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Betting against ethics

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ABSTRACT

This thesis investigates whether a long-short unethical portfolio, combining sin stocks, anti-ESG, and pollutive factors, can outperform the market. The portfolio was constructed using data from 2000-2023, with both equal-weighted and value-weighted approaches tested. Performance was evaluated against established models, including the Fama-French 3-factor and 5-factor models, along with a Fama-MacBeth regression. Results showed that while the portfolio generated positive returns, these were not consistently significant across all models. The portfolio's returns were largely driven by size and profitability factors, with minimal impact from transaction costs. These findings suggest that while unethical portfolios may offer unique returns, they also come with significant risks, and their performance is heavily dependent on market conditions. This study contributes to the ongoing debate on the financial viability of unethical investing strategies.

Keywords: Investing, Portfolio, Ethics, ESG, Emissions, Sin stocks,

JEL Classification: G11

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CHAPTER 1 Introduction

Ethical investing has taken the world by storm, with asset managers, private equity companies, hedge funds and even retail investors all striving to make a positive impact on God's green earth. On the other side of the spectrum lies, rather aptly named, unethical investing, focusing on companies engaged in "questionable" business practices. That is what I will centre my research around – specifically anti-ESG (Environmental, Social, Governance) measures, sin stocks and the pollutive factor – and whether a portfolio combining these factors can outperform the market, and if so, by how much? In the ever-expanding factor zoo (Feng et al., 2020), it is essential to keep up to date with the outperforming factors, in the hopes of making informed investment decisions and beating the market. Moreover, this line of study sheds light on how moral and ethical considerations influence market dynamics and investor behaviour – the societal impact of such research cannot be understated.

Existing literature on the topic of sin stocks is quite conflicting and nuanced. The idea was introduced by Fabozzi et al. (2008) who found that the sin portfolio did outperform common benchmarks, which they attribute in part to the neglected stocks effect – investors intentionally omitting sin stocks due to social norms and ethical considerations. Other noted sources of outperformance include the higher risk premium or stable demand for goods such as tobacco and alcohol. However, the study revisited has shown that the bulk of the outperformance can be attributed to the quality and investment factors as defined in the Fama-French 5-factor model (Blitz & Fabozzi, 2017). Yet, a recent study by Blitz and Swinkels (2023) reveals that the exclusion of sin stocks from a portfolio can lead to under-diversification and an exposure to unrewarded risk, even though the expected loss could potentially be mitigated through non-sin stocks that offer the best hedging properties and similar or better factor exposures. In terms of ESG investing, a meta-analysis conducted by Friede et al. (2015), incorporating the findings of about 2200 individual studies, shows that 90% of studies find a non-negative ESG-CFP (corporate financial performance) relation, with the majority showing a positive relation. Similarly, De Spiegeleer et al. (2023) do not find evidence for enhanced performance of portfolios with either high or low ESG scores. The prevailing literature, regarding the PMC portfolio does not necessarily focus on its performance, but rather on measuring climate risk exposure (carbon beta), thus it is unclear whether such a strategy can outperform the market (Huij et al., 2021), as such further research is necessary.

My study intends to examine the performance of a combination of the aforementioned factors into one novel unethical portfolio. I believe combining these factors could lead to a unique source of outperformance not captured by common risk factors such as the Fama-French 5-factor model (Fama & French, 2015). Therefore, I will attempt to answer the research question: "Can a portfolio combining sin stocks, anti-ESG and pollutive factors outperform the market?"

and to confirm or refute the current consensus with regards to the first two factors (sin stocks and anti-ESG) and contribute new findings regarding the performance of the pollutive factor.

To construct the sin stocks part of the portfolio, I will follow the methodology as described by Fabozzi et al. (2008) but focusing solely on common stocked listed on NYSE, AMEX and NASDAQ in the years 2000-2023 (using this sample for the other factors as well). To create the anti-ESG factor, I will split the universe of stocks into quintiles based on their ESG score and deem unethical the bottom quintile (worst ESG score), and conversely the top quintile ethical. To construct the pollutive factor, I will split the universe of stocks based on their CO2 emissions and, similarly, deem the top quintile (most pollutive stocks) as unethical and the bottom quintile (least pollutive stocks) as ethical. The construction of the actual long-short unethical portfolio combining these factors will include an eligibility check wherein to be classified into the long part of the portfolio (unethical) a firm must fulfil two or more of the unethical criteria (sin stock, bottom ESG quintile, top pollutive quintile) in a given firm-month. Conversely, to be classified into the short part of the portfolio (ethical) a firm must fulfil all three of the ethical criteria (non-sin stock, top ESG quintile, bottom pollutive quintile) in the given firm-month. I intend to test both equal- and value-weighted portfolios to create a more rounded assessment and to explore the specific risk characteristics of each. In order to test the performance of the portfolios, I will, first, perform a t-test for excess returns of the portfolio to check whether they are significantly different from zero. Subsequently, I will regress the CAPM (Capital Asset Pricing Model) beta, Fama-French 3-factor model and Fama-French 5-factor model onto the excess returns of my portfolio to test whether it's performance can be explained by any of the already identified factors. Next, I will conduct a Fama-MacBeth regression with the same factors to estimate the return and risk characteristics, accounting for potential autocorrelation and heteroskedasticity in the time-series of coefficients (Fama & MacBeth, 1973). Finally, I shall bisect the portfolio based on each stock's liquidity, as measured by the relative bid-ask spread, which will serve as a proxy for transaction costs, as described by Chung and Zhang (2014). Returns and industry information (for the creation of the sin stock portfolio) will be collected from Compustat. ESG scores and CO2 emissions will be collected from Refinitiv Workspace. To obtain Fama-French factor returns I will use Kenneth French's website. And, finally, liquidity information I will obtain from CRSP Monthly Stock data.

I expect to find that the anti-ESG factor will not outperform the benchmark as per related literature both new and old. With regards to sin stocks, the most current literature to my knowledge is from 2017 and since many changes have occurred in the general market, with increased focus on ethical investing, thus the exclusion of sin stocks from portfolios might lead to them being underpriced, therefore I would expect to earn a premium. As for the PMC factor, no data is available as to its general performance over the market, but I hypothesize significant returns cannot be earned, seeing as climate risk and the

regulatory environment might mitigate most of the positive returns they would have earned. With my research I hope to at least provide a semblance of an answer on whether unethical investing is profitable or if positive returns can be earned in an ethical manner. It will by no means provide the final answer, as the methodology, proxies for being "ethical" and overall data are all up for debate, nevertheless hopefully it will be a step in the right direction.

Given the related literature, but also recent investment trends I formulate my first hypothesis as follows, H1: The unethical portfolio will generate statistically significant excess returns over to the market. Moreover, regressing on Fama-French factors, I intend to test the second hypothesis, H2: The excess returns of the unethical portfolio cannot be fully explained by common risk factors, indicating the presence of a unique alpha. Lastly, accounting for liquidity, I would like to test the final hypothesis, H3: There is no significant difference in excess returns between liquid and illiquid stocks within the unethical portfolio.

CHAPTER 2 Theoretical Framework

2.1 Source of outperformance

Ethical (or social) investing can be defined as a "set of approaches which include social or ethical goals or constraints as well as more conventional financial criteria in decisions over whether to acquire, hold or dispose of a particular investment" (Cowton, 1999, p. 60). The original premise involved companies adhering to high ethical standards by which they might obtain superior long-term performance due to better risk management, improved corporate governance, and enhanced reputational benefits (Cowton, 1999). Such companies would implement governance frameworks striving to achieve high transparency and accountability, which could decrease risks and prevent corporate scandals. Another benefit is reduced long-term operational costs and exposure to regulatory fines, thanks to sustainable business practices which would address environmental and social concerns. Their market position could be further strengthened by increased reputation benefits, which would attract a loyal customer based and create positive relationships with stakeholders, such as: investors, regulators, and the community. It could be, in fact, hypothesized that today, these ethical and social considerations are not just added benefits but are more so becoming the main drivers in investment decisions, as investors are recognizing the key role they play in long-term business sustainability and success.

On the other hand, unethical investing focuses on companies that engage in activities considered harmful or controversial, such as tobacco and alcohol production. Another example is an association with unethical business practices. These companies might offer higher returns as compensation for the additional risk or regulatory and reputational challenges they might face (Hong & Kacperczyk, 2009). For example, sin stocks often have stable demand and high profit margins, as they produce goods and services with inelastic demand curves. Because of that, consumers of such products tend to remain loyal in spite of social disapproval – this ensures consistent revenue streams and profitability. Another factor that might impact the performance of unethical companies are boycotts, legal challenges, and stricter regulations (Renneboog et al., 2008). Because of this controversial nature they might become exposed to significant risks, such as legal battles, regulatory crackdowns, and social activism campaigns, which aim at impeding their business activities. These challenges can result in significant financial penalties and increased compliance costs, which in turn would decrease profitability and lead to losing potential customers. However, the potential for higher returns in unethical investing is supported by compensation for additional risk. Unethical companies oft operate in environments of increased scrutiny and regulatory pressures, which can lead to higher expected returns because of investors demanding compensation for these risks. This risk-return tradeoff can make unethical stocks attractive to investors willing to accept the associated volatility and uncertainty (Fabozzi et al., 2008).

Moreover, due to seemingly lower risk, ethical companies can benefit from lower costs of capital, as opposed to unethical companies which need to offer higher returns to attract investors. This higher cost of capital reflects the market's assessment of greater risk. However, it also implies that these companies need to be more efficient and innovative in order to sustain their operations and to deliver competitive returns. People who invest in unethical companies might be rewarded with higher dividends and capital gains, as a compensation for increased risk (Goss & Roberts, 2011). The regulatory environment, even though it might be challenging, can also present opportunities for unethical companies to innovate and adapt. Companies that successfully navigate these challenges can emerge stronger and more resilient, which could lead to outperforming ethical companies. The ability to manage regulatory risks can signify a company's strategic acumen and operational effectiveness (Cheng et al., 2014).

Therefore, while ethical investing focuses on socially responsible practices, unethical investing can present an alternative for investors seeking high returns. The risks associated with unethical companies are significant, but because of higher profit margins, stable demand, and the potential for substantial financial gains, these are often compensated. For those willing to accept these risks, unethical companies can offer attractive investment opportunities, which could outperform ethical companies.

2.2 Previous empirical results

Friede et al. (2015) have conducted a meta-analysis which reviewed over 2,000 studies. The authors have found that approximately 90% of these studies reported a non-negative relationship between ESG criteria and corporate financial performance. Moreover, the majority indicated a positive relationship. Their review suggests that the integration of ESG factors into investment strategies does not necessarily compromise financial returns, and, what's more it might even enhance them. The positive correlation, among firms with high ESG scores, can be attributed to several factors, such as better risk management, increased operational effectiveness, and stronger corporate governance. Companies that prioritize ESG factors often have more resiliency towards ESG shocks. This contributes to their long-term financial stability and attractiveness to investors. Moreover, another study that examined the complex relationship between ESG and financial performance was that of Hassel et al. (2005). They found that firms with high ESG scores often benefit from higher market valuations, which was measured by their price-to-book ratio. Similarly, Clark et al. (2015) have found that firms adopting sustainable strategies tend to yield greater financial returns. Furthermore, Nagy et al. (2016) showed that MSCI's ESG stocks portfolio outperformed the MSCI World index from 2007 to 2015, showing superior performance of ESG stocks over the market. In contrast, studies by Velte (2017) and Alsayegh et al. (2020) reported mixed results, indicating that while ESG factors can enhance short-term financial performance, their long-term impact remains uncertain.

Conversely, Fabozzi et al. (2008) constructed a portfolio of sin stocks, including companies involved in activities such as tobacco, alcohol, gambling, and defense. They have shown that these companies tend to outperform the market, due to the controversial nature of these industries. It is created because of investors demanding higher risk premiums for their ownership. Additionally, sin stocks typically benefit from stable demand and high profit margins. This is caused by their products and services having inelastic demand. The initial findings by Fabozzi et al. (2008) have been further refined by Blitz and Fabozzi (2017). The superior performance of sin stocks was attributed to factors such as quality and investment (as defined in the Fama-French 5-factor model). Moreover, diversification benefits of including sin stocks in a portfolio were found by Blitz and Swinkels (2023). They also have cautioned against the exclusion of sin stocks due to the potential for under-diversification and exposure to unrewarded risks. Therefore, by including sin stocks, investors can achieve a more balanced risk-return profile, utilizing these controversial sectors.

Huij et al. (2021) have introduced the concept of a carbon beta which was used to quantify climate risk. It was meant to provide a market-based measure of a company's exposure to climate-related risks. However, it mainly addresses risk exposure, as opposed ot potential returns, therefore the performance implications of such a strategy remain unclear. While it might provide insights into how climate risks are priced in the market, it does not necessarily indicate whether an investment strategy utilizng it can consistently outperform the market. My strategy is based on this principle and involves going long in pollutive companies while shorting those with low emissions, as such creating a portfolio that bets against clean companies.

In conclusion, ethical investing and financial performance have shown a high degree of correlation. Unethical investing, however, especially in sin stocks, can offer higher returns primarily due to greater risk premiums. The carbon beta provides an intersting view of climate risk exposure but proves lackluster in providing clear evidence on its performance potential. These articles underscore the complex relationship between ethical considerations and financial performance. They imply that both ethical and unethical investment strategies can have their advantages depending on elements such as the specific market conditions and investor preferences.

2.3 The Known, the Unknown and the Unethical

Despite the multitude of research on ethical and unethical investing, it is necessary to investigate further as several gaps remain. One such gap is that most existing studies focus on individual unethical factors in isolation only, these being for example sin stocks or high carbon emissions. This approach might overlook the potential synergistic effects that can exhibit themselves only if multiple unethical factors

are combined into one portfolio. This combined impact on portfolio performance is less explored, thus, leaving a significant gap in our understanding.

Such is the case with sin stocks, whose performance is well documented, however it is unclear how they might perform if they were to be combined with other unethical factors. Sin stocks outperformed market benchmarks due to their high-profit margins and stable demand (Fabozzi et al., 2008), however, not when combined with high-emission stocks. The potential interactions between the risk premiums associated with sin stocks, and the regulatory and reputational risks of high-emission stocks could either amplify returns or increase risks. This could lead to unpredictable performance patterns. This gap directly relates to the first hypothesis, which investigates whether a portfolio combining sin stocks, anti-ESG stocks, and pollutive stocks can outperform the market. Based on the literature on sin stocks, It can be reasoned that a portfolio combining other unethical factors could potentially generate significant excess returns compared to the market, however, the interactions between these factors could lead to unpredictable outcomes. Therefore, I would like to investigate this case further empirically.

Several studies have examined the raw returns of ethical and unethical portfolios. But a current gap in knowledge remains, pertaining to the risk-adjusted returns using methodologies like the Fama-French 5-factor model or the Fama-MacBeth regression. The Fama-French 5-factor model, offers an overview of several factors and how these impact returns. They include market risk, size, value, profitability, and investment factors (Fama & French, 2015). A related research by Blitz and Fabozzi (2017), who revisited the sin stock anomaly, attributed the outperformance of sin stocks to quality and investment factors. They have remarked on the importance of adjusting for the Fama-French factors so as to truly understand the drivers of returns. The Fama-MacBeth regression further refines this analysis by addressing potential biases and providing more robust coefficient estimates over time (Fama & MacBeth, 1973). Their insights will lend into addressing my second research question, which asks whether the excess returns of the unethical portfolio can be fully explained by common risk factors – which would indicate the presence of a unique alpha. It can be argued that the findings of Blitz and Fabozzi (2017) support this hypothesis, as their model concerning sin stocks exhibits unique performance characteristics not entirely captured by traditional risk models. However, this is merely a presumption, and as such it must be tested within the context of a combined unethical portfolio using these risk-adjustment methodologies.

The impact of transaction costs on porfolio performance has been thoroughly investigated. Even though still, it is worthwhile to research in every new context, to ascertain other studies are generalizable. That's why I would like to verify empirically what's the impact of transaction costs or rather liquidity in the context of the unethical portfolio. Liquidity risk can significantly affect the feasibility of an investment strategy, particularly for portfolios that include stocks with high bid-ask spreads or low trading volumes.

It has been shown that liquidity constraints and high transaction costs can significantly affect portfolio performance, as they may lead to slippage in expected returns. For example, Amihud and Mendelson (1986) demonstrated that illiquidity can impose a persistent drag on returns. In another study, Pastor and Stambaugh (2003) found that liquidity risk is a key determinant of stock returns, suggesting that less liquid stocks require higher expected returns as compensation for the additional risk. Transaction costs, which include both direct costs (such as brokerage fees) and indirect costs (such as market impact costs), can erode returns and alter the risk-return profile of a portfolio. For example, the relative illiquidity of certain sin stocks might increase the cost of trading, thereby diminishing the net returns despite their high gross returns. Chung and Zhang (2014) provided a methodology to approximate intraday spreads using daily returns data. They have found that transaction costs have a significant impact on net returns. This relates directly to the third research question, which examines whether there is a significant difference in excess returns between liquid and illiquid stocks within the unethical portfolio. Existing research on liquidity, such as the aforementioned study, suggests that transaction costs and liquidity risk can significantly impact net returns, but it remains to be seen if these same effects can be observed in an unethical portfolio. Therefore empirical analysis is necessary to investigate the impact of liquidity differences on the performance of the unethical portfolio.

Addressing these hypotheses will aid me in providing a comprehensive understanding of the performance and performance characteristics of unethical investing strategies. This research direction holds the potential to uncover new insights into how various unethical factors interact, impact portfolio performance, and guide investors in making informed decisions.

CHAPTER 3 Data

I have utilised four sources to collect data – full list of variables collected can be found in Appendix B. The first of them is Compustat, a database from which I extracted monthly closing prices, amount of shares outstanding and industry information for the whole universe of US firms in years 2000-2023. The second data source is Refinitiv Workspace, which provided me with access to ESG scores and carbon emissions data in the same years. The third source is Kenneth French's website[1] allowing access to an array of financial information, but crucial for the thesis, the Fama-French 3- and 5-factor portfolio returns and the risk free rate, defined as the one-month T-bill rate. Lastly, I utilize CRSP Monthly Stock data to obtain bid and ask prices. Following the literature, I have limited the research to only common stocked listed on NYSE, AMEX and NASDAQ (stock exchange codes 11, 12 and 14). Moreover, I have removed financial companies as well as companies that have closed with prices below five dollars on the last day of the previous month, due to high volatility and liquidity issues. I opted to investigate the period of 2000-2023, so as to capture only relevant recent trends in ethical investing. This resulted in a sample of 9,820 unique firms and 835,750 firm-month observations.

My variables of interest are, first and foremost, monthly returns (hereafter, *returns*), calculated as the percentage change in month-end closing price between months t-1 and t0. From there I was able to obtain *excess returns* which are returns subtracted by the risk-free rate. In creation of the sin stock portfolio I have identified the NAICS (North American Industry Classification System) codes that correspond to activities that may be regarded as immoral or unethical by a non-negligible part of investors activities, grouping them into: Alcohol, Biotech[2], Defense, Gambling and Tobacco (full list of identified NAICS sin industries available in Appendix A). In doing so, I have chosen to follow the methodology of Fabozzi et al. (2008), who justify this choice saying that "most contemporary cultures [agree] that the consumption of alcohol and tobacco, and engaging in gaming, are sinful behaviors" (p. 85). This distinction becomes less clear for the defense industry, which could differ, depending on the investors' moral or religious views, however, following the methodology of Fabozzi et al., I opt to include it as well. *ESG scores* as calculated by Refinitiv are constructed using corporate public reporting (i.e., annual reports, corporate social responsibility (CSR) reports, company websites and global media sources), constituting a subset of 186 most relevant and comparable metrics. Another variable is the

[1] https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

[2] Biotech is not necessarily associated with unethical or immoral activities, but is often classified as such due to activities relating to genetic tampering, thus I investigated two cases: (1) sin stocks excl. biotech, (2) sin stocks incl. biotech. Since the results were very similar, in terms of magnitude and significance, I opted to investigate further the results only for sin stocks including biotech, as the returns were slightly higher.

ESG combined score[3] which combines, as the name suggests, ESG scores with ESG controversy scores – a company is penalised if a scandal occurs based on 23 ESG controversy topics (London Stock Exchange Group, n.d.). The last variable of interest is *CO2 emissions* which is the estimated total (direct and indirect) CO2 and CO2 equivalents emissions in tonnes.

In Table 1, you can see the summary statistics for the returns of the (un)ethical portfolios. Ethical portfolios, both including and excluding biotech stocks, show consistent mean returns around 0.84%, with lower maximum returns (714.0% and 89.7%) and standard deviations (10.6% and 9.6%) compared to unethical portfolios. Unethical portfolios have higher mean returns around 0.96%, with higher maximum returns (465.2%) and a higher standard deviation (14.9%), indicating greater risk and return volatility. The total dataset shows an overall mean return of 0.664% with a high maximum return of 2723.4% and a standard deviation of 14.3%, reflecting a broad range of returns across the entire dataset. The combined scores and inclusion of biotech stocks do not significantly alter these trends.

Table 1. Summary statistics for the monthly returns of the different ethical and unethical portfolios

Variable	Mean	Minimum	Maximum	St. dev.	N
Total	0.664%	-99.6%	2723.4%	14.3%	835,750
Ethical	0.841%	-95.6%	714.0%	10.6%	26,415
Ethical bio	0.841%	-95.6%	714.0%	10.6%	26,415
Ethical combined	0.838%	-79.3%	89.7%	9.6%	23,510
Ethical bio combined	0.838%	-79.3%	89.7%	9.6%	23,510
Unethical	0.969%	-89.0%	465.2%	14.9%	25,964
Unethical bio	0.970%	-89.0%	465.2%	14.9%	26,084
Unethical combined	0.961%	-89.0%	465.2%	14.9%	25,725
Unethical bio combined	0.963%	-89.0%	465.2%	14.9%	25,845

Note. Total indicates returns for the entire dataset, *bio* indicates returns including bio-tech stocks, *combined* indicates returns using the ESG combined score. For the ethical portfolios, no differences were noted for stocks including and excluding bio-tech stocks.

[3] Similarly, as with biotech, the results did not differ much for the ESG score vs ESG combined score, therefore I investigate further only the case with the regular ESG score.

CHAPTER 4 Method

4.1 Portfolio creation

The analysis begins with the creation of a long-short portfolio incorporating the factors of interest, i.e. anti-ESG, pollutive, and sin stocks. The construction of the anti-ESG and pollutive factors follows a similar procedure, where I divide the whole universe of stocks into five quintiles, based on their ESG score or amount of CO2 emission in a given month. In each firm-month, a company is deemed eligible for the long part of the portfolio if it falls into the top quintile for either of the factors (lowest ESG or highest emissions) or if it is identified as a sin stock. A company is subsequently classified as "unethical" for that firm-month if it meets at least two of these criteria[4] (ideally, I would use only companies satisfying all three of these criteria, but this creates too small a sample). Conversely, a company is deemed eligible for the short part of the portfolio if it falls into the bottom quintile for either of the factors (highest ESG or lowest emissions) or it is not a sin stock. However, a company is classified as "ethical" for that firm-month if it meets all three criteria – here, the sample size allowed for such a restriction, enhancing the accuracy of the portfolio. The difference in returns, between the unethical and ethical companies, constitute the returns of the "unethical portfolio". I test both equal-weighted and value-weighted portfolios to achieve a more complete understanding of the portfolio's performance and risk characteristics. As such, I intend to create a portfolio whose returns are significantly greater than zero, as indicated by a t-test, where H_0: $\mu = 0$, H_a: $\mu \neq 0$. If the null hypothesis be rejected, it will indicate the portfolio generates significant excess returns, demonstrating the effectiveness of the investment strategy incorporating anti-ESG, pollutive, and sin stocks.

4.2 OLS risk adjustment

In order to compare the strategy's performance to that of already established financial models, I will examine risk-adjusted returns of my portfolio. Specifically, I compare my returns against the common risk factors identified by Fama and French (1993; 2015), using an ordinary least squares (OLS) methodology. The equations used for risk-adjustment below.

Risk-adjustment against Fama-French 3-factors (FF3):

$$r_{i,t} = \alpha_i + \beta_1 * Mktrf + \beta_2 * SMB + \beta_3 * HML + \varepsilon_{i,t}$$

[4] Meaning the company either: (1) is a sin stock with low ESG (but low emissions), (2) is a sin stock with high emissions (but high ESG), (3) has low ESG and high emissions (but is not a sin stock), (4) is a sin stock with high emissions and low ESG.

Risk-adjustment against Fama-French 5-factors (FF5):

$$r_{i,t} = \alpha_i + \beta_1 * Mktrf + \beta_2 * SMB + \beta_3 * HML + \beta_4 * RMW + \beta_5 * CMA + \varepsilon_{i,t}$$

Where $r_{i,t}$ is return of portfolio *i* at time *t*, and α_i is the intercept indicating expected return of portfolio *i* that is not explained by the risk factors. Mktrf is the excess return of the market portfolio over the risk-free rate or the market risk premium, SMB is the size premium (excess return of small-cap stocks over large-cap stocks), HML is the value premium (excess return of high book-to-market stocks over low book-to-market stocks), RMW is the profitability premium (excess returns of stocks with high operating profitability over low operating profitability stocks), and CMA is the investment premium (excess returns of companies with conservative investment over those with aggressive investments). Finally, $\varepsilon_{i,t}$ is the error term.

The results of the risk adjustment will provide insights into whether the excess returns of the unethical portfolio can be attributed to common risk factors or if they represent unique alpha. If the intercept α_i is significantly greater than zero, it indicates that the portfolio generates returns that are not explained by these known risk factors, demonstrating the effectiveness and uniqueness of the investment strategy. On the other hand, if α_i is not significantly different from zero, it suggests that the portfolio's returns can be explained by common risk factors, indicating that the strategy does not provide a distinct advantage over traditional risk-adjusted benchmarks.

4.3 Fama-Macbeth regression

The following step of methodology is to employ a Fama-Macbeth regression analysis, following the approach of its authors (Fama & Macbeth, 1973), separating the beta-estimation process into two stages.

Firstly, at each point in time (i.e., at the end of each month), I run a cross-sectional regression of returns on the factors, producing a time series of coefficients. Specifically, for each month t, the regression model is as follows:

$$r_{i,t} = \alpha_t + \beta_{Mktrf,t} * Mktrf_t + \beta_{SMB,t} * SMB_t + \beta_{HML,t} * HML_t + \beta_{RMW,t} * RMW_t + \beta_{CMA,t} * CMA_t + \varepsilon_{i,t}$$

This model is run for each month in the sample period, starting from January 2000 to December 2023, resulting in a series of monthly regression coefficients. Each regression is based on the returns and risk factors for that particular month, with the time series of coefficients reflecting how these relationships evolve over the 24-year period.

Secondly, I compute the average of the estimated coefficients from the first stage across all time periods and their associated standard errors:

$$\hat{\beta}_{Mktrf} = \frac{1}{T}\sum_{t=1}^{T} \beta_{Mktrf,t}$$

This approach adjusts the standard errors for cross-sectional correlation, accounting for potential autocorrelation and heteroskedasticity in the time-series of coefficients. It also separates the time-series and cross-sectional variations, potentially providing more robust estimates when dealing with panel data that might have time-varying risks and returns. The efficiency of my portfolio will be signified by the alpha or the constant – the excess return of the unethical portfolio that is not explained by the included factors (Mktrf, SMB, HML, RMW, CMA) – a high and significant value entailing its effectiveness.

4.4 Illiquidity measurement

The final element of the methodology is to examine the investment strategy within the context of transaction cost. Following the procedure proposed by Chung and Zhang (2014), I will employ the relative bid-ask spread as a proxy for liquidity. As such, stocks with a higher bid-ask spread are considered to be less liquid. This approach should elucidate whether any premium created can be attributed to trading in highly illiquid stocks (which might be impossible or quite costly), showing as a significant difference between liquid and illiquid stock returns. To this end, I will first compute the relative bid-ask spread, and then bisect the "unethical" portfolio into high and low liquidity stocks. In order to determine whether the difference in returns between them is significantly different, I will perform a t-test, where H_0: $\mu = 0$, H_a: $\mu \neq 0$. If the null hypothesis is rejected, it would indicate that there is a significant difference in returns between liquid and illiquid stocks, suggesting that the liquidity of stocks significantly impacts the returns of the portfolio and that trading costs might significantly decrease the returns. Conversely, if the null hypothesis is not rejected, it implies that the returns of the portfolio are not significantly affected by the liquidity of the stocks, indicating that the strategy's performance is robust to transaction costs and liquidity issues.

CHAPTER 5 Results

5.1 Equal-weighted portfolio

In Table 2, one can see the results of the t-test for the excess returns of the equal-weighted long-short unethical portfolio. The mean value of 0.23 indicates monthly excess returns of 0.23% or 2.8% per year. Due to the high standard error, however, this result is rendered insignificant, indicating no reason to assume effectiveness of the strategy.

Table 2. Long-short equal-weighted unethical portfolio t-test

Portfolio type	Statistic	
Equal-weighted	Mean	0.23 (0.17)
	N	234

Note. Standard error in brackets

In Table 3, one can see the results of the OLS risk adjustment of the long-short equal-weighted unethical portfolio against the common risk factors identified in the Fama-French 5-factor model. The first column includes only the market risk premium, the second column includes FF3 factors, and the third column includes all FF5 factors. When the returns are regressed solely on the market risk premium, the coefficient is 0.18, meaning the portfolio's returns increase by 0.18 times the return of the market portfolio, which is statistically significant at the 1% level. Adding the FF3 factors increases the market risk premium's coefficient up to 0.78, which entails an increase that many times over the market portfolio. The effect remains significant at the 5% level. The size factor significantly decreases returns by 0.57 times the return difference between small-cap and large-cap stocks, and the value factor decreases returns by 0.24 times the return difference between high book-to-market and low book-to-market stocks. Both of these coefficients are significant at the 1% level. By extending to FF5, one can see that the size factor's negative impact remains strong at 0.47 times the return difference. However, the profitability factor and investment factor are reduced by 0.26 and 0.45 times each of their factors, respectively. In this extended model, the market risk premium and value factors lose statistical significance.

The consistently significant negative coefficient for the size factor indicates that the portfolio tends to underperform when smaller firms outperform larger firms. This suggests that the portfolio is tilted towards larger firms or that it suffers when small-cap stocks do well. In the FF3 model, the negative and significant coefficient for the value factor implies that the portfolio tends to perform poorly when value stocks outperform growth stocks. However, when extended into the FF5 framework, the relationship loses on significance – this indicates that the value factor might be mitigated by other factors. The negative coefficient in the five-factor model suggests that the portfolio tends to underperform when

more profitable firms do well. This could indicate a tilt towards less profitable firms or a strategy that doesn't favour high profitability. Lastly, the negative coefficient for the investment factor suggests that the portfolio tends to underperform when more conservative firms perform well. While this coefficient does not directly affect the portfolio's composition, it suggests that the portfolio may be more exposed to firms with higher asset growth or aggressive investment strategies.

Table 3. Long-short equal-weighted OLS risk adjustment by Mktrf, FF3 and FF5

	Model		
	Mktrf	FF3	FF5
Mktrf	0.18*** (0.037)	0.78** (0.034)	0.033 (0.032)
SMB		0.57*** (0.060)	0.47*** (0.060)
HML		-0.24*** (0.046)	-0.051 (0.053)
RMW			-0.26*** (0.075)
CMA			-0.45*** (0.085)
Constant	0.085 (0.17)	0.13 (0.14)	0.29** (0.13)

Note. Standard errors in brackets. Significance levels: * p<0.1, ** p<0.05, *** p<0.01

In Table 4, one can see the results of the Fama-MacBeth regression of the long-short equal-weighted unethical portfolio against the common FF5 risk factors. Similarly, the first column includes only the market risk premium, the second column includes the FF3 factors, and the third column includes all FF5 factors. The Fama-MacBeth regression results of the final model reveal that the impact of the market risk premium is not statistically significant, with a coefficient of 0.042. This result is consistent with previous findings, though the coefficient is slightly higher compared to the three-factor model, and it contrasts with the significant coefficient observed in the first OLS model. The size factor shows a positive and significant relationship, with a coefficient of 0.095, consistent with the three-factor model and indicating a robust positive impact on the portfolio returns. The value factor has a coefficient of -0.022, but this is not statistically significant, suggesting a consistent yet non-significant negative relationship. The profitability factor has a positive coefficient of 0.18, but it is not significant, indicating an insignificant impact on the portfolio returns. The investment factor shows a marginally significant negative relationship with a coefficient of -0.037, indicating a weak negative impact on the portfolio returns.

Overall, the Fama-MacBeth results suggest more conservative and robust estimates for the impact of these risk factors on your portfolio returns, highlighting potential overestimation in previous OLS regressions. The size factor's positive significance in the Fama-MacBeth results is particularly noteworthy, indicating a potential opportunity for revisiting the portfolio's exposure to size-related risks, further motivating the following methodology.

Table 4. Long-short equal-weighted Fama-Macbeth regression against Mktrf, FF3 and FF5

	Model		
	Mktrf	FF3	FF5
Mktrf	0.10** (0.045)	0.032 (0.033)	0.042 (0.029)
SMB		0.091*** (0.028)	0.095*** (0.019)
HML		-0.025 (0.020)	-0.022 (0.016)
RMW			-0.018 (0.015)
CMA			-0.037* (0.019)
Constant	0.037 (0.065)	0.0056 (0.020)	0.010 (0.013)

Note. Standard errors in brackets. Significance levels: * p<0.1, ** p<0.05, *** p<0.01

The results of the t-test for the long-short equal-weighted unethical portfolio segmented by liquidity, as presented in Table 5, indicate no significant difference in excess returns between liquid and illiquid stocks. The mean excess return for liquid stocks is 0.064 with a standard error of 0.18, while the mean excess return for illiquid stocks is 0.25 with a standard error of 0.59. The difference in mean excess returns between illiquid and liquid stocks is -0.19 percentage points, with a standard error of 0.60. These high standard errors suggest that the excess returns for both liquid and illiquid stocks are not significantly different from zero, implying that neither category generates significant excess returns. Consequently, the difference between the two is also statistically insignificant. Thus, liquidity, as measured in this analysis, does not appear to impact the performance of the unethical portfolio. This finding suggests that investors following this unethical investment strategy should not expect superior performance based solely on the liquidity of the stocks selected. Therefore, the analysis can be considered robust to liquidity issues, as the performance of the portfolio does not depend significantly on the liquidity of the included stocks.

Table 5. Long-short equal-weighted unethical portfolio liquidity t-test

Portfolio type	Statistic	
Liquid	Mean	0.064 (0.18)
	N	234
Illiquid	Mean	0.25 (0.59)
	N	234
Difference	Mean	-0.19 (0.60)
	N	234

Note. Standard error in brackets.

Looking at Tables 2-5, for the equal-weighted long-short unethical portfolio, the regression results showed a constant term that was not statistically significant. This suggests that the portfolio did not generate significant excess returns beyond those explained by the included risk factors in the OLS and Fama-MacBeth regressions. However, the t-test results indicate a mean excess return of 0.23% per month with a standard error of 0.17. Although this mean return is positive, the relatively high standard error and lack of statistical significance in the constant term from the regression suggest that the equal-weighted strategy may not consistently achieve significant excess returns. The t-test does not reject the null hypothesis, implying that the mean return is not significantly different from zero. Therefore, the strategy can be deemed ineffective.

5.2 Value-weighted portfolio

Table 6 presents the results of a t-test for the excess returns of the value-weighted long-short unethical portfolio. The results indicate average excess returns of 0.43% per month (or 5.3% p.a.) – an increase of 0.2 p.p. over equal-weighting – similarly, with a high standard error, but significant at the 10% level. This suggests a plausibility of the strategy in achieving positive excess returns, therefore H1 is accepted.

Table 6. Long-short value-weighted unethical portfolio t-test

Portfolio type	Statistic	
Value-weighted	Mean	0.43** (0.21)
	N	234

Note. Standard error in brackets. Significance level: ** p<0.05

Table 7 depicts the results of the long-short value-weighted unethical portfolio excess returns against the common FF5 factors, using an OLS regression, split into three models as before. The regression on the market risk premium shows a positive and significant coefficient of 0.14, indicating that the portfolio's returns increase by 0.14 times the return of the market portfolio. However, when the Fama-French three factors are included, the market risk premium's effect becomes insignificant, while the size factor has a strong positive and significant coefficient of 0.63, suggesting that the portfolio still benefits from exposure to smaller firms, with returns increasing by 0.63 times the return difference between small-cap and large-cap stocks. The value factor shows a significant negative impact with a coefficient of -0.33, meaning that returns decrease by 0.33 times the return difference between high book-to-market and low book-to-market stocks. In the five-factor model, the size factor remains positive and significant with a coefficient of 0.51, while the profitability factor and investment factor both show significant negative impacts with coefficients of -0.32 and -0.43, respectively, indicating the portfolio underperforms with exposure to less profitable and more aggressively investing firms. The market risk premium and value factors are insignificant in this model.

Comparing these results to the OLS risk adjustment findings, the value-weighted methodology consistently shows a positive and significant impact of the size factor, contrasting with the negative impact observed in the equal-weighted OLS regressions. The market risk premium's impact is similar, being significant in the single-factor model but losing significance with additional factors in both methodologies. The value factor's negative impact is consistent across both methods, although it becomes insignificant in the five-factor value-weighted model. The profitability and investment factors exhibit significant negative effects in both methodologies, reaffirming their detrimental impact on portfolio performance. Overall, the value-weighted approach emphasizes the positive influence of larger firms and reveals more nuanced effects of the various risk factors compared to the equal-weighted OLS results.

Table 7. Long-short value-weighted unethical portfolio OLS risk adjustment with Mktrf, FF3 and FF5

	Model		
	Mktrf	FF3	FF5
Mktrf	0.14** (0.056)	0.03 (0.056)	-0.014 (0.056)
SMB		0.63*** (0.10)	0.51*** (0.10)
HML		-0.33*** (0.075)	-0.14 (0.093)
RMW			-0.32** (0.13)
CMA			-0.43*** (0.15)
Constant	0.33 (0.26)	0.37 (0.23)	0.54** (0.23)

Note. Standard errors in brackets. Significance levels: * p<0.1, ** p<0.05, *** p<0.01

Lastly, I will analyze the results of Table 8, showcasing the results of the Fama-MacBeth regression for the value-weighted long-short unethical portfolio against the same FF5 factors. In the single-factor model, the market risk premium has a coefficient of 0.059, which is not statistically significant, indicating an insignificant relationship with portfolio returns. When incorporating the FF3 factors, the market risk premium remains insignificant with a coefficient of 0.018, while the size factor shows a positive and significant coefficient of 0.12, suggesting a beneficial impact from smaller firms, with returns increasing by 0.12 times the return difference between small-cap and large-cap stocks. The value factor is negative but insignificant with a coefficient of -0.016. In the FF5 model, the market risk premium remains insignificant with a coefficient of 0.041. The size factor continues to show a positive and significant coefficient of 0.12, while the value factor remains negative and insignificant. The profitability factor and investment factor are both negative but not statistically significant, with coefficients of -0.025 and -0.039, respectively.

Comparing these results with the OLS risk adjustment findings, several differences emerge. In the Fama-MacBeth analysis, the market risk premium consistently shows an insignificant impact across all models, contrasting with the significant effect observed in the single-factor OLS model. The size factor shows a positive and significant impact in both methodologies, but the Fama-MacBeth results suggest a slightly lower coefficient, indicating a more conservative estimate. The value factor's negative impact is consistently insignificant in the Fama-MacBeth models, whereas it was significant in the OLS models. The profitability and investment factors exhibit significant negative effects in the OLS models but are insignificant in the Fama-MacBeth results, suggesting potential overestimation in the OLS approach. Overall, the Fama-MacBeth results provide a more conservative and nuanced view of the risk factors affecting the value-weighted portfolio returns. Nevertheless, the SMB factor remains consistently significant regardless of the testing method and the other factors appear at least partly significant throughout, suggesting the unethical portfolio does not generate an entirely unique alpha, therefore H2 is rejected.

Table 8. Long-short value-weighted Fama-Macbeth regression against Mktrf, FF3 and FF5

	Model		
	Mktrf	FF3	FF5
Mktrf	0.059 (0.086)	0.018 (0.056)	0.041 (0.055)
SMB		0.12*** (0.038)	0.12*** (0.028)
HML		-0.016 (0.031)	-0.026 (0.027)
RMW			-0.025 (0.016)
CMA			-0.039* (0.026)
Constant	0.021 (0.085)	0.0027 (0.042)	0.018 (0.034)

Note. Standard errors in brackets. Significance levels: * p<0.1, ** p<0.05, *** p<0.01

The results of the t-test for the long-short value-weighted unethical portfolio, segmented by liquidity, show no significant difference in excess returns between liquid and illiquid stocks. The difference in mean excess returns between illiquid and liquid stocks is -0.30 p.p., with a standard error of 0.71%. Similar to the equal-weighted portfolio, the high standard errors suggest that neither category generates significant excess returns, indicating that liquidity does not impact the performance of the unethical portfolio. Thus, the analysis remains robust to liquidity issues across both equal-weighted and value-weighted strategies, as the portfolio performance is not significantly influenced by the liquidity of the stocks included. Therefore, Hypothesis 3 is accepted.

Table 9. Long-short equal-weighted unethical portfolio liquidity t-test

Portfolio type	Statistic	
Liquid	Mean	0.19 (0.28)
	N	234
Illiquid	Mean	0.49 (0.66)
	N	234
Difference	Mean	-0.30 (0.71)
	N	234

Note. Standard error in brackets.

In contrast to the equal-weighted strategy, looking at Tables 6-9 the value-weighted long-short unethical portfolio presents a more promising scenario. The constant term in the FF5 OLS regression was statistically significant, indicating the presence of significant excess returns after adjusting for multiple risk factors. The t-test results also reveal a mean excess return of 0.43% per month with a standard error of 0.25, and this result is statistically significant at the 5% level. This indicates that, on average, the value-weighted strategy produces positive and statistically significant excess returns. However, it is important to note that the constant terms in the other OLS and Fama-MacBeth regressions were not statistically significant. Despite the t-test and FF5 OLS regression indicating potential for significant excess returns, the lack of significance in the constants of other models suggests that these results should be interpreted with caution. Thus, while the value-weighted strategy appears more feasible for achieving significant excess returns compared to the equal-weighted strategy, this conclusion is tempered by the mixed significance results across different models.

CHAPTER 6 Discussion

The results of this study both align with and diverge from existing literature on unethical investing. On the one hand, the consistent positive relationship between the size factor and the portfolio's returns is supported by previous findings of Fabozzi et al. (2008) and Blitz and Fabozzi (2017). Similarly, they emphasized the strong performance of sin stocks, often characterized by smaller firms with stable demand. On the other hand, this study also diverges from prior research. Friede et al. (2015) found a positive correlation between ESG factors and financial performance, while my findings indicate that it was the unethical companies who outperformed. This discrepancy suggests that while unethical investments may benefit from certain market conditions, they do not consistently outperform traditional investment strategies.

These findings carry important implications for the broader debate on ethical versus unethical investing. The results suggest that, even though the portfolio might offer unique returns, it also carries substantial risk that might not be fully captured by traditional risk models. The loss of significance in the market risk premium and value factors in the FF5 model implies that the returns of unethical strategies may be more susceptible to market conditions than previously thought. This complicates the decision-making process for investors who might be considering unethical strategies. This becomes amplified in an environment where regulatory scrutiny and social norms are increasingly focused on ethical business practices, which frequently is the case and increasingly so. Moreover, the strong impact of e.g. the size factor underscores the role of small-cap stocks in driving the returns of an unethical portfolio. This suggests that market dynamics are critical in understanding the feasibility of unethical investing. As investor sentiment towards ESG factors continues to evolve, it is likely that the performance of unethical portfolios will become increasingly tied to these broader market trends.

While the study provides valuable insights, some limitations must be considered. One such limitation is that investor sentiment towards ESG investing has shifted over the studied period. This would lead to a change in market dynamics and, thus, on the examined returns. It could be argued that the market may have started to price in the risks associated with unethical stocks, and thus, diminishing their ability to generate excess returns. But it could also be argued, that the effect could be opposite, with more investors opting for ethical investment choices, the unethical portfolio could become increasingly underpriced. Lastly, the lack of significance in the constant terms across multiple models suggests that the findings should be interpreted with caution, so as to avoid spurious results.

Further research could involve employing the Gibbons, Ross, and Shanken (GRS) regression, in order to provide a more rigorous test of the portfolio's performance, as compared to the methods used in this study. While the current methodology assesses the impact of individual factor, the GRS test would allow

for a simultaneous evaluation of whether the intercepts (alphas) across multiple portfolios are collectively equal to zero. Employing this method would offer a more comprehensive view of whether the excess returns observed are truly unique or simply due to model limitations. This approach could strengthen the conclusions by testing the joint significance, providing a clearer distinction of the unethical portfolio's effectiveness. Another area that could be further researched arises when considering the seemingly paradoxical finding that both sin stocks and high ESG stocks have been shown to outperform the market. This raises the question of whether stocks that fall in the middle of the ESG spectrum may actually offer a poor risk-return trade-off, which would then underperform in both extremes. Thus, what could be tested is a "pollutive + clean-middle" portfolio that goes long in the top and bottom 20% of the ESG spectrum and short in the middle 30-40%. Such a strategy might utilize the strong performance at both extremes while hedging against the potentially weaker performance of mid-range ESG stocks.

Despite the limitations, this study makes several important contributions to the field of financial economics, particularly in the context of unethical investing. It provides new insights into how such portfolios perform relative to established risk factors and offers a more nuanced understanding of the risks and rewards associated with unethical investment strategies. By highlighting the complex interplay between market conditions, investor behavior, and regulatory environments, this research advances the ongoing debate on the viability and ethics of investing in controversial sectors. Ultimately, this study suggests that while unethical portfolios may offer unique opportunities for return, these come with significant risks that must be carefully considered by investors.

CHAPTER 7 Conclusion

In this thesis, I set out to explore the performance of a long-short unethical portfolio, combining sin stocks, anti-ESG factors, and pollutive factors. Its purpose, first and foremost, was to determine whether such a portfolio could outperform the market, also when adjusted for common risk factors. And, secodnly, to assess the impact of liquidity or transaction costs on its performance. This study is significant beause of the current conflicting literature on the topic of ethical and unethical investing. Moreover, little exploration was done on the examined factors in combination. Therefore, the central research question addressed in this study was: "Can a portfolio combining sin stocks, anti-ESG, and pollutive factors outperform the market?"

In order to answer this research question, I have created both equal-weighted and value-weighted portfolios based on these unethical factors. I have then tested their performance in separation, by means of a t-test, and then against common financial models, including the Fama-French 3-factor and 5-factor models, utilizing both an OLS regression and a Fama-Macbeth regression. Finally, I intended to measure the impact of transaction costs, using the relative-bid ask spread as a proxy, by bisecting the portfolio into liquid and illiquid stocks. The results indicated that while the value-weighted unethical portfolio did generate positive returns, these were not consistently significant across all models. Furthermore, no real unique alpha was found as the portfolio's excess returns could largely be explained by factors such as size and profitability. Other factors such as market risk premium and value factors lost significance in more comprehensive models. Lastly, I did not find any statistically significant evidence as to the effect of liquidity on portfolio performance. This entails that transaction costs do not erode the returns in a significant manner.

This study contributes to the broader debate on ethical versus unethical investing by providing new insights into the performance dynamics of unethical portfolios. It reveals that while such portfolios may offer unique returns, these are not independent of common risk factors and are highly sensitive to market conditions. This suggests that unethical investment strategies carry substantial risks that may not be fully captured by traditional financial models, complicating the decision-making process for investors. Moreover, as the regulatory environment and social norms continue to evolve, the performance of unethical portfolios is likely to become increasingly tied to these broader trends. Despite the study’s limitations, it nonetheless advances our understanding of the complex interplay between market conditions, investor behavior, and regulatory factors in the context of unethical investing.

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APPENDIX

Table A. Sin stock identifiers

NAICS code	Sin Industry
111910	Tobacco Farming
312230	Tobacco Manufacturing
459991	Tobacco, Electronic Cigarette, and Other Smoking Supplies Retailers
424940	Tobacco Product and Electronic Cigarette Merchant Wholesalers
424820	Wine and Distilled Alcoholic Beverage Merchant Wholesalers
722410	Drinking Places (Alcoholic Beverages)
312140	Distilleries
424810	Beer and Ale Merchant Wholesalers
312120	Breweries
312130	Wineries
312140	Distilleries
332992	Small Arms Ammunition Manufacturing
332993	Ammunition (except Small Arms) Manufacturing
332994	Small Arms, Ordnance, and Ordnance Accessories Manufacturing
336414	Guided Missile and Space Vehicle Manufacturing
336992	Military Armored Vehicle, Tank, and Tank Component Manufacturing
713210	Casinos (except Casino Hotels)
713290	Other Gambling Industries
541713*	Research and Development in Nanotechnology
541714*	Research and Development in Biotechnology (except Nanobiotechnology)

Note. * are companies classified as biotech

Table B. Variables list

Variable name	Description	Source
LPERMNO	Historical CRSP PERMNO Link to COMPUSTAT Record	Compustat
prccm	Price - Close - Monthly	
cshoq	Common Shares Outstanding	
exchg	Stock Exchange Code	
naics	North American Industry Classification Code	
fyear	Data Year - Fiscal	
cusip	CUSIP	
ESG	ESG score	Refinitv Workspace
ESG_comb	ESG combined score (incl. controversy)	
emissions_score	Estimated total (direct and indirect) CO2 and CO2 equivalents emissions in tonnes.	
Mktrf	Market risk premium	Kenneth French's website
SMB	Small-minus-big	
HML	High-minus-low	
CMA	Conservative-minus-aggressive	
RMW	Robust-minus-weak	