

Are Sin Stocks Worth the Sin?

New evidence on sin stock performance in the United States

THEODOR STENMO
ALEXANDER HJORTH

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Abstract:

In this paper, we empirically test whether sin stocks outperform the financial market in the United States. The time period studied is from 2007-2021. We create a portfolio of all the publicly traded U.S. companies from the following industries: alcohol, tobacco, gaming and cannabis. Each industry is compared to a set of comparables so that we can obtain the accurate return of our sin portfolio. By employing a multi-factor performance measurement we are able to obtain evidence that there is a significant difference in the financial performance of ethical and unethical companies.

Keywords: sin stocks, excess returns, U.S. market, unethical investing, socially responsible investing, portfolio

Authors:

Theodor Stenmo (25100)

Alexander Hjorth (25129)

Tutor: Adrien d'Avernas

Examiner: Adrien d'Avernas

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1. Introduction

1.2 Background

The end object of all investors always align, that is to pursue returns in order to accumulate as much wealth as possible. For investors in the public market, that means green returns and minimizing losses. Unfortunately when losses do arrive, investors are presented with the decision to turn their back on that risky asset and stop that particular investment or to keep investing. If an opportunity arises to make even more money and get a better excess return elsewhere, people often quickly latch onto that chance. However, in recent decades especially, there has been an ever growing factor of ethical investing which firms and individuals are willing to endure. The potential additional costs associated with ethical investing often does not mean that investors aren't making any money, instead, it is about possibly accepting a lower return than otherwise. The idea of pursuing ethical investments due to social norms despite its possible impact on profit has recently been in the spotlight. It is a concept that has undergone significant research over time. Early studies shaping knowledge about this angle in economics is Becker's (1957) model of discrimination. Through his model, he demonstrates that agents, i.e. employers, bear financial costs from not interacting with certain types of people due to prejudiced norms made by the community. The concept of taking on financial costs in order to get rewarded by other sentiments has thus been prominent throughout history and is part of the nature of human beings. This argument was further expanded by numerous studies but more importantly articulated from the point of view of an investor as written by Geczy, Stambaugh and Levin (2005) who claim that investors that have the aim of creating an optimal portfolio of risky assets, yet limit themselves to institutions that are seen as ethical, can risk a lower return. Recognizing that an individual's wants can significantly interfere with the potential returns may help readers understand why the public eye has turned its attention to analyze if the returns of ethical stocks are worth the possible cost they bear.

This paper provides new evidence as to how “sin stocks” have performed against the rest of the market. More specifically, it analyzes the returns of public sin companies listed in the United States in comparison to relative comparables in the public U.S. market. This study is of great interest to financial markets right now because there are clear trends against pro human vice funding¹. As a result, less people want to be associated with these companies and therefore avoid investing in their stocks.

Recent evidence supporting this claim can be seen in what is known as social responsible investing (SRI). SRI has been a practice for longer than many believe. In North America, SRI was shaped in the 1960s and 1970s during the rise of anti war movements, fighting for racial equality, women's rights, consumer protection and the environment (Townsend, 2020). As people

¹ These types of funds primarily invest in stocks in the alcohol, tobacco, gaming, and defense industries.

started to realize that there are ways of making money while not being associated with activities considered unethical, one of the first modern U.S. SRI mutual funds, the Pax World Fund, was founded. Its investment strategy avoided militarism, especially the Vietnam war and weapon contractors in general. (Renneboog, Ter Horst and Zhang, 2008)

The notable increase in research from authors has grown hand in hand with socially responsible investments. The Forum of Sustainability and Responsible Investing (U.S. SIF Report, 2020) reported that assets under management using sustainable investing strategies grew from \$12.0 trillion at the start of 2018 to \$17.1 trillion at the start of 2020, an increase of 42%. Given that this number was at around \$4.0 trillion in 2012, there has been a dramatic shift of capital within the U.S. In fact, as of 2020, 33% or one in three dollars, of the \$51.4 trillion in total U.S. assets under professional management are allocated to sustainable investing. Sustainable and responsible investments, often categorized as investments in ESG companies, are repeatedly classified as ethical due to the alignments between financial returns and the good the investment brings for the society / the environment. The share dollar value of these investments has increased remarkably due to ongoing ESG trends and environmental movements. In addition, society as a whole has started to put labels on what is deemed as ethical and unethical. This can be seen in everyday news, social media and any social interaction. People are getting a high level of exposure towards information regarding ethical behaviors and practices. Thus, from all the coverage, it does not come as a surprise that the amount of U.S.-domiciled assets invested by institutions that practice “ESG incorporation” grew 43% since 2018 to \$16.6 trillion in 2020 (U.S. SIF Report, 2020).

The growth in SRI funds has led to multiple publications about their performance. In fact, researchers have had opposing conclusions since studies first began. Examples of research done by Hamilton, Jo and Satman (1993) and Geczy et al. (2005) strengthen the argument that SRIs do not earn excess returns beyond traditional mutual funds, and that they are instead reaping costs due to having a constraining investment strategy that focuses on companies labeled as ethical. A similar conclusion was presented by Bauer and Otten (2005) where he argued in his studies that there was no statistical significance proving that SRI mutual funds outperform or underperform compared to traditional mutual funds. To broaden the spectrum even more, (Financial Times, 2006) suggested that there are excess returns to be made from unethical companies in tobacco, gambling, and alcohol industries who yield higher returns.

This paper categorizes the word unethical stocks in the public U.S. market into “sin stocks”. Since there is no clear definition of sin stocks, this analysis follows one defined by Hong and Kacperczyk (2009) with an extended industry, namely, publicly traded companies involved in the production of alcohol, tobacco, gaming and cannabis. The original sin industries of alcohol, tobacco and gambling originate from a term of industries known as “Triumvirate of Sin”. The term gaming will in this paper be changed to gambling for clarification reasons. The change is

being done because during the time period studied by Hong et al. (2009) the gaming industry with consoles etc was not as big, so to differentiate the two we will go with the term *gambling*. To deepen the field of study, we decided to extend Hong et al. (2009) by including the cannabis industry.

Alcohol in the U.S., as for many other countries, has been around for centuries. Due to the numerous problems such as health related issues, crime and social issues that arose with the consumption of alcohol, in the 1920s, the U.S. banned the manufacture, transportation, and sale for thirteen years (Wallenfeldt, 2022), also known as the prohibition. After that period, it was introduced back into society, and people realized the problems it could lead to. Despite laws around alcohol changing from time to time, today, it is a heavily consumed good by many over the age of 21. Nonetheless, societies are aware of the possible addiction and health problems associated with alcohol which are, amongst others, two of the main reasons why it is part of our sinful industry classification.

The tobacco industry has been a fairly recent introduction to the U.S. It wasn't until the 1900's that cigarettes were produced and sold in the U.S. There were multiple studies that followed up warning the public of tobacco's dangers. However, it took roughly 60 years, until 1965, when the Congress passed the Federal Cigarette Labeling and Advertising Act. This law required the surgeon general to give a warning on all tobacco packages. On top of this, more regulations followed, for example the advertising act that was enforced in 1971 when advertising through television and radio channels of tobacco products was banned. One of the most recent legal updates for purchasing tobacco is the increased minimum age to 21. Similar to alcohol, due to its health problems, this industry is classified as sinful.

Of the four, gambling in the U.S. has experienced some of the fastest growth in the past years. For decades, gambling was a regulated activity to prevent criminal involvement and addiction issues associated with it (Engebø, J. et al., 2021). By mid 1999, over 260 casinos and gambling outlets had opened across 26 states in the U.S. (Chen and Feng-Shun, 2021). Today, 48 states grant some form of regulated gambling highlighting the exponential growth seen within the industry. Like alcohol and tobacco, gambling preys off individuals with addictions and despite the recent easing from the different states, gambling is still regarded as a sinful industry.

Given the extension of the analysis, cannabis has been a criminalized industry for a long time and as a result it has been stigmatized which has led to a lot of its negative connotation (Cutler, 2009). Since an individual is under the influence when cannabis is consumed, many people do not like the idea of it being a widely consumed good. This is especially the case seen worldwide, however, the U.S. have a progressive stance on this matter and are in many states starting to allow for recreational and medical use. Today, 37 states allow for medical use whereas 21 states

allow recreational use. Nonetheless, due to its history of being a longstanding criminalized industry, as well as its recent hype, it is an interesting industry to include in the sin portfolio.

Many individuals in the U.S. identify alcohol, tobacco, gambling and cannabis as sinful for two primary reasons: they contain addictive properties and / or because they bear social consequences when consumed excessively (Hong et al. 2009). In addition, cannabis is regarded as sinful since it was previously classed as an illegal substance in the U.S., and shares similar characteristics with alcohol, tobacco, gambling. These four industries are ideal for our analysis as they are some of the most widely consumed sinful goods.

1.3 Research question

The main studies suggesting sin stocks outperform the market on a risk-adjusted basis over a studied period of time have been performed by Hong et al. (2009), Fabozzi, Ma and Oliphant (2008) and Salaber (2009). In contrast to Hong et al. (2009) and Fabozzi et al. (2008), Salaber (2007) defines the geography of her study as Europe. The study is thus conducted on European sin stocks within tobacco, alcohol and gambling. Interestingly enough, the results from Salaber (2007) are in line with the ones obtained by Fabozzi's (2008) study, suggesting a global trend of sin stocks having an excess return.

From studies mentioned, there is empirical evidence indicating that sin stocks have produced abnormal returns in the respective time periods. Since sin stocks performance is of great interest to the financial world, this paper aims to deepen research in this field by asking the question:

Did American sin stocks outperform the market on a risk-adjusted basis during the period 2007-2021?

The findings of this study will be used to extend previous research on sin stock performance in the American market. By replicating many performance measures used in previous studies, an analysis of sin stocks' abnormal returns during the time period will be executed. This will be done using the Capital Asset Pricing Model (CAPM) and the Fama and French (1992) three-factor model and Carhart (1997) four-factor model.

This study will highlight the performance of sin stocks from the years 2007 to 2021. In comparison to other studies, this analysis will track the sin stocks through two time periods of significant economic crisis: the 2007/2008 financial crisis as well as the most recent COVID period. By diving deeper into the individual time periods, this paper will be able to analyze if it's worth holding sin stocks during times of economic crisis'.

Moreover, cannabis has also been included as an extension since it is a rapidly growing industry in the U.S. right now that has taken the center stage. It is still a controversial industry where

many in the country have opposing views, as seen by the fact that only some of the states have legalized recreational use.

In addition, the whole world for the past 5-10 years has had a great focus on ESG. This has significantly changed the way many companies do business and altered many investor strategies. This can be seen through the ever growing socially responsible investing (mentioned in the introduction) which has significantly increased investors allocation to SRI assets and added pressures for investors to avoid sin stocks, affecting their valuation.

1.4 Methodology

1.4.1 Sample selection

Despite the time difference between this research and that of Hong et al. (2009), their method is still applicable. Thus, after narrowing down to the Triumvirate of Sin with an extension of the cannabis industry, as described above, the next step was to identify the applicable stocks. Alcohol and tobacco stocks were selected by analyzing the 48 industries included in the Fama and French (1997) classifications. From the classifications, we were able to obtain our groups: alcohol or beer (group 4) and smoke or tobacco (group 5). Since each group is associated with SIC codes, we obtained that sic codes 2080-2085 represented beer or alcohol (group 4). Using the same process, smoke or tobacco was represented by SIC codes 2100-2199. The reason it was not possible to obtain gambling from this list was because Fama French does not make the separation between gambling stocks and hotel or entertainment stocks. Therefore, the NAICS classification scheme was used instead to select the gambling stocks. NAICS codes: 7132, 71312, 713210, 71329, 713290, 72112, and 721120 were the ones used as they concerned gambling in North America. Meanwhile, public cannabis companies listed in the U.S. were obtained through the Bloomberg terminal's tool EQS screen. Our list of sin stocks thus became a combination of group 4 and group 5 from Fama and French (1997) classification scheme, NAICS group for gambling and an output from the Bloomberg terminal for the cannabis companies.

The expanded 50-industry group is what we are left with. The data for beer or alcohol as well as smoke or tobacco was derived from the CRSP database. This database was chosen as it has the most comprehensive collection of security prices, returns, and volume data for the NYSE, AMEX and NASDAQ stock markets. Similarly, the NAICS list gave us a list of gambling stocks across all of North America and since it was not only the U.S., we had to filter out the other countries. Data on the cannabis companies was taken from Bloomberg terminal as CRSP did not include the trading information about the cannabis industry.

To further narrow down the list into the companies that operate within alcohol, tobacco and gambling, a search across segment level was necessary. Through COMPUSTAT segment data,

we were able to get information on SIC and NAICS codes from the different segments of a company, during the time period 2007-2021. Bloomberg has a different system and the output was the most accurate list possible therefore this step had already been performed.

The next step of classifying our list was to decide upon if a stock really was a sin stock. We first included companies that had a SIC code in group 4 or group 5, NAICS code in gambling, as well as cannabis companies as defined above. The segmenting step is very important as it augments the list to help us find companies which have diversified operations. Once this list was complete, every company was googled to understand exactly what industry they were in and what type of business they perform. This step was crucial for the NAICS gambling codes as there were a few companies who were miss placed such as Second Solar inc. Our list of sin stocks was then cross checked with lists provided by Hong et al. (2009) as many of the companies in their list were still active in our time period. Worth mentioning about the cannabis stock sample, is that it may be exposed to survivorship bias² since the Bloomberg screening tool could only identify firms active today. However, the bias is likely relatively small since our start date, 2007, for the sample was not that long ago.

After this step, the final list of sin stocks was compiled. Based on the three screenings - the first applying the Fama French (1997), NAICS classification scheme at a company level and the Bloomberg EQS screening tool, then looking at segment level using COMPUSTAT segment data and finally hand picking companies that do not belong to our final list of sin stocks.

² Survivorship bias related to portfolio construction occurs when only including active stocks to measure portfolio performance. By not including firms that no longer exist in the sample, the portfolio returns etc. may be overestimated.

2. Literature Review

Given the analysis of this paper is based on a specific time period of 2007 to 2021, there is minimal supporting evidence from the more recent years. However, previous research has been done to help conclude if sin stocks do outperform comparables on a timely basis.

Hong et al. (2009) conducted a study where they investigated sin stocks characteristics on the U.S. market, such as excess returns compared to their comparables and the social norms related to sin stocks. The paper mainly focused on the years 1965-2006, but also included a longer time period between the years 1926-2006. Given the success of their study, we decided to follow their stock selection methodology as mentioned above. Their selection of stocks was based off of the Fama-French (1997) industry classification groups 4 and 5 (namely, alcohol or beer and smoke or tobacco) and the NAICS codes for gambling: 7132, 71312, 713210, 71329, 713290, 72112, and 721120. The list of sin stocks produced was then later augmented with a screening on a segment level using COMPUSTAT segment data. Hong et al. (2009) concluded that their equally weighted portfolio with a long position in sin stock and short position in comparable firms had an average monthly excess return of 0.96% for 1965-2006. Moreover, their time-series regression with the same dependent variable, as just mentioned, yielded a statistically significant return of 26 basis points per month after adjusting for the Carhart four-factor model for 1965-2006. They also computed the same regression over 1926-2006 which the model yielded an alpha of 31 basis points per month, with significance. Since their study was over such a long timer period, it contributes to that U.S. sin stocks have outperformed the market over time.

An interesting comparison to Hong et al. (2009) was a study by Salaber (2007) who set out to study whether sin stocks outperform markets in other places than the U.S. Salaber selected 18 European stock markets, and the industry definition of the sin stocks in the portfolio was tobacco, alcohol and gambling. This study was examining the time period 1975 to 2006. Salaber provided evidence as to reasons why sin stocks listed in some countries outperform others. The author proved that additional factors such as religion, taxation and litigation risk all play a part in the return of sin stocks. This was an important addition as all these factors change amongst different markets. The authors' results revealed a positive alpha as well as significance. Later in 2009, another study was conducted by Salaber (2009) on the U.S. market with the same industry classifications. The study conducted obtained the same results as Hong et al. (2009), that sin stocks produce significant abnormal returns. The study proved that sin stocks during the period got better excess return compared to both comparables and the market. As an extension, the paper proved that sin stocks produce significant abnormal returns compared to the market during contraction periods, but not during economic expansion.

The argument that sin stocks have abnormal returns was further strengthened by Fabozzi et al. (2008) research. They selected a sample of sin stocks from 21 countries during the time period

1970 to 2007. From these 21 countries, their list comprised of companies from six industries, namely, alcohol, defense, biotech, tobacco, gambling and pornography. Despite having a different sin stock industry definition and a global perspective, they found that their portfolio of stocks had a positive and significant absolute return of 3% annually on the market during their time period.

For the importance of our study, Statman and Glushkov (2009) tested to see if an investor weights their stocks towards companies with high social responsibility scores, would it compensate for the incurred loss by excluding sin stocks. Their portfolio of sin stocks was based on the U.S. market with companies operating in the industries of alcohol, tobacco, gambling, weapons and nuclear operations. Their test to see the excess return of their sin stock portfolio resulted in a significant positive alpha between 2-3% per year for the one, three and four factor model.

Kim and Venkatachalam (2011) is an interesting paper to include because they took a slightly different approach by examining if higher sin stock returns could be due to greater levels of information risk. This would be the case due to bad financial reporting quality. They obtained results suggesting that a lack of reporting quality cannot be used to explain the high returns of sin stocks. The alpha they obtained was positive and significant. An additional finding was that investors were willing to neglect sin stocks due to social norms at the expense of excess returns. This provides further evidence that investors are greatly affected by social norms.

Karlén and Poulsen (2013) conducted a similar study to Hong et al. (2009) with a portfolio based on the U.S. market of industries within alcohol, defense, gambling and tobacco between the period 1973 to 2012. They concluded that their portfolio outperformed the market by a positive and significant 5.8% annually, with tobacco having the highest abnormal returns.

In 2016, two interesting papers were written regarding sin stocks. Liston. et al. (2016) analyzed a portfolio of U.S. stock from 1988 to 2009 with a similar industry definition to Hong et al. (2009): alcohol, tobacco and gambling. They tested for the effects of investor sentiment on sin stocks and concluded that after controlling for it, sin stocks do not produce abnormal returns. In addition, Lobe and Walkshäusl (2016) created three different sin stock portfolios: global, regional and domestic. Their comparison of portfolios was to a comparable socially responsible portfolio. Their industry definition was alcohol, tobacco, gambling, weapons, pornography and nuclear power. What stood out was that results for the excess returns were positive however they were insignificant. A possible reason for this could be that nuclear power represented 46% of the portfolio.

Richey wrote three different research papers each building on each other with the same study of daily returns of alcohol, tobacco and gambling stocks in the U.S. The first paper was Richey

(2014) where tests are done from the CAPM and the Fama-French three factor model. These results proved to be positive and significant. To further his research, Richey (2016) adds the Carhart Four Factor model. Despite adding another model, the research still holds that the sin industries have significant and positive alpha throughout the time period of 1995-2015 as well as outperform the overall market. In his latest research, Richey (2017) includes the Fama-French Five-Factor model, which is an extended version of the Richey (2014) test by adding profitability and investments to the Fama-French three factor model. Interestingly enough, the addition of the variables resulted in a positive alpha but it was now insignificant.

Blitz and Fabozzi (2017) conducted a study to examine if sin stocks provide a premium for the reputation risk they carry. Their study was conducted on the U.S., Japanese, European and global stock market. For Japan, Europe and the global market, the time period was 1990-2016, whereas, for the U.S. it was 1963-2016, 1973-2016 and 1990-2016. Their initial hypothesis was that the sin stocks are underpriced as they have such a negative connotation associated with them that investors who are willing to bear the reputation risk will also get an abnormal return. Their study involved several models with the ultimate finding that sin stocks produce positive but statistically insignificant returns for the five factor model including a BAB (betting against beta). The research concluded that there is not enough evidence that sin stocks provided a premium for the negatively associated reputation risk they carry after control for the multiple variable such as size, value, momentum factors, the profitability factor RMW (robust minus weak) and the investment factor CMA (conservative minus 7 aggressive) as well a beta factor BAB by Frazzini and Pedersen (2014).

Winberg (2019) studied the monthly returns of sin stock portfolios of the Nordic markets from 1990 to 2018. The research defines the stocks in the portfolio as companies from the following industries: tobacco, alcohol, gambling and weapons. In comparison to many of the other studies, Winberg (2019) has two main dependent variables such as SMC (Sin Minus Comparable) and SOMO (Sin Oil Minus Other). Overall, this study was not able to conclude that sin stocks have any particular excess return to the Nordic market.

To summarize, from previous research there is a clear trend that sin stocks outperform the market in comparison to other stock portfolios. However, there are four papers which do not come to the same conclusion, namely, Liston. et al. (2016), Lobe et al. (2016), Blitz et al. (2017) and Winberg (2019). Possible reasons for this are different markets, extra factors involved in the analysis as control variables and different industry classifications.

3. Data

Table 1.

From the time period 2007 to 2021, the portfolio of sin stocks is recorded below. It represents the year by year number of sin stocks between the four different industries (alcohol, tobacco and gambling and cannabis) and a combination of them. The sum at the bottom is the number of distinct companies per industry throughout the time period.

Panel A: Distribution by Year

Variable	All	Alcohol	Tobacco	Gambling	Cannabis
2007	123	36	6	81	29
2008	119	35	5	79	32
2009	115	32	5	78	35
2010	115	33	5	77	34
2011	119	36	5	78	34
2012	114	36	5	73	39
2013	106	36	5	65	39
2014	108	35	6	67	43
2015	105	35	5	65	45
2016	100	34	5	61	49
2017	96	34	4	58	50
2018	95	33	4	58	56
2019	89	32	4	53	59
2020	89	30	4	55	62
2021	88	29	4	55	65
Unique companies	113	31	11	71	65

The first output from the data is Table 1 which shows a year by year look at the selected sin stocks from 2007 to 2021. This table illustrates how many sin stocks were public in the U.S. during a specific year. The total at the bottom demonstrates the number of distinct names, for the sin stocks from 2007 to 2021, there were a total of 113 distinct names, of which 31 were alcohol or beer, 11 were smoke or tobacco, 71 gambling and 65 cannabis companies. The number of alcohol and tobacco sin stocks have been marginally decreasing throughout our time period and the gambling industry experienced the largest decrease in the number of public companies. As

the gambling market was still fairly new in 2007, there were a lot of companies trying to enter the market. Oftentimes in the new markets there are a lot of players at first and as time goes on a few leading companies start to consolidate and buy the smaller ones, or some go out of business. By looking at the number of companies, cannabis has seen some serious growth. Nonetheless, this list of sin stocks gives us the tools to make ground breaking comparisons to the U.S. market of the matching time period.

3.1 Variables

3.1.1 Variables in time-series return regressions

For the time series return regressions for 2007-2021, the dependent variable $SINPt-COMPt$ is the monthly return of an equally weighted portfolio (EWP) of sin stocks (alcohol, tobacco and gambling), net of an equally weighted portfolio of comparable stocks. Like Hong and Kacperczyk's paper (2009), the comparable stocks are from Fama and French (1997) industry groups 2 (food), 3 (soda), 7 (fun) and 43 (meals and hotels), where soda is the comparable industry to alcohol, food to tobacco and cannabis, and fun together with meals and hotels to gambling. $MKTPREMt$ is the monthly return of the CRSP value-weighted portfolio in month t , net of the risk-free rate. $SMBt$, $HMLt$, and $MOMt$ are well-known portfolio return data sets downloaded from Kenneth R. French's website. SMB (small minus big) is the monthly return of a long portfolio on small stocks and short on large stocks, HML (high minus low) is monthly return of a long portfolio on high book-to-market stocks and short on low book-to-market stocks, i.e., long value stocks and short growth stocks. Lastly, MOM (momentum) is the monthly return of a portfolio that takes a long position on past 12 month return winners and a short position on past 12 month return losers.

In addition to conducting the same portfolio as Hong et al. (2009), an equally weighted portfolio of the same sin stock industries (alcohol, tobacco and gambling) including cannabis was also created. The variable $EXSINP2t$ is thus the excess monthly return of this equally weighted updated sin stock portfolio. For this portfolio, the comparable portfolio is left unchanged since there isn't any evident comparable industry to cannabis and it's assumed that food can be regarded as a peer to cannabis since it's the tobacco industry's comparable.

Supplementary time series regressions were also conducted for each sub-portfolio of the larger sin portfolio and comparables portfolio for 2007-2021. Here, $EXALCPt$ represents the monthly returns of an equally weighted portfolio of alcohol stocks, net of the risk-free rate and $EXFOODPt$ monthly returns of an EWP of food stocks, net of the risk-free rate. The same goes for the other variables such as $EXTOBPt$ (excess monthly return of equally weighted tobacco portfolio), $EXGAMPt$ (excess monthly return of equally weighted gambling portfolio), $EXCANPt$ (excess monthly return of equally weighted cannabis portfolio), $EXSODAPt$ (excess

monthly return of equally weighted soda portfolio), EXFUNHOTPt (excess monthly return of equally weighted portfolio of fun and meals and hotels stocks).

4. Empirical analysis

4.1 Results

4.1.1 Descriptive statistics

Table 2. reports descriptive statistics for each variable. Through these tables you get a quick understanding of the various variables by their arithmetic means, standard deviations and cumulative return for some.

Table 2.

Panel A: Time-Series Return Regressions (2007-2021)

Variable	Mean	Standard Deviation
<i>EXSINP (%)</i>	1.55	7.02
<i>EXCOMP (%)</i>	0.91	5.94
<i>MKTPREM (%)</i>	0.88	4.42
<i>SMB (%)</i>	0.08	2.42
<i>HML (%)</i>	-0.30	3.08
<i>MOM (%)</i>	0.05	4.71

It's clear that the majority of the sin stocks and sin portfolios, on average, have had higher monthly returns than their comparables for the period 2007-2021. Moreover, the standard deviation of the monthly returns is generally higher for the sin stocks than its comparables, indicating higher price volatility. For example, EXSINP which is the excess monthly return of the original sin portfolio has a mean of 1.55% return per month and a standard deviation of 7.02%, whereas EXCOMP, the comparables portfolio, has a mean of 0.91% and a standard deviation of 5.94. Thus, on average, the sin portfolio had a 0.64 percentage points higher monthly return than its comparable portfolio, but also a 1.08 percentage points higher standard deviation.

Panel B: Additional Times-Series Return Regressions Sub-portfolios (2007-2021)

Variable	Mean	Standard Deviation
<i>EXALCP (%)</i>	1.98	7.35
<i>EXTOBP (%)</i>	0.88	5.77
<i>EXGAMP (%)</i>	1.41	11.29
<i>EXCANP (%)</i>	0.72	4.15
<i>EXSINP₂ (%)</i>	1.13	4.28

Interestingly, when including cannabis stocks in the sin stock portfolio, the mean of monthly returns for the portfolio drops down to 1.13%, with a standard deviation of only 4.28 (see *EXSINP₂*). This effect is believed to be due to the lower mean and variation in prices of cannabis stocks (see *EXCANP*), mitigating the effects of the high mean of alcohol stocks (see *EXALCP*) and large standard deviation of gambling stocks (see *EXGAMP*). This is plausible due to the magnitude of cannabis on the overall sample, since the number of cannabis stocks have expanded a lot throughout the time period 2007-2021 (see Table 1.).

Panel C: Additional Times-Series Return Regressions Comparables (2007-2021)

Variable	Mean	Standard Deviation
<i>EXSODAP (%)</i>	0.98	5.43
<i>EXFOODP (%)</i>	0.86	4.62
<i>EXFUNHOTP (%)</i>	0.93	7.42

Regarding the comparable equally weighted sub-portfolios, we see that the mean of monthly returns are quite similar, with the soda portfolio expressing the largest number (see *EXSODAP*). Furthermore, the table suggests that the industries fun and meals and hotels experienced the highest monthly price volatility of the three sub-portfolios, as seen by the standard deviation of 7.42% (see *EXFUNHOTP*). This is consistent with gambling having the highest standard deviation of the sin sub-portfolios, which these two industry groups are comparable to.

Panel D: Descriptive Statistics Financial Crisis (Dec 2007-Feb 2009)

Variable	Cumulative Return	Mean	Standard Deviation
<i>EXSINP (%)</i>	-62.07	-4.14	7.83
<i>EXCOMP (%)</i>	-73.32	-4.89	7.59

According to the National Bureau of Economic Research (NBER), who are known for providing start and end dates to recessions in the U.S., the 2007-2008 recession officially started in December 2007 and ended in April 2009 (National National Bureau of Economic Research, 2021). However, since the U.S. market reached the bottom in the beginning of March 2009 (Forbes, 2010), and shortly thereafter began experiencing positive returns, the descriptive statistics for this crisis is from December 2007 until and including February 2009. In Panel D we see that, on average, the sin stock portfolio performed better monthly returns than the comparable portfolio during the recession by 0.75 percentage points. In addition, the cumulative return of the sin portfolio is less negative than the comparable portfolio, by 11.25 percentage points.

Panel E: Descriptive Statistics Financial Crisis (Rest of 2009)

Variable	Cumulative Return	Mean	Standard Deviation
<i>EXSINP (%)</i>	81.16	8.12	14.75
<i>EXCOMP (%)</i>	71.20	7.12	9.68

Panel E shows that our sin stock portfolio had better recovery after the market through, with an average monthly excess return of 8.12% during the rest of 2009, compared to 7.12% for the comparables portfolio - i.e., one percentage point larger. The cumulative return for sin stocks was also higher than their comparables, by 9.96 percentage points.

Panel F: Descriptive Statistics Covid-19 Recession (Jan-March 2020)

Variable	Cumulative Return	Mean	Standard Deviation
<i>EXSINP (%)</i>	-42.40	-14.13	11.30
<i>EXCOMP (%)</i>	-38.04	-12.68	10.81

The National Bureau of Economic Research declared that the recession related to the Covid-19 pandemic was between February and April 2020, lasting only two months (National Bureau of Economic Research, 2021). This table however is between January 2020 until and including March 2020 since U.S. market prices began showing positive returns in April 2020 (Pisani, 2021), likewise for our portfolios, and our portfolio returns for January 2020 were already negative. Contrary to the financial crisis shown in Panel D, Panel F shows a slightly higher negative cumulative return for the sin portfolio, as well as the mean of the monthly returns, compared to the comparables portfolio.

Panel G: Descriptive Statistics Covid-19 Recession (Rest of 2020)

Variable	Cumulative Return	Mean	Standard Deviation
<i>EXSINP (%)</i>	71.80	7.98	9.73
<i>EXCOMP (%)</i>	61.18	6.80	8.95

Panel G represents the remaining months of 2020, i.e., how well the two portfolios recuperated after the overall market downturn. Here we see that both the sin portfolio experienced higher returns than its comparables, with 10.62 percentage points higher cumulative return and 1.18 percentage points higher mean of the monthly returns.

4.1.2 Return Performance of Sin Stocks

To examine the return performance of sin stocks in our time period, we analyze the time series returns of a sin portfolio, net of comparables, to identify any excess returns while adjusting for well-known asset pricing model factors. This is done by constructing a long position in the equally weighted sin stock portfolio, while keeping a short position in the comparables portfolio. SIN-COMP represents this long-short portfolio, and is also the dependent variable in the regression. First, the dependent variable is estimated on the market premium, also known as the capital asset pricing model (CAPM), through the following linear regression model:

$$R_t = \alpha + \beta MKTPREM_t + \varepsilon_t \quad t=1, \dots, T, \quad (1)$$

where R_t is the dependent variable SIN-COMP which is the monthly return of an equally weighted sin portfolio, net of the monthly returns of an equally weighted comparables portfolio. $MKTPREM_t$ is the excess monthly return of the value-weighted CRSP index at time t , and ε_t represents the generic error term. Here, the important variable is α , alpha, which is the excess return of the SIN-COMP portfolio. Two other asset pricing models were also tested on the dependent variable SIN-COMP, the Fama-French three factor model including the *SMB* and *HML* factors, and also the Carhart (1997) four factor model including the momentum factor (*MOM*). Thus, our most conservative estimation is given by:

$$R_t = \alpha + \beta_1 MKTPREM_t + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 MOM_t + \varepsilon_t \quad t=1, \dots, T, \quad (2)$$

where R_t , α and ε_t denote the same thing as before, and the β_i 's are the loadings on the other factor portfolios used to estimate R_t .

Table 3. reports the coefficients and regression output of the various time-series return regressions for the portfolios. *** 1% significance; ** 5% significance; and * 10% significance.

Table 3.

Panel A: Time-Series Return Regressions (Net of Comparables): 2007-2021

Variable	ALPHA	MKTPREM	SMB	HML	MOM
SIN-COMP	0.0066** (0.0030)	-0.0135 (0.0658)			
SIN-COMP	0.0066** (0.0030)	-0.010 (0.0684)	-0.0231 (0.1253)		
SIN-COMP	0.0064** (0.0030)	-0.0060 (0.0704)	-0.0187 (0.1268)	-0.0258 (0.0994)	
SIN-COMP	0.0067** (0.0029)	-0.0746 (0.0712)	-0.0511 (0.1234)	-0.1726 (0.1054)	-0.2476*** (0.0719)

The results of the time series regressions of the various models can be seen in Table 3. The CAPM yields an alpha of 0.0066 (or 66 basis points per month), which is statistically significant at the 5% level. For the two-factor model (market and SMB), the alpha and significance level remain unchanged. When HML is included as well the alpha drops slightly to 64 basis points per month, and finally including MOM the alpha increases again to 67 basis points per month. All at 5% level of significance. We can also see that the momentum factor is highly significant with a loading of -0.2476, indicating that the dependent variable is negatively exposed to the momentum factor.

Panel B: Time-Series Return Regressions Including Cannabis (Net of Comparables): 2007-2021

Variable	ALPHA	MKTPREM	SMB	HML	MOM
SIN-COMP ₂	0.0068*** (0.0023)	-0.5130*** (0.0509)			
SIN-COMP ₂	0.0066*** (0.0022)	-0.4704*** (0.0516)	-0.2946*** (0.0944)		
SIN-COMP ₂	0.0061*** (0.0023)	-0.4714*** (0.0527)	-0.2755*** (0.0949)	-0.1111 (0.0744)	
SIN-COMP ₂	0.0055*** (0.0023)	-0.4693*** (0.0548)	-0.2843*** (0.0950)	-0.1511* (0.0812)	-0.0675 (0.0554)

Panel B of Table 3. show the regression output of the same model for the updated sin portfolio with cannabis stocks included. When including cannabis stocks in the sample, the CAPM yields a slightly higher alpha than before, with 68 basis points per month, and is statistically significant

at the 1% level. When including SMB, the alphas are the same as before and for the additional factors HML and MOM the alphas are slightly lower than the previous model.

Pancel C: Alcohol Time-Series Return Regressions (Net of Comparable): 2007-2021

Variable	ALPHA	MKTPREM	SMB	HML	MOM
ALC-SODA	0.0122** (0.0053)	-0.2418** (0.1177)			
ALC-SODA	0.0122** (0.0053)	-0.2456** (0.1224)	-0.0264 (0.2240)		
ALC-SODA	0.0126** (0.0054)	-0.2586** (0.1259)	0.0124 (0.2265)	0.0811 (0.1776)	
ALC-SODA	0.0128** (0.0054)	-0.3085** (0.1308)	-0.0111 (0.2266)	-0.0258 (0.1936)	-0.1804 (0.1321)

Supplementary time series regressions were conducted for all the sub-portfolios that make up the sin stock portfolio used for the general regression. Other than cannabis, the only sub-portfolio, net of its comparable that had a statistically significant alpha was the alcohol portfolio, net of its comparable portfolio soda. Results shown in Panel C of Table 3., CAPM yields an alpha of 1.22% per month with a statistical significance of 5%. The alpha is unchanged when adding the SMB factor, but increases to 1.26% when subsequently adding HML, and lastly 1.28% when estimated on the four-factor model, with again a 5% significance level.

4. Discussion

4.1 Sin Portfolio

Sin portfolios have and will always be subject to scrutiny. Most also argue that they carry a negative connotation for reasonable grounds. However, from an investor's point of view, it is important to remember that the industries these firms operate in are often regulated which leads to lower competition and creates stable profits (Kenton, 2022). When comparing our results to the research this paper is making an extension on, namely that of Hong et al. (2009) there is a clear uptick in the mean return of the sin portfolio in comparison to comparables. In fact, if the analysis is looked at from the most comparable point of view with the same industries, that is including alcohol, tobacco and gambling, the 1.55% mean monthly return obtained is more attractive than the 0.96% monthly return from the same industries in the time period 1965-2004. It goes to show that sin portfolios are even more attractive now than what they were in the past years. Interestingly enough, the sin portfolios have managed to perform better under circumstances of higher scrutiny, as seen since SRI investing is at its peak. It may thus be the case that tailoring one's portfolio to ethical stocks may impact one's returns. Infact, Statman et al. (2008) reinforce this claim by their findings which suggest that an SRI portfolio that excludes sin stocks received a small benefit which is greatly offset by the forgone return. Moreover, comparing our results to a more recent paper by Richey (2016), who regressed the excess returns of a sin portfolio on the Carhart four-factor model for 1995-2015, we see that our portfolio has a slightly higher alpha per annum than the one obtained in his paper. Even though his dependent variable in the model is the sin portfolio, net of the risk-free rate and ours is net of comparables, the comparison can still be made. Richey (2016) demonstrates an alpha of 7.67% per annum³ in the Carhart-model for 1995-2015, whereas our alpha is 8.04% per annum⁴ for 2007-2021. All above literature comparisons goes to show that the theory regarding abnormal returns of sin stock still holds, if not stronger in recent years than previous.

One important factor which has enhanced sin industries performance and protects their robust business model is that all these industries have high barriers to entry. The high barriers to entry come as important factors for investors since current companies can become stronger when few new players enter the market. A primary reason why they have high barriers is because they are highly regulated (Fontinelle and Kim, 2022). This means that an oligopoly is created from the existing companies - making it very hard to enter and gain market share. Having a solidified position in an oligopoly is a very positive sign as a company. Investors know that there is a high chance the company will be around for a very long time. In addition, if the company is in an

³ Calculated by taking the alpha of the dependent variable "*ViceFund*" in Exhibit 3. of Richey (2016), multiplied by 365 (since it's based on daily returns) and converted to a percentage.

⁴ Calculated by taking our alpha of "*SIN-COMP*" of the Carhart four-factor model in Panel A. Table 3., multiplied by 12 (since it's based on monthly returns) and converted to a percentage.

attractive industry that is growing the company will most probably grow as well, increasing investors incentive to buy a part of the company. A second reason why the barriers are high is due to the high taxes that sinful industries have (Fontinelle et al., 2022). By having high taxes, new comers will not be able to withstand the financial pressures. This once again strengthens the oligopoly other companies share in the industry.

4.2.1 U.S. vs. Europe

It is hard to tell if sin industries perform only as well on the U.S market. Infact, Lobe et al. (2011) performed research on the European market and were not able to get any definitive results. Though Lobe et al. (2011) obtained positive results for Europe, they did not get any statistical significance. In Lobe et al. (2011) study, the monthly alpha for the sin portfolio under the CAPM for Europe was .18% which was the same for the U.S. Under the CAPM in this study, U.S sin stocks obtained an alpha of 0.66% which is substantially higher than that of Europe under Lobe et al. (2011) research. A contradicting study by Salaber (2007) could be a possible explanation as for why the sin industry may be stronger in the U.S., Salaber (2007) found that the performance of sin stocks was highly dependent on the legal and cultural characteristics of a country such as its religious orientation, litigation risk as well as its level of taxation. Given that the U.S. is one nation, with fewer inner differences than some European countries, these results could point to the fact that the sin market is stronger in the U.S. than in Europe. Nevertheless, in order to understand more about sin stock performance, analyzing it from an industry basis is necessary as they differ to a great extent.

4.2 Alcohol

It is difficult to do a direct comparison to much of the literature about returns from the alcohol industry since other literature did not get as deep as to split up their industries and analyze the performance. However, one such paper did do so, namely, Fabozzi et. al (2008), where their research suggested that alcohol had an excess monthly return of 1.16% during the time period 1970-2007. The data in this study suggested a 1.55% excess monthly return for alcohol. Comparing that to the overall performance of Hong et al. (2009), there is a similar difference. Infact, Hong et al. (2009) sin portfolio return was 0.96%, however, this does include other industries than just alcohol and therefore could potentially make the results misleading. Richey (2016) also isolated alcohol stocks and regressed an alcohol portfolio on the Carhart four-factor model. In his paper, the annual alpha for the alcohol portfolio was 12.76%⁵ for 1995-2015 with 10% significance, whereas our number is 15.36% alpha per annum⁶ (also with 10% significance). As mentioned previously, these numbers cannot be compared perfectly since his portfolio only is net of the risk-free rate, while ours also is net of the comparable industry group for alcohol (soda). However, the results likely point to the evidence that alcohol stocks have continued to deliver abnormal risk-adjusted returns, and even somewhat higher in recent years. Digging into the reasons why the time period 2007-2021 has returned higher monthly returns for alcohol than previous studies have is crucial to understanding the difference.

The U.S. alcohol market is the longest standing one out of the industries in the analysis. Having seen a 32% growth with a CAGR of 2.0% from 2007-2021, the market has grown at the slowest rate out of them all (Conway, 2022). However, this does not come as a surprise. Despite its CAGR growth, the industry has still been able to obtain an average of a 1.98% excess monthly return. According to Grand View Research (2021), the demand for premium products within the alcohol industry has been driving the growth in North America. In the U.S., consumer preferences, improved standards of living, increasing disposable income labels, changing lifestyles are all simulating the level of demand premium alcohol is experiencing (Grand View Research, 2021). Namely this goes well with the market trends of the industry as the high-end alcohol segment has been the growth driver outpacing other segments. A conclusion to make from this is that the growth from the premium products has been the prime driver of investors sentiment and interest in being part of the alcohol industry.

⁵ Calculated by taking the alpha of the dependent variable “*AlcFund*” in Exhibit 3. of Richey (2016), multiplied by 365 (since it’s based on daily returns) and converted to a percentage.

⁶ Calculated by taking our alpha of “*SIN-COMP*” of the Carhart four-factor model in Panel C. Table 3., multiplied by 12 (since it’s based on monthly returns) and converted to a percentage.

4.3 Tobacco

When looking at the tobacco industry, it seems as though the industry has gone past its peak. Infact, Fabozzi et al. (2008) took a similar look by singling out the tobacco industry and during the years 1970-2007, tobacco had an average monthly return of 1.24% From this data, tobacco during the time period had a 0.88% monthly return. Even though the monthly return of Fabozzi et al. (2008) is higher, the research he conducted was based on 21 countries. However, in alignment with Fabozzi et al. (2008) study, Karlén et al. (2013) performed a study on the U.S. market from 1972-2012 and obtained an average excess monthly return of 1.23% which again is significantly higher than ours. Therefore, suggesting that investors' sentiment to hold tobacco stocks has decreased in the U.S.

One such reason might be because tobacco products have become increasingly unethical. The industry has always been a major contributor to both human and environmental damages (Tobacco Tactics, 2022). Taking a look at the start of the value chain at the growing, plantation and production end, it is clear that tobacco industry causes sizable harm to the environment through amongst other ways, deforestation, soil degradation and biodiversity loss. The World Health Organization estimated that about 3.5 million hectares are used yearly for the production of tobacco (Dr Khetrpal Singh, 2022). The majority of the tobacco does not come from the U.S., however, the companies grow their products on scarce land in food-insecure countries then use that product and export it back to their countries of sale (Tobacco Tactics, 2022). Taking up land to farm these products means that natural biodiversity is impacted as well as roughly 50 million trees being cut down yearly for production purposes (Action on Smoking and Health (ASH), 2021). Because people are so aware of these issues there is a strong affection against people holding the stock. So far only the environmental aspects have been touched upon, and yet there is much more such as farmers health, child labour, illegal production and humans health.

Zooming in on the effect tobacco has on humans, in most of its forms, has become one of the most toxic substances to consume due to the carbon monoxide, tar and other toxic chemicals (NHS inform, 2021). The human effects can be argued to be a stronger contributor to the unethicalness of the industry. When people start reading facts such as 8 million people die from the use of tobacco or second hand smoking each year, or that cigarettes cause about one in every fifth death in the U.S., it is hard to support companies in these industries ((World Health Organization, 2009) & (National Center for Chronic Disease Prevention and Health Promotion, 2020)). Because of the widespread information about the effects of tobacco that has not been as public or at the forefront before, the awareness could be a reason for the lower returns as less people want to hold such companies knowing the cause they are supporting. Which inturn explains why the monthly return from the years 2007-2021 is lower than in studies such as Karlén et al. (2013) and Fabozzi et al. (2008) where people were less knowledgeable about this topic and thus people were more keen to invest in the industry.

Due to the rising awareness and scrutiny that the tobacco industry has received, one would assume that the strong unethicalness of investing in tobacco industry would outweigh the possible returns. However, that is easier said than done when investors are looking at an industry with extremely high margins, hence overall profit, very low costs, little R&D, strong customer repetition as they are addicted, as well as strong pricing power due to their oligopoly positions - supported by our data with only 11 unique, publicly listed firms in the U.S. between 2007-2021 (Branston, 2021). The current regulatory restrictions which are for example forbidding advertising make it hard for new entrants to come into the market and promote themselves. In addition, because of their strong pricing power, when new regulations come into play such as tax increases, the tobacco companies use this as an opportunity to mask their increase in prices even further (Gilmore, Branston and Sweanor, 2010). In contrast to the moral standpoint, these impressive financial factors of the tobacco companies are likely seen as attractive for many investors, which leads them to people investing in the companies, and therefore can be an explanation as to why the tobacco companies still beat comparables.

4.4 Gambling

In Fabozzi et al. (2008) paper, which investigated sin stocks across 21 countries for the period 1970 to 2007, the average excess monthly return for the gambling industry was 2.29%. In this study, we obtained a slightly lower number of 1.41% but it can still be regarded as quite high since it is larger than our comparable groups fun, and meals and hotels which had a monthly excess return of 0.93%. In addition, we found that the U.S. public gambling industry had the largest standard deviations in monthly returns of all sinful industries. A similar result was found in Goodall's (1994) paper, that gambling stocks tend to experience more price volatility than the market and that they also have outperformed the market.

Gambling, in particular, has been an interesting industry during the studied time period from 2007-2021. In 2021, a reported \$53 billion revenue was earned throughout the U.S. This is up 21% from the previous all time high set in 2019 (Yakowicz, 2022). Undoubtedly, the U.S. gambling market is booming. Despite media attention that online gambling has received, slot, table and physical sportsbook accounted for 85% of the total revenue. Most of the big names are surpassing their earnings record which is partially also due to the recent introduction of online gambling. No other time period has had as many legal states, 48, in some shape or form of gambling (Fox, 2022). This again is another prime reason for the increase in revenue which has come from the volume of players in the U.S.. Given that the gambling companies' revenues are soaring, more than they ever have, it does not come to a surprise that their public stock valuations have also been increasing.

The optionality to gamble online has also accelerated the gambling market. Though it represents a much smaller proportion of the total gambling market, it is valued at about \$2 billion in the U.S, and is still forecasted to grow at roughly 18% per year from 2022-2027 (Mordor Intelligence,

2021). As most gambling companies have seen this trend, there are massive movements to shift focus within the industry. All the big players just to name a few, Churchill Downs, Eldorado Resorts and MGM have already established online platforms or have announced the launch of new platforms to solidify their position in the fragmented online gambling market (Mordor Intelligence, 2021). Certain factors such as increased smartphone adoption, accessibility to online gambling and the legalization of online gambling in numerous states are key drivers for the market growth. (BlueWeave Consulting and Research Pvt Ltd, 2022). Unlike other industries such as tobacco, this industry is new and legislations throughout the U.S. seems to be opening new doors for the companies by progressively allowing more forms of gambling in each state. Comparing this situation to the previous report, it is during a time period where more states allow for gambling in all forms and more people are utilizing the service through different platforms. By easing the ability to gamble, more people will gamble, thus leading to more profitable companies which attract the investors. Seeing as the U.S. market is still very underdeveloped and is expecting exponential growth in the coming years, with a CAGR of roughly 12% from 2022-2030 (StraitsResearch, 2022), there is a substantial incentive for investors to hold gambling stocks in their portfolios. From the market statistics, it becomes clear that the excitement around owning stock of companies in the gambling industry has increased over the past few years and therefore, we assume investors have started to strategically position themselves by adding gambling companies to their portfolios early on (i.e. during the time period we studied) which has increased the stock prices of the gambling companies.

4.5 Cannabis

The research of this paper was extended both by time period but also by including the cannabis industry. It has become a renown industry through the headlines it has received in the past years. What makes it so interesting to include in this analysis is that the point can be argued whether it should be classified as a sin industry or not. However, this research paper has found clear reasoning as to why cannabis as a whole is included as a sin portfolio and that is most notably because it used to be a nation wide criminalized industry. One might make the argument that it is used for medical purposes which would make it an ethical stock, nonetheless, given its history of negative connotation as well as the fact that the majority of the rest of the world sees cannabis as illegal, it is hard to make an argument for its ethical purposes. Furthermore, if alcohol is classified as sin stock as it puts someone under the influence so should cannabis. Nonetheless, given the product's versatility, it has become an increasingly used product in many substances such as cosmetic, pharmaceutical, and food & beverage industries (Grand View Research, 2022). By increasing the consumption forms, companies have been able to make more money as they have more products to sell.

Overall, the U.S. recreational market is valued at \$11 bn in 2021 and this number includes CBD, THC and other forms of uses. Recreational use is for people to buy and consume if they are over the age of 21. In many countries this is still illegal, however, in some states in the U.S., it is legal.

The legalization of recreational use for many states is another reason as to why it could be an industry that has been performing well over recent years. In 2012, the first state legalized recreational use of cannabis, and since then 21 states have also legalized recreational use. This alone is a prime explanation for the drastic increase in usage and sales. Recreation use is also expected to witness the fastest growth up until 2030. This is simplified as it is sold without prescription and therefore allows for an extremely large customer base. (Grand View Research, 2022)

Medical use on the other hand has a very different purpose. There has been a strong growing acceptance for medical cannabis over the years as it can be used for the treatment of various chronic conditions such as depression, cancer, diabetes, and anxiety. The approval of drugs for medical use and treating conditions is contributing to the growth of the industry (Grand View Research, 2022). Moreover, since California first legalized medical cannabis in 1996, the number of states in the U.S. that are legalizing medical cannabis is increasing at a fast pace. As of 2022, 37 U.S. states have legalized the use of medical cannabis which is opening up for growth and expansion possibilities within the market (Grand View Research, 2022). Nonetheless, there are only so many patients who are eligible to get medical exemption for cannabis thus limiting the customer base.

Given the solid foundations the industry already has in the medical sphere, and its predicted growth within the recreational routes, there seem to be a lot of possibilities for the industry to perform very well. Not only that but if it is to become a medical product, there will be an everlasting demand which is a very positive aspect for the industry. With that in mind, the market seems to be looking very positively at the future of the industry and thus investors add cannabis companies to their portfolios which in effect drives up the price, i.e the monthly return.

4.6 Financial Crisis

Our findings for the financial crisis of 2007-2009 both show that sin stocks had a smaller downturn than the comparable portfolio, as well as better recovery post-recession. This result is in line with Salaber (2009) who concludes that sin stocks likely have little sensitivity to economic conditions such as recessions, and tend to produce an outperformance relative to the market during economic declines. In addition, Salaber (2009) mentions that the comparable stocks, such as the food industry, behave quite similarly as sin companies, since they also are non-cyclical in their nature. Our thesis can confirm this since the difference between returns of sin and comparable stocks during the financial crisis isn't extreme, and because comparable stocks also experienced a considerable recovery the months after the market through in 2009.

4.7 Covid-19 Recession

The covid crisis resulted in some interesting takes for the sin portfolio. In fact, it underperformed its comparables by about 1.45% for the dip. Despite the fall being very short, conclusions can be drawn from the data. First of all, the reason the sin portfolio underperformed comps might be because of the in house confinement. Because it was only over a month's period, it had had more to do with investor mindset rather than the performance of the companies. It is interesting that investors sentiment to sell off shares seem to be high when it comes to sin stocks as their stock performance fell more than what comparables did, meaning more people sold those off first.

5. Conclusion

The aim of this paper was to examine if what we defined as “sin stocks” (publicly traded companies in the alcohol, tobacco, gambling and cannabis industry) obtain abnormal returns. Through the evidence above, it is clear that such a case holds true throughout the period 2007-2021 on the U.S. public market.

Current market trends show that investors are shifting their focus from sin stocks to ESG companies. Following social trends by investing in ESG friendly companies is obviously a significant factor which has helped move investors capital away from sin companies. However, due to the strong performing companies in the different sin industries, with gambling in particular, it is difficult for individuals to see past the foregone potential returns of sin stocks. Thus, the results pose a question for investors and fund managers whether or not to include sin stocks in their portfolio. As shown in this paper, these types of firms tend to outperform the market and also during recessions, which could indicate that including higher portfolio weights of sin stocks during such times could lead to greater returns. It then becomes up to the investor or fund manager to decide if they want to bear the ethical cost of such an investment. It may very well be the case that a mutual fund that increases its exposure to sinful stocks would receive lower inflows of capital due to the potential critique it could get, based on social norms.

Results from prior research remains mixed whether sin stocks portfolios outperform comparables, however, this comes down to firstly the geographical market of study and secondly the industries classified as sin. Given a study is done on U.S. public companies within the industries of alcohol, tobacco, gambling and cannabis, the hypothesis that sin portfolios outperform comparables hold true as the evidence indicates that a sin stock anomaly is present. The findings of this analysis are in line with those of the paper that we set out to make an extension on - Hong et al. (2009). In addition, literature from Blitz and Fabozzi (2017), Fabozzi, Ma & Oliphant (2008), Statman and Glushkov (2009), Salaber (2009) and Richey (2016) come to similar findings that sin stock portfolios do outperform comparable portfolios.

This research helps contribute to several pieces of literature. To start off with, the time period selected from 2007-2021 is one of the most updated research papers published on sin stock portfolios. There is less empirical evidence from research on sin stock performance within the U.S. market with the industry classifications of alcohol, tobacco, gambling and cannabis industry, and this analysis provides much needed context, evidence and data to help measure sin stocks performance against comparables.

For future research it would be interesting to take a more holistic view on social norms regarding sin stocks from a global perspective. Doing this, would both broaden the industry definition by including several geographical markets and firms, which ought to give an even more accurate result regarding sin stock characteristics, as well as explore the undermining social causes for these potential abnormal returns. The cannabis industry could also be looked at from different segments of the industry as some might perform differently and not be considered unethical. Also, the methodology could be extended in this paper by adding more variables to the regression outputs, to see if one obtains a different result, such as the Fama-French five factor model.

The basis of our research was done on the financial market and that is constantly changing. New companies are entering the financial sphere as well as some who are ceasing operations. Not only that but increasing interest rates in the current climate has had a notable impact on stock markets and the overall economy. Therefore, constantly updating this study is crucial to provide evidence that sin stock portfolios keep outperforming since previous stock returns may not predict future outcomes.

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Appendix

Table 1

Panel A: Distribution by Year

For the time period 2007 to 2021, the portfolio of sin stocks used in this paper is recorded below. It represents the year by year number of sin stocks between the three different industries (alcohol, tobacco and gambling) and combination of them. The sum at the bottom is the number of distinct companies per industry throughout the time period.

Variable	All	Alcohol	Tobacco	Gambling	Cannabis
2007	123	36	6	81	29
2008	119	35	5	79	32
2009	115	32	5	78	35
2010	115	33	5	77	34
2011	119	36	5	78	34
2012	114	36	5	73	39
2013	106	36	5	65	39
2014	108	35	6	67	43
2015	105	35	5	65	45
2016	100	34	5	61	49
2017	96	34	4	58	50
2018	95	33	4	58	56
2019	89	32	4	53	59
2020	89	30	4	55	62
2021	88	29	4	55	65
Unique companies	113	31	11	71	65

Panel B: Previous Research

The table describes the previous literature on unethical investing. The categories start by defining the market, then the observed period which is followed by sample size. The following column explains the main models which are used in the research. These are either the Capital Asset Pricing Model (CAPM), the Fama-French Three Factor Model (FF3), the Carhart Four-Factor Model (C4), the Fama-French Five Factor Model (FF5) and the Betting Against Beta (BAB). The industries which the papers have defined are then listed.

Author	Market	Observed Period	Sample Size	Model
Salaber (2007)	18 European Markets	1975-2006	158	C4
Fabozzi et al., (2008)	21 developed markets	1970-2007	267	CAPM & FF3
Statman & Glushkov (2008)	US	1991-2007	198	CAPM, FF3 & FF4
Salaber (2009)	US	1926-2005	183	FF3
Hong & Kacperczyk (2009)	US	1926-2006	184	CAPM, FF3 & C4
Kim & Venkatachalam (2011)	US	1988-2006	117	FF3
Lobe & Walkshäus (2011)	51 countries	1995-2007	755	CAPM & C4
Anders & Sebastian (2013)	US	1973-2012	159	C4
Richey (2014)	US	1993-2013	41	CAPM & FF3
Liston (2016)	US	1988-2009	-	CAPM, FF3 & C4
Richey (2016)	US	1995-2015	41	CAPM, FF3 & C4
Blitz & Fabozzi (2017)	US,Europe,Japan,Global	1963-2016	-	CAPM, FF3, C4, BAB, FF5
Richey (2017)	US	1996-2016	65	CAPM, FF3, C4 & FF5
Winberg (2019)	Nordics	1990-2018	2,089	FF3 & FF5

Panel C: Previous Research

The industries which the previous research has are defined below, namely, Adult Entertainment, Alcohol, Defense (Weapons), Gambling, Nuclear Energy & Uranium, Tobacco and others. Each industry that is included in the research is ticked. Finally, the results of the research is presented and states if the results were positive or negative and significant or insignificant.

Author	Adult ent.	Alcohol	Defense (Weapons)	Gambling	Nuclear Energy & Uranium	Tobacco	Other	Results
Salaber (2007)		x		x		x		Positive and significant
Fabozzi et al., (2008)	x	x	x	x		x	x	Positive and significant
Statman & Glushkov (2008)		x	x	x	x	x		Positive and significant
Salaber (2009)		x		x		x		Positive and significant
Hong & Kacperczyk (2009)		x		x		x		Positive and significant
Kim & Venkatachalam (2011)	x	x		x		x		Positive and significant
Lobe & Walkshäus (2011)	x	x	x	x	x	x		Positive but insignificant
Anders & Sebastian (2013)		x	x	x		x		Positive and significant
Richey (2014)		x		x		x		Positive and significant
Liston (2016)		x		x		x		Positive and insignificant
Richey (2016)		x		x		x		Positive and significant
Blitz & Fabozzi (2017)		x	x	x		x		Positive but insignificant
Richey (2017)		x	x	x		x		Positive but insignificant
Winberg (2019)		x	x	x		x	x	Positive and significant

Table 2.

The panels under table 2 report the descriptive statistics for various variables, to give the reader a quick understanding of the variables by their arithmetic means, standard deviations and cumulative return for some. *EXSINP* (*EXCOMP*) is the excess monthly return net of the risk free rate for an equal-weighted portfolio of sin (comparable) stocks. The same goes for all other variables starting with “EX”, where the sub-portfolios have been abbreviated. *EXALCP* is the alcohol portfolio, *EXTOBP* tobacco, *EXGAMP* gambling, *EXCANP* cannabis. In addition, *EXSINP₂* is the excess monthly return net of the risk-free rate for an equal-weighted portfolio of sin stocks, including the cannabis industry. *EXSODAP*, *EXFOODP*, *EXFUNHOTP* are the comparable sub-portfolios, which again is the monthly excess return of such an equally weighted portfolio. *EXSODAP* is the soda portfolio, *EXFOODP* food and *EXFUNHOTP* the portfolio for industry groups fun and meals/hotels in the Fama French 1997 classification. *MKTPREM* is the excess monthly return of the value-weighted CRSP index, *SMB* the monthly return of a long portfolio on small stocks and short on large stocks, *HML* the monthly return of a long portfolio on high book-to-market stocks and short on low book-to-market stocks, *MOM* is the monthly return of a portfolio that takes a long position on past 12 month return winners and a short position on past 12 month return losers. Lastly, Panel D, E, F and G include the cumulative excess returns of the sin and comparable portfolios given the time period of focus.

Panel A: Time-Series Return Regressions (2007-2021)

Variable	Mean	Standard Deviation
<i>EXSINP</i> (%)	1.55	7.02
<i>EXCOMP</i> (%)	0.91	5.94
<i>MKTPREM</i> (%)	0.88	4.42
<i>SMB</i> (%)	0.08	2.42
<i>HML</i> (%)	-0.30	3.08
<i>MOM</i> (%)	0.05	4.71

Panel B: Additional Times-Series Return Regressions Sub-portfolios (2007-2021)

Variable	Mean	Standard Deviation
<i>EXALCP</i> (%)	1.98	7.35
<i>EXTOBP</i> (%)	0.88	5.77
<i>EXGAMP</i> (%)	1.41	11.29
<i>EXCANP</i> (%)	0.72	4.15
<i>EXSINP₂</i> (%)	1.13	4.28

Panel C: Additional Times-Series Return Regressions Comparables (2007-2021)

Variable	Mean	Standard Deviation
<i>EXSODAP (%)</i>	0.98	5.43
<i>EXFOODP (%)</i>	0.86	4.62
<i>EXFUNHOTP (%)</i>	0.93	7.42

Panel D: Descriptive Statistics Financial Crisis (Dec 2007-Feb 2009)

Variable	Cumulative Return	Mean	Standard Deviation
<i>EXSINP (%)</i>	-62.07	-4.14	7.83
<i>EXCOMP (%)</i>	-73.32	-4.89	7.59

Panel E: Descriptive Statistics Financial Crisis (Rest of 2009)

Variable	Cumulative Return	Mean	Standard Deviation
<i>EXSINP (%)</i>	81.16	8.12	14.75
<i>EXCOMP (%)</i>	71.20	7.12	9.68

Panel F: Descriptive Statistics Covid-19 Recession (Jan-March 2020)

Variable	Cumulative Return	Mean	Standard Deviation
<i>EXSINP (%)</i>	-42.40	-14.13	11.30
<i>EXCOMP (%)</i>	-38.04	-12.68	10.81

Panel G: Descriptive Statistics Covid-19 Recession (Rest of 2020)

Variable	Cumulative Return	Mean	Standard Deviation
<i>EXSINP (%)</i>	71.80	7.98	9.73
<i>EXCOMP (%)</i>	61.18	6.80	8.95

Table 3.

Table 3. show several OLS-regression outputs for different portfolios. All regression analysis were based on the same independent variables, namely *MKTPREM* - the excess monthly return of the value-weighted CRSP index, *SMB* - the monthly return of a long portfolio on small stocks and short on large stocks, *HML* - the monthly return of a long portfolio on high book-to-market stocks and short on low book-to-market stocks and *MOM* - the monthly return of a portfolio that takes a long position on past 12 month return winners and a short position on past 12 month return losers. Computing a linear regression on *MKTPREM* yields the CAPM model, including *SMB* and *HML* the Fama-French three-factor model, and lastly including all the Carhart four-factor model. In panel A, the dependent variable is *SIN-COMP*, the excess monthly return of an equally weighted sin portfolio, net of the monthly returns of an equally weighted comparables portfolio. Panel B has almost the same dependent variable, but also includes cannabis stocks in the sin portfolio, making it *SIN-COMP₂*. Panels C, D, E & F represent the same regression of the dependent variable long sin and short its comparable industry, but on the specific sub-portfolios that make up the larger sin and comparable portfolios.

Panel A: Time-Series Return Regressions (Net of Comparables): 2007-2021

Variable	ALPHA	MKTPREM	SMB	HML	MOM
SIN-COMP	0.0066** (0.0030)	-0.0135 (0.0658)			
SIN-COMP	0.0066** (0.0030)	-0.010 (0.0684)	-0.0231 (0.1253)		
SIN-COMP	0.0064** (0.0030)	-0.0060 (0.0704)	-0.0187 (0.1268)	-0.0258 (0.0994)	
SIN-COMP	0.0067** (0.0029)	-0.0746 (0.0712)	-0.0511 (0.1234)	-0.1726 (0.1054)	-0.2476*** (0.0719)

Panel B: Time-Series Return Regressions Including Cannabis (Net of Comparables): 2007-2021

Variable	ALPHA	MKTPREM	SMB	HML	MOM
SIN-COMP ₂	0.0068*** (0.0023)	-0.5130*** (0.0509)			
SIN-COMP ₂	0.0066*** (0.0022)	-0.4704*** (0.0516)	-0.2946*** (0.0944)		
SIN-COMP ₂	0.0061*** (0.0023)	-0.4714*** (0.0527)	-0.2755*** (0.0949)	-0.1111 (0.0744)	
SIN-COMP ₂	0.0055*** (0.0023)	-0.4693*** (0.0548)	-0.2843*** (0.0950)	-0.1511* (0.0812)	-0.0675 (0.0554)

Panel C: Alcohol Time-Series Return Regressions (Net of Comparable): 2007-2021

Variable	ALPHA	MKTPREM	SMB	HML	MOM
ALC-SODA	0.0122** (0.0053)	-0.2418** (0.1177)			
ALC-SODA	0.0122** (0.0053)	-0.2456** (0.1224)	-0.0264 (0.2240)		
ALC-SODA	0.0126** (0.0054)	-0.2586** (0.1259)	0.0124 (0.2265)	0.0811 (0.1776)	
ALC-SODA	0.0128** (0.0054)	-0.3085** (0.1308)	-0.0111 (0.2266)	-0.0258 (0.1936)	-0.1804 (0.1321)

Panel D: Tobacco Time-Series Return Regressions (Net of Comparable): 2007-2021

Variable	ALPHA	MKTPREM	SMB	HML	MOM
TOB-FOOD	0.0021 (0.0038)	-0.2036* (0.0854)			
TOB-FOOD	0.0020 (0.0038)	-0.1721 (0.0883)	-0.2175 (0.1617)		
TOB-FOOD	0.0018 (0.0039)	-0.1659 (0.0909)	-0.2109 (0.1636)	-0.0390 (0.1282)	
TOB-FOOD	0.0017 (0.0039)	-0.1373 (0.0946)	-0.1973 (0.1640)	0.0223 (0.1401)	0.1035 (0.0956)

Panel E: Gaming Time-Series Return Regressions (Net of Comparable): 2007-2021

Variable	ALPHA	MKTPREM	SMB	HML	MOM
GAM-FUNHOT	0.0005 (0.0044)	0.4825*** (0.0971)			
GAM-FUNHOT	0.0006 (0.0044)	0.4516*** (0.1006)	0.2136 (0.1841)		
GAM-FUNHOIT	0.0006 (0.0044)	0.4532*** (0.1035)	0.2153 (0.1863)	-0.0099 (0.1460)	
GAM-FUNHOT	0.0011 (0.0042)	0.3271*** (0.1026)	0.1559 (0.1779)	-0.2798 (0.1520)	-0.4555*** (0.1037)

Panel F: Cannabis Time-Series Return Regressions (Net of Comparable): 2007-2021

Variable	ALPHA	MKTPREM	SMB	HML	MOM
CAN-FOOD	0.0065* (0.0036)	-0.8780*** (0.0801)			
CAN-FOOD	0.0064* (0.0036)	-0.8377*** (0.0825)	-0.2782* (0.1510)		
CAN-FOOD	0.0059 (0.0036)	-0.8203*** (0.0847)	-0.2595* (0.1525)	-0.1094 (0.1195)	
CAN-FOOD	0.0057 (0.0036)	-0.7895*** (0.0881)	-0.2450 (0.1527)	-0.0435 (0.1305)	0.1112 (0.0890)

Graph 1.

The graph gives a visual comparison of the cumulative returns between the sin stock portfolio (here including alcohol, tobacco and gambling) and the comparables portfolio (soda, food, fun, meals/hotels) for January 2007 to December 2007. The red line is the sin portfolio, and the blue line the comps.

