Exploring the Sin Stock Premium: A Comparative Analysis Across Regions and Industries

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Abstract

This paper investigates the consistent outperformance of sin stocks - companies in sectors such as gaming, tobacco, and alcohol - relative to peers and the market. The presence of a sin stock premium has previously been debated; some studies found abnormal returns, while others linked the outperformance to traditional risk factors. To assess whether a sin premium exists in modern markets, I run a number of time-series regressions including the Fama-French models using data from 2000 to 2023.

My results confirm a sin stock premium. When comparing US and European sin stocks, the former exhibit a noticeably higher premium. This is consistent with other research that found variations in market dynamics and investor behaviour by geography.

Furthermore, I investigate the industry-level performance of sin stocks. Although the size of the sin stock premium varies, the results demonstrate continuous outperformance in each of the three industries. This analysis supports the hypothesis that sin stocks provide abnormal returns that are not entirely explained by conventional risk factors.

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Resumo

Este documento investiga o desempenho superior consistente das acções do pecado - empresas de sectores como o jogo, o tabaco e o álcool - relativamente aos seus pares e ao mercado. A presença de um prémio para as acções do pecado foi anteriormente debatida; alguns estudos encontraram retornos anormais, enquanto outros associaram o desempenho superior a factores de risco tradicionais. Para avaliar se existe um prémio de pecado nos mercados modernos, realizo uma série de regressões de séries temporais, incluindo os modelos Fama-French, utilizando dados de 2000 a 2023.

Os meus resultados confirmam a existência de um prémio para as acções pecaminosas. Quando se comparam as acções pecaminosas dos EUA e da Europa, as primeiras apresentam um prémio visivelmente mais elevado. Este facto é consistente com outros estudos que encontraram variações na dinâmica do mercado e no comportamento dos investidores por região geográfica.

Além disso, analiso o desempenho das acções do pecado a nível setorial. Embora a dimensão do prémio das acções do pecado varie, os resultados demonstram um desempenho superior contínuo em cada um dos três sectores. Esta análise apoia a hipótese de que as acções pecuniárias proporcionam retornos anormais que não são inteiramente explicados pelos factores de risco convencionais.

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Tópico : Explorando o Prémio de Stock Sin: Uma análise comparativa entre regiões e sectores

Palavras-chave: Acções Pecado, Excesso de Retorno, Ineficiências de Mercado, Comportamento do Investidor, Precificação de Activos, Modelos Fama-French, Regressões de Séries Temporais

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List of Abbreviations

3FF	Fama-French Three-Factor
5FF	Fama-French Five-Factor
Adj.	Adjusted
Alpha	Jensen's alpha
Cap	Capitalization
CAPM	Capital Asset Pricing Model
CMA	Investment strategy factor
CRSP	The Center for Research in Security Prices, LLC
ER	Excess Return
FE	Fixed Effects
HML	Value factor
MRP	Market Risk Premium
NAICS	North American Industry Classification System
p.a.	Per annum
R^2	R-squared
RMW	Operating profitability factor
RoE	Return on Equity
SD	Standard Deviation
SIC	Standard Industry Classification
SMB	Size factor
UK	United Kingdom
US	United States
WRDS	Wharton Research Data Services

1 Introduction

Companies engaged in industries often considered ethically problematic or controversial, such as alcohol, tobacco, and gaming, have been the subject of attention of academics and investors alike due to their counterintuitive performance. Despite societal condemnation and exclusion from many institutional portfolios caused by ethical or regulatory issues (Blitz & Swinkels, 2021), these so called “sin stocks” have persistently exhibited excess returns (ER) relative to the market (Hong & Kacperczyk, 2009; Liston & Soydemir, 2010).

This phenomenon, referred to as the "sin stock premium" (Sagbakken & Zhang, 2022), caused debate over the underlying causes of this enhanced performance. Do these ERs originate from risk premia, market inefficiencies, or exclusively from investor sentiment? The study aims to examine the reasons that lead to the consistent outperformance of sin stocks, drawing on the seminal research by Hong and Kacperczyk (2009).

The main goal of this thesis is to assess the ERs generated by sin stocks in comparison to the overall market and analogous non-sin equities across different sectors and industries. Utilizing data from 2000 to 2023, I analyze the persistence of the sin stock premium in modern markets and across various geographies, specifically the United States (US) and Europe. This time frame enables a thorough examination of the performance of individual stocks over time, taking into account market conditions during both economic growth and recession. Additionally, I try to mitigate survivorship bias by including companies that have been delisted in the research.

The study complements the current literature by examining the performance of sin stocks in greater depth, investigating the alcohol, tobacco, and gaming industries separately to identify any industry-specific characteristics affecting returns.

To do this, the Fama-French Three-Factor (FF3) and Five-Factor (FF5) models are employed on the selected sample of stocks, alongside a set of firm-specific control variables, including market value, price-to-book ratio, operating profit margin, and return on equity (RoE). These models are employed to separate and analyze the influence of traditional asset pricing factors, including market risk, size, value, profitability, and investment strategies, on the ERs produced by sin stocks. The study investigates whether firm-specific variables augment or diminish the returns associated with sin stocks. The study also performs regressions on sub-samples particular to regions and sectors. This analysis offers insights into potential discrepancies in the performance of sin stocks in the US and Europe, along with variances within the alcohol, tobacco, and gambling sectors.

This meticulous approach enables me to do an in-depth assessment of individual stock performance, compared to both the broader market and firms within peer industries identified by prior research. This study aims to contribute to the ongoing debate over the existence and resilience of the sin stock premium by employing a robust set of asset pricing models as well as firm-specific variables. Additionally, it intends to provide insights into the variances in performance across different countries and industries.

The study is organized as follows. Section 2 gives an overview of the relevant literature, followed by Section 3, which describes the data as well as the data extraction process. In Section 4, the methodology is outlined. Section 5 reports the empirical results and starts with the discussion of findings. This is continued in Section 6, which concludes and presents limitations and an outlook.

2 Literature Review

In the following, I will provide an overview of the literature on sin stocks, focusing on the findings regarding a sin stock premium or overperformance.

One of the most influential papers in the sin stock literature is “The price of sin: The effects of social norms on markets” by Hong and Kacperczyk (2009). It provides evidence for the impact of social norms on stock markets by studying sin stocks. The authors classify sin stocks as stocks of companies belonging to the alcohol, tobacco, and gaming industry. Their findings show that sin stocks are less frequently held by norm-constrained institutions such as pension plans, receive less analyst coverage, and have higher expected returns than comparable stocks. The results suggest a societal norm against funding operations that promote vice, leading to a financial cost for investors abstaining from sin stocks. They also indicate that sin stocks are neglected by norm-constrained investors and face greater litigation risk heightened by social norms. The effects of social norms on sin stocks are robust, even when defense stocks are included in the sin category. The results also hold across international markets, with sin stocks in, e.g., the United Kingdom (UK) and Germany showing similar ownership and return patterns (Hong & Kacperczyk, 2009).

In my thesis, I follow Hong and Kacperczyk (2009) in choosing stocks from the alcohol, tobacco, and gaming industries. These three are the sin industries commonly used in the literature, while others, such as defense and adult services (Fabozzi et al., 2008), or more recently introduced ones, such as carbon-intensive industries (Sagbakken & Zhang, 2022), are included in some studies but excluded in others.

Most papers during earlier stages of sin stock research obtain results in line with Hong and Kacperczyk (2009) concerning an outperformance of sin stocks, which cannot be explained by asset pricing factors but rather by factors such as risk premia or avoidance due to ethical considerations. For example, Fabozzi et al. (2008) examine sin stock excess and risk-adjusted (adj.) returns in the six industries of alcohol, tobacco, defense, biotech, gaming, and adult services, finding that they outperform the market (19.02% vs. 7.87% annualized return) from 1970-2007. Their findings attribute this anomaly to undervaluation due to ethical avoidance and a potential risk premium in sin industries. The study reveals variation across sub-categories as the gaming industry had the highest ER (26.35%) and adult entertainment the lowest (5.27%), but still a significant and consistent outperformance across the different industries and suggests a global phenomenon. Being one of the few papers during earlier research on sin stocks focusing on both international markets and the US, it examined sin stock returns in 21 national markets, most of them members of the European Union (Fabozzi et al., 2008). Liston and Soydemir (2010) found similar results as they examined an equally weighted sin stock portfolio of US sin stocks within the alcohol, tobacco, and gambling industries during 2001-2007. Using the capital asset pricing model (CAPM), the 3FF model and the Carhart (1997) four-factor model, they discovered significant abnormal returns compared to the market with all three models using daily data (Liston & Soydemir, 2010). Statman and Glushkov (2009) also conclude that sin stocks offer higher returns due to lower valuations and higher risk premia, as avoiding sin stocks leads to a disadvantage in terms of returns to socially responsible investors.

Other authors tried to find explanations for the observed market outperformance of sin stocks. Salaber (2009) studies the previous evidence of sin stock outperformance on the American market throughout the business cycle. For her analysis, she uses conditional models accounting for time-varying risk premia and macroeconomic variables as well as the Carhart (1997) four-factor model. She presents three different factors that suggest that sin stocks should not behave in the same way as the market. The author hypothesizes sin stocks to be recession-proof due to their stable cash flows, the addictive nature of their products, and higher leverage ratios, making them independent from financial markets. The results show that sin stocks produce significant abnormal returns, but only in comparison to the market. The ER of sin stocks disappears compared to firms in similar industries, which are also labelled recession-proof, therefore arguing against a sin stock premium.

Salaber (2013) examines the impact of religious preferences on share prices and expected returns at the country level in Europe. She finds that religious preferences, specifically in

Protestant and Catholic environments, have a significant effect on the share price of companies involved in unethical activities such as tobacco manufacturing and alcohol production. Investors in Protestant countries are more sin-averse than in Catholic countries, leading to lower share prices and higher expected returns on sin stocks (Salaber, 2013), therefore supporting the social norm hypothesis mentioned before in Hong and Kacperczyk (2009).

Liston (2015) also provides a possible explanation for the outperformance. He tests the effect of investor sentiment on overall stock returns and volatility using industry return data and asset pricing methods, such as the GARCH and 5FF models. To evaluate their effects on stock performance, investor sentiment is separated into individual, institutional, and rational and irrational components. The results show that investor attitude substantially impacts sin stock returns, with positive sentiment shifts increasing ER and volatility clustering. Investor emotion accounts for a significant proportion of the abnormal returns of sin stocks, which have been frequently documented in prior research. This suggests that model misspecification, not sin stocks' intrinsic qualities, is the cause of these excessive returns (Liston, 2015).

More recent literature, for example, Blitz and Fabozzi (2017), who revisit the original study from Fabozzi et al. (2008), challenges the idea that sin stocks outperform the market due to ethical investor aversion. In their study, the authors examine the US, European, Japanese, and global markets separately and posit that exposure to asset pricing factors is the true driver of market outperformance. They analyze sin stocks through the 5FF model and find no evidence of a standalone sin premium after controlling for these factors. This suggests that historical outperformance is a function of their factor exposures, not their association with sin (Blitz & Fabozzi, 2017).

In line with Blitz and Fabozzi (2017), Sagbakken and Zhang (2022) also find no significant sin premium. They analyze sin stocks in the European market, including traditional sin stocks in alcohol, tobacco, gambling, and defense sectors, as well as newly evolved sin stocks in carbon-intensive sectors such as oil and gas, metals and mining, uranium, and coal. They find no robust sin premium for both new and traditional sin stocks, having also compared sin stocks to their peers in similar industries. They also identify that investors in sin stocks are mainly investment managers, corporations, and individuals, with institutional investors, which are more norm-constrained, showing more interest in new sin stocks. In addition, the authors note a trend of divestment of institutional investors from carbon-intensive sectors after the Paris Agreement in 2015 (Sagbakken & Zhang, 2022).

Another study by Lobe and Walkshäusl (2016), who include nuclear power as a sin industry in addition to the ones used by Hong and Kacperczyk (2009), tests if the performance of portfolios made up of sin stocks and socially responsible stocks differs. They do not find evidence that the sin stock portfolios outperform. However, to put their results into perspective, about half of the sin portfolio consists of companies in the nuclear power industry – a sector that has only been covered in a few other studies.

Overall, the results in the literature do not seem to be conclusive regarding a sin stock premium, with earlier research supporting the hypothesis but more recent research mostly arguing against it. In addition, very few papers look at the differences between US and European sin stocks or between sin industries. My contribution to the existing literature lies primarily in the exploration of the differences between the two regions and the examined industries regarding performance and firm-specific factors.

3 Data

First, I choose a time frame for my study. As most well-known papers on sin stocks (Fabozzi et al., 2008; Hong & Kacperczyk, 2009; Salaber, 2009) use data only until the mid-2000s, starting as early as 1926, I decided to investigate more recent data from 2000 to 2023. Moreover, I included firms in my sample even if they ceased to exist or were delisted before 2023 if they were trading on a relevant stock market during the observation period. This allows me to avoid survivorship bias, i.e., the phenomenon of overestimating historical performance by exclusively considering the stocks of surviving companies (Brown et al., 1992).

When deciding which industries to include in my sample of sin stocks, I follow Hong and Kacperczyk (2009) and their approach. They selected stocks from the "Triumvirate of Sin" (Hong & Kacperczyk, 2009, p.18), meaning from the alcohol, tobacco, and gaming industries. Other papers additionally include companies from the adult, defense, or nuclear industry (Fabozzi et al., 2008; Kempf & Osthoff, 2007). More recent papers, e.g., Sagbakken and Zhang (2022), include stocks in carbon-intensive sectors such as oil and gas, metals and mining, uranium, and coal as well.

Hong and Kacperczyk (2009) identify sin stocks based on their Standard Industry Classification (SIC) codes, following the classification of stocks of Fama and French (1997) in 48 industries based on SIC codes. They classify stocks in Fama-French industry groups 4 (beer or alcohol), SIC codes 2080-2085, and industry group 5 (smoke or tobacco), SIC codes 2100-2199, as sin

stocks.[1] For their third sin industry, gaming, they use the North American Industry Classification System (NAICS), as the SIC codes do not separate between gaming stocks and hotel or entertainment stocks. The used NAICS codes are 7132, 71312, 713210, 71329, 713290, 72112, and 721120. In addition, to extend their sample, the authors use Compustat Segment data to screen across companies on a segment level. With the segment data, which assigns a SIC or NAICS code to every segment of a company, it is possible to identify a company as a sin stock if one of the segments matches a code from one of the three sin industries. Hong and Kacperczyk (2009) assume a stock identified as a sin stock via a segment to be sinful throughout its history. I follow the same approach for the US companies in my sample, using Wharton Research Data Services (WRDS) to access The Center for Research in Security Prices, LLC (CRSP) for SIC and NAICS codes and Compustat for the Historical Segments data.

For the European companies in my sample, as WRDS is widely used only for US stocks, I use Refinitiv Datastream to download the company's SIC codes. As NAICS codes are only available for US companies, I follow Fixdal and Storetvedt (2020) for the selection of gaming stocks in Europe. They use the Datastream industry groups to select their sin stock sample. For gambling stocks, they chose all stocks from the sub-industry "Casinos & Gambling" in the industry "Travel & Leisure". To comply with the selection process of US stocks, I looked up the SIC codes to the NAICS equivalents for gaming (gambling/casino) stocks (7011, 7993, and 7999) and kept only the stocks in the sub-industry with these SIC codes.[2] To also include European companies, which have business segments in sin industries, I downloaded the SIC codes 1 to 8 in Datastream, as these represent the SIC codes for the eight largest business segments of a company, if applicable, and added those whose SIC codes match a sin industry to my sin stock sample.

Appendix A displays a table showing an overview of the countries from which companies are included, as well as the number of companies from each country. Following Sagbakken and Zhang (2022), only stocks from the European Economic Area and the UK were included in the sample for Europe. In Table 1, the number of companies that were active each year is shown.

[1] Table of SIC and NAICS codes in Appendix B and C.
[2] The conversion tables from NAICS to SIC codes are available at https://www.census.gov/naics/?68967 (Reference Files – Concordances).

Table 1 – Number of active companies each year by industry

Year	Alcohol	Tobacco	Gaming	Total
2000	131	21	81	233
2001	136	21	83	240
2002	134	21	89	244
2003	129	20	92	241
2004	124	19	91	234
2005	116	20	96	232
2006	111	19	96	226
2007	116	27	94	237
2008	114	25	96	235
2009	115	25	95	235
2010	113	25	87	225
2011	110	25	86	221
2012	110	25	83	218
2013	110	24	78	212
2014	111	24	76	211
2015	110	22	74	206
2016	108	21	72	201
2017	108	21	70	199
2018	108	21	70	199
2019	108	20	64	192
2020	99	19	67	185
2021	99	18	65	182
2022	100	20	64	184
2023	101	20	62	183

To avoid downloading the same variables for US stocks from WRDS and European Stocks from Datastream, I used the Excel plug-in “Fuzzy Match” for the company names to match the US sin stocks from WRDS with the ones from Datastream. For the WRDS US sin stocks still missing a ticker after this procedure, I manually searched in Datastream for the company name to find a ticker.

Afterwards, I downloaded yearly data of stock returns and all variables listed in Table 2 as company controls. Company controls for the European sample were downloaded from Datastream. All company-specific control variables that I use are the changes of the initially downloaded variables and winsorized at the 1st and 99th percentile. The only exception is the market value of the companies, which is the change of the natural logarithm of the company's market value but also winsorized at the same percentile level. This is done to reduce the impact of potential outliers and improve robustness (Yaffee, 2002).

Table 2 – Overview of company control variables

Name	Description	Code in Source	Calculation in Source	Source	Reference
Market Value	Market value (in millions)	MV	Number of shares * security price (P)	Refinitiv Datastream	Hong and Kacperczyk (2009)
Price-to-Book	Price to Book value	PTBV	Share Price / book value per share	Refinitiv Datastream	Hong and Kacperczyk (2009)
Op. Profit Margin	Operating Profit Margin (in %)	WC08316	Operating Income / Net Sales or Revenues * 100	Refinitiv Datastream	Choiriyah et al. (2020)
RoE	Return on Equity (in %)	WC08301	(Net Income - Bottom Line - Preferred Div. Requirement) / Average of Last Year's & Current Year's Common Equity * 100	Refinitiv Datastream	Hong and Kacperczyk (2009)
CF Operating	Net Cash Flow Operating Activities	WC04860	Sum of Funds from Operations, Funds From/Used for Other Operating Activities and Extraordinary Items	Refinitiv Datastream	Rayburn (1986)
D/E	Total Debt / Common Equity (in %)	WC08231	(Long Term Debt + Short Term Debt & Current Portion of Long Term Debt) / Common Equity * 100	Refinitiv Datastream	Heikal et al. (2014)

To proxy for the market, I use the S&P 500 index return for the US and the STOXX Europe 600 return for Europe. Data on the risk-free rate, market risk premium (MRP), size factor (SMB), value factor (HML), operating profitability factor (RMW), and investment strategy factor (CMA) are all retrieved from the Kenneth French online data library.[3]

ERs are calculated by subtracting either the S&P 500 index return or the STOXX Europe 600 return from the individual company's return, depending on the primary region of the company.

For my selection of comparable companies, I follow Hong and Kacperczyk (2009) in choosing the food industry as peer industry for tobacco, the soda industry as peer industry for alcoholic beverages, and the fun industry as well as the meals and hotels industry as peer industry for gaming. The SIC codes for these industries are 2000-2046, 2050-2063, 2070-2079, 2090-2095, and 2098-2099 for food, 2064-2068, 2086-2087, and 2096-2097 for soda, 7800-7841 and 7900-7999 for fun, and 5800-5813, 5890, 7000-7019, 7040-7049, 7213 for meals and hotels. To not include stocks I had already identified as sin stocks from these industries (SIC codes 7011, 7993, and 7999), I manually cross-checked both sin stocks and peers.

To identify all companies active in the peer industries, I apply the same procedure as for the sin stocks, including downloading the SIC codes 1-8 for the business segments in Datastream. I then retrieve stock return data and all variables listed in Table 2 and adjust them accordingly.

4 Methodology

In order to find out if sin stocks outperform the market and comparable companies, the outperformance being measured by a statistically significant alpha, I perform a number of time-series regressions. In the next step, if sin stocks exhibit a higher return, I want to explore if the ER can be explained by asset pricing models and how their impact is influenced by introducing different firm characteristics (company control variables) or if there is truth to the sin stock premium mentioned in previous literature (Hong & Kacperczyk, 2009; Fabozzi et al., 2008; Liston & Soydemir, 2010).

4.1 Dependent variables

For the purpose of this study, I choose *yearly stock returns* (of stock *i* at year *t*) *in excess of either the market or comparable companies* as the dependent variables of interest. By applying this procedure, I follow both Blitz and Fabozzi (2017) and Hong and Kacperczyk (2009). To

[3] https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html, on 18.02.2024.

get the ER over the market, same as Blitz and Fabozzi (2017), instead of using the risk-free rate of return to calculate the ER of the sin stocks, I subtract the market return instead. In my case, the proxy for the market return for European stocks is the STOXX Europe 600 return, and for the US stocks the S&P 500 return. For calculating the ER over the comparable companies, I subtract the return of an equal-weighted portfolio of comparable stocks instead of the risk-free rate. The portfolio of comparable stocks consists of stocks in the industries listed in the data section of this paper.

4.2 Control variables

To better isolate the explanatory effect of asset pricing models on possible ERs of sin stocks, I choose several company control variables[4], that have been identified in the literature as being able to predict stock returns. These are a company's market value, price-to-book ratio, operating profit margin, return-on-equity ratio, cash flow from operations, and debt-to-equity ratio. In the regression models, I use the yearly change of those variables (for the calculations, see Table 2).

4.3 Time-series return regressions

To find out if there are parts of the difference in return between sin stocks, the comparable companies' portfolios, and the market proxy that cannot be explained through risk factors and firm-specific variables, I run several time-series regressions. For that purpose, I use the 3FF model, introduced by Fama and French (1992), and the 5FF model, an extended version of the 3FF (Fama & French, 2015). In addition, I introduce all the company control variables mentioned in the previous chapter one by one. By adding control variables, I choose a less common approach, as most sin stock literature focuses on the FF models and other non-company specific variables such as social norms.

By basing my regressions on the 3FF and 5FF model to assess the sin stock returns, I follow most of the existing literature (Fabozzi et al., 2008; Liston & Soydemir, 2010; Blitz & Fabozzi, 2017; Sagbakken & Zhang, 2022). In some of the literature the CAPM is also used for regression equations, but it has been widely criticized for its simplicity and shortcomings, e.g., the lack of explanatory variables (Fama & French, 2003). This is the reason I only focus on the 3FF and 5FF in my research. However, as both the 3FF and 5FF are based on the CAPM, I will start with a short overview of the CAPM.

[4] A list of the company control variables, including references, can be found in Chapter 3.

4.3.1 Capital Asset Pricing Model and Jensen's Alpha

The CAPM was developed by Treynor (1961), Sharpe (1964) and, Lintner (1965) and describes the relationship of risk and return. The rationale is that investors should get higher returns as compensation for higher systematic risk, which is a risk that cannot be diversified away. If the CAPM holds, all expected returns should have an alpha of zero, meaning the return of a portfolio less the market return should be explained entirely by its exposure to systematic market risk (Mullins Jr., 1982).

Jensen's Alpha (alpha) builds on the CAPM model and is the average return on an investment or portfolio in excess of the CAPM's projections (Jensen, 1969). If an investment or portfolio performs significantly better (or worse) than predicted by the CAPM, the applied asset pricing model will result in a significantly positive (or negative) alpha.

Based on both the CAPM and Jensen's alpha, a portfolio's return can be explained as follows:

$$R_{i,t} - R_{f,t} = \alpha_i + \beta_i * MRP_t + \varepsilon_{i,t} \quad (1)$$

Where:

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

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

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

β_i = *Exposure to the market risk factor (Coefficient)*

MRP_t = *Market risk premium, meaning ER of the market portfolio over the risk-free rate*

$\varepsilon_{i,t}$ = *Error term i at time t (Residual)*

4.3.2 Regressions based on the Fama-French Three-Factor Model

In 1992, Fama and French proposed two additional factors, size and value, to characterize portfolios that have consistently outperformed the market. In other words, they discovered that the performance of company portfolios with smaller market capitalization (cap) was generally better than those with bigger market caps. Furthermore, they observed that historically, portfolios with a high book-to-market ratio have performed better than portfolios with a low book-to-market ratio. As such, the 3FF model adds a size factor and a value factor, denoted as

SMB and HML, to the CAPM (Fama & French, 1992). SMB is the abbreviation of small minus big and equals the ER of a diversified portfolio of small-cap stocks over a diversified portfolio of large-cap stocks. HML stands for high minus low and represents the ER of a portfolio of value stocks, with a high book-to-market ratio, over a portfolio of growth stocks, with a low book-to-market ratio, assuming both portfolios to be diversified. By controlling for SMB and HML, the 3FF model can more effectively isolate an investment's or portfolio's outperformance relative to the market.

I apply the 3FF model to my data set using a fixed effects (FE) regression accounting for firm-specific effects. The decision to use an FE model instead of a random effects model is based on the Hausman (1978) test. The test checks whether the unique characteristics of each subject are related to other variables in the study. In my case, according to the Hausman test, they are related. That is why the test suggests using an FE model to be able to get more reliable results by controlling for these unique characteristics (Amini et al., 2012).[5] Using FE in a regression can also help to reduce omitted variable bias by controlling for unobserved factors (Cellini, 2008). In addition, I employ robust standard errors to account for potential heteroscedasticity (Croux et al., 2003).

The left-hand side of all my regression equations, i.e., the dependent variable, consists of the ER of sin stocks, calculated in two different ways (Chapter 3.1). For the left-hand side of equation (2), I subtract the market return from the sin stock return. In equation (3) the return of a portfolio of comparable companies is subtracted instead. Regression equation (2) is estimated as follows:

$$R_{i,t} - R_{m,t} = \alpha_i + \beta_i * MRP_t + s_i * SMB_t + h_i * HML_t + Firm\ FE + \varepsilon_{i,t} \quad (2)$$

Where:

$R_{i,t} - R_{m,t}$ = *Expected return of sin stock I at time t in excess of the market*

s_i, h_i = *Exposure to the size (SMB) and value (HML) factor (Coefficients)*

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

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

And regression equation (3) is estimated as depicted in the following:

$$R_{i,t} - R_{c,t} = \alpha_i + \beta_i * MRP_t + s_i * SMB_t + h_i * HML_t + Firm\ FE + \varepsilon_{i,t} \quad (3)$$

[5] For the results of the Hausman test, see Appendix D.

Where:

$R_{i,t}$ - $R_{c,t}$ = *Expected return of sin stock i at time t in excess of the portfolio of comparable stocks*

4.3.3 Regressions based on the Fama-French Five-Factor Model

In 2015, Fama and French expanded further on the 3FF model by adding two new factors, a profitability factor (RMW) and an investment factor (CMA) (Fama & French, 2015). RMW is the abbreviation of robust minus weak and equals the ER of a portfolio of companies with robust profitability over a portfolio of companies with weak profitability. CMA stands for conservative minus aggressive and represents the ER of a portfolio of low-investment companies (conservative) over a portfolio of high-investment companies (aggressive). Both portfolios in RMW and CMA are assumed to be diversified.

I apply the same modifications and procedures to the 5FF models as to the 3FF models, resulting in regression equations (4) and (5).

$$R_{i,t} - R_{m,t} = \alpha_i + \beta_i * MRP_t + s_i * SMB_t + h_i * HML_t + r_i * RBW_t + c_i * CMA_t + Firm\ FE + \varepsilon_{i,t} \quad (4)$$

Where:

r_i, c_i = *Exposure to the profitability (RBW) and investment (CMA) factor (Coefficients)*

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

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

$$R_{i,t} - R_{c,t} = \alpha_i + \beta_i * MRP_t + s_i * SMB_t + h_i * HML_t + r_i * RBW_t + c_i * CMA_t + Firm\ FE + \varepsilon_{i,t} \quad (5)$$

The regression equations (2) to (5) are the basis for my regression models. Each model starts with one of those 4 equations. After that, all company control variables described in Chapter 3.2 are introduced one by one in the regression equation to isolate the effect that each of them has on the impact of the 3FF and 5FF factors on the dependent variable. Following that procedure, the last regression in each model would look like one of the following regressions (6) to (9), depending on whether it is based on 3FF or 5FF and on how the ER is calculated:

$$R_{i,t} - R_{m,t} = \alpha_i + \beta_i * MRP_t + s_i * SMB_t + h_i * HML_t + \sum \beta_k \, Controls_{i,t} + Firm\ FE + \varepsilon_{i,t} \quad (6)$$

Where:

β_k = *Exposure to company control variables (Coefficients)*

$Controls_{i,t}$ = *Change in company control variable i at time t*

$$R_{i,t} - R_{c,t} = \alpha_i + \beta_i * MRP_t + s_i * SMB_t + h_i * HML_t + \sum \beta_k \, Controls_{i,t} + Firm\ FE + \varepsilon_{i,t} \quad (7)$$

$$R_{i,t} - R_{m,t} = \alpha_i + \beta_i * MRP_t + s_i * SMB_t + h_i * HML_t + r_i * RBW_t + c_i * CMA_t + \sum \beta_k \, Controls_{i,t} + Firm\ FE + \varepsilon_{i,t} \quad (8)$$

$$R_{i,t} - R_{c,t} = \alpha_i + \beta_i * MRP_t + s_i * SMB_t + h_i * HML_t + r_i * RBW_t + c_i * CMA_t + \sum \beta_k \, Controls_{i,t} + Firm\ FE + \varepsilon_{i,t} \quad (9)$$

In addition to looking into the ER of sin stocks for my whole sample, I also examine the data at the regional and industry levels. For the research on a regional level, I split the sin stocks into a US sub-sample and a European sub-sample. For the research on the industry level, I split the sin stocks in three sub-samples, one for each of the three sin industries *Alcohol*, *Tobacco*, and *Gaming*, based on their respective SIC codes. I run the same regressions on the sub-samples as I do for the whole sample. The purpose of this part of my research is to find out if there are differences in the results when splitting my data into sub-samples.

5 Empirical results and analysis

5.1 Descriptive statistics

Table 3 – Summary Statistics

This table reports summary statistics for all variables included in my sample. Included are the number of observations, mean, median, standard deviation, minimum and maximum. In this table all control variables are displayed as the change from one year to the next and winsorized at the 1% level.

Variable	Obs	Mean	Median	Std. Dev.	Min	Max
Dependent variables						
Excess Return_Market	5175	.090	-.015	.849	-1.231	23.772
Excess Return_Peers	5175	.020	-.089	.886	-1.549	23.380
Main variables						
FF 3F MktRF	9384	.073	.112	.191	-.383	.352
FF 3F SMB	9384	.019	-.019	.089	-.078	.265
FF 3F HML	9384	.020	.018	.182	-.467	.450
FF 5F MktRF	9384	.073	.112	.191	-.383	.352
FF 5F SMB	9384	.024	.005	.088	-.084	.245
FF 5F HML	9384	.020	.018	.182	-.467	.450
FF 5F RMW	9384	.054	.043	.102	-.204	.267
FF 5F CMA	9384	.030	.005	.118	-.210	.307
Control variables						
Market Value	4950	-.025	.005	2.012	-107.220	43.951
Price-to-Book	4830	.158	.000	2.255	-68.047	32.753
Op. Profit Margin	4480	-.148	-.039	5.723	-160.143	71.010
RoE	4078	-.790	-.105	17.502	-478.571	116.533
CF Operating	4373	.182	-.018	6.258	-48.105	191.364
D/E	3973	.693	-.059	9.193	-14.984	307.245

Table 3 reports summary statistics for my whole sample. The sample period is from January 2000 until December 2023. The data indicates, as expected, that sin stocks outperform both the market proxy as well as their peers on average. While they display an ER over the market of 9.0% per annum (p.a.), they exhibit an ER over their peers of 2.0% p.a. Contrary, the median values show an underperformance of sin stocks against both benchmarks. Both dependent variables exhibit a high standard deviation (SD) ranging between 84.9% and 88.6%, indicating significant variations in the size of the ERs. The main variables, consisting of the 3FF and 5FF variables, display a much smaller SD of 8.8% to 19.1%, with mean returns between 1.9% and 7.3%.

5.2 Results for the whole sample

The regression results for the whole sin stock sample are presented first. The dependent variable is either the yearly return of the sin stocks less the yearly return of the market (Chapter 5.2.1) or less the yearly return of a portfolio of comparable companies (Chapter 5.2.2).

5.2.1 Excess return over the market

Table 4 – Excess Return over the market with 3FF

This table presents regression results across the sample for the ER over the market proxy using the 3FF factors as the main regressors. Robust standard errors are shown in parentheses and *, **, *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

	3FF - Excess Return over the market						
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
FF_3F_MktRF	-0.179**	-0.197**	-0.249***	-0.257***	-0.298***	-0.286***	-0.273***
	(0.0805)	(0.0762)	(0.0729)	(0.0525)	(0.0513)	(0.0540)	(0.0509)
FF_3F_SMB	0.867***	0.391**	0.366**	0.325***	0.401***	0.365***	0.164
	(0.154)	(0.165)	(0.160)	(0.117)	(0.105)	(0.114)	(0.107)
FF_3F_HML	0.0127	-0.0788	-0.0969	-0.197***	-0.202***	-0.184***	-0.133**
	(0.108)	(0.0934)	(0.0977)	(0.0560)	(0.0518)	(0.0556)	(0.0523)
Market Value		-0.219***	-0.217***	-0.221***	-0.207***	-0.212***	-0.201***
		(0.0261)	(0.0269)	(0.0246)	(0.0192)	(0.0201)	(0.0177)
Price-to-Book			0.0931***	0.0720**	0.139***	0.140***	0.158***
			(0.0339)	(0.0290)	(0.0263)	(0.0275)	(0.0250)
Op. Profit Margin				0.000784	0.000421	0.000653	-0.000718
				(0.00150)	(0.00136)	(0.00140)	(0.000947)
RoE					0.000930	0.000383	0.000569
					(0.000890)	(0.000941)	(0.000832)
CF Operating						0.00286*	0.00202
						(0.00165)	(0.00124)
D/E							-0.00848*
							(0.00449)
Constant	0.0826***	1.173***	1.183***	1.305***	1.230***	1.285***	1.272***
	(0.00649)	(0.128)	(0.137)	(0.138)	(0.109)	(0.115)	(0.106)
Observations	5,175	5,139	4,820	3,955	3,645	3,422	3,001
Adj. R^2	0.008	0.075	0.142	0.180	0.261	0.264	0.311
Sample Size	391	391	377	361	347	337	317

Table 4 displays the regression results with the 3FF factors in column (1). In columns (2) to (7), the results, including the company control variables, are shown. In each of those a new control variable is introduced. This is the general structure I use in all the following regression models as well. The consistent negative and highly significant coefficient of the market risk factor (*FF_3F_MktRF*) suggests that an increase in market risk is associated with a decline in the ERs of sin stocks. In turn, it also proposes that my sample of sin stocks mostly consists of low-beta stocks, which is line with results from Liston (2015) and Blitz and Fabozzi (2017). The

FF_3F_SMB factor, which represents the size premium, exhibits a notable trend where smaller sin stocks demonstrate superior performance compared to larger ones, as can be seen by the positive coefficients displayed in most regressions. In the last one, when the *D/E* ratio is included, the coefficient loses its significance. This indicates that the impact of size is likely influenced by other variables used in subsequent models. The value premium (*FF_3F_HML*) exhibits negative and statistically significant coefficients excluding the first regression, suggesting that stocks with higher book-to-market ratios usually perform worse than the ones with lower book-to-market ratios. This is a surprise, as in a FF3 model, one would expect to see a positive coefficient there (Fama & French, 1992). The inclusion of control variables enhances the analysis. *Market Value* constantly exhibits a negative correlation with ERs, thereby validating the conclusions pertaining to size. The *Price-to-Book* ratio has a favourable and significant impact, which is also in line with the analysis of the value premium. Variables such as *Op. Profit Margin* and *RoE* do not demonstrate substantial effects, suggesting that they do not make a large contribution to the additional returns of sin stocks, although the addition of both leads to a noticeable increase in R-squared (R^2) and adj. R^2. The latter regressions indicate a weakly positive effect of *CF Operating* and a marginal negative impact of the *D/E* ratio (significant at 10% level).

An intriguing discovery from the investigation is the consistently significant and positive constant, representing the alpha, observed in all models. This indicates that sin stocks continually produce a positive ER, depending on the regression, up to 1.305% yearly, compared to the market, which is not accounted for by the traditional 3FF variables or any regression in combination with control variables. This could be seen as evidence for the presence of a "sin premium" (Sagbakken & Zhang, 2022). The results regarding the alpha with the 3FF model are consistent with most of the previous literature, for example, Blitz and Fabozzi (2017) and Liston and Soydemir (2010).

Although the addition of more variables enhances the ability of the regressions to describe the data, as seen by the increase in R^2 values from 0.008 to 0.313 and the adj. R^2 values to 0.311, a significant amount of the variability still lacks explanation. This highlights the possibility of missing factors or the constraints of the FF3 model in accurately reflecting the unique return patterns associated with sin stocks.

Table 5 – Excess Return over the market with 5FF

This table presents regression results across the sample for the ER over the market proxy using the 5FF factors as the main regressors. Robust standard errors are shown in parentheses and *, **, *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

	5FF - Excess Return over the market						
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
FF_5F_MktRF	-0.0838	-0.139	-0.186	-0.276***	-0.339***	-0.335***	-0.311***
	(0.141)	(0.131)	(0.124)	(0.0533)	(0.0516)	(0.0539)	(0.0527)
FF_5F_SMB	1.030***	0.542***	0.518***	0.542***	0.564***	0.557***	0.340**
	(0.171)	(0.181)	(0.173)	(0.144)	(0.134)	(0.148)	(0.141)
FF_5F_HML	-0.185	-0.128	-0.139	-0.0468	-0.0523	0.00101	0.0504
	(0.133)	(0.111)	(0.109)	(0.103)	(0.0952)	(0.102)	(0.102)
FF_5F_RMW	0.366	0.284	0.317	0.0712	-0.0450	-0.0485	-0.00827
	(0.279)	(0.264)	(0.267)	(0.122)	(0.119)	(0.127)	(0.113)
FF_5F_CMA	-0.0541	-0.170	-0.188	-0.530***	-0.495***	-0.573***	-0.509***
	(0.196)	(0.180)	(0.178)	(0.186)	(0.174)	(0.190)	(0.194)
Market Value		-0.218***	-0.216***	-0.220***	-0.206***	-0.211***	-0.200***
		(0.0260)	(0.0269)	(0.0246)	(0.0193)	(0.0202)	(0.0178)
Price-to-Book			0.0928***	0.0717**	0.138***	0.139***	0.157***
			(0.0338)	(0.0289)	(0.0262)	(0.0274)	(0.0248)
Op. Profit Margin				0.000689	0.000261	0.000495	-0.000875
				(0.00151)	(0.00137)	(0.00141)	(0.000974)
RoE					0.000933	0.000380	0.000562
					(0.000889)	(0.000940)	(0.000830)
CF Operating						0.00300*	0.00211*
						(0.00164)	(0.00123)
D/E							-0.00842*
							(0.00446)
Constant	0.0532**	1.150***	1.159***	1.301***	1.237***	1.293***	1.277***
	(0.0263)	(0.119)	(0.131)	(0.140)	(0.111)	(0.118)	(0.109)
Observations	5,175	5,139	4,820	3,955	3,645	3,422	3,001
Adj. R^2	0.008	0.076	0.142	0.182	0.263	0.266	0.313
Sample Size	391	391	377	361	347	337	317

I run the same regressions for the 5FF as for the 3FF but include the two new factors of the 5FF. The results are shown in Table 5.

According to the 5FF model, the market risk factor (*FF_5F_MktRF*) exhibits a negative correlation with the ERs of sin stocks, although this correlation is not statistically significant at first. However, if additional factors are incorporated, this association becomes highly significant, with coefficients ranging from -0.276 to -0.339. This discovery is consistent with the results of the 3FF model, suggesting sin stocks to be mostly low beta stocks. The size premium (FF_5F_SMB) exhibits a positive and highly significant impact in all regressions of the 5FF analysis, with coefficients ranging from 0.340 to 1.030. This validates the previous findings in the 3FF model that smaller sin stocks typically achieve better performance than larger ones. The pronounced effect noted in the five-factor model underscores the significance

of size as a predictor of superior returns for sin stocks, even when accounting for additional factors such as profitability and investment. Curiously, the value premium (*FF_5F_HML*), which had a major impact in the later regressions of the three-factor model, loses its statistical significance in the five-factor model. This change indicates that the inclusion of profitability (*FF_5F_RMW*) and investment (*FF_5F_CMA*) factors reduces the impact of the value effect on sin stocks. It suggests that the additional elements in the five-factor model may more accurately capture the factors that generate higher returns in sin stocks, hence reducing the significance of the classic value impact in this particular setting. The profitability factor exhibits a variety of both positive and negative coefficients; however they lack statistical significance. This suggests that profitability does not significantly impact the ERs of sin stocks when analyzing yearly data, in contrast to the expectations of the 5FF model (Chapter 4.3.3), where profitability plays a crucial role in generating returns (Fama & French, 2015). Previous literature on sin stocks also found evidence for this assumption (Blitz & Fabozzi, 2017).

Furthermore, the investment component continually exhibits negative and statistically significant coefficients in subsequent regressions, indicating that those stocks with more aggressive investment strategies (marked by higher asset growth) are likely to outperform in terms of ERs. This discovery differs compared to the findings of Fama and French in 2015, which state that companies with cautious investing strategies tend to generate greater profits (Fama & French, 2015). The control variables, especially *Market Value* and *Price-to-Book* ratio, continue to demonstrate their statistical significance and consistent relationship with similar outcomes compared to the 3FF model.

Similar to the 3FF model, the 5FF model displays a highly significant and positive alpha of up to 1.301% per year. This result goes directly against the findings of more recent literature (Blitz & Fabozzi, 2017; Sagbakken & Zhang, 2022), which find that the statistical significance of the alpha term vanishes when controlling for the 5FF factors. The presence of alpha in both the three-factor and five-factor models underscores the fact that neither model provides a complete explanation for the returns of sin stocks. This further supports the notion that these stocks may possess a distinct risk premium. The R^2 and adj. R^2 of the 5FF model are only marginally higher than in the 3FF model (31.6% vs. 31.3% and 31.3% vs. 31.1%), indicating that a significant percentage of the variability in sin stock returns still cannot be accounted for.

5.2.2. Excess return over comparable companies

I ran the same regressions as described in Chapter 5.2.1, but now the ER is calculated by the sin stock return minus the return of a portfolio of comparable stocks instead of the market return. The results of the regression with the 3FF model are displayed in Table 6, and the results of the 5FF model regression in Table 7.

Table 6 – Excess return over comparable companies with 3FF

This table presents regression results across the sample for the ER over the comparable companies using the 3FF factors as the main regressors. Robust standard errors are shown in parentheses and *, **, *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

	Excess Return over comparable companies						
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
FF_3F_MktRF	0.778***	0.756***	0.714***	0.665***	0.629***	0.656***	0.668***
	(0.0814)	(0.0772)	(0.0744)	(0.0536)	(0.0518)	(0.0543)	(0.0510)
FF_3F_SMB	1.216***	0.702***	0.660***	0.632***	0.682***	0.631***	0.431***
	(0.156)	(0.167)	(0.163)	(0.119)	(0.107)	(0.116)	(0.109)
FF_3F_HML	0.0171	-0.0861	-0.110	-0.166***	-0.173***	-0.188***	-0.137**
	(0.108)	(0.0938)	(0.0983)	(0.0577)	(0.0526)	(0.0564)	(0.0540)
Market Value		-0.238***	-0.241***	-0.266***	-0.256***	-0.264***	-0.256***
		(0.0263)	(0.0269)	(0.0254)	(0.0205)	(0.0215)	(0.0193)
Price-to-Book			0.0897***	0.0690**	0.136***	0.137***	0.155***
			(0.0332)	(0.0282)	(0.0260)	(0.0272)	(0.0245)
Op. Profit Margin				0.000248	8.78e-05	0.000321	-0.00107
				(0.00148)	(0.00138)	(0.00143)	(0.00105)
RoE					0.000733	8.33e-05	0.000285
					(0.000881)	(0.000921)	(0.000804)
CF Operating						0.00207	0.00149
						(0.00170)	(0.00139)
D/E							-0.00834*
							(0.00435)
Constant	-0.0598***	1.130***	1.166***	1.399***	1.353***	1.426***	1.444***
	(0.00655)	(0.129)	(0.137)	(0.142)	(0.115)	(0.123)	(0.115)
Observations	5,175	5,139	4,820	3,955	3,645	3,422	3,001
Adj. R^2	0.056	0.132	0.192	0.261	0.337	0.342	0.387
Sample Size	391	391	377	361	347	337	317

In contrast to the results in Chapter 5.2.1, the market risk coefficient in Table 6 consistently demonstrates a highly significant but positive impact throughout, with coefficients ranging from 0.629 to 0.778. The robustness of the correlation indicates that sin stocks likely outperform their peers in times of rising market risk. In turn, it could also mean that the peer stocks have an even lower beta than the sin stocks on average. The size premium exhibits positive and statistically significant coefficients for all regressions, albeit with a decrease in values from 1.216 in the first model to 0.431 in the final model. The discovery indicates that smaller sin stocks typically provide more ERs in comparison to larger ones, even when compared to peer companies. The

initial coefficient for the value premium is close to zero and lacks significance. However, in subsequent regressions, it becomes negative and significant. The growing importance of this factor in later regressions suggests that the impact of the value effect becomes more noticeable when considering other variables. Within the set of control variables, same as in Tables 4 and 5 (Chapter 5.2.1), *Market Value* consistently exhibits a negative and highly significant correlation with ERs, supporting the implications of the size premium. The *Price-to-Book* ratio has a positive correlation with ERs. Its coefficients in the whole model are consistently significant and positive. Additional control factors, such as *RoE* and *CF Operating* exhibit minimal and statistically non-significant coefficients. Only the *D/E* ratio exhibits a weakly significant negative coefficient, indicating that increased leverage may marginally diminish the ERs of sin stocks compared to similar companies.

The constant term (alpha) is statistically significant and positively correlated in all regressions except the first one, where it exhibits a small negative correlation while still being significant. The presence of positive alpha in most regressions indicates, as did the results from the previous models, the presence of a sin premium, also holding when comparing the returns of sin stocks against the ones of comparable companies.

Table 7 – Excess return over comparable companies with 5FF

This table presents regression results across the sample for the ER over the comparable companies using the 5FF factors as the main regressors. Robust standard errors are shown in parentheses and *, **, *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

	5FF - Excess Return over comparable companies						
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
FF_5F_MktRF	0.788***	0.725***	0.683***	0.583***	0.524***	0.532***	0.556***
	(0.142)	(0.131)	(0.125)	(0.0547)	(0.0525)	(0.0547)	(0.0536)
FF_5F_SMB	1.515***	0.982***	0.957***	0.794***	0.793***	0.784***	0.574***
	(0.172)	(0.183)	(0.174)	(0.146)	(0.136)	(0.150)	(0.145)
FF_5F_HML	-0.0535	0.00266	0.00476	-0.0562	-0.0568	0.00324	0.0504
	(0.133)	(0.110)	(0.108)	(0.102)	(0.0946)	(0.102)	(0.100)
FF_5F_RMW	0.150	0.0560	0.0831	-0.221*	-0.334***	-0.380***	-0.330***
	(0.280)	(0.265)	(0.268)	(0.124)	(0.122)	(0.131)	(0.118)
FF_5F_CMA	-0.398**	-0.516***	-0.570***	-0.415**	-0.387**	-0.531***	-0.470**
	(0.197)	(0.179)	(0.176)	(0.188)	(0.177)	(0.194)	(0.196)
Market Value		-0.237***	-0.240***	-0.263***	-0.254***	-0.261***	-0.254***
		(0.0262)	(0.0269)	(0.0254)	(0.0207)	(0.0217)	(0.0195)
Price-to-Book			0.0895***	0.0689**	0.136***	0.137***	0.155***
			(0.0331)	(0.0281)	(0.0260)	(0.0271)	(0.0245)
Op. Profit Margin				1.40e-05	-0.000220	-3.48e-05	-0.00143
				(0.00149)	(0.00138)	(0.00142)	(0.00104)
RoE					0.000724	7.44e-05	0.000274
					(0.000879)	(0.000922)	(0.000805)
CF Operating						0.00212	0.00153
						(0.00170)	(0.00138)
D/E							-0.00830*

							(0.00434)
Constant	-0.0691***	1.126***	1.163***	1.406***	1.370***	1.448***	1.462***
	(0.0266)	(0.121)	(0.132)	(0.143)	(0.117)	(0.125)	(0.117)
Observations	5,175	5,139	4,820	3,955	3,645	3,422	3,001
Adj. R^2	0.058	0.133	0.194	0.264	0.339	0.345	0.391
Sample Size	391	391	377	361	347	337	317

Within the 5FF model, the market risk factor consistently maintains a positive and statistically significant presence in all regressions, the same as in the 3FF model. The coefficients associated with this factor are lower compared to the 3FF model, ranging from 0.524 to 0.788. Still, this ongoing importance strengthens the conclusion that sin stocks gain advantages from heightened market risk in comparison to their peers. The size premium stays positive and very significant. Remarkably, the influence of firm size is more pronounced in the 5FF model, implying that the supplementary components improve the model's capacity to measure the effect of firm size on ERs. The value premium in the 5FF model is not statistically significant, as the coefficients tend to vary around zero, contrasting the 3FF model, where subsequent regressions found HML to be significant. This observation is in line with the results of Chapter 5.2.1 and most likely has to do with the two additional variables profitability and investment. The profitability factor exhibits a combination of positive and negative coefficients, with the negative coefficients gaining significance in subsequent regressions. This suggests that sin stocks with higher profitability are likely to do worse than those with lower profitability. The investment component exhibits negative and statistically significant coefficients throughout, indicating that those stocks with more aggressive investment strategies tend to have a better performance. The results for RMW and CMA go against the findings of Fama and French (2015). The control variables, as well as the alpha, behave similarly to the 3FF model, the latter one still indicating the existence of a sin premium. My results regarding a significant alpha are in contrast to Sagbakken and Zhang (2022) and Salaber (2009), whose findings suggest no ERs of sin stocks over their peers. It should be mentioned though, that the divergence could be based on the different industry classifications used, at least in the case of Sagbakken and Zhang (2022). Hong and Kacperczyk's (2009) results are in line with mine, showing a consistent sin stock outperformance of their peers.

5.3 Results on a regional level – Europe vs. US

Now, I want to look more into the results on a sub-sample level, first on a regional level, splitting the sample into European and US stocks. The results are presented in Tables 8 to 11 and follow the same order as in Chapter 5.2.

In Table 8, the ER over the market regressed against the 3FF model is displayed. Within the European setting, the market risk factor consistently exhibits a negative and highly significant impact in all regressions, with coefficients ranging from -0.312 to -0.369. In contrast, the market risk factor in the US is generally not significant. The divergence between the European and US markets could possibly be ascribed to variations in regulatory frameworks, investor conduct, or market configurations, which can impact the response of individual stocks to overall market risk (Bali & Cakici, 2010). Differences are also observed in the size premium. Within the European sub-sample, the size premium exhibits varying levels of significance. While it is highly significant in the first regressions, the coefficient drops in value and becomes less reliable, only exhibiting significance in some regressions.

In comparison, the size premium in the US regularly shows a more positive value of the coefficients but also fades in later regressions. The difference in value premium is another factor that sets the two regions apart. Within the European sample, the value premium experiences significance at, at least, the 5% level throughout, with coefficients ranging from -0.161 to -0.343. The only exception is the first regression, which is not significant. In the US, the value premium lacks significance throughout the regressions, with decreasing coefficients. This result contrasts the findings in Europe, indicating that the value component has a much smaller impact on the ERs of US sin stocks relative to the market than in Europe.

Control variables, especially *Market Value* and the *Price-to-Book* ratio, exhibit similarity in both regions and show similar results to those of the sample models. What is interesting is that regarding the other control variables, *Op. Profit Margin*, *RoE,* and *CF Operating* are almost exclusively significant in the US sub-sample, with significance varying from the 1% to the 10% level, while *D/E* is only significant for the European sample.

Table 8 – Excess return over the market with 3FF - Europe vs. US

This table presents regression results for the European sample on the left side and for the US sample on the right side. The dependent variable is the ER over the market using the 3FF factors as the main regressors. Robust standard errors are shown in parentheses and *, **, *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

	Excess Return – Europe							Excess Return - US						
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
FF_3F_MktRF	-0.312***	-0.304***	-0.331***	-0.333***	-0.364***	-0.347***	-0.369***	0.0483	-0.00866	-0.108	-0.136	-0.176	-0.174	-0.135
	(0.0831)	(0.0775)	(0.0577)	(0.0540)	(0.0505)	(0.0539)	(0.0516)	(0.162)	(0.157)	(0.163)	(0.101)	(0.110)	(0.110)	(0.100)
FF_3F_SMB	0.680***	0.215	0.255	0.326**	0.397***	0.333**	0.165	1.163***	0.680**	0.528*	0.322	0.345*	0.345*	0.150
	(0.154)	(0.185)	(0.172)	(0.128)	(0.115)	(0.131)	(0.122)	(0.315)	(0.321)	(0.299)	(0.221)	(0.204)	(0.205)	(0.189)
FF_3F_HML	-0.161	-0.221**	-0.250***	-0.331***	-0.343***	-0.328***	-0.247***	0.300	0.160	0.144	0.0479	0.0542	0.0599	0.0612
	(0.125)	(0.0923)	(0.0905)	(0.0654)	(0.0564)	(0.0637)	(0.0541)	(0.199)	(0.192)	(0.202)	(0.0908)	(0.0982)	(0.0986)	(0.0991)
Market Value		-0.226***	-0.225***	-0.206***	-0.185***	-0.192***	-0.178***		-0.209***	-0.208***	-0.226***	-0.232***	-0.232***	-0.217***
		(0.0454)	(0.0450)	(0.0265)	(0.0247)	(0.0267)	(0.0234)		(0.0298)	(0.0328)	(0.0385)	(0.0286)	(0.0286)	(0.0251)
Price-to-Book			0.0884	0.0508	0.110***	0.110***	0.147***			0.0965**	0.107***	0.183***	0.183***	0.183***
			(0.0580)	(0.0335)	(0.0298)	(0.0317)	(0.0280)			(0.0390)	(0.0334)	(0.0411)	(0.0411)	(0.0363)
Op. Profit Margin				-0.00110	-0.00128	-0.00108	-0.00142*				0.00577***	0.00542***	0.00538***	0.00990
				(0.00128)	(0.00122)	(0.00127)	(0.000779)				(0.00171)	(0.00191)	(0.00190)	(0.00873)
RoE					0.00111	0.000625	0.000588					-0.00273*	-0.00275*	-0.00257*
					(0.000824)	(0.000843)	(0.000491)					(0.00146)	(0.00146)	(0.00134)
CF Operating						0.00227	0.00181						0.00349*	0.00246*
						(0.00293)	(0.00268)						(0.00182)	(0.00131)
D/E							-0.0184**							-0.00683
							(0.00904)							(0.00483)
Constant	0.0897***	1.202***	1.213***	1.145***	1.036***	1.103***	1.070***	0.0692***	1.136***	1.151***	1.471***	1.537***	1.536***	1.484***
	(0.00678)	(0.220)	(0.226)	(0.140)	(0.130)	(0.144)	(0.132)	(0.0127)	(0.149)	(0.170)	(0.236)	(0.181)	(0.180)	(0.164)
Observations	3,247	3,236	2,975	2,522	2,386	2,163	1,858	1,928	1,903	1,845	1,433	1,259	1,259	1,143
Adj. R^2	0.010	0.083	0.148	0.161	0.224	0.224	0.298	0.011	0.073	0.138	0.219	0.329	0.330	0.347
Sample Size	254	254	240	231	228	218	201	137	137	137	130	119	119	116

In both sub-samples, the alpha stays positive and significant at a 1% level, suggesting that sin stocks generate additional returns beyond what can be accounted for by the model parameters. In regressions (11) - (14), the alpha is considerably larger than in (4) - (7), indicating that sin stocks in the US may experience a larger inexplicable premium in comparison to sin stocks in Europe. This could suggest varying market dynamics or investor views towards sin stocks in the US. The R^2 values in both regions are somewhat similar, the US ones being a little higher, indicating a more pronounced ability to explain the variation in ERs. While both start at around 0.01, the last regression exhibits values larger than 0.30 (Europe – 0.301, US – 0.352). The adj. R^2 values exhibit the same pattern.

In Table 9, the ER over the market regressed against the 5FF model is displayed. Similar to the 3FF model, most FF factors exhibit a distinguished impact on the ERs. For the European sample, the market risk factor exhibits a negative and statistically significant impact in all regressions. The inverse correlation between market risk and ERs in Europe is consistent with earlier results in this paper. Conversely, the market risk factor coefficients in the US start out being positive but lacking significance. However, in subsequent regressions, the market risk factor exhibits a negative and significant impact, as in Europe, with coefficients ranging from -0.214 to -0.236. This indicates that although US sin stocks may appear less responsive to market risk at first, they ultimately perform worse compared to the market in higher-risk settings.

Regarding the size premium, within Europe, it exhibits a positive and statistically significant effect only in certain regressions, with coefficients ranging from 0.0477 to 0.548. In contrast, the size premium in the US is significantly more robust and consistent, with coefficients varying between 0.678 and 1.792. The value premium emphasizes the variations across the sub-samples. Within the European sample, the value premium consistently exhibits a negative and statistically significant pattern across all regressions. On the other hand, the value premium in the US is positive and gains significance only in subsequent models. This indicates that in the US, the stocks that prioritize value tend to outperform those that prioritize growth, which is in stark contrast to the outcomes observed in Europe.

Table 9 – Excess return over the market with 5FF - Europe vs. US

This table presents regression results for the European sample on the left side and for the US sample on the right side. The dependent variable is the ER over the market using the 5FF factors as the main regressors. Robust standard errors are shown in parentheses and *, **, *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

	Excess Return – Europe							Excess Return – US						
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
FF_5F_MktRF	-0.260*	-0.282**	-0.299***	-0.364***	-0.404***	-0.390***	-0.378***	0.230	0.128	0.0172	-0.125	-0.236**	-0.233**	-0.214**
	(0.146)	(0.135)	(0.105)	(0.0612)	(0.0565)	(0.0601)	(0.0569)	(0.288)	(0.271)	(0.274)	(0.0983)	(0.105)	(0.105)	(0.101)
FF_5F_SMB	0.548***	0.0477	0.0955	0.229	0.310**	0.243*	0.0704	1.792***	1.341***	1.143***	1.023***	0.906***	0.910***	0.678***
	(0.139)	(0.191)	(0.169)	(0.141)	(0.127)	(0.145)	(0.149)	(0.372)	(0.358)	(0.329)	(0.300)	(0.273)	(0.275)	(0.252)
FF_5F_HML	-0.369**	-0.311***	-0.353***	-0.324***	-0.327***	-0.278**	-0.256**	0.105	0.157	0.174	0.417**	0.470**	0.475**	0.537***
	(0.150)	(0.0953)	(0.0921)	(0.102)	(0.101)	(0.114)	(0.101)	(0.252)	(0.245)	(0.236)	(0.206)	(0.183)	(0.184)	(0.197)
FF_5F_RMW	0.0274	-0.0490	-0.00748	-0.178	-0.207	-0.231	-0.0978	0.930*	0.852	0.822	0.449**	0.147	0.153	0.0931
	(0.297)	(0.277)	(0.284)	(0.141)	(0.142)	(0.157)	(0.139)	(0.554)	(0.536)	(0.532)	(0.226)	(0.205)	(0.206)	(0.186)
FF_5F_CMA	0.235	0.181	0.177	-0.0322	-0.0658	-0.112	0.0262	-0.501	-0.710*	-0.705*	-1.272***	-1.233***	-1.235***	-1.260***
	(0.191)	(0.164)	(0.145)	(0.170)	(0.180)	(0.207)	(0.184)	(0.405)	(0.384)	(0.368)	(0.361)	(0.338)	(0.337)	(0.376)
Market Value		-0.228***	-0.226***	-0.207***	-0.186***	-0.194***	-0.179***		-0.204***	-0.204***	-0.217***	-0.226***	-0.226***	-0.212***
		(0.0457)	(0.0454)	(0.0267)	(0.0249)	(0.0269)	(0.0235)		(0.0292)	(0.0321)	(0.0385)	(0.0284)	(0.0284)	(0.0252)
Price-to-Book			0.0881	0.0507	0.110***	0.110***	0.147***			0.0950**	0.105***	0.180***	0.180***	0.180***
			(0.0578)	(0.0334)	(0.0297)	(0.0317)	(0.0280)			(0.0387)	(0.0329)	(0.0404)	(0.0404)	(0.0355)
Op. Profit Margin				-0.00125	-0.00146	-0.00128	-0.00148*				0.00569***	0.00525***	0.00521***	0.00970
				(0.00128)	(0.00122)	(0.00128)	(0.000815)				(0.00174)	(0.00199)	(0.00198)	(0.00880)
RoE					0.00113	0.000645	0.000606					-0.00281**	-0.00284**	-0.00261**
					(0.000820)	(0.000841)	(0.000489)					(0.00141)	(0.00142)	(0.00127)
CF Operating						0.00226	0.00179						0.00365**	0.00269**
						(0.00294)	(0.00266)						(0.00168)	(0.00125)
D/E							-0.0184**							-0.00663
							(0.00904)							(0.00476)
Constant	0.0815***	1.211***	1.220***	1.164***	1.057***	1.128***	1.087***	0.00255	1.056***	1.078***	1.411***	1.514***	1.513***	1.473***
	(0.0274)	(0.207)	(0.217)	(0.144)	(0.135)	(0.150)	(0.136)	(0.0531)	(0.140)	(0.164)	(0.240)	(0.180)	(0.180)	(0.167)
Observations	3,247	3,236	2,975	2,522	2,386	2,163	1,858	1,928	1,903	1,845	1,433	1,259	1,259	1,143
Adj. R^2	0.008	0.082	0.148	0.160	0.223	0.223	0.297	0.019	0.080	0.145	0.233	0.341	0.342	0.361
Sample Size	254	254	240	231	228	218	201	137	137	137	130	119	119	116

The profitability factor in the European sample is usually negative and not significant. In the US, although positive and significant in some regressions, the effect weakens in later models. Examining the last factor, investment, one can see different results again. It exhibits positive coefficients in Europe, especially in regressions (1) – (3), albeit lacking statistical significance, but negative ones in the US, which become highly significant in subsequent regressions, with values ranging from -0.710 to -1.272. The control variables behave similarly to the 3FF model as well as the alpha, also suggesting a consistent sin premium in returns and a stronger effect in the US sub-sample. In addition, the results for R^2 and adj. R^2 observations follow a similar pattern.

Within the European and US sub-samples in Table 10, the market risk factor consistently exhibits a positive and highly significant influence, at the 1% level, across all regression models. The coefficients are larger in the US, either suggesting that sin stocks in the US generally display a higher beta than their European equivalents or that US peers exhibit lower betas in comparison. Regional variations are also evident in the size premium. In Europe, all models show that the size premium is both positive and statistically significant. Nevertheless, the coefficient is weaker in subsequent regressions.

In contrast, the size premium in the US is significantly more robust and constant, as it displays higher coefficients and significance at the 1% level throughout. The value premium highlights a clear distinction between the two as well, as the results are similar to the ones in Table 8. The control variables also behave similarly to the other models. The same goes for the alpha, still being larger in the US, as well as both R^2.

As for the 5FF model (Table 11), the market risk factor and size premium display very similar results to the 3FF model (Table 10), both being of high statistical significance, with larger coefficients in the US. The only distinction to the 3FF model is that the 5FF model coefficients for those two variables are larger on average. Regarding the value premium, contrarily to the 5FF regressions of ERs over the market, the significance in the European sub-sample fades completely, the same as in the US sub-sample. The profitability factor exhibits diverse effects across Europe and the US, as observed in previous results. Within Europe, this particular element exhibits a negative impact that grows increasingly significant in subsequent regression models.

Table 10 – Excess return over comparable companies with 3FF - Europe vs. US

This table presents regression results for the European sample on the left side and for the US sample on the right side. The dependent variable is the ER over comparable companies using the 3FF factors as the main regressors. Robust standard errors are shown in parentheses and *, **, *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

	Excess Return – Europe							Excess Return - US						
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
FF_3F_MktRF	0.651***	0.658***	0.642***	0.597***	0.572***	0.613***	0.591***	0.994***	0.926***	0.837***	0.773***	0.733***	0.734***	0.773***
	(0.0842)	(0.0780)	(0.0592)	(0.0553)	(0.0509)	(0.0540)	(0.0521)	(0.163)	(0.159)	(0.166)	(0.103)	(0.111)	(0.111)	(0.101)
FF_3F_SMB	0.896***	0.394**	0.409**	0.534***	0.583***	0.480***	0.315**	1.728***	1.207***	1.040***	0.784***	0.793***	0.793***	0.591***
	(0.154)	(0.184)	(0.172)	(0.131)	(0.118)	(0.134)	(0.126)	(0.319)	(0.326)	(0.307)	(0.223)	(0.203)	(0.204)	(0.190)
FF_3F_HML	-0.0938	-0.166*	-0.195**	-0.233***	-0.255***	-0.285***	-0.201***	0.204	0.0520	0.0278	-0.0343	-0.0241	-0.0191	-0.0225
	(0.125)	(0.0939)	(0.0928)	(0.0697)	(0.0594)	(0.0662)	(0.0586)	(0.199)	(0.192)	(0.203)	(0.0920)	(0.0994)	(0.0998)	(0.102)
Market Value		-0.248***	-0.252***	-0.245***	-0.230***	-0.240***	-0.229***		-0.226***	-0.229***	-0.278***	-0.287***	-0.287***	-0.273***
		(0.0444)	(0.0437)	(0.0274)	(0.0258)	(0.0280)	(0.0250)		(0.0309)	(0.0334)	(0.0403)	(0.0316)	(0.0316)	(0.0289)
Price-to-Book			0.0849	0.0493	0.108***	0.108***	0.144***			0.0927**	0.101***	0.179***	0.179***	0.179***
			(0.0567)	(0.0328)	(0.0296)	(0.0316)	(0.0278)			(0.0381)	(0.0333)	(0.0403)	(0.0402)	(0.0358)
Op. Profit Margin				-0.00154	-0.00162	-0.00141	-0.00190**				0.00476***	0.00490**	0.00486**	0.0113
				(0.00128)	(0.00126)	(0.00134)	(0.000856)				(0.00173)	(0.00203)	(0.00203)	(0.00901)
RoE					0.000964	0.000375	0.000363					-0.00328*	-0.00330*	-0.00295*
					(0.000819)	(0.000814)	(0.000471)					(0.00169)	(0.00170)	(0.00152)
CF Operating						0.000984	0.00124						0.00305	0.00187
						(0.00304)	(0.00295)						(0.00189)	(0.00147)
D/E							-0.0174**							-0.00681
							(0.00875)							(0.00471)
Constant	-0.0657***	1.153***	1.197***	1.184***	1.104***	1.194***	1.193***	-0.0510***	1.105***	1.142***	1.657***	1.750***	1.750***	1.723***
	(0.00684)	(0.215)	(0.220)	(0.144)	(0.136)	(0.151)	(0.141)	(0.0128)	(0.155)	(0.174)	(0.246)	(0.199)	(0.199)	(0.188)
Observations	3,247	3,236	2,975	2,522	2,386	2,163	1,858	1,928	1,903	1,845	1,433	1,259	1,259	1,143
Adj. R^2	0.053	0.134	0.197	0.234	0.341	0.342	0.348	0.064	0.133	0.190	0.302	0.341	0.342	0.441
Sample Size	254	254	240	231	228	218	201	137	137	137	130	119	119	116

Table 11 – Excess return over comparable companies with 5FF - Europe vs. US

This table presents regression results for the European sample on the left side and for the US sample on the right side. The dependent variable is the ER over comparable companies using the 5FF factors as the main regressors. Robust standard errors are shown in parentheses and *, **, *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

	Excess Return - Europe							Excess Return – US						
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
FF_5F_MktRF	0.566***	0.541***	0.528***	0.459***	0.423***	0.441***	0.458***	1.182***	1.065***	0.958***	0.798***	0.696***	0.699***	0.711***
	(0.147)	(0.135)	(0.106)	(0.0619)	(0.0574)	(0.0610)	(0.0579)	(0.289)	(0.272)	(0.275)	(0.0996)	(0.105)	(0.105)	(0.101)
FF_5F_SMB	0.952***	0.410**	0.455***	0.458***	0.513***	0.443***	0.278*	2.415***	1.918***	1.719***	1.318***	1.186***	1.189***	0.964***
	(0.139)	(0.189)	(0.170)	(0.146)	(0.132)	(0.149)	(0.156)	(0.373)	(0.360)	(0.331)	(0.298)	(0.272)	(0.274)	(0.253)
FF_5F_HML	-0.0420	0.0122	-0.00472	-0.130	-0.136	-0.0516	-0.0350	-0.0845	-0.0323	-0.00433	0.0622	0.109	0.114	0.184
	(0.150)	(0.0972)	(0.0948)	(0.106)	(0.106)	(0.120)	(0.107)	(0.251)	(0.243)	(0.236)	(0.208)	(0.185)	(0.185)	(0.197)
FF_5F_RMW	-0.314	-0.396	-0.364	-0.561***	-0.597***	-0.700***	-0.548***	0.928*	0.832	0.794	0.321	0.0461	0.0512	-0.0218
	(0.297)	(0.275)	(0.282)	(0.141)	(0.144)	(0.158)	(0.144)	(0.555)	(0.536)	(0.534)	(0.229)	(0.210)	(0.211)	(0.190)
FF_5F_CMA	-0.312	-0.367**	-0.420***	-0.167	-0.202	-0.396*	-0.245	-0.514	-0.725*	-0.755**	-0.742**	-0.686**	-0.688**	-0.738**
	(0.196)	(0.169)	(0.155)	(0.184)	(0.196)	(0.227)	(0.206)	(0.402)	(0.380)	(0.364)	(0.364)	(0.334)	(0.333)	(0.371)
Market Value		-0.249***	-0.252***	-0.243***	-0.228***	-0.238***	-0.228***		-0.220***	-0.224***	-0.268***	-0.280***	-0.280***	-0.268***
		(0.0449)	(0.0443)	(0.0277)	(0.0262)	(0.0285)	(0.0254)		(0.0302)	(0.0327)	(0.0400)	(0.0312)	(0.0312)	(0.0288)
Price-to-Book			0.0853	0.0494	0.107***	0.107***	0.143***			0.0910**	0.0993***	0.178***	0.178***	0.177***
			(0.0565)	(0.0327)	(0.0296)	(0.0314)	(0.0277)			(0.0378)	(0.0330)	(0.0399)	(0.0399)	(0.0354)
Op. Profit Margin				-0.00198	-0.00211*	-0.00200	-0.00233***				0.00480***	0.00482**	0.00479**	0.0112
				(0.00126)	(0.00125)	(0.00131)	(0.000877)				(0.00173)	(0.00207)	(0.00206)	(0.00901)
RoE					0.000953	0.000376	0.000365					-0.00334**	-0.00336**	-0.00298**
					(0.000809)	(0.000811)	(0.000469)					(0.00166)	(0.00167)	(0.00145)
CF Operating						0.000961	0.00131						0.00317*	0.00200
						(0.00305)	(0.00291)						(0.00183)	(0.00146)
D/E							-0.0173**							-0.00668
							(0.00874)							(0.00468)
Constant	-0.0402	1.192***	1.232***	1.217***	1.140***	1.239***	1.228***	-0.120**	1.021***	1.066***	1.587***	1.716***	1.714***	1.702***
	(0.0274)	(0.204)	(0.212)	(0.148)	(0.141)	(0.157)	(0.144)	(0.0534)	(0.146)	(0.168)	(0.247)	(0.194)	(0.194)	(0.187)
Observations	3,247	3,236	2,975	2,522	2,386	2,163	1,858	1,928	1,903	1,845	1,433	1,259	1,259	1,143
Adj. R^2	0.053	0.136	0.199	0.239	0.293	0.300	0.354	0.073	0.142	0.198	0.309	0.417	0.417	0.445
Sample Size	254	254	240	231	228	218	201	137	137	137	130	119	119	116

Conversely, in the US, the profitability factor is typically positive, with values ranging from -0.0218 to 0.928. However, its significance is limited to the earliest model. Within the European sample, the investment factor has negative coefficients, which are statistically significant in certain regressions, notably in the earlier stages. In the US, as in previous models, the investment factor constantly shows a negative trend and becomes statistically significant in later regressions. This suggests that in the US, stocks that follow aggressive investment techniques also tend to achieve better performance, this effect being more noticeable and reliable compared to the European sub-sample. The alpha term, R^2 and adj. R^2 behave similarly to the other results, suggesting a statistically significant sin premium, higher (adj.) R^2 for the 5FF models when compared to 3FF models and a larger explanation of variations in the ER of sin stocks (R^2) in the US sub-sample.

5.4 Results on an industry level

After exploring the results of my sub-sample of US stocks and European stocks, I want to examine the results on an industry sub-sample level. I split my sample of sin stocks into the three sin industries Tobacco, Alcohol and Gaming. The results can be found in Appendix E – Appendix H.

For the ER over the market models (Appendix E and F), as in previous models, the MRP is an important factor in explaining ERs in both the 3FF and 5FF models, spanning all three sub-samples. The coefficient is typically negative and statistically significant for tobacco, alcohol, and gambling stocks, although mostly in the latter regression models; only for alcohol does it exhibit statistical significance throughout. The negative coefficient is further evidence that sin stocks, across all three industries, are mostly low-beta stocks. This pattern is consistent in both models. Nevertheless, the market risk coefficient is somewhat reduced in the 5FF model (Appendix F), indicating that the extra variables (RMW and CMA) in the 5FF model account for some of the risks previously attributed solely to the market factor in the 3FF model.

Interestingly, for the tobacco stocks, in both the 3FF and 5FF models, none of those factors show any statistical significance before introducing the control variables. One possible explanation could be the small sample size, as the FF factors are expected to hold only for diversified portfolios, for which the number of companies is likely too low. The size premium is particularly notable and significant in the gaming sub-sample (columns 15-21). Notably, the positive magnitude of its coefficients is typically greater in the 5FF model, particularly for gaming stocks. This implies that the incorporation of further factors amplifies the influence of

business size on ERs. The value premium, while exhibiting mixed results for the tobacco and gaming sub-sample, has consistently negative and statistically significant coefficients in both models for alcohol stocks. This suggests that value stocks, which are characterized by high book-to-market ratios, typically exhibit lower ERs in this industry. The RMW factor, exhibits varied outcomes among the sub-samples, with minimal statistical significance. The CMA component behaves similarly except for gaming stocks, where it shows a significant and negative coefficient during the whole model. This implies that enterprises operating in this industries, which choose more cautious investment methods, typically experience lower levels of additional returns.

As observed in the regression results in previous chapters, the constant term in both models exhibits a positive and statistically significant value. This applies to nearly all specifications of tobacco, alcohol, and gaming stocks. The magnitude of the constant is generally comparable between the 3FF and 5FF models, but it is greater in certain instances in the 3FF model. This suggests that adding additional components to the 5FF model may modestly decrease the unexplained ERs, particularly for gaming stocks. The R^2 and adj. R^2 values are somewhat greater in the 5FF model for the majority of parameters. This enhancement is uniform across all three sub-samples. What stands out are the particular high R^2 values in later regressions in the tobacco industry compared to both other industries (0.58 / 0.56 vs ca. 0.3). One possible explanation could be the smaller sample size of the tobacco sub-sample. When comparing the two models, it is evident that the 5FF model provides a small increase in explanatory ability. However, the 3FF model already captures a significant amount of the variation in ERs. The inclusion of extra components, particularly CMA, enhances the comprehension of the risk-return characteristics in the 5FF model, especially within the gaming sub-sample. Nevertheless, the overall improvements in R^2 are moderate, indicating that the 3FF model is already resilient.

The findings of the 3FF model in regards to the ER over peer companies (Appendix G) demonstrate a robust correlation between the level of market risk and the additional returns generated by sin stocks compared to their peers. The coefficient for the market risk factor continuously maintains a positive value and has statistical significance across all industries (almost exclusively at a 1% level). This is in line with my previous results which showed that sin stocks have higher betas than their peers. The size factor also displays a favourable and significant effect on ERs, the largest impact being noticeable in the gaming industry. Same as in the results for ERs over the market (Appendix G), the value component yields varied outcomes across different industries. In the context of alcohol, the coefficient is negative and

statistically significant across almost all regressions. Nevertheless, in the tobacco and gaming industry, the influence of the value component is less noticeable, lacking statistical significance. The alpha, interestingly, is negative in the first regression model across all industries, being significant at a 1% level, except for in the tobacco sample, and then turns strong positive and significant in all other models, indicating an alpha of up to 2.21% p.a. Both R^2 values are more balanced than in ER over the market models, with tobacco still displaying the highest values but lower than before and higher values for alcohol and gaming.

The findings of the FF5 model in Appendix H demonstrate consistent patterns, where market risk and size have significant and positive impacts on deciding additional returns. The value component, although statistically relevant in certain instances within the 3FF model, becomes statistically insignificant in the majority of circumstances when the 5FF model is utilized. This implies that the inclusion of the profitability and investment components weakens the influence of the value element. The profitability factor exhibits a combination of positive and negative coefficients, which are mostly insignificant, except for the alcohol industry, where the coefficients are all negative and significant at the 1% or 5% level. The investment factor behaves very similarly, but in this case, it is only highly statistically significant and consistently negative in the gaming sub-sample with larger coefficients than the RMW in the alcohol sub-sample. The alpha, R^2 and adj. R^2 behaves similarly to the 3FF model, the only exception being the non-significance in the first regression in the gaming industry.

6 Discussion and conclusion

I started my research with three main questions. Firstly, do sin stocks consistently outperform the market and its peers, as reported by much of the literature? Secondly, if that is the case, are common asset pricing models able to explain the outperformance? This is where the literature comes to altering conclusions. Whilst earlier research, such as Hong and Kacperczyk (2009), finds evidence for a sin premium, other, mostly more recent literature, like Blitz and Fabozzi (2017), obtain contrary outcomes. Thirdly, do the results of the first two questions hold for sub-samples as well? That is why I split my sample and looked into regional differences (Europe and the US) as well as differences on an industry level (Tobacco, alcohol and gaming).

To answer the first question, I find evidence of a raw outperformance of sin stocks on average when compared to both the market (9.0% p.a.) and their peers (2.0% p.a.). This comes as no surprise because all papers reach this conclusion as well. Although my data set contains more recent data than the other literature, I expected this result.

Regarding the question whether common asset pricing models are able to explain this ER of sin stocks, my findings are in line with earlier research, indicating a sin premium. Looking into the sample of sin stocks, I find a consistent and statistically significant positive alpha across all models, indicating a sin premium of over 1.0% p.a. Only for one regression is the constant negative. This reinforces the idea that sin stocks offer abnormal returns beyond what can be explained by conventional risk factors. Sin stocks generally exhibit low betas, with a negative market risk factor when measured against the market but a positive one compared to peers. The size premium is consistently positive, and the 5FF model reveals significant negative effects from investment and profitability factors.

Looking into data on a regional and industry level, the findings regarding the alpha are validated across all models with no region or industry driving the results specifically. However, there are noticeable differences between the sub-samples as the alpha in the US gets much larger than in Europe with the introduction of more control variables and tobacco stocks exhibiting the highest alphas in earlier regressions while gambling stocks do so in the last ones. The results and significance of the MRP and size premium of the sample mostly persist on a sub-sample level as well, being negative for ER over the market and positive for ER over peers and consistently positive for the size premium. However, the size premium is only significant throughout the gaming industry on an industry level. The ER in Europe is more negatively affected by the value premium, while the investment premium is highly significant for US sin stocks ERs. Alcohol stock ERs are especially negatively affected by the value premium, while profitability and investment premium exhibit minimal significance, especially for the tobacco industry.

Interestingly, control variables such as Price-to-Book and Operating Profit Margin are highly significant in US models compared to European ones, leading to generally higher R^2 values in the US. For the industries, tobacco stocks consistently show the highest R^2 values across models, which is a surprise as the FF factors explain the outperformance there the least. This could be explained by the small sample size of tobacco stocks, which challenges the robustness of the results regarding this industry. Other factors that could pose a contest to my results are the use of yearly data and the declaration of companies as sin stocks if only one of their segments belongs to a sin industry. Therefore, the sample probably includes companies that are not necessarily seen as sin stocks, which could potentially have distorted my results.

However, as my findings support the notion of a sin premium, consistent throughout the sub-samples, the question arises as to what the reason for the unexplained ER could be. One popular explanation for the abnormal returns seen in sin companies is the consistent undervaluation due

to many investors shunning them. This allows investors who are prepared to invest in these, against societal norms, to receive a premium for taking on reputation risk (Blitz & Fabozzi, 2017). Blitz and Swinkels (2023) and Sagbakken and Zhang (2022) find evidence for the shunning of sin companies, especially in the case of norm-constrained investors like sovereign wealth or pension funds. Fabozzi et al. (2008) propose a few possible reasons for the alphas in sin stocks as well. First, non-compliance with social standards can result in economic benefits, as firms incur expenses to maintain these standards. Second, they find that sin stocks are initially undervalued because of the negative effect on the ordinary investor. A finding similar to the shunning theory. Third, the entry barriers for starting a business in the sin industries are high as strict rules, regulations, and multi-jurisdictional laws exist to restrict the existence and operation of sin industries. They suggest that the businesses that have managed to endure in the industries have generated positive monopolistic profits. Other possible explanations from the literature are cultural and social factors that shape investment decisions and challenge the traditional concepts of market efficiency (Hamdan et al., 2023). Salaber (2013) proposes something similar as her findings suggest that religion has a significant effect on the prices of sin companies. Liston (2015) tests the role of investor sentiment and finds that the ERs of sin stocks disappear when including investor sentiment in his models.

Lastly, future research could investigate the impact of factors such as global regulation differences on sin stock performance to further understand the drivers of their abnormal returns or examine regions with varying economic characteristics, especially emerging markets, to find out if the sin premium is a truly global phenomenon, as these areas have not yet been studied.

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Appendix

Appendix A – Number of companies per country in sample

Country	Number of Companies
Austria	9
Belgium	4
Bulgaria	15
Croatia	6
Cyprus	4
Czech Republic	4
Denmark	8
Estonia	2
Finland	4
France	32
Germany	26
Greece	12
Hungary	2
Iceland	1
Ireland	2
Italy	7
Latvia	1
Lithuania	5
Luxembourg	1
Malta	3
Netherlands	3
Norway	2
Poland	6
Portugal	3
Romania	3
Slovakia	1
Slovenia	1
Spain	9
Sweden	17
UK	62
Total Europe	254
US	137

Appendix B – SIC codes belonging to each industry based on Fama and French (1997)

Relevant industries marked in bold. Industries with [1] are sin stock industries and industries with [2] are peer industries. Fun and Meals are marked with both, as Fun includes sin stocks as well (SIC codes 7993 and 7999), same as Meals (SIC code 7011).

Short name	Long name	SIC codes
Agric	Agriculture	0100-0799, 2048
Food[2]	**Food Products**	**2000-2046, 2050-2063, 2070-2079, 2090-2095, 2098-2099**
Soda[2]	**Candy and Soda**	**2064-2068, 2086-2087, 2096-2097**
Beer[1]	**Alcoholic Beverages**	**2080-2085**
Smoke[1]	**Tobacco Products**	**2100-2199**
Toys	Recreational Products	0900-0999, 3650-3652, 3732, 3930-3949
Fun[1,2]	**Entertainment**	**7800-7841, 7900-7999**
Books	Printing and Publishing	2700-2749, 2770-2799
Hshld	Consumer Goods	2047, 2391-2392, 2510-2519, 2590-2599, 2840-2844, 3160-3199, 3229-3231, 3260, 3262-3263, 3269, 3630-3639, 3750-3751, 3800, 3860-3879, 3910-3919, 3960-3961, 3991, 3995
Clths	Apparel	2300-2390, 3020-3021, 3100-3111. 3130-3159, 3965
Hlth	Healthcare	8000-8099
MedEq	Medical Equipment	3693, 3840-3851
Drugs	Pharmaceutical Products	2830-2836
Chems	Chemicals	2800-2829, 2850-2899
Rubbr	Rubber and Plastic Products	3000, 3050-3099
Txtls	Textiles	2200-2295, 2297-2999, 2393-2395, 2397-2399
BldMt	Construction Materials	0800-0899, 2400-2439, 2450-2459, 2490-2499, 2950-2952, 3200-3219, 3240-3259, 3261, 3264-3264, 3270-3299, 3420-3442, 3446-3452, 3490-3499, 3996
Cnstr	Construction	1500-1549, 1600-1699, 1700-1799
Steel	Steel Works, Etc.	3300-3369, 3390-3399
FabPr	Fabricated Products	3400, 3443-3444, 3460-3479
Mach	Machinery	3510-3536, 3540-3569, 3580-3599
ElcEq	Eletrical Equipment	3600-3621, 3623-3629, 3640-3646, 3648-3649, 3660, 3691-3692, 3699
Misc	Miscellaneous	3900, 3990, 3999, 9900-9999

Autos	Automobiles and Trucks	2296, 2396, 3010-3011, 3537, 3647, 3694, 3700-3716, 3790-3792, 3799
Aero	Aircraft	3720-3729
Ships	Shipbuilding, Railroad Eq	3730-3731, 3740-3742
Guns	Defense	3480-3489, 3760-3769, 3795
Gold	Precious Metals	1040-1049
Mines	Nonmetallic Mining	1000-1039, 1060-1099, 1400-1499
Coal	Coal	1200-1299
Enrgy	Petroleum and Natural Gas	1310-1389, 2900-2911, 2990-2999
Util	Utilities	4900-4999
Telcm	Telecommunications	4800-4899
PerSv	Personal Services	7020-7021, 7030-7039, 7200-7212, 7215-7299, 7395, 7500, 7520-7549, 7600-7699, 8100-8199, 8200-8299, 8300-8399, 8400-8499, 8600-8699, 8800-8899
BusSv	Business Services	2750-2759, 3993, 7300-7372, 7374-7394, 7397, 7399, 7510-7519, 8700-8748, 8900-8999
Comps	Computers	3570-3579, 3680-3689, 3695, 7373
Chips	Electronic Equipment	3622, 3661-3679, 3810, 3812
LabEq	Measuring and Control Equip	3811, 3820-3830
Paper	Business Supplies	2520-2549, 2600-2639, 2670-2699, 2760-2761, 3950-3955
Boxes	Shipping Containers	2440-2449, 2640-2659, 3210-3221, 3410-3412
Trans	Transportation	4000-4099, 4100-4199, 4200-4299, 4400-4499, 4500-4599, 4600-4699, 4700-4799
Whlsl	Wholesale	5000-5099, 5100-5199
Rtail	Retail	5000-5099, 5100-5199, 5200-5299, 5300-5399, 5400-5499, 5500-5599, 5600-5699, 5700-5736, 5900-5999
Meals[1,2]	**Restaurants, Hotel, Motel**	**5800-5813, 5890, 7000-7019, 7040-7049, 7213**
Banks	Banking	6000-6099, 6100-6199
Insur	Insurance	6300-6399, 6400-6411
RlEst	Real Estate	6500-6533
Fin	Trading	6200-6299, 6700-6799

Appendix C – Relevant NAICS codes

Only including relevant sectors incl. sub-sectors (US only). For an extensive list see https://www.census.gov/naics/reference_files_tools/2022_NAICS_Manual.pdf.

NAICS Sector	NAICS Sub-sector	NAICS codes
71 - Arts, Entertainment, and Recreation	713 - Amusement, Gambling, and Recreation Industries	7132 - Gambling Industries, 71312 - Amusement Arcades, 713210 - Casinos (except Casino Hotels), 71329 & 713290- Other Gambling Industries,
72 – Accommodation and Food Services	721 - Accommodation	72112 & 721120 - Casino Hotels

Appendix D – Results of the Hausman (1978) test

The important value in this table is the Prob > chi2 = 0.0000. If the value is < 0.05, a FE model should be used.

```
Fixed-effects (within) regression               Number of obs      =       3,001
Group variable: company_un~g                    Number of groups   =         317

R-squared:                                      Obs per group:
     Within  = 0.3128                                         min =           1
     Between = 0.0037                                         avg =         9.5
     Overall = 0.0492                                         max =          23

                                                F(9, 2675)         =      135.32
corr(u_i, Xb) = -0.8444                         Prob > F           =      0.0000
```

ERovermarket	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
FF_3F_MktRF	-.2730662	.0469867	-5.81	0.000	-.3652002	-.1809323
FF_3F_SMB	.1640143	.1009604	1.62	0.104	-.0339539	.3619826
FF_3F_HML	-.1329154	.0503319	-2.64	0.008	-.2316089	-.034222
LN_MV_w	-.2014962	.0113819	-17.70	0.000	-.2238144	-.179178
PB_CHANGE_w	.1581647	.0061202	25.84	0.000	.146164	.1701655
OPMARGIN_CHANGE_w	-.0007185	.0015803	-0.45	0.649	-.0038172	.0023802
ROE_CHANGE_w	.0005686	.0004883	1.16	0.244	-.0003889	.001526
CFOPERATING_CHANGE_w	.0020206	.0017548	1.15	0.250	-.0014203	.0054615
DE_CHANGE_w	-.0084837	.0010429	-8.13	0.000	-.0105287	-.0064387
_cons	1.271687	.0685706	18.55	0.000	1.13723	1.406143
sigma_u	.62839925					
sigma_e	.43671142					
rho	.67432367	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(316, 2675) = 2.67                     Prob > F = 0.0000
```

```
Random-effects GLS regression                   Number of obs      =       3,001
Group variable: company_un~g                    Number of groups   =         317

R-squared:                                      Obs per group:
     Within  = 0.2583                                         min =           1
     Between = 0.0800                                         avg =         9.5
     Overall = 0.1983                                         max =          23

                                                Wald chi2(9)       =      924.69
corr(u_i, X) = 0 (assumed)                      Prob > chi2        =      0.0000
```

ERovermarket	Coefficient	Std. err.	z	P>|z|	[95% conf.	interval]
FF_3F_MktRF	-.3004067	.0474972	-6.32	0.000	-.3934994	-.2073139
FF_3F_SMB	.5523661	.0982778	5.62	0.000	.3597451	.7449871
FF_3F_HML	.0226766	.0497717	0.46	0.649	-.0748742	.1202274
LN_MV_w	-.0351528	.0055435	-6.34	0.000	-.0460178	-.0242878
PB_CHANGE_w	.1678111	.0060209	27.87	0.000	.1560104	.1796119
OPMARGIN_CHANGE_w	-5.46e-06	.0016175	-0.00	0.997	-.0031757	.0031648
ROE_CHANGE_w	.0006454	.0004657	1.39	0.166	-.0002673	.001558
CFOPERATING_CHANGE_w	.0029039	.0017788	1.63	0.103	-.0005826	.0063903
DE_CHANGE_w	-.0106308	.0009988	-10.64	0.000	-.0125885	-.0086731
_cons	.2509596	.0349991	7.17	0.000	.1823626	.3195565
sigma_u	.21552546					
sigma_e	.43671142					
rho	.19585781	(fraction of variance due to u_i)				

	Coefficients			
	(b) fixed	(B) random	(b-B) Difference	sqrt(diag(V_b-V_B)) Std. err.
FF_3F_MktRF	-.2730662	-.3004067	.0273405	.
FF_3F_SMB	.1640143	.5523661	-.3883518	.0231185
FF_3F_HML	-.1329154	.0226766	-.155592	.0074885
LN_MV_w	-.2014962	-.0351528	-.1663434	.0099407
PB_CHANGE_w	.1581647	.1678111	-.0096464	.0010979
OPMARGIN_C~w	-.0007185	-5.46e-06	-.000713	.
ROE_CHANGE_w	.0005686	.0006454	-.0000768	.0001469
CFOPERATIN~w	.0020206	.0029039	-.0008833	.
DE_CHANGE_w	-.0084837	-.0106308	.0021472	.0002999

b = Consistent under H0 and Ha; obtained from **xtreg**.
B = Inconsistent under Ha, efficient under H0; obtained from **xtreg**.

Test of H0: Difference in coefficients not systematic

chi2(**9**) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= **320.10**
Prob > chi2 = **0.0000**
(V_b-V_B is not positive definite)

Appendix E – Excess return over the market with 3FF - Industry

This table presents regression results for the all the industry samples Tobacco, Alcohol, and Gaming, from left to right. The dependent variable is the ER over the market using the 3FF factors as the main regressors. Robust standard errors are shown in parentheses and *, **, *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

	Tobacco							Alcohol							Gaming						
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
FF_3F_MktRF	-0.14	-0.17	-0.25	-0.45***	-0.55***	-0.62***	-0.63***	-0.32***	-0.32***	-0.36***	-0.30***	-0.31***	-0.27***	-0.26***	-0.00	-0.06	-0.12	-0.17	-0.25**	-0.25**	-0.26**
	(0.399)	(0.289)	(0.228)	(0.107)	(0.119)	(0.106)	(0.132)	(0.062)	(0.060)	(0.051)	(0.054)	(0.055)	(0.057)	(0.059)	(0.162)	(0.157)	(0.166)	(0.107)	(0.109)	(0.112)	(0.106)
FF_3F_SMB	0.86	-0.27	0.01	0.34	0.66**	0.58*	0.55	0.44***	0.20	0.30**	0.23*	0.19	0.07	-0.07	1.47***	0.88***	0.77**	0.59**	0.73***	0.75***	0.45**
	(0.684)	(0.830)	(0.514)	(0.235)	(0.257)	(0.296)	(0.348)	(0.133)	(0.126)	(0.114)	(0.129)	(0.121)	(0.134)	(0.125)	(0.318)	(0.327)	(0.320)	(0.229)	(0.208)	(0.213)	(0.194)
FF_3F_HML	0.23	0.34	0.23	-0.13	-0.19	-0.12	-0.11	-0.06	-0.18***	-0.20***	-0.20***	-0.22***	-0.22***	-0.20***	0.04	-0.04	-0.02	-0.16	-0.15	-0.13	-0.02
	(0.700)	(0.477)	(0.422)	(0.113)	(0.116)	(0.118)	(0.126)	(0.057)	(0.054)	(0.048)	(0.057)	(0.055)	(0.061)	(0.060)	(0.212)	(0.207)	(0.225)	(0.119)	(0.113)	(0.115)	(0.105)
Market Value		-0.36**	-0.29***	-0.18***	-0.17***	-0.15***	-0.19***		-0.16***	-0.14***	-0.16***	-0.16***	-0.17***	-0.17***		-0.23***	-0.24***	-0.27***	-0.26***	-0.26***	-0.24***
		(0.175)	(0.086)	(0.043)	(0.047)	(0.044)	(0.047)		(0.017)	(0.017)	(0.021)	(0.022)	(0.023)	(0.021)		(0.035)	(0.037)	(0.041)	(0.034)	(0.034)	(0.030)
Price-to-Book			0.22***	0.10***	0.14***	0.15***	0.14***			0.14***	0.11**	0.16***	0.16***	0.17***			0.06*	0.05	0.13***	0.13***	0.18***
			(0.057)	(0.030)	(0.015)	(0.013)	(0.010)			(0.051)	(0.043)	(0.052)	(0.055)	(0.055)			(0.030)	(0.035)	(0.039)	(0.040)	(0.035)
Op Profit Margin				-0.00	0.00	-0.00	-0.01				-0.00	-0.00	-0.00	-0.00				0.00	0.00	0.00	-0.00
				(0.003)	(0.003)	(0.003)	(0.010)				(0.002)	(0.002)	(0.002)	(0.002)				(0.002)	(0.002)	(0.002)	(0.001)
RoE					0.00	-0.00	-0.00					0.00	0.00	0.00					-0.00	-0.00**	-0.00*
					(0.001)	(0.001)	(0.001)					(0.003)	(0.003)	(0.003)					(0.001)	(0.001)	(0.001)
CF Operating						0.00	0.00						-0.00	0.00						0.01*	0.01
						(0.001)	(0.001)						(0.003)	(0.003)						(0.005)	(0.005)
D/E							-0.03*							-0.01							-0.02***
							(0.015)							(0.003)							(0.004)
Constant	0.11***	2.32**	1.85***	1.23***	1.07***	0.99***	1.36***	0.08***	0.85***	0.75***	0.93***	0.95***	1.04***	1.07***	0.08***	1.21***	1.25***	1.56***	1.53***	1.54***	1.46***
	(0.028)	(1.048)	(0.502)	(0.275)	(0.284)	(0.264)	(0.318)	(0.006)	(0.083)	(0.089)	(0.117)	(0.124)	(0.137)	(0.130)	(0.012)	(0.164)	(0.182)	(0.224)	(0.191)	(0.192)	(0.173)
Observations	523	519	503	422	342	320	253	2,721	2,703	2,508	2,076	1,991	1,810	1,682	1,931	1,917	1,809	1,457	1,312	1,292	1,066
Adj. R^2	0.00	0.09	0.31	0.38	0.49	0.52	0.56	0.01	0.09	0.24	0.22	0.27	0.27	0.28	0.02	0.08	0.10	0.16	0.24	0.25	0.33
Sample Size	39	39	38	36	36	33	29	197	197	190	183	179	172	165	155	155	149	142	132	132	123

Appendix F – Excess return over the market with 5FF - Industry

This table presents regression results for the all the industry samples Tobacco, Alcohol, and Gaming, from left to right. The dependent variable is the ER over the market using the 5FF factors as the main regressors. Robust standard errors are shown in parentheses and *, **, *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

	Tobacco							Alcohol							Gaming						
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
FF_5F_MktRF	0.47	0.24	0.15	-0.44***	-0.56***	-0.56***	-0.53***	-0.29***	-0.30***	-0.32***	-0.28***	-0.31***	-0.28***	-0.28***	0.04	-0.05	-0.09	-0.25**	-0.37***	-0.39***	-0.37***
	(0.799)	(0.629)	(0.549)	(0.109)	(0.123)	(0.114)	(0.146)	(0.077)	(0.072)	(0.055)	(0.059)	(0.057)	(0.060)	(0.063)	(0.291)	(0.274)	(0.293)	(0.112)	(0.113)	(0.115)	(0.110)
FF_5F_SMB	0.91	-0.11	-0.07	0.46	0.89**	0.90**	0.77	0.32**	0.07	0.13	0.14	0.14	-0.01	-0.15	2.10***	1.48***	1.44***	1.35***	1.30***	1.37***	1.03***
	(0.609)	(0.881)	(0.523)	(0.320)	(0.363)	(0.436)	(0.480)	(0.163)	(0.146)	(0.130)	(0.149)	(0.130)	(0.149)	(0.143)	(0.353)	(0.360)	(0.351)	(0.308)	(0.298)	(0.301)	(0.270)
FF_5F_HML	-0.80	-0.12	-0.41	-0.16	-0.16	-0.18	-0.30	-0.25**	-0.30***	-0.37***	-0.29**	-0.24**	-0.22*	-0.17	0.07	0.15	0.21	0.38*	0.31	0.40**	0.50**
	(0.770)	(0.282)	(0.256)	(0.187)	(0.189)	(0.186)	(0.191)	(0.108)	(0.101)	(0.096)	(0.112)	(0.110)	(0.121)	(0.126)	(0.253)	(0.249)	(0.251)	(0.222)	(0.190)	(0.200)	(0.205)
FF_5F_RMW	2.17	1.60	1.39	0.09	0.10	0.44*	0.54***	-0.05	-0.05	-0.02	-0.00	-0.03	-0.06	-0.08	0.51	0.43	0.56	0.19	-0.08	-0.10	-0.02
	(1.680)	(1.439)	(1.390)	(0.237)	(0.295)	(0.222)	(0.190)	(0.135)	(0.134)	(0.111)	(0.111)	(0.110)	(0.118)	(0.126)	(0.589)	(0.569)	(0.598)	(0.282)	(0.271)	(0.280)	(0.224)
FF_5F_CMA	1.08	0.46	0.86	-0.13	-0.41	-0.35	-0.05	0.31*	0.25	0.31**	0.13	0.01	0.02	0.00	-0.91**	-1.00**	-1.11***	-1.66***	-1.40***	-1.55***	-1.44***
	(0.928)	(0.619)	(0.585)	(0.300)	(0.308)	(0.340)	(0.284)	(0.182)	(0.158)	(0.148)	(0.183)	(0.173)	(0.197)	(0.211)	(0.389)	(0.386)	(0.394)	(0.414)	(0.389)	(0.400)	(0.420)
Market Value		-0.36**	-0.28***	-0.18***	-0.17***	-0.15***	-0.18***		-0.16***	-0.14***	-0.16***	-0.16***	-0.17***	-0.17***		-0.23***	-0.24***	-0.27***	-0.26***	-0.26***	-0.24***
		(0.169)	(0.080)	(0.043)	(0.047)	(0.043)	(0.047)		(0.017)	(0.017)	(0.022)	(0.022)	(0.024)	(0.022)		(0.034)	(0.037)	(0.042)	(0.035)	(0.035)	(0.031)
Price-to-Book			0.22***	0.10***	0.14***	0.15***	0.14***			0.14***	0.11**	0.16***	0.16***	0.17***			0.05*	0.05	0.12***	0.13***	0.18***
			(0.056)	(0.030)	(0.015)	(0.013)	(0.011)			(0.051)	(0.043)	(0.053)	(0.055)	(0.055)			(0.030)	(0.034)	(0.038)	(0.039)	(0.034)
Op Profit Margin				-0.00	0.00	-0.00	-0.01				-0.00	-0.00	-0.00	-0.00				0.00	0.00	0.00	-0.00
				(0.003)	(0.003)	(0.003)	(0.010)				(0.002)	(0.002)	(0.002)	(0.002)				(0.002)	(0.002)	(0.002)	(0.001)
RoE					0.00	-0.00	-0.00					0.00	0.00	0.00					-0.00	-0.00**	-0.00*
					(0.001)	(0.001)	(0.001)					(0.003)	(0.003)	(0.003)					(0.001)	(0.001)	(0.001)
CF Operating						0.00	0.00						-0.00	0.00						0.01*	0.01
						(0.001)	(0.001)						(0.003)	(0.003)						(0.005)	(0.005)
D/E							-0.03*							-0.01							-0.02***
							(0.015)							(0.003)							(0.003)
Constant	-0.06	2.15**	1.67***	1.21***	1.05***	0.93***	1.27***	0.08***	0.86***	0.75***	0.94***	0.96***	1.06***	1.09***	0.05	1.19***	1.22***	1.57***	1.56***	1.58***	1.51***
	(0.154)	(0.927)	(0.403)	(0.277)	(0.291)	(0.265)	(0.315)	(0.013)	(0.087)	(0.093)	(0.121)	(0.129)	(0.142)	(0.135)	(0.054)	(0.159)	(0.178)	(0.234)	(0.200)	(0.202)	(0.185)
Observations	523	519	503	422	342	320	253	2,721	2,703	2,508	2,076	1,991	1,810	1,682	1,931	1,917	1,809	1,457	1,312	1,292	1,066
Adj. R^2	0.01	0.09	0.32	0.37	0.49	0.52	0.57	0.01	0.09	0.24	0.21	0.27	0.27	0.28	0.02	0.08	0.11	0.18	0.25	0.26	0.35
Sample Size	39	39	38	36	36	33	29	197	197	190	183	179	172	165	155	155	149	142	132	132	123

Appendix G – Excess return over the comparable companies with 3FF - Industry

This table presents regression results for the all the industry samples Tobacco, Alcohol, and Gaming, from left to right. The dependent variable is the ER over comparable companies using the 3FF factors as the main regressors. Robust standard errors are shown in parentheses and *, **, *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

	Tobacco							Alcohol							Gaming						
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
FF_3F_MktRF	0.85**	0.81***	0.74***	0.49***	0.42***	0.39***	0.37***	0.62***	0.62***	0.59***	0.61***	0.59***	0.65***	0.66***	0.97***	0.90***	0.85***	0.77***	0.69***	0.70***	0.68***
	(0.403)	(0.293)	(0.234)	(0.108)	(0.110)	(0.098)	(0.113)	(0.062)	(0.062)	(0.053)	(0.055)	(0.055)	(0.057)	(0.059)	(0.164)	(0.159)	(0.169)	(0.109)	(0.111)	(0.114)	(0.107)
FF_3F_SMB	1.19*	0.06	0.32	0.70***	0.96***	0.87***	0.85**	0.74***	0.47***	0.53***	0.49***	0.43***	0.27**	0.15	1.90***	1.26***	1.14***	0.95***	1.06***	1.09***	0.79***
	(0.685)	(0.825)	(0.520)	(0.243)	(0.264)	(0.306)	(0.367)	(0.132)	(0.127)	(0.117)	(0.132)	(0.120)	(0.130)	(0.123)	(0.324)	(0.334)	(0.328)	(0.232)	(0.211)	(0.216)	(0.198)
FF_3F_HML	0.24	0.34	0.22	-0.11	-0.16	-0.15	-0.11	-0.02	-0.16***	-0.18***	-0.15**	-0.18***	-0.22***	-0.21***	0.00	-0.09	-0.07	-0.16	-0.14	-0.12	-0.01
	(0.692)	(0.479)	(0.425)	(0.115)	(0.125)	(0.135)	(0.152)	(0.055)	(0.054)	(0.048)	(0.059)	(0.055)	(0.060)	(0.060)	(0.213)	(0.208)	(0.226)	(0.124)	(0.116)	(0.118)	(0.110)
Market Value		-0.37**	-0.30***	-0.22***	-0.20***	-0.19***	-0.22***		-0.18***	-0.16***	-0.21***	-0.21***	-0.23***	-0.23***		-0.25***	-0.26***	-0.31***	-0.31***	-0.31***	-0.29***
		(0.168)	(0.084)	(0.057)	(0.061)	(0.062)	(0.070)		(0.020)	(0.021)	(0.025)	(0.024)	(0.026)	(0.024)		(0.035)	(0.038)	(0.041)	(0.035)	(0.035)	(0.030)
Price-to-Book			0.21***	0.10***	0.13***	0.14***	0.13***			0.13**	0.11**	0.16***	0.16***	0.17***			0.05*	0.05	0.12***	0.13***	0.18***
			(0.056)	(0.027)	(0.015)	(0.013)	(0.011)			(0.052)	(0.044)	(0.052)	(0.055)	(0.056)			(0.030)	(0.034)	(0.039)	(0.040)	(0.034)
Op Profit Margin				-0.00	-0.00	-0.00	-0.01				-0.00**	-0.00**	-0.00	-0.00				0.00	0.00	0.00	-0.00
				(0.003)	(0.002)	(0.002)	(0.012)				(0.002)	(0.002)	(0.003)	(0.003)				(0.002)	(0.002)	(0.002)	(0.001)
RoE					0.00	-0.00	-0.00					0.00	0.00	0.00					-0.00*	-0.00**	-0.00**
					(0.001)	(0.001)	(0.001)					(0.003)	(0.003)	(0.003)					(0.001)	(0.001)	(0.001)
CF Operating						0.00	0.00						-0.00	0.00						0.01	0.00
						(0.001)	(0.001)						(0.003)	(0.004)						(0.005)	(0.006)
D/E							-0.05**							-0.01							-0.02***
							(0.017)							(0.003)							(0.003)
Constant	-0.03	2.21**	1.75***	1.31***	1.10***	1.06***	1.44***	-0.06***	0.81***	0.73***	1.04***	1.09***	1.22***	1.26***	-0.06***	1.18***	1.25***	1.64***	1.65***	1.66***	1.62***
	(0.028)	(1.011)	(0.493)	(0.368)	(0.368)	(0.376)	(0.474)	(0.006)	(0.097)	(0.106)	(0.135)	(0.135)	(0.149)	(0.144)	(0.013)	(0.168)	(0.183)	(0.225)	(0.194)	(0.194)	(0.174)
Observations	523	519	503	422	342	320	253	2,721	2,703	2,508	2,076	1,991	1,810	1,682	1,931	1,917	1,809	1,457	1,312	1,292	1,066
Adj. R^2	0.02	0.11	0.32	0.38	0.46	0.46	0.49	0.07	0.16	0.29	0.30	0.35	0.36	0.37	0.07	0.14	0.16	0.25	0.33	0.33	0.42
Sample Size	39	39	38	36	36	33	29	197	197	190	183	179	172	165	155	155	149	142	132	132	123

Appendix H – Excess return over the comparable companies with 5FF - Industry

This table presents regression results for the all the industry samples Tobacco, Alcohol, and Gaming, from left to right. The dependent variable is the ER over comparable companies using the 5FF factors as the main regressors. Robust standard errors are shown in parentheses and *, **, *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

	Tobacco							Alcohol							Gaming						
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
FF_5F_MktRF	1.35*	1.11*	1.01*	0.43***	0.37***	0.36***	0.39***	0.54***	0.53***	0.51***	0.54***	0.51***	0.55***	0.55***	0.96***	0.85***	0.83***	0.66***	0.54***	0.52***	0.54***
	(0.797)	(0.628)	(0.552)	(0.110)	(0.120)	(0.116)	(0.137)	(0.079)	(0.074)	(0.058)	(0.060)	(0.056)	(0.059)	(0.061)	(0.294)	(0.276)	(0.294)	(0.114)	(0.117)	(0.119)	(0.115)
FF_5F_SMB	1.45**	0.43	0.47	0.89**	1.30***	1.34***	1.19**	0.77***	0.48***	0.52***	0.36**	0.33**	0.17	0.05	2.62***	1.95***	1.91***	1.60***	1.53***	1.60***	1.28***
	(0.606)	(0.868)	(0.510)	(0.334)	(0.385)	(0.452)	(0.506)	(0.163)	(0.149)	(0.135)	(0.157)	(0.133)	(0.147)	(0.144)	(0.356)	(0.364)	(0.355)	(0.307)	(0.297)	(0.300)	(0.274)
FF_5F_HML	-0.58	0.09	-0.16	-0.08	-0.07	-0.06	-0.21	-0.04	-0.10	-0.14	-0.22**	-0.19*	-0.15	-0.11	0.08	0.15	0.22	0.24	0.19	0.28	0.39*
	(0.763)	(0.298)	(0.270)	(0.198)	(0.223)	(0.229)	(0.227)	(0.108)	(0.101)	(0.098)	(0.111)	(0.108)	(0.120)	(0.124)	(0.252)	(0.247)	(0.247)	(0.223)	(0.191)	(0.201)	(0.205)
FF_5F_RMW	1.93	1.35	1.12	-0.18	-0.07	0.14	0.25	-0.32**	-0.33**	-0.32***	-0.37***	-0.40***	-0.49***	-0.49***	0.37	0.27	0.42	0.01	-0.27	-0.31	-0.21
	(1.667)	(1.430)	(1.389)	(0.250)	(0.310)	(0.294)	(0.266)	(0.138)	(0.137)	(0.115)	(0.114)	(0.113)	(0.122)	(0.129)	(0.593)	(0.570)	(0.600)	(0.285)	(0.278)	(0.287)	(0.237)
FF_5F_CMA	0.55	-0.06	0.26	-0.28	-0.60	-0.70	-0.28	-0.10	-0.16	-0.14	0.18	0.06	-0.03	-0.05	-1.12***	-1.21***	-1.34***	-1.39***	-1.13***	-1.29***	-1.20***
	(0.909)	(0.618)	(0.571)	(0.329)	(0.419)	(0.473)	(0.422)	(0.192)	(0.168)	(0.166)	(0.194)	(0.182)	(0.208)	(0.221)	(0.387)	(0.377)	(0.379)	(0.412)	(0.388)	(0.401)	(0.415)
Market Value		-0.36**	-0.29***	-0.22***	-0.19***	-0.18***	-0.21***		-0.18***	-0.16***	-0.21***	-0.21***	-0.23***	-0.23***		-0.25***	-0.26***	-0.31***	-0.31***	-0.31***	-0.29***
		(0.164)	(0.079)	(0.056)	(0.060)	(0.060)	(0.069)		(0.020)	(0.021)	(0.025)	(0.025)	(0.026)	(0.025)		(0.035)	(0.038)	(0.042)	(0.035)	(0.036)	(0.031)
Price-to-Book			0.21***	0.10***	0.13***	0.14***	0.13***			0.13**	0.11**	0.16***	0.16***	0.17***			0.05*	0.05	0.12***	0.13***	0.18***
			(0.055)	(0.027)	(0.015)	(0.013)	(0.011)			(0.052)	(0.044)	(0.052)	(0.055)	(0.056)			(0.029)	(0.033)	(0.038)	(0.039)	(0.034)
Op Profit Margin				-0.00	-0.00	-0.00	-0.01				-0.00**	-0.00**	-0.00	-0.00				0.00	0.00	0.00	-0.00
				(0.003)	(0.002)	(0.003)	(0.012)				(0.002)	(0.002)	(0.003)	(0.003)				(0.002)	(0.002)	(0.002)	(0.001)
RoE					0.00	-0.00	-0.00					0.00	0.00	0.00					-0.00*	-0.00**	-0.00**
					(0.001)	(0.001)	(0.001)					(0.003)	(0.003)	(0.003)					(0.001)	(0.001)	(0.001)
CF Operating						0.00	0.00						-0.00	0.00						0.01	0.00
						(0.001)	(0.001)						(0.004)	(0.004)						(0.005)	(0.005)
D/E							-0.05**							-0.01							-0.02***
							(0.017)							(0.003)							(0.003)
Constant	-0.18	2.07**	1.61***	1.30***	1.08***	1.02***	1.36***	-0.04***	0.83***	0.75***	1.06***	1.12***	1.25***	1.29***	-0.07	1.17***	1.23***	1.65***	1.68***	1.70***	1.66***
	(0.152)	(0.899)	(0.414)	(0.361)	(0.363)	(0.368)	(0.467)	(0.013)	(0.100)	(0.109)	(0.140)	(0.139)	(0.154)	(0.149)	(0.055)	(0.163)	(0.180)	(0.231)	(0.199)	(0.201)	(0.182)
Observations	523	519	503	422	342	320	253	2,721	2,703	2,508	2,076	1,991	1,810	1,682	1,931	1,917	1,809	1,457	1,312	1,292	1,066
Adj. R^2	0.03	0.11	0.32	0.38	0.46	0.47	0.49	0.07	0.16	0.29	0.30	0.36	0.37	0.37	0.08	0.15	0.17	0.26	0.33	0.34	0.43
Sample Size	39	39	38	36	36	33	29	197	197	190	183	179	172	165	155	155	149	142	132	132	123