fact that many investors shun sin stocks because of the risk related to them. Investors might fear that investing in sin stocks will harm their reputation (Blitz & Fabozzi, 2017) or they worry about other types of risk, such as regulatory risk[2] (Fontinelle, 2020) or

[1] Environmental, social and corporate governance.

[2] Regulatory risk refers to the risk that changes in laws or regulations will affect a stock, company, sector or market (Hayes, 2018).

headline risk[3] (Fabozzi, Ma & Oliphant, 2008). However, some investors believe that this increased risk will result in increased return. Other reasons for the believed sin stock premium are related to the very nature of the sin industries. Companies operating in these industries generally have a steady stream of customers and thus also cash flows (Kenton, 2020c). This is partly because the products and services these companies provide are addictive and the demand consequently is relatively inelastic (Kenton, 2020c).

In this thesis, we want to look closer at the claimed sin stock premium and understand whether there actually are positive abnormal returns related to sin investing. In addition, we want to examine whether there is a difference between sin stock returns and the returns related to investing in utility stocks which do not carry the same stigma. Furthermore, we want to analyze how the potential abnormal returns can be explained and what drives them. We want to understand if sin stocks truly achieve abnormal returns compared to the market and utility stocks, or if there are other factors that can explain the return of sin stocks.

To carry out our analysis, we have gathered data from Thomson Reuters' Datastream and Kenneth French' Data Library. We focus on three categories of sin stocks: tobacco, alcohol and gambling, and a time span including the last two decades, 2000-2019. Furthermore, we have extracted data on a set of comparable listed companies operating within the electricity, water, gas or multi-utility industry. All data is gathered for companies in the Western world. Using the extracted data, we have constructed market capitalization-weighted portfolios for the sin stocks and for the comparable utility stocks. The portfolios were created for each sin industry, country and continent separately, and for the industries and continents all together. We have analyzed the portfolios by 1) going long in the relevant sin portfolio[4] and short in the market and 2) going long in the total sin portfolio and short in the comparable portfolio, and then applied the Fama-French three-factor, four-factor (Carhart) and five-factor model, with and without momentum. The objective of the analysis is to estimate alphas to explore whether the sin portfolio outperforms the market and the comparable portfolio or not.

[3]Headline risk refers to the risk that news about a company will affect the price of its stock negatively, regardless of the news being true or not (Fabozzi, Ma & Oliphant, 2008).

[4]The portfolios referred to as the relevant sin portfolios throughout the thesis are the total sin portfolio, the three sin industry portfolios, the three continent portfolios and the two decade portfolios.

Our thesis builds on existing literature about sin investing. Although this literature is still limited to this day, there are some widely cited papers on the topic. In their well recognized 2009 paper, Hong and Kacperczyk found that sin stocks deliver a return premium compared to other comparable groups of stocks. They consequently concluded that investors who avoid such stocks pay a significant financial cost by doing so, as they sacrifice this potential return in order to do what is considered socially right. In a similar sense, Fabozzi, Ma and Oliphant (2008) found that sin stocks outperform common benchmarks due to a number of reasons, such as the monopolistic nature of the sin industries and the related headline risk. In contrast to these papers, Blitz and Fabozzi (2017) concluded that the return on sin stocks can be fully explained by controlling for other factors, such as profitability and investment strategy.

Our tests show that the total sin portfolio outperforms the market. The estimated alpha of a long-short investment strategy, going long in the total sin portfolio and short in the market, using the Fama-French five-factor model, is 0.594% per month. However, when splitting the sin portfolio, we find that the alcohol portfolio outperforms the market, whereas this is not the case for the tobacco and gambling portfolios nor the continent or decade portfolios. Furthermore, we do not find evidence that the sin portfolio outperforms the comparable portfolio, as none of the regression models applied to the difference portfolio deliver significant alphas. Moreover, the regressions indicate that the total sin portfolio mostly consists of low-beta stocks. Nevertheless, we find that this portfolio is more volatile than the comparable portfolio, given the positive and significant market risk factor for the difference portfolio regression. We further find that both the total sin portfolio in excess of the market and the difference portfolio load positively on the profitability factor. These findings indicate that the sin portfolio mostly consists of companies with robust profitability, and to a larger extent than the comparable portfolio.

The rest of the thesis is structured in the following way: Part two provides more background information and previous literature on sin stocks. Part three explains the data gathering and the choices we made during this process. Furthermore, this part describes the portfolio construction. Part four describes the methodology used in our analysis and potential weaknesses in the applied models. The results of the analysis is presented in part five and further discussed in part six. Finally, part seven provides our conclusion.

2 Background and Literature Review

In this chapter we will start by presenting the concept and origin of socially responsible investing. Next, we will present the definition of sin stocks used in this thesis and explain some reasons why investors believe sin investing is related to a return premium. Thereafter, we will review some existing literature on this topic, before we finally present our research question.

2.1 Socially Responsible Investing

Socially responsible investing (SRI) is a term that has evolved over time and that different people tend to give different meanings. According to James Chen (2020b), there are two common main goals of SRI: social impact and financial return. However, as Chen (2020b) argues, these goals do not necessarily go hand in hand. Firstly, a "socially good" investment might not reward the investor with positive returns, and a "financially good" investment might not have a positive social impact. Thus, investors with a desire to practice SRI must try to balance these two goals.

Secondly, what is considered "socially good" is subjective and changes over time. Hence, it is difficult to define socially responsible investing. The Forum for Social and Responsible Investment (US SIF) (2020) defines sustainable investing as "an investment discipline that considers environmental, social and corporate governance (ESG) criteria to generate long-term competitive financial returns and positive societal impact". In other words, socially responsible investments can be thought of as investments that consider one or more of the ESG criteria. Furthermore, a socially responsible investment might be one that either contributes to one of these areas in a positive way, or that prevents it from being affected in a negative way. However, focusing on ESG factors when investing is only one of the approaches investors can use to practice SRI (O'Shea & Benson, 2020).

Socially responsible investing is based on principles dating several hundred years back in time. One example dates back to 1758 when the Philadelphia Yearly Meeting of the Religious Society of Friends, known as Quakers, forbid its members from engaging in slavery (Soderlund, 1985). The Quakers also bought slaves from others with the goal of freeing them. Hence, the members of the society were not allowed to engage in an activity

that affected others, the slaves, in a negative way and they actively tried to put an end to the slavery. Another example is the efforts of Nelson Mandela during apartheid in South Africa in the 1960s and 1970s. Mandela encouraged investors and companies to sell their holdings that supported apartheid (Metoyer, n.d.). In other words, he tried to target those that supported apartheid in a way that would put an end to the system.

Histories like these have laid the foundation for what we know as socially responsible investing today. During the 21st century, SRI has gained increasingly more supporters around the world (Hale & Ginty, 2020). According to the US SIF (2020), "as of year-end 2019, one out of every three dollar under professional management in the United States - $17.1 trillion or more - was invested according to sustainable investing strategies". A similar pattern can be seen in other parts of the world: James Cherowbrier (2019) writes that "assets managed on the European SRI market nearly doubled in value" from 2010 to 2016. Furthermore, the United Nations launched their organization the UN Principles for Responsible Investment in 2006 (PRI, n.d.-a). The organization, named the UNPRI or simply PRI, aims to get more investors to incorporate the ESG factors in their decision making (PRI, n.d.-b). Given the growth seen over the last decades and the launch of the PRI, it is reasonable to believe that the focus on sustainable and responsible investing will continue in the future.

2.2 The Definition of Sin Stocks

On the other end of the investment spectrum from sustainable and responsible investing, we find sin investing. While sustainable and responsible investing is associated with good ethics and moral, sin investing is widely associated with the opposite. Similar to the concept of sustainable and responsible investing, the definition of a sin stock is ambiguous and subjective. Earlier papers have given the term different meanings and for this reason, previous researchers have collected different data for their analyses. According to Will Kenton (2020c), a sin stock is "a publicly traded company involved in or associated with an activity that is considered unethical or immoral." The Sin Stock Report (2015) states that the three main categories of sin stocks are tobacco, alcohol and gambling. However, one can also choose to include other industries, such as the adult entertainment industry and the weapon industry. These other potential sin categories are often of a newer kind and

more prone to split views regarding whether they are sinful or not. Consequently, these categories have not been included in much empirical writing about sin stock performance as of this thesis. For this reason, we have chosen to define a sin stock in accordance with The Sin Stock Report and Hong and Kacperczyk (2009) in this thesis, as "a publicly traded company involved in the tobacco, alcohol and/or gaming[5] industry" - industries collectively known as the "Triumvirate of Sin". In section 3.1, we will elaborate further on the inclusion and exclusion of various industries.

It should also be mentioned that the definition of a sin stock is changing over time. Firstly, as trends in society change, people might consider new groups of stocks sinful. For example, as the focus on health increases and the obesity pandemic expands, stocks such as The Coca Cola Company and McDonald's might be considered sin stocks. Secondly, companies can change their product mix and the focus of their business over time. Thus, a company may migrate into or out of a sin category. An example is a traditional alcoholic drink manufacturer that starts focusing more on non-alcoholic beverages. Over time, the manufacturer may not be considered sinful anymore.

2.3 Approaches to Sin Stocks

Sin investing is an investment strategy where the investors actively seek sin stocks and invest in these. However, this is an investment strategy related to great risk (Kenton, 2020c). Hence, some investors refrain from this strategy and rather approach sin stocks in the way of negative screening. In this section we will discuss reasons behind both of these approaches to sin stocks.

Negative screening means that investors avoid investing in companies operating in certain industries, for example industries that they consider unethical or sinful (Wallace, 2017). There can be various reasons for approaching sin stocks through the strategy of negative screening. Firstly, investors might fear that investing in sin stocks will give them a negative reputation (Blitz & Fabozzi, 2017). In other words, the investors worry about what their clients, friends or other groups of people will think of them if they invest in such stocks. Secondly, investors can have their own personal values and goals that they want to honor, and might consequently dislike sin stocks (Fabozzi, Ma & Oliphant, 2008). Also, investors

[5]Note that gaming is included in our constructed gambling portfolio.

may believe that if they avoid investing in a company they consider sinful, they do their part in contributing to making the world a bit of a better place (AMP Capital, 2019). In turn, this can potentially decrease the market capitalization (hereafter market cap) of the company due to a lower demand for the company's stock.

However, as mentioned, some investors approach sin stocks in the opposite way. That is, they use an investment strategy where they actively invest in these stocks. A well known fund using this investment strategy is the Vitium Global Fund, previously known as the Vice Fund. This is a US mutual fund that primarily invests in companies "engaged in the aerospace and defense industries, owners and operators of casinos and gaming facilities, manufacturers of cigarettes and other tobacco products, and brewers, distillers, vintners and producers of other alcoholic beverages" (USA Mutuals, n.d.). Those that choose to actively invest in sin stocks, such as the Vitium Global Fund, generally do so because they believe such stocks deliver positive abnormal returns (Fabozzi, Ma & Oliphant, 2008).

2.3.1 The Sin Stock Premium

There are various reasons why some investors believe sin stocks provide positive abnormal returns. In this section, we will list some of the most common explanations.

Firstly, some are of the opinion that sin stocks are systematically underpriced because many investors actively avoid these stocks (Blitz & Fabozzi, 2017). Hence, those that are willing to invest in sin stocks will be able to earn a premium.

Secondly, some assign the abnormal returns of sin stocks to the fact that sin industries often have monopolistic characteristics (Fabozzi, Ma & Oliphant, 2008). Sin industries are known to have high barriers to entry, be under strict rules and be closely monitored by the government (USA Mutuals, n.d.). Hence, it is challenging to establish a company within one of these industries and it is difficult to survive once established. The companies that do survive over time can consequently get a monopolistic position, or something close to it, which can lead to monopolistic stock returns (Fabozzi, Ma & Oliphant, 2008).

A third possible reason to why sin stocks generate abnormal returns is that these companies are considered more predictable than other companies (Tromp, 2019). Sin industries are "unlikely to fade away" due to delivering addictive products and services (Bajpai, 2020). In other words, there is a consistent consumer demand for these products. The addictive

nature of the so-called "sin" products and services is something the companies producing them can exploit, making them able to generate predictable returns by sticking to the same, well-known business strategies. For example, people are addicted to and will drink alcohol, smoke cigarettes or gamble regardless of the state of the world. In addition, consumers of sin products are often brand loyal (USA Mutuals, n.d.). In sum, companies operating within sin industries often have predictable cash flows and are believed to be more recession-resistant than other companies (Tromp, 2019).

Furthermore, related to the fact that sin companies provide steady cash flows, some believe sin stocks deliver significantly positive abnormal returns simply because they are cash cows[6] (Tromp, 2019). Due to delivering addictive products and services with good chances of considerable expansion in line of products and customers, sin stocks can be thought of as cash cows that will outperform the market over time.

2.4 Literature Review

As the concept of sin investing has become more established in the investment landscape, more research about the topic has surfaced. Still, we consider previous research about sin investing as being limited. However, there are some widely cited papers on the topic. These papers look for abnormal returns in different categories of sin stocks, in different parts of the world and time spans, and compare them to various groups of comparable stocks or benchmarks.

One of the most widely cited papers on sin stocks and sin investing is a 2009 paper by Hong and Kacperczyk. They studied the returns of stocks in the tobacco, alcohol and gambling industry in the US market[7], and compared them to the returns of stocks in the Fama and French industry groups food, soda, fun, and meals & hotels. The primary research objective of Hong and Kacperczyk (2009) was to test "whether the shares of sin stocks is less held by institutions that are subject to social norm pressures" (p. 23) and whether sin stocks and other stocks consequently have different institutional investor

[6]Stocks can widely be categorized into two categories: growth stocks and value stocks, where growth stocks are also known as cash cows. Growth stocks are believed to outperform the market over time, because they have good future potential. Value stocks tend to be more established firms that trade at a price below what analysts believe the stock is worth (Cussen, 2019).

[7]Hong and Kacperczyk analyzed the US market in their main analysis. However, to ensure robustness for these results, they extend the analysis to seven large markets in Europe and to Canada.

following. Based on their analysis, they concluded that sin stocks generate higher returns, which is related to the investors "facing greater litigation risk heightened by social norms" (p. 15), compared to their categories of comparable stocks (Hong & Kacperczyk, 2009). Consequently, Hong and Kacperczyk found that investors who avoid investing in sin stocks pay a significant financial cost, as they sacrifice the potentially higher returns in order to do what is considered socially right. In addition, they found that sin stocks are less likely to be owned by large institutional investors than the comparable stocks due to the stigma of investing in stocks viewed as unethical or sinful.

Another paper examining sin stock returns is a 2008 paper by Fabozzi, Ma and Oliphant. They used Hong and Kacperczyk's first draft from 2007 as inspiration, but expanded the research with additional countries and categories of sin stocks. In addition to the US, Fabozzi, Ma and Oliphant included countries in Europe, Oceania and Asia. Furthermore, they examined six sin industries: alcohol, tobacco, weapons, gaming, biotech and adult services. Using the CAPM, the researchers found that a portfolio of sin stocks "produced an annual return of 19%, unambiguously outperforming common benchmarks[8]" (p. 92), which produced an average annual return of 7.8%. They attributed this outperformance to several factors. Among others, they concluded that there is a cost of conforming to social standards. Investors willing to take the risk of not conforming will hence be rewarded with a premium. In addition, Fabozzi, Ma and Oliphant stated that sin industries are more likely to be monopolistic industries, and that sin stocks thus earn "positive monopolistic returns" (p. 93).

A newer paper on sin stocks is a 2017 paper by Blitz and Fabozzi. These researchers addressed the US, European and Japanese market and looked at the performance of tobacco, alcohol and weapon stocks in 1963-2016. Blitz and Fabozzi used the Fama-French three-factor, four-factor and five-factor model, with and without momentum, to try to explain the outperformance of sin stocks compared to the market. Using these models, they found that the at-first significantly positive alpha was shrinking as they added more risk factors to the models. In all their tests, the alpha disappeared completely as they reached the five-factor models or a five-factor model plus a sixth factor; betting against

[8]The benchmarks used were market index returns from the included countries.

beta[9]. Hence, the paper concluded that the returns related to sin stocks can be fully explained by controlling for more risk factors. In particular, they gave credit to the profitability and investment factors in explaining the return of sin stocks. Thus, Blitz and Fabozzi reached the conclusion that there are no abnormal returns related to sin investing. This provides an interesting opposite to the conclusion of Hong and Kacperczyk, and Fabozzi, Ma and Oliphant.

2.5 Research Question

In this section we will present our main research question. However, as we go about our work, we will be open to explore other relevant findings along the way.

In our thesis we conduct a portfolio study, studying portfolios of sin stocks and utility stocks in addition to the market proxy. The objective of the thesis is to explore whether sin stocks outperform the market and the chosen comparable stocks. As mentioned in the literature review, previous studies have had conflicting conclusions. Hence, we do not know in advance where our study will lead us. However, due to the reasons discussed in section 2.3.1 about the sin stock premium, we believe that the sin portfolio will outperform the market and the chosen comparable portfolio. Consequently, our thesis will mainly focus on the following research question:

Do sin stocks outperform the market and the chosen comparable stocks?

We explore this research question by estimating alphas through several statistical models. The following chapters will describe how we have extracted the data used to construct the portfolios and what statistical models we will apply to them.

[9]Betting against beta (BAB) is a low- versus high-beta factor. The factor is used to isolate the return of a diversified portfolio of high-beta stocks in excess of the return on a diversified portfolio of low-beta stocks (Frazzini & Pedersen, 2013).

3 Data

In the following chapter we will present the data we have extracted for our analysis. We will start by presenting how we selected the sin companies, comparable companies, countries and time span. Moreover, we will explain the exclusion of other possible sin industries. Then, we will describe how we have constructed the portfolios analyzed in this thesis, based on the extracted data. The last section of this chapter explains some possible concerns about the data set.

3.1 Data Selection

As mentioned in section 2.2, our analysis is focused around the tobacco, alcohol and gambling industry. We have retrieved data from Thompson Reuters' Datastream and Kenneth R. French' Data Library for our analysis. Thompson Reuters' Datastream is a global financial and macroeconomic database (Reuters, 2008), which provided us with information about each company such as industry categorization, monthly share price and market cap. Kenneth R. French' Data Library provided us with historical benchmark return data necessary to construct multi-factor models for our analysis.

3.1.1 Selection of Tobacco Companies

Tobacco companies are classified relatively well in Datastream. We considered all companies within the "Tobacco" category relevant for our analysis, and consequently chose to not exclude any companies within this industry classification. In addition to the traditional tobacco companies, a few companies included in the "Tobacco" category, such as VPR brands and Bang Holdings, are only developing and marketing electronic cigarettes. We chose to include these companies in our analysis as most e-cigarettes contain nicotine and are highly addictive (Jankowski et al., 2019). Thus, this industry can be considered sinful. Furthermore, we chose to include companies engaged in the cannabis industry, which are also classified in the "Tobacco" category in Datastream. In a similar sense as tobacco, cannabis can be harmful and addictive (NHS, 2017) and can thus be viewed as a sinful industry.

3.1.2 Selection of Alcohol Companies

The selection process for alcohol companies was somewhat more complex than for tobacco companies. Datastream contains an industry category called "Beverages" which consists of several subcategories. Two of these subcategories, "Breweries" and "Distillers & Wineries", include alcoholic drink manufacturers. Within these subcategories, we discovered that the industry classification contains some mistakes. For instance, we found both a mining company and a shoe manufacturer within the subcategories. Consequently, we had to manually screen all companies that belonged to the "Breweries" and "Distillers & Wineries" subcategories. In order to get an analysis as precise as possible, we chose to eliminate all companies that neither have alcoholic beverages as their core business[10], nor as an essential part of their marketing strategy. One could discuss further if it makes a significant difference to investors whether a company is exclusively sinful or not. However, as it is reasonable to limit the scope of this thesis, we chose these criteria for exclusion of companies.

On the case of marketing, we chose to include companies like Fever-Tree. Fever-Tree is a UK-based company producing carbonated mixers for alcoholic spirits (Fever-Tree, 2020). The company does not sell alcohol, but markets all its beverages in an alcoholic context and declares that "the mixers are designed to be accompaniments for alcoholic spirits or used in cocktails" (Fever-Tree, 2020). Considering the chosen criteria for inclusion of alcohol companies, we consider Fever-Tree and other similar companies to meet this requirement based on their marketing strategy.

3.1.3 Selection of Gambling Companies

We based our selection of gambling companies on the subcategory "Casinos & Gambling" in Datastream, which is a subcategory of the broader industry category "Travel and Leisure". Similar to the selection of alcohol companies, we had to manually screen all companies in this subcategory in order to decide whether to include a company in the data set or not. Thus, we screened all companies within the subcategory and kept companies with casinos, gaming and gambling as a part of their core business.

[10]Core business: alcohol production is the main activity and an essential part of the company.

Many of the companies in the "Casinos & Gambling" subcategory are companies owning resorts with casinos. We chose to include these companies in our sample. The rationale behind this is that we believe casinos are appealing to a certain group of customers and an important deciding factor for them when choosing between different resorts. Based on this, we for example chose to include the Star Entertainment Group. This is an Australian company that owns several resorts, where most of them have casinos (The Star Entertainment Group, n.d.).

3.1.4 Other Sin Industries

As mentioned, our thesis is focused around the "Triumvirate of Sin". However, the definition of sin is subjective and people will consider different companies and industries sinful. We are not able to take all of these different views into consideration in our research. Thus, in the following, we will present some industries that are considered sinful by some, but that we have chosen to not include in this thesis for various reasons.

Weapons

The view on the weapon industry is split around the world. While some consider the industry sinful, others consider it necessary. For example, the firearm industry has grown significantly in the United States over the last decade, and is producing many jobs throughout the country (NSSF, 2020). For this reason, many Americans are proud of the industry and consider it necessary. In Australia, on the other hand, the gun laws are stricter and Australians are in general more sceptical towards the industry (Patrick, 2018). Conflicting views as these makes the inclusion of weapon stocks in our analysis challenging. Furthermore, as Brett Scott (2016) states, it can be difficult to distinguish between weapons that are necessary “in situations of national danger” and those produced as part of a war industry that encourage “politicians to engage in conflict” with profit maximization as the goal. Based on these difficulties and contradicting opinions, as well as the necessity to limit the scope of this thesis, we have decided not to include weapon stocks in our analysis.

Adult Entertainment

Hong and Kacperczyk (2009) found that there are few publicly traded companies that operate heavily within the adult entertainment industry. Thus, they concluded that excluding these companies from their analysis would not have a significant impact on their results. In addition to Hong and Kacperczyk's argument, there is no clear industry classification for the adult entertainment industry in Datastream today (Reuters, 2020), which makes the inclusion of the industry in this thesis challenging.

Furthermore, according to The Sin Stock Report's (2012) classification of sin stocks, some publicly traded companies classified as "sex companies" are companies that sell articles necessary to have safe sex, such as birth control and condom manufacturers. An example of such a company is SSL International, a British manufacturer of healthcare products that produces condoms under the Durex brand (Durex Network, n.d.). There are people and investors around the world that consider such companies sinful, for example due to religion (Pandia Health, n.d.). However, the United Nations (2015) state that the Western World is amongst the parts of the world where the contraceptive prevalence[11] is the highest. This gives a clear indication that such products are not widely considered sinful in the Western world. Consequently, it supports our decision to not include the adult entertainment industry in our thesis as we want to limit the scope of it.

Health

Blitz and Fabozzi (2017) stated that it is likely that companies operating in "unhealthy" industries, such as The Coca-Cola Company and McDonald's, will be considered sinful in the future as the current global focus on health continues to increase. However, as of now, most research on sin stocks do not include companies involved in the production of sugary foods and drinks.

Joshua Dopkowski (2019) writes that "one key indicator that a company stock might be migrating into the sin category is when governments start to tax it in order to curtail consumption." Over the last years, most countries in our sample have either introduced or increased taxes on sugary drinks (The World Bank, 2020). Thus, it could be interesting

[11]Contraceptive prevalence is according to the World Health Organization (n.d.) "the percentage of women who are currently using, or whose sexual partner is currently using, at least one method of contraception, regardless of the method used".

to repeat our analysis in a few years and include companies operating in these industries. However, as of now, we choose to not include these companies in order to limit the scope of the thesis.

Climate

Over the past decades, the focus on climate has increased and many have given their takes on how to approach the climate challenge. In line with the increased climate focus, investors around the world have started to exclude stocks based on ESG principles, and Peter Sainsbury (2020) argues that fossil fuel companies are the "new" tobacco companies. These companies are under increasing pressure from the media, banks, courts and investors because the nature of their businesses is damaging to the climate and the Earth's inhabitants (Sainsbury, 2020). Thus, fossil fuel companies are considered sinful by many. Although this view is becoming more widespread, they have not been included in much empirical writing about sin stocks as of this thesis. However, as we move forward and as the climate focus and ESG trend continue to gain attention, we believe such stocks will be included in more research on sin investing. Nevertheless, these companies are not included in our analysis as we must limit the scope of the thesis.

3.1.5 Selection of Countries

Although the socially responsible investing trend is present at some level in all countries and markets, we have chosen to focus on the Western world in this analysis. The rationale behind this is that we want to compare similar countries and insulate the findings in the best possible way. Hong and Kacperczyk (2009) argued that the US, Canada and several European markets have the same attitudes towards sin stocks, and that they are exposed are exposed to the same trends such as demographic and cultural changes. Such trends are likely to influence investors and thereby stock returns within a country (Dorsainvil, 2019). In addition, the majority of the population in the Western World identify themselves as Christians (World Population Review, 2020), which makes it more likely that the investors share more of the same biases towards the chosen sin and comparable industries.

The countries included in the term "Western world" varies. In this thesis, we have chosen to use Samuel Huntington's (1993) definition of the Western world. The countries classified as Western countries according to Huntington are the United States, Canada, a selection of European countries[12], Australia and New Zealand. Due to data limitations in Datastream, we have excluded all Western countries with no listed companies registered within any of our chosen sin industries. We ended up with a list of 24 countries with listed companies operating within the tobacco, alcohol and/or gambling industry. The full list of countries can be found in table 3.1.

[12]European countries classified as Western European countries according to Huntington are: Austria, Belgium, Croatia, Denmark, Estonia, Finland, France, Germany, Hungary, Iceland, Ireland, Italy, Latvia, Lichtenstein, Lithuania, Malta, Monaco, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Svalbard, Sweden, Switzerland and the UK.

Table 3.1: Sin stocks per industry and country

Country	**Tobacco(%)**	**Alcohol(%)**	**Gambling(%)**	**Total(%)**
Australia	0	8(7.9%)	9(11.5%)	**17(8.5%)**
Austria	0	1(1.0%)	0	**1(0.5%)**
Belgium	0	2(2.0%)	0	**2(1.0%)**
Canada	4(19%)	7(6.9%)	5(6.4%)	**16(8.0%)**
Croatia	0	2(2.0%)	0	**2(1.0%)**
Denmark	1(4.8%)	3(3.0%)	0	**4(2.0%)**
Estonia	0	1(1.0%)	0	**1(0.5%)**
Finland	0	2(2.0%)	0	**2(1.0%)**
France	0	9(8.9%)	4(5.1%)	**13(6.5%)**
Germany	0	10(9.9%)	4(5.1%)	**14(7.0%)**
Hungary	0	1(1.0%)	0	**1(0.5%)**
Italy	0	3(3.0%)	0	**3(1.5%)**
Latvia	0	1(1.0%)	0	**1(0.5%)**
Malta	0	1(1.0%)	0	**1(0.5%)**
Monaco	0	0	1(1.3%)	**1(0.5%)**
Netherlands	0	2(2.0%)	0	**2(1.0%)**
New Zealand	0	4(4.0%)	1(1.3%)	**5(2.5%)**
Norway	0	1(1.0%)	1(1.3%)	**2(1.0%)**
Poland	0	4(4.0%)	0	**4(2.0%)**
Portugal	0	0	1(1.3%)	**1(0.5%)**
Spain	0	2(2.0%)	1(1.3%)	**3(1.5%)**
Sweden	1(4.8%)	3(3.0%)	10(12.8%)	**14(7.0%)**
The UK	2(9.5%)	7(6.9%)	5(6.4%)	**14(7.0%)**
The US	13(61.9%)	27(26.7%)	36(46.2%)	**76(38.0%)**
Total	**21(10.5%)**	**101(50.5%)**	**78(39.0%)**	**200(100%)**

The percentages within the "Tobacco", "Alcohol" and "Gambling" columns represent a country's share of companies within the specific sin category. The percentages within the "Total" column represent a country's total share of the 200 sin stocks. The percentages in the "Total" row represent the share each sin category make up out of the total sin portfolio.

From the table we observe that the US comprise the largest share of stocks within all three sin stock categories. Australia, Canada, Germany, Sweden, the UK and France are following. Sweden's total share of sin stocks is boosted by its 10 listed companies within the gambling industry, while France and Germany hold 9 and 10 companies within the alcohol sector, respectively. Canada and the UK have companies within all three industries. Otherwise, most countries hold 1 or 2 companies within the sin categories and, consequently, do not constitute a large share of our data set.

3.1.6 Selection of Comparable Companies

We have chosen listed utility companies as comparable companies. The rationale behind this is that both sin stocks and utility stocks can be considered "defensive stocks" which according to Chen (2020a) are stocks that deliver stable dividends and earnings regardless of the state of the overall economy. He states that this for example is the case for "consumer staples", which he defines as "essential products that include typical products such as foods & beverage, household goods, and hygiene products; but the category also includes such items as alcohol and tobacco" (Chen, 2020a). Hence, there will likely be a demand for tobacco and alcohol regardless of the state of the world. This applies to water, electricity and gas as well, as utility companies also generally provide steady cash flows, predictable earnings and are known to be recession-resistant (Ciovacco Capital Management, n.d.). Furthermore, a utility stock is often referred to as a "safe haven", which according to Chen and Scott (2020) is "an investment that is expected to retain or increase in value during times of market turbulence". Based on these arguments, we consider utility stocks a good fit for our comparable portfolio. In addition, utility stocks do not carry the same stigma as sin stocks, which gives us the opportunity to examine if there exists an explicit sin premium or simply just a premium related to common characteristics of these industries.

Consequently, we extracted stock prices and market caps for companies operating within the electricity, water, gas or multi-utility industry from Datastream. Our comparable portfolio consists of companies from the same countries as our sin portfolio to eliminate country-specific risks and developments.

Nevertheless, we are aware that one should always be careful with the comparable term. As there are several criteria that can be considered when selecting comparable companies in a specific case, people might have split views on what companies to choose. Amongst these criteria, we for example find industry classification, size, growth rate, capital structure, profitability and cash flows (Damodaran, 2011). We have chosen to select comparables based on the latter criterion as both sin and utility companies are known to have stable earnings and cash-flows.

We did consider using companies that operate in similar industries as our sin industries as comparables. That is, we would have focused on the "industry classification" criterion, as Hong and Kacperczyk (2009) did. Examples of such industries are non-alcoholic drinks as a comparable industry to alcoholic drinks, and cinemas and hotels without casinos as comparable industries to gambling. However, with our objective of analyzing returns and comparing returns for sin and non-sin companies, we found it more meaningful to do this for companies that have similar cash flow and return potential.

3.1.7 Selection of Time Span

Our selected time span is 01.01.2000-31.12.2019. As mentioned, the definition of a sin stock is changing over time. Thus, we wanted to limit the numbers of years back in time in order to analyze the more recent investor trends concerning what is considered sinful. We also wanted to look at two full decades, which gives the opportunity to compare them and explore if there are indications that sin stock returns differ between the periods. In addition, our time span includes the financial crisis in 2008 and 2009. The crisis led to abnormally volatile markets and there are even some long-term effects of this crisis that affect economies today (Kasman, n.d.), although the crisis formally ended in 2009 (Reuters Staff, 2010). Hence, our selected time span enables us to explore if sin stocks and comparable utility stocks are recession-resistant, like Chen's (2020a) definition of defensive stocks suggests.

3.2 Portfolio Construction

Our analysis is based around a sin portfolio and a comparable portfolio which are both market cap-weighted. We believe this will provide us with more reliable portfolios than for example equally-weighted portfolios, as the returns of stocks of bigger (smaller) companies will be given more (less) weight in the total portfolios.

The portfolios are constructed by extracting monthly closing prices and market caps from Datastream for each company within the sin and comparable industries constituting our data set. All values are extracted in United States Dollars (USD). This is to control for currency fluctuations which might make an investment more or less profitable than what local returns would suggest (Christy, 2019).

3.2.1 Calculating the Return

We calculated the monthly returns for each company based on the closing prices extracted from Datastream. These closing prices are adjusted for stock splits and dividends (Reuters, 2020), so it was not necessary to make any adjustments to them. The monthly returns are calculated in the following way:

$$r_t = \frac{P_t}{P_{t-1}} - 1 \tag{3.1}$$

Where:

r_t = Return at time t

P_t = Adjusted stock price at time t

P_{t-1} = Adjusted stock price at time t-1

3.2.2 Sin and Comparable Portfolio

In the following, we will describe the approach used to create the portfolios explored in our analysis. We have created an industry portfolio per country, an industry portfolio per continent, total industry portfolios, total continent portfolios and a total portfolio including all continents and industries. Since the same approach is used to construct the sin and the comparable portfolios, we will only describe the process thoroughly for the

creation of the sin portfolios.

3.2.2.1 Industry Portfolio Per Country

We started by creating country-specific market cap-weighted portfolios for each sin industry separately (i.e. tobacco, alcohol and gambling). An example of such a portfolio is the "Tobacco in Germany"-portfolio. The weights are given by the individual stock's market cap, divided by the market cap for all stocks in the relevant industry in the given country. The portfolio weights consequently sum to one.

The returns of the market cap-weighted industry portfolio per country are calculated as follows:

$$r_{p,t} = \sum_{i=1}^{N} (w_{i,t} * r_{i,t}) \tag{3.2}$$

$$w_{i,t} = \frac{mv_{i,t}}{\sum_{i=1}^{N} mv_{i,t}} \tag{3.3}$$

Where:

$r_{p,t}$ = Market cap-weighted return of industry per country portfolio p at time t

$r_{i,t}$ = Return of stock i at time t

$w_{i,t}$ = Weight of stock i at time t

$mv_{i,t}$ = Market cap of stock i at time t

3.2.2.2 Industry Portfolio Per Continent

Using the industry portfolios per country, we created portfolios for each continent[13], still divided into the three separate sin industries. An example of such a portfolio is the "Alcohol in Europe"-portfolio. In this case, the weights are given by the market cap of each individual country-specific portfolio divided by the market cap for all country-specific portfolios within the relevant industry in the given continent.

[13]Note that we use the term "continent" for the grouping of countries used in this thesis. That is, we refer to the US and Canada, the previously mentioned Western European countries, and Australia and New Zealand as three separate continents, although the actual continents do not only consist of these countries.

The returns of the market cap-weighted continent-specific portfolios are calculated as follows:

$$r_{p,t} = \sum_{i=1}^{N} (w_{i,t} * r_{i,t}) \tag{3.4}$$

$$w_{i,t} = \frac{mv_{i,t}}{\sum_{i=1}^{N} mv_{i,t}} \tag{3.5}$$

Where:

$r_{p,t}$ = Market cap-weighted return of industry per continent portfolio p at time t

$r_{i,t}$ = Return of industry per country portfolio i at time t

$w_{i,t}$ = Weight of industry per country portfolio i at time t

$mv_{i,t}$ = Market cap of stocks in industry per country portfolio i at time t

Once the industry portfolios for each continent were constructed, we subtracted the market effect for the respective continents from the return of the continent portfolios[14]. The rationale behind this is that we want to go long in the continent portfolio and short in the market, in order to isolate the sin effect on the returns as much as possible.

3.2.2.3 Total Industry Portfolios

Given that we also want to analyze the sin industries in our sample separately, we further created a total portfolio for the alcohol, tobacco and gambling industry. An example of such a portfolio is the "Total Gambling"-portfolio. In this case, the calculations are based on the industry portfolios per continent less the continent-specific market effects, presented in the previous section. The rationale behind this is that we want to examine if each individual sin industry portfolio outperforms the market.

For the total industry portfolios, the weights for each industry portfolio per continent are given by the individual continent portfolio's market cap divided by the market cap for all three continent-specific portfolios within the industry.

[14]The market effect is constructed by adding the risk-free rates on the "Market minus Risk-free"-factor from Kenneth French' Data Library to isolate the market returns. The approach of subtracting the continent-specific market effects from the portfolios is discussed in section 3.4.1.

$$r_{p,t} = \sum_{i=1}^{N} (w_{i,t} * r_{i,t}) \tag{3.6}$$

$$w_{i,t} = \frac{mv_{i,t}}{\sum_{i=1}^{N} mv_{i,t}} \tag{3.7}$$

Where:

$r_{p,t}$ = Market cap-weighted return of total continent portfolio p at time t

$r_{i,t}$ = Return of industry per continent portfolio i at time t,
where i = US and Canada, Europe, Australia and NZ

$w_{i,t}$ = Weight of industry per continent portfolio i at time t,
where i = US and Canada, Europe, Australia and NZ

$mv_{i,t}$ = Market cap of stocks in industry per continent portfolio i at time t,
where i = US and Canada, Europe, Australia and NZ

3.2.2.4 Total Continent Portfolios

Furthermore, we created total continent sin portfolios. In this case, we used each industry portfolio per continent and weighed these to total continent sin portfolios. An example of such a portfolio is the "Australia and New Zealand total sin"-portfolio. The previously created industry portfolios per continent are already deducted their respective continent-specific market effects. Thus, the total continent sin portfolios are also deducted these effects, making it possible to analyze whether each continent in the data set outperforms its respective market. For the total continent portfolios, the weights for each separate industry per continent portfolio are given by the individual sin industry portfolio's market cap within a continent divided by the total market cap for all sin industry portfolios within the relevant continent.

$$r_{p,t} = \sum_{i=1}^{N} (w_{i,t} * r_{i,t}) \tag{3.8}$$

$$w_{i,t} = \frac{mv_{i,t}}{\sum_{i=1}^{N} mv_{i,t}} \tag{3.9}$$

Where:

$r_{p,t}$ = Market cap-weighted return of total continent portfolio p at time t

$r_{i,t}$ = Return of industry per continent portfolio i at time t,

where i = Tobacco, Alcohol, Gambling

$w_{i,t}$ = Weight of industry per continent portfolio i at time t,

where i = Tobacco, Alcohol, Gambling

$mv_{i,t}$ = Market cap of stocks in industry per continent portfolio i at time t,

where i = Tobacco, Alcohol, Gambling

3.2.2.5 The Total Sin Portfolio

Lastly, we constructed the total sin portfolio. We gave each total continent portfolio weights according to their market cap compared to the total market cap for all the total continent portfolios.

The returns of the total market cap-weighted sin portfolio is calculated as follows:

$$r_{p,t} = \sum_{i=1}^{N} (w_{i,t} * r_{i,t}) \tag{3.10}$$

$$w_{i,t} = \frac{mv_{i,t}}{\sum_{i=1}^{N} mv_{i,t}} \tag{3.11}$$

Where:

$r_{p,t}$ = Market cap-weighted return of sin portfolio p at time t

$r_{i,t}$ = Return of total continent portfolio i at time t

$w_{i,t}$ = Weight of total continent portfolio i at time t

$mv_{i,t}$ = Market cap of total continent portfolio i at time t

The same procedure as described in section 3.2.1-3.2.2.5 was used to create a market cap-weighted total comparable portfolio consisting of utility stocks.

3.2.3 The Difference Portfolio

The sin and comparable portfolios discussed in the previous sections were also used to create a difference portfolio. However, the creation of the difference portfolio did not include a deduction of the respective market effects for each continent. The difference portfolio employs a zero-net investment strategy, taking a long position in the total sin portfolio and a short position in the total comparable portfolio. As part of the objective of our thesis is to analyze whether sin stocks outperform comparable stocks, examining the difference portfolio is more relevant than studying the comparable portfolio on its own.

3.3 The Fama-French Factors

We retrieved the Fama-French factors for North America, Europe and the Asia-Pacific excluding Japan from Kenneth French' Data Library. Although the European and Asia-Pacific factors reflect larger areas than we include in our portfolios, these are the most explicit risk factors we could retrieve for the included European countries as well as Australia and New Zealand. Appendix A3 gives an overview of what countries are included in each continent according to Kenneth French' Data Library.

The different Fama-French factors are constructed using 6 market cap-weighted portfolios formed on size and book-to-market, on size and operating profitability and on size and investment (French, 2020). The risk-free rates are based on the returns for a 1-month Treasury Bill (French, 2020) and are also extracted for the different continents, with all returns being in USD. The Fama-French factors used in the different regressions are weighed in the same way as the total portfolios. That is, they are market cap-weighted based on the market caps of the continents.

In addition, we have retrieved the market proxies for each included continent from Kenneth French' Data Library and weighed them to a market proxy based on the market caps of the sin and/or comparable companies on each continent depending on the purpose of the analysis.

3.4 Concerns About the Data Set

In this section, we will explain some of the concerns about our data set. We will describe how we have gone about these concerns and we will keep them in mind as we proceed with our analyses.

3.4.1 The Fama-French Factors

There is a concern about the data set regarding the Fama-French factors. As mentioned, we have only been able to extract these factors at a continent-level. Thus, we have not subtracted the country-specific market effect, in order to make the dependent variables the portfolios' return in excess of the market return. However, we have subtracted the market effect on a continent-level, and weighed each of the remaining Fama-French factors in the same way as our portfolios in order to make them as applicable as possible for our data.

3.4.2 Datastream

The selection of companies for this thesis is based on Datastream. However, this data base will not always be updated with all listed companies on all different stock exchanges. Hence, there might be some relevant listed companies within a country that are not included in this thesis. In addition, we discovered some industry classification mistakes throughout the data selection process. Nevertheless, Datastream is user-friendly and well recognized around the world, and for this reason we ended up using this data base to gather relevant data. To limit the possibility of extracting the wrong data, we thoroughly went through all companies in each industry group included in this thesis.

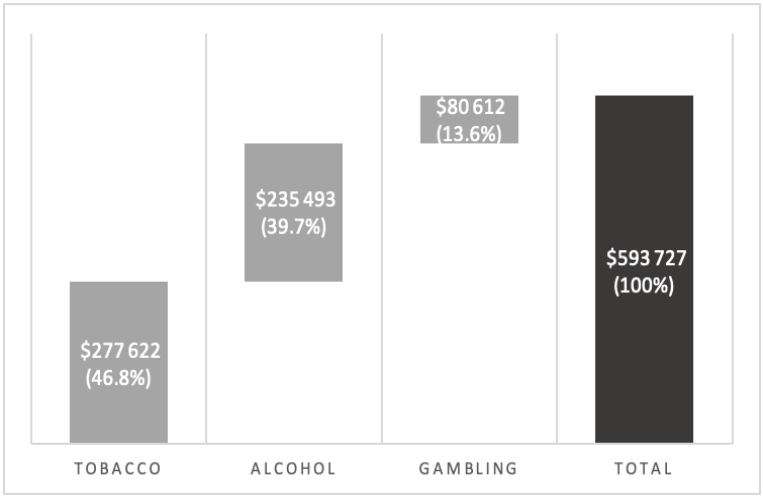
3.4.3 Industry Composition

A third concern about the data set is the difference in market cap between the three sin industries. The skewness is illustrated in figure 3.1. Looking at this figure, we see that the tobacco industry is the main contributor to the total average market cap of the total sin portfolio during the time span, making up 46.8%. While alcohol companies also hold a significant share of the total average market cap with 39.7%, the gambling companies are

especially underrepresented in terms of market cap and only make up 13.6%. It is worth noting that this also gives us an indication of the industry concentrations. Considering the *number* of companies within each sin industry, shown in figure 3.2, the tobacco industry is clearly underrepresented with 21 companies, while we have a sufficient sample of both alcohol and gambling companies, with 101 and 78 companies respectively. This indicates that the tobacco industry is more concentrated than the other two industries.

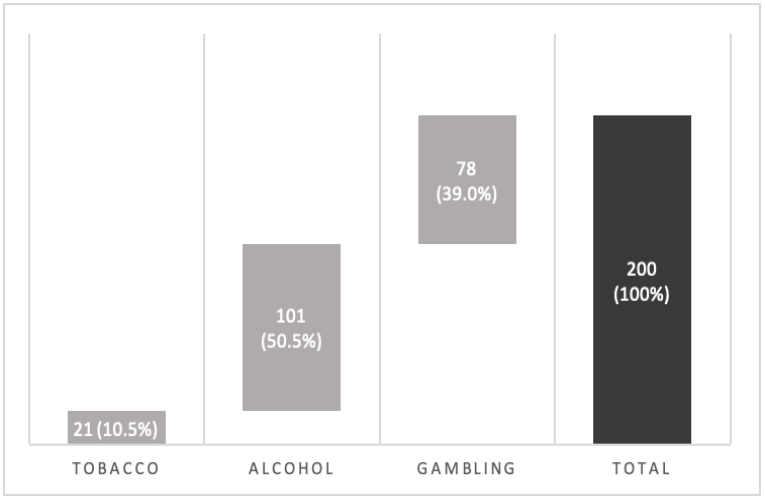
All in all, this can pose a problem as the industries might be related to different biases and risks. Furthermore, as the definition of a sin stock is partly subjective, not all investors will consider each of the sectors in our sin portfolio equally sinful. Consequently, investors might expect to be compensated differently depending on which of these industries they invest in. That is, the industries might be related to different risk premiums.

Figure 3.1: Industry distribution, average market cap



The bars represent the total average market cap per industry during the time span in million USD. The percentages represent the share of average market cap from each industry given the total average market cap for all industries.

Figure 3.2: Industry distribution, number of companies



The bars represent the number of companies per industry. The percentages represent the fraction of companies for each industry given the total number of companies for all industries.

This is also a potential concern for the portfolio of comparable companies. As mentioned, this portfolio consists of companies operating within the electricity, water, gas or multi-utility industry. However, these companies do not make up equal shares of the total average market cap of the comparable portfolio. Therefore, we risk having industry-related biases affecting the results as well.

4 Methodology

In this chapter we will describe the methodology we have applied to examine if there are any differences in return between the sin portfolio, the comparable portfolio and the market proxy. To achieve this, we compute the alphas of a long-short investment strategy, where we 1) go long in the relevant sin portfolio and short in the market and 2) go long in the sin portfolio and short in the comparable portfolio. We compute the alphas using the Fama-French three-factor, four-factor[15] and five-factor model, with and without momentum. These are all models expanding on the capital asset pricing model (hereafter CAPM) by adding various company-specific risk factors (Hayes, 2020). Hence, this section will start with a presentation of the CAPM. However, as this model has been criticized for its simplicity and shortcomings, for example the lack of explanatory variables (Fama & French, 2003), we will not use the CAPM in our actual analysis. At the end of the chapter we will explain the tests we have performed to ensure robustness in our results and discuss some weaknesses regarding the applied regression models.

4.1 Capital Asset Pricing Model and Jensen's Alpha

The CAPM was developed by Treynor (1961), Sharpe (1964), Lintner (1965) and Mossin (1966). The model "describes the relationship between systematic risk and expected return for stocks" (Kenton, 2020a). The rationale of the model is that investors should get higher returns as compensation for higher systematic risk[16], as this risk cannot be diversified. If the CAPM holds, all expected returns should present an alpha of zero (Mullins Jr., 1982).

A continuation of the CAPM is Jensen's Alpha. Jensen's alpha (herafter alpha) represents the average return on a portfolio or investment in excess of what is projected by the CAPM (Jensen, 1969). If a portfolio or an investment performs significantly better (worse) than the market, the applied asset pricing model will deliver a significantly positive (negative) alpha. Alternatively, the alpha represents a pricing error if incorrect factors are used

[15]The four-factor model is known as the Fama-French three factor model plus momentum or the Carhart four-factor model.

[16]Risk can be classified into two categories: systematic and unsystematic risk. Systematic risk is also called undiversifiable risk due to it applying to the whole market. Thus, investors cannot remove the risk by diversifying their portfolios. Unsystematic risk, also called diversifiable risk, is risk specific for a company or an industry. Thus, it can be reduced through diversification (Fontinelle, 2019).

or if constant betas are employed in the model instead of time-varying betas (Jarrow & Protter, 2013).

Based on the CAPM and Jensen's alpha, a portfolio's return can be explained in the following way:

$$R_{i,t} - R_{f,t} = \alpha_i + \beta_{mrkt} * (R_{m,t} - R_{f,t}) + \epsilon_t \tag{4.1}$$

Where:

$R_{i,t}$ = *Return of portfolio i at time t*

$R_{f,t}$ = *Risk-free rate of return at time t*

α_i = *Jensen's alpha, i.e the intercept/abnormal return*

β_{mrkt} = *Exposure to the market risk factor*

$R_{m,t}$ = *Return of the market at time t*

$R_{m,t} - R_{f,t}$ = *Excess return of the market portfolio (index)*

ϵ_t = *Error term at time t*

4.2 Fama-French Three-Factor Model

In 1993, Fama and French introduced two additional factors to describe portfolios that have historically outperformed the market: size and value. That is, they found that portfolios of companies with smaller market caps tended to outperform portfolios of companies with larger market caps. In addition, they saw that portfolios of high book-to-market stocks, i.e. value stocks, have historically outperformed portfolios of low book-to-market stocks, i.e. growth stocks. Consequently, the three-factor model expands on the CAPM by adding a size factor and a value factor, noted as SMB and HML (Fama & French, 1993). SMB is short for "small minus big" and represents the return of a diversified portfolio of small market cap companies minus the return of a diversified portfolio of big market cap companies. HML is short for "high minus low" and represents the return of a portfolio of high book-to-market stocks in excess of the returns of a portfolio of low book-to-market stocks. By controlling for SMB and HML, the three-factor model is better able to isolate the outperformance of a portfolio or an investment compared to the market. We apply the Fama-French three-factor model to our portfolios using ordinary least squares regression. However, in accordance with Blitz and Fabozzi (2017), we replace the risk-free rate on the

left-hand side, in this and the following models, with the return of the market in order to analyze a portfolio's return in excess of the market return:

$$R_{i,t} - R_{m,t} = \alpha + \beta_{mrkt} * (R_{m,t} - R_{f,t}) + \beta_{SMB} * SMB_t + \beta_{HML} * HML_t + \epsilon_t \quad (4.2)$$

Where:

$R_{i,t} - R_{m,t}$ = *Expected return of the portfolio in excess of the market*

β_{SMB} = *Exposure to the size factor*

SMB_t = *Size premium at time t (small minus big)*

β_{HML} = *Exposure to the value factor*

HML_t = *Value premium at time t (high minus low)*

4.3 Carhart Four-Factor Model

The Carhart model is an extension of the Fama-French three-factor model, proposed in 1997. Mark Carhart (1997) suggested adding a fourth factor to the model; a momentum factor. The rationale behind adding this factor was the observed tendency that stocks that had performed well or poorly in the recent past also kept doing so. Thus, the momentum factor (MOM) captures the return of a diversified portfolio that has performed well in the recent past in excess of the return of a diversified portfolio that has performed badly in the recent past (Carhart, 1997). The Carhart model is built in the following way:

$$\begin{aligned} R_{i,t} - R_{m,t} =& \alpha + \beta_{mrkt} * (R_{m,t} - R_{f,t}) + \beta_{SMB} * SMB_t + \beta_{HML} * HML_t \\ &+ \beta_{MOM} * MOM_t + \epsilon_t \end{aligned} \quad (4.3)$$

Where:

β_{MOM} = *Exposure to the momentum factor*

MOM_t = *Momentum premium at time t*

4.4 Fama-French Five-Factor Model

In 2014, Fama and French expanded further on their three-factor model by adding two new factors to the model. In addition to the three original factors, the five-factor model includes a profitability factor (RMW) and an investment factor (CMA) (Fama & French, 2014). RMW is short for "robust minus weak" and represents the return of a portfolio of companies with robust profitability in excess of the return of a portfolio of companies with weak profitability, both portfolios being diversified. CMA is short for "conservative minus aggressive" and represents the return of a diversified portfolio of low investment companies (conservative) in excess of the return on a diversified portfolio of high investment companies (aggressive). The Fama-French five-factor model is structured in the following way:

$$\begin{aligned} R_{i,t} - R_{m,t} =& \alpha + \beta_{mrkt} * (R_{m,t} - R_{f,t}) + \beta_{SMB} * SMB_t + \beta_{HML} * HML_t \\ &+ \beta_{RMW} * RMW_t + \beta_{CMA} * CMA_t + \epsilon_t \end{aligned} \tag{4.4}$$

Where:

β_{RMW} = *Exposure to the profitability factor*

RMW_t = *Profitability premium at time t (robust minus weak)*

β_{CMA} = *Exposure to the investment factor*

CMA_t = *Investment premium at time t (conservative minus aggressive)*

4.5 Fama-French Five-Factor Model Plus Momentum

We have also included the Fama-French five-factor model plus momentum in our analysis. The rationale behind this is that we want to see if the performance of the sin portfolio compared to the market or the comparable portfolio can be further isolated. The five-factor model plus momentum is structured as follows:

$$\begin{aligned} R_{i,t} - R_{m,t} =& \alpha + \beta_{mrkt} * (R_{m,t} - R_{f,t}) + \beta_{SMB} * SMB_t + \beta_{HML} * HML_t \\ &+ \beta_{RMW} * RMW_t + \beta_{CMA} * CMA_t + \beta_{MOM} * MOM_t + \epsilon_t \end{aligned} \tag{4.5}$$

4.6 Model Testing

Five Gauss-Markov assumptions need to be fulfilled in order to trust the results from our ordinary least squares regressions; i) linear parameters, ii) no perfect collinearity, iii) zero conditional mean, iv) homoskedasticity and v) no serial-/autocorrelation (Wooldridge, 2012). The independent factors we employ to our models are already established factors which have proven to significantly affect stock returns, which indicates that assumption i) and ii) already holds and hence do not need to be tested (Carhart, 1997).

Autocorrelation and heteroskedasticity in the error terms can create biased regression results and invalidate inference (Wooldridge, 2012). We test for the presence of autocorrelation and heteroskedasticity by conducting a Breush-Godfrey and a Breush-Pagan test, respectively. The results of these tests indicate that neither autocorrelation nor heteroskedasticity is a concern in our models[17]. Furthermore, we test for normality with histograms and QQ-plots. The histograms verify that the sample mean is centered around zero for both portfolios and the QQ-plots show that the standardized residuals form a line that is fairly straight in the middle, which means that also the zero conditional mean assumption is fulfilled. In sum, all five Gauss-Markov assumptions are satisfied and we can use all features of the OLS regression without any restrictions.

In addition to the five Gauss-Markov assumptions, stationarity is an important precondition when analyzing time series data. A time series process is stationary if the probability distribution is stable over time (Wooldridge, 2012). This implies that we should be able to collect random variables in a sequence and then shift that sequence ahead without changing the probability distribution (Wooldridge, 2012). If our time series data does not fulfill this requirement, the results may be spurious. We test for stationarity by running an augmented Dickey-Fuller test for unit root. The results from the tests indicate that we do not need to worry about non-stationary in our data.

[17] Outputs from the tests can be found in section A1 in the appendix.

4.7 Model Weaknesses

In similarity to the CAPM, the Fama-French models have also been criticized throughout the years. Regarding the three-factor model, Daniel and Titman (1997) for example argued that the value factor is more of a characteristic of a firm and that investors prefer to hold high book-to-market stocks to low book-to-market stocks, rather than book-to-market being a risk measure that determines expected returns. Furthermore, Fama and French (1996) have admitted themselves that the three-factor model lack a factor that captures the short-term continuation of returns. The advocates of the momentum factor argue that this is the factor missing in the Fama-French three-factor model.

Furthermore, the augmented five-factor model has also been criticized. Blitz, Hanauer and Van Vliet (2018) argued that adding more explanatory variables to a model is always risky. The added factors are likely to interact, "which makes it more difficult to summarize the cross section of stock returns." They further argued that the research about the profitability factor and the investment factor is relatively new and limited. Thus, they claimed that Fama and French might not be precise enough in their definitions of the variables. Furthermore, the researchers critique that the five-factor model still does not include the momentum factor. Fama and French (2014) do, however, argue that adding the momentum factor to the five-factor model will result in correlation between the explanatory variables, which can result in faulty diversification in the portfolios used to create the explanatory factors.

5 Analysis

In this chapter we will present the results of our analysis. We conduct the analysis with the objective of answering our main research question:

Do sin stocks outperform the market and the chosen comparable stocks?

We will start by analyzing the descriptive statistics of the sin and comparable portfolios as well as the market proxy. The descriptive analysis also includes a presentation of the cumulative returns of the various portfolios and the market. Thereafter, we will present the regression results for the total sin portfolio's monthly returns less the market monthly returns. We will also look closer at the sin portfolio and analyze the three sin industries, the continents and the two decades in our data set separately. Lastly, we will present the regression results for the difference portfolio.

5.1 Descriptive analysis

In this section we will provide the descriptive statistics of the sin portfolio, the comparable portfolio and the market proxy. Then, we will analyze the cumulative returns during our chosen time period, 2000-2019.

5.1.1 Portfolio Overview

Table 5.1 presents the descriptive statistics of the sin and comparable portfolios as well as the market proxy, based on monthly returns for the whole period and divided into the two decades.

Table 5.1: Descriptive statistics of the sin portfolio, comparable portfolio and the market proxy

Statistic	Sharpe Ratio	Mean Return	Std.Dev	Min	Max
Panel A: Total period					
Sin portfolio	0.206	0.011	0.047	-0.238	0.188
Comparable portfolio	0.152	0.008	0.044	-0.170	0.122
Market proxy	0.100	0.006	0.047	-0.205	0.125
Panel B: 2000-2009					
Sin portfolio	0.209	0.014	0.056	-0.238	0.188
Comparable portfolio	0.160	0.010	0.048	-0.170	0.122
Market proxy	0.014	0.003	0.051	-0.205	0.125
Panel C: 2010-2019					
Sin portfolio	0.189	0.008	0.035	-0.093	0.102
Comparable portfolio	0.112	0.005	0.041	-0.148	0.120
Market proxy	0.185	0.008	0.041	-0.105	0.113

Note: The Sharpe ratio is the excess return reward (average return minus the average risk-free rate) per unit of risk. Mean return is the expected return of all stocks in the relevant portfolio. The min (max) return is the smallest (largest) return observed in a portfolio in the relevant period of time.

In sum, the table of descriptive statistics indicates that the sin portfolio generated a higher Sharpe ratio than the comparable portfolio and market proxy (hereafter market), over the whole time period. This finding is not in line with the CAPM, which considers the market portfolio to be the most optimal choice (Kenton, 2020a). Furthermore, the comparable portfolio also outperformed the market when examining the total time period. The standard deviations of the sin portfolio and the market were the same for the total time period, but the sin portfolio held the most extreme minimum and maximum monthly returns.

Moreover, the first decade seems to be considerably more volatile than the second based on the standard deviations and minimum and maximum returns. This is likely due to the financial crisis in 2008 and 2009. In addition, 2000-2009 is often referred to as "The Lost Decade" by investors, as it generated negative returns for many large stock market

indexes such as the S&P 500 (Patton Funds, n.d.). The weak market performance is confirmed by the low Sharpe ratio for the market. For the sin and comparable portfolio, on the other hand, 2000-2009 was the decade that provided the highest Sharpe ratios and mean returns.

During 2010-2019, the market outperformed the comparable portfolio based on the Sharpe ratios. However, the sin portfolio was still the superior portfolio with the highest Sharpe ratio.

Nevertheless, we cannot conclude on anything based on the descriptive statistics alone, as we must control for various risk factors before concluding on potential differences in risk-adjusted return.

5.1.2 Cumulative returns

Total Portfolios

Figure 5.1 shows the cumulative returns of the total sin portfolio, the comparable portfolio and the market from 2000-2019. The first striking finding is that the graph confirms the findings presented in table 5.1: the sin portfolio outperformed the market over the whole time period. Moreover, we observe that the cumulative returns of the sin portfolio increased the most during the first decade, which is also confirmed by the differences in Sharpe ratio and mean return in panel B and C in the same table. All in all, the development of the sin portfolio looks to mostly follow the market movements, however always at a higher return level.

A second prominent finding from figure 5.1 is that the sin portfolio outperformed the comparable portfolio over the whole time period, although the portfolios' movements seem to be quite similar, especially during the first decade. The outperformance of the sin portfolio was larger during the second half of the time span.

Furthermore, the figure indicates that the sin and comparable portfolio as well as the market were all affected by the financial crisis. Both portfolios followed the market downward during this time period, indicating that these groups of stocks might not be as recession-resistant as some investors tend to believe (Tromp, 2019).

Figure 5.1: Cumulative returns, 2000-2019

The x-axis represents the year and the y-axis represents the cumulative return in percent

Industry Divided Portfolios

To explore the cumulative return of the sin portfolio compared to the market further, we look at the cumulative return of each sin industry in our sample individually. Figure 5.2 shows the cumulative return of the market value-weighted tobacco, alcohol and gambling portfolios, as well as the market from 2000-2019. The graph shows that all three sin industry portfolios outperformed the market over the whole time period.

Furthermore, we observe that all industry portfolios were seemingly affected by the financial crisis and followed the market downward during this time period. However, the gambling portfolio's cumulative return was affected considerably more by the recession than the alcohol and tobacco portfolios' cumulative returns. The most prominent explanation to this observation is that many of the companies in this portfolio are companies owning hotels with casinos. During a financial crisis, people are less likely to prioritize traveling and thereby hotel stays (Borko, 2018). Thus, it seems logical that the gambling portfolio suffers the most as investors might be scared to hold such stocks during an economic recession. Alcohol and tobacco, on the other hand, are more easily accessible consumer goods. One could therefore argue that consumers still prioritize buying them, ensuring stable cash flows for the companies which can make these stocks somewhat safer to hold.

Figure 5.2: Cumulative returns per industry, 2000-2019

The x-axis represents the year and the y-axis represents the cumulative return in percent

Continent Divided Portfolios

We have further calculated the cumulative returns for each continent portfolio constituting the total sin portfolio to explore if there are any differences between these and to compare the portfolios to their respective markets. This is presented in figure 5.3.

We observe that the US and Canada portfolio was superior over the whole time period, followed by the Europe portfolio. Both of these portfolios also outperformed their respective markets over the whole time span. The Australia and New Zealand (NZ) portfolio generated the lowest cumulative return out of the sin portfolios. Furthermore, this portfolio did not consistently outperform the Australia and NZ market. It can also be noted that this continent portfolio suffered the most during the financial crisis, although the US and Canada portfolio and the Europe portfolio followed the market downward as well. Nevertheless, the Australia and NZ portfolio seems to have generated the highest cumulative return out of all the portfolios after the trough.

Figure 5.3: Cumulative returns per continent, 2000-2019

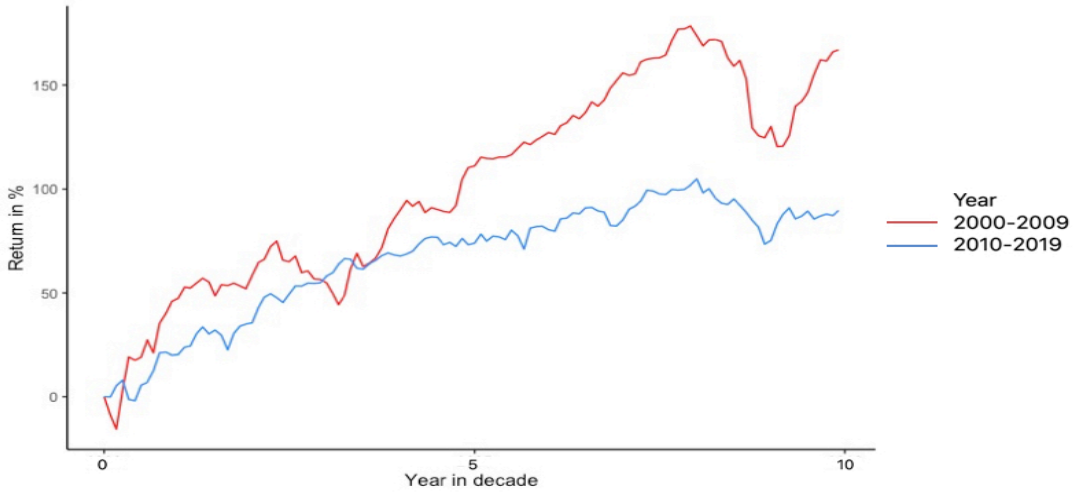
The x-axis represents the year and the y-axis represents the cumulative return in percent

Decade Divided Portfolios

In addition to the complete portfolios, we have calculated the cumulative returns for the total sin portfolio divided into the two decades. This is presented in figure 5.4. The rationale behind this is that we want to explore if there are any sin stock return differences between the decades constituting the total time span. We also plot the cumulative returns for the comparable portfolio for the two decades, shown in figure 5.5, to examine if the potential differences are unique findings for the sin portfolio or not.

Figure 5.4 shows the cumulative return of the sin portfolio during the two decades. We observe that the figure supports the descriptive statistics in table 5.1, where 2000-2009 generated the highest mean return for the sin portfolio with 1.4%, compared to 0.8% in 2010-2019. The graphs indicate a difference between the two decades in favor of 2000-2009, despite the recession due to the financial crisis. This might indicate a change in investors' attitudes towards sin investing, causing lower cumulative returns.

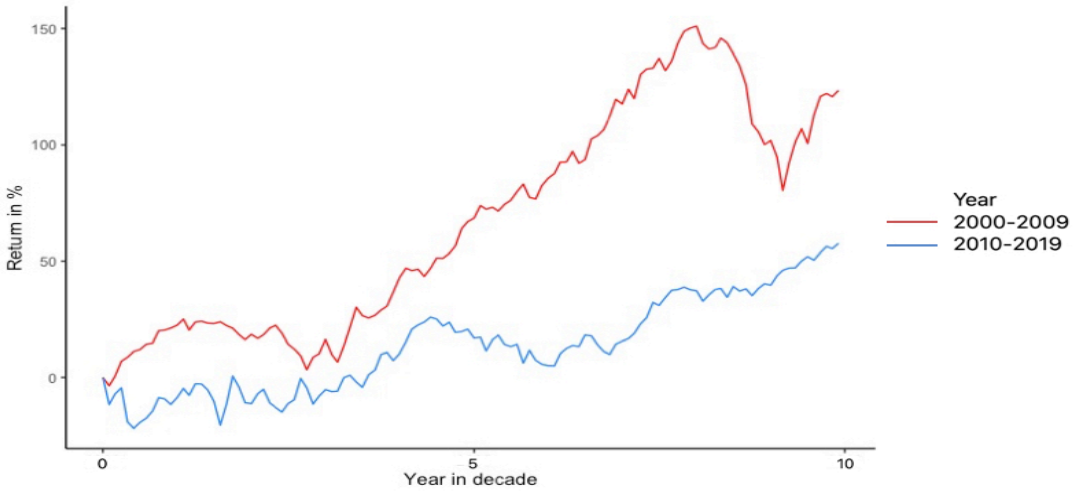
Figure 5.4: Cumulative returns for the sin portfolio during each decade



The x-axis represents the year in the decade and the y-axis represents the cumulative return in percent

Figure 5.5 shows the cumulative return of the comparable portfolio during the two decades. Compared to the sin portfolio, the contrast between the decades is larger. 2000-2009 generated a cumulative return of more than 100%, while the cumulative return was about 50% during 2010-2019. This graph also matches the findings from table 5.1 (descriptive statistics), where the expected return in the first decade was 1%, while it was halved to 0.5% in the second decade.

Figure 5.5: Cumulative returns for the comparable portfolio during each decade



The x-axis represents the year in the decade and the y-axis represents the cumulative return in percent

In sum, the graphs indicate a difference in monthly returns for sin stocks between the two decades of our time span. 2000-2009 holds the highest expected and cumulative returns which indicate an overall change in sin stock returns. However, the differences also apply to the comparable portfolio, and to an even larger extent. Therefore, the investment landscape in general might have changed during the decades.

Nevertheless, we cannot conclude on anything based on these figures. Rather, we have to examine the findings closer by regressing the two portfolios with respect to the risk factors in the Fama-French pricing models.

5.2 Regression Results

In this section, we present the regression results. As previously mentioned, the objective is to analyze whether the sin portfolio outperforms the market and the comparable portfolio. In order to achieve this, we estimate alphas using the Fama-French three-factor, four-factor (Carhart) and five-factor model, with and without momentum. To explore if the sin portfolio outperforms the market, we apply a long-short investment strategy going long in the relevant sin portfolio, i.e. the total sin portfolio, the industry portfolios, the continent portfolios and the decade portfolios, and short in the market. Hence, the dependent variable is the relevant sin portfolio's monthly returns less the market monthly returns. To explore if the sin portfolio outperforms the comparable portfolio, we apply a zero-net investment strategy, going long in the total sin portfolio and short in the comparable portfolio. Consequently, the dependent variable is the sin portfolio's monthly returns minus the comparable portfolio monthly returns.

5.2.1 The Sin Portfolio

5.2.1.1 The Total Sin Portfolio

We start by presenting the regression results for the total sin portfolio, where the dependent variable across all regressions is the sin portfolio's monthly returns less the market monthly returns. The results are presented in table 5.2.

Table 5.2: Regression results for the total sin portfolio's monthly returns in excess of the market monthly returns

	Model applied:			
	3 factor	Carhart	5 factor	5 factor + Momentum
Constant(α)	0.952***	0.960***	0.594*	0.620*
	(0.319)	(0.325)	(0.331)	(0.332)
Rm-Rf	-0.460***	-0.465***	-0.311***	-0.327***
	(0.068)	(0.074)	(0.084)	(0.085)
SMB	-0.048	-0.042	0.109	0.174
	(0.167)	(0.172)	(0.170)	(0.179)
HML	0.436***	0.432***	0.224	0.135
	(0.116)	(0.120)	(0.188)	(0.203)
MOM		-0.012		-0.097
		(0.082)		(0.085)
RMW			0.664***	0.712***
			(0.204)	(0.208)
CMA			0.261	0.346
			(0.266)	(0.276)
Observations	240	240	240	240
R^2	0.210	0.210	0.248	0.252
Adjusted R^2	0.200	0.197	0.232	0.233

Note: *p<0.1; **p<0.05; ***p<0.01 (standard errors in parenthesis).
The table provides the results for the total sin regressions. All models are estimated based on monthly data from January 2000 to December 2019. The dependent variables are $r_{sin,t} - r_{mrkt,t}$. The constant represents the monthly alpha, i.e. the monthly abnormal returns in percentages. The coefficients on the explanatory variables captures the difference in exposure between the sin portfolio and the market. The explanatory variable Rm-Rf is the value-weighted market return minus the risk-free rate. SMB (small minus big) captures the portfolio's exposure to small market cap stocks. HML (high minus low) captures the portfolio's exposure to high book-to-market stocks. MOM (momentum) seizes the exposure to previous price movements. RMW (robust minus weak) captures the exposure to companies with robust profitabilities. CMA (conservative minus aggressive) seizes the exposure to a conservative investment strategy.

Starting with the three-factor model, our findings are to a large extent consistent with the findings of Blitz and Fabozzi (2017). The alpha indicates that the sin portfolio outperforms the market as it delivers an average monthly excess return of 0.952%. This is represented by the highly significant constant term. In addition, the market risk factor is statistically

significant at a 1% level. Given the negative sign of the coefficient, the model proposes that the portfolio of sin stocks mostly consists of low-beta stocks.

Furthermore, the three-factor and Carhart regressions suggest that the sin portfolio's return is attributed to the value premium (HML). However, when applying the five-factor model, this factor becomes insignificant. Firstly, the value factor is highly correlated with the now included investment factor (CMA)[18]. This is consistent with the well recognized theory that low book-to-market stocks, i.e. growth stocks, tend to be companies with an aggressive investment strategy, and vice versa. When the investment factor is added to the regressions, the correlated variables will, to a larger extent, represent their own, isolated effects (Wooldridge, 2012). As the value factor is no longer significant, there are no indications that sin stocks are mainly cash cows, such as Tromp (2019) suggested, nor do we get indications that they are mainly the opposite, i.e. value stocks.

Secondly, the five-factor model suggests that the sin portfolio loads positively on the profitability factor (RMW) compared to the market. Although the profitability factor is not highly correlated with the value factor, the factors *are* positively correlated and it is thus reasonable to believe that the inclusion of the profitability factor affects the significance of the value factor. Given the positive sign of the RMW coefficient, the regression model indicates that sin companies mainly have robust profitabilities. This is in line with the theory that sin stocks are stable and profitable because sin companies provide products and services that are addictive. In addition, it also matches Blitz and Fabozzi's (2017) findings that profitability is an important factor in explaining the returns of sin stocks.

Moreover, when we apply the five-factor model, both the alpha and the market risk factor remain significant. However, the alpha becomes smaller and is now only statistically significant at a 10% level. The reduction in the significance of the alpha coefficient is likely explained by the now included profitability factor, which explains some of the abnormal returns of the sin portfolio. The regression result suggests that the sin portfolio delivers an average monthly return in excess of the market of 0.594%.

[18]The correlation between all the explanatory variables can be found in the correlation matrix in section A2.1 in the appendix.

When we add the momentum factor to the five-factor model, the coefficients from the five-factor model without momentum remain the same in terms of significance, which is reasonable as the momentum factor is not statistically significant at any conventional significance level. However, several of the coefficients increase or decrease in size. A possible explanation is that the momentum factor is correlating with some of the other factors, as Fama and French (2014) also argued could be a challenge when including this factor. Although the momentum factor does not highly correlate with the other included factors, they are correlated to a certain degree which can affect the estimated coefficients.

5.2.1.2 The Sin Industries Separately

As we observe a statistically significant alpha throughout all the regressions models in table 5.2, at least at a 10% significance level, we find it interesting to further analyze each sin industry separately. As mentioned in section 3.4.3, different investors might consider the sin industries included in this thesis differently. Some industries may be related to a higher risk level and are hence expected to deliver a higher return as compensation. Thus, we apply the Fama-French five-factor model without momentum to each of our sin industry portfolios' monthly returns less the market monthly returns. We apply the five-factor model without momentum as this model has the highest R^2, disregarded the five-factor model plus momentum, and as the momentum factor is not statistically significant.

The regression results are presented in table 5.3. The dependent variables in these regressions are the three individual sin industry portfolio's monthly returns less the market monthly returns.

Table 5.3: Regression results for each industry portfolio's monthly returns in excess of the market monthly returns

	Portfolio tested:		
	Tobacco	Alcohol	Gambling
Constant(α)	0.472	0.549*	0.235
	(0.353)	(0.330)	(0.384)
Rm-Rf	-0.333***	-0.543***	0.251**
	(0.090)	(0.084)	(0.097)
SMB	-0.148	0.107	0.875***
	(0.181)	(0.169)	(0.197)
HML	0.031	0.310*	0.860***
	(0.200)	(0.187)	(0.217)
RMW	0.596***	0.689***	0.822***
	(0.218)	(0.203)	(0.236)
CMA	0.627**	-0.147	-0.533*
	(0.284)	(0.265)	(0.308)
Observations	240	240	240
R^2	0.279	0.326	0.210
Adjusted R^2	0.263	0.312	0.193

Note: *p<0.1; **p<0.05; ***p<0.01 (standard errors in parenthesis).
The table provides the results for the industry regressions. All models are estimated based on monthly data from January 2000 to December 2019. The dependent variables are $r_{industryportfolioi,t} - r_{mrkt,t}$. The constant represents the monthly alpha, i.e. the monthly abnormal returns in percentages. The coefficients on the explanatory variables captures the difference in exposure between the industry portfolios and the market. The explanatory variable Rm-Rf is the value-weighted market return minus the risk-free rate. SMB (small minus big) captures the portfolio's exposure to small market cap stocks. HML (high minus low) captures the portfolio's exposure to high book-to-market stocks. RMW (robust minus weak) captures the exposure to companies with robust profitabilities. CMA (conservative minus aggressive) seizes the exposure to a conservative investment strategy.

The first noticeable finding is that the alcohol regression is the only one with a significant alpha, suggesting a monthly return of 0.549% in excess of the market. In other words, it appears to be a return premium for alcohol stocks. A possible explanation of this finding is that the model fits differently on the total sin portfolio and the alcohol portfolio than on the other sub-samples. Although we have the same number of monthly returns to analyze in the total portfolio and the industry portfolios (n=240), the industry portfolios

will naturally consist of fewer companies, which might affect the results. However, we observe that the alpha for the tobacco regression is not too far away from the critical value of 1.645, with a t-statistic of 1.337[19]. Furthermore, the regression results indicate that the gambling portfolio differs from the other industry portfolios. This regression returns an alpha further from the critical value[20], and several of the other coefficients are different in terms of sign and significance, compared to the coefficients from the tobacco and alcohol regressions.

The market risk factor is statistically significant at a 5% level for the gambling regression and at a 1% level for the other two industry regressions. The coefficient's sign for the gambling regression indicates that the portfolio of gambling stocks mostly consists of high-beta stocks. As the opposite is the case for the tobacco and alcohol regressions, we get an indication that gambling stocks are more volatile. This is in line with the results of Hong and Kacperczyk (2009), who calculated betas below 1 for their alcohol and tobacco portfolios (referred to as "beer" and "smoke" in their paper) and a beta above 1 for their gaming portfolio (gaming stocks is included in our gambling portfolio).

A possible explanation for this finding, is that the tobacco and alcohol industries are older and thus more established than the gambling industry. Therefore, governments may have found reliable regulations for these industries, contributing to making them more predictable and stable. In addition, as Stephen Connolly (2019) states, the gambling industry is still experiencing rapid changes, especially due to the remote gambling industry's current growth. He claims that this industry is still in its infancy in many countries. As many of the gambling companies in our data set are online gaming and gambling companies, this might contribute to making the gambling portfolio over all more volatile.

Furthermore, the size factor is only statistically significant in the gambling regression. This suggests that the gambling portfolio consists of more small market cap stocks, which we also got an indication of from figure 3.1 and 3.2 showing the average market cap and number of companies per industry, respectively. Moreover, the alcohol and gambling portfolios load positively on the value factor. This indicates that these portfolios mainly consist of high book-to-market stocks compared to the market and that they consequently

[19]We calculate the t-statistic as the coefficient divided by the standard error. The critical value of 1.645 is retrieved from a t-distribution table for a two-sided test at a 10% significance level with an infinite (n>100) number of observations.

[20]The t-statistic for the alpha in the gambling industry is 0.612 (0.235/0.384).

are mainly value stocks.

All three industry portfolios load positively on the profitability factor. This indicates that the portfolios mostly consists of companies with robust profitability compared to the market. Finally, the tobacco and gambling regressions have significant coefficients for the investment factor, however opposite coefficient signs. The tobacco portfolio is exposed to conservative investment companies compared to the market, whereas the opposite is true for the gambling portfolio. One could argue that this is in line with what we discussed regarding the market risk factor. As the gambling industry is newer, it could require a more aggressive investment strategy for the companies in order to gain market shares.

All in all, the regression results indicate that the tobacco and alcohol portfolios share more characteristics with each other than they do with the gambling portfolio. The tobacco and alcohol regressions both deliver a negative coefficient for the market risk factor, which indicates that these portfolios consist of low-beta stocks. In addition, these regressions have more similar alphas in terms of significance, with the alcohol regression delivering a positive and significant alpha and the tobacco regression being close to it. The gambling regression, on the other hand, delivers a market risk factor with the opposite sign, in addition to a highly significant and positive exposure to the size and value factors, compared to the market.

5.2.1.3 The Continents Separately

To analyze the sin portfolio further, we divide it into the three continents constituting the total sin portfolio. As for the industry regressions, we estimate alphas in this case by applying the Fama-French five-factor model without momentum. The dependent variables are the continent portfolios' monthly returns less the *respective* market monthly returns[21]. This enables us to analyze whether the continent portfolios outperform their respective markets and if they perform differently from each other. The regression results are presented in table 5.4.

[21]For example, the respective market returns for the US and Canada sin portfolio is the North American market returns, extracted from Kenneth French' Data Library.

Table 5.4: Regression results for each continent portfolio's monthly returns in excess of the market monthly returns

	Portfolio tested:		
	US and Canada	Europe	Australia and NZ
Constant(α)	0.449	0.494	0.659
	(0.367)	(0.331)	(0.407)
Rm-Rf	-0.038	-0.621***	-0.528***
	(0.094)	(0.073)	(0.081)
SMB	0.010	0.196	0.514***
	(0.147)	(0.152)	(0.146)
HML	-0.162	0.497***	0.192
	(0.174)	(0.185)	(0.199)
RMW	0.520***	0.558**	0.249
	(0.179)	(0.233)	(0.193)
CMA	0.631***	0.074	-0.141
	(0.218)	(0.244)	(0.232)
Observations	240	240	240
R^2	0.161	0.378	0.231
Adjusted R^2	0.143	0.365	0.215

Note: *p<0.1; **p<0.05; ***p<0.01 (standard errors in parenthesis).
The table provides the results for the industry regressions. All models are estimated based on monthly data from January 2000 to December 2019. The dependent variables are $r_{continentportfolioi,t} - r_{mrkt,t}$. The constant represents the monthly alpha, i.e. the monthly abnormal returns in percentages. The coefficients on the explanatory variables captures the difference in exposure between the continent portfolios and the market. The explanatory variable Rm-Rf is the value-weighted market return minus the risk-free rate. SMB (small minus big) captures the portfolio's exposure to small market cap stocks. HML (high minus low) captures the portfolio's exposure to high book-to-market stocks. RMW (robust minus weak) captures the exposure to companies with robust profitabilities. CMA (conservative minus aggressive) seizes the exposure to a conservative investment strategy.

None of the continent regressions deliver statistically significant alphas. Thus, the results indicate that none of the continent portfolios outperform their respective market. However, the regressions deliver alphas not too far away from the critical value of 1.645, with t-statistics of 1.223, 1.492 and 1.619, respectively. Again, the lack of statistically significant alphas may be caused by the model working more poorly on these sub-samples than on the total sample due to fewer company stocks. For instance, the Australia and NZ portfolio

only consists of 22 stocks.

Furthermore, the market risk factors indicate that the Europe portfolio and Australia and NZ portfolio are less volatile than their respective markets, whereas there is no evidence that this nor the opposite is the case for the US and Canada portfolio. Moreover, the size factor indicates that the Australia and NZ portfolio mostly consists of smaller market cap stocks than the Asia Pacific (ex Japan) market, and the value factor indicates that the Europe portfolio is exposed to high book-to-market stocks compared to the European market.

The US and Canada and Europe portfolios load positively on the profitability factor, suggesting that these portfolios consists of stocks with robust profitability compared to their respective markets. As figure 5.3 (cumulative returns per continent) showed, the Australia and NZ portfolio was affected the most by the financial crisis, which might have affected the overall profitability of this portfolio. Finally, only the US and Canada portfolio is tilted towards conservative investment companies compared to their respective market.

5.2.1.4 Decade Portfolios

The significant alphas of the total sin portfolio regression and the cumulative returns figure in section 5.1.2 make it interesting to examine the two decades in our time span separately. As for the industry and continent regressions, we estimate alphas using the five-factor model without momentum. The dependent variable in the regressions is the decade portfolio's monthly returns less the market monthly returns for the respective decade. The results are presented in table 5.5.

Table 5.5: Regression results for each decade's monthly returns in excess of the market monthly returns

	Decade tested:	
	2000-2009	2010-2019
Constant(α)	0.756	0.024
	(0.464)	(0.248)
Rm-Rf	-0.343***	-0.342***
	(0.116)	(0.063)
SMB	0.069	-0.232
	(0.197)	(0.172)
HML	0.418*	0.001
	(0.241)	(0.209)
RMW	0.370	0.859***
	(0.254)	(0.272)
CMA	0.218	-0.020
	(0.309)	(0.312)
Observations	120	120
R^2	0.356	0.437
Adjusted R^2	0.328	0.412

Note: *p<0.1; **p<0.05; ***p<0.01 (standard errors in parenthesis).
The table provides the results for the decade regressions. All models are estimated based on monthly data from January 2000 to December 2019. The dependent variables are $r_{decadeportfolioi,t} - r_{mrkt,t}$. The constant represents the monthly alpha, i.e. the monthly abnormal returns in percentages. The coefficients on the explanatory variables captures the difference in exposure between the decade portfolios and the market. The explanatory variable Rm-Rf is the value-weighted market return minus the risk-free rate. SMB (small minus big) captures the portfolio's exposure to small market cap stocks. HML (high minus low) captures the portfolio's exposure to high book-to-market stocks. RMW (robust minus weak) captures the exposure to companies with robust profitabilities. CMA (conservative minus aggressive) seizes the exposure to a conservative investment strategy.

Figure 5.4 showed that the cumulative return of the sin portfolio increased more during the first decade than during the second decade. However, as we look at regression table 5.5, none of the decade regressions generates a significant alpha. Thus, we cannot conclude that there are any differences in abnormal returns between the decades of our time span. It is worth noting that the number of observations is halved as the time span is split in two, however 120 observations should still be enough to get adequate statistical power

(Wooldridge, 2012). Thus, we conclude that, based on this analysis, there is no difference in abnormal returns between the first and second decade of our time span.

Moreover, the market risk factor coefficient for both decade regressions is negative, indicating that the sin portfolio is less volatile than the market during both decades. This is in line with the findings for the total sin portfolio. Furthermore, the significance of the value and profitability factor is opposite for the two decade regressions, with the value factor being significant for the first decade and the profitability factor being significant for the second. This indicates that the first decade portfolio consist of more high book-to-market stocks compared to the market, whilst this cannot be said about the second decade portfolio. This portfolio, on the other hand, loads positively on the profitability factor, indicating that this portfolio consists of more companies with robust profitabilities compared to the market. In other words, considering the differences in coefficient significance for the risk factors, the characteristics of the companies or markets in our data set might have changed during the time span.

5.2.2 The Difference Portfolio

To examine whether sin stocks outperform the non-sin utility stocks, we test a difference portfolio with the dependent variables being the total sin portfolio's monthly returns less the comparable portfolio's monthly returns[22]. These regression results are presented in table 5.6.

[22]Note that the coefficients for the difference portfolio regressions are not exactly equal to the coefficients from the "total sin portfolio regression" less the coefficients from the "comparable portfolio regression", as the subtracted market effects on the left-hand side of these regressions are weighted based on the market cap for each continent in each of the portfolios. They will therefore differ as there are unequal weights of the market cap assigned to each continent for the sin and comparable portfolios. The regression results for the comparable portfolio's monthly returns less the market monthly returns can be found in appendix A3.

Table 5.6: Regression results for the difference portfolio

	Model applied:			
	3 factor	Carhart	5 factor	5 factor + Momentum
Constant(α)	0.182	0.118	-0.114	-0.122
	(0.321)	(0.326)	(0.336)	(0.338)
Rm-Rf	0.065	0.099	0.191**	0.196**
	(0.064)	(0.071)	(0.080)	(0.081)
SMB	-0.438***	-0.484***	-0.310*	-0.331*
	(0.168)	(0.173)	(0.172)	(0.182)
HML	0.026	0.059	-0.170	-0.141
	(0.116)	(0.120)	(0.191)	(0.207)
MOM		0.091		0.032
		(0.082)		(0.086)
RMW			0.528**	0.512**
			(0.207)	(0.212)
CMA			0.255	0.227
			(0.270)	(0.281)
Observations	240	240	240	240
R^2	0.030	0.035	0.060	0.061
Adjusted R^2	0.018	0.019	0.040	0.037

Note: *p<0.1; **p<0.05; ***p<0.01 (standard errors in parenthesis).
The table provides the results for the difference portfolio. All models are estimated based on monthly data from January 2000 to December 2019. The dependent variables are $r_{sin,t} - r_{comparable,t}$. The constant represents the monthly alpha, i.e. the monthly abnormal returns in percentages. The coefficients on the explanatory variables captures the difference in exposure between the sin portfolio and the comparable portfolio. The explanatory variable Rm-Rf is the market value-weighted market return minus the risk-free rate. SMB (small minus big) captures the portfolio's exposure to small market cap stocks. HML (high minus low) captures the portfolio's exposure to high book-to-market stocks. MOM (momentum) seizes the exposure to previous price movements. RMW (robust minus weak) captures the exposure to companies with robust profitabilities. CMA (conservative minus aggressive) seizes the exposure to a conservative investment strategy.

Firstly, we observe that none of the models return a statistically significant alpha. Hence, based on these regression results, we cannot conclude that the sin portfolio outperforms the comparable portfolio. However, both the total sin portfolio and the total comparable

portfolio[23] individually outperformed the market.

Secondly, the market risk factor is positive and statistically significant for the five-factor model, with and without momentum, at a 5% level. This indicates that utility stocks are even less volatile than sin stocks. One could argue that this is in line with table 5.1 (descriptive statistics), showing a lower standard deviation and less extreme minimum and maximum monthly returns for the comparable portfolio. As discussed in section 3.1.6, we chose utility companies as comparables because they are known to be defensive stocks with stable cash-flows and predicable earnings, similar to sin companies.

Moreover, the size factor is negative and statistically significant, at least at a 10% level across all models. This indicates that the sin portfolio consists of more large market cap stocks than the comparable portfolio. As mentioned earlier, Fabozzi, Ma and Oliphant (2008) stated that sin industries are likely to be monopolistic industries, and thus, it is likely that these industries are dominated by companies with large market caps. For instance, Phillip Morris International make up 46.1% of the total average market cap for the tobacco industry in our data set. From figure 3.1 in section 3.4.3, we also saw that although only 10.5% of the 200 companies in our data set are tobacco companies, they make up 46.8% of the total average market cap. The utility industry, on the other hand, has seen a change from larger cap companies to smaller cap companies in recent times. David Roberts (2015) writes that in its infancy, the utility industry was a highly monopolistic industry with the main objective of providing utility services to the country. However, in recent times, the industry has made a shift towards more diversification, as the benefits of competition have started to outweigh the benefits of monopolies (Roberts, 2015). Thus, smaller companies now constitute a larger part of the industry.

Furthermore, the profitability factor is positive and statistically significant at a 5% level for the difference portfolio in the five-factor models. This implies that the sin portfolio is more exposed to robust profitability companies than the comparable portfolio. Again, the monopolistic argument of Fabozzi, Ma and Oliphant (2008) can be applied. As many sin companies have existed for decades, it can be reasonable to assume that they are at a mature stage of their life cycle and thus have more robust profitabilities (Kenton, 2019).

[23]The regression results for the comparable portfolio's monthly returns less the market monthly returns can be found in appendix A3.

Finally, we note that the R^2 is considerably lower when we test the difference portfolio compared to the regressions applied to the various sin portfolios return less the market return. This may indicate that the model works more poorly in the regressions on the difference portfolio. Consequently, we are careful with fully trusting the interpretations of the coefficients for these regressions.

Explicit regression results for the comparable portfolio's monthly returns less the market monthly returns can be found in appendix A4.

6 Discussion

This thesis aims to answer whether sin stocks in the Western world outperform the market and comparable utility stocks. This chapter includes a further discussion of the abnormal return findings from our analysis. As we discuss these findings, it should be kept in mind that an alpha different from zero may represent a pricing error and suggest that inadequate asset pricing models have been applied. For example, there might be factors we have not controlled for in the regressions that can explain the abnormal returns of the relevant portfolios[24]. Nevertheless, this discussion is based on the interpretation that alpha represents abnormal returns.

Table 6.1 summarizes the alphas found throughout the analysis in chapter five.

Table 6.1: Summary of the alphas found in the analysis

	Model applied:			
Portfolio	**3 factor**	**Carhart**	**5 factor**	**5 factor + momentum**
Total sin portfolio	0.952***	0.960***	0.594*	0.620*
Tobacco portfolio			0.472	
Alcohol portfolio			0.549*	
Gambling portfolio			0.235	
US and Canada portfolio			0.449	
Europe portfolio			0.494	
Australia and NZ portfolio			0.659	
2000-2009			0.756	
2010-2019			0.024	
Difference portfolio	0.182	0.118	-0.114	-0.122

Note: *p<0.1; **p<0.05; ***p<0.01
The alphas represent the monthly abnormal returns in percentages. The dependent variable in each regression model is the monthly returns of the relevant sin portfolio in excess of the market monthly returns/the comparable portfolio's monthly returns.

[24]For instance, Blitz and Fabozzi (2017) controlled for the sixth factor "betting against beta" in their analysis, with the reasoning that high-beta assets are overpriced and low-beta assets are underpriced. Furthermore, Pastor and Stambaugh (2003) suggested adding a liquidity factor to the Fama-French three-factor model, arguing that investors holding illiquid assets should be compensated with a risk-premium.

Firstly, we find that the total sin portfolio outperforms the market when controlling for all five explanatory risk factors. Hence, there are indications that investors abstaining from sin investing pay a significant financial cost by doing so, like Hong and Kacperczyk (2009) stated. The average return premium of the sin portfolio compared to the market was 0.594% per month. Our finding of there being positive abnormal returns for sin stocks is in line with the findings of Fabozzi, Ma and Oliphant (2008) and Hong and Kacperczyk (2009). As the latter researchers only analyzed the US stock market in their main analysis, our study contributes by confirming similar results for the Western world as a whole. However, the results are opposite to the non-existing alphas Blitz and Fabozzi found in 2017.

There are several possible explanations for the findings of abnormal returns for the sin portfolio. An explanation researchers tend to highlight in their papers is the risk premium related to sin stocks. Sin companies operate within industries where the consumer demand is known to be consistent and brand loyalty is known to be strong. In that sense these companies are believed to be predictive in terms of cash flows. Nevertheless, there is a risk related to for example heightened litigation and government restrictions. Hong and Kacperczyk (2009) stated that the risk related to sin stocks is mainly litigation risk, which is "the possibility that legal action will be taken because of an individual's or corporation's actions, inaction, products, services, or other events" (Kenton, 2020b). This could for example be that the company gets sued or that new restrictions affecting the industry is being introduced. Fabozzi, Ma and Oliphant (2008) claimed that investors investing in sin stocks are heavily exposed to headline risk, for example rumors about a new tax regulation or rumors about an unexpected decline in cash flows. In sum, standard risk-return theory suggests that investors willing to take on the risk related to sin investing will be compensated for it.

Another possible reason for the outperformance of the sin portfolio, is that the included sin companies tend to stick to their business strategies over time. The current focus in the investment landscape on ESG and sustainable investments might take away from the traditional primary focus of a company, which is generating returns (Boffo & Patalano, 2020). Thus, the sin portfolio might outperform the market because the sin companies have found a "winning strategy" that they stick to. In other words, these companies are aware

that their products and services sell well and that their consumers oftentimes are addicted, and they keep profit maximization as their primary objective by continuing to provide these products and services, instead of changing their business strategies completely to fit newer investment trends. Instead, these companies might change their business strategies only partly, so that they continue to operate within the same industry. For example, although Philip Morris International have an ambition to stop selling traditional cigarettes, they have chosen to stay within the "tobacco" industry as they expand their product line with electronic cigarettes (Philip Morris International, 2019).

Looking at the industry regressions, the alcohol portfolio is the only portfolio generating a return premium compared to the market after controlling for the five Fama-French factors. Our finding of the alcohol portfolio seemingly driving the total sin portfolio's alpha during our time span, is similar to what Hong and Kacperczyk (2009) found for their tobacco portfolio during their time span (1965-2006). Some of the reasoning these researchers used to explain the outperformance of the tobacco portfolio might apply to the outperformance of the alcohol portfolio in our analysis. For example, the returns of this portfolio may be influenced by positive results from litigation or unexpectedly good cash flow news during our time span.

The continent and decade regressions delivered no significant alphas. This indicates that an investor could not earn abnormal returns in excess of for example the European market by investing in European sin stocks. Hence, we get indications that trends affect the returns of sin stocks in all the included continents in a similar way. In addition, an investor investing in the sin portfolio in 2000 have not significantly outperformed an investor investing in 2010, or vice versa. In other words, there are no clear indications that investors' attitudes towards sin stocks have changed during the decades, which have generated a significantly higher or lower average monthly return in the 2000s compared to the 2010s.

Finally, considering the estimated alphas for the difference portfolio, there is no statistically significant proof that there is a premium related to investing in sin stocks rather than non-sin utility stocks. In other words, the reasoning behind the return premium as compensation for heightened risk related to sin investing might not be valid, as utility stocks experience a similar premium.

A possible explanation to why both portfolios outperformed the market individually is that there are common factors affecting the returns of both sin and utility stocks, enabling portfolios of such stocks to deliver positive abnormal returns compared to the market. These factors could for example be overall market or investment trends, or specific company characteristics that apply to both sin and utility companies. For instance, both sin and utility companies are, as mentioned, known to generate stable cash flows due to providing products with a consistent consumer demand. This might attract investors looking for safe investments. In addition, the argument of sin companies sticking to their "winning strategy" might also apply to utility companies, leading to solid financial performance and high stock returns over time. Altogether, our analysis indicates that investors could earn similar returns by investing in utility stocks as they could by investing in sin stocks, and that they can thereby avoid "sinning" if that is their desire.

In sum, the implications of our analysis is that the total sin portfolio as well as the alcohol portfolio outperform the market after controlling for the Fama-French factors. However, as we did not find evidence that the sin portfolio outperforms the comparable portfolio, we cannot conclude that there is a premium explicitly related to sin investing. Both sin stocks and utility stocks generate positive abnormal returns, which might be caused by common characteristics for these types of stocks, such as consistent consumer demand, strong brand loyalty, stable cash flows and a consistent business strategy.

7 Conclusion

The objective of this thesis is to explore whether sin stocks outperform the market and comparable utility stocks. As there is limited literature available on sin stock performance and as previous research have come to contradicting conclusions, we wanted to contribute to the literature by examining sin stock returns in a new time span and geographical area.

Our results suggest that certain sin stocks outperform the market. This is in line with the previous findings of Hong and Kacperczyk (2009) and Fabozzi, Ma and Oliphant (2008), but the contrary to what Blitz and Fabozzi (2017) found. Moreover, our findings suggest that sin companies tend to have robust profitabilities and their stocks tend to be low-beta stocks. Additionally, we do not find that the sin portfolio outperforms the comparable portfolio. This is an interesting finding seeing that sin stocks are widely considered to be related to increased risk, for example in the form of headline or litigation risk, whereas utility companies are considered "safe havens" not carrying the same stigmas as sin stocks. Thus, traditional risk-return theory suggests that investors willing to take on the risk related to sin investing should be compensated for it. Our analysis conclude that sin investors do get compensated, however not to a significantly larger extent than investors investing in non-sin utility stocks.

Our findings are meaningful for anyone interested in investing in sin stocks, especially alcohol, tobacco and gambling stocks in the Western world. Based on our results, these investors should be able to earn a return premium. However, we note that the sin term is constantly changing, which is likely to affect the positive abnormal returns investors can earn by investing in these stocks. Thus, investors interested in sin investing should always try to be updated on this development and also consider other potential sin categories not included in this thesis. Moreover, investors interested in utility stocks can also learn from our research. Such investments provide investors with a premium as well, according to our findings. Hence, our analysis shows that there might be a premium related to common factors affecting both of these groups of stocks or related to the common characteristics of the companies in these industries. In sum, we conclude that although sinning *is* winning, investors do not have to sin to win. Instead, they can invest in utility stocks and experience a similar return premium in excess of the market.

References

AMP Capital. (2019). *Do no harm: what is negative screening and how do you apply it?* Retrieved from https://www.ampcapital.com/au/en/insights-hub/articles/2019/january/Do-no-harm-what-is-negative-screening

Bajpai, P. (2020). *Industries that will never go away.* Retrieved from https://www.investopedia.com/articles/personal-finance/040515/industries-will-never-go-away.asp

Blitz, D. & Fabozzi, F. J. (2017). Sin stocks revisited: Resolving the sin stock anomaly. *Institutional Investor Journals*, *44*(1).

Blitz, D., Hanauer, M. & Van Vliet, P. (2018). *Fama-french 5-factor model: why more is not always better.* Retrieved from https://www.robeco.com/me/insights/2015/10/fama-french-5-factor-model-why-more-is-not-always-better.html

Boffo, R. & Patalano, R. (2020). *"esg investing: Practices, progress and challenges".* OECD Paris. Retrieved from www.oecd.org/finance/ESG-Investing-Practices-Progress-and-Challenges.pdf

Borko, S. (2018). *10 years later: How the travel industry came back from the financial crisis.* Retrieved from https://skift.com/2018/09/14/10-years-later-how-the-travel-industry-came-back-from-the-financial-crisis/

Carhart, M. M. (1997). On persistence in mutual fund performance. *The Journal of Finance*, *52*(1), 57–82.

Chasan, E. (2019). *Global sustainable investments rise 34 percent to $30.7 trillion.* Retrieved from https://www.bloomberg.com/news/articles/2019-04-01/global-sustainable-investments-rise-34-percent-to-30-7-trillion

Chen, J. (2020a). *Defensive stock.* Retrieved from https://www.investopedia.com/terms/d/defensivestock.asp

Chen, J. (2020b). *Socially responsible investment (sri).* Retrieved from https://www.investopedia.com/terms/s/sri.asp

Chen, J. & Scott, G. (2020). *Safe haven.* Retrieved from https://www.investopedia.com/terms/s/safe-haven.asp

Cherowbrier, J. (2019). *Ethical investments in europe - statistics facts.* Retrieved from https://www.statista.com/topics/3973/ethical-investments-europe/

Christy, J. (2019). *How currencies impact international investments.* Retrieved from https://www.thebalance.com/how-currencies-impact-international-investments-1978999

Ciovacco Capital Management. (n.d.). *Utility stocks in bear markets.* Retrieved from https://www.ccmmarketmodel.com/utility-stocks

Connolly, S. (2019). *Down but not out: gambling stocks have a bright future.* Retrieved from https://moneyweek.com/501414/down-but-not-out-gambling-stocks-have-a-bright-future

Cussen, M. P. (2019). *Value or growth stocks: Which is better?* Retrieved from https://www.investopedia.com/articles/professionals/072415/value-or-growth-stocks-which-best.asp

Damodaran, A. (2011). *The little book of valuation: How to value a company, pick a stock and profit.* John Wiley Sons Inc.

Daniel, K. & Titman, S. (1997). Evidence on the characteristics of cross sectional variation in stock returns. *The Journal of Finance*, *52*(1), 1–33.

Dopkowski, J. (2019). *Sugar & sin.* Retrieved from https://medium.com/lhistoire-des-affaires/sugar-sin-9b0ae07dbc20

Dorsainvil, R. (2019). *How culture impacts investing habits.* Retrieved from https://www.forbes.com/sites/riankadorsainvil/2019/10/03/how-culture-impacts-investing-habits/?sh=138f1bd16572

Durex Network. (n.d.). *About the durex network.* Retrieved from http://www.durexnetwork.org/en-gb/aboutthedurexnetwork/

Fabozzi, F. J., Ma, K. C. & Oliphant, B. J. (2008). Sin stock returns. *The journal of portfolio management: a publication of institutional investors*, *35*(1), 82–94.

Fama, E. F. & French, K. R. (1993). Common risk factors in the returns on stocks and bonds. *The Journal of Economics*, *33*(1), 3–56.

Fama, E. F. & French, K. R. (1996). Multifactor explanations of asset pricing anomalies. *The Journal of Finance*, *1*(1), 55–84.

Fama, E. F. & French, K. R. (2003). The capital asset pricing model: Theory and evidence. *The Journal of Economic Perspectives*, *18*(3), 25–46.

Fama, E. F. & French, K. R. (2014). A five-factor asset pricing model. *The Journal of Financial Economics*, *116*(1), 1–22.

Fever-Tree. (2020). *About us.* Retrieved from https://fever-tree.com/en_GB/about-us

Fontinelle, A. (2019). *Systematic risk.* Retrieved from https://www.investopedia.com/terms/s/systematicrisk.asp

Fontinelle, A. (2020). *Sin stocks are shares in companies whose business can be considered unethical — here's why they're so enticing and who the major players are.* Retrieved from https://www.businessinsider.com/what-are-sin-stocks?r=US&IR=T

Frazzini, A. & Pedersen, L. H. (2013). Betting against beta. *The Journal of Financial Economics*, *111*(1), 1–25.

French, K. R. (2020). *Kenneth french' data library.* Retrieved from https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

Hair, J. F., Anderson, R. E., Tatham, R. L. & Black, W. C. (1995). *Multivariate data analysis* (Vol. 3). Macmillan.

Hale, J. & Ginty, B. (2020). *Esg investing comes of age.* Retrieved from https://www.morningstar.com/features/esg-investing-history

Hayes, A. (2018). *Regulatory risk.* Retrieved from https://www.investopedia.com/terms/r/regulatory_risk.asp

Hayes, A. (2020). *Fama and french three factor model.* Retrieved from https://www.investopedia.com/terms/f/famaandfrenchthreefactormodel.asp

Hong, H. & Kacperczyk, M. (2009). The price of sin: The price of social norms on markets. *Journal of Financial Economics*, *93*(1), 15–36.

Huntington, S. P. (1993). The clash of civilizations? *Council on Foreign Relations*, *72*(3), 22–49.

Investopedia Staff. (2020). *Using beta to understand a stock's risk.* Retrieved from https://www.investopedia.com/investing/beta-gauging-price-fluctuations/

Jankowski, M., Krzystanek, M., Zejda, J. E., Majek, P., Lubanski, J., Lawson, J. A. & Brozek, G. (2019). *E-cigarettes are more addictive than traditional cigarettes - a study in highly educated young people.* Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6651627/

Jarrow, R. & Protter, P. (2013). Positive alphas, abnormal performance, and illusory arbitrage. *Mathematical Finance*, *23*(1).

Jensen, M. C. (1969). The pricing of capital assets, and the evolution of investment portfolios. *The Journal of Business*, *42*(2), 167–247.

Kasman, B. (n.d.). *10 years after the financial crisis.* Retrieved from https://www.jpmorgan.com/insights/research/10-years-after-crisis

Kenton, W. (2019). *Mature firm.* Retrieved from https://www.investopedia.com/terms/m/mature-firm.asp

Kenton, W. (2020a). *Capital asset pricing model (capm).* Retrieved from https://www.investopedia.com/terms/c/capm.asp

Kenton, W. (2020b). *Litigation risk.* Retrieved from https://www.investopedia.com/terms/l/litigation-risk.asp

Kenton, W. (2020c). *Sin stocks.* Retrieved from https://www.investopedia.com/terms/s/sinfulstock.asp

Lintner, J. (1965). The valuation of risk assets and the selection of risky investments in stock portfolios and capital budgets. *The Review of Economics and Statistics*, *47*(1), 13–37.

Metoyer, A. B. (n.d.). *Socially responsible investing.* Retrieved from https://www.britannica.com/topic/socially-responsible-investing

Mossin, J. (1966). Equilibrium in a capital asset market. *Econometrica*, *34*(4), 768–783.

Mullins Jr., D. W. (1982). Does the capital asset pricing model work? *Harvard Business Review*, 105–113. Retrieved from https://hbr.org/1982/01/does-the-capital-asset-pricing-model-work

NHS. (2017). *Cannabis: the facts.* Retrieved from https://www.nhs.uk/live-well/healthy-body/cannabis-the-facts/

NSSF. (2020). *Firearm and ammunition industry economic impact report 2020.* Retrieved from https://www.nssf.org/government-relations/impact/

O'Shea, A. & Benson, A. (2020). *What is socially responsible investing (sri) and how to get started?* Retrieved from https://www.nerdwallet.com/article/investing/socially-responsible-investing

Pandia Health. (n.d.). *Birth control and religion.* Retrieved from https://www.pandiahealth.com/resources/birth-control-religion/

Pastor, L. & Stambaugh, R. F. (2003). Liquidity risk and expected stock returns. *The Journal of Political Economy*, *111*(3), 642–685.

Patrick, A. O. (2018). *Australia's gun laws are not a model for america.* Retrieved from https://www.nytimes.com/2018/02/23/opinion/australias-gun-laws-america.html

Patton Funds. (n.d.). *Remembering a lost decade.* Retrieved from https://www.pattonfunds.com/remembering-a-lost-decade.html

Philip Morris International. (2019). *Pmi: A company in transformation towards a smoke-free future.* Retrieved from https://www.pmi.com/our-transformation/pmis-transformation

PRI. (n.d.-a). *About the pri.* Retrieved from https://www.unpri.org/pri/about-the-pri

PRI. (n.d.-b). *What are the principles of responsible investment?* Retrieved from https://www.unpri.org/pri/what-are-the-principles-for-responsible-investment

PwC. (2019). *Asset and wealth management revolution: Investor perspectives -*

rethinking purpose and performance. Retrieved from https://www.pwc.com/gx/en/industries/financial-services/assets/pwc-awm-revolution-screen.pdf

Ratner, B. (2009). The correlation coeffi cient: Its values range between + 1 / 1, or do they ? *Journal of Targeting, Measurement and Analysis for Marketing*, *17*, 139–142. Retrieved from https://www.researchgate.net/publication/263326577_The_correlation_coefficient_Its_values_range_between_1-1_or_do_they

Reuters, T. (2008). Datastream global equity indices. *Thomson Reuters Datastream.*

Reuters, T. (2020). *Thomson reuters datastream.*

Reuters Staff. (2010). *Recession ended in june 2009: Nber.* Retrieved from https://www.reuters.com/article/us-usa-economy-nber-idUSTRE68J2JJ20100920

Roberts, D. (2015). *Power utilities are built for the 20th century. that's why they're flailing in the 21st.* Retrieved from https://www.vox.com/2015/9/9/9287719/utilities-monopoly

Rogerson, P. A. (2001). *Statistical methods for geography.* SAGE Publications.

Sainsbury, P. (2020). *Are oil companies the new sin stocks? here's what that might mean for investors.* Retrieved from https://medium.com/@PeterSainsbury/are-oil-companies-the-new-sin-stocks-heres-what-that-might-mean-for-investors-b350bb61f717

Scott, B. (2016). *Ditching tobacco and arms does not make you an ethical investor.* Retrieved from https://www.theguardian.com/sustainable-business/2016/feb/15/tobacco-arms-ethical-investment-sin-stocks-finance

Sharpe, W. F. (1964). Capital asset prices: A theory of market equilibrium under conditions of risk. *The Journal of Finance*, *19*(3), 425–442.

Soderlund, J. R. (1985). Quakers and slavery: A divided spirit.

The Sin Stock Report. (2012). *List of sin stocks.* Retrieved from https://sinstocksreport.com/list-of-sin-stocks/

The Sin Stock Report. (2015). *What are sin stocks.* Retrieved from https://sinstocksreport.com/what-are-sin-stocks/

The Star Entertainment Group. (n.d.). *The star entertainment group.* Retrieved from https://www.starentertainmentgroup.com.au/starentertainmentgroup

The World Bank. (2020). *Taxes on sugar-sweetened beverages: International evidence and experiences.* Retrieved from https://openknowledge.worldbank.org/bitstream/handle/10986/33969/Support-for-Sugary-Drinks-Taxes-Taxes-on-Sugar-Sweetened-Beverages-Summary-of-International-Evidence-and-Experiences.pdf?sequence=6

Treynor, J. L. (1961). Market value, time, and risk. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2600356

Tromp, S. (2019). *Sin stocks: An investor's guilty pleasure?* Retrieved from https://www.initio.eu/blog/2019/9/30/sin-stocks-an-investors-guilty-pleasure

United Nations. (2015). Trends in contraceptive use world wide. Retrieved from https://www.un.org/en/development/desa/population/publications/pdf/family/trendsContraceptiveUse2015Report.pdf

US SIF. (2020). *Sustainable investment basics.* Retrieved from https://www.ussif.org/sribasics

USA Mutuals. (n.d.). *Vitium global fund.* Retrieved from https://usamutuals.com/vitium-global-fund/

Wallace, C. (2017). *What is negative screening?* Retrieved from https://www.theimpactivate.com/what-is-negative-screening/

Ward, K. & Wu, J. (2019). *How is esg affecting the investment landscape?* Retrieved from https://am.jpmorgan.com/gb/en/asset-management/adv/insights/market-insights/on-the-minds-of-investors/how-esg-affects-investment-process/

Wooldridge, J. (2012). *Introductory econometrics - a modern approach* (Vol. 5). Cengage Learning.

World Health Organization. (n.d.). *Contraceptive prevalence.* Retrieved from https://www.who.int/reproductivehealth/topics/family_planning/contraceptive_prevalence/en/

World Population Review. (2020). *Most christian countries 2020.* Retrieved from https://worldpopulationreview.com/country-rankings/most-christian-countries

Appendix

A1 Model Testing

To check whether there are any problems related to our regressions, and thereby results, we conduct several tests to assure that the Gauss-Markov assumptions and the stationarity requirement are satisfied.

A1.1 Portfolio Distributions

Although our sample size is sufficient with 240 observations, and we consequently can rely on the central limit theorem (Wooldridge, 2012), we want to check if the normality assumption is satisfied. We examine the distribution of the residuals of our portfolios by looking at their histograms and density lines, as well as QQ-plots. Figure A1.1 shows that our data is normally distributed. The density line is centered around zero, and there is limited skewness in the data. Figure A1.2 presents the QQ-plot for the standardized residuals of the sin portfolio, and shows that they form a line that is fairly straight in the middle, with small tails on each side. Figure A1.3 presents the histogram and density line for the standardized residuals of the comparable portfolio, and A1.4 shows the QQ-plot. The figures indicate the same as for the sin portfolio: the data is normally distributed around zero and there is limited skewness.

Figure A1.1: Histogram of model residuals, sin portfolio

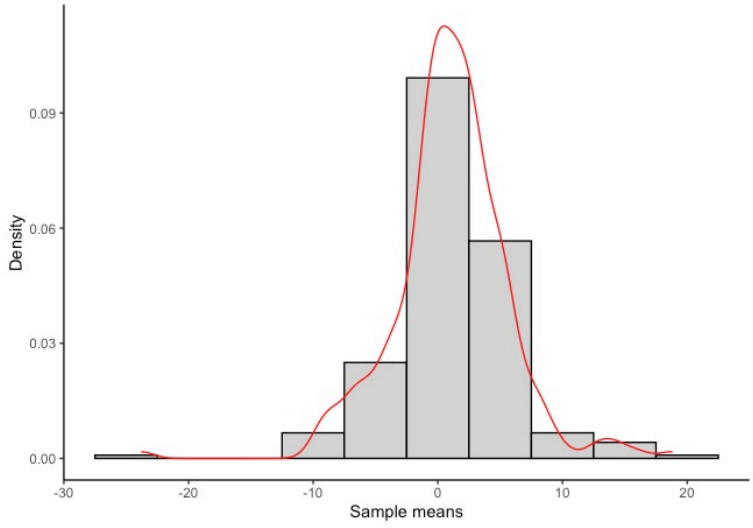


Figure A1.2: QQ-plot of model residuals, sin portfolio

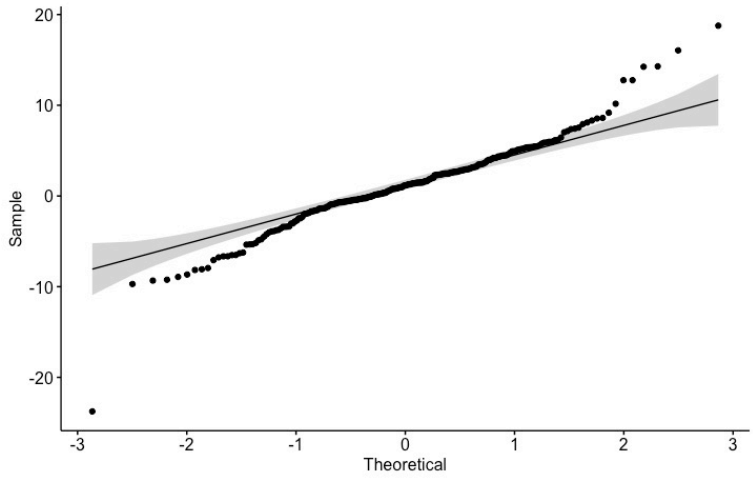


Figure A1.3: Histogram of model residuals, comparable portfolio

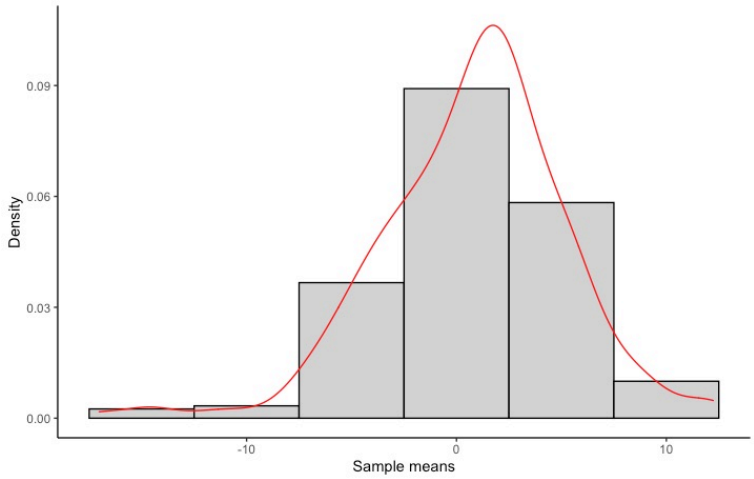
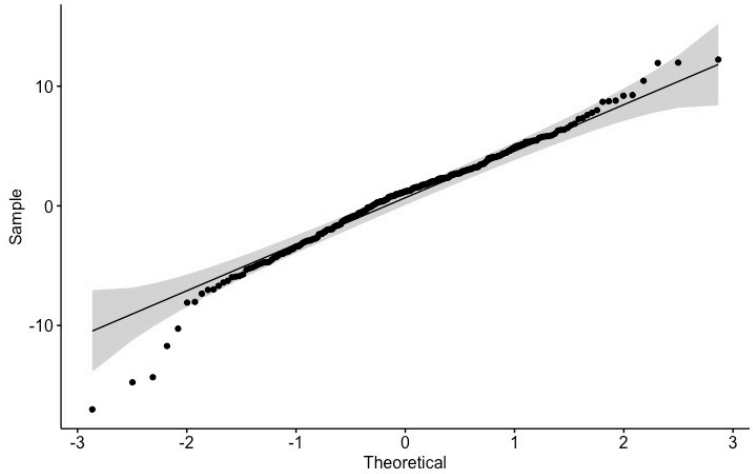


Figure A1.4: QQ-plot of model residuals, comparable portfolio



A1.2 Breusch-Pagan Test for Homoscedasticity

Table A1.1 presents the results of the Breusch-Pagan test applied to test for homoscedasticity. We test for homoscedasticity in both the sin and comparable portfolio, using the three-factor, four-factor (Carhart) and five-factor model, with and without momentum. In the table, "BP" represents the test statistic, which follows a chi-squared distribution. The null hypothesis is that the error variances are all equal, i.e. homoscedasticity.

The high P-values in the table indicate that we cannot reject the H0 of homoscedasticity. Hence, we conclude that we do not have presence of heteroscedasticity in our data. In other words, there is no clear necessity to adjust the standard errors for heteroscedasticity when conducting hypothesis testing based on our portfolios (Wooldridge, 2012).

Table A1.1: Breusch-Pagan test for homoscedasticity

	(BP)	**P-value**
Fama-French three-factor		
Sin portfolio	1.936	0.586
Comparable portfolio	1.996	0.573
Carhart		
Sin portfolio	6.231	0.183
Comparable portfolio	4.439	0.350
Fama-French five-factor		
Sin portfolio	2.983	0.703
Comparable portfolio	3.503	0.623
Fama-French five-factor + momentum		
Sin portfolio	8.024	0.236
Comparable portfolio	6.170	0.404

A1.3 Breusch-Godfrey Test for Autocorrelation

Table A1.2 shows the results of the Breusch-Godfrey test for autocorrelation. Autocorrelation is, in itself, no problem for the coefficient estimates. That is, the coefficient estimates are still consistent (Wooldridge, 2012). However, standard errors and statistical tests need to be adjusted for autocorrelation if it is present. In the table below, "LM" represents the test statistic. The null hypothesis is that there is no autocorrelation in our portfolios. Hence, a large test statistic and a low P-value indicate that we have a problem.

From the table we observe low test statistics and high P-values for our portfolios and cannot reject H0 for any of our tests. We therefore conclude that autocorrelation is not a problem in our data set.

Table A1.2: Breusch-Godfrey test for autocorrelation

	(LM)	**P-value**
Fama-French 3 factor		
Sin portfolio	0.011	0.916
Comparable portfolio	0.058	0.809
Carhart		
Sin portfolio	0.059	0.808
Comparable portfolio	0.115	0.734
Fama-French 5 factor		
Sin portfolio	0.011	0.918
Comparable portfolio	0.030	0.863
Fama-French 5 factor + Momentum		
Sin portfolio	0.003	0.959
Comparable portfolio	0.052	0.819

A1.4 Augmented Dickey-Fuller Test for Unit Root

Table A1.3 shows the results from the augmented Dickey-Fuller test for stationarity. The test is conducted for all dependent and independent variables used in our regressions. "DF" represents the test statistic and should be lower than a chosen critical value. The null hypothesis is that the data is non-stationary, i.e that a unit root is present. Hence, a high P-value indicates that we have a problem.

From the table we observe low P-values for our portfolios and pricing factors, and we can clearly reject H0 for all our tests at a 5% level. We therefore conclude that all our variables are stationary and can be applied to the OLS regressions without any problems.

Table A1.3: Augmented Dickey-Fuller test for unit root

Dependent Variables	**(DF)**	**P-value**
Sin portfolio	-14.09	0.01
Comparable portfolio	-13.13	0.01
Pricing Factors	**(DF)**	**P-value**
Rm-Rf	-10.50	0.01
SMB	-12.15	0.01
HML	-11.83	0.01
RMW	-12.39	0.01
CMA	-10.28	0.01
MOM	-12.27	0.01

A2 Multicollinearity

A2.1 Correlation Matrix

Table A2.1 shows the Pearson correlation coefficients for the Fama-French risk factors applied to our regressions as explanatory variables. From the table we see that most variables are correlated, however not to an extent where multicollinearity becomes a problem. The highest correlation is between the HML and CMA coefficients, representing value stocks versus growth stocks and conservative versus aggressive investment strategy companies. This correlation is 0.747, which is categorized as a strong positive linear

relationship according to Ratner (2009)[25]. Hence, we might have a problem with multicollinearity for these two variables which can weaken the statistical power of our regression models.

Table A2.1: Pearson correlation coefficients for Fama-French risk factors

	(Rm-Rf)	**SMB**	**HML**	**RMW**	**CMA**	**MOM**
(Rm-Rf)	1.000					
SMB	0.113	1.000				
HML	-0.019	-0.041	1.000			
RMW	-0.460	-0.271	0.170	1.000		
CMA	-0.364	-0.147	0.747	0.315	1.000	
MOM	-0.370	0.180	-0.227	0.236	0.077	1.000

A2.2 The Variance Inflation Factor

To further test if multicollinearity is a problem in our data, we use the variance inflation factor (VIF) to measure the amount of multicollinearity in our explanatory variables. Several recommendations for a maximum level of the VIF value have been suggested. For example, Hair et al. (1995) suggested 10 as an acceptable level, while Rogerson (2001) suggested a maximum level of 5. Regardless, the VIF function for the included explanatory variables, presented in table A2.2, indicate that multicollinearity is not a serious problem for our explanatory variables as they are all below 5. Hence, we use all the variables in our regressions. However, we keep the results from the correlation matrix in mind as we interpret the regression results.

Table A2.2: The Variance Inflation Factor for the Fama-French risk factors

	VIF
(Rm-Rf)	1.674
SMB	1.223
HML	3.228
RMW	1.478
CMA	1.458
MOM	3.447

[25]Correlation coefficients between ± 0.7 and ± 1 are categorized as high, and implies strong correlation (Ratner, 2009).

A3 Kenneth French' Continent Division

Figure A3.1 presents the division of countries into continents in Kenneth French' Data Library. We have focused on Europe, Asia Pacific excluding Japan and North America. As the table shows, both Europe and the Asia Pacific include some countries that are not included in our thesis. However, we believe the Fama-French factors retrieved from Kenneth French' Data Library are the most applicable factors we are able to find for the continents analyzed in this thesis.

Table A3.1: Kenneth French' division of countries into continents

Country	Developed	Developed ex US	Europe	Japan	Asia-Pacific ex Japan	North America
Australia	✓	✓			✓	
Austria	✓	✓	✓			
Belgium	✓	✓	✓			
Canada	✓	✓				✓
Switzerland	✓	✓	✓			
Germany	✓	✓	✓			
Denmark	✓	✓	✓			
Spain	✓	✓	✓			
Finland	✓	✓	✓			
France	✓	✓	✓			
Great Britain	✓	✓	✓			
Greece	✓	✓	✓			
Hong Kong	✓	✓			✓	
Ireland	✓	✓	✓			
Italy	✓	✓	✓			
Japan	✓	✓		✓		
Netherlands	✓	✓	✓			
Norway	✓	✓	✓			
New Zealand	✓	✓			✓	
Portugal	✓	✓	✓			
Sweden	✓	✓	✓			
Singapore	✓	✓			✓	
United States	✓					✓

A4 Regression Output for the Comparable Portfolio

Table A4.1 presents the regression results for the comparable portfolio where the dependent variable is the comparable portfolio's monthly returns less the market monthly returns.

Table A4.1: Regression results for the comparable portfolio's monthly returns in excess of the market monthly returns

	Model applied:			
	3 factor	Carhart	5 factor	5 factor + Momentum
Constant(α)	0.688**	0.773**	0.638*	0.678*
	(0.325)	(0.330)	(0.346)	(0.345)
Rm-Rf	-0.518***	-0.627***	-0.563***	-0.586***
	(0.069)	(0.076)	(0.088)	(0.089)
SMB	0.319*	0.379**	0.341*	0.440**
	(0.170)	(0.174)	(0.177)	(0.186)
HML	0.363***	0.319***	0.350*	0.217
	(0.118)	(0.121)	(0.196)	(0.211)
MOM		-0.120		-0.146
		(0.0083)		(0.088)
RMW			0.110	0.183
			(0.213)	(0.217)
CMA			0.003	0.132
			(0.278)	(0.287)
Observations	240	240	240	240
R^2	0.258	0.265	0.259	0.267
Adjusted R^2	0.248	0.252	0.243	0.248

Note: *p<0.1; **p<0.05; ***p<0.01 (standard errors in parenthesis).

The table provides the results for the comparable regressions. All models are estimated based on monthly data from January 2000 to December 2019. The dependent variables are $r_{comparables,t} - r_{mrkt,t}$. The constant represents the monthly alpha, i.e. the monthly abnormal returns in percentages. The coefficients on the explanatory variables captures the difference in exposure between the comparable portfolio and the market. The explanatory variable Rm-Rf is the market value-weighted market return minus the risk-free rate. SMB (small minus big) captures the portfolio's exposure to small market cap stocks. HML (high minus low) captures the portfolio's exposure to high book-to-market stocks. MOM (momentum) seizes the exposure to previous price movements. RMW (robust minus weak) captures the exposure to companies with robust profitabilities. CMA (conservative minus aggressive) seizes the exposure to a conservative investment strategy.

Firstly, the alpha is significant at a 5% or 10% level across all models. This indicates that the comparable portfolio outperforms the market, with 0.638% on a monthly basis, based on the five-factor model.

Moreover, the market risk factor is negative and statistically significant at a 1% level, indicating that the comparable portfolio mostly consists of low-beta stocks. This is reasonable, as utility stocks are known to be less risky than the market (Investopedia Staff, 2020). In addition, it is in line with the findings of Hong and Kacperczyk (2009), who found a beta below 1 for their utility portfolio. Hence, our hypothesis about the comparable stocks being "safe havens" seems to be correct.

Furthermore, the comparable portfolio loads positively on the SMB factor across all regression models. The sign and magnitude of the coefficient suggest that the abnormal return of the portfolio is in part explained by the exposure to small market cap stocks compared to the market. Moreover, the value factor is statistically significant for all models, except for the five-factor model with momentum. In other words, part of the return premium can be explained by the fact that the portfolio mainly consists of high book-to-market stocks compared to the market. However, looking at the five-factor model with momentum, we get an indication that the returns of the comparable portfolio are not attributed to any value premium.