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"Honey, I Shrunk the ESG Alpha": Risk-Adjusting ESG Portfolio Returns

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Summary

In this paper, we show that there is no solid evidence supporting recent claims that ESG strategies generate outperformance. We construct ESG strategies that have been shown to outperform in popular papers. We assess performance benefits to investors when accounting for sector and factor exposures, downside risk, and attention shifts.

Simple returns of ESG strategies look attractive, with annualised returns of up to almost 3% per year. But when accounting for exposure to standard factors, none of the twelve different strategies we construct to tilt to ESG leaders adds significant outperformance, whether in the US or in developed markets outside the US. 75% of outperformance is due to quality factors that are mechanically constructed from balance sheet information.

ESG strategies do not offer significant downside risk protection either. Accounting for exposure of the strategies to a downside risk factor does not alter the conclusion that there is no value-added beyond implicit exposure to standard factors such as quality.

Recent strong performance of ESG strategies can be linked to an increase in investor attention. Flows into sustainable mutual funds show that attention to ESG has risen remarkably over the later period of our sample, from about 2013. We find that alpha estimated during low attention periods is up to four times lower than alpha during high attention periods. Therefore, studies that focus on the recent period tend to overestimate ESG returns.

We conclude that claims of positive alpha in popular industry publications are not valid because the analysis underlying these claims is flawed. Omitting necessary risk adjustments and selecting a recent period with upward attention shifts enables the documenting of outperformance where in reality there is none.

Our findings do not question that ESG strategies can offer substantial value to investors. Instead, they suggest that investors who look for value-added through outperformance are looking in the wrong place. It might be time to consider ESG strategies for the unique benefits that they can provide, such as hedging climate or litigation risk, aligning investments with norms, and making a positive impact for society. Investors would benefit from further research on these important questions.

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Introduction

Introduction

Investors are increasingly concerned with integrating environmental, social and governance (ESG) criteria when constructing their equity portfolios. There are four important motivations for doing so:
i) aligning portfolios with investors' values and norms;
ii) making a social impact by pushing companies to act responsibly;
iii) reducing exposure to risks faced by ESG laggards, such as climate or litigation risk; and
iv) generating performance by favouring ESG leaders.

Our objective is to assess whether there is support in the data for the fourth motivation. ESG is often perceived as a source of outperformance and ESG providers are fond of endorsing this perception. In particular, numerous studies have looked at ESG strategies and concluded that they do generate outperformance.

Exhibit 1 provides an overview of popular papers that analyse different types of ESG strategies. A first set of papers analyses the performance of portfolios that sort stocks on their aggregate ESG scores or on sub-components, such as environmental scores. Giese, Nagy and Lee (2020) conclude that favouring ESG leaders generates positive alpha. Likewise, Giese, Lee, Melas, Nagy and Nishikawa (2019) conclude that there is a visible performance advantage of ESG leaders. A second type of ESG strategy is ESG Momentum, which favours stocks with increasing ESG scores. Such strategies generate positive alpha, according to Nagy, Kassam and Lee (2016) and Giese and Nagy (2018). A third type of strategy combines the previous two. For example, Verheyden, Eccles and Feiner (2016) consider a strategy that favours ESG leaders that also have high Momentum. They conclude that such a strategy delivers positive alpha.

Exhibit 1: Overview of Papers that Conclude on Positive Alpha from ESG Strategies

Type of ESG Strategy	Papers	Results	Stock Universe
ESG Overall and Component Alpha	Deconstructing ESG Ratings Performance (Giese, Nagy and Lee, 2020)	Long/short portfolios from sorting on ESG, E, S, G (and other more specific key issue scores) come with **positive active return** and positive alpha.	MSCI AC World Index IMI (2013-2019).
	Foundations of ESG Investing: How ESG Affects Equity Valuation, Risk, and Performance (Giese, Lee, Melas, Nagy and Nishikawa, 2019)	"the **performance advantage** of higher ESG-rated companies is visible across the entire universe"	Several MSCI universes including Europe and US
ESG Momentum Alpha	Can ESG add alpha? An analysis of ESG Tilt and Momentum Strategies (Nagy, Kassam and Lee 2016)	ESG momentum strategies generate **positive alpha**.	MSCI World Index (2008-2015)
	How Markets Price ESG: Have Changes in ESG Scores Affected Stock Prices? (Giese and Nagy, 2018)	A long/short ESG momentum strategy shows a **positive alpha**.	MSCI World Index (2009-2018), MSCI Emerging market index (2013-2018).
ESG Combined Alpha	ESG for All? The Impact of ESG Screening on Return, Risk and Diversification (Verheyden, Eccles and Feiner, 2016)	Excluding stocks with lowest ESG scores leads to **improved returns**, lower volatility, and lower tail risk.	Large and Mid Cap Global and Developed (2010-2015).

Introduction

Asset managers readily adopt the idea of a positive ESG alpha. For example, Dutch asset manager NN Investment Partners "a*re convinced that responsible investing enhances risk-adjusted returns and believe that companies with sustainable business practices and high standards of corporate governance will become the success stories of the future.*"[1] Global asset management firm State Street affirms that their "*Active Quantitative Equity group views ESG as a source of alpha that could lead to positive portfolio performance over time. […] . This premise rests on the thesis that value creation (or destruction) is influenced by more than financial capital alone, especially longer term.*" [2]

Investors need to ask whether the promise of generating outperformance from ESG leaders is credible. Claims of outperformance may be based on simple returns from ESG strategies, or on returns after adjusting for market exposure alone. However, such a simplistic view of performance is insufficient. Even if ESG strategies have higher returns, investors do not gain if these returns are due to sector biases or exposure to standard factors. The relevant question to ask for investors is whether non-financial information in ESG scores offers *additional* performance benefits. Our empirical analysis addresses this question. We construct ESG strategies used in popular industry papers and assess their value-added to investors when accounting for sector and factor exposures, downside risk, and attention shifts.

In particular, we ask whether ESG strategies offer value-added over sector exposures and exposures to standard factors and draw on standard performance evaluation methods to account for exposures to equity styles such as value and quality. Using a tractable measure of downside risk, we also assess whether ESG strategies offer downside protection and if they produce higher risk-adjusted returns when accounting for their downside risk exposure. Finally, we account for the shift in investor preferences towards ESG by considering fund flows, a well-established measure of investor attention. We ask whether an upward shift may generate inflated ESG returns over the recent period when compared with the long-term returns that investors can expect from ESG strategies.

Our findings show that ESG strategies do not generate positive alpha.

- First, claims of outperformance only hold when considering standalone returns and ignoring estimation risk. By contrast, there is no outperformance of the ESG strategies when applying standard risk adjustments. This finding shows that ESG ratings do not add value over information contained in sector classifications and factor attributes. Despite relying on analysis of non-financial information by hundreds of ESG analysts, ESG strategies perform like simple quality strategies mechanically constructed from accounting ratios[3]. The lack of alpha means that investors would incur performance losses if they wrongly assumed that ESG is a separate rewarded factor[4].
- Second, ESG strategies do not offer downside risk protection. Therefore, accounting for downside risk exposure does not change our conclusion that there is no positive alpha.
- Third, our findings suggest that rising attention to ESG has inflated returns over part of our sample period. When investor attention to ESG does not rise, ESG performance is even weaker than over the entire sample. Investors can easily overestimate long-term ESG returns when considering short time periods with rising attention to ESG.

1 - NN IP (2020).
2 - State Street (2018).
3 - The provider of the ESG data used in our study reports, MSCI, reports employing 250 analysts as of 2019 to come up with the ESG ratings data. See Beerens (2019).
4 - See Amenc, Esakia and Goltz (2021) for a detailed discussion. Also see the supplement material to this paper.

Introduction

Our findings contradict common claims in the industry that ESG is a source of outperformance. They do not question that ESG strategies can offer substantial value to investors. But investors who look for value-added through outperformance are looking in the wrong place. It might be time to consider ESG strategies for the unique benefits that they can provide, such as hedging climate or litigation risk, aligning investments with norms, and making a positive impact for society.

1. Constructing ESG Strategies

1. Constructing ESG Strategies

We use monthly ESG ratings data from MSCI (also known as IVA for 'Intangible Value Assessment') from January 2007 to June 2020. ESG ratings range from 0.0 to 10.0 with a high score indicating strong performance on ESG issues. We use the component scores for the environmental (E), social (S), and governance (G) components of the overall rating. To come up with these scores, the data provider assesses firms on a set of issues for each component, the set of issues and their weighting differs across industries. For example, as of January 2020, the main issue for the social rating of automobile manufacturers is product safety and the main issue for household appliances producers is supply chain labour standards. We use the scores, as published by MSCI, to design strategies that focus on one component. In addition, we use aggregate ESG scores. We construct the aggregate ESG score of a firm as the weighted average of the component scores[5]. We use the weight of each component, as provided by MSCI. These weights depend on the industry a stock belongs to. For example, as of January 2020, the weight assigned to the environmental component in the overall ESG score is 68% for Commodity Chemicals but only 9% for Banks.

ESG scores are necessary to select stocks for the strategies we test. We apply these scores to stocks in a typical US equity index universe, made up of large and mid-cap stocks. We also test the strategies in a Developed Markets universe excluding the US. We obtain returns in USD for stocks in the Scientific Beta US index universe and the Scientific Beta Developed ex US universes[6]. Stocks with missing ESG data are excluded at each rebalancing date. There is no back-filling or forward-filling.

We construct long/short strategies that capture performance differences between ESG leaders and ESG laggards as follows: at each monthly rebalancing date, we select 30% of the stocks with the highest ESG scores in the long leg, and 30% of stocks with the lowest score in the short leg. The rebalancing date is the third Friday of the calendar month. Stocks within the long and the short leg are equally weighted. We then evaluate strategy returns from 1 January 2008 to 39 June 30 2020.

We construct three types of strategies, following the popular industry papers cited in the introduction.

- Overall ESG score and component scores (E, S and G):
  - We select stocks based on their overall ESG score, or the score for one of the three components, following Giese, Nagy and Lee (2020). This leads to four different strategies.
- ESG Momentum score:
  - We select stocks based on their ESG Momentum, defined as the change of their ESG score over 12-months, see Giese and Nagy (2018). We exclude stocks with missing and zero ESG Momentum scores[7].
- Combined score (ESG and ESG Momentum):
  - We select 30% of stocks in the long leg by selecting 40% of stocks with the highest ESG score and then excluding 10% of stocks with the lowest ESG Momentum. Similarly, the short leg selects 40% of stocks with the lowest ESG score and then excludes 10% of stocks with the highest ESG Momentum. This sequential combination is based on Verheyden, Eccles and Feiner (2016).

5 - The MSCI data we use does not contain the simple aggregation of E, S and G components but it does contain the weights for each component in each industry. We use this information to derive the overall ESG score. MSCI also publishes an overall ESG score which is not the weighted average of components, but instead removes cross-industry effects by normalising scores based on their GICS industry classification (69 industries). Instead of using these scores, we rely on the overall ESG scores computed as the weighted average individual component score (E, S, and G scores). We test the use of overall ESG and individual component scores (E,S and G) in both standard and sector neutral strategies, where we neutralise sector effects based on the TRBC sector classification.
6 - The Scientific Beta stock universes are similar to those of other equity indices covering large and mid-cap stocks. Over the sample period (1/01/2008 - 30/06/2020) the correlation of daily returns (in dollars) over time of the Scientific Beta US Cap-weighted index with the MSCI USA Index is 0.99, and the correlation of daily returns (in dollars) over time of the Scientific Beta Developed ex-US Index with the MSCI World ex-USA is 0.99.
7 - An ESG Momentum score is missing if the current or last year's ESG score is missing.

2. Factor Exposures and Sector Biases

2. Factor Exposures and Sector Biases

2.1. Simple Performance

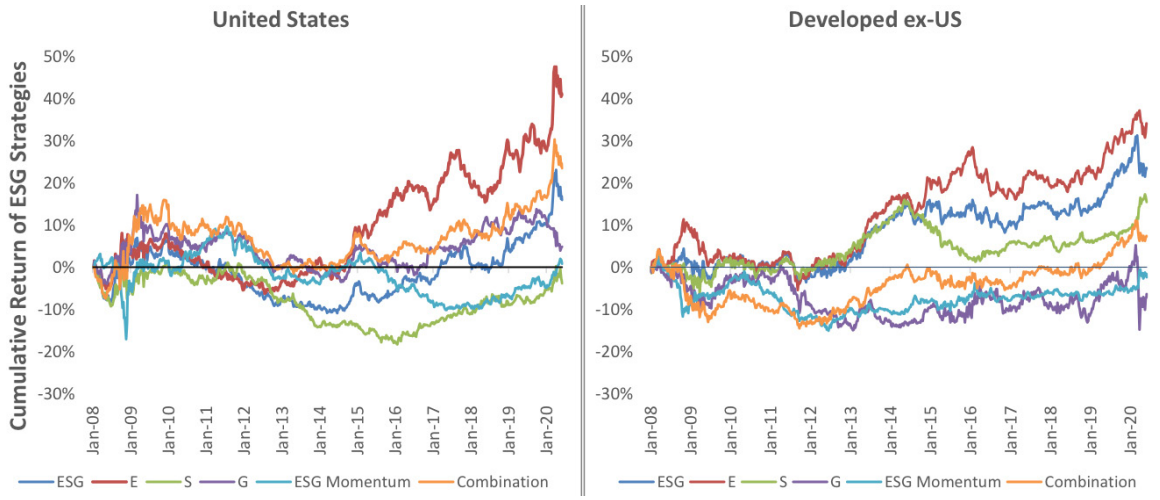
Exhibit 2 shows basic risk and return metrics over our sample period from January 2008 to June 2020. Clearly, the simple performance of ESG strategies looks attractive. In line with the original papers, some ESG strategies have positive returns, that can be economically large – with up to almost 3% per year – albeit statistically insignificant.

Exhibit 2: Basic Risk and Return Statistics for ESG Strategies

Jan 2008 - Jun 2020	ESG	E	S	G	ESG Momentum	Combination
Scientific Beta US Universe						
Ann. Return	1.29%	2.89%	-0.23%	0.45%	0.15%	1.92%
t-statistic	0.85	1.71	-0.05	0.40	0.19	1.23
Ann. Volatility	6.13%	6.29%	5.47%	5.17%	5.35%	5.92%
Sharpe Ratio	0.21	0.46	-0.04	0.09	0.03	0.32
Max Drawdown	17.29%	13.64%	20.07%	18.04%	19.71%	14.91%
Scientific Beta Developed ex-US Universe						
Ann. Return	1.63%	2.43%	1.07%	-0.85%	-0.26%	0.48%
t-statistic	0.90	1.59	0.70	-0.05	-0.11	0.36
Ann. Volatility	7.43%	5.71%	6.36%	11.60%	4.81%	7.01%
Sharpe Ratio	0.22	0.43	0.17	-0.07	-0.05	0.07
Max Drawdown	11.19%	16.26%	13.04%	19.52%	17.96%	18.40%

The analysis is based on the Scientific Beta United States universe in the upper panel and on Scientific Beta Developed ex-US in the lower panel. The analysis was done using daily data. t-statistics with an absolute value greater than two indicate statistical significance at conventional levels. The sample period ranges from 1/01/2008 to 30/06/2020.

Exhibit 3: Cumulative Returns of ESG Strategies



The plots show the time series of cumulative returns of the strategies, calculated from daily returns for the entire sample period. The sample period ranges from 1/01/2008 to 30/06/2020. The strategies refer to the Scientific Beta US universe and Scientific Beta Developed ex-US universe.

It is useful to assess how returns evolved over our sample period. Exhibit 3 plots the time series of cumulative returns. The plot on the left-hand side shows US returns, and the plot on the right-hand side shows developed markets outside the US. Cumulative returns for the best performing strategies

2. Factor Exposures and Sector Biases

are substantial: above 30% in both universes. Returns of most strategies are particularly strong in the second half of the sample. This pattern implies that omitting the earlier period would lead to higher estimates of average returns. Indeed, using the period from 2013 as in Giese, Nagy, and Lee (2020) increases ESG returns by more than 1% per year[8].

While such return plots are commonly shown in communications of asset managers to their clients – and in papers on ESG investing – they do not allow for sensible conclusions on the investment merits of a strategy. Instead, investors need to consider risk-adjusted returns.

2.2. Adjusting for Factor Exposures

Simple returns (or volatility-adjusted returns such as the Sharpe Ratio) are not relevant for investors because they ignore interaction of the strategy with other components of the investor's portfolio. Except for the degenerate case where an investor considers holding 100% of their portfolio in a candidate strategy, we need to account for their other investment options. In particular, we need to account for overlap with standard factors. Factors such as value, size, momentum, low risk, investment and profitability have been documented as sources of long-term returns. Investors who have access to such factors only care about a strategy's value-added beyond compensation for its factor exposures.

Value-added needs to be measured as alpha from a multi-factor spanning regression (Fama 1998). Only ESG strategies with significant alpha increase the Sharpe ratio of the total portfolio of investors who have access to standard factors. Gibbons, Ross, Shanken (1989) show that the difference in squared Sharpe ratio between the total portfolio that includes a candidate strategy and the squared Sharpe ratio of the portfolio without this strategy is a function of the multi-factor alpha. Taking the ESG strategy as the candidate strategy, we can write:

$$\left(\frac{\alpha_{ESG}^2}{\sigma_\varepsilon^2}\right) = SR^2(ESG\ and\ Factors) - SR^2(Factors\ without\ ESG)$$

Where SR denotes the Sharpe ratio, α_{ESG} is the intercept from a time series regression for strategy returns onto the returns of standard factors, and σ_ε iis the idiosyncratic volatility of the ESG strategy, i.e. the variation of returns that is not explained by the standard factors. The equation shows that an ESG strategy with a multi-factor alpha of zero does not support increasing the Sharpe ratio for the investor, relative to the case where he ignores the ESG strategy[9].

To measure the level of returns of ESG strategies that does not come from exposure to standard factors, we employ a standard time series regression. The multi factor model includes seven factors: the market (MRK), value (HML), size (SMB), momentum (MOM), low volatility (VOL), high profitability (PRO), and low investment (INV) factors. We estimate alpha in time series regressions of weekly ESG portfolio returns (in excess of the risk-free rate) on factor returns:

$$r_{S,t} - r_{f,t} = \alpha_S + \beta_{MKT,S}\left(r_{M,t} - r_{f,t}\right) + \beta_{SMB,S}(SMB_t) + \beta_{HML,S}(HML_t) + \beta_{MOM,S}(MOM_t) + \beta_{VOL,S}(VOL_t) + \beta_{PRO,S}(PRO_t) + \beta_{INV,S}(INV_t) + \varepsilon_{S,t}$$

8 - For the period from Jan 2013 to Dec 2019, used in Giese, Nagy and Lee (2020), our strategy using the overall ESG score has an average annualised return of 2.55% (US) and 2.95% (Developed ex US). This compares to annualised returns of 1.29% (US) and 1.63% (Developed ex US) over our full period, as shown in Exhibit 2. Also see the supplement material to this paper for further details.

9 - An ESG strategy with a positive alpha will help investors improve the Sharpe ratio of their overall portfolio through a long position in this strategy. An ESG strategy with a negative alpha will also help investors improve the Sharpe ratio but through a short position, i.e., a vice investing strategy.

2. Factor Exposures and Sector Biases

Again, a positive alpha in this model implies that ESG strategies enable investors to improve their risk-adjusted returns. For comparison, we also report alpha from the CAPM which adjusts returns only for market risk, and thus ignores other risk premia available in equity markets.

Exhibit 4 shows the estimated alphas, as well as simple returns for reference. Let us first consider the estimated CAPM alphas, that only account for the market factor as a source of reward. For the strategies that use the aggregate ESG ratings, CAPM alphas are large in magnitude (2.57% for the US and 1.63% for developed markets outside the US) but at best marginally significant. The strategy using environmental ratings in the US shows a statistically significant CAPM alpha of 3.99%. Strategies using social or governance ratings have CAPM alpha estimates that are not significantly different from zero. The ESG Momentum strategy leads to CAPM alpha estimates that are close to zero (-0.14% and 0.06% per year) and far from reaching thresholds for significance. Finally, the combination strategy that selects stocks based on both their aggregate ESG rating and their ESG Momentum has results that are somewhat similar to the strategy that uses ESG ratings alone. While the CAPM alphas do not provide strong support for positive ESG performance, a casual observer might still conclude that there is some positive alpha to be found, especially when using environmental ratings.

However, the estimates of multi-factor alpha in Exhibit 4 subdue such a positive view on ESG alpha. When adding non-market factors in US data, alpha shrinks from 3.99% to 0.96% for the environmental strategy, and from 2.57% to -0.33% for the ESG strategy. In the data for developed markets outside the US, adding equity style factors to the market factor shrinks the estimate of alpha by about 30 basis points for the overall ESG strategy and the environmental ratings strategy. Importantly, across the different ways of using ESG ratings to build the strategies and across the two universes, none of the estimates of multi-factor alpha are significantly different from zero. This implies that an investor cannot improve their Sharpe ratio by using the ESG strategies we analyse here.

Exhibit 4: Estimates of Alpha of ESG Strategies from Factor Models

Jan 2008 - Jun 2020	ESG		E		S		G		ESG Momentum		Combination	
Geographic Universe	US	Dev ex-US	US	Dev ex-US	US	Dev ex-US	US	Dev ex-US	US	Dev ex-US	US	Dev ex-US
Ann. Return	1.29%	1.63%	2.89%	2.43%	-0.23%	1.07%	0.45%	-0.85%	0.15%	-0.26%	1.92%	0.48%
t-statistic	0.85	0.90	1.71	1.59	-0.05	0.70	0.40	-0.05	0.19	-0.11	1.23	0.36
CAPM Alpha	2.57%	1.63%	3.99%	2.43%	0.54%	1.08%	1.30%	-0.52%	0.06%	-0.14%	2.84%	0.53%
t-statistic	1.55	1.05	2.28	1.68	0.35	0.79	0.84	-0.23	0.04	-0.12	1.62	0.37
7 Factor Alpha	-0.33%	1.31%	0.96%	1.95%	-1.17%	1.95%	-0.22%	-1.75%	0.00%	0.86%	0.96%	0.52%
t-statistic	-0.24	0.85	0.68	1.43	-0.84	1.43	-0.16	-0.78	0.00	0.73	0.59	0.36

The analysis was done using daily data to compute annualised returns, and weekly data for CAPM and Multi-Factor analysis. The multi-factor model includes the market factor and the Scientific Beta long-short equal-weighted factors, namely the Size, Value, Momentum, Low Volatility, Profitability and Investment. t-statistics with an absolute value greater than two indicate statistical significance at conventional levels. Factors returns are computed using the stocks of the relevant geographic universe. The sample period ranges from 1/01/2008 to 30/01/2020.

2. Factor Exposures and Sector Biases

We have used the multi-factor regressions as a tool to assess the incremental value-added of ESG strategies over the implicit factor exposures. Beyond analysing value-added, it is interesting to ask which factors drive ESG performance. Exhibit 5 shows the return contributions from standard factors to ESG strategy returns. Panel A shows the return contributions from each factor. A high positive contribution results from a high positive exposure to the factor if the factor had positive returns over the sample period. For reference, Panel B also shows the factor exposures.

The results in Panel B of Exhibit 5 show that ESG strategies heavily load on some style factors. We can take the strategy using overall ESG scores as an example. This strategy has significant negative exposure to the size factor and positive exposure to the high profitability and the low investment factor across the two geographical universes. Firms that are highly profitable and invest conservatively are also known as quality firms. These factor exposures show that the overall ESG strategy behaves like a large cap quality strategy. Other factor exposures of the overall ESG strategy are either more muted or mixed across the two geographical universes. Neither the US nor the developed markets strategy load significantly on the value factor. The US strategy loads positively on the low risk factor and negatively on the momentum factor but the strategy for markets outside the US does not have significant loadings on these two factors.

The strong relation of ESG strategies with quality factors is also visible for the other strategies that use a single component of ESG ratings or combine ESG ratings and their momentum. Only the strategy that focusses on ESG Momentum clearly deviates from this pattern of positive quality exposure. Likewise, negative exposure to the size factor is common across the different types of ESG strategies. The ESG strategies clearly resemble large cap quality strategies.

The strong quality exposure aligns with evidence that firms with strong corporate financial performance are also ESG leaders, as developed in a literature following Wadock and Graves (1997).

Unsurprisingly, the ESG strategies received substantial return contributions from their exposures to standard factors. Panel A of Exhibit 5 shows how these factor exposures influenced the strategy returns over our sample. For some factors, return contributions are relatively weak despite statistically significant exposures. This is the case for the size factor. For example, despite a significantly negative loading on the size factor, the aggregate ESG strategy for the US receives a contribution of only -0.01% from the size exposure. This is due to the relatively low magnitude of the size exposure and the relatively low returns of the size factor over the sample period. Other factor exposures led to pronounced return contributions. The results show that the quality factors (high profitability and low investment) make pronounced positive return contributions to most types of ESG strategies.

2. Factor Exposures and Sector Biases

Exhibit 5: Factor Exposures of ESG Strategies and Return Contributions from Factors

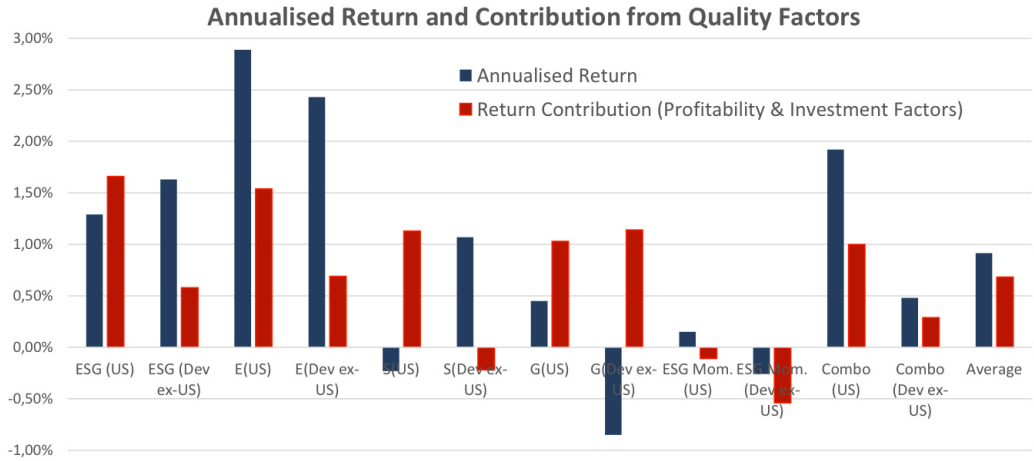
Jan 2008 - Jun 2020	ESG		E		S		G		ESG Momentum		Combination	
Panel A: Factor Return Contribution												
Universe	US	Dev ex-US	US	Dev ex-US	US	Dev ex-US	US	Dev ex-US	US	Dev ex-US	US	Dev ex-US
Market	-0.14%	0.08%	0.09%	0.06%	-0.25%	0.05%	-0.19%	0.13%	0.08%	0.00%	-0.21%	0.07%
Size	-0.01%	-0.40%	-0.01%	-0.40%	-0.01%	-0.42%	0.01%	-0.19%	0.00%	-0.17%	-0.01%	-0.23%
Value	0.07%	-0.03%	0.28%	0.01%	0.09%	0.02%	-0.23%	-0.07%	0.22%	0.07%	0.12%	0.03%
Momentum	0.14%	0.01%	0.17%	-0.01%	0.17%	-0.09%	-0.15%	0.05%	0.16%	-0.13%	0.14%	-0.13%
Low Volatility	-0.02%	0.04%	-0.01%	0.03%	0.01%	-0.02%	-0.04%	0.09%	0.01%	-0.05%	0.00%	0.03%
Profitability	1.47%	0.50%	1.42%	0.56%	0.95%	-0.28%	0.93%	1.14%	-0.12%	-0.49%	0.82%	0.24%
Investment	0.19%	0.08%	0.12%	0.13%	0.18%	0.06%	0.10%	0.00%	0.01%	-0.05%	0.18%	0.05%
Panel B: Factor Exposures (Betas)												
Universe	US	Dev ex-US	US	Dev ex-US	US	Dev ex-US	US	Dev ex-US	US	Dev ex-US	US	Dev ex-US
Market	-0.02	0.10	0.01	0.06	-0.03	0.05	-0.03	0.15	0.01	0.00	-0.03	0.08
t-statistic	-1.38	5.86	0.88	4.39	-2.36	3.65	-1.84	6.00	0.65	-0.17	-1.73	5.24
Size	-0.09	-0.14	-0.12	-0.14	-0.07	-0.15	0.11	-0.07	-0.01	-0.06	-0.10	-0.08
t-statistic	-4.40	-3.85	-5.84	-4.36	-3.18	-4.61	4.94	-1.26	-0.63	-2.09	-4.13	-2.33
Value	-0.04	0.07	-0.16	-0.02	-0.05	-0.06	0.13	0.17	-0.13	-0.18	-0.07	-0.07
t-statistic	-0.95	1.15	-3.82	-0.30	-1.21	-1.02	3.04	1.89	-2.70	-3.91	-1.44	-1.18
Momentum	-0.05	0.01	-0.06	0.00	-0.06	-0.04	0.05	0.02	-0.06	-0.06	-0.05	-0.06
t-statistic	-2.67	0.19	-3.10	-0.17	-3.20	-1.63	2.72	0.48	-2.74	-2.49	-2.34	-2.15
Low Volatility	0.06	0.02	0.04	0.02	-0.02	-0.02	0.11	0.06	-0.03	-0.03	0.01	0.02
t-statistic	2.95	0.78	2.03	0.66	-1.03	-0.60	5.60	1.39	-1.53	-1.29	0.58	0.61
Profitability	0.28	0.13	0.27	0.15	0.18	-0.07	0.18	0.30	-0.02	-0.13	0.16	0.06
t-statistic	7.43	1.78	6.98	2.24	4.68	-1.12	4.49	2.72	-0.54	-2.25	3.50	0.88
Investment	0.25	0.20	0.15	0.32	0.23	0.15	0.13	0.00	0.01	-0.11	0.22	0.13
t-statistic	6.28	4.07	3.76	7.18	5.82	3.31	3.23	-0.07	0.21	-3.01	4.84	2.84

The attributed return is the product of annualised factor return (geometric) and the corresponding factor exposure. The unexplained is computed as a difference between portfolio's excess return (over the risk-free) and the total performance explained by the factor model. Factors are computed using the stocks of the relevant universe. The factor performance contributions table refer to the breakdown of annualised return of strategies computed with weekly data. The sample period ranges 1/01/2008 to 30/01/2020. The multi-factor model includes the market factor and the Scientific Beta long-short equal-weighted factors, namely the Size, Value, Momentum, Low Volatility, Profitability and Investment. The factors are not neutralised with respect to the market factor. t-statistics with an absolute value greater than two indicate statistical significance at conventional levels.

Exhibit 6 further illustrates the importance of quality factors for the returns of ESG strategies. The bars indicate the sum of return contribution from the low investment and the high profitability factor for each of the ESG strategies. Annualised returns of the strategies are shown for comparison. It is clear from these results that returns of the ESG strategy heavily depend on quality factors. For example, the US strategy that uses aggregate ESG ratings has a contribution from quality factors of about 1.7% per year, exceeding its annualised returns of about 1.3%. Over our sample period, an investor who has simply tilted to quality factors with the same intensity as the US ESG strategy has done, would have outperformed the ESG strategy. For the strategy using overall ESG ratings outside the US, the quality factors contributed roughly to one third of its returns. The return contribution of quality factors to the other types of strategies is also substantial when compared to their annualised returns.

2. Factor Exposures and Sector Biases

Exhibit 6: Contribution from Quality Factors to Returns of ESG Strategies



Based on factor return contributions reported in Exhibit 5. The bars indicate the sum of return contribution from the low investment and the high profitability factor for each of the ESG strategies.

The rightmost bars indicate the average across all 12 ESG strategies (six ways of using ESG ratings in two geographies). On average, the ESG strategies deliver annualised returns of 0.91% per year, of which 0.68% per year are contributed by exposures to the quality factors. Thus, on average, quality factors account for 75% of ESG returns[10].

2.3. Accounting for Sector Biases and Factor Exposures

In addition to factor exposures, portfolios that favour ESG leaders may pick up industry effects. There is no good reason why firm performance on environmental, social and governance issues should be orthogonal to industries. Therefore, the strategies analysed above may be subject to important sector biases. We can easily identify sector biases in these long/short strategies. Differences in sector allocation among ESG leaders (in the long leg) and laggards (in the short leg) will show up directly as nonzero sector weights at the level of the long/short strategy.

Indeed, Exhibit 7 shows that the ESG strategies have pronounced sector biases, except in the case of the ESG Momentum strategy. Omitting Momentum, the total sector bias (defined as the sum of absolute sector weights) reaches levels ranging from 22% to 46% across the different strategies. This means that shuffling stock weights to get to a sector neutral strategy would induce a (one-way) turnover of 22% to 46%. Clearly, stock weights in the strategies are far away from sector neutrality.

10 - This result is obtained from computing the average return contribution from the two quality factors across the 12 strategies above and dividing by the average value of the annualised return across the 12 strategies.

2. Factor Exposures and Sector Biases

Exhibit 7: Sector Weights of Long/Short ESG Strategies

Average Sector Allocation Over Time (Jan 2008 - Jun 2020)	ESG		E		S		G		ESG Momentum		Combination	
Universe	US	Dev ex-US	US	Dev ex-US	US	Dev ex-US	US	Dev ex-US	US	Dev ex-US	US	Dev ex-US
Energy	-8.73%	1.60%	-13.80%	-2.73%	-0.04%	4.97%	-3.30%	1.42%	2.34%	0.23%	-5.61%	1.17%
Basic Materials	-1.67%	-2.35%	-3.80%	-7.23%	-1.11%	-1.61%	0.74%	4.16%	-0.29%	-0.29%	-1.99%	-1.70%
Industrials	5.78%	6.00%	2.27%	7.33%	-3.46%	2.49%	2.60%	-6.20%	1.38%	2.30%	7.28%	5.39%
Cyclical Consumer	-5.39%	0.96%	-0.41%	1.21%	-6.37%	-0.50%	-0.93%	-0.89%	-0.65%	-1.08%	-5.56%	0.94%
Non-Cyclical Consumer	-2.88%	-4.68%	-2.97%	-5.11%	-0.71%	-1.22%	-0.69%	2.91%	1.18%	0.32%	-1.70%	-3.66%
Financials	0.19%	-6.95%	2.91%	-5.87%	-2.62%	-7.23%	0.90%	-2.13%	-1.57%	-0.80%	-1.63%	-6.55%
Healthcare	-1.75%	-2.57%	10.11%	3.61%	-0.47%	-0.86%	-9.32%	-4.95%	-1.74%	-0.69%	-1.77%	-3.00%
Technology	12.75%	0.62%	6.33%	0.65%	12.51%	0.49%	8.29%	2.03%	-1.67%	-0.27%	9.46%	0.83%
Telecoms	-0.81%	2.63%	1.46%	6.03%	-0.87%	1.84%	-0.11%	0.11%	0.18%	1.44%	-0.84%	3.54%
Utilities	2.50%	4.74%	-2.09%	2.11%	3.14%	1.62%	1.82%	3.53%	0.85%	-1.16%	2.37%	3.04%
Total Sector Bias	**42.45%**	**33.08%**	**46.15%**	**41.90%**	**31.31%**	**22.83%**	**28.69%**	**28.33%**	**11.86%**	**8.59%**	**38.21%**	**29.81%**

We use the Thomson Reuters Sector Classification (TRBC). The table shows the average sector weight over time for each of the six ESG strategies over the sample January 2008 - June 2020 for US universe and Developed ex-US universe. Sector weights are computed for each strategy at each monthly rebalancing date and averaged over time. The total Sector Bias is the sum of the absolute values of the portfolio weights in each sector.

In the US, ESG strategies overweight technology stocks. The strategy using the overall ESG rating has a 12.75% weight in technology stocks. A strong bias towards technology stocks is also present in each of the strategies using a single ratings component.

When constructing the strategies, we can impose constraints to match sector allocations in the long and short. We create ESG strategies that remove sector biases at each monthly rebalancing date. To obtain sector neutral portfolios, we select stocks by their ESG characteristics within each of the 10 sectors, using the Thomson Reuters sector classification. We equally-weight the selected stocks within each sector, and weight each sector portfolio by the sector's weight in the cap-weighted index. Due to this procedure, the total sector bias of the ESG strategies will be zero by construction.

The performance of sector neutral ESG strategies captures their value-added more accurately, removing the confounding effects of sector allocation differences across strategies. Exhibit 8 reports the annualised returns and annualised alphas of the sector neutral strategies. The annualised returns of the corresponding strategies without sector neutrality are reported as a reference point.

2. Factor Exposures and Sector Biases

Exhibit 8: Annualised Returns and Estimated Alphas of Sector Neutral Strategies

Jan 2008 – Jun 2020	ESG		E		S		G		ESG Momentum		Combination	
Universe	US	Dev ex-US	US	Dev ex-US	US	Dev ex-US	US	Dev ex-US	US	Dev ex-US	US	Dev ex-US
Without Sector Neutrality												
Ann. Return	1.29%	1.63%	2.89%	2.43%	-0.23%	1.07%	0.45%	-0.85%	0.15%	-0.26%	1.92%	0.48%
t-statistic	0.85	0.90	1.71	1.59	-0.05	0.70	0.40	-0.05	0.19	-0.11	1.23	0.36
With Sector Neutrality												
Ann. Return	-0.58%	1.33%	0.48%	1.28%	-0.72%	0.91%	0.87%	0.36%	0.10%	-0.14%	0.74%	0.67%
t-statistic	-0.36	0.74	0.46	0.86	-0.52	0.62	0.81	0.31	0.16	-0.03	0.62	0.46
CAPM Alpha	0.25%	1.28%	1.03%	1.19%	-0.16%	0.86%	1.51%	0.55%	0.06%	0.04%	1.21%	0.69%
t-statistic	0.2	0.83	0.82	0.91	-0.14	0.67	1.29	0.26	0.05	0.03	0.91	0.49
7 Factor Alpha	-1.09%	0.79%	-0.32%	0.92%	-1.28%	1.58%	0.40%	-0.30%	0.31%	0.85%	-0.05%	0.81%
t-statistic	-0.99	0.52	-0.29	0.74	-1.19	1.23	0.35	-0.14	0.24	0.78	-0.04	0.58

The analysis was done using daily data except for CAPM and Multi-Factor analysis, which uses weekly data. The multi-factor model includes the market factor and the Scientific Beta long-short equal-weighted factors, namely the Size, Value, Momentum, Low Volatility, Profitability and Investment. t-statistics with an absolute value greater than two indicate statistical significance at conventional levels. Strategies are sector-neutralised by selecting and weighting stocks at the sector-level and then re-aggregating all sectorial portfolio to match the sector allocation of the cap-weighted index of the relevant stock universe. Factors are computed on using the stocks of the relevant stock universe. The sample period ranges 1/01/2008 to 30/01/2020

It is clear from the results in Exhibit 8 that sector neutrality weakens the performance of the ESG strategies. Returns for US strategies shrink dramatically when imposing sector neutrality. Annualised returns of the aggregate ESG ratings strategy were 1.29% per year without sector neutrality. The corresponding sector neutral strategy yielded returns of -0.58%. The strategy using the environmental ratings had annualised returns of 2.89% when accepting the implicit sector bets. With sector neutrality, returns shrink to 0.48% per year.

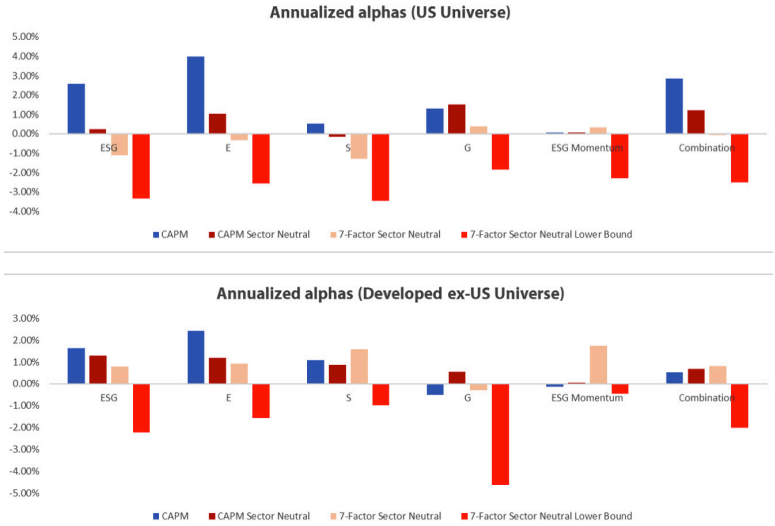
Going beyond simple returns, Exhibit 8 reports the CAPM alpha and multi-factor alpha of the sector neutral strategies. None of the sector neutral strategies shows significant alpha in any model. This finding implies that ESG ratings were not a separate source of outperformance for investors over our sample period. Instead, ESG strategies implicitly tilted to different sectors (such as technology) and equity style factors (such as quality) and these implicit tilts may have paid off over the sample period.

Exhibit 9 provides a summary of our findings. For each of the strategies we have constructed, we first plot the annualised CAPM alpha. Using this popular performance measure suggests benefits for most strategies. But measuring performance as CAPM alpha does not provide relevant conclusions. We analyse how performance metrics change when accounting for implicit biases of the ESG strategies. Exhibit 9 plots the resulting performance metrics. First, we show the CAPM alpha after removing sector effects. We then add equity style factors to the model. Finally, we account for estimation risk by plotting the lower bound of the alpha estimate at 95% confidence. If there was significant outperformance after all adjustments, these lower bounds would be positive.

A Scientific Beta Publication — "Honey, I Shrunk the ESG Alpha": Risk-Adjusting ESG Portfolio Returns — April 2021

2. Factor Exposures and Sector Biases

Exhibit 9: Shrinking ESG Alphas when Applying Subsequent Risk Adjustments

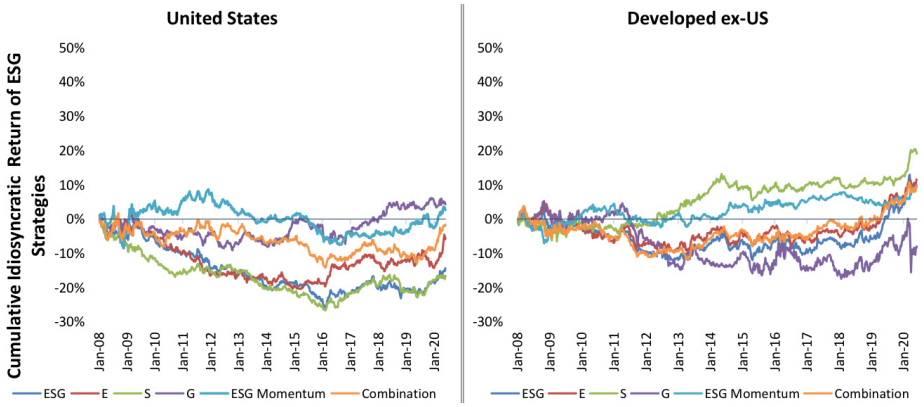


The two charts above show annualised alphas of the six ESG strategies after several factor and sector adjustments for the US universe and the Developed ex-US Universe respectively, over the period 1 Jan 2008 to 30 Jun 2020, computed using weekly data. The bar chart shows the annualised CAPM alpha of the six ESG strategies, the annualised CAPM alpha of the six ESG strategies in the sector-neutral version, the 7-Factor alpha of the six ESG strategies in the sector-neutral version, and the 7-Factor alpha Lower Bound of the six ESG strategies in the sector-neutral, which is defined as the annualised 7-Factor alpha of the sector-neutral ESG strategy minus two standard errors.

Exhibit 9 shows that performance shrinks when making necessary risk adjustments. None of the strategies adds performance over simple sector and factor tilts.

Our conclusion holds when considering the period from 2008 to 2020, admittedly a rather short period. We had seen from Exhibit 3 that returns of ESG strategies were stronger in the later part of our sample. To provide perspective on the evolution of performance over time, Exhibit 10 plots cumulative alphas, defined as the difference between the return of the sector-neutral ESG strategies and the return component that is explained by their factor exposures.

Exhibit 10: Cumulative Returns Net of Sector and Factor Effects



The plots show the time series of cumulative 7-Factor alphas of the strategies (Sector Neutral Version), calculated from daily returns for the entire sample period. The cumulative alpha is computed as a difference between cumulative absolute returns of a strategy cumulative factor returns times the factor betas estimated over the full sample. The sample period ranges from 1/01/2008 to 30/06/2020. The strategies refer to the Scientific Beta US universe and Scientific Beta Developed ex-US universe.

2. Factor Exposures and Sector Biases

The graphs in Exhibit 10 show that ESG strategies consistently deliver zero alpha when accounting for sector neutrality and exposure to standard factors. The flat lines in Exhibit 10 provide relevant information for investors on the performance benefits of ESG strategies because the results fully account for risks related to sector biases and factor exposures. In contrast, the upward-sloping lines in Exhibit 3 are much less relevant because they ignore such risks. Figures of unadjusted returns (like Exhibit 3) seem to be much more popular in the investment industry than figures of risk-adjusted returns (like Exhibit 10). We suspect that this might be due to a preference for upward-sloping lines among product providers, but we leave a thorough investigation of this topic to future research.

3. Downside Risk

3. Downside Risk

A popular argument is that ESG ratings capture risk exposures that stem from environmental, social and governance issues. Therefore, ESG leaders may be less risky than ESG laggards. There is some empirical support for this idea. For example, Dunn, Fitzgibbons and Pomorski (2018) find that ESG leaders tend to have lower market beta and lower volatility.

The analysis above of value-added from factor models fully accounts for possible risk reduction benefits of ESG leaders in terms of volatility or market beta. Our factor models capture such effects as they include both a market and a low volatility factor. Exhibit 5 above includes factor exposures to the market factor and the low volatility factor. In the US data, the overall ESG strategy, the environmental ratings strategy and the governance ratings strategy all have significant positive exposure to the low volatility factor. The US ESG ratings strategy, the social ratings strategy and the governance ratings strategy have significant negative market beta. This confirms that ESG leaders may have lower risk. The multi factor alpha we use as a measure of value added fully accounts for this. For example, if a strategy has a negative market beta (and market returns are positive), the reduction in market exposure will lower its normal returns and drive up its estimated alpha.

However, our factor models do not capture potential benefits from reduced downside risk. Unlike simple market beta, downside risk captures asymmetric exposure. Investors are averse to losses that occur in bad times more than to losses that occur in good times, and this idea can be captured in measures of downside risk. It has been argued that ESG strategies offer exposure to equity markets, with reduced sensitivity in crisis periods. There is support for this idea in the empirical literature, even though studies focus on particularly short time periods. For example, Lins, Servaes and Tamayo (2017) find that socially responsible firms suffered less during the 2008-09 financial crisis. Albuquerque et al (2020) find that stocks with a high environmental and social rating suffered less during the downmarket in the first quarter of 2020. Asset managers also emphasise that ESG strategies are useful for downside risk reduction. For example, Allianz Global Investors (2018) states: "*the focus on ESG is a core part of the armoury in protecting portfolios against downside risk.*"

Our performance analysis above does not capture such possible downside risk reduction benefits, because we use constant parameter models that do not include any asymmetries or state dependencies. We extend our analysis to account for possible benefits in terms of downside risk reduction. We augment standard factor models with a downside risk factor. Similar to the analysis above, we run time series regressions of strategy returns on a set of risk factors:

$$r_{s,t} - r_{f,t} = \alpha_s + \beta_s^D D_t + \beta_s^F F_t + \varepsilon_{s,t}$$

where D_t is the return of the downside risk factor during week t, and F_t is a column vector of returns in week t of a standard set of risk-factors. We consider two specifications for F_t, one where we only include only the market factor and one where we include the market factor and the six equity style factors. β_s^D is the loading of the strategy returns on the downside risk factor and β_s^F is the row vector of loadings on the other factors.

3. Downside Risk

Our analysis allows us to address two questions:

- First, we test whether ESG strategies protect against downside risk. If they do, our estimate of β_s^D should be negative.
- Second, we test whether ESG strategies outperform when accounting for downside risk. If so, our estimate of α_s should be positive.

Before turning to results, we will discuss how we define the downside risk factor. This factor should capture the risk of an increase in portfolio's market exposure during down markets. Following Ang, Chen and Xing (2006), we compute a stock's downside beta[11], which we denote with β_i^{Down}, as the difference between its market beta in periods when market returns are low (below the median) and its unconditional market beta, i.e.

$$\beta_i^{Down} = \beta_i^- - \beta_i$$

where

$$\beta^- = \frac{Cov(r_i - r_f, r_m - r_f \,|(r_m - r_f) < median(r_m - r_f))}{Var(r_m - r_f \,|(r_m - r_f) < median(r_m - r_f)}$$

The downside risk factor is long 30% of stocks with the highest downside beta and short 30% of stocks with the lowest downside beta. The stock selection is done each quarter based on the market betas and downside betas estimated over the most recent two-year period. In the developed ex-US universe, the stock selection is made within each geographical block[12], and stocks are equally weighted within each block. The geographical blocks are weighted with their market capitalisation.

Turning to our first test, we assess if the different types of ESG strategies we have constructed have negative exposure to the downside risk factor. Exhibit 11 shows the estimate of exposure to the downside risk factor and the associated t-statistic. Statistically significant estimates of downside risk exposure at 5% level are indicated in bold.

Exhibit 11: Exposure to Downside Risk Factor

Jan 2008 - Jun 2020	ESG		E		S		G		ESG Momentum		Combination	
Universe	US	Dev. Ex-US	US	Dev. Ex-US	US	Dev. Ex-US	US	Dev. Ex-US	US	Dev. Ex-US	US	Dev. Ex-US
Augmented CAPM												
Downside Risk Exposure	**-0.15**	0.00	**-0.17**	-0.01	**-0.10**	0.04	**-0.05**	-0.06	0.03	0.01	**-0.14**	-0.01
t-statistic	-7.02	-0.03	-7.5	-0.52	-4.85	1.64	-2.37	-1.41	1.31	0.29	-5.94	-0.53
Augmented 7 Factor Model												
Downside Risk Exposure	0.03	**0.14**	0.00	**0.22**	**-0.08**	0.07	**0.11**	0.02	0.01	-0.06	-0.06	0.07
t-statistic	1.14	2.78	0.08	5.04	-2.76	1.58	3.72	0.28	0.22	-1.49	-1.76	1.45

The table reports downside betas and corresponding t-statistics estimated in CAPM and 7-factor models augmented by the addition of the Downside risk-factor. t-statistics with an absolute value greater than two indicate statistical significance at conventional levels. The analysis has been computed using weekly returns. The sample period ranges 1/01/2008 to 30/01/2020.

11 - We use two years of weekly data in local currency. If a stock has fewer than 90 weekly return observations its relative downside beta will be considered as missing and replaced by the cross-sectional median value of relative downside beta estimates of stocks in the same universe. The long/short factor is rebalanced quarterly. In the Developed ex-US Universe, the stock selection is made within each geographical block, and stocks are equally weighted within each block. Then the aggregate weight assigned to a geographical block reflects the weight of the geographical block in the Cap-Weighted Portfolio. Whenever the geographical block contains multiple countries with different national currencies, we use returns in USD for estimation.

12 - The Scientific Beta Developed ex-US universe consists of the following six geographic blocks: Canada, Developed Asia Pacific ex-Japan, Japan, Developed EMEA ex-Eurozone and ex-UK, Eurozone and UK.

3. Downside Risk

It appears from the results in Exhibit 11 that ESG Strategies do not offer downside risk protection.

When using the CAPM to represent the set of standard factors, evidence is mixed across geographies. In the US data, we observe significant negative exposures, i.e., downside risk protection, for all strategies except the ESG Momentum strategy. This result, however, may be driven by other factor exposures, notably quality exposure. Outside the US, none of the strategies shows significant downside risk exposure.

When considering the full set of factors, downside risk exposures are mostly insignificant or even positive. Only the US strategy using social ratings maintains negative exposure to the downside risk factor. We estimate significantly positive exposures to downside risk for the Developed-ex-US strategies using the overall ESG ratings and the environmental ratings, as well as for the US strategy using governance ratings. We conclude that information in ESG ratings does not provide downside protection beyond what is available from information in stock returns and accounting ratios that are used to construct equity style factors.

We next assess whether the risk-adjusted performance (or alpha) of ESG strategies differs when including exposure to the downside risk factor in the set of risk adjustments. Exhibit 12 displays the alphas and associated t-statistics when using different factor models. Estimates of alpha obtained from the standard CAPM look very similar to alphas obtained from its augmented version that adds the downside risk factor. Likewise, multi-factor alphas from the multi-factor model do not show notable changes when augmenting the model with a downside risk factor.

Exhibit 12: Estimates of Alpha When Accounting for Downside Risk

Jan 2008 - Jun 2020	ESG		E		S		G		ESG Momentum		Combination	
CAPM												
Universe	US	Dev. Ex-US	US	Dev. Ex-US	US	Dev. Ex-US	US	Dev. Ex-US	US	Dev. Ex-US	US	Dev. Ex-US
Alpha	2.57%	1.63%	**3.99%**	2.43%	0.54%	1.08%	1.30%	-0.52%	0.06%	-0.14%	2.84%	0.53%
t-statistic	1.55	1.05	2.28	1.68	0.35	0.79	0.84	-0.23	0.04	-0.12	1.62	0.37
Augmented CAPM												
Universe	US	Dev. Ex-US	US	Dev. Ex-US	US	Dev. Ex-US	US	Dev. Ex-US	US	Dev. Ex-US	US	Dev. Ex-US
Alpha	2.09%	1.62%	**3.46%**	2.38%	0.24%	1.22%	1.14%	-0.72%	0.14%	-0.12%	2.41%	0.48%
t-statistic	1.31	1.04	2.06	1.65	0.16	0.89	0.74	-0.32	0.09	-0.10	1.41	0.33
Multi-Factor Model												
Universe	US	Dev. Ex-US	US	Dev. Ex-US	US	Dev. Ex-US	US	Dev. Ex-US	US	Dev. Ex-US	US	Dev. Ex-US
Alpha	-0.33%	1.31%	0.96%	1.95%	-1.17%	1.95%	-0.22%	-1.75%	0.00%	0.86%	0.96%	0.52%
t-statistic	-0.24	0.85	0.68	1.43	-0.84	1.43	-0.16	-0.78	0.0	0.73	0.59	0.36
Augmented Multi-Factor Model												
Universe	US	Dev. Ex-US	US	Dev. Ex-US	US	Dev. Ex-US	US	Dev. Ex-US	US	Dev. Ex-US	US	Dev. Ex-US
Alpha	-0.35%	1.27%	0.96%	1.90%	-1.11%	1.93%	-0.31%	-1.76%	0.00%	0.87%	1.01%	0.50%
t-statistic	-0.26	0.83	0.67	1.42	-0.80	1.42	-0.22	-0.78	0.00	0.74	0.62	0.35

The analysis was done using weekly returns in USD, from January 2008 to June 2020. The table reports alphas from the CAPM and 7-Factor models as well as the 7-factor model augmented with the downside risk factor. Corresponding t-statistics are also reported.

3. Downside Risk

Our analysis in this section does not change the conclusions from the previous section. Accounting for downside risk exposure does not increase alphas. None of the strategies shows a significantly positive alpha when using the full set of factors either with or without accounting for downside risk exposure.

Of course, our analysis does not capture all possible ways in which risk reduction could materialise. We build on the idea that ESG strategies may reduce risk in down markets and use a particular measure of downside risk exposure to assess ESG strategies. The advantage of our downside risk measure is that it has a precise and tractable definition and allows us to go beyond analysing an arbitrary sub-period, such as the global financial crisis of 2008 and 2009 or the initial spread of the Coronavirus pandemic in the second quarter of 2020. We do not analyse[13] whether ESG strategies can hedge alternative sources of risk that are not captured in our downside risk measure, such as litigation risk[14] or climate risk. However, in a competitive financial market, any risk reduction available from ESG ratings would be priced in, thus lowering expected returns of ESG leaders. Therefore, risk reduction per se does not constitute a source of outperformance for ESG strategies.

We leave an investigation of how ESG strategies can address such risk objectives for further research. Evidence on risk reduction related to the social or governance dimensions is relatively scarce and does not necessarily confirm risk reduction benefits. For example, it has been shown that governance ratings are not good indicators of litigation risk (Kim and Skinner 2012). In contrast, there is some evidence that ESG scores can be used to hedge climate change news (Engle et al., 2020) and firms with higher carbon emissions face greater tail risk (Ilhan, Sautner and Vilkov, 2020). Accounting for climate risk exposures of equity portfolios is a promising avenue for future research.

13 - Nor do the papers that claim there is positive ESG alpha cited in our introduction.
14 - For example, there is evidence that firms with high emissions of toxic chemicals face regulatory uncertainty and litigation risk (Hsu, Li and Tsou 2020).

4. Attention Shifts

4. Attention Shifts

Our analysis exploits a sample from January 2008 to June 2020. We have shown that, over this period, ESG strategies did not deliver value-added to investors in terms of financial performance. Even if ESG strategies do not provide outperformance over an extended period, they may outperform in the short term. In particular, if attention to ESG shifts upwards, ESG strategies have positive short-term performance. but their long-term expected returns decline (Pastor, Stambaugh, and Taylor 2020; Cornell 2020).

For investors, it is crucial to disentangle long-term returns from the effects of attention shifts. If upward attention shifts drive ESG returns over the recent period, investors need to conduct two adjustments to observed returns to form realistic expectations. First, returns of ESG strategies over periods with upward attention shifts are inflated. Increasing attention raises demand for a firm's shares, leading to higher prices. Investors need to deflate returns by subtracting the tailwind from rising attention. These deflated returns will of course look less attractive than the returns that were observed over the period. Second, following upward attention shifts, long-term expected returns will be even lower than they were before the attention shifts occurred. This is because increasing attention drives up prices and thus drives down expected returns. Investors thus need to adjust the deflated returns and subtract the drag imposed by rising valuations that occurred because of rising attention. In other words, not only will ESG strategy returns go back to their initial long-term average after a period of tailwind from upward attention shifts, but they will now deliver a lower long-term average return.

The following table illustrates this principle[15]:

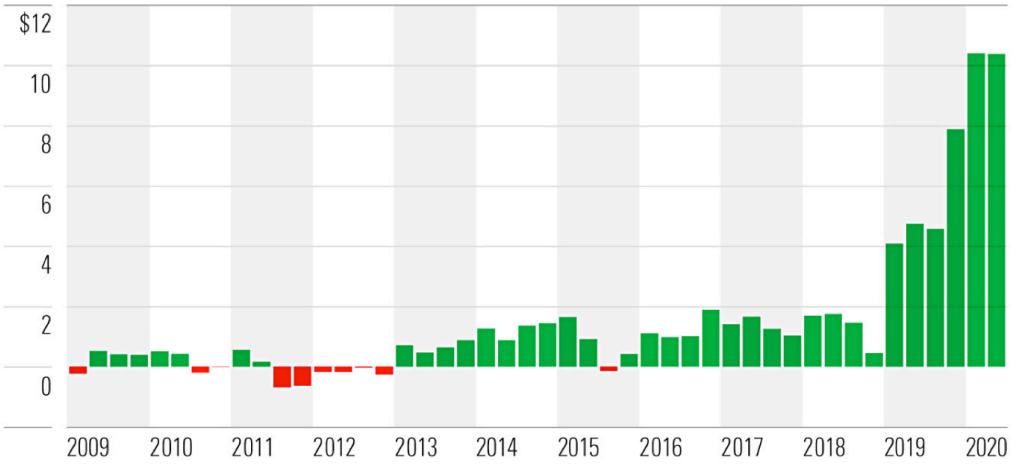
	Before attention shifts	During period when attention shifts upward	After attention shifts
Return of ESG strategies (after removing random error)	Initial Long-Term Average	Initial Long-Term Average **+ Tailwind**	Initial Long-Term Average **- Drag**

We assess the impact of attention shifts on ESG performance by distinguishing high and low attention states. We proxy for shifts of investor attention to ESG with flows into sustainable funds. Fund flows are a common proxy for investor attention or sentiment (see Baker and Wurgler 2007). Exhibit 13 shows that fund flows into sustainable funds have seen a strong upward shift over the second half of our sample period.

15 - This table builds on the model insights of Pastor, Stambaugh and Taylor (2020) who assume that a single preference shift occurs at a discrete point in time. The table indicates what happens during the period of attention shifts and afterwards. In real life, attention shifts are likely to occur continuously and repeatedly. After a period of upward attention shift, the attention level does not stay constant. Even after an upward shift there may be further upward shifts, boosting returns with more tailwind. On the other hand, attention may also decline, creating a headwind. Betting on the direction of attention shifts that are not expected by the market could be another motivation for ESG investing (when predicting positive shocks to attention) or anti-ESG investing (when expecting negative shocks), for investors who believe they have unique insights to predict changes in attention shifts.

4. Attention Shifts

Exhibit 13: Net Flows into US Sustainable Funds (in USDbn)



Source Morningstar. https://www.morningstar.com/articles/994219/sustainable-funds-continue-to-rake-in-assets-during-the-second-quarter.

We divide the sample into quarters with high and low attention, using the median value of fund flows into sustainable funds as the cut-off point to classify quarters. Exhibit 14 shows annualised returns and alphas during high and low attention states, as well as the difference across the two states.

Exhibit 14: Return and Alpha when Conditioning on Attention to ESG

Annualised Conditional Metrics	Conditional value of the Attention Shift Proxy	ESG		E		S		G		ESG Momentum		Combination		Average
		US	Dev Ex-US	US	Dev Ex-US	US	Dev Ex-US	US	Dev Ex-US	US	Dev Ex-US	US	Dev Ex-US	
Return	High Attention	3.16%	1.78%	2.97%	1.14%	**3.33%**	1.40%	1.74%	2.37%	1.29%	-0.16%	2.74%	1.54%	1.94%
	t-statistic	1.44	1.30	0.99	0.65	3.07	0.98	0.90	0.77	0.90	-0.11	1.37	1.30	
	Low Attention	-0.47%	2.48%	1.90%	2.57%	-2.34%	1.82%	-1.06%	-0.93%	-0.16%	0.78%	0.06%	1.46%	0.51%
	t-statistic	-0.20	1.39	0.98	1.28	-1.47	1.21	-0.39	-0.34	-0.04	0.53	0.09	0.89	
	High-Low	3.63%	-0.70%	1.07%	-1.43%	**5.68%**	-0.42%	2.80%	3.30%	1.44%	-0.94%	2.68%	0.08%	1.43%
	t-statistic	1.25	-0.31	0.32	-0.51	2.91	-0.20	0.88	0.85	0.62	-0.48	0.87	0.01	
CAPM Alpha	High Attention	**4.97%**	0.99%	5.17%	1.37%	**4.09%**	1.06%	2.68%	0.33%	0.79%	0.26%	3.93%	1.00%	2.22%
	t-statistic	2.44	0.69	1.84	0.73	3.74	0.68	1.34	0.19	0.58	0.24	2.08	0.84	
	Low Attention	1.27%	1.38%	3.40%	1.83%	-1.32%	0.91%	-0.15%	-2.01%	-0.11%	0.79%	1.72%	0.92%	0.72%
	t-statistic	0.88	0.83	1.83	0.87	-0.88	0.69	-0.02	-0.89	-0.01	0.55	0.98	0.57	
	High-Low	3.70%	-0.39%	1.77%	-0.46%	**5.41%**	0.14%	2.83%	2.35%	0.90%	-0.53%	2.22%	0.08%	1.50%
	t-statistic	1.46	-0.18	0.54	-0.16	2.91	0.07	0.99	0.64	0.36	-0.28	0.82	0.02	
7 Factor Alpha	High Attention	1.55%	1.60%	0.63%	1.69%	2.10%	2.09%	2.13%	0.09%	0.16%	0.13%	1.62%	1.17%	1.25%
	t-statistic	0.95	1.07	0.33	0.94	1.81	1.35	1.25	0.12	0.15	0.16	1.03	0.98	
	Low Attention	-0.98%	1.32%	1.35%	1.90%	-2.73%	2.33%	-1.44%	-3.62%	-0.06%	2.28%	0.17%	1.21%	0.14%
	t-statistic	-0.52	0.95	0.80	1.13	-1.66	1.78	-0.66	-1.75	0.02	1.58	0.14	0.85	
	High-Low	2.53%	0.28%	-0.72%	-0.22%	**4.82%**	-0.24%	3.57%	3.72%	0.22%	-2.14%	1.46%	-0.04%	1.10%
	t-statistic	1.04	0.13	-0.23	-0.08	2.37	-0.11	1.31	1.01	0.08	-1.20	0.51	-0.03	

The table reports annualised returns and alphas conditional on realisations of the ESG attention shift proxy for six ESG strategies constructed using the Scientific Beta US universe and the Developed Ex-US universe. The attention shift proxy used is the net flows in US ESG funds (ESG_FF), for which we obtained quarterly observations from Morningstar (https://www.morningstar.com/articles/994219/sustainable-funds-continue-to-rake-in-assets-during-the-second-quarter). For each strategy we report the average annualised Return, CAPM alpha, 7-Factors alpha, and their t-stats conditional on ESG_FF being above the median (High attention), and below the median (Low Attention) of the period. We also report the difference in the average analytics and test their significance with a two-sample t-test. Unconditional alphas are obtained regressing the returns of the ESG strategies over the factors of the model over the entire period using weekly data. We then obtain weekly alphas adding the weekly residual to the unconditional alpha. Finally, we obtain quarterly observations as the sum of the weekly alphas over the quarter. Quarters are defined as High (Low) attention shift if the value of the ESG funds' flows in that quarter is above (below) the median of the entire period. Data for the returns of the ESG strategies are from Scientific Beta. The time sample is from January 2008 to June 2020.

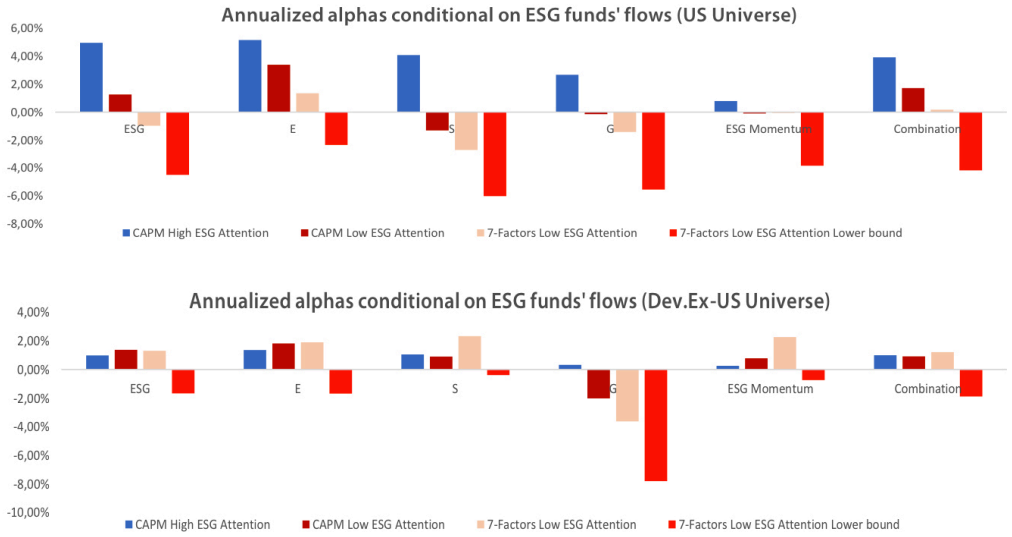
4. Attention Shifts

The results in Exhibit 14 suggest that high attention leads to inflated performance. Some ESG strategies have significant CAPM alphas in high attention states, but their outperformance disappears in low attentions states. For example, the US strategy using aggregate ESG ratings shows a large CAPM alpha of 4.97% during high attention states. The estimated CAPM alpha in low attention states is only 1.27%. A prudent investor may prefer to look at low attention states to form expectations about ESG returns. None of the ESG strategies have significant alpha or returns in low attention states, even when we stay with the CAPM and thus do not adjust for exposure to equity style factors.

An important implication of these results is that focusing on the later period of the sample, when attention was high, would inflate performance. Investors need to be wary of findings about ESG performance from studies which focus on a short period that is affected by upward attention shifts.

We summarise our results on attention shifts in Exhibit 15. Outperformance during high attention periods, and when adjusting only for market exposure, is spectacular. The US strategies based on overall ESG ratings or on either of the three components all show substantial positive performance often exceeding 4% per year. However, outperformance shrinks and sometimes becomes negative when considering the low attention states. When adjusting for additional factors, outperformance shrinks further. Finally, accounting for parameter uncertainty does not lead to a single positive result for any of the strategies.

Exhibit 15: Shrinking ESG Alphas when Adjusting for Attention Shifts



The chart shows annualised alphas conditional on realisations of the ESG attention shift proxy for six ESG strategies constructed using the Scientific Beta US universe (top chart) and the Developed Ex-US universe (bottom chart). The attention shift proxy used is net flows in US ESG funds (ESG_FF), for which we obtained quarterly observations from Morningstar (https://www.morningstar.com/articles/994219/sustainable-funds-continue-to-rake-in-assets-during-the-second-quarter). For each strategy we report the average CAPM alpha conditional on ESG_FF being above the median, the average CAPM alpha conditional on ESG_FF being below the median, the average 7 Factors alpha conditional on ESG_FF being below the median, and the 95% lower bound of the 7 Factors alpha conditional on ESG_FF being below the median. Unconditional alphas are obtained regressing the returns of the ESG strategies over the factors of the model over the entire period using weekly data. We then obtain weekly alphas adding the weekly residual to the unconditional alpha. Finally, we obtain quarterly observations as the sum of the weekly alphas over the quarter. Quarters are defined as High (Low) attention shift if the value of the ESG funds' flows in that quarter is above (below) the median of the entire period. Data for the returns of the ESG strategies are from Scientific Beta. The time sample is from January 2008 to June 2020.

5. Conclusions

5. Conclusions

We construct equity strategies that exploit information in ESG ratings, following several papers that suggest these strategies lead to outperformance. While many of the ESG strategies have positive returns, adjusting these returns for risk shrinks alpha to zero. Sector biases and exposures to equity style factors capture the returns of ESG strategies. Considering downside risk exposure does not change this conclusion. In addition, our analysis suggests that returns are inflated when investor attention to ESG rises.

We have tested several specifications which confirm the robustness of our findings. These results are reported in a supplement to this document.

- First, we confirm our conclusions on alpha when using alternative factor models.
- Second, we confirm our conclusions on downside risk when measuring the dependency of market beta on economic conditions.
- Third, we confirm our conclusions when measuring attentions shifts using internet search volume for terms that relate to ESG investing.

Readers need to bear in mind that our results are specific to our sample. We analyse data from a single ESG ratings provider, over a relatively short period. However, we have reasons to be confident in the validity of our conclusion that there is no positive alpha for ESG strategies.

First, we understand that our alphas, if anything, are overstated. We test a total number of 24 different strategies, resulting from six different ways of using the ratings in two different universes, with and without sector neutrality. Testing such a large number of strategies creates a substantial risk of falsely discovering alpha in-sample, even if there is no true effect. We do not account for this risk since we compute statistical significance using standard methods that assume that we conduct a single test. Even though we set the bar too low, there is not one among the 24 strategies that shows significantly positive alpha after adjusting for risk. Accounting for multiple testing would lead to even less support for positive alpha.

Second, our finding that there isn't any positive alpha is not a surprise[16]. In somewhat competitive financial markets, investors do not easily gain an information advantage. Even if ESG leaders have better corporate financial performance, this does not increase their expected returns, if investors know about this relation (Bebchuk, Cohen and Wang, 2013). In such markets, investors face trade-offs. Theory suggests that investors forego returns by tilting to ESG leaders because they receive other benefits. Investing in ESG leaders offers non-pecuniary benefits, such as aligning investments with norms (Pastor, Stambaugh and Taylor, 2020), and may allow hedging certain types of risks, such as litigation or climate risk. Such benefits offset lower expected returns.

Our findings have important implications for investors. As a general matter, our analysis provides an example of how one can document outperformance where there is none: it suffices to omit necessary risk adjustments. Concerning ESG strategies, our findings question a widespread practice of using ESG as an alpha signal. They do not question the value-added of such strategies on other dimensions.

16 - Also see Amenc, Bruno and Goltz (2021) for an analysis of economic mechanisms behind the performance of ESG strategies.

5. Conclusions

Investors should ask how ESG strategies can help them to achieve objectives other than alpha, such as aligning investments with their values and norms, making a positive social impact, and reducing climate or litigation risk. Investors would benefit from further research on these important questions.

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About Scientific Beta

About Scientific Beta

EDHEC-Risk Institute set up Scientific Beta in December 2012 as part of its policy of transferring know-how to the industry. In January 2020, Singapore Exchange (SGX) acquired a majority stake in Scientific Beta and is maintaining the strong collaboration with EDHEC Business School and principles of independent, empirical-based academic research that have benefited Scientific Beta's development to date. Scientific Beta is an original initiative which aims to favour the adoption of the latest advances in "smart beta" design and implementation by the whole investment industry. Its academic origin provides the foundation for its strategy: offer, in the best economic conditions possible, the smart beta solutions that are most proven scientifically with full transparency of both the methods and the associated risks. Smart beta is an approach that deviates from the default solution for indexing or benchmarking of using market capitalisation as the sole criterion for weighting and constituent selection.

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