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Doing Well While Doing Good? The Cost of Responsible Investing

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Claremont Mckenna College

Doing Well While Doing Good?
The Cost of Responsible Investing

Submitted to

Professor Eric Hughson

by

Elizabeth Iwicki

for

Senior Thesis

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Abstract

In this paper, I estimate the monthly alpha of highly rated ESG stocks, with the motivation to assess the effects of ESG investors on public equity markets. I hypothesize, consistent with the motivating theory of Heinkel et al. (2001), that the shift in investor preferences toward ESG-friendly investments leads to the underperformance of a broad ESG portfolio relative to a portfolio of comparable stocks. I test my hypothesis using the methodology of Hong and Kacperczyk (2009) and Wallace (2022), where I apply the methods to an ESG portfolio rather than a "sin" portfolio. Consistent with my hypothesis, I find that ESG portfolio significantly underperforms the comparable companies through the 2006-2021 period.

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1: Introduction

The term "ESG" denoting environmental, social, and governance was coined in a report titled "Who Cares Wins," published in 2004. This report, a joint initiative of the United Nations, the Swiss Federal Department of Foreign Affairs, and 23 major international financial institutions, consolidated recommendations of the financial services industry to better integrate the ESG factors in asset management and securities brokerage.[1] Since then, the global focus on EGS investing has grown rapidly. According to Bloomberg, global ESG assets are slated to represent more than a third of total assets under management (AUM) by 2025 (Bloomberg Intelligence).[2]

While capital has rapidly flowed into ESG assets, the opinions surrounding ESG investing are far from unanimous. Many politicians have raised concerns that institutional investors are using AUM to make political and social statements, rather than seeking the highest possible return. For example, in 2022, nineteen state attorneys general wrote to the SEC requesting the Commission to explore whether BlackRock's ties to climate groups and ESG initiatives are conflicting with their fiduciary responsibilities (Moynihan).

Until 2021, the legal precedent regarding fiduciaries who fall under the Employee Retirement Income Security Act of 1974 (ERISA) stated that fiduciaries must follow the "tiebreaker" or "all things being equal" standard.[3] The "tiebreaker" standard establishes that collateral benefits (such as ESG factors) may be considered as a deciding factor between

[1] Some of the financial institutions include Goldman Sachs, BNP Paribas, and the World Bank Group.
[2] ESG assets are on track to pass $53 trillion by 2025, over a third of the projected $140.5 total AUM.
[3] The following information is gathered from *Prudence and Loyalty in Selecting Plan Investments and Exercising Shareholder Rights*, a ruling by the Employee Benefits Security Administration, Department of Labor.

investments that are indistinguishable based on pecuniary factors. Additionally, the legal precedent stated that managers should only exercise proxy voting when the decision will directly affect the economic value of the asset. However, in early 2021 The Department of Labor conducted an outreach to interested stakeholders with the possibility of amending the current ERISA regulations.

This review resulted in the Department adopting amendments to the Investment Duties regulation of ERISA in December of 2022. The amendment established two major changes in ERISA regulations. The first, altered the "tiebreaker" rule. Now, assets do not need to be equal regarding pecuniary factors before considering collateral benefits. Fiduciaries are no longer prohibited from selecting investments based on collateral benefits rather than investment returns. The second change is that the Department has loosened the requirements on fiduciaries to record and report proxy voting activities.

The Department of Labor's decision was immediately contested by Republican lawmakers. Congress passed legislation to strike down the new ESG rule on March 1st by a vote of 50 to 46. However, on March 20th, Joe Biden vetoed the bill asserting that all relevant factors like climate change and executive compensation should be considered in investment decisions because they can affect investment returns.

One question the ESG debate raises is how much money the average investor would be willing to forgo to invest sustainably. Two studies, Blend and Ravenswaay (1999) and Hirst et al. (2021), have explored the question of sustainability and consumer preferences. The first, Blend and Ravenswaay (1999), explores the phenomenon of ecolabeling, a voluntary claim that a product reduces the environmental damage caused by the production

or consumption of that product. The study measures consumer's willingness to incur a premium on the price of apples if they were ecolabeled. The results show that 27.4% of respondents would not buy the ecolabeled apples, even if there was no price differential. At a price premium of $.20 and $.40, 52.4% and 42.3% of consumers would purchase the ecolabeled apples, respectively.

The second paper, Hirst et al. (2021), measures investors' willingness to invest sustainably, even at the cost of a lower return. This study offered participants a general portfolio and a lower-return portfolio that advanced a specific social interest (either faith-based values, gender diversity, income equality, or environmental protection). The study found that 44% to 62% (depending on the specific social interest) of participants were unwilling to invest in the lower-return portfolio, regardless of the difference in returns. The average participant was willing to sacrifice, at most, 1.76% to 2.53% of returns relative to the guaranteed 10% returns. Both studies reveal that there are some investors who are willing to sacrifice value for the sake of doing good. However, they both reveal that, in the majority of cases, people are only willing to sacrifice a small percentage of value, if any at all.

Taken together, these studies imply that not all investors have the same preferences regarding ESG investments. Some may be willing to forego higher returns as a matter of principle and others may not. Satisfying these investors' preferences may affect the expected returns of the firms in which they invest, which then affects the returns these investors achieve.

The political debate over ESG raises the question of whether ESG investments are economically distinguishable from non-ESG investments. Much depends on what happens to

the investment portfolio of a socially responsible investor who shuns so-called "sin" stocks. That investor will diversify less effectively, reducing the Sharpe Ratio (the reward-to-risk ratio) of its portfolio. The shunning of sin stocks in itself will not necessarily affect expected returns for either stocks favored or disfavored by socially responsible investors. Much depends on whether capital diverted from sin stocks can be fully replaced by that of neutral investors. If neutral investor demand is not downward sloping, there will be no effect on asset returns.

If instead, when capital is diverted from sin stocks, it is not fully replaced by that of neutral investors, i.e., if demand for securities is downward sloping, then asset prices and returns *will* be affected by the actions of the socially responsible. Heinkel et al. (2001) construct a model in which they assume that demand for securities is downward sloping due to investor risk aversion and investigate how the participation of socially responsible investors affects asset returns. They find that the more "green" or socially responsible investors there are in the market, the larger the gap in expected returns will be between responsible investors and neutral investors. This follows because the presence of green investors shifts the risk-reward dynamic and cost of capital of firms shunned by responsible investors. Specifically, the authors conclude that excluded firms (sin stocks/non-ESG stocks) will earn a higher risk-adjusted return than the ESG-friendly stocks.

There are several studies that investigate the return behavior of so-called sin stocks – stocks shunned by socially responsible investors. Hong and Kacperczyk (2009) find that sin stock returns experience a significant premium of 3.5% per year relative to comparable

companies.[4] There are also a number of studies that investigate whether mutual funds that shun sin stocks perform differently from those that do not. Statman (2000), finds that an ESG portfolio performs no differently than conventional portfolios. This is unsurprising because the screens employed by Statman do not screen out very many firms.[5] More surprisingly, Derwall et al. (2011), find that ESG funds that use positive screens achieve abnormal returns above shunned stocks. This last result is inconsistent with Heinkel et al.'s theory.

In this paper, I investigate whether stocks favored by ESG investors – those that pass positive screens - underperform similar stocks that are not. An implication of Heinkel et al. is that these stocks should underperform similar stocks in the same sector that do not pass such screens. The reasoning behind my hypothesis is the converse of the reasoning behind why sin stocks outperform comparable companies in Hong and Kacperczyk (2009). Further, my design has advantages over that employed by Hong and Kacperczyk (2009). When comparing the returns of sin stocks to those of comparables, their comparables set is not in the same industry as the sin stocks themselves. Instead, they control for industry effects using industry fixed effects at the level of a single-digit standard industrial classification (SIC) code[6]. The reason for using comparables outside of the stocks' industries is obvious – if all alcohol stocks are sin stocks, it is not possible to find a comparable non-sin stock in the same industry. In contrast, I am able to find stocks comparable to my so-called "virtue" stock set in the same industry. This means that unlike Hong and Kacperczyk (2009), whose result

[4] This result is found using the 4-factor model on the difference of the sin stock returns and the comparable portfolio.
[5] This is explained later in the Literature Review.
[6] It is hard to know the effect of this control on the results because all regressions in Hong and Kacpercyzk (2009) table 3 include fixed effects.

can be criticized because their sin stock outperformance can be perhaps attributed to the choice of industry, my results are more robust along that dimension.[7]

Indeed, I find that the ESG portfolio underperforms by ~38 basis points per month under the most conservative model.[8] This underperformance is slightly larger in magnitude than the outperformance found by Hong and Kacperczyk (2009). I achieve these results by generally following the methodology of Hong and Kacperczyk (2009). That is, I construct a portfolio of "virtue" stocks and a portfolio of comparables and test whether the virtue stock portfolio underperforms the comparable portfolio adjusting for risk using both the capital asset pricing model (CAPM) and factor asset pricing models. My finding and that of Hong and Kacperczyk (2009) are broadly consistent with Heinkel et al (2000): over-invested stocks (ESG stocks) underperform, and the under-invested stocks (sin stocks) outperform.

The remainder of the paper proceeds as follows: in Section 2, I discuss the motivating theory, followed by a review of the prior literature in Section 3. In Section 4, I discuss the selection and construction of my ESG portfolio and in Section 5, I outline the data collection process and construction of the comparable portfolio. I share the results of the study in Section 6, followed by an analysis of the results and robustness checks in Section 7. In section 8, I conclude the study and offer final thoughts on the topic and results.

[7] To further explain, there will be no perfect comparable company for a sin stock that is not a different sin stock, as any tobacco, alcohol, or gaming company is considered a sin stock. Thus, the comparable companies, while controlled at the 1-digit SIC code level, cannot control for all industry effects.
[8] This result is found using the Fama French 4-factor model with the *EXCOMP* variable (see table 4 for results).

2: Motivating Theory and Hypothesis Development

My empirical investigation is motivated by the model in Heinkel et al. (2000). In Heinkel et al. (2000), there are three types of firms in the economy: acceptable (socially responsible investors will invest in), unacceptable (socially responsible investors will not invest in), and reformed (formerly unacceptable, now acceptable). There are two types of investors: neutral investors who seek to maximize returns and socially responsible investors. Neutral investors invest in any type of firm, while socially responsible investors only invest in acceptable or reformed firms. Thus, the pool of investors willing to invest in unacceptable firms is smaller than the pool of investors willing to invest in acceptable and reformed firms. A reformed firm is a firm in the same sector as an unacceptable firm and has the same expected cash flows and risk profile. The lower demand for unacceptable stocks will push the price down and vice versa for the acceptable and reformed stocks. The greater the proportion of socially responsible investors there are, given the number of total investors remains constant, the cheaper unacceptable stocks become. In the simple model, the wedge between the prices of unacceptable and acceptable and reformed firms is constant, so that the degree of sin stock underperformance relative to comparable firms is unaffected by the proportion of socially responsible investors. In a richer model, those stocks more heavily favored by responsible investors would see their prices rise so that these stocks would thereafter underperform. As the number of willing investors decreases for the unacceptable firms, neutral investors can expect to receive a higher return on their investment to compensate for the increased risk associated with holding a larger proportion of unacceptable firms. This compensation would not be necessary if all investors were neutral. These price effects result in acceptable and reformed stocks having higher share prices and

lower expected returns and unacceptable stocks having lower share prices and higher expected returns. In other words, acceptable and reformed stocks are overvalued due to the market participation of socially responsible investors and unacceptable stocks are undervalued. In Heinkel et al.'s model, only stocks in the same sector as sin stocks are affected by the presence of socially responsible investors. This is one reason why it is important in an analysis of sin and virtue stocks under that model to find a set of comparable stocks in the same sector as those stocks affected by the demand of socially responsible investors.

As outlined by Heinkel et al. (2000), a firm's cost of capital is defined as expected cash flow divided by current price. Because expected cash flow is not affected by investor or firm actions in the model, the cost of capital is inversely related to the price of the stock. If neutral investors shift to socially responsible preferences, the price of acceptable and reformed firms rise and the cost of capital falls. The cost of capital is the expected return for the capital providers of the business. In summary, influxes of socially responsible investors cause the price of the stock to rise, which pushed the cost of capital down, equating to a lower expected return for investors. The inverse should hold for unacceptable stocks, leading to a higher expected return for neutral investors.

Heinkel et al. (2000) further explains that the result of participation by the norm-constrained/responsible investors is that all three types of firms plot off of the security market line (SML).[9] Any security plotted above the SML is considered overvalued as it would

[9] The security market line is a graphed representation of the CAPM model, where any given security is plotted as the intersection of its expected return (cost of capital) and systematic risk (beta). The slope of the SML represents the market risk premium.

offer lower returns than would be predicted by the level of risk. The opposite also holds, where securities below the SML are undervalued as they offer a higher expected return than is accounted for by their risk. Based on this theory, ESG stocks should be overvalued, and sin stocks should be undervalued. Any deviation from the SML, above or below, should be detected as Jensen's alpha.[10]

My hypothesis follows the guidelines of Heinkel's theory: highly rated ESG stocks should underperform comparable stocks, detectable by a negative and significant Jensen's alpha. I hypothesize that this negative alpha will be detectable throughout the 2006-2021 time period using the methodology of Hong and Kacperczyk (2009).

3: Literature Review

Many studies have directly or indirectly investigated whether ESG investing yields positive alpha. This array of studies provides mixed results, some finding that socially responsible investors underperform irresponsible investors, and others asserting that socially responsible investors have insignificantly different returns from neutral investors. These discrepancies stem from a variety of methodologies and definitions of "socially responsible." Hong and Kacperczyk (2009) address socially responsible investing through the reverse lens of sin stocks and provide evidence that societal pressures against funding harmful industries have created a higher expected return for sin stocks for those willing to invest in them. Their paper suggests that the combination of litigation risk and norm-constrained institutional investors (pension plans, university endowments, religious institutions, etc.) has led to a heightened risk-reward dynamic and subsequently higher

[10] Jensen's alpha is a measure of alpha calculated using the CAPM equation.

expected returns for sin stocks. To assess the returns of sin stocks versus socially responsible stocks, the authors built a portfolio of 193 publicly traded companies with any operations within the alcohol, gaming, or tobacco industries. Then, they used the CAPM to measure the excess return of sin stocks on a comparable-but-responsible portfolio, adjusted for overall-market returns. The CAPM model finds that a portfolio that is long sin stocks and short comparable companies yields 25 basis points a month. When including controls for size, value, and momentum (under the Fama-French 4-factor model), which is the most conservative model, the outperformance is 26 basis points.

Wallace (2022) updates Hong and Kacperczyk (2009) using data from 1965-2021. Using the Fama-French model, Wallace (2022) observes 19 basis points of monthly alpha over 1965-2021, which is lower than the 1965-2006 monthly alpha of 26 basis points. Under the CAPM, the monthly alpha is 9 basis points relative to the 1965-2006 alpha of 25 basis points. The deterioration of alpha implies a declining expected return for sin stocks over 2007-2021. These results may be explained by recent flows of ESG investors into the market, causing short-term upward pressure on ESG stocks and downward pressure on sin stock prices. These assessments of sin stocks versus socially responsible stocks provide the insight that socially responsible investors may now be leaving money on the table. However, this methodology uses a positive screen for sin, rather than a positive ESG screen. Other studies of ESG stocks utilize different screening methods centering ESG.

Now, consider Statman (2000), a study that uses the approach of a negative screen to build their ESG portfolio. This paper suggests that a socially responsible portfolio has indistinguishable returns from a conventional market portfolio. Using the Domini Social Index (DSI) as their ESG portfolio, the author concludes that the socially responsible portfolio

did no worse than the S&P 500. While the author found no significant difference between the portfolios' returns, the portfolio constituents were more similar than they were different. The DSI consists of 400 stocks, 250 of which are in the S&P 500. The index was built using a negative screen, meaning that they started with a market portfolio and used screening criteria to remove a small number of *irresponsible* companies based on their negative social or environmental impacts. The negative screen is likely the primary reason behind their conclusion that socially responsible portfolios yield the same returns as neutral portfolios, as the pool of non-negative companies is much larger than the subset of ESG-responsible companies. Rather than establishing strict ESG-specific positive criteria to build a portfolio on, Statman (2000) used the conventional portfolio as a base and made exclusionary adjustments.

Despite this conclusion, it is evident that alternative screening methods will yield differing results. Hylton (1992) examines the three methods of responsible investing and portfolio building: negative screen, positive screen, and activism. After examining these methods of socially responsible investing, the author asserts that, in an efficient market, socially responsible investors will face lower returns. In assessing the returns of portfolios with positive screens over the period of 1992-2008, Derwall et al. (2011) finds that positive screens are relevant in achieving abnormal returns above sin/shunned stocks. However, in studies held at the end of or later than the 1992-2008 period, researchers fail to find superior returns on positive screen portfolios. The paper discusses the shunned-stock hypothesis which posits that sin stocks produce abnormal returns in excess of the benchmark due to the risk-sharing opportunity caused by institutional investor neglect. However, the paper

counters the shunned-stock hypothesis, stating that ESG stocks can deliver superior returns, as the market systematically underestimates the value-add of ESG.

Other papers, rather than looking at the value of ESG through a portfolio perspective, approach the issue of ESG investing at a fund level. Looking to reveal mutual fund managers' true beliefs on ESG investing, Orlov et al. (2022) study the relationship between sustainability levels of funds' investments and management ownership of those funds. The paper finds that the compensation structure in mutual funds has a significant effect on managers' willingness to invest in ESG stocks. Managerial co-ownership is shown to have a negative relationship with future ESG/sustainability performance with significance at the 1% level. Additionally, the higher the co-investment value the higher the reduction in the funds' high-ESG investments. For robustness, the authors measured ESG investments by managers who manage multiple funds simultaneously. The paper finds that these managers, within the same quarter, have a significantly lower ESG performance in the funds where they have higher ownership. The authors also explore the effects of compensation structure outside of ownership and co-investment levels. Managers who are compensated based on AUM or investment flows tend to invest more in ESG stocks, while managers who are paid based on financial performance invest less in high-ESG stocks than other managers. The positive effect of AUM or investment flow-based compensation on ESG performance is entirely reversed if the managers have co-investment in the fund. These findings indicate that managers do not believe that ESG investing yields abnormally high returns, and when they have skin in the game, will not put their own money on the line for the sake of sustainability.

Other papers seek to reveal the difference in returns between conventional and socially responsible mutual funds. While Statman (2000) studied the difference in returns between the DSI and the S&P 500, the paper also analyzed returns at the fund level. They find that socially responsible mutual funds underperformed the S&P 500 Index over 1990-1998 period. However, these responsible funds performed the same as conventional funds, implying that there was no penalty for ESG investing at the mutual fund level. On a similar theme, Geczy et al. (2003) assesses the Sharpe ratio of conventional mutual funds versus socially responsible funds. The authors conclude that the cost of socially responsible investing depends on the investor's beliefs on asset pricing models and luck versus skill of investing. The authors find that an investor who strongly believes in the CAPM and has no belief in managerial skills will find minimal (a few basis points per month) difference in returns. However, when the investor believes in a Fama-French type multi-factor model or the investor has belief in managerial skill, there are significant costs to socially responsible investing.

While there is extensive literature on ESG and socially responsible investing, and the cost or premium associated with various screens relative to conventional investing, there is an evident gap in the methodology. Many papers study ESG returns at the mutual fund level (Geczy et al. 2003, Statman 2000). Other papers use individual stocks to build a socially responsible portfolio to be compared to a conventional index (Statman 2000). The research has also covered the expectations of managers on ESG returns (Orlov et al. 2022). However, the gap exists in that no paper has executed the methodology of Hong and Kacperczyk (2009) while substituting the positive screen to apply to highly rated ESG stocks rather than companies within the “Triumvirate of Sin” (alcohol, tobacco, and gaming).

4: ESG Stock Selection

Selecting the criteria to define an ESG stock is critical in the study of ESG equity returns. Even a small difference in screening criteria could produce a quite different ESG portfolio. In selecting my criteria, I first look at pre-existing ESG scoring systems and screening that could be utilized in building an ESG-friendly portfolio.[11] Notable ESG rating systems include MSCI, Morningstar's Sustainalytics, Refinitiv Eikon, and S&P Global ESG Ratings.

In determining which of these screening systems to utilize, I first consider access. Morningstar Sustainalytics is a public ESG rating platform, meaning anyone can enter a public company's ticker into Sustainalytics' search engine and find the current ESG rating. Private but accessible platforms include Refinitiv Eikon and the rating system accessible within Bloomberg's database.

The next consideration in deciding which scoring system to use in screening for the ESG portfolio, was access to historical ESG scores. Historical ESG scores are needed together with current ESG scores as a firm's ESG commitment can widely vary throughout its lifetime. For example, Hasbro, a children's toys and games company, is rated as having "Negligible Risk" by Morningstar and was rated with an overall ESG score of A in 2021 by Refinitiv Eikon. However, Hasbro faced significant controversy in late 2007, when a workers' rights group

[11] I decided to use ESG scores as my basis of screening for ESG-friendly stocks. I recognize that there are many pitfalls to this method. The criteria behind ESG scores are not always transparent, and "greenwashing" is prevalent problem that could encourage overly high scores. However, for the sake of market-wide access to ESG data, this was the most practical approach. Additionally, I believe that it is more important to assess the relationship between perceived ESG-commitment rather than actual ESG-commitment. My reasoning behind this, is that socially responsible funds and investors typically invest in companies with high ESG ratings rather than ESG-compliant businesses Raghunandan and Rajgopal (2022). This shows that the flow of funds is targeted towards publicly perceived ESG-compliance (reflected in scores) rather than true ESG compliance (such as carbon emissions). I am most interested in learning whether the ESG criteria of socially responsible funds is correlated with additional alpha, thus I decide to use the available ESG ratings.

exposed the brand for illegal and abusive working conditions in their Chinese factories (Barboza). These practices included the hiring of over 1,000 junior high school students (when the province only allowed for workers 16 and over) and reports of managers who sexual harassed and verbally abused employees. Thus, it is evident that Hasbro, while it may be included in an ESG-based portfolio in 2021, would not be included for the year 2007. Refinitiv Eikon is the only one of these ESG rating databases to provide historical ratings, and thus is the scoring system I use in building my portfolio.

The Refinitv ESG scoring system has a variety of ESG ratings for each company that could be used in determining social responsibility. Refinitv offers individual ratings for the Environmental Pillar, Social Pillar, and Governance Pillar, as well as an ESG Controversies Score. The database also offers an ESG Combined Score which accounts for all 4 individual ratings. I use the ESG Combined score in determining social responsibility, as it provides the most holistic view of ESG practices. Then, to build the index, I screen the entire universe of U.S public equities to include any firms that have received an A+, A, or A- ESG Combined Score on a year-to-year basis. Thus, the ESG index changes each year, based on which firms fit the screening criteria during the given year.

This screening process differs from the screening of Hong and Kacperczyk (2009) and Wallace (2022) due to the differing nature of ESG stocks and Sin stocks. Sin stocks are solely defined by the industry in which they operate.[12] ESG stocks, on the other hand, are defined by the quality of their operations and their commitment to the themes of environmental, social, and governance.[13] Therefore, a company operating in a sinful industry could still fit

[12] As defined by Hong and Kacperczyk (2009).
[13] According to the definition of ESG I use in my screen.

into the ESG portfolio given their operations and mission align with ESG values. For example, Melco Resorts and Entertainment Limited operate a slot machine brand and own multiple casinos yet received an A- or above ESG rating from 2019-2021.

The applied screening criteria produces a portfolio of 266 unique public equities across the years of 2006-2021. The portfolio begins in 2006 due to a lack of ESG rating availability prior to that year. 128 different industries are represented in the portfolio, with the most represented industries being Real Estate Investment Trusts, Electric Services, Semiconductors and Related Devices, and Prepackaged Software.

Table 1: ESG Portfolio Size by Year

This table reports the number of companies contained in the ESG portfolio each year. The number of companies in the portfolio is representative of the number of A+, A, and A- rated public U.S. listed firms in the given year. Thus, there were 5 firms rated A+, A, or A- in 2006, and so forth.

ESG Portfolio by Year	
Year	Companies
2006	5
2007	9
2008	12
2009	20
2010	16
2011	18
2012	28
2013	22
2014	28
2015	42
2016	44
2017	76
2018	77
2019	97
2020	118
2021	182

5: Data and Research Design

Following the ESG stock selection procedure, I turn to building a portfolio of comparable companies. In Hong and Kacperczyk (2009) and Wallace (2022) sin stock portfolio companies are benchmarked against a comparable stock determined by the Fama French (1997) industry groups. All companies in the sin portfolio are benchmarked against a company in either 2 (food), 3 (soda), 4 (fun), and 43 (meals and hotels) depending on the industry of the sin stock. Thus, all alcohol-related businesses are compared against a single soda company, as tobacco is with food, gaming with fun, and casinos with meals and hotels.

However, the nature of the ESG portfolio is more diverse regarding industry groupings, having 128 unique industries rather than the 3 industries represented in the sin stock portfolio. Thus, rather than selecting a comparable for each industry represented, I select a comparable for each equity in the ESG portfolio based on SIC code and size. The comparable companies are based on matching 4-digit SIC codes and market-capitalization, and the comparable may not be represented in the ESG portfolio. If there are no other U.S public equities within the 4-digit SIC code, I instead use the 3-digit SIC code. Additionally, the comparable company must have public data for each year the associated ESG company is represented in the ESG portfolio.[14]

Following the construction of the ESG portfolio and the comparable portfolio, I collect the relevant data required to assess the portfolio returns. First, I retrieve monthly total returns from the Center of Research in Commodity Prices (CRSP) for each sin stock throughout the duration of its existence as a public company, dating back to 2006. Then, I

[14] If the most similar company by SIC code and market capitalization does not have enough historical public data to benchmark the ESG firm, the next most similar company would be selected.

retrieve the monthly total returns of the comparable companies from CRSP over the same period.

From this data, I define two primary variables of interest. $EXCOMP_t$, is defined as the monthly return of an equal-weighted portfolio of ESG stocks, net of the monthly return of an equally weighted portfolio of comparable companies.[15] Next, I define $EXESG_t$ as the monthly return of an equal-weighted portfolio of ESG stocks, net of the risk-free return.[16] $EXCOMP_t$ is a more conservative measure of the value of ESG, as it accounts for the difference returns between companies within the same industry. On the other hand, $EXESG_t$ measures the performance of ESG firms versus the market as a whole. Thus, this may be considered a measure of the premium/discount on the industries in which ESG firms tend to operate in, rather than a premium/discount on ESG commitment specifically.[17]

I then consider these variables of interest in two separate models, the first and simpler model being the traditional capital asset pricing model (CAPM).[18] This model uses a single control variable, $MKTPREM_t$, which is the market return less of the risk-free rate. The market return, obtained from Ken French's website, is defined as the value-weighted market index return. This return includes all U.S stocks that trade on AMEX, NASDAQ, and NYSE exchanges, and is inclusive of dividends. The CAPM implies that an asset's covariance with the investor's portfolio determines the asset's risk and that the risk will be agreed upon by

[15] This methodology follows that of Hong and Kacperczyk (2009) and Wallace (2022)
[16] This methodology is borrowed from Wallace (2022) but is not used in Hong and Kacperczyk (2009)
[17] For example, the most represented industry in the ESG portfolio is Real Estate Investment Trusts (REITs). With *EXESG*, a positive alpha may simply indicate that REITs outperform the average of the market. A positive alpha using *EXCOMP* would instead indicate that the ESG-friendly firm within the REITs industry outperforms an ESG neutral/unfriendly firm within the REITs industry.
[18] The capital asset pricing model can be attributed to Sharpe (1964) and Lintner (1965). The breakthrough of the CAPM allowed for the development of asset pricing models with clear testable predictions about risk and return.

all investors who share the same portfolio. According to the CAPM, if all investors hold the market portfolio, then a given stock's covariance with the market defines its risk. In the case of this study, the covariance of the ESG portfolio (either using $EXCOMP_t$ or $EXESG_t$) against the market portfolio ($MKTPREM_t$) represents the risk of the ESG portfolio. The coefficient of $MKTPREM_t$ represents the beta of the asset, meaning the coefficient represents the risk linearly correlated with the return of the market portfolio.

The other model I use to assess the alpha of the ESG portfolio is the Fama-French 4-factor model. This model includes 3 control variables in addition to the $MKTPREM_t$ variable. These variables are SMB_t, HML_t, and MOM_t. The SMB_t factor accounts for the tendency of small-cap stocks to outperform large-cap stocks. The factor is calculated as the difference in returns between small and large-cap stocks for the given period. The HML_t factor accounts for value stocks typically outperforming growth stocks. Value and growth stocks are defined by having a low or high price-to-book ratio respectively. HML_t is calculated as the difference between the returns of high price-to-book and low price-to-book stocks. The final factor is MOM_t, which captures the tendency for stocks that performed well in the past to perform well in the future. The factor is calculated as the difference in returns of high and low momentum stocks. The Fama-French 4-factor model is intended to capture variation in alpha that cannot be explained by market returns alone.[19] These factors are available to download on Ken French's website.

[19] Gibbons et al. (1989) should receive credit for their discovery of these weaknesses in the CAPM model. In a sample of data from 1926-1982 they found that specific industries outperform the CAPM while others underperform, and the smallest firms outperformed. They did not create the 4-factor model, but their discoveries led to the development of factor models, including that of Fama and French.

Between the two dependent variables and the two models, 4 distinct regressions are created. Two following the CAPM:

$$EXCOMP_t = \alpha_t + \beta MKTPREM_t + \varepsilon_t$$

$$EXESG_t = \alpha_t + \beta MKTPREM_t + \varepsilon_t$$

The other two models follow the Fama-French 4-factor:

$$EXCOMP_t = \alpha_t + \beta_1 MKTPREM_t + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 MOM_t + \varepsilon_t$$

$$EXESG_t = \alpha_t + \beta_1 MKTPREM_t + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 MOM_t + \varepsilon_t$$

I choose to run the regressions with dummies for each 36-month subperiod rather than a single 16-year period.[20][21] This way, there is room for the coefficient values to vary over time and allows for a time-varying alpha. Using this method, I can assess whether or not ESG stocks have a consistent pattern of outperforming/underperforming or if it is dependent on the time period. Another reason having variation in the coefficients is important is due to the varying composition of the index and the varying risk of any given company over time. The variation in the portfolio composition is quite evident in the ESG portfolio. The ESG portfolio grows from 5 companies in 2006 to 182 companies in 2021. Additionally, each firm in the index, even if included each year, has variation in risk over time. One example of time-varying beta is with the company Agilent Technologies Incorporated, a firm that is included in the portfolio 12 out of the 16 years. Today, Agilent Technologies' 5-year beta is 1.03.[22] This means the stock's returns track nearly identically to the market. In 2011, if you were to use data over the 5-year period of 2006-2010, you would find a beta of 1.36, suggesting much

[20] The method of splitting into 36-month subperiods is borrowed from Wallace (2022).
[21] Using this methodology, one year must be excluded due to having 3-year periods and 16 total years. Thus, I excluded 2006, to keep the remaining sub-periods aligned with those in Wallace (2022).
[22] According to S&P Capital IQ 5-yr beta.

greater exposure to systematic risk. Thus, it is imperative that the model allows for this firm to have different beta values across each year to capture the changing risk profile.

Using the dummies for each 36-month subperiod allows the regression to capture a single alpha over the 16-year period, yet still allow for time varying coefficients for $MKTPREM_t$, SMB_t, HML_t, and MOM_t. This model is constructed using a dummy variable for the periods 2007-2009, 2010-2012, 2013-2015, 2016-2018, and 2019-2021 (1 during the period and 0 any other year), where each independent variable is multiplied by each period's dummy variable. When using the CAPM model, the independent variables include $MKTPREM_{07-09} - MKTPREM_{19-21}$. When using the Fama French 4-factor model, there are 20 different coefficients (excluding the constant), including $MKTPREM_{07-09} - MKTPREM_{19-21}$, $SMB_{07-09} - SMB_{19-21}$, $HML_{07-09} - HML_{19-21}$, and $MOM_{07-09} - MOM_{19-21}$. Each regression is run against both $EXCOMP_t$ and $EXESG_t$. Using the single-alpha model (rather than a separate regression for each period) allows for higher degrees of freedom but still accounts for time-varying risk.

6: Results

Tables 3 and 4 summarize the regression results using the CAPM and Fama French models against the $EXCOMP_t$ variable. Under both models, $EXCOMP_t$, the return of the equal-weighted ESG portfolio less the returns of the equal-weighted comparable portfolio, produces negative alpha. $EXCOMP_t$ has a market beta close to zero in Table 2 in the CAPM regressions, which reveals that the comparables portfolio does a good job controlling for systematic risk. However, Table 3 reveals that the size factor sensitivity of $EXCOMP_t$ is negative, suggesting that virtue stocks are larger than their comparables.

The results on underperformance are similar regardless of the model used to control for risk. The alpha under the CAPM is -0.44% per month and is statistically significant at the 5% level, with a t-statistic of -2.53. The monthly alpha translates to a yearly alpha of -5.25%. Under the 4-factor model, the monthly alpha is -0.3757% and is statistically significant at the 5% level, with a t-statistic of -2.25. This corresponds to a yearly alpha of -4.51%. The higher monthly alpha given the additional factors suggests that perhaps some of the underperformance of the ESG portfolio under the CAPM is accounted for by size, value, and momentum factors. The difference is economically less than one percentage point per year, however.

Table 2: EXCOMP CAPM Regression Results

This table reports the regression results of the CAPM model using the $EXCOMP_t$ variable. The alpha coefficient represents the primary result of interest, as it is the monthly alpha of the ESG portfolio. The coefficients of the $MKTRF_t$ variables represent the beta of the portfolio for the given time period. The alpha is representative of the portfolio over the entire period, while the betas are representative of the given 3-year period. These results were achieved by using dummy variables which indicated 1 for the given 3-year period and 0 for every other year, then multiplying the $MKTRF_t$ value by each dummy.

EXCOMP CAPM				
EXCOMP	Coefficient	Std. err.	T-Stat	P-Value
MKTRF0709	-0.0467734	0.06474	-0.72	0.471
MKTRF1012	-0.1175238	0.08094	-1.45	0.148
MKTRF1315	0.0022824	0.11354	0.02	0.984
MKTRF1618	-0.0162393	0.11091	-0.15	0.884
MKTRF1921	-0.0642638	0.06766	-0.95	0.344
α	-0.4377692	0.17293	-2.53	0.012

Table 3: EXCOMP FF 4-Factor Regression Results

This table reports the regression results of the Fama French 4-factor model using the $EXCOMP_t$ variable. The alpha coefficient represents the primary result of interest, as it is the monthly alpha of the ESG portfolio. The coefficients of the $MKTRF_t$ variables represent the beta of the portfolio for the given time period. The alpha is representative of the portfolio over the entire period, while the betas are representative of the given 3-year period. These results were achieved by using dummy variables which indicated 1 for the given 3-year period and 0 for every other year, then multiplying the $MKTRF_t$, SMB_t, HML_t, and MOM_t values by each dummy.

EXCOMP FF 4-Factor				
EXCOMP	Coefficient	Std. err.	T-Stat	P-Value
MKTRF0709	-0.1032	0.07616	-1.36	0.177
MKTRF1012	-0.0533	0.09693	-0.55	0.583
MKTRF1315	0.02465	0.10875	0.23	0.821
MKTRF1618	0.0608	0.11302	0.54	0.591
MKTRF1921	-0.1164	0.07665	-1.52	0.131
SMB0709	-0.4107	0.15932	-2.58	0.011
SMB1012	-0.4517	0.21871	-2.07	0.041
SMB1315	-0.268	0.15175	-1.77	0.079
SMB1618	-0.3284	0.15288	-2.15	0.033
SMB1921	-0.1068	0.14118	-0.76	0.451
HML0709	0.41491	0.11493	3.61	0
HML1012	0.29454	0.18246	1.61	0.108
HML1315	0.06218	0.23413	0.27	0.791
HML1618	0.14563	0.15728	0.93	0.356
HML1921	0.05543	0.09525	0.58	0.561
MOM0709	0.00748	0.05846	0.13	0.898
MOM1012	-0.0159	0.1249	-0.13	0.899
MOM1315	0.05225	0.14145	0.37	0.712
MOM1618	-0.0598	0.14907	-0.4	0.689
MOM1921	-0.1261	0.1081	-1.17	0.245
α	-0.3757	0.16705	-2.25	0.026

Tables 5 and 6 reveal an interesting dichotomy between the results using the $EXCOMP_t$ and $EXESG_t$ variables. Using $EXESG_t$, the return of the ESG portfolio net of the risk-free rate, the results of both the CAPM and 4-factor models are positive and insignificant. This implies that the performance of the ESG portfolio is insignificantly different from the

market's performance. The CAPM model produces a monthly alpha of 0.07% and a t-statistic of 0.5. The 4-factor model produces a monthly alpha of .15% and a t-statistic of 1.18. These t-statistics correspond to p-values of .621 and .242, respectively. The results are positive and insignificant, which is the opposite of the $EXCOMP_t$ results. Based on the results of $EXCOMP_t$ it would be expected that the $EXESG_t$ models would also be negative and significant. These results reveal that the returns of these ESG firms are insignificantly different from the market. However, once I control for industry effects using $EXCOMP_t$, the result is negative and significant. What these results imply is that the outperformance of ESG stocks, relative to the market, is attributed to industry effects. When industry effects are controlled for using the comparable portfolio, all positive alpha disappears, and the result is a negative alpha. Thus, I can assume that the industries in which ESG firms operate outperform the market, but the ESG firms underperform their non-ESG peers within those industries.

Table 4: EXESG CAPM Regression Results

This table reports the regression results of the CAPM model using the $EXESG_t$ variable. The alpha coefficient represents the primary result of interest, as it is the monthly alpha of the ESG portfolio. The coefficients of the $MKTRF_t$ variables represent the beta of the portfolio for the given time period. The alpha is representative of the portfolio over the entire period, while the betas are representative of the given 3-year period. These results were achieved by using dummy variables which indicated 1 for the given 3-year period and 0 for every other year, then multiplying the $MKTRF_t$ value by each dummy.

EXESG CAPM				
EXESG	Coefficient	Std. err.	T-Stat	P-Value
MKTRF0709	1.18211	0.05104	23.16	0
MKTRF1012	1.01423	0.06381	15.89	0
MKTRF1315	0.99069	0.08952	11.07	0
MKTRF1618	1.01699	0.08744	11.63	0
MKTRF1921	1.18316	0.05335	22.18	0
α	0.06753	0.13634	0.5	0.621

Table 5: EXESG FF 4-Factor Regression Results

This table reports the regression results of the Fama French 4-factor model using the $EXESG_t$ variable. The alpha coefficient represents the primary result of interest, as it is the monthly alpha of the ESG portfolio. The coefficients of the $MKTRF_t$ variables represent the beta of the portfolio for the given time period. The alpha is representative of the portfolio over the entire period, while the betas are representative of the given 3-year period. These results were achieved by using dummy variables which indicated 1 for the given 3-year period and 0 for every other year, then multiplying the $MKTRF_t$, SMB_t, HML_t, and MOM_t values by each dummy.

EXESG FF 4-Factor				
EXESG	Coefficient	Std. err.	T-Stat	P-Value
MKTRF0709	1.15423	0.05659	20.4	0
MKTRF1012	0.92168	0.07202	12.8	0
MKTRF1315	0.97759	0.0808	12.1	0
MKTRF1618	1.00128	0.08397	11.92	0
MKTRF1921	1.05039	0.05695	18.44	0
SMB0709	-0.1406	0.11838	-1.19	0.237
SMB1012	0.22365	0.1625	1.38	0.171
SMB1315	0.03548	0.11275	0.31	0.753
SMB1618	-0.0639	0.11359	-0.56	0.574
SMB1921	0.14111	0.1049	1.35	0.18
HML0709	-0.0965	0.0854	-1.13	0.26
HML1012	0.23071	0.13557	1.7	0.091
HML1315	-0.0381	0.17396	-0.22	0.827
HML1618	-0.0476	0.11686	-0.41	0.685
HML1921	0.32096	0.07077	4.54	0
MOM0709	-0.1003	0.04344	-2.31	0.022
MOM1012	-0.0165	0.0928	-0.18	0.859
MOM1315	-0.0143	0.1051	-0.14	0.892
MOM1618	-0.1844	0.11076	-1.66	0.098
MOM1921	-0.1207	0.08032	-1.5	0.135
α	0.14584	0.12412	1.18	0.242

Exhibits 1 and 2 demonstrate the importance of allowing a time varying beta, justifying the decision to include a dummy variable for each 3-year period. The beta in the $EXCOMP_t$ CAPM model beta varies by ~.12 over the period and the $EXESG_t$ CAPM model beta varies by ~.2 through the period.

Exhibit 1: EXCOMP Market Beta Over Time (CAPM)

This graph represents the changing value of the portfolio beta over the test period. These betas are obtained from the CAPM regression of the $EXCOMP_t$ variable. Each 3-year period's beta is marked as the first year in the period. Thus, the 2007-2009 portfolio beta is reported as occurring in 2007. This explains why the graphs values end in 2019 rather than 2021.

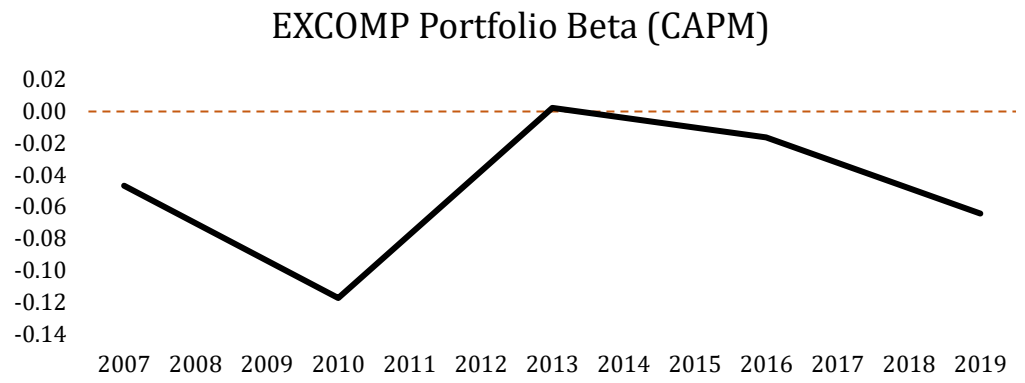
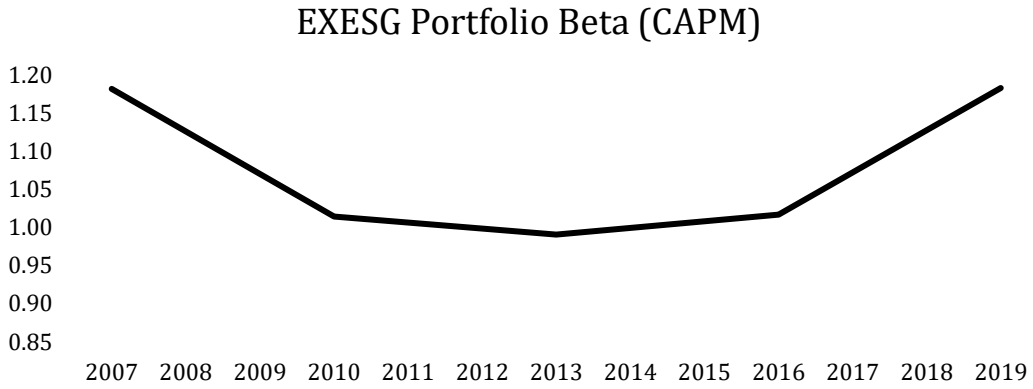


Exhibit 2: EXESG Market Beta Over Time (CAPM)

This graph represents the changing value of the portfolio beta over the test period. These betas are obtained from the CAPM regression of the $EXESG_t$ variable. Each 3-year period's beta is marked as the first year in the period. Thus, the 2007-2009 portfolio beta is reported as occurring in 2007. This explains why the graphs values end in 2019 rather than 2021.



7: Discussion

Heinkel et al. (2001) asserts that shunned stocks, such alcohol, tobacco, and gaming stocks, should experience abnormal positive alpha as the limitations will allow for neutral investors to buy at a discount. On the other hand, the theory implies that over-invested stocks, such as ESG-friendly stocks, will be overpriced and thus, underperform over time.

The results of Wallace (2022) and Hong and Kacperczyk (2009) support the theory of Heinkel et al. (2001) that the participation of socially responsible capital creates a material price effect on sin stocks. These studies find that sin stocks produce statistically significant alpha over the market and comparable companies during the 1967-2006 and 2006-2021 periods. Empirically, the opposite should be true for ESG stocks which should underperform comparable companies' returns due to the price premium induced by ESG investors. My results confirm this theory, as the alpha of the ESG portfolio is significantly negative.

As a robustness check, and to decipher the alphas of the individual 3-year periods, I ran the $EXCOMP_t$ CAPM and Fama French 4-factor models separately for each time-period. What I find in both models, is that the alpha of the ESG portfolio hits the lowest value during the 2013-2015 period and the highest alpha during the 2010-2015 period. Wallace (2022) uses the methodology of running separate 36-month period regressions; thus, this robustness check allows direct comparison to the sin stock alphas over the same 36-month periods.[23] Wallace (2022) finds that, within the 2007-2021 range, the 2013-2015 period experiences the highest sin-stock alpha and the 2019-2021 period experiences the lowest alpha. The 2013-2015 period corroborates across my empirical results and the results of

[23] This methodology refers to running separate 36-month regressions, to establish a time-varying alpha, and then averaging the alphas of each period.

Wallace (2022) as the lowest ESG return period matches the highest sin-stock return period. However, the period with the highest ESG return does not directly match the lowest sin-stock return. Over the 2007-2021 period, the ESG portfolio and the sin stock portfolio have a return correlation of -0.8582, confirming that the two portfolios' alphas move inversely.[24]

This negative correlation is interesting because it suggests that dynamics are missing from the analysis of Heinkel et al. (2001) and that these dynamics are important. In Heinkel et al. the investment horizon is a single period, and the analysis is performed assuming that the fraction of socially responsible investors is constant. Then, Heinkel et al. (2001) examine what happens as one varies the proportion of socially responsible investors and conclude that the more socially responsible investors there are, the greater the likelihood that sin stocks outperform in expectation. But the reality is more complicated. The fraction of socially responsible investors is increasing over time, and it is possible that in a model in which this is taken into account, that the premium for sin stocks and the expected negative alpha for virtue stocks might not be constant over time. It is difficult to solve such a model formally because much depends on expectations about the future fraction of socially responsible investors.

Still, it is possible to speculate about what would happen if an abnormally large fraction of investors changed their investing policy to become more socially responsible. In that case, money would flow out of sin stocks and into virtue stocks. Although this would depress future virtue stock expected returns and increase expected sin stock returns, during the period where capital moved out of sin stocks, those stocks would see lower returns and

[24] This correlation specifically accounts for the *EXCOMP* Fama French 4-factor alphas of both portfolios.

virtue stocks would see correspondingly higher returns. This effect is a potential source of the negative correlation I observe.

One question that arises in comparing the results of Wallace (2022) to my empirical findings, is why ESG stocks do not experience a positive alpha when sin-stocks experience a negative alpha. In Wallace (2022), 3 out of the 5 36-month periods from 2007-2021 experience a negative sin-stock alpha using the 4-factor model and 2 out of the 5 periods experience a negative alpha using the CAPM model. By contrast, my model experiences a negative ESG-stock alpha for all 5 36-month periods. It would be expected that the periods which experience a negative sin-stock alpha would also experience a positive ESG-alpha. However, I believe that the criteria defining ESG and sin stocks do not directly contradict each other, and thus leave room for the two portfolios to have similar returns. ESG stocks are defined by ESG score rather than industry, while sin-stocks are defined solely by industry. Thus, sin stocks have the capacity to fall into both portfolios. In my ESG portfolio, there are cigarette and gaming companies represented, demonstrating that the two portfolios are not mutually exclusive.[25] In this case, ESG-focused investors may instead shun stocks with low overall ESG ratings or stocks that fail to meet standards in one of the three ESG categories.

[25] Altria Group, a cigarette company, is included in the ESG portfolio across 4 years. The company focuses on ESG-forward messaging and responsible tobacco usage. Phillip Morris International, another cigarette company, is included in the portfolio across 2 years. They are pushing the concept of a "smoke-free" future, which is more environmentally friendly than classic cigarettes. Wynn Resorts and Melco Resorts and Entertainment are both casinos that are included in the ESG portfolio for 2 and 3 years, respectively.

Table 6: EXCOMP 36-Month Period Regression Results

This table summarizes the results of the $EXCOMP_t$ regressions (both CAPM and Fama French 4-Factor), with each 36-month period run as a separate regression. The bottom of the table shows the average of the 5 separate periods.

EXCOMP Regression Results Per 36-Month Period

Start	End	Model	α	αS.E	α T-Stat	MKTPREM	SMB	HML	MOM	Var
Jan-07	Dec-09	CAPM	-0.427	0.5717	-0.75	-0.047				0.3268
		FF 4-Factor	-0.164	0.5475	-0.3	-0.098	-0.419	0.4281	0.0144	0.2998
Jan-10	Dec-12	CAPM	-0.219	0.3673	-0.6	-0.128				0.1349
		FF 4-Factor	-0.146	0.3505	-0.42	-0.067	-0.446	0.3097	-0.028	0.1228
Jan-13	Dec-15	CAPM	-0.797	0.3722	-2.14	0.0413				0.1385
		FF 4-Factor	-0.964	0.386	-2.5	0.0955	-0.302	0.0779	0.1116	0.149
Jan-16	Dec-18	CAPM	-0.302	0.2654	-1.14	-0.025				0.0704
		FF 4-Factor	-0.364	0.2326	-1.56	0.0599	-0.328	0.1458	-0.06	0.0541
Jan-19	Dec-21	CAPM	-0.478	0.2705	-1.77	-0.062				0.0732
		FF 4-Factor	-0.33	0.2652	-1.24	-0.12	-0.107	0.057	-0.127	0.0703
		Average CAPM	-0.163		-0.946	-0.015				0.7439
		Average FF 4-Factor	-0.094		-0.561	-0.004	-0.098	0.0665	0.0017	0.6961

The results of my study show that there is a consistent underperformance of ESG-alpha relative to comparable companies from 2007-2021. Thus, across both short and long term investments, there is little pecuniary justification for investors to choose ESG rated over other stocks. If the goal (or duty) of a fund is to seek the highest possible returns for a given amount of risk, then funds should lean away from ESG screens in choosing their investments. And if investors are seeking the highest possible return on their capital, they should lean away from ESG funds and toward conventional funds.

Based on the results of this study and revisiting The Department of Labor's decision to adjust the definition of fiduciary duty away from the "tiebreaker" guidelines and allowing greater consideration of ESG factors by fiduciaries in making investment decisions, I would recommend a reconsideration. The empirical evidence implies that ESG acts as a negative factor in the relative returns of a portfolio, and thus should not be considered as a positive factor in the screening of investment choices. My results also imply that if two investment

opportunities are pecuniarily indistinguishable, the manager should not choose the highly rated ESG firm, to achieve maximal returns.

8: Conclusion

This paper contributes to the extensive body of literature studying the market effects caused by the rise of ESG-focused investment. Prior studies address the topic of ESG alpha using existing ESG and conventional mutual funds or using a negative screen to build an ESG portfolio. My study adds a unique perspective to the literature, as my portfolio utilizes a positive screen, meaning each included stock meets a stringent ESG threshold, and every stock in the U.S. listed public equity universe that meets the criteria is included in the portfolio.

To assess the returns of the portfolio relative to comparable companies, I applied the methodology of Hong and Kacperczyk (2009) to my ESG portfolio. Hong and Kacperczyk (2009) find the difference between the monthly returns of the sin portfolio and a comparable portfolio, and then find the alpha using the CAPM model and Fama French 4-factor model. In utilizing this methodology, I established a more precise process for building the comparable portfolio. Hong and Kacperczyk (2009) build the comparable portfolio by establishing a single comparable company for each industry. Thus, each alcohol stock is compared to the same beverage stock, and the same follows with tobacco and gaming. In building a comparable portfolio for sin stocks, they could not benchmark the sin stocks against the most similar company in their industry, as that stock would also be included in the sin portfolio. Thus, the comparable portfolio, while providing a general control for industry movements, is not an exact representation of the portfolio if it was sin-free.

Because my ESG portfolio is screened based on ESG ratings rather than industry, the comparable portfolio represents a much closer match by industry than Hong and Kacperczyk (2009) are able to achieve. Each comparable stock operates within the same industry (either matched on 3 or 4 digit SIC code) as the relative ESG stock and has the most similar market capitalization of the companies within that industry. Using a comparable portfolio that exactly replicates the industries represented in the ESG portfolio allows the model to account for industry effects and isolate the impact of a high ESG-rating on the portfolio's alpha.

The results of this paper support the theory that the rise of ESG investors has led to a shift in the risk-reward dynamic of ESG stocks. According to my empirical results, the trend of ESG investment has driven the underperformance of ESG-stocks from 2006-2021. ESG stocks plot below the security market line, suggesting that the expected return of these stocks is not enough to compensate for their systematic risk. Therefore, the results imply that highly rated ESG stocks are overvalued.

If ESG investors, realizing the negative financial implications of their investment choices, decided to transition away from ESG stocks toward neutral investments, then the negative alpha of the ESG portfolio would be arbitraged away. Unless ESG inherently lowers the intrinsic value of the firm, the negative alpha should fully disappear if ESG investors become neutral investors. Thus, the ongoing underperformance of ESG would be a function of the continued public perception that ESG investing is both socially and financially beneficial.

There are many avenues for further study in the area of ESG investment. One specific point that would add to the robustness of this study is using alternative ESG rating systems. This study could be repeated using a similar ESG rating system such as Morningstar

Sustainalytics, MSCI, or Bloomberg ESG ratings. If these rating systems use different criteria when rating stocks, then the alpha generated by the ESG portfolio would change. However, one may want to find alternatives to off-the-shelf ESG ratings altogether. While ESG ratings are useful in research in terms of accessibility, many studies have critiqued their validity. The MIT Sloan Sustainability Initiative found that the correlation among prominent agencies' ESG ratings was on average .54. This is quite weak when comparing the number to the correlation of Moody's and Standard & Poor's credit ratings, which is .92. The lack of agreement between ratings that, in name, measure the same factors, is concerning. Clearly ESG ratings are quite noisy and are difficult to quantify. Thus, an avenue for further study could include building a more stringent screening process for allowing stocks into the ESG portfolio (for example, carbon emissions, percentage of women on the board, CEO pay relative to lowest paid employee, etc.)

I believe that creating screening criteria from scratch would significantly change the results of the study. Having more rigorous screening would differentiate "greenwashed" firms from truly ESG-friendly firms. Raghunandan and Rajgopal (2022) find that self-labeled ESG mutual funds hold portfolio firms with higher average ESG scores than conventional funds. On the other hand, these same ESG funds hold portfolio firms with worse compliance records and carbon emissions levels than conventional funds. This study exemplifies the reality that ESG ratings may be a measure of factors (such as ESG-forward language in annual reports) rather than actual ESG performance. Thus, a more careful ESG screen would differentiate between the price effects of true ESG-performance versus ESG-perception.

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10: Appendix

Table A1: ESG Portfolio Industry Representation

This table reports the industries represented by the companies in the ESG portfolio. The industry names are attached to the specific SIC code of the company. The frequency represents the number of companies in the ESG portfolio that are classified within that industry. For example, 25 companies classified as Real Estate Investment Trusts are in the portfolio at least 1 time from 2006-2021.

Industry Representation	
Industries Represented	Frequency
Accident and Health Insurance	1
Advertising Agencies	2
Air-Conditioning and Warm Air Heating..	2
Aircraft	1
Aircraft Engines and Engine Parts	2
Aircraft Parts and Auxiliary Equipmen..	1

Aluminum Rolling and Drawing, not els..	1
Amusement and Recreation Services, No..	1
Apparel and Other Finished Products M..	1
Asbestos Products	1
Biological Products, Except Diagnosti..	4
Bituminous Coal and Lignite Surface M..	1
Blankbooks, Looseleaf Binders and Dev..	1
Bottled and Canned Soft Drinks and Ca..	3
Chemicals and Chemical Preparations, ..	1
Chocolate and Cocoa Products	1
Cigarettes	2
Colleges, Universities, and Professio..	1
Commercial Economic, Sociological, an..	1
Commercial Physical and Biological Re..	1
Computer And Office Equipment	1
Computer Communications Equipment	2
Computer Integrated Systems Design	4
Computer Peripheral Equipment, not el..	2
Computer Processing and Data Preparat..	4
Computer Programming Services	1
Computer Programming, Data Processing..	1
Computers and Computer Peripheral Equ..	2
Converted Paper And Paperboard Produc..	2
Copper Ores	1
Credit Reporting Services	1
Crude Petroleum and Natural Gas	1
Department Stores	1
Drug Stores and Proprietary Stores	2
Dry, Condensed, and Evaporated Dairy ..	1
Eating Places	5
Electric Housewares and Fans	1
Electric Services	10
Electric and Other Services Combined	5
Electrical Apparatus and Equipment Wi..	1
Electrical Machinery, Equipment, and ..	1
Electrical Work	1
Engineering Services	2
Equipment Rental and Leasing, not els..	1
Family Clothing Stores	2
Fire, Marine, and Casualty Insurance	2
Food Preparations, not elsewhere clas..	4
Games, Toys, and Children's Vehicles,..	1
Gold Ores	2
Grain Mill Products	2
Groceries, General Line	1
Guided Missiles and Space Vehicles	1
Hardware, not elsewhere classified	1
Heating Equipment, Except Electric An..	1
Help Supply Services	3
Hospital and Medical Service Plans	2

Hotels and Motels	5
Household Appliances	1
In Vitro and In Vivo Diagnostic Subst..	1
Industrial Inorganic Chemicals	2
Industrial Instruments for Measuremen..	2
Industrial Machinery and Equipment	1
Industrial Organic Chemicals, not els..	3
Industrial Sand	1
Instruments for Measuring and Testing..	1
Internal Combustion Engines, not else..	1
Investment Advice	3
Laboratory Analytical Instruments	5
Life Insurance	2
Local Trucking Without Storage	1
Lumber and Other Building Materials D..	1
Management Consulting Services	4
Medical Laboratories	1
Men's And Boys' Furnishings, Work Clo..	1
Men's and Boys' Separate Trousers and..	1
Men's and Boys' Shirts, Except Work S..	1
Miscellaneous home furnishings Stores	1
National Commercial Banks	6
Natural Gas Distribution	2
Natural Gas Transmission	2
Nondurable Goods, not elsewhere class..	1
Office Furniture, except Wood	1
Offices of Holding Companies, Not Els..	2
Oil and Gas Field Machinery and Equip..	1
Oil and Gas Field Services, not elsew..	3
Orthopedic, Prosthetic, and Surgical ..	1
Paints, Varnishes, Lacquers, Enamels,..	2
Paper Mills	1
Perfumes, Cosmetics, and Other Toilet..	2
Personal Credit Institutions	1
Pesticides and Agricultural Chemicals..	1
Petroleum Refining	2
Pharmaceutical Preparations	6
Phosphatic Fertilizers	1
Plastics Materials, Synthetic Resins,..	3
Plastics Products, not elsewhere clas..	1
Prepackaged Software	8
Primary Production of Aluminum	1
Printed Circuit Boards	1
Public Building and Related Furniture	1
Pumps and Pumping Equipment	3
Radio and Television Broadcasting and..	3
Radio, Television, and Consumer Elect..	1
Radiotelephone Communications	1
Railroads, Line-Haul Operating	1
Real Estate Agents and Managers	3

Real Estate Investment Trusts	25
Refuse Systems	2
Rubber and Plastics Footwear	1
Search, Detection, Navigation, Guidan..	1
Security Brokers, Dealers, and Flotat..	1
Security and Commodity Exchanges	1
Semiconductors and Related Devices	8
Special Industry Machinery, not elsew..	1
Specialty Cleaning, Polishing, and Sa..	1
Sporting Goods Stores and Bicycle Shops	1
State Commercial Banks	2
Steam, Gas, and Hydraulic Turbines, a..	1
Steel Works, Blast Furnaces (Includin..	1
Surgical and Medical Instruments and ..	6
Surgical, Medical, And Dental Instrum..	1
Transportation Equipment, not elsewhe..	1
Travel Agencies	1
Variety Stores	1
Water Supply	2
Water Transportation	1
Wood Office Furniture	1
X-Ray Apparatus and Tubes and Related..	1

Table A2: EXESG 36-Month Period Regression Results

This table summarizes the results of the *EXESG* regressions (both CAPM and Fama French 4-Factor), with each 36-month period run as a separate regression. The bottom of the table shows the average of the 5 separate periods.

EXESG Regression Results Per 36-Month Period

Start	End	Model	α	αS.E	α T-Stat	MKTPREM	SMB	HML	MOM	Var
Jan-07	Dec-09	CAPM	0.7985	0.35637	2.24	1.19154				0.127
		FF 4-Factor	0.7329	0.37063	1.98	1.16912	-0.1645	-0.06	-0.0812	0.13737
Jan-10	Dec-12	CAPM	-0.0674	0.32881	-0.2	1.02041				0.10812
		FF 4-Factor	-0.0009	0.33555	0	0.93066	0.21999	0.22107	-0.009	0.11259
Jan-13	Dec-15	CAPM	-0.1998	0.2101	-0.95	1.01971				0.04414
		FF 4-Factor	-0.2266	0.23137	-0.98	1.02246	0.01414	-0.0281	0.02332	0.05353
Jan-16	Dec-18	CAPM	0.0899	0.1673	0.54	1.01553				0.02799
		FF 4-Factor	0.0689	0.15417	0.45	1.00687	-0.0668	-0.0485	-0.1855	0.02377
Jan-19	Dec-21	CAPM	-0.3767	0.37724	-1	1.21176				0.14231
		FF 4-Factor	0.0855	0.21155	0.4	1.05539	0.14112	0.31889	-0.119	0.04475
		Average CAPM	0.04889		0.36456	1.09179				0.44955
		Average FF 4-Factor	0.13196		1.08172	1.0369	0.02878	0.08067	-0.0743	0.37202

Table A3: EXCOMP Yearly Regression Results (Fama French 4-Factor)

This table reports the results of the *EXCOMP* regression using the 4-Factor model. The portfolio alpha is the primary result of interest. The alpha is representative of the portfolio over the entire period, while the betas are representative of each year. These results are achieved by using dummy variables which indicate 1 for the given year and 0 for every other year, then multiplying the MKTRF value by each dummy.

	EXCOMP FF 4-Factor				
Variable	Coefficient	T-Stat	Variable	Coefficient	T-Stat
MKTRF06	0.2601654	0.48	HML06	0.57885	1.04
MKTRF07	0.2841725	0.96	HML07	-0.2795	-0.4
MKTRF08	-0.2994808	-1.86	HML08	0.20749	0.59
MKTRF09	-0.0706689	-0.3	HML09	0.45288	1.81
MKTRF10	-0.168701	-0.93	HML10	0.39574	1.28
MKTRF11	-0.0417225	-0.15	HML11	-0.3717	-0.67
MKTRF12	0.0527832	0.14	HML12	0.51044	1.05
MKTRF13	0.1791958	0.55	HML13	-0.3148	-0.33
MKTRF14	0.0358724	0.11	HML14	0.20843	0.43
MKTRF15	0.1556099	0.6	HML15	0.41692	0.68
MKTRF16	-0.2490344	-0.67	HML16	0.09702	0.35
MKTRF17	0.3528539	0.83	HML17	0.05886	0.13
MKTRF18	0.1308973	0.7	HML18	0.05795	0.1
MKTRF19	0.1705904	0.46	HML19	0.15342	0.34
MKTRF20	-0.1780531	-1.47	HML20	-0.0902	-0.48
MKTRF21	0.0420795	0.17	HML21	0.23367	1.19
SMB06	-1.759444	-3.31	MOM06	0.47672	0.94
SMB07	-1.025489	-1.56	MOM07	-0.4682	-1.33
SMB08	0.1207892	0.3	MOM08	-0.0767	-0.35
SMB09	-0.4087729	-1.52	MOM09	0.01659	0.18
SMB10	-0.5042314	-1.2	MOM10	0.13642	0.42
SMB11	-0.057804	-0.09	MOM11	0.04827	0.11
SMB12	-0.8706721	-1.04	MOM12	-0.0766	-0.18
SMB13	-1.068307	-1.87	MOM13	-0.0378	-0.05
SMB14	-0.3883434	-1.22	MOM14	0.76572	1.24
SMB15	-0.1378754	-0.44	MOM15	0.14801	0.56
SMB16	-0.0690327	-0.16	MOM16	-0.1355	-0.42
SMB17	-0.0070487	-0.01	MOM17	0.22198	0.49
SMB18	-0.4123604	-1.33	MOM18	-0.2412	-0.61
SMB19	-0.1656034	-0.29	MOM19	0.09924	0.2
SMB20	-0.1404333	-0.32	MOM20	-0.2819	-0.97
SMB21	-0.0932309	-0.31	MOM21	0.02564	0.1
			α	-0.5515	-2

Table A4: EXCOMP Yearly Regression Results (CAPM)

This table reports the results of the *EXCOMP* regression using the 4-Factor model. The portfolio alpha is the primary result of interest. The alpha is representative of the portfolio over the entire period, while the betas are representative of each year. These results are achieved by using dummy variables which indicate 1 for the given year and 0 for every other year, then multiplying the MKTRF, SMB, HML, and MOM values by each dummy.

EXCOMP CAPM		
Variable	Coefficient	T-Stat
MKTRF06	-1.194122	-2.98
MKTRF07	0.1875291	0.63
MKTRF08	-0.228837	-2.03
MKTRF09	0.126756	1.05
MKTRF10	-0.1995138	-1.43
MKTRF11	-0.1071572	-0.63
MKTRF12	0.1046263	0.43
MKTRF13	-0.0547266	-0.24
MKTRF14	-0.0158009	-0.05
MKTRF15	0.0607714	0.29
MKTRF16	-0.189957	-0.8
MKTRF17	0.2883705	0.69
MKTRF18	0.0228792	0.13
MKTRF19	0.060922	0.34
MKTRF20	-0.1236171	-1.24
MKTRF21	0.049218	0.21
α	-0.4314463	-1.98

Table A5: EXESG Yearly Regression Results (Fama French 4-Factor)

This table reports the results of the *EXESG* regression using the 4-Factor model. The portfolio alpha is the primary result of interest. The alpha is representative of the portfolio over the entire period, while the betas are representative of each year. These results are achieved by using dummy variables which indicate 1 for the given year and 0 for every other year, then multiplying the MKTRF, SMB, HML, and MOM values by each dummy.

EXESG FF 4-Factor					
Variable	Coefficient	T-Stat	Variable	Coefficient	T-Stat
MKTRF06	1.173781	3.99	HML06	-0.7047	-2.3
MKTRF07	1.205564	7.42	HML07	-0.1912	-0.5
MKTRF08	0.9186207	10.44	HML08	-0.4294	-2.22
MKTRF09	1.455578	11.11	HML09	-0.2398	-1.75
MKTRF10	0.781413	7.9	HML10	0.34827	2.05
MKTRF11	0.9979556	6.52	HML11	-0.155	-0.51
MKTRF12	0.8327553	4.06	HML12	0.2353	0.89
MKTRF13	1.151988	6.44	HML13	-0.6312	-1.22
MKTRF14	1.253983	7.31	HML14	0.00467	0.02
MKTRF15	0.8809699	6.22	HML15	-0.1665	-0.49
MKTRF16	1.166339	5.76	HML16	-0.0641	-0.42
MKTRF17	1.111927	4.76	HML17	-0.0291	-0.12
MKTRF18	0.996224	9.68	HML18	-0.0374	-0.12
MKTRF19	1.084725	5.32	HML19	0.19446	0.78
MKTRF20	1.063739	15.97	HML20	0.32484	3.14
MKTRF21	1.047938	7.61	HML21	0.31941	2.96
SMB06	-0.7923452	-2.72	MOM06	-0.0804	-0.29
SMB07	-0.1822987	-0.51	MOM07	0.02727	0.14
SMB08	0.4110938	1.87	MOM08	-0.1049	-0.88
SMB09	-0.2948238	-2	MOM09	-0.0986	-1.96
SMB10	-0.2533507	-1.1	MOM10	0.58592	3.28
SMB11	0.6058984	1.69	MOM11	-0.3626	-1.5
SMB12	0.179156	0.39	MOM12	-0.1922	-0.8
SMB13	0.0710998	0.23	MOM13	-0.7123	-1.72
SMB14	-0.0700022	-0.4	MOM14	-0.0595	-0.18
SMB15	0.1173351	0.68	MOM15	-0.0146	-0.1
SMB16	-0.3360295	-1.38	MOM16	-0.1569	-0.89
SMB17	-0.0001618	0	MOM17	-0.0002	0
SMB18	0.0910427	0.54	MOM18	-0.3516	-1.61
SMB19	0.1740159	0.57	MOM19	0.06458	0.24
SMB20	0.2133618	0.89	MOM20	-0.1519	-0.95
SMB21	0.1032283	0.63	MOM21	-0.2739	-1.9
			α	0.01249	0.08

Table A6: EXESG Yearly Regression Results (CAPM)

This table reports the results of the *EXESG* regression using the 4-Factor model. The portfolio alpha is the primary result of interest. The alpha is representative of the portfolio over the entire period, while the betas are representative of each year. These results are achieved by using dummy variables which indicate 1 for the given year and 0 for every other year, then multiplying the MKTRF value by each dummy.

EXESG CAPM		
Variable	Coefficient	T-Stat
MKTRF06	0.5972836	2.3
MKTRF07	1.197976	6.24
MKTRF08	1.005306	13.71
MKTRF09	1.38319	17.57
MKTRF10	0.920226	10.14
MKTRF11	1.164942	10.56
MKTRF12	1.015506	6.46
MKTRF13	0.9835187	6.65
MKTRF14	1.227775	6.27
MKTRF15	0.9010309	6.56
MKTRF16	1.068983	6.92
MKTRF17	1.130844	4.18
MKTRF18	0.9749161	8.39
MKTRF19	1.081157	9.22
MKTRF20	1.244039	19.24
MKTRF21	1.062859	6.88
α	-0.016642	-0.12