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SIN STOCKS IN EUROPEAN COUNTRIES: THE INFLUENCE OF WEALTH AND FAMILIARITY BIAS ON INVESTMENT CHOICES

Abstract

This study examines the relationship between the wealth of European societies and their investment decisions in «sinful» industries, including tobacco, alcohol, and gambling. The study aims to challenge the widely held belief that wealthier countries are more socially responsible in their investment choices and to investigate the impact of familiarity bias on investment decisions in these industries. An experimental research design with panel data compares the returns from a portfolio of sin stocks from Northern Europe with a portfolio of sin stocks from Southern and Eastern Europe. The study utilises multiple models, including the CAPM single-factor, the Fama-French three-factor, and the Fama-French five-factor, to measure the risk-adjusted returns of sin stocks across various European countries. Findings reveal that sin stocks from wealthier countries tend to have higher risk-adjusted returns compared to those from less wealthy countries. Sin stocks have a significant relation with the market, but their volatility is consistently lower. Countries that drink more alcohol are more willing to invest in alcohol stocks than countries that drink less, as these stocks outperform the market during economic downturns. Sin stocks impact financial performance, investor behaviour, social responsibility, market efficiency, and regulations. The study uncovers the influence of familiarity bias, indicating that investors from countries more accustomed to «sinful» activities are less reluctant to invest in such industries than countries with lower familiarity. This finding highlights the importance of cultural and social factors in shaping investment decisions and challenges traditional concepts of market efficiency.

Keywords behavioral finance, European countries, risk-adjusted returns, market efficiency, social norms, moral considerations

JEL Classification G40, G41

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INTRODUCTION

Sin stocks refer to companies that engage in unethical activities, such as alcohol, tobacco, gambling, and weapons. These stocks have gained attention in the field of finance and investing due to their potential to yield higher returns than the market average. Several studies have found that sin stocks tend to outperform the market, leading to discussions about their performance and potential for generating abnormal returns. However, there is limited research on why sin stocks outperform the market, particularly in different regions. One possible explanation for this phenomenon is the familiarity bias of investors. Familiarity bias suggests that investors tend to invest in stocks they are familiar with, which may influence their decision to invest in sin stocks. Additionally, there seems to be a correlation between ethical investing and wealth, with more enthusiastic ethical investors in wealthier regions. Understanding the relationship between sin stocks, geographic regions, and investor behaviour is crucial to shed light on this phenomenon.

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The impact of sin stocks on European economies can be multifaceted. On the one hand, sin industries such as tobacco, alcohol, and gambling can generate significant revenue, create jobs, and contribute to tax revenues for governments. These industries often have a large customer base and can be profitable, positively affecting economic growth and stability. However, there are also potential negative consequences associated with sin stocks. These industries may impose social costs related to health issues, addiction, and societal harm, which can strain healthcare systems and social services. Government regulation and control of sin industries can also require significant resources and efforts, impacting their budgets and priorities. Overall, the impact of sin stocks on European economies involves a trade-off between financial benefits and social costs that policymakers and stakeholders must consider carefully.

The study investigates the relationship between a country's wealth and investment in sin stocks. While Western European countries share a common culture and values, their attitudes towards "sinful" activities such as tobacco, alcohol, and gambling may vary. This variation could be due to factors such as religion or societal norms. The research explores whether the ability to neglect sin stocks and avoid their associated risks is a privilege afforded to wealthier investors. If this is the case, sin stocks in wealthier countries may have higher risk-adjusted returns due to their neglect by investors.

The study will test the following hypotheses about the relationship between regional and cultural factors and the performance of sin stocks in Europe.

H1: Sin stocks from Northern Europe have higher risk-adjusted returns than their Southern and Eastern European counterparts.

H2: Alcohol stocks in countries with higher levels of alcohol consumption have lower risk-adjusted returns than countries with lower consumption of those products and services.

H3: Gambling stocks in countries with higher levels of gambling consumption have lower risk-adjusted returns than countries with lower consumption of those products and services.

1. LITERATURE REVIEW

Investing in firms engaging in unethical activities such as alcohol, tobacco, gambling, and weapons may yield higher returns than the market average (Blitz & Fabozzi, 2017). Stocks of such firms are called various names; however, sin stocks is one of the most common terms. Some studies (Fabozzi et al., 2008; Fauber & McDonald, 2014; Hong & Kacperczyk, 2009; Salaber, 2007; Salaber, 2009; Kim & Venkatachalan, 2011) have found that sin stocks tend to yield higher returns than the market average, leading to discussions about the performance of these stocks and their potential for generating abnormal returns.

As the literature lacks a standardised categorisation of sin stocks, this study focuses on the three most extensively examined industries in the review: tobacco, alcohol, and gambling. Although other industries, such as weapons, pornography, and cannabis, are considered sin stocks, they have limited research available (sinstocksreport.com, 2022).

Previous studies have identified several reasons for the abnormal returns of sin stocks. One commonly researched factor is that not all investors are willing to trade in sin stocks, resulting in these stocks being priced below the market average. This can lead to higher compensation returns for investors in sin stocks willing to go against social norms (Fabozzi et al., 2008). Statman and Glushkov (2009) propose the "making good but not well" hypothesis, suggesting that conventional stocks outperform socially responsible stocks in terms of returns. Fama (1965) and Friedman (1953) argued against the significance of noise traders in the price formation process, as they would not be able to affect prices for long if trading against rational agents. Hong and Kacperczyk (2009) assume that some investors, particularly institutions subject to norms, may incur a financial cost in ab-

staining from investing in sin stocks due to societal norms against funding operations that promote vice. Other factors explored in the literature include potential monopolistic returns and litigation risks that may warrant higher returns for sin stocks. The contribution of Salaber (2007) with the Three-Factor model of Fama and French (1993) explored the relationship between sin stock performance, taxation, religion and litigation risks. They find empirical evidence supporting the idea that sin stocks have higher abnormal returns in Protestant than in Catholic countries. In other words, Protestants need a higher return to encourage them to invest in sin stocks. The evidence is supported by the Pew Research Center (2008), which shows that in Europe, the national average of people for whom religion plays a vital role in their lives of 23%. Moreover, the Protestant countries in the sample have an average GDP per capita of $51.857 compared to a GDP per capita of $45.394 in Catholic countries (IMF, 2019). As a result, the differences in sin stock performance might also be attributed to the wealth factor.

The literature differs regarding the definition of sin stock. All the studies reviewed have used the triumvirate of sin definition. Still, others, such as Fabozzi et al. (2008), consider sin stocks as those belonging to firms in the adult entertainment, alcohol, biotechnology, gambling, tobacco and weapon sectors. Using CAPM, the result indicates that sin stocks consistently outperform their benchmark market. However, categorising stocks from the weapon and biotechnology sector as sin stocks is controversial since it is not a "sinful" activity per se. There are no biases towards the industry itself but towards its perceived risks, rooted in ignorance and scientific ignorance illiteracy (Mchughen, 2007). Fauber and McDonald (2014) compared the importance of social norms in the G20 countries regarding alcohol, tobacco and gambling to find if these variances result in varying levels of return for sin stocks. They found countries of the G20 where alcohol, tobacco and gambling have a higher negative perception are the ones where sin stocks are cheaper and offer higher abnormal returns. The authors also find that sin stock abnormal returns are concentrated in countries with high capital flow restrictions.

Notably, there are also some methodological issues. The fact that only the CAPM market model is used means that some factors causing the abnormal returns are unaccounted for, and all the "success" is attributed to the sin stock denomination of the sample. Moreover, the fact that sectors like the defence industry and biotech are considered "sinful" is highly debatable: as an anecdotal example, the military is the most trusted institution in the US. Thus, this paper supports that abnormal returns can be expected from sin stocks, conditional on the social norms of specific countries and arbitrage. Adding the wealth variable to the model would have been interesting.

Previous research linked social norms and investors' characteristics to how they shape their investments (Fabozzi et al., 2008; Hong & Kacperczyk, 2009). Also, culture is examined with sin stock investment (Salaber, 2007b; Cheung & Lam, 2015). Evidence linking religion and a country's specific idiosyncrasy to the returns of sin stocks is reported by Salaber (2007). Nowadays, although every country has nuances in Western Europe, a common culture and a set of common values are shared. However, it seems that countries invest differently. The reason might be the social perception of the "sinful" activities varying from one country to country. It could be related to religion or a combination of many factors.

The purpose of this study is to investigate the potential relationship between a society's wealth and its investment in sin stocks, specifically in the tobacco, alcohol, and gambling industries. The study aims to determine if neglecting sin stocks is a privilege reserved for wealthy investors and if this leads to higher risk-adjusted returns for sin stocks in wealthier countries. The study seeks to contribute to the literature on the abnormal returns of sin stocks and the various factors that may influence their performance.

2. METHODS

2.1. Research models and variable measurements

The methodology used is an experimental research design with panel data comparing the returns from a portfolio of sin stocks from Northern Europe with a portfolio of sin stocks from Southern and Eastern Europe. If sin stocks are neglected more in Northern Europe than in the South and the East, statistically significantly higher risk-adjusted returns should be observed

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in the Northern Europe portfolio, where alcohol, tobacco and gambling are higher. The observation period encompasses 20 years, from July 21, 2000 to July 23, 2020. The long-term analysis is for avoiding any seasonal variations. The literature review shows business cycles significantly impact sin stock returns (Salaber, 2009).

Regarding risk-adjusted returns measurement, three quantitative methods are used: the CAPM single-factor or market model, the Fama-French three-factor model (Fama & French, 1993) and the Fama-French five-factor model (Fama & French, 2015). Thus, the data is regressed using the following models:

$$r_{i,t} - r_{f,t} = \alpha_i + \beta_i \left(r_{m,t} - r_{m,t} \right) + \varepsilon_{i,t}, \quad (1)$$

$$r_{i,t} - r_{f,t} = \alpha_i + \beta_i \left(r_{m,t} - r_{m,t} \right) + \\ + s_i SMB_t + h_i HML_t + \varepsilon_{i,t}, \quad (2)$$

$$r_{i,t} - r_{f,t} = \alpha_i + \beta_i \left(r_{m,t} - r_{m,t} \right) + s_i SMB_t + \\ + h_i HML_t + r_i RMW_t + c_i CMA_t + \varepsilon_{i,t}, \quad (3)$$

where r_{it} is the total return of a specific stock or Portfolio i at time t, and r_f is the risk-free rate at time t. The intercept, α_i, proxies the abnormal return measured by the model's return on the value-weight of the market portfolio. Thus, $(r_m - r_f)$ is the excess return on the market portfolio, SMB_t is the small minus big premium, HML_t is the high minus low premium. β_i, s_i, h_i, r_i, and c_i are factor coefficients in the equations and are treated as true rather than estimates. That means when the factor exposures capture all variation in expected returns, the intercept α_i will be zero for all securities and portfolios i. The Fama-French five-factor model is augmented with two more variables: RMW_t – the most profitable minus least profitable premium, and CMA_t, the conservative investing minus aggressive investing premium. As explained below, the Fama-French factors constitute the explanatory variables obtained from the Kenneth French Data Library.

The reason behind the variety of models used is that these models are standard in the existing literature (Salaber, 2007; Fabozzi et al., 2008; Kim & Venkatachalan, 2011; Lobel & Walkshäusl, 2016; Blitz & Fabozzi, 2017) compare the results to other papers. In addition, firms that existed in 2000 but ceased to exist before 2020 will be included in the regression to avoid survivorship bias, i.e., the tendency to overestimate past performance by considering only surviving companies' stocks (Brown et al., 1992).

2.2. Data

The times series data has been collected from DataStream, IQ Capital, the US Department of Treasury website and the Kenneth French Data Library. The data series are direct quotes from public companies from the countries of the European Union (EU) with an available ticket code and description in the DataStream database. The sample comprises 125 different European sin stocks: 30 tobacco stocks, 55 alcohol beverages stocks and 40 gambling stocks. Table 1 shows how the portfolios are formed and by how many stocks. This study uses the proxies for the Fama-French factors of Fama and French (1993) and Fama and French (2015) to fit the data into the models. These have been collected from the Kenneth French Data Library (2020) and are updated monthly. Since the values used can be country-specific or global, Fama and French (1998) argue that values obtained using global portfolios are more diversified, and their returns have less idiosyncratic.

For the comparison between regions and assessment of the first hypothesis (H1), the data is consolidated in two portfolios: North Europe and South plus East Europe. Thus, the Portfolio of North Europe includes sin stocks from the counties part of the EU that the United Nations Statistics Division (2020) regards and Northern and Western Europe. These countries are Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Ireland, Iceland, Latvia, Lithuania, Luxemburg, the Netherlands, Sweden and the UK. Although the UK formally left the EU in 2021, it has not been excluded because it has been a formal member during most of the analysed period. Following the same source, the countries that comprise the South & East Europe portfolio are Croatia, Greece, Italy, Portugal, Slovenia and Spain, plus the Eastern European countries – Bulgaria, the Czech Republic, Hungary, Poland, Romania and Slovakia. The second and third (H2

and H3) hypotheses follow the same analysis style using the processed data series described above. The portfolios are created based on countries' consumption of alcohol and gambling. The mortality rate attributed to alcohol acts as a proxy of alcohol consumption. The test assumes that countries with higher levels of deaths attributed to alcohol consumption are the ones with higher levels of alcohol consumption and the other way around. The data is gathered from the World Health Organization (2019). Two portfolios were created: High alcohol consumption, integrated by sin stocks from the upper half of countries in the consumption ranking, and Low alcohol consumption, integrated by sin stocks from the lower half of countries in the consumption ranking.

3. RESULTS

This study uses panel data to empirically study the attributes and customs of investors and how it affects the returns of sin stocks in Europe. Familiarity bias in these stocks and its outcomes can shed more light on a field of research with a lot of potential for development since most of the literature focuses on testing the existence of abnormal returns of sin stocks. At the same time, the causes of this anomaly remain vastly unexplored.

3.1. Descriptive statistics

Table 1 summarises the descriptive statistics of the returns of different time series used as dependent variables, including the mean, median, maximum and minimum, standard deviation and the number of deviations for each. The stocks are grouped to form sin portfolios in pairs: High Alcohol and High gambling are formed of sin stocks from those industries that belong to the EU and the UK with higher consumption of those 'sinful' products and services and vice versa for the portfolios Low Alcohol, Low Gambling and Low Tobacco.

The High Alcohol portfolio has a mean value of the monthly return of 0.8% for the period, whereas the Low Alcohol portfolio registers an average of 0.6%. Nevertheless, the higher returns come with higher risks for the High Alcohol portfolio, which shows a standard deviation of 5.37%, higher than the 2.94% of the Low Alcohol portfolio. The data indicates that the second hypothesis (H2) may not hold, but the higher returns of the High Alcohol portfolio may be due to the higher risk. However, the tests with different asset pricing models will help clarify that.

Table 2 shows the summary statistics of the data series returns that conform to the explanatory variables. The spread between the market returns and the risk-free ($r_{i,t} - r_{f,t}$) indicates that the market portfolio returns calculated by Kenneth French were above the risk-free rate by a monthly average of 0.4%. The median value is 0.9%, and the maximum and minimum values observed in the series are 11.41% and –19.51%. The standard deviation is 4.52%. Following the market excess return comes the small minus big premium (SMB) or size premium. The variable accounts for publicly traded companies with small market capitalisation tend to generate higher returns. According to the data, these higher returns have a monthly mean value of 0.06% for the 20 years with a standard deviation of 1.64%. The median value is 0%, and the maximum and minimum values are 4.1% and –5.6%, respectively. It can be appreciated how the SMB effect has a low but consistent impact with low additional returns but a low standard deviation and narrow spread.

Similarly, the *HML* data shows stocks with high book-to-market ratios tend to generate higher returns than the market. These returns have a monthly

Table 1. Descriptive statistics of the dependent variables

Variables / Statistics	North Europe	South and East Europe	High Alcohol	Low Alcohol	High Gambling	Low Gambling	High Tobacco	Low Tobacco
Mean	0.01417	0.01263	0.0088	0.0060	0.01702	0.02067	1.10747	0.00491
Median	0.01048	0.00421	0.0056	0.0079	0.01430	0.01230	1.16735	0.00000
Maximum	0.27295	0.40494	0.3175	0.1182	030190	0.36349	8.45768	0.71658
Minimum	–0.15101	–0.11640	–0.1782	–0.1266	–0.19693	–0.20687	0.23832	–0.09573
Std. Dev.	0.04338	0.05096	0.0537	0.0294	0.08114	0.07859	0.51500	0.05491
Observations	239	239	239	239	239	239	239	239

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Table 2. Descriptive statistics of the explanatory variables

Variables / Statistics	$r_{mt} - r_f$	SMB	HML	SMB 5	HML 5	RMW 5	CMA 5
Mean	0.00420	0.00066	0.00226	0.00150	0.00226	0.00388	0.00264
Median	0.00930	0.00000	0.00120	0.00080	0.00120	0.00400	–0.00060
Maximum	0.11410	0.04100	0.12200	0.04950	0.12200	0.06170	0.09550
Minimum	–0.19510	–0.05670	–0.09210	–0.06030	–0.09210	–0.05050	–0.05030
Std. Dev.	0.04523	0.01646	0.02417	0.01664	0.02417	0.01438	0.01859
Observations	239	239	239	239	239	239	239

mean value of 0.26%, and similarly to the SMB factor, the standard deviation has a low value compared to other variables, 2.41% in this case. The median, maximum and minimum values are 0.12%, 12.2% and –9.21%, respectively. HML and SMB are also present among the explanatory variables of the Fama-French five-factor asset pricing model with slightly different values in the small minus big premium case. The profitability factor accounts for the difference in returns between the most profitable and least profitable firms at an operational level. For this sample, the mean return of this factor is a monthly 0.38% with a standard deviation of 1.43%. The median, maximum and minimum values are 0.4%, 6.17% and –5.05%, respectively. The investment factor (CMA) reflects the return spread between firms that invest conservatively and aggressively. In this case, it has a mean monthly value of 0.02% and a standard deviation of 1.85%. This variable is the only one with a negative median value of –0.06%. The maximum value is 9.55%, and the minimum is –5.03%.

3.2. North Europe versus South and East Europe: Regression results

This study tests whether wealthier countries neglect sin stocks to a greater extent than not-so-wealthy ones – the first hypothesis. Table 3 shows the regression outcome of plotting the monthly portfolio returns with the explanatory variables of the CAPM, Fama-French Three Factor and Fama-French Five Factor models. First, with the one-factor CAPM, the suggestions from the correlation analysis are confirmed.

Table 3 is the regression output of the North Europe and South and East Europe portfolios using the CAPM, Fama-French three-factor and Fama-French five-factor models. The Northern European Portfolio shows a stronger correlation to the market and has a higher coefficient than South and East Europe. Both coefficients are significant at the 1% level. Northern European sin stocks are more volatile than their Southern and Eastern European counterparts. A coefficient equal to unity means that the stocks are as volatile as the market. Thus, with coefficient values of 0.5282 and 0.4685, the North, South, and East European portfolios are approximately half as volatile as the market.

Unlike the Fama-French model, the regression's intercepts are not zero for all portfolios and securities. That means the portfolios and securities are not perfectly tracking with the benchmark index. The intercept, α_i which measures the excess return for a certain level of risk, is significant at

Table 3. Regression output for North Europe and South and East Europe portfolios

Explanatory Variables / Dependent Variables	Alpha	Beta	SMB	HML	SMB 5	HML 5	RMW 5	CMA 5	Adjusted R^2
North Europe	0.0119***	0.5282***							0.3033
	0.0115***	0.5117***	0.4007***	0.1154					0.3213
	0.0097***	0.5481***			0.4270***	0.1385	0.4222**	–0.1873	0.3366
South and East Europe	0.0106***	0.4685***							0.1694
	0.0106***	0.4709***	–0.0193	0.028					0.1626
	0.0097***	0.4751***			–0.0189	0.1716	0.3267	–0.2824	0.1662

Note: *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

1% for both portfolios. The intercept value of the North Europe portfolio is 0.0119, 12% higher than the intercept of the South and East Europe portfolios, which has a value of 0.0106. Consequently, using CAPM, the hypothesis that sin stocks from Northern Europe have higher risk-adjusted returns than their Southern and Eastern European counterparts is not rejected.

The Fama-French three-factor regression outcome offers similar results. The coefficient of both portfolios is still significant at the 1% level, with values of 0.5117 in the case of the North Europe portfolio and 0.4709 for its counterpart. The value of the coefficients of North Europe is lower than the coefficient from the CAPM regression. Such is the consequence of adding a significant variable that absorbs part of its explanatory potential. The SMB premium is significant at the 1% level explaining the performance of the North Europe portfolio. The HML variable is not significant, indicating no trend in the book-to-market values of sin stocks. The intercept values resulting from this analysis are 0.0115 and 0.0106 for the North Europe and South and East Europe portfolios, respectively, both significant at the 1% level. There are signs of "sin aversion", with sin stocks from Northern European countries having monthly excess returns 8.43% higher than those in the South and East. Adding the new variables increases the adjusted R-squared value in the case of the North Europe portfolio, but it does not so for the South and East Europe portfolio, so using more variables helps understand better the reasons for the returns of Northern European sin stocks but not for the other regions of Europe. Studies that analyse sin stocks with CAPM as the only model, like Fabozzie et al. (2008), potentially miss out on the effects of additional significant variables like the small minus big premium in this case.

The regression using the Fama-French five-factor model and the monthly portfolio returns have a positive coefficient of 0.5481 for the North Europe portfolio. Likewise, the coefficients of the South and East Europe portfolios are positive with 0. 4751, all at the 1% level. Adding the new variables explains the South and East Europe portfolio returns separately. As for the Northern European sin stocks, the coefficient of the variable RMW 5 is significant at the 1% level and has a value of 0.4222. Thus, profitability is a significant variable that explains the returns of Northern European sin stocks. The intercepts of both portfolios are significant at 1%. However, the intercept of the North Europe portfolio remains 0.16% higher than that of the South and East Europe portfolios. It may seem like a small amount as a monthly value, but if annualised, it becomes a difference of 1.93%. Thus, the hypothesis that Sin stocks from Northern Europe have higher risk-adjusted returns than their Southern and Eastern European counterparts cannot be rejected.

The adjusted R-squared value does not change despite adding more variables in the regressions using the South and East Europe portfolio variables. On the one hand, this may be due to additional variables not being valid in explaining South and East European, but this is unlikely to be valid (Lobe & Walkshäusl, 2016). On the other hand, the data from the Kenneth French Library is built using data from a group of "developed" countries, and many of the sin stocks in the South and East Europe portfolio are not based on any of those. Another issue is the consistency with which both portfolios have a significant coefficient that rounds the value of 50%, which aligns with the literature consensus. Salaber (2007) claims that sin stock coefficients are lower than unity and not very sensitive to the market. A coefficient lower than unity seems to explain that these stocks tend to outperform the market during economic downturns. Finally, the HML variable's coefficient is not significant in any of the tests because sin stocks have balanced book-to-market ratios in general, or the ratio is not significant in the performance of the stocks as they may hide intangible flaws or strengths in the firms.

3.3. High alcohol consumption and Low alcohol consumption

This study tests the second hypothesis to check whether familiarity bias is true in sin stock investing and whether investors more familiarised with drinking alcohol are less opposed to investing in the alcohol industry.

Table 4 shows the regression output of the High Alcohol and Low Alcohol portfolios using the CAPM, Fama-French three-factor and Fama-

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Table 4. Regression output for High Alcohol and Low Alcohol Portfolios

Explantory Variables / Dependent Variables	Alpha	Beta	SMB	HML	SMB 5	HML 5	RMW 5	CMA 5	Adjusted R^2
High Alcohol	0.0062**	0.5590***							0.2183
	0.0055*	0.5368***	0.5903***	0.2131*					0.2530
	0.0040	0.5439***			0.5909***	0.3549*	0.4627**	−0.4614*	0.2711
Low Alcohol	0.0041***	0.4357***							0.4437
	0.0036***	0.4253***	0.2978***	0.1478**					0.4810
	0.0034**	0.4022***			0.2804***	0.2933***	0.1708	−0.3646***	0.5037

Note: *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

French five-factor models. The models using portfolios formed by sin stocks are based on countries with the top half consumption of alcohol per capita (High alcohol) and those in the lower half (Low alcohol). The parameter for the High Alcohol and Low Alcohol portfolio is significant at the 1% level. The coefficient's value varies depending on the model used, and Portfolio tested, but similarly to the previous test, it oscillates around 0.5000, making the High Alcohol portfolio stronger. The coefficients for the SMB and SMB 5 variables are also significant at 1% in every case. The values are consistently higher for the High Alcohol portfolio, indicating that alcohol firms are relatively small in countries with high per-capita consumption compared to the same firms in countries with low consumption of alcohol. Using the Fama-French three-factor model, the HML variable coefficients obtained are 0.2131 significant at the 10% level for the High Alcohol portfolio and 0.1478 significant at the 5% level for the Low Alcohol portfolio. However, with the five-factor version of the model, the coefficients of the HML 5 variable are 0.3549 for the High Alcohol portfolio and 0.2933 for the Low Alcohol portfolio – significant at the 10% and 1% levels, respectively.

The profitability factor (RMW 5) is significant at 10% with a coefficient of 0.4626, so the firms' profitability is higher in the High Alcohol portfolio than in the Low alcohol portfolio. The investment factor (CMA 5) is significant and negative in both cases, at the 10% level for the High Alcohol portfolio and 1% for the Low Alcohol portfolio. Therefore, European alcohol firms may invest more conservatively than the market average, especially in a highly alcohol-consuming country.

When testing the second hypothesis, mixed results were found from the values of the intercepts. The intercept of the High Alcohol portfolio is 0.0062, significant at the 5% level if the CAPM is used. When the Fama-French three-factor is used, the intercept has a value of 0.0055, which is significant at 5%. Both values are higher than those of the Low alcohol portfolio intercept, significant at the 1% level. So far, this information leads to rejecting the accuracy of the second hypothesis, which would mean that sin stocks from countries with higher levels of alcohol consumption do not have lower risk-adjusted returns than sin stocks from countries with lower consumption.

On the other hand, if the Fama-French five-factor is used, the intercept of the Low Alcohol portfolio has a value of 0.0034 significant at the 5%. In contrast, the intercept of the High Alcohol portfolio is not significantly different from zero, so the hypothesis is not rejected in this case.

3.4. High gambling consumption and Low gambling consumption

The regression outcome of the High Gambling and Low Gambling portfolios is analysed in testing the third hypothesis. Gambling-related stocks form the High Gambling portfolio from the top 14 gambling-consuming countries of the EU and UK, and gambling-related stocks form the Low Gambling portfolio from the bottom 14 gambling-consuming countries of the region. If familiarity bias is true here, investors from countries with more common gambling will feel less aversion to the industry. As a result, gambling stocks from countries with low gambling consumption will be neglected to a greater extent than their counterparts.

Table 5 shows the regression output of the High Gambling and Low Gambling portfolios using

Table 5. Regression output for High Gambling and Low Gambling Portfolios

Dependent Variables \ Explantory Variables	Alpha	Beta	SMB	HML	SMB 5	HML 5	RMW 5	CMA 5	Adjusted R^2
High Gambling	0.0138***	0.7644***							0.1780
	0.0137***	0.7118***	0.8510***	−0.1221					0.2020
	0.0147***	0.6507***			0.7768***	−0.0176	−0.1366	−0.4152	0.197
Low Gambling	0.0175***	0.7478***							0.1852
	0.0165***	0.7108***	0.8809***	−0.2367					0.2136
	0.0162***	0.6906***			0.8590***	0.3045	0.1400	−0.3827	0.2109

Note: *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

the CAPM, Fama-French three-factor and Fama-French five-factor models. The parameter of the portfolios is significant at the 1% level regardless of the model used in what seems to be a constant pattern among sin stocks, according to the results obtained in this study. The coefficient value is as high as 0.7644 for the High Gambling portfolio and 0.7478 for the Low Gambling portfolio using CAPM, although the value shrinks as more variables are incorporated. The gambling industry returns are more volatile than the alcohol industry and the "triumvirate of sin" than the other portfolios. As seen above, the small minus big premium is vital in explaining sin stocks returns, and the gambling industry is no exception. For the High Gambling Portfolio, the SMB and SMB 5 coefficients are 0.8510 using the Fama-French three-factor model and 0.7768 using the Fama-French five-factor model. The coefficients are statistically significant in both cases at the 1% level. As for the Low Gambling portfolio using the Fama-French three-factor model, the coefficient is 0.8809 and 0.8590 if the Fama-French five-factor is used, both significant at the 1% level.

When the Fama-French five-factor model was tested, and variables were added, the results were not significant to explain the portfolios' returns. The fact that the profitability factor (RMW 5) and the investment factor (CMA 5) are not significant suggests that European gambling stocks do not follow any specific pattern regarding their profitability and level of investment compared with other stocks. Moreover, adding the new variables reduces the value of the adjusted R-squared to 0.1970 from 0.2020 for the High Gambling portfolio, and it also reduces it from 0.2136 to 0.2109 for the Low Gambling portfolio. Hence, adding these extra variables is not indifferent to the model but reduces the goodness of fit.

The Low-Gambling portfolio is significant and higher than the High-Gambling portfolio for the intercepts – α_i. It indicates a higher abnormal return for the Low Gambling portfolio. Consequently, evidence of familiarity bias is found, and the hypothesis that gambling stocks from countries with higher levels of gambling consumption have lower risk-adjusted returns than sin stocks from countries with lower consumption of those products and services is not rejected.

3.5. Robustness check

The two-decade period is divided into two sub-periods: one from the first ten years until 30 June 2010 and another from the remaining years until 30 June 2020. With this change, the outcome does not affect the overall results of the original regressions. However, an issue is worth pointing out: the intercepts have higher values in the first decade, all significant except those of the High Alcohol portfolio. Salaber (2009) argued for the increased performance of sin stocks during crises. The 2008 financial crisis could explain the exceptional performance of Sin stock during the first decade.

The same regressions are run but using robust standard error. The estimators of an ordinary least squares regression (OLS) are only the best linear unbiased estimators (BLUE) if homoscedasticity is present. However, in data series involving stock returns, there are periods of calm in which people rush to sell or buy. As a consequence, the variance of the error terms is not constant, and heteroskedasticity may be present. Although heteroskedastic estimators are not biased, they are neither BLUE. By running these regressions, the robustness of the previous outcome can be tested for heteroskedasticity. The outcome of the robust regressions tends to show a higher adjusted R-squared

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value for the different portfolios and models, and the intercepts obtained for the High Alcohol portfolio fail to be significant; otherwise, there are no critical differences in the results.

4. DISCUSSION

This study finds positive and significant intercepts in most of the tests to evidence the existence of abnormal returns. The results follow the literature (Fabozzi et al., 2008; Fauber & McDonald, 2014; Hong & Kacperczyk, 2009; Salaber, 2007; Salaber, 2009; Kim & Venkatachalan, 2011). When the Fama-French Five factor is used, these abnormal returns are only absent for the High Alcohol portfolio. Coincidentally, Blitz and Fabozzi (2017) obtain similar results with the same model. These estimates of the intercepts tend to be smaller the more variables are added to the model, and the p-values tend to grow. It indicates that the α_i Sin stocks have only been measured in the literature due to incomplete models that missed key variables.

Results show sin stocks in Northern Europe outperformed those in Southern and Easter Europe regarding risk-adjusted returns. Familiarity bias is not rejected in gambling-related stocks. The study finds that those in the EU and UK with a higher degree of gambling consumption yield higher risk-adjusted returns than those in which gambling is uncommon. It is not the case for the alcohol industry in the region, for which the outcome varies depending on the model used, in some cases resulting in a rejection of the hypothesis of familiarity bias in this industry.

Finally, the evidence supports that sin stocks have a significant relation with the market, but their volatility is consistently lower. There are also indications that sin stocks may have better risk-adjusted returns during times of economic downturn. The small minus big premium (SMB) is also consistently significant across portfolios, which indicates that firms in the European "sin industries" tend to be smaller than other stocks. On the other hand, the high minus low premium (HML) is not statistically significant for any portfolio except for High and Low Alcohol. The outcome may be due to a low book-to-market ratio for alcohol firms compared to the market and other sin stocks. The mixed results for the alcohol industry might be the correlation between poverty and alcoholism (Grittner et al., 2013). Thus, the comparison is both high alcohol consumption versus low alcohol consumption and more developed countries versus not-so-developed countries. This poses a methodological limitation that new research could overcome by using alcohol stocks from different countries and controlling for development and wealth in the models. Finally, due to the small portfolio size, the European tobacco industry could not be tested for familiarity bias.

CONCLUSION

This study examined the financial and ethical aspects of investing in sin stocks across European countries. It found that sin stocks offer higher risk-adjusted returns in wealthier countries where investors neglect them more. It also found that sin stocks are more resilient to economic shocks than the market. Sin stocks have a significant relation with the market, but their volatility is consistently lower. Investors from countries that drink more alcohol are more willing to invest in alcohol stocks than those from countries that drink less. These findings have important implications for investors, policymakers, and advocates interested in sin industries' social and economic consequences. The study suggests that wealth does not necessarily imply higher ethical standards in investment decisions, and familiarity bias may influence the demand for sin stocks. The study also found that familiarity bias plays a role in mitigating the feeling of rejection associated with investing in gambling stocks. Investors from countries with higher gambling consumption are less reluctant to invest in gambling stocks than those from countries with lower gambling consumption, as reflected by the significant and higher intercept coefficient of the Portfolio formed by gambling stocks from higher-consuming countries. The study highlights the importance of behavioural finance factors such as familiarity bias in shaping investment decisions. It provides important insights that challenge traditional concepts of market efficiency solely based on mathematical models. Future research could explore the factors that drive the neglect or preference for sin stocks in different countries and regions.

AUTHOR CONTRIBUTIONS

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Validation: Nasir Aminu, Mohammed Hamdan.
Visualisation: Nasir Aminu.
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