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George Serafeim

Working Paper 19-044



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Public Sentiment and the Price of Corporate Sustainability

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Abstract

Combining corporate sustainability performance scores based on environmental, social and governance (ESG) data with big data measuring public sentiment about a company's sustainability performance, I find that the valuation premium paid for companies with strong sustainability performance has increased over time and that the premium is increasing as a function of positive public sentiment momentum. An ESG factor going long on firms with superior or increasing sustainability performance and negative sentiment momentum and short on firms with inferior or decreasing sustainability performance and positive sentiment momentum delivers significant positive alpha. This low sentiment ESG factor is uncorrelated with other factors, such as value, momentum, size, profitability and investment. In contrast, the high sentiment ESG factor delivers insignificant alpha and is strongly negatively correlated with the value factor. The evidence suggests that public sentiment influences investor views about the value of corporate sustainability activities and thereby both the price paid for corporate sustainability and the investment returns of portfolios that consider ESG data.

Keywords: *corporate sustainability, ESG metrics, public sentiment, corporate valuation, investment management*

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"In this age, in this country, public sentiment is everything."

Abraham Lincoln

1. Introduction

News about firms' impact on society is an everyday phenomenon. According to TruValue Labs, a data provider that analyzes public sentiment from NGOs, think tanks, industry experts, and media sources, about companies' sustainability activities, in 2018 there were more than 250 thousand unique articles focusing on environmental, social and governance (ESG) issues, across 8,000 companies globally.[1] In this paper, I analyze how public sentiment influences the market pricing of firms' sustainability activities and thereby the future stock returns of portfolios that integrate ESG data.

Thousands of companies are investing resources to reduce energy consumption, waste and carbon emissions and to provide products that improve environmental and social outcomes. For example, developments in healthy nutrition, access to wellbeing services, low carbon transportation, and green buildings have provided billions in revenues for companies that developed products for these markets (Generation Investment Management 2017). Similarly, companies spend significant resources to improve employee safety and well-being and to conduct business with integrity avoiding corruption. These activities, typically referred by companies as corporate sustainability activities, are under the supervision of a Chief Sustainability Officer and are disclosed in sustainability reports (Miller and Serafeim 2015). The data from sustainability reports and other sources that might also reflect controversies around human rights, pollution, discrimination and corruption, are collected by data providers and form the basis of measures of company's performance on environmental, social and governance (ESG) issues.

I combine ESG performance scores from MSCI, the largest provider of ESG data to investors, with big data from TruValue Labs that measure public sentiment momentum around ESG issues between 2009 and 2018. The latter is a measure of whether sentiment has turned negative or positive for a company, from a

[1] This measure considers only English articles. The true number of articles is likely to be multiple times of that if one considers articles in all languages. As of 2018, TruValue Labs analyzed articles only in English.

set of vetted, credible, and reputable resources (e.g. NGOs, industry analysts, think tanks, media) in the past twelve months. I expect a lower valuation of corporate ESG performance in the presence of negative sentiment momentum for multiple reasons. First, firms with strong ESG performance and occasional or temporary societal controversies might be judged as weak ESG performers. Similarly, firms with weak ESG performance that have strong marketing campaigns to advertise their ESG activities might be judged as strong ESG performers. Moreover, negative news on a specific topic (e.g. supply chain controversies) might affect investor views about other ESG issues (e.g. climate change strategy or human capital development) leading them to undervalue strong ESG performance in those other issues. Second, investors might assign a higher discount rate to a firm's ESG performance in the presence of negative sentiment momentum because they expect future reputational, legal, or operating costs. Third, even if investor views about a firm's ESG performance are unaffected by sentiment, their incentives might lead them to ignore firms with strong ESG performance and negative sentiment momentum (or to hold firms with weak ESG performance and positive sentiment momentum). If institutional asset owners and retail investors value holding (avoiding) companies with positive (negative) sentiment momentum, asset managers will act to satisfy their clients' preferences (Amel-Zadeh and Serafeim 2018).

I estimate market valuation models, where the dependent variable is a firm's market-to-book ratio at the end of each month and independent variables include a firm's ESG performance as a well as control variables for a firm's size, profitability, past returns and revenue growth, leverage and industry membership. I find that the valuation of corporate ESG performance increases as a function of public sentiment. The positive association between ESG performance and market valuation is stronger for firms with more positive public sentiment momentum. An increase in a firm's ESG performance has nearly two to three times the effect on a firm's market valuation for a firm with positive relative to a firm with negative public sentiment momentum.

The differential pricing of sustainability activities based on public sentiment momentum raises the question if the price paid for these activities is efficient, or the market undervalues strong ESG performance in the presence of negative sentiment or overvalues strong ESG performance in the presence of positive

sentiment. To answer this question, I construct ESG factors following the standard approach in the literature (Fama and French 2018), based both on the levels and/or the change in ESG performance scores. Importantly, I separate the ESG factor to a high and low sentiment. The high sentiment ESG factor goes long on firms with strong ESG performance and positive sentiment momentum and short on firms with weak ESG performance and negative sentiment momentum. Therefore, the factor has a positive spread both on ESG performance and sentiment momentum. The low sentiment ESG factor goes long on firms with strong ESG performance and negative sentiment momentum and short on firms with weak ESG performance and positive sentiment momentum. Therefore, the factor has a positive spread on ESG performance and a negative spread on sentiment momentum. If the market efficiently prices sustainability activities independent of sentiment, then both factors should exhibit an insignificant alpha. If the market undervalues sustainability activities in the presence of negative sentiment, the low sentiment ESG factor should exhibit a positive alpha. In contrast, if the market overvalues sustainability activities in the presence of positive sentiment, the high sentiment ESG factor should exhibit a negative alpha.

The low sentiment ESG factor produces significant positive alpha of about 4-5% annually. It exhibits a higher Sharpe ratio than other factors during the period of study and does not exhibit significant correlation with any of the six factors introduced in the literature (Novy-Marx 2013; Fama-French 2016). Moreover, the long portfolio of the ESG factor has dramatically better ESG profile than the short portfolio. The average ESG score assigned by MSCI is close to 100% higher in the long portfolio and the average change in ESG score for the long (short) portfolio is an increase (a decrease) of close to the sample standard deviation of ESG score. This suggests that the ESG factor goes long on firms with significantly greater positive social impact than the firms in the short portfolio, if MSCI ESG ratings are correlated with social impact.

In contrast, the high sentiment ESG factor exhibits insignificant alpha. Moreover, it exhibits very strong correlations with many other factors. Importantly, it has a strong negative correlation with the value factor suggesting high sentiment firm portfolios with better ESG characteristics have returns that resemble those of growth stocks. This is consistent with the market valuation results that positive sentiment momentum

accentuates the association between ESG performance and market valuation. I find some evidence of overvaluation in more recent years, with the high sentiment ESG factor yielding negative alphas in the years between 2015 and 2018, although the estimates are insignificant. The low sentiment ESG factor yields a significant positive alpha in those years.

I complement the results using US data with data across 37 more countries to understand if the role of sentiment generalizes to other markets. These results should be viewed with caution as the sentiment data do not derive from languages other than English. The low sentiment ESG factor delivers even higher alpha, between 2010 and 2018, in a sample of international firms traded in European and Asian-Pacific stock exchanges. The four-factor alpha in the international sample ranges between 44 and 57 basis points monthly (6-8% annually). As in the US, in the international sample the high sentiment ESG factor yields an insignificant alpha. Overall, the results support the interpretation that the market undervalues sustainability activities in the presence of negative sentiment.

The results of this paper contribute to two distinct streams of literature. First, a literature seeks to understand the implications of corporate sustainability activities for firm performance (Deng et al. 2013; Eccles et al. 2014; Khan et al. 2016; Ferrell et al. 2016). The evidence in this study add to this literature showing that the price of corporate sustainability in capital markets is conditional on public sentiment about a firm's sustainability activities and thereby the returns to portfolios that consider ESG data are affected by public sentiment. Second, the higher price of corporate sustainability as a function of public sentiment represents new evidence that not only investor sentiment about the stock market (Baker and Wurgler 2006; Tetlock 2007; Yu and Yuan 2011; Stambaugh, Yu and Yuan, 2012) but also public sentiment about firms' sustainability activities affect the valuation of a firm.

From a practitioner perspective, with an increasing number of investors seeking to integrate ESG data in their portfolios, the question arises how, in the spirit of value investing, to identify companies with strong sustainability performance for a good price. The evidence presented here suggest that combining ESG performance scores with big ESG data might be helpful in identification of stocks with superior and undervalued ESG characteristics. Similarly, for companies, the results suggest that monitoring sentiment

shifts in the presence of new analyses by NGOs, media, industry analysts and other sources is important in understanding if capital markets reward a company's investments in sustainability activities.

The rest of the paper proceeds as follows. Section 2 provides the motivation and discusses the past literature. Section 3 presents the data and the sample. Sections 4 and 5 present the results for the market valuation and stock return analyses respectively. Section 6 expands the analysis to an international sample. Section 7 concludes.

2. Motivation and Literature Review

2.1. Developments related to sustainability activities

The MSCI ESG data, described in more length below, measure both opportunities and risk emerging from social and environmental issues. On the opportunity side, activities related to green buildings, health and nutrition, and renewable energy are issues that are covered. For example, the green construction industry's growth rate is rapidly outpacing that of conventional construction and is expected to account for more the 3.3 million jobs in 2018; more than one-third than the entire US construction sector. From 2015 to 2018 the industry is expected to contribute $304 billion to US Gross Domestic Product (GDP) (Booz Allen Hamilton and USGBC 2015). On the health and nutrition front, changing consumer preferences to healthy foods and wellness-based products are driving growth in new markets. In 2015, the global organic food market was valued at $77 billion and expected to reach $321 billion by 2025, $110 billion coming from fruits and vegetables (Grand View Research 2017). Similarly, the Non-GMO food and beverage market was estimated at $550 billion in 2014 and was on pace to double by 2019 (Packaged Facts 2015). Growth in perceived healthy food markets mirrors a drop in other food markets. From 2004 to 2017, cases of 192-ounce carbonated soft drinks volume sold fell over 15%. At the same time, bottled water brands Aquafina and Poland Spring increased sales 10.9% and in 2016 Americans drank more bottled water than soda.

On renewable energy, 157 gigawatts (GW) of renewable energy were commissioned in 2017, compared to 70GW of fossil fuel generation capacity added. 2017 also saw $280 billion of renewable energy investments, bringing cumulative investments to $2.2 trillion since 2010 and $2.9 trillion since 2004 (Frankfurt School et al. 2018). To limit global warming to within 2° Celsius (2DC) over pre-industrial

averages, estimates held that by 2030 $1 trillion of annual investment in renewable energy would be required (Ceres 2014). In addition to making investments into renewable energy, as of 2013, 43% of Fortune 500 companies had set targets in either greenhouse gas reductions, energy efficiency, or renewable energy (WWF et al. 2014). The transition to a low carbon economy is driving change outside the energy sector, for example the automotive sector. In 2010, electric vehicles (EVs) were a novelty. In 2017, 1 million EVs were sold globally, bringing the global total fleet to over 3 million vehicles. Bloomberg New Energy Finance (BNEF), predicts annual sales will reach 11 million by 2025 and 30 million by 2030 (Bloomberg New Energy Finance 2018). Responding to growing demand, every major auto manufacturer has announced plans to electrify a large portion of their fleet. As of early 2018, manufacturers had cumulatively planned to invest $90 billion in batteries and EVs. While EVs represent possible growth opportunities in the auto manufacturing market, they represent risks to oil companies by displacing oil demand. Two million barrels of oil per day could be displaced as early as 2028 (Carbon Tracker Initiative 2017). Oil displacement estimates from BP equate an extra 100 million EVs to 1.4 million barrels per day displacement (BP 2017).

Further on the risk side, and specifically on issues such as business ethics and board diversity, that constitute a significant part of the governance element of ESG data, firms are changing practices to manage reputational, legal, and regulatory risks. For example, an increasing number of companies are appointing women on board to avoid reputational costs associated with lack of diversity and to improve the governance process. In 2016, women held 21.2% of S&P 500 board seats, up from 15.7% in 2010 and 13.6% in 2003 (Catalyst 2017).

Over the past few years, assets under management in ESG funds grew significantly. As of 2018, investors with $80 trillion in assets under management had publicly committed, through the United Nations Principles for Responsible Investing, to consider ESG data in investment analysis. This initiative did not exist before 2006. In 2016, total global assets under management in different ESG styles, such as negative screening, best in class, engagement etc., were $22.9 trillion, up from $13.6 trillion in 2012 (Global Sustainable Investment Alliance 2017). The scale of the sustainable investing market differed significantly across regions. In 2016, Europe had the highest proportion of sustainable investments, followed by

Australia and New Zealand and the United States (Bernow, Klempner and Magnin 2017). ESG products were still rare in Japan and other Asian countries (Bernow, Klempner and Magnin 2017).

2.2. The value of sustainability activities

Past literature discusses how investors used to view sustainability activities negatively, through an agency lens (Ioannou and Serafeim 2016). It shows that sell-side analysts were pessimistic in their recommendations for firms with better ESG performance scores and that this pessimism disappeared over time, as investor logic of sustainability activities changed from an agency to a value perspective. According to the agency perspective, sustainability expenditures are a waste of company resources benefiting corporate managers by allowing them to build reputation in society or to entrench themselves in their firms (Benabou and Tirole 2010; Kitzmueller and Shimshack 2012). Theoretical models show how managers can buy employee support by adopting more employee-friendly workplace practices to avoid replacement (Cespa and Cestone 2007) or takeovers (Pagano and Volpin 2005). Similarly, these expenditures could enhance corporate managers reputation in society with little benefit to the company (Barnea and Rubin 2010). Cheng, Hong and Shue (2013) show that after the 2003 Dividend Tax cut, firms with moderate levels of insider ownership cut ESG investments by more than firms with low levels (where the tax cut has no effect) and high levels (where agency is less of an issue), suggesting that ESG investments are partly due to agency problems.

Recent research examines the relation between agency costs and ESG performance and concludes the opposite. Ferrell, Hao and Renneboog (2016) find that well-governed firms that suffer less from agency concerns have higher ESG performance. Porter and Kramer (2011) present a framework on creating shared value where companies' ESG activities are blended in corporate strategy rather than representing peripheral activities. Khan, Serafeim and Yoon (2016) show that firms with improving performance on industry-specific material ESG issues outperform in the future firms with declining performance on material ESG issues. Deng, Kang and Low (2013) show that mergers by high ESG performance acquirers take less time to complete, have larger increases in post-merger long-term operating performance, and are less likely to

fail than mergers by low ESG performance acquirers. Ghoul et al. (2011) find that firms with high ESG performance exhibit lower cost of capital.

On the social side, studies show that firms with better employee satisfaction and stronger sense of corporate purpose among employees have better financial performance (Edmans 2011; Gartenberg, Prat and Serafeim 2018) providing support to human relation theories that identify employees as key organizational assets (e.g. Maslow, 1943; Hertzberg, 1959; McGregor, 1960). On the environmental side, numerous studies show that a worse environmental footprint is associated with lower market valuation (Konar and Cohen 2001; Matsumura, Prakash, and Vera-Muñoz 2014).

2.3. ESG Performance and Sentiment

Prior literature provides the basis for a connection between investor sentiment and pricing of securities (Baker and Wurgler 2006; Stambaugh, Yu and Yuan, 2012; Yu and Yuan 2011). In this literature, investor sentiment is defined as the propensity to speculate or as optimism or pessimism for stocks generally. In this paper, I focus on public sentiment momentum about a firm's sustainability activities, defined as the change in how positive or negative beliefs by a wide variety of constituents (e.g. NGOs, industry experts, analysts, think tanks and reputable media) are about a company's ESG performance.

Given the previous evidence that investors focus on ESG data and impound them into the valuation of a firm, there are multiple reasons why sentiment momentum could affect the valuation and future returns of portfolios that consider corporate ESG data. First, firms with strong ESG performance but with occasional or temporary societal controversies might be now judged as weak ESG performers. Similarly, firms with weak ESG performance that have strong marketing campaigns and advertise their ESG activities might be now judged as strong ESG performers. In addition, negative sentiment in a specific ESG issue might spread to a perception that a firm is weak across many sustainability activities. Second and related to the previous argument, investors might assign a higher discount rate to a firm's ESG performance in the presence of negative sentiment because they expect future reputational, legal, or operating costs. Investors might expect that negative sentiment will affect the value of a company's sustainability activities thereby raising their riskiness and the discount rate assigned to them.

Third, asset manager incentives might lead them to ignore firms with strong ESG performance and negative sentiment momentum. Evidence in the literature suggest that management fees due to increased flows could be a significant incentive in driving a positive ESG image for a fund manager. Białkowski and Starks (2016) examine U.S. equity mutual funds, self-labeled as ESG funds, and conclude that inflows to those funds have been higher than inflows to comparable funds without similar mandates. Hartzmark and Sussman (2018) utilize the introduction of mutual fund sustainability rankings, published by Morningstar, and find low ESG-rated funds experiencing outflows of $12 billion and increased probability of liquidations, while high ESG-rated funds experiencing inflows greater than $22 billion. If institutional asset owners and retail investors value holding (avoiding) companies with positive (negative) ESG sentiment momentum, asset managers will act to satisfy their clients' preferences. Therefore, investors will avoid holding stocks with negative public sentiment momentum even if they have strong ESG performance. With almost $80 trillion now committed, through the United Nations Principles for Responsible Investment, to take ESG issues into account and evidence that for most asset managers customer preferences, rather than integration of ESG issues in business analysis, are driving the incorporation of ESG data in investments products (Amel-Zadeh and Serafeim 2018), it is plausible that sentiment momentum affects investor decisions.

3. Data and Sample

3.1. ESG Performance

Data on firm ESG performance comes from MSCI ESG Ratings. There is no generally accepted definition of what constitutes good ESG performance. As in the case of credit ratings or product ratings, such as cars or restaurants, different ESG rating providers, use different methodologies to assign scores. Moreover, given the multidimensionality of the ESG scores, the lack of agreement across rating providers is less surprising. I use the MSCI ESG ratings as a proxy for the market's view of ESG performance because they are the most widely used by the investment community. Out of the 50 largest asset managers, ranked by assets under management, 46 are clients of MSCI ESG ratings according to MSCI, with the total number of clients being more than 1,200 investment firms. MSCI defines the purpose of their ratings as "to help

investors to understand ESG risks and opportunities and integrate these factors into their portfolio construction and management process."[2] MSCI coverage universe is based on major MSCI indices (e.g. MSCI World Index, MSCI Emerging Markets Index, MSCI country specific Investible Market Indices) that include the world's largest and most liquid stocks.

MSCI ESG Ratings are based off 37 Key Issues. Key Issues correspond to one of ten macro themes MSCI identifies as of concern to investors: climate change, natural capital, pollution and waste, environmental opportunities, human capital, product liability, stakeholder opposition, social opportunities, corporate governance, and corporate behavior. Key Issues are annually selected for each of the 156 GICS Sub-Industries and weighted according to MSCI's materiality mapping framework. Each Key Issue score consists of a risk exposure – a company's exposure to a key issue – and risk management – the company's management of each material issue – component. For a given Key Issue score the required risk management component score is conditional on the risk exposure faced by the company; a company with a greater risk exposure would be required to have strong risk management practices in place. Conversely, a company with minimal management strategies on a low exposure risk issue would not be penalized. For Key Issues that measure opportunity (e.g. Opportunities in Green Building, Opportunities in Renewable Energy, Opportunities in Nutrition and Health, Access to Health Care), exposure indicates the relevance of this opportunity to a given company based on its current business and geographic segments.

MSCI measures the risk and opportunity exposure of each company by combining company-specific operations data with Key Issue relevant macro-level data relating to a companies' geographies of operations and business segments. Company operations data are sourced from corporate reporting, such as annual reports, investor presentations, and financial and regulatory filings, with macro-level data being sourced from a wide variety of academic, government, and NGO databases. In a similar fashion, risk and opportunity management related data come from corporate documents, government data, news media, relevant organizations and professionals, and an assortment of popular, trade, and academic journals. As part of their

[2] MSCI provides more information here.

data verification process, MSCI engages in direct communication with companies and invites companies to participate in a data review process, which includes commenting on the accuracy of company data for all MSCI ESG Research reports.[3]

MSCI aggregates the issue data to an overall score where each issue is weighted according to its assessed materiality in each industry. Given that ESG issues tend to vary systematically across industries MSCI calculates an industry-adjusted score that serves as the basis for their ratings scheme. I use this industry-adjusted score as the measure of a company's ESG performance (*ESG level*), except in the market valuation models where I use the weighted-average ESG score before the industry adjustment and I include industry fixed effects. The score ranges from zero to ten with zero (ten) being the worst (best) possible performance. I calculate *ESG change* as the change in the ESG level of each company between two subsequent rating events. I keep *ESG change* at the value of the first month of the ESG score revision for each subsequent month until the next revision. Given that MSCI most often revises ratings every 12-18 months, I keep *ESG level* and *ESG change* at that value for up to 24 months after the rating event.

3.2. Public Sentiment about Corporate Sustainability Activities

I supplement MSCI ESG Ratings data with data from TruValue Labs that provides sentiment data on companies' ESG performance. Some of the largest asset managers (e.g. State Street) and asset owners (e.g. Global Pension Investment Fund of Japan) use TruValue Labs data. TruValue Labs employs big data and artificial intelligence to capture and analyze unstructured data. Every day, TruValue Labs uses artificial intelligence algorithms to find ESG-relevant articles for each company categorized by ESG-specific issue. TruValue Labs uses the Sustainability Accounting Standards Board's (SASB) materiality taxonomy to measure sentiment on material ESG data fields.

The TruValue Labs platform includes information from a wide variety of sources, including reports by analysts, various media, advocacy groups, and government regulators. TruValue Labs emphasizes that its measures focus on vetted, reputable and credible sources that are likely to generate new information and

[3] In 2017, MSCI reported an approximate 40 percent response rate (MSCI ASWI Index companies).

therefore insights for investors. To increase transparency and validate the data, the TruValue Labs platform allows a user to track the original source of the articles and events that inform the sentiment analysis for each specific issue. The platform aggregates unstructured data from over 100,000 sources into a continuous stream of ESG data for monitored companies. The cognitive computing system uses natural language processing (NLP), to interpret semantic content and generate analytics scoring data points on performance using a zero to 100 scale. A score of 50 represents a neutral impact. Scores above 50 indicate positive sentiment, and scores below 50 reflect negative sentiment. For example, Ingersoll Land had positive sentiment following news on the firm's investments to improve waste and hazardous materials management, materials sourcing and product safety. In contrast, Facebook had negative sentiment following news on the firm's data privacy issues, concerns about regulatory pressure and user rights.[4]

The sentiment analysis performed by TruValue Labs is capable of codifying not only positive versus negative sentiment in a binary way, but also degrees of positivity or negativity. For example, the algorithms assign a relatively more negative score to a catastrophic oil spill affecting several workers and communities and a less negative score to a workplace incident that leads to a minor injury for one worker. The algorithms assign such scores in a consistent manner based on the semantic content across data points, so that hypothetically if there is an identical event such as the catastrophic oil spill and identical discussion of the event in a textual document, the sentiment-based score for such an event would be the same.

TruValue Labs labels the daily score of their analysis Pulse. From those daily scores TruValue Labs derives the Insight Score, a measure of a company's longer-term ESG sentiment. Scores are derived using an exponentially-weighted moving average of Pulse. The half-life of an event's influence on the Insight score is 6 months. Insight scores are less sensitive to daily events and reflect the enduring sentiment around a company over time (*ESG Sentiment*). One of TruValue Labs' key metrics is the Momentum score which is derived from the Insight Score and measured as the logarithm of the slope of Insight over a trailing 12-month period. The measure is normalized by the logarithm of the maximum slope over the universe at the

[4] See TruValue Labs analysis for Ingersoll Rand here and for Facebook here.

same sampling point in time, and further normalized into the zero to a 100 range with below 50 indicating negative sentiment momentum and above 50 indicating positive sentiment momentum. The momentum score reveals the change in sentiment over time based on recent articles flow (*ESG Sentiment Momentum*).

3.3. Sample

MSCI employs approximately 185 analysts that rate companies. As with equity analysts, ESG analysts specialize by industry. The time-series files include the date that the scores were released for each company. For most companies, an analyst issues one rating for all ESG categories every year but there are exceptions as some companies have significant news that change their assessment. I merge the MSCI data with the TruValue data by linking each end of month ESG sentiment datapoint for a firm to the closest in past time MSCI ESG performance score. This ensures that for the date the sentiment is measured the ESG performance score of the company was already released by MSCI. I impose a criterion to match the two datasets by up to 24 months lag in MSCI ESG performance score. This is reasonable given that most scores are updated by MSCI within 12 to 18 months. If more than 24 months have elapsed, it is likely that the score is not representative of the firm anymore.

TruValue Labs has available data starting in the beginning of 2008 for the momentum score. However, in 2008 the intersection of the datasets produces a sample of close to 200 stocks in each month. Over time, the sample of stocks each month is increasing as MSCI and TruValue Labs are increasing coverage. Given the volatility due to the financial crisis and the small number of stocks in the sample, I start the analysis in 2009. Therefore, the sample spans the 114 months between January 2009 and June 2018. I supplement the ESG data with financial accounting data from Compustat and stock market data from CRSP. The merged ESG performance and sentiment data are merged with the most recent past quarterly and annual Compustat files based on quarterly earnings announcement dates and with CRSP monthly data based on calendar dates (i.e. end of month sentiment data are matched with next month stock returns).

Table 1 presents the summary statistics for the sample used in the market valuation analysis and Table 2 the summary statistics for the sample used in the stock return analysis. Because the market valuation analysis does not require calculation of the change in ESG performance from MSCI, the sample is slightly

larger at 138,349 firm-month pairs compared to 123,384 firm-month pairs for the stock return analysis sample. Table 2 Panel A shows that the sample increases from approximately 350 companies in 2009 to about 1,900 companies in 2018. Panel B presents summary statistics. Average *ESG level* is 4.21. There is significant variability across companies with the standard deviation of 2.[5] Average and median *ESG change* are both close to zero. This is not surprising as some companies will experience performance declines and some performance increases, with the overall industry-adjusted score change being close to zero. Of more importance is the standard deviation of 1.27, which suggests significant variation across companies in ESG performance changes over time. The average *ESG Sentiment* of 62 suggests that companies in the sample have on average positive sentiment. Average and median *ESG Sentiment Momentum* are close to 50 suggesting that the sample in this study experience on average no significant change in the ESG sentiment. Importantly, there is significant variation across firms as the standard deviation is 26. In fact, the standard deviation of *ESG Sentiment Momentum* is higher than the standard deviation of *ESG Sentiment*.

Firms with higher *ESG Level* have higher MTB, ROE, and firm size with the univariate correlations being close to 0.12, 0.08 and 0.15 respectively. *ESG Change* in contrast exhibits smaller univariate correlations with the highest being with MTB (0.04). *ESG Sentiment Momentum* is significantly positively correlated with past one-year revenue growth, but the correlation is very small (0.01). *ESG Sentiment* exhibits stronger correlation with both past revenue growth but also with MTB (0.06), leverage (-0.07) and firm size (-0.08). The univariate correlations between *ESG Level* and *ESG Sentiment Momentum* is zero and with *ESG Sentiment* is 0.09. *ESG Sentiment Momentum* is not correlated with *ESG Change* either.

The firms in the sample are larger than the universe of companies listed in US markets. This is not surprising as it is a function of ESG data coverage tilted towards larger firms. Average and median market capitalization is $3.7 and $3.4 billion. However, it has implications for the tests. Past literature has found that a range of investment strategies are more likely to have significant alphas for smaller firms (Novy-

[5] *ESG Performance* in Table 1 is the weighted-average ESG score of MSCI and *ESG Level* in Table 2 Panel B is the industry-adjusted weighted-average ESG score of MSCI which is derived from the former and it is industry-adjusted. The industry-adjusted score exhibits similar mean and median but higher standard deviation.

Marx 2013). Therefore, it is likely that the tilt of the sample towards larger firms decreases the probability of finding a significant alpha. However, the tilt towards larger firms has an advantage when it comes to measurement quality of sentiment. According to TruValue Labs the measurement quality of sentiment increases with the number of articles. In any given month, approximately 80-90% of the sample companies have above median volume of articles, as measured by TruValue Labs within their universe of coverage. Average and median market-to-book ratio is 2.6 and 2.5.

4. Market Valuation Results

Does public sentiment momentum influence the market pricing of corporate ESG performance? To answer this question, I estimate market valuation models of ESG performance. Specifically, for each month, I estimate cross-sectional models where the dependent variable is the natural logarithm of the market-to-book ratio at the end of each month. The independent variables include a series of control factors and the weighted-average ESG performance score from MSCI (*ESG Performance*) and its interaction with *ESG Sentiment Momentum*.[6] The model is below:

$$\text{Ln}\,(MTB_{it}) = a_j + b_1 \text{ x ESG Performance}_{it} + b_2 \text{ x ESG Performance}_{it} \text{ x ESG Sentiment Momentum}_{it} + \text{Controls}_{it}$$

MTB is measured at the end of each month as the market capitalization from CRSP and the most recent publicly available total shareholder's equity from the quarterly Compustat file.[7] Controls include firm profitability (ROE), firm size (natural logarithm of end of previous month market capitalization), past one-year sales growth, past six-month stock returns, and financial leverage (one minus total shareholder's equity over total assets). The model includes two-digit SIC code fixed effects and month fixed effects. I demean *ESG Performance* and *ESG Sentiment Momentum* to facilitate interpretation of the estimated coefficient on the interaction term b_2. Demeaning the two variables allows for the base effect of *ESG Performance* to be evaluated at the neutral level of *ESG Sentiment Momentum* when including the interaction term.

[6] I use the weighted average ESG score that is not industry adjusted in the market valuation models as they include industry fixed effects. Using the industry-adjusted ESG score yields similar results.
[7] I use the quarterly earnings announcement data to determine whether shareholder's equity is publicly disclosed.

Before showing the results for the full model, I estimate a base model of the association between ESG performance and market valuation. Figure 1 shows the exponentially weighted moving average estimated coefficient on *ESG Performance* from cross-sectional models estimated each month between 2003 and 2018.[8] To mitigate the likelihood that differences over time are driven by changes in the sample with available ESG data as data coverage increases over time, I require that a firm appears at least 120 months in the sample. This way the sample is significantly more balanced over time. The average number of firms, across months, is approximately 300. The market pricing of ESG performance has increased significantly as investors have shifted their views on the value of ESG performance consistent with the market developments described in section 2. Importantly, the coefficient has shifted from a negative to a positive territory. The fact that the price of corporate sustainability has increased over time could be attributed to developments that favor the economics of ESG activities, as described in section 2 as well as an increasing number of investors considering ESG data in their capital allocations. The sharp decline of the valuation coefficient in 2016 coincides with the US presidential election in November 2016. One interpretation is that investors expected the new administration not to benefit firms with investments in renewable energy and other ESG activities that are inconsistent with the new administration's agenda.[9] Indeed, following the elections firms with low ESG scores such as coal companies and private prison firms had large positive returns while the returns of firms in wind and solar energy experienced sharp stock price declines. This case increases confidence that the cross-sectional models yield estimated coefficients that reflect how investors value a firm's ESG performance.

In the first model of Table 3 Panel A, the estimated coefficient on the ESG performance variable is positive and significant. A two points increase in ESG performance is associated with approximately 6.1% higher market valuation in the period 2009-2018. The second model in Table 3 shows that the coefficient

[8] I plot the exponentially weighted moving average to smooth out the intertemporal pattern. I use a lambda of 0.5 to put more importance on more recent coefficients. However, the figure is very similar when I plot the cross-sectional coefficients.

[9] In April 2018, the Department of Labor issued new guidance that was widely interpreted as a pushback on ESG investing. Relevant articles can be found here, here and here.

on *ESG Performance* stays the same when I add in the model *ESG Sentiment Momentum*. The coefficient on *ESG Performance* stays identical because ESG performance and ESG sentiment momentum have a univariate correlation of close to zero. The estimated coefficient on ESG sentiment momentum is insignificant suggesting that on its own ESG sentiment momentum does not explain variation in corporate valuation multiples. In the third model of Table 3, the coefficient on the interaction term between ESG performance and sentiment is positive and statistically significant. The association between ESG performance and market valuation seems to vary considerably as a function of sentiment. For a company with negative sentiment momentum of 30 the increase in market valuation associated with a two-points increase in ESG performance is only 4.2%. In contrast, for a company with positive sentiment momentum of 80 the increase in market valuation associated with a two-points increase in ESG performance is more than double at 8.6%. I evaluate the economic effect at these levels of sentiment momentum as they are close to the average values in the long and short portfolio in the next section.

Panel B assesses the robustness of these results to alternative models. In the first model, I also include gross margin as independent variable as firms with better ESG performance might have higher gross margins. The variable loads with a significant coefficient and the coefficient on ROE loses significance consistent with past research (Novy-Marx 2013). The difference in the valuation of ESG performance becomes even more significant across public sentiment. It is now three times as large for firms with positive sentiment relative to negative sentiment compared to Panel A where it was two times. For firms with negative sentiment momentum a two-points increase in ESG performance is associated with 2.1% increase in market valuation. For firms with positive sentiment momentum a two-points increase in ESG performance is associated with 6.7% increase in market valuation. In the second model, in addition to one-year revenue growth I add 3-year revenue growth as a determinant. In the third model, I also add one and three-year asset growth as determinants. I am particularly worried about how past growth might affect the relation between ESG performance, ESG sentiment momentum and market valuation as growth firms might be more likely to make sustainability investments and to have more positive sentiment momentum. The results are very similar across models. In unreported results, I add other variables in the model, such as

research and development expenditures, capital expenditures and past cumulative selling, general and administrative expenses as a percentage of sales. None of those variables change the principal inferences. Overall, the results suggest that public sentiment momentum has a considerable effect on how a firm's sustainability activities are valued in the market.

5. Stock Return Results

Portfolio Construction

I construct the ESG factor sorting, each month, firms in terciles according to *ESG change* or *ESG level*.[10] The former leads to factor ESG1 and the latter to ESG2. All portfolio construction processes are described in Appendix 1. Using the industry-adjusted ESG scores from MSCI creates more industry-balanced portfolios avoiding the issue that industries where most companies have higher (lower) ESG Scores are systematically included in long (short) portfolios, although this would not necessarily affect the portfolio allocation rule based on changes rather than levels. Independently, I sort companies based on beginning of month market capitalization and allocate them into terciles. Following standard factor construction process (Fama and French 2018), I value-weight returns within each of the three size portfolios and three ESG score portfolios. Then, within each month, I calculate the equal weighted average of returns across the three size portfolios for each tercile of the ESG score. The ESG factor is then constructed as the return in the top ESG tercile of firms minus the return in the bottom ESG tercile of firms.

Long and short portfolios in factors ESG3 and ESG4 are subsets of ESG1 and ESG2 respectively. ESG3 includes in the long and short portfolios the same stocks as ESG1 but excludes from the long (short) portfolio firms at the bottom (top) tercile of *ESG level*. Effectively, it does not penalize firms for declines in ESG performance if after the decline the ESG performance is industry-leading, and it does not reward firms for increases in ESG performance if after the increase the ESG performance is industry-lagging. ESG4 includes in the long and short portfolios the same stocks as ESG2 but excludes from the long (short)

[10] I use terciles as the main portfolio construction rule as my sample is limited compared to the sample in other papers because of ESG data coverage requirements. Using quartile or quintiles leads to significantly thinner portfolios especially when I perform analysis supplementing ESG performance scores with ESG sentiment.

portfolio firms at the bottom (top) tercile of *ESG change*. Effectively, it does not penalize firms for low ESG performance if the change in ESG performance is industry-leading, and it does not reward firms for high levels of ESG performance if the change in ESG performance is industry-lagging. While ESG3 and ESG4 create portfolios with even larger differences in ESG profile, they lead to portfolios with fewer stocks increasing the variability of returns on the factor over time. ESG5 is a combination of ESG1 and ESG2 adding the companies in the long portfolios and the companies in the short portfolios. To further optimize the portfolio's ESG profile it excludes from the short (long) portfolio firms with ESG performance increases and firms that have industry-leading ESG performance as reflected in an MSCI ESG rating equal or above A (ESG performance declines and firms that have industry-lagging ESG performance as reflected in an MSCI ESG rating below B). The advantage of ESG5 is that it seeks to improve the ESG profile of the portfolio while at the same time increasing the number of stocks in each portfolio thereby creating more diversified portfolios.

I construct portfolios for each ESG factor by differentiating based on *ESG Sentiment Momentum*. Effectively, the firms in the long and short portfolios are now allocated in two distinct portfolios. To classify firms according to their *ESG Sentiment Momentum* I sort firms each month to two portfolios based on the median of the *ESG Sentiment Momentum* score. Firms that are in the long portfolio but not in the high (low) positive sentiment momentum portfolio are labelled as low (high) sentiment firms. Firms that are in the short portfolio but not in the high (low) negative sentiment portfolio are labelled as low (high) sentiment momentum firms. Indicatively, firms such as, the Movado Group, Domino's, Overstock com., and Pinnacle Financial services, have been included in the long portfolio of the low sentiment ESG factor. Firms such as Buffalo Wild Wings, Regis, Liberty Media and Eagle Bancorp have been included in the short portfolio of the low sentiment factor. Kroger, HP, Cheesecake Factory, and Ally Financial have been included in the long portfolio of the high sentiment ESG factor. Vector Group, Electronic Arts, Krispy Kreme Doughnuts, and Guess are some of the companies in the short portfolio of the high sentiment ESG factor. Appendix 2 provides an example of four companies in the restaurant industry and why they were classified in different portfolios.

Table 4 Panel A presents summary statistics for the low sentiment momentum ESG factors and Panel B for the high sentiment momentum ESG factors. By construction ESG1 and ESG3 exhibit larger differences in ESG change between the short and long portfolios rather than ESG level. The opposite is the case for ESG2 and ESG4. Furthermore, by construction, the difference in ESG change (ESG level) between the short and long portfolios is larger in ESG3 (ESG4) compared to ESG1 (ESG2). ESG5 shows large differences in both ESG level and change but also significant increase in the average number of stocks included in the short and long portfolios. Across Panels A and B, the summary statistics on both ESG change and ESG level are close to identical. By construction, what differs is sentiment. In Panel A (B) firms in the long (short) portfolio have lower *ESG Sentiment* and *ESG Sentiment Momentum*. The difference in *ESG Sentiment* is orders of magnitude lower than the difference in *ESG Sentiment Momentum*. This is important as it suggests that what differs dramatically across portfolios is the trajectory of the sentiment rather than the overall sentiment about a company. This means that even though the long portfolio in the low sentiment momentum ESG factor has low sentiment momentum the overall sentiment is not negative. Moreover, the average *ESG Sentiment* is higher than 50 for all portfolios suggesting that on average the samples have more positive rather than negative sentiment even when there is negative momentum. These statistics suggest that investors that care about ESG impacts would not find themselves in a position of investing in stocks that would be outside their mandate (i.e. tobacco, coal etc.).

Stock Returns Analysis

Table 5 Panel A shows estimates for raw returns and t-statistics rejecting the null hypothesis that the average monthly return on ESG1 and ESG2 factors is zero. The first two estimates are for the factors comprising all stocks independent of sentiment. The average return is positive and marginally significant in the case of ESG change (18 basis points monthly) or significant in the case of ESG level (24 basis points monthly). The remaining columns present estimates separating the sample to the low and high sentiment samples. The average raw return on the ESG factors is much higher for the low sentiment sample. The average return based on ESG change and ESG level are 38 and 34 basis points monthly respectively. Both estimates are

highly statistically significant. In contrast, for the high sentiment sample the estimates are only 6 and 17 basis points and insignificant.

Panel B presents the results for factors ESG3-ESG5. For the low sentiment sample all factors have positive and highly significant average raw returns. Based on ESG change (ESG3) the estimate rises to 0.47, ESG level (ESG4) to 0.40 and combined ESG change and level (ESG5) to 0.35. All are significant. In contrast, the estimates among the high sentiment sample are not statistically different from zero. The higher returns in Panel B suggests that further improving the ESG profile of the factor is beneficial to investment returns. Figures 2c, 2b and 2c present graphically over time the returns to factors ESG3, ESG4 and ESG5. To keep the figures concise, I omit ESG1 and ESG2 as they provide similar insights. The low sentiment factors performed well in the early and late years of the analysis period. The high sentiment factors exhibit their worst performance in the late years. In fact, they yield negative returns after 2014. Lower average returns and higher standard deviation of returns leads to the high sentiment ESG factors exhibiting a Sharpe ratio between 0.04 and 0.11. In contrast, the Sharpe ratio of the low sentiment ESG factors ranges between 0.23 and 0.29. The Sharpe ratios of the size, value, and momentum factors during the same period have been 0.08, -0.05 and -0.05 for comparison purposes. The profitability and investment factors had a Sharpe ratio of 0.07 and 0.01 respectively. The correlation between ESG1 and ESG2 is close to 0.61 suggesting that ESG factors based on changes and levels yield returns with high positive correlation but at the same time they are distinct strategies.

Table 6 follows the same structure as Table 5 but instead reports results from the four-factor model. I use the ESG factor returns as the dependent variable in a model where independent variables include the Fama-French (1993) market, size and value factors supplemented by the momentum factor (Carhart 1997). The results for ESG1 and ESG2 are in Panel A. The alpha for both ESG1 and ESG2 among all firms is positive (21 and 23 basis points) and significant. The two strategies have very different loadings on the factors. Using ESG change as the basis for portfolio construction yields portfolio returns with a negative loading on the market and value factors and a positive loading on the size factor. The coefficient on the momentum factor is insignificant. In contrast, using ESG level as the basis for portfolio construction yields

portfolio returns with a negative loading on the momentum and value factors. The coefficients on the market and size factors are insignificant.

Perhaps more interestingly, these results differ dramatically across low and high sentiment samples. The ESG1 and ESG2 factors for the low sentiment sample yield alphas monthly of 37 and 30 basis points respectively. ESG1 is not correlated with any of the factors while ESG2 exhibits a negative correlation only with the momentum factor. In contrast, the ESG1 and ESG2 factors for the high sentiment sample yield positive but insignificant alphas. ESG1 exhibits large negative loadings on the market and value factors and a positive loading on the size factor. The coefficient on the momentum factor is insignificant. ESG2 exhibits large negative loadings on the momentum and value factors. The coefficients on the market and size factors are insignificant. The returns on the ESG factor among high sentiment firms are correlated strongly with the returns of growth firms. The t-statistics of the coefficients on the value factors rise to 4.5-6.1 region suggesting very reliable associations.

Panel B shows the models for factors ESG3-ESG5. The results tell a similar story. Alphas on the ESG factors among low sentiment firms are between 35 and 38 basis points. The annual abnormal returns in the range of 4.3-4.7% are very significant. In contrast, among high sentiment firms, alphas are much lower, insignificant, and exhibit strong associations with other factors, in particular, the value factor. The loading on the value factor is consistent with firms with more positive sentiment momentum and strong ESG performance having higher valuation multiples. In more recent years, between 2015 and 2018, the low sentiment ESG factor yields a positive and significant monthly alpha of about 27 basis points. In contrast, the high sentiment ESG factor yields a negative but insignificant monthly alpha of about 12 basis points.

In Table 7, I add the gross profitability and the investment factor as independent variables in the model. The results are similar for the low sentiment ESG factors. The high sentiment ESG factors exhibit strong correlation with all other factors. The estimates suggest strong negative loadings with the market, momentum, value and investment factors and positive loadings on the size and profitability factors. The high sentiment ESG factor does better when market returns are lower, and it behaves similar to investing in small, growth, high profitability, low momentum and aggressive investing firms.

Sorts on Size

To understand better the source of the significant alphas on the ESG factor, I estimate the four-factor model separately for firms that are classified in each month in terciles according to beginning of month market capitalization. Table 8 Panel A shows the results for each tercile of the low sentiment ESG5 factor. The alpha is positive and significant across all terciles but its magnitude declines moving from small to medium and large firms. Statistical significance declines as the portfolios become less diversified and as a result the standard deviation of portfolio returns across months increases. The alpha increases from 26 basis points for the large size sample to 36 basis points for the medium size sample and to 46 basis points for the small size sample. It is worth highlighting that firms are labelled small or large in relative terms within the sample. The firms in the small size sample are not small in absolute terms, as the ESG data coverage universe is tilted towards large liquid firms.

Sorts on Market-to-Book ratio

Panel B presents similar analysis but now the three portfolios are formed based on beginning of month market-to-book ratio (MTB). The alpha is positive and significant for both value and growth firms and insignificant for the neutral portfolio. The alpha is 59 basis points within the sample of value firms and 42 basis points within the sample of growth firms. Both results for the size and MTB terciles should be interpreted with caution as the portfolio decomposition produces more concentrated portfolios. Future research can corroborate or reject these results as ESG data becomes more widely available.

I now turn to analyze international data to understand whether the results generalize to other markets. It is not clear that this would be the case. Different markets have had different business, corporate reporting and investment management developments and the role that news and thereby public sentiment might play in capital markets is likely to be different. But importantly, the sentiment data derive from articles in English. Thereby in non-English speaking countries the data omit a large fraction of the news that comprise public sentiment.

6. International Data

Data and Sample

The data for international firms comes from Compustat Global. I calculate returns for each month from the securities file and convert all prices and market capitalization data to US dollars based on exchange rates from Bloomberg. Because TruValue Labs coverage of international firms starts later in the sample and more firms are needed in each country for portfolio construction, I use data spanning 1st of January 2010 and 30th of June 2018. Therefore, all tests on the international sample use 102 monthly observations.

Table 9 Panel A shows that the number of stocks with available data in MSCI, TruValue and Compustat Global increases from about 500 companies in 2010 to about 2,000 companies in 2018. The total number of observations is 124,603 firm-month pairs. Panel B presents summary statistics for the whole international sample. A few observations are worth pointing out. First, according to MSCI the international firms in the sample have slightly better performance than the US firms. Of course, this could be because the international firms in the sample are much larger than the US firms. Median market capitalization in the international sample is about $6.2 billion. This is not surprising given the coverage criteria for both MSCI and TruValue. Both data providers cover stocks in the major stock indices within each country. The median MTB ratio is lower in the international sample at 1.73.

Portfolio Construction

The analysis in the international sample uses the portfolio construction process of ESG5. While ESG5 did not yield the highest returns among the different ESG factors it is best suited for this sample as it increases the number of stocks in both the long and short portfolios. This is especially important in the international sample where the process requires enough stocks within each country or sub-region stock exchange. ESG5 for international firms is constructed in the same way as ESG5 for US firms but with an extra step where returns are averaged across portfolios of stock exchange country or sub-regions after the process for ESG5 has been followed within each exchange country or sub-region. This ensures that the portfolios are not dominated by stocks of specific exchange countries or sub-regions if some exchange countries or sub-regions tend to exhibit higher or lower ESG scores. I construct two factors. The first, $ESG5_{INT1}$, averages returns across exchange countries and the second, $ESG5_{INT2}$, averages returns across sub-regions that lump together several countries. The advantage of the first version is that it assigns equal importance in the

calculation to each country thereby mitigating the effect of country-specific factors. However, its advantage is its drawback as it assigns equal importance to exchanges that have large market size and exchanges with small market size. The second version, $ESG5_{INT2}$, addresses this concern by creating sub-regions and lumping together exchanges to create closer to equal size stock exchange sub-regions.

For $ESG5_{INT1}$ ($ESG5_{INT2}$) each month, every stock is sorted independently within an exchange country (sub-region) in terciles according to the change, level in ESG performance and beginning of month market capitalization. For the firms in the top tercile of ESG change or level, value-weighted returns within each country (sub-region) and size tercile ($ESG_{TOPsmall}$, $ESG_{TOPmedium}$, $ESG_{TOPlarge}$) are calculated each month. The equal weighted-return across the three size terciles ($ESG_{TOPsmall}$, $ESG_{TOPmedium}$, $ESG_{TOPlarge}$) within a country (sub-region) is the return for that month and country (sub-region) ESG_{TOP}. The overall return for the long portfolio of the ESG factor then is the equal-weighted return across all countries (sub-regions). For the firms in the bottom tercile of ESG change or level, value-weighted returns within each country (sub-region) and size tercile ($ESG_{BOTsmall}$, $ESG_{BOTmedium}$, $ESG_{BOTlarge}$) are calculated each month. The equal weighted-return across the three size terciles ($ESG_{BOTsmall}$, $ESG_{BOTmedium}$, $ESG_{BOTlarge}$) is the return for that month and country (sub-region) ESG_{BOT}. The overall return for the short portfolio of the ESG factor then is the equal-weighted return across all countries (sub-regions). The ESG factor then is the difference between ESG_{TOP} and ESG_{BOT} in each month.

I classify firms into 12 sub-regions. The goal is to have sub-regions with enough companies to populate the portfolios while lumping together countries that share common characteristics shaping a firm's efforts in the ESG domain. For countries with enough observations to stand on their own in the portfolio construction, such as Japan, I treat them as separate sub-regions. The two exceptions are Australia and the UK. While there are enough observations and it would be possible to represent standalone sub-regions, I lump with them other countries that they share common characteristics and where these other countries do not have enough observations to stand on their own. In the region of Asia-Pacific, the sub-regions are 1) Australia and New Zealand, 2) Japan, 3) South-East Asia, including India, Indonesia, Thailand, Philippines and Malaysia, 4) Chinese provinces and special administrative regions, China, Hong Kong and Taiwan,

and 5) other high GDP Asian countries, South Korea and Singapore. In the region of EMEA, the sub-regions are 1) Central Europe, including Austria, Belgium, Switzerland, Netherlands, and Poland 2) Germany, 3) France, 4) the Nordics, 5) Mediterranean and Middle East, including Italy, Spain, Greece, Turkey, United Arab Emirates and Egypt, 6) British Isles, UK and Ireland and 7) South Africa.

Table 10 presents summary statistics for the long and short portfolios across all geographies to keep the table concise. Note that the companies included in the long and short portfolios are the same across $ESG5_{INT1}$ and $ESG5_{INT2}$. What differs across the two is the weight of each exchange country in the portfolio. Therefore, across both factors the summary statistics are the same as tabulated in Table 10. As with Table 4 the statistics for ESG change and ESG level are almost identical across the low and high sentiment groups. The short and long portfolios exhibit very large differences both in *ESG change* and *ESG level*. Again, the differences for *ESG sentiment* are moderate but the differences for *ESG sentiment momentum* are very large.

Results

Table 11, Panel A presents the estimates both for raw returns and the results from estimating the four-factor model for $ESG5_{INT1}$. The factors are for the global market excluding the United States. The low sentiment ESG factor has average returns of 44 basis points monthly and this estimate is statistically significant. The alpha is 57 basis points and significant. There is a negative loading on the market factor suggesting that in the international sample the ESG factor performs better during months with lower market returns. The same is true for the high sentiment ESG factor. The alpha is negative but insignificant for this sample.

Panel B presents the estimates both for raw returns and the results from estimating the four-factor model for $ESG5_{INT2}$. The low sentiment ESG factor has average returns of 23 basis points monthly and this estimate is statistically significant. The alpha is 35 basis points and significant. There is a negative loading on the market and the size factor suggesting that in the international sample the ESG factor exhibits returns that resemble more the returns of large firms. The same is true for the high sentiment ESG factor. The alpha is positive and larger for the high sentiment $ESG5_{INT2}$ compared to $ESG5_{INT1}$. Further exploration suggests that this is driven primarily by Japan, which in $ESG5_{INT2}$ has a larger weight and where the high (low) sentiment ESG factor performs well (poorly) during the period of the analysis. When I decompose the

international sample to the EMEA and the Asia-Pacific ex Japan region I find that the low sentiment ESG factor yields positive and significant alpha in both regions.

7. Conclusion

The importance of public sentiment is well captured in the quote by Abraham Lincoln at the beginning of this paper. During a speech he used it to defend his position for abolishing slavery against his opponent Stephen Douglas, who accused Lincoln of hypocrisy by linking him to a document with extremist positions. But while the importance of public sentiment was early on recognized by Lincoln and has been linked more recently in the academic literature to a series of economic phenomena, such as consumer spending, we have little evidence how it impacts the valuation of corporate activities and the returns to those activities.

According to the evidence presented in this paper, public sentiment momentum about a firm's sustainability activities has significant implications for the valuation of corporate sustainability activities and the performance of portfolios that seek alignment with better ESG performance. In the presence of negative public sentiment, firm sustainability activities are valued less and associated with positive abnormal returns in the future. No such future positive abnormal returns are associated with firm sustainability activities in the presence of positive public sentiment.

This paper is a first attempt at understanding the role of public sentiment in how markets value corporate sustainability activities. Many questions remain unanswered. For example, how public sentiment about a firm's sustainability activities forms and what is the role of corporate disclosures both in shaping sentiment but also in response to it? How do firms change their corporate sustainability activities in response to changes in public sentiment? These and other questions are likely to lead to a more complete understanding of the field in the intersection of business and society.

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Appendix 1

Factor	Description
ESG1: ESG changes	Each month, every stock is sorted independently in terciles according to the change in ESG performance and beginning of month market capitalization. For the firms in the top tercile of ESG change, value-weighted returns within each size tercile ($ESG_{TOPsmall}$, $ESG_{TOPmedium}$, $ESG_{TOPlarge}$) are calculated each month. The equal weighted-return across the three size terciles ($ESG_{TOPsmall}$, $ESG_{TOPmedium}$, $ESG_{TOPlarge}$) is the return for that month ESG_{TOP}. For the firms in the bottom tercile of ESG change, value-weighted returns within each size tercile are calculated each month $ESG_{BOTsmall}$, $ESG_{BOTmedium}$, $ESG_{BOTlarge}$. The equal weighted-return across the three size terciles ($ESG_{BOTsmall}$, $ESG_{BOTmedium}$, $ESG_{BOTlarge}$) is the return for that month ESG_{BOT}. ESG1 is the difference between ESG_{TOP} and ESG_{BOT} in each month. The low (high) sentiment version of the factor includes in the TOP and BOT portfolios only stocks that are below (above) median in the ESG sentiment momentum score
ESG2: ESG levels	Each month, every stock is sorted independently in terciles according to the level of ESG performance and beginning of month market capitalization. For the firms in the top tercile of ESG level, value-weighted returns within each size tercile ($ESG_{TOPsmall}$, $ESG_{TOPmedium}$, $ESG_{TOPlarge}$) are calculated each month. The equal weighted-return across the three size terciles ($ESG_{TOPsmall}$, $ESG_{TOPmedium}$, $ESG_{TOPlarge}$) is the return for that month ESG_{TOP}. For the firms in the bottom tercile of ESG levl, value-weighted returns within each size tercile are calculated each month $ESG_{BOTsmall}$, $ESG_{BOTmedium}$, $ESG_{BOTlarge}$. The equal weighted-return across the three size terciles ($ESG_{BOTsmall}$, $ESG_{BOTmedium}$, $ESG_{BOTlarge}$) is the return for that month ESG_{BOT}. ESG2 is the difference between ESG_{TOP} and ESG_{BOT} in each month. The low (high) sentiment version of the factor includes in the TOP and BOT portfolios only stocks that are below (above) median in the ESG sentiment momentum score
ESG3: ESG changes accounting for ESG level	ESG3 follows the same process with ESG1 but excludes companies in a given month from the TOP (BOT) portfolio that are in the bottom (top) tercile of ESG performance level
ESG4: ESG levels accounting for ESG change	ESG4 follows the same process with ESG2 but excludes companies in a given month from the TOP (BOT) portfolio that are in the bottom (top) tercile of ESG performance change
ESG5: ESG combined changes and levels	ESG5 combines in the TOP (BOT) portfolio, in any given month, stocks that are in ESG1 or ESG2 TOP (BOT) portfolio and imposes absolute filters. Excludes companies from the TOP portfolio with lower than ESG B rating (<=1.4 ESG score) or negative ESG performance change in a given month. Excludes companies from the BOTTOM portfolio with ESG A rating and above (=>5.7 ESG score) or positive ESG performance change in a given month
$ESG5_{INT1}$: ESG5 International Sample by Exchange Country	Each month, every stock is sorted independently in terciles according to the level, change in ESG performance and beginning of month market capitalization. For the firms in the top tercile of ESG level or change, value-weighted returns within each size tercile ($ESG_{TOPsmall}$, $ESG_{TOPmedium}$, $ESG_{TOPlarge}$) are calculated each month separately for each exchange country. The equal weighted-return across the three size terciles ($ESG_{TOPsmall}$, $ESG_{TOPmedium}$, $ESG_{TOPlarge}$) is the return for that month ESG_{TOP} separately for each exchange country. The portfolio level ESG_{TOP} each month is then the equal weighted average of the exchange country specific ESG_{TOP}. For the firms in the bottom tercile of ESG level or change, value-weighted returns within each size tercile are calculated each month $ESG_{BOTsmall}$, $ESG_{BOTmedium}$, $ESG_{BOTlarge}$ separately for each exchange country. The equal weighted-return across the three size terciles ($ESG_{BOTsmall}$, $ESG_{BOTmedium}$, $ESG_{BOTlarge}$) is the return for that month ESG_{BOT} separately for each exchange country. The portfolio level ESG_{BOT} each month is then the equal weighted average of the exchange country specific ESG_{BOT}. $ESG5_{INT1}$ is the difference between ESG_{TOP} and ESG_{BOT} in each month

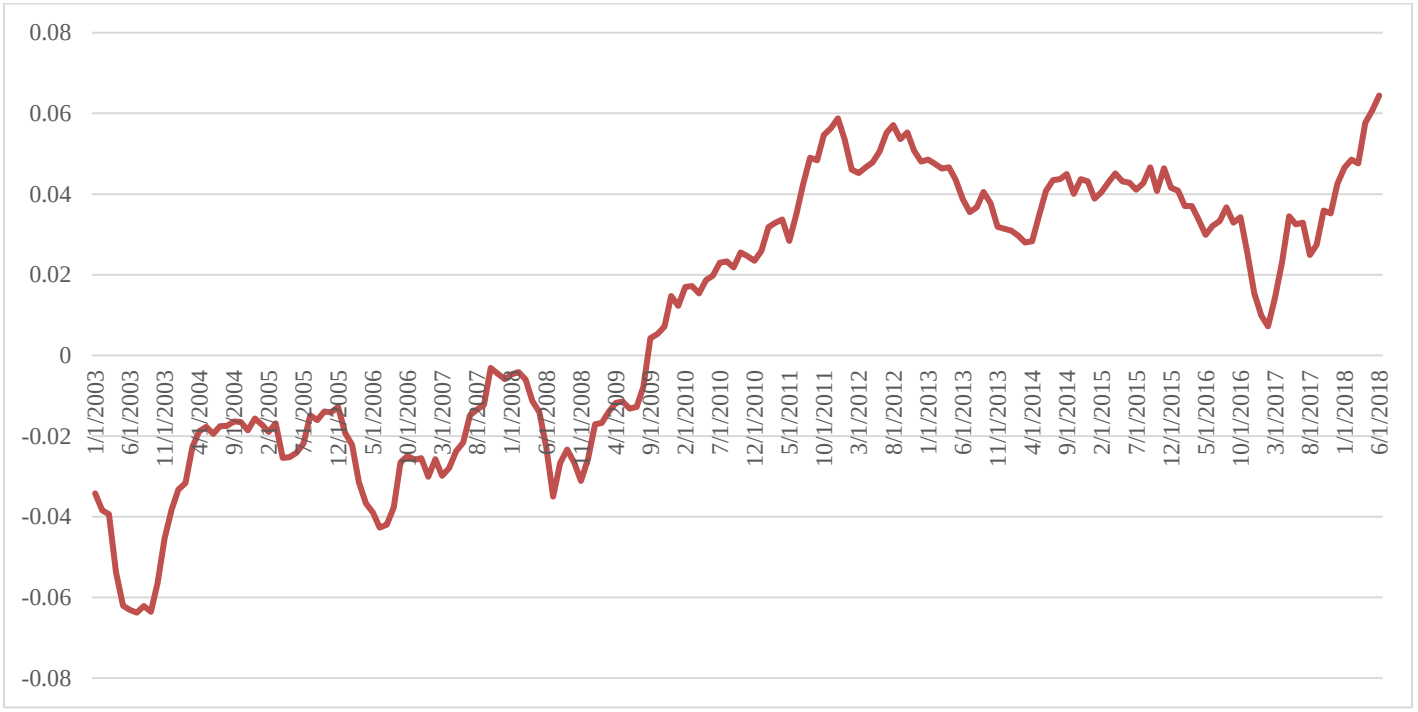
$ESG5_{INT2}$: ESG5 International Sample by Exchange Region	Each month, every stock is sorted independently in terciles according to the level, change in ESG performance and beginning of month market capitalization. For the firms in the top tercile of ESG level or change, value-weighted returns within each size tercile ($ESG_{TOPsmall}$, $ESG_{TOPmedium}$, $ESG_{TOPlarge}$) are calculated each month separately for each exchange region. The equal weighted-return across the three size terciles ($ESG_{TOPsmall}$, $ESG_{TOPmedium}$, $ESG_{TOPlarge}$) is the return for that month ESG_{TOP} separately for each exchange region. The portfolio level ESG_{TOP} each month is then the equal weighted average of the exchange region specific ESG_{TOP}. For the firms in the bottom tercile of ESG level or change, value-weighted returns within each size tercile are calculated each month $ESG_{BOTsmall}$, $ESG_{BOTmedium}$, $ESG_{BOTlarge}$ separately for each exchange region. The equal weighted-return across the three size terciles ($ESG_{BOTsmall}$, $ESG_{BOTmedium}$, $ESG_{BOTlarge}$) is the return for that month ESG_{BOT} separately for each exchange region. The portfolio level ESG_{BOT} each month is then the equal weighted average of the exchange region specific ESG_{BOT}. $ESG5_{INT2}$ is the difference between ESG_{TOP} and ESG_{BOT} in each month

Appendix 2

	Domino's Pizza	Buffalo Wild Wings	The Cheesecake Factory	Krispy Kreme Doughnuts
ESG Performance	High	Low	High	Low
ESG Sentiment Momentum	Low	High	High	Low
ESG Performance	5.2	2.6	5.2	2.6
Climate Change	9.3	6.0	7.1	6.0
Product Safety & Quality	3.0	2.5	5.6	2.6
Opportunities in Nutrition & Health	4.4	1.6	2.5	0.2
ESG Sentiment Momentum	15.0	76.4	87.0	17.1
Customer Welfare	36.6	87.4	85.4	19.0
Fair Disclosure & Marketing	72.1	91.6	67.2	14.9
Product Quality & Safety	32.3	87.3	87.2	18.1
Fuel Management	50.0	N/A	50.0	50.0
Greenhouse Gas Emissions	N/A	N/A	50.0	N/A

The restaurant industry provides an illustration of the selection process of the proposed long-short portfolio. I intentionally choose examples of companies that tend to focus on the broad customer base of the restaurant industry instead of niche players that offer only healthy food. All companies entered in the ESG5 portfolios around March 2014 and apart from Krispy Kreme they were still in the portfolios until June 2018. The table provides ESG performance and sentiment momentum data from 2014 for Domino's Pizza (High ESG Performance – Low ESG Sentiment), Buffalo Wild Wings (Low ESG Performance – High ESG Sentiment), The Cheesecake Factory (High ESG Performance – High ESG Sentiment) and Krispy Kreme Doughnuts (Low ESG Performance – Low ESG Sentiment). The ESG performance score is the overall industry-adjusted ESG score provided by MSCI. The selected ESG performance sub-topics are components of the overall ESG performance score that are emphasized as they are driving the differences across companies. MSCI assigns a higher weight on social than environmental or governance issues within the restaurant industry. MSCI applies an approximate 60%-30%-10% weighting for social, environmental and governance issues, respectively, which reflects the weighting of the importance of these issues for the restaurant industry. Domino's Pizza has a high "Climate Change" score in addition to relatively higher "Product Safety & Quality" score and "Opportunities in Nutrition & Health" score. Comparatively, Buffalo Wild Wings receives a "low" ESG performance score due to relatively lower performance on all three categories. A similar analysis explains the difference in ESG performance scores between The Cheesecake Factory and Krispy Kreme Doughnuts. ESG sentiment scores show a much more positive sentiment for Buffalo Wild Wings and The Cheesecake Factory compared to Domino's Pizza and Krispy Kreme Doughnuts. Given that all four companies have either missing data or the same scores for environmental sub-topics, their overall ESG sentiment score is driven by the social dimensions of "Customer Welfare", "Fair Disclosure & Marketing" and "Product Quality & Safety" scores.

Figure 1: Market Valuation of Corporate ESG Performance Score over time



Note: Figure 1 plots the exponentially weighted moving average coefficient on ESG performance from cross-sectional models. For each month, I estimate models where the dependent variable is the natural logarithm of the market-to-book ratio (MTB). MTB is measured at the end of each month as the market capitalization from CRSP and the most recent publicly available total shareholder's equity from the quarterly Compustat file. Independent variables include the ESG performance score from MSCI, firm profitability (ROE), firm size (natural logarithm of end of month market capitalization), past one-year sales growth, past six-month stock returns, and financial leverage (one minus total shareholder's equity over total assets). The model includes two-digit SIC code fixed effects for the US sample. To mitigate the likelihood that differences over time are driven by changes in the sample as ESG data coverage increases over time, a firm is included if it appears at least 120 months. MSCI scores are available starting 2003.

Figure 2a: Evolution of $1 invested in ESG3: Changes in ESG Performance

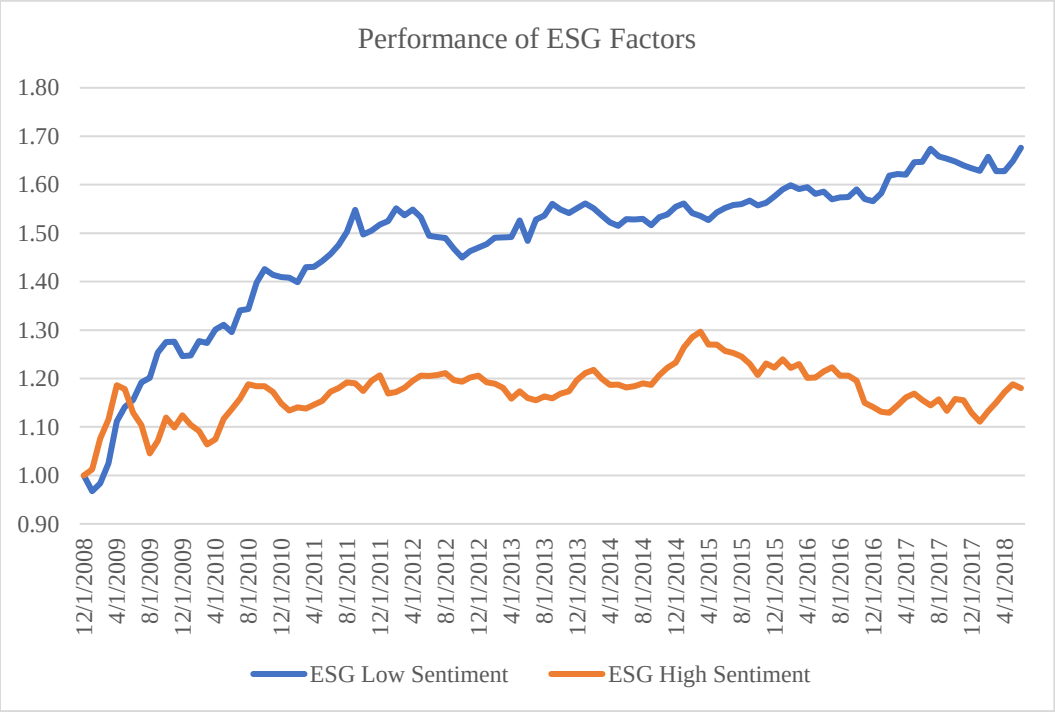


Figure 2b: Evolution of $1 invested in ESG4: Levels of ESG Performance

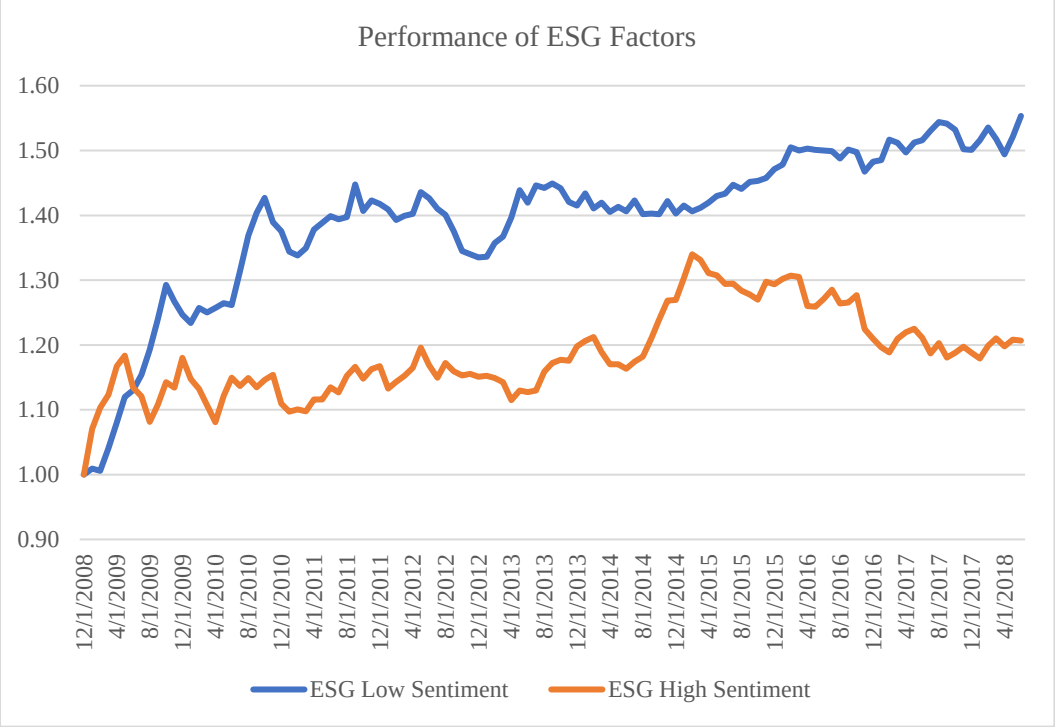
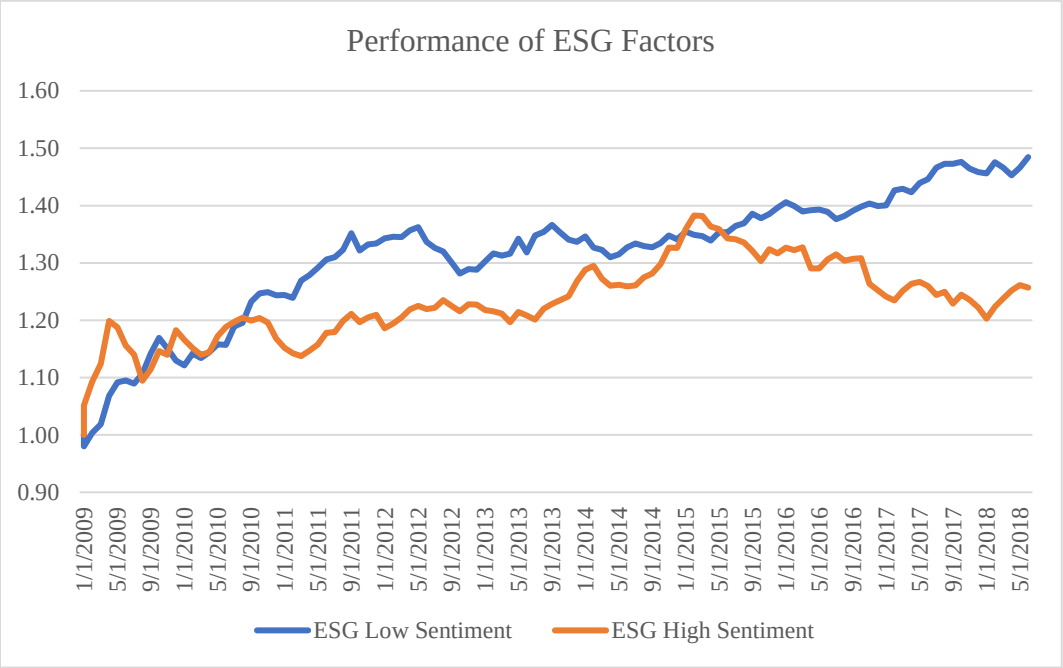


Figure 2c: Evolution of $1 invested in ESG5: Changes and Levels of ESG Performance



Note: Figures 2a-2c plot the evolution of $1 dollar invested in the ESG1, 2 and 5 factors for high and low sentiment samples. ESG factor portfolio construction is defined in the Appendix. The period is 1/1/2009 until 6/30/2018.

Figure 3a: Evolution of $1 invested in $ESG5_{INT1}$ Global x US

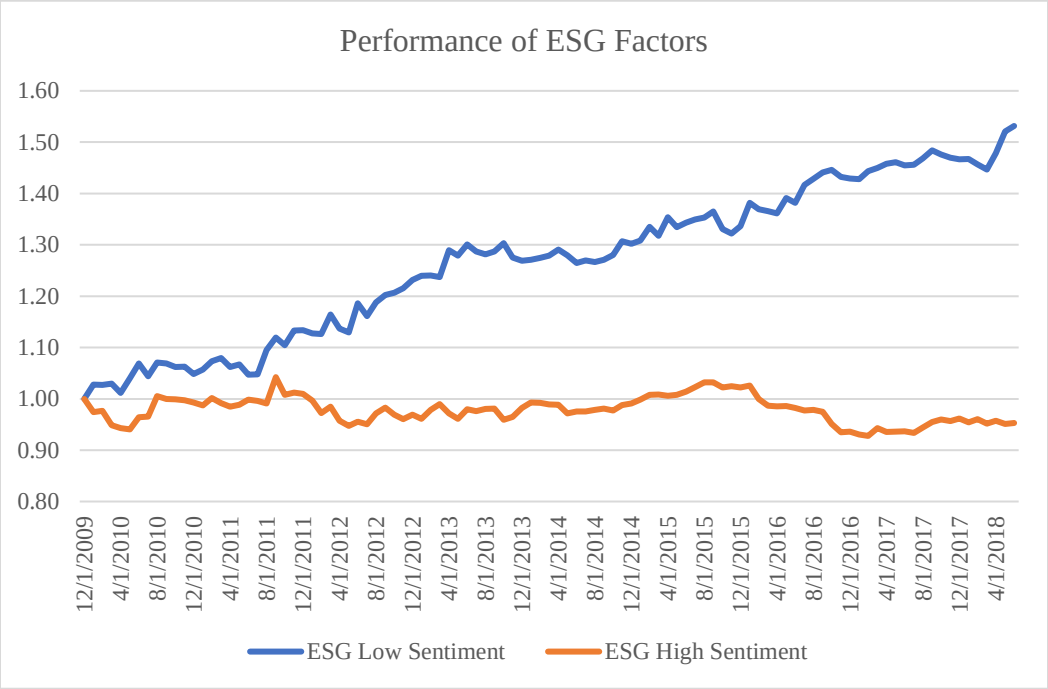
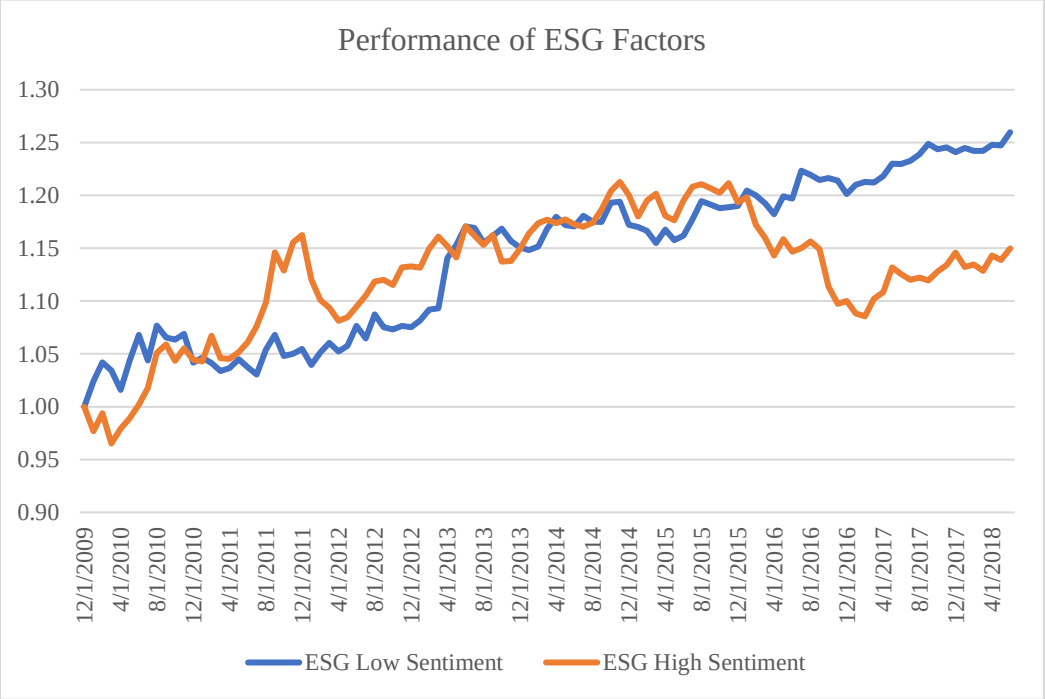


Figure 3b: Evolution of $1 invested in the long and short portfolios of $ESG5_{INT2}$ Global x US



Note: Figures 3a-3b plot the evolution of $1 dollar invested in the $ESG5_{INT1}$ and $ESG5_{INT2}$ factor for high and low sentiment samples. Portfolio construction is defined in the Appendix. The period is 1/1/2010 until 6/30/2018.

Table 1

Summary Statistics for Market Valuation Analysis Sample

Variable Name	Mean	Median	Std Dev	Interquartile Range
ESG Performance	4.47	4.40	1.09	1.30
ESG Sentiment Momentum	51.42	50.00	25.82	48.99
Past Return	0.08	0.07	0.28	0.27
Leverage	0.57	0.58	0.23	0.34
Log Market Cap	14.94	14.81	1.57	2.25
Log MTB	0.95	0.91	0.75	1.05
Revenue growth	0.07	0.05	0.22	0.15
ROE	0.08	0.10	0.27	0.14

ESG performance is the level of a firm's ESG performance in a given month as rated by MSCI's weighted-average score. ESG Sentiment Momentum is TruValue Labs' Momentum score which is derived from the Insight Score and measured as the slope or trajectory over a trailing 12-month time (TTM) period. Past return is the cumulative stock returns over the past six months. Leverage is one minus total equity over total debt. Log Market Cap is the natural logarithm of beginning of month market capitalization. Log MTB is the natural logarithm of end of month market-to-book ratio. Revenue growth is past one-year revenue growth rate. ROE is net income over total shareholders' equity. Data span the period from 1st of January 2009 to 30th of June 2018 and they are measured monthly. Number of observations is 138,349.

Table 2

Panel A: Number of Companies by Month

Year	Month	N	Year	Month	N	Year	Month	N	Year	Month	N	Year	Month	N
2009	1	337	2011	1	350	2013	1	543	2015	1	1723	2017	1	1900
2009	2	337	2011	2	349	2013	2	558	2015	2	1724	2017	2	1939
2009	3	337	2011	3	356	2013	3	565	2015	3	1738	2017	3	1928
2009	4	332	2011	4	364	2013	4	567	2015	4	1739	2017	4	1941
2009	5	339	2011	5	380	2013	5	582	2015	5	1738	2017	5	1932
2009	6	343	2011	6	384	2013	6	602	2015	6	1746	2017	6	1934
2009	7	347	2011	7	389	2013	7	612	2015	7	1790	2017	7	1932
2009	8	350	2011	8	394	2013	8	619	2015	8	1813	2017	8	1966
2009	9	340	2011	9	395	2013	9	635	2015	9	1811	2017	9	1960
2009	10	343	2011	10	399	2013	10	675	2015	10	1810	2017	10	1954
2009	11	343	2011	11	401	2013	11	803	2015	11	1844	2017	11	1944
2009	12	344	2011	12	403	2013	12	871	2015	12	1850	2017	12	1933
2010	1	341	2012	1	408	2014	1	1443	2016	1	1837	2018	1	1931
2010	2	343	2012	2	410	2014	2	1473	2016	2	1860	2018	2	1947
2010	3	345	2012	3	413	2014	3	1534	2016	3	1866	2018	3	1934
2010	4	345	2012	4	414	2014	4	1554	2016	4	1896	2018	4	1920
2010	5	352	2012	5	416	2014	5	1565	2016	5	1895	2018	5	1902
2010	6	344	2012	6	421	2014	6	1591	2016	6	1897	2018	6	1889
2010	7	347	2012	7	423	2014	7	1599	2016	7	1895			
2010	8	338	2012	8	431	2014	8	1610	2016	8	1892			
2010	9	348	2012	9	431	2014	9	1621	2016	9	1876			
2010	10	336	2012	10	438	2014	10	1628	2016	10	1924			
2010	11	341	2012	11	526	2014	11	1631	2016	11	1922			
2010	12	347	2012	12	536	2014	12	1672	2016	12	1909			

Panel B: Summary Statistics for Stock Return Analyses Sample

Variable	Mean	Median	Std Dev	Interquartile Range
ESG Level	4.21	4.10	2.00	2.80
ESG Change	0.04	0.00	1.27	1.30
ESG Sentiment	61.81	63.71	15.62	19.79
ESG Sentiment Momentum	51.25	50.00	26.05	49.72
Log Market Cap	15.12	15.03	1.57	2.25
Log MTB	0.95	0.92	0.75	1.04

In Panel A, number of stocks is the number of stocks with available data from MSCI, TruValue Labs, and CRSP. The number of observations is 123,384 firm-month pairs. In Panel B, ESG level is the level of a firm's ESG performance in a given month as rated by MSCI's industry-adjusted score. ESG change is the change in a firm's ESG performance in a given month, calculated as the difference from the previous MSCI rating and maintained at this value for the minimum of, until the score is updated or 24 months. ESG sentiment is the Insight Score from TruValue Labs calculated as an exponentially-weighted moving average of daily sentiment scores where the half-life of an event's influence on the Insight score is 6 months. ESG Sentiment Momentum is TruValue Lab's Momentum score which is derived from the Insight Score and measured as the slope or trajectory over a trailing 12-month time (TTM) period. Log Market Cap is the natural logarithm of beginning of month market capitalization in millions of USD. Log MTB is the natural logarithm of end of month market-to-book ratio. Data span the period from 1st of January 2009 to 30th of June 2018 and they are measured monthly.

Table 3

Panel A: Market Valuation of Corporate ESG Performance Scores and Public Sentiment

Parameter	Estimate	t-value	Estimate	t-value	Estimate	t-value
Intercept	-0.55595	-4.24	-0.55603	-4.24	-0.55631	-4.24
ESG Performance	0.03043	3.22	0.03043	3.22	0.03034	3.22
ESG Sentiment Momentum			0.00002	0.14	0.00003	0.20
ESG Performance*ESG Sentiment Momentum					0.00044	2.90
Past Return	0.52341	12.01	0.52339	12.01	0.52326	11.98
Leverage	0.43290	6.98	0.43291	6.98	0.43208	6.97
Log Market Cap	0.11372	12.82	0.11372	12.82	0.11372	12.83
Revenue Growth	0.40213	11.11	0.40211	11.11	0.40242	11.12
ROE	0.22268	4.77	0.22263	4.76	0.22213	4.76
Industry effects	Yes		Yes		Yes	
Year-month effects	Yes		Yes		Yes	
Adj R-squared	39.47%		39.47%		39.49%	

The dependent variable is Log MTB, the natural logarithm of end of month market-to-book ratio. ESG performance is the level of a firm's ESG performance in a given month as rated by MSCI's weighted-average score. ESG Sentiment Momentum is TruValue Lab's Momentum score which is derived from the Insight Score and measured as the slope or trajectory over a trailing 12-month time (TTM) period. I demean ESG Level and ESG Sentiment Momentum to facilitate interpretation of the interaction term. Past return is the cumulative stock returns over the past six months. Leverage is one minus total equity over total debt. Log Market Cap is the natural logarithm of beginning of month market capitalization. Revenue growth is past one-year revenue growth rate. ROE is net income over total shareholder's equity. Data span the period from 1st of January 2009 to 30th of June 2018 and they are measured monthly. Standard errors are clustered at the firm level and are robust to heteroscedasticity. Number of observations is 138,349.

Panel B: Market Valuation of Corporate ESG Performance Scores and Public Sentiment - Additional Models

Parameter	Estimate	t-value	Estimate	t-value	Estimate	t-value
Intercept	-1.20552	-9.48	-1.22630	-9.57	-1.30268	-10.27
ESG Level	0.01961	2.23	0.02028	2.31	0.02108	2.41
ESG Sentiment Momentum	0.00004	0.24	0.00004	0.25	0.00002	0.12
ESG Level*ESG Sentiment Momentum	0.00046	3.22	0.00042	2.96	0.00042	2.96
Past Return	0.50965	11.50	0.51381	11.43	0.51814	11.40
Leverage	0.59679	10.11	0.60684	10.19	0.64157	10.78
Log Market Cap	0.12723	15.24	0.12701	15.22	0.12621	15.26
Revenue Growth	0.34684	9.85	0.28325	8.20	0.15742	4.62
3-year Revenue Growth			0.04392	2.76	0.01909	0.85
ROE	0.00135	0.03	0.02370	0.53	-0.00373	-0.08
Gross Margin	1.26268	18.71	1.27053	18.57	1.33307	19.15
Asset Growth					0.27408	9.17
3-year Asset Growth					0.03645	1.72
Industry effects	Yes		Yes		Yes	
Year-month effects	Yes		Yes		Yes	
Adj R-squared	46.75%		47.07%		47.65%	

The dependent variable is Log MTB, the natural logarithm of end of month market-to-book ratio. ESG level is the level of a firm's ESG performance in a given month as rated by MSCI's industry-adjusted score. ESG Sentiment Momentum is TruValue Lab's Momentum score which is derived from the Insight Score and measured as the slope or trajectory over a trailing 12-month time (TTM) period. I demean ESG Level and ESG Sentiment Momentum to facilitate interpretation of the interaction term. Past return is the cumulative stock returns over the past six months. Leverage is one minus total equity over total debt. Log Market Cap is the natural logarithm of beginning of month market capitalization. Revenue growth is past one-year revenue growth rate. 3-year Revenue growth is past three-year revenue growth rate. ROE is net income over total shareholder's equity. Asset growth is past one-year asset growth rate. 3-year Asset growth is past three-year asset growth rate. Data span the period from 1st of January 2009 to 30th of June 2018 and they are measured monthly. Standard errors are clustered at the firm level and are robust to heteroscedasticity. Number of observations is 138,349 for the first model and 137,270 for the second and third models.

Table 4

Panel A: Summary Statistics for Low Sentiment ESG Factor

		ESG1		ESG2		ESG3		ESG4		ESG5	
Variable	Portfolio	Mean	St Dev	Mean	St Dev	Mean	St Dev	Mean	St Dev	Mean	St Dev
ESG Level	Short	3.67	1.88	2.03	0.87	2.87	1.29	1.96	0.92	2.78	1.42
	Long	4.82	1.82	6.46	1.16	5.44	1.46	6.46	1.16	5.23	1.82
	Diff	1.15	-0.07	4.43	0.28	2.57	0.17	4.51	0.24	2.45	0.41
ESG Change	Short	-1.23	0.85	-0.42	1.15	-1.29	0.90	-0.76	0.99	-1.01	0.91
	Long	1.31	0.90	0.45	1.31	1.40	0.94	0.45	1.31	1.10	0.94
	Diff	2.54	0.05	0.87	0.16	2.69	0.04	1.21	0.32	2.11	0.02
ESG Sentiment	Short	66.16	14.35	64.64	15.06	65.59	14.64	64.78	15.02	65.40	14.68
	Long	58.40	15.73	60.18	14.71	59.24	15.48	60.18	14.71	58.86	15.44
	Diff	-7.76	1.38	-4.46	-0.35	-6.35	0.84	-4.60	-0.31	-6.54	0.76
ESG Sentiment Momentum	Short	75.86	11.17	76.08	11.33	76.09	11.30	76.20	11.31	76.03	11.22
	Long	30.62	14.64	30.49	13.96	30.82	14.54	30.49	13.96	30.55	14.54
	Diff	-45.24	3.47	-45.58	2.63	-45.26	3.24	-45.71	2.66	-45.48	3.33
Number of Stocks	Short	167		161		128		129		177	
	Long	195		192		156		192		236	

Panel B: Summary Statistics for High Sentiment ESG Factor

		ESG1		ESG2		ESG3		ESG4		ESG5	
Variable	Portfolio	Mean	St Dev	Mean	St Dev	Mean	St Dev	Mean	St Dev	Mean	St Dev
ESG Level	Short	3.65	1.85	2.08	0.82	2.90	1.26	2.01	0.86	2.78	1.37
	Long	4.88	1.85	6.46	1.18	5.48	1.50	6.46	1.18	5.36	1.79
	Diff	1.24	0.00	4.38	0.36	2.58	0.23	4.45	0.32	2.58	0.43
ESG Change	Short	-1.24	0.84	-0.39	1.12	-1.28	0.88	-0.72	0.96	-0.99	0.91
	Long	1.32	0.94	0.46	1.31	1.40	0.98	0.46	1.31	0.90	1.20
	Diff	2.56	0.09	0.84	0.20	2.68	0.10	1.18	0.36	1.89	0.29
ESG Sentiment	Short	57.22	15.86	55.31	16.47	56.58	16.16	55.38	16.52	56.33	16.29
	Long	66.55	13.73	67.50	12.96	67.13	13.29	67.50	12.96	66.92	13.44
	Diff	9.33	-2.14	12.19	-3.51	10.55	-2.87	12.12	-3.56	10.59	-2.85
ESG Sentiment Momentum	Short	30.87	14.58	30.67	15.07	30.95	14.84	30.88	15.08	30.79	14.85
	Long	75.67	11.29	75.04	10.94	75.69	11.26	75.04	10.94	75.48	11.20
	Diff	44.80	-3.30	44.37	-4.13	44.74	-3.58	44.16	-4.14	44.69	-3.65
Number of Stocks	Short	193		197		150		158		212	
	Long	166		168		134		168		217	

ESG1-ESG5 factors are defined in the Appendix. Long (short) portfolios comprise stocks in TOP (BOT). Diff is the difference between the value for the long and short portfolio. Panel A (B) presents statistics for the low (high) sentiment momentum portfolio. ESG level is the level of a firm's ESG performance in a given month as rated by MSCI's industry-adjusted score. ESG change is the change in a firm's ESG performance in a given month, calculated as the difference from the previous MSCI rating and maintained at this value for the minimum of, until the score is updated or 24 months. ESG sentiment is the Insight Score from TruValue Labs calculated as an exponentially-weighted moving average of daily sentiment scores where the half-life of an event's influence on the Insight score is 6 months. ESG Sentiment Momentum is TruValue Lab's Momentum score which is derived from the Insight Score and measured as the slope or trajectory over a trailing 12-month time (TTM) period. Number of stocks is the average number of stocks included in each portfolio across all months. Data span the period from 1st of January 2009 to 30th of June 2018 and they are measured monthly. The number of observations is 123,384 firm-month pairs.

Table 5

Panel A: Raw Returns for ESG Factors based on ESG performance changes and levels

	All Sentiment				Low Sentiment				High Sentiment			
Factor	ESG1		ESG2		ESG1		ESG2		ESG1		ESG2	
Parameter	Estimate	t-value	Estimate	t-value	Estimate	t-value	Estimate	t-value	Estimate	t-value	Estimate	t-value
Return	0.182	1.77	0.240	2.19	0.379	2.88	0.340	2.48	0.061	0.45	0.169	1.12

Panel B: Raw Returns for ESG factors after improving portfolio ESG profile

	Low Sentiment						High Sentiment					
Factor	ESG3		ESG4		ESG5		ESG3		ESG4		ESG5	
Parameter	Estimate	t-value	Estimate	t-value	Estimate	t-value	Estimate	t-value	Estimate	t-value	Estimate	t-value
Return	0.467	3.11	0.399	2.75	0.354	3.23	0.162	0.96	0.182	1.05	0.213	1.45

ESG1-ESG5 factors are defined in the Appendix. Data span the period from 1st of January 2009 to 30th of June 2018 and are measured monthly. The number of data points is 114 monthly observations. The table shows the average raw return for each factor and the t-statistic measuring whether the average raw return is different from zero.

Table 6

Panel A: Four-factor Model Estimates for ESG factors based on ESG performance changes and levels

	All Sentiment				Low Sentiment				High Sentiment			
Factor	ESG1		ESG2		ESG1		ESG2		ESG1		ESG2	
Parameter	Estimate	t-value	Estimate	t-value	Estimate	t-value	Estimate	t-value	Estimate	t-value	Estimate	t-value
Alpha	0.206	2.15	0.232	2.30	0.366	3.08	0.299	2.17	0.110	0.91	0.166	1.28
Market	-0.057	-1.92	-0.027	-0.82	-0.016	-0.39	0.029	0.62	-0.093	-2.72	-0.057	-1.41
SMB	0.076	1.71	-0.044	-1.04	0.048	0.80	-0.097	-1.58	0.118	2.11	0.020	0.32
UMD	-0.065	-1.00	-0.091	-3.00	-0.092	-1.27	-0.068	-1.98	-0.046	-0.78	-0.099	-2.55
HML	-0.109	-1.89	-0.190	-4.62	-0.004	-0.05	-0.045	-0.68	-0.224	-4.45	-0.311	-6.13

Panel B: Four-factor Model Estimates for ESG factors after improving portfolio ESG profile

	Low Sentiment						High Sentiment					
Factor	ESG3		ESG4		ESG5		ESG3		ESG4		ESG5	
Parameter	Estimate	t-value	Estimate	t-value	Estimate	t-value	Estimate	t-value	Estimate	t-value	Estimate	t-value
Alpha	0.384	2.83	0.374	2.59	0.345	3.35	0.199	1.26	0.215	1.48	0.219	1.85
Market	0.035	0.64	0.005	0.10	-0.015	-0.37	-0.099	-2.17	-0.103	-2.76	-0.084	-2.72
SMB	0.016	0.24	-0.101	-1.62	0.012	0.24	0.108	1.50	0.047	0.66	0.107	1.69
UMD	-0.117	-1.85	-0.093	-2.92	-0.064	-1.39	-0.097	-1.24	-0.117	-2.43	-0.125	-1.91
HML	-0.046	-0.53	-0.107	-1.76	-0.060	-0.90	-0.282	-3.35	-0.393	-6.73	-0.320	-5.92

ESG1-ESG5 factors are defined in the Appendix. Data span the period from 1st of January 2009 to 30th of June 2018 and are measured monthly. The number of data points is 114 monthly observations. The table shows estimates where the dependent variable is each month the return on the ESG factor and independent variables are factor-mimicking portfolios for market (Market), size (SMB), momentum (UMD) and value (HML). Alpha is the excess return earned by the ESG portfolio after accounting for the other factors.

Table 7

Panel A: Six-factor Model Estimates for Low Sentiment ESG Factor

	ESG1		ESG2		ESG3		ESG4		ESG5	
Parameter	Estimate	t-value	Estimate	t-value	Estimate	t-value	Estimate	t-value	Estimate	t-value
Alpha	0.347	3.01	0.288	2.12	0.356	2.73	0.359	2.45	0.338	3.39
Market	-0.013	-0.30	0.031	0.64	0.043	0.78	0.009	0.18	-0.015	-0.35
SMB	0.097	1.38	-0.062	-1.01	0.065	0.85	-0.075	-1.12	0.045	0.80
UMD	-0.085	-1.28	-0.064	-2.03	-0.111	-1.94	-0.092	-3.07	-0.058	-1.36
HML	0.044	0.45	0.013	0.16	0.000	0.00	-0.076	-1.07	-0.014	-0.16
RMW	0.151	1.34	0.107	1.01	0.178	1.67	0.084	0.75	0.093	1.06
CMA	-0.124	-1.10	-0.112	-0.90	-0.100	-0.76	-0.038	-0.29	-0.116	-1.17

Panel B: Six-factor Model Estimates for High Sentiment ESG Factor

	ESG1		ESG2		ESG3		ESG4		ESG5	
Parameter	Estimate	t-value	Estimate	t-value	Estimate	t-value	Estimate	t-value	Estimate	t-value
Alpha	0.093	0.79	0.139	1.07	0.171	1.11	0.178	1.23	0.188	1.62
Market	-0.090	-2.63	-0.050	-1.36	-0.094	-2.10	-0.092	-2.53	-0.076	-2.47
SMB	0.176	2.99	0.084	1.27	0.194	2.72	0.115	1.58	0.172	2.57
UMD	-0.032	-0.64	-0.086	-2.66	-0.077	-1.21	-0.104	-2.54	-0.112	-2.01
HML	-0.133	-2.40	-0.203	-2.63	-0.141	-1.63	-0.299	-3.39	-0.230	-3.24
RMW	0.207	2.51	0.250	2.73	0.317	2.84	0.278	2.74	0.257	2.69
CMA	-0.252	-2.37	-0.259	-1.97	-0.365	-2.59	-0.222	-1.88	-0.234	-2.13

ESG1-ESG5 factors are defined in the Appendix. Data span the period from 1st of January 2009 to 30th of June 2018 and are measured monthly. The number of data points is 114 monthly observations. The table shows estimates where the dependent variable is each month the return on the ESG factor and independent variables are factor-mimicking portfolios for market (Market), size (SMB), momentum (UMD), value (HML), profitability (RMW) and investment (CMA). Alpha is the excess return earned by the ESG portfolio after accounting for the other factors.

Table 8

Panel A: Four-factor Model Estimates for Low Sentiment ESG Factor by Firm Size

Size	Small		Medium		Large	
Parameter	Estimate	t-value	Estimate	t-value	Estimate	t-value
Alpha	0.456	1.88	0.361	2.23	0.259	1.68
Market	-0.109	-1.20	-0.067	-1.23	-0.035	-0.64
SMB	0.136	0.98	0.104	1.33	-0.020	-0.31
UMD	-0.096	-0.50	-0.031	-1.07	-0.118	-2.75
HML	-0.117	-0.94	-0.074	-1.23	-0.024	-0.29

Panel B: Four-factor Model Estimates for Low Sentiment ESG Factor by Market-to-Book Ratio

Market-to-Book	Value		Neutral		Growth	
Parameter	Estimate	t-value	Estimate	t-value	Estimate	t-value
Alpha	0.588	3.05	0.071	0.48	0.418	1.93
Market	-0.007	-0.11	0.018	0.39	-0.045	-0.62
SMB	-0.068	-0.73	-0.133	-2.37	0.183	1.89
UMD	-0.098	-1.87	-0.073	-2.25	-0.003	-0.04
HML	-0.053	-0.73	-0.003	-0.04	0.026	0.19

ESG1-ESG5 factors are defined in the Appendix. Data span the period from 1st of January 2009 to 30th of June 2018 and are measured monthly. The number of data points is 114 monthly observations. The table shows estimates where the dependent variable is each month the return on the ESG factor and independent variables are factor-mimicking portfolios for market (Market), size (SMB), momentum (UMD) and value (HML). In Panel A (B) the sample is split in terciles according to beginning of month market capitalization (market-to-book ratio). Alpha is the excess return earned by the ESG portfolio after accounting for the other factors.

Table 9

Panel A: Number of Stocks by Month for International Sample

Year	Month	N	Year	Month	N	Year	Month	N	Year	Month	N	Year	Month	N
2010	1	529	2012	1	676	2014	1	1215	2016	1	1609	2018	1	1974
2010	2	536	2012	2	693	2014	2	1228	2016	2	1615	2018	2	1994
2010	3	533	2012	3	721	2014	3	1239	2016	3	1643	2018	3	2006
2010	4	530	2012	4	733	2014	4	1265	2016	4	1676	2018	4	2018
2010	5	546	2012	5	754	2014	5	1279	2016	5	1697	2018	5	2027
2010	6	539	2012	6	767	2014	6	1294	2016	6	1719	2018	6	2004
2010	7	541	2012	7	789	2014	7	1310	2016	7	1734			
2010	8	543	2012	8	810	2014	8	1340	2016	8	1759			
2010	9	555	2012	9	814	2014	9	1359	2016	9	1782			
2010	10	550	2012	10	833	2014	10	1391	2016	10	1801			
2010	11	555	2012	11	851	2014	11	1405	2016	11	1811			
2010	12	570	2012	12	859	2014	12	1431	2016	12	1820			
2011	1	580	2013	1	872	2015	1	1438	2017	1	1821			
2011	2	579	2013	2	892	2015	2	1445	2017	2	1838			
2011	3	585	2013	3	908	2015	3	1460	2017	3	1857			
2011	4	594	2013	4	946	2015	4	1475	2017	4	1859			
2011	5	611	2013	5	974	2015	5	1479	2017	5	1881			
2011	6	609	2013	6	995	2015	6	1497	2017	6	1893			
2011	7	621	2013	7	1012	2015	7	1506	2017	7	1906			
2011	8	619	2013	8	1039	2015	8	1520	2017	8	1929			
2011	9	635	2013	9	1060	2015	9	1542	2017	9	1936			
2011	10	651	2013	10	1102	2015	10	1559	2017	10	1943			
2011	11	649	2013	11	1120	2015	11	1582	2017	11	1959			
2011	12	650	2013	12	1144	2015	12	1593	2017	12	1966			

Panel B: Number of Companies-Month Observations by Stock Exchange Country

Exchange Country	N	%	Exchange Country	N	%
Australia	11380	9.13	Malaysia	2399	1.93
Austria	784	0.63	Netherlands	1879	1.51
Belgium	697	0.56	New Zealand	898	0.72
China	2596	2.08	Norway	1329	1.07
Denmark	1353	1.09	Philippines	1060	0.85
Egypt	320	0.26	Poland	1032	0.83
Finland	1204	0.97	Singapore	2240	1.80
France	6216	4.99	South Africa	5303	4.26
Germany	7415	5.95	South Korea	4949	3.97
Greece	439	0.35	Spain	1941	1.56
Hong Kong	6406	5.14	Sweden	2421	1.94
India	4596	3.69	Switzerland	2978	2.39
Indonesia	1426	1.14	Taiwan	3942	3.16
Ireland	490	0.39	Thailand	1036	0.83
Israel	763	0.61	Turkey	1043	0.84
Italy	2170	1.74	United Arab Emirates	298	0.24
Japan	23081	18.52	United Kingdom	18519	14.86

Panel C: Summary Statistics for International Sample

Variable	Mean	Median	Std Dev	Interquartile Range
ESG Level	5.38	5.50	2.41	3.40
ESG Change	0.09	0.00	1.29	1.22
ESG Sentiment	61.22	63.23	16.93	22.24
ESG Sentiment Momentum	51.17	50.00	25.52	47.98
Log Market Cap	8.76	8.73	1.26	1.62
Log MTB	0.61	0.55	0.79	1.05

In Panel A, number of stocks is the number of stocks with available data from MSCI, TruValue Labs, and Compustat Global. The number of observations is 124,603 firm-month pairs. Panel B shows the number of observations by exchange country, the country that a company is traded in a stock exchange. In Panel C, ESG level is the level of a firm's ESG performance in each month as rated by MSCI's industry-adjusted score. ESG change is the change in a firm's ESG performance in a given month, calculated as the difference from the previous MSCI rating and maintained at this value for the minimum of, until the score is updated or 24 months. ESG sentiment is the Insight Score from TruValue Labs calculated as an exponentially-weighted moving average of daily sentiment scores where the half-life of an event's influence on the Insight score is 6 months. ESG Sentiment Momentum is TruValue Lab's Momentum score which is derived from the Insight Score and measured as the slope or trajectory over a trailing 12-month time (TTM) period. Log Market Cap is the natural logarithm of beginning of month market capitalization in millions of USD. Log MTB is the natural logarithm of end of month market-to-book ratio. Data span the period from 1st of January 2010 to 30th of June 2018 and they are measured monthly.

Table 10

Summary Statistics for International Sample ESG Factor

		ESG5 Low Sentiment		ESG5 High Sentiment	
		Mean	St Dev	Mean	St Dev
ESG Level	Short	3.14	1.57	3.15	1.58
	Long	6.45	2.16	6.52	2.12
	Diff	3.32	0.58	3.37	0.54
ESG Change	Short	-0.92	1.09	-1.02	1.07
	Long	1.09	1.00	0.90	1.11
	Diff	2.01	-0.08	1.93	0.03
ESG Sentiment	Short	64.2	16.1	54.8	17.9
	Long	57.4	16.7	66.7	15.1
	Diff	-6.8	0.6	11.9	-2.8
ESG Sentiment Momentum	Short	72.7	14.6	30.9	15.5
	Long	31.2	15.5	72.3	14.2
	Diff	-41.5	0.9	41.4	-1.3
Number of Stocks	Short	154		172	
	Long	265		269	

Long (short) portfolios comprise stocks in TOP (BOT). Diff is the difference between the value for the long and short portfolio. ESG level is the level of a firm's ESG performance in a given month as rated by MSCI's industry-adjusted score. ESG change is the change in a firm's ESG performance in a given month, calculated as the difference from the previous MSCI rating and maintained at this value for the minimum of, until the score is updated or 24 months. ESG sentiment is the Insight Score from TruValue Labs calculated as an exponentially-weighted moving average of daily sentiment scores where the half-life of an event's influence on the Insight score is 6 months. ESG Sentiment Momentum is TruValue Lab's Momentum score which is derived from the Insight Score and measured as the slope or trajectory over a trailing 12-month time (TTM) period. Number of stocks is the average number of stocks included in each portfolio across all months. Data span the period from 1st of January 2010 to 30th of June 2018 and they are measured monthly. The number of observations is 124,603 firm-month pairs.

Table 11

Panel A: Raw Return and Four Factor Model Estimates for $ESG5_{INT1}$ Factor

Geography	All International							
Sample	Low Sentiment				High Sentiment			
Parameter	Estimate	t-value	Estimate	t-value	Estimate	t-value	Estimate	t-value
Alpha	0.429	2.85	0.570	3.59	-0.040	-0.30	0.022	0.14
Market			-0.105	-2.73			-0.084	-1.64
SMB			-0.126	-1.06			-0.044	-0.52
UMD			-0.065	-0.82			-0.003	-0.04
HML			0.008	0.08			-0.021	-0.17

Panel B: Raw Return and Four Factor Model Estimates for $ESG5_{INT2}$ Factor

Geography	All International							
Sample	Low Sentiment				High Sentiment			
Parameter	Estimate	t-value	Estimate	t-value	Estimate	t-value	Estimate	t-value
Alpha	0.233	2.06	0.346	3.24	0.146	1.09	0.223	1.53
Market			-0.108	-4.00			-0.098	-2.20
SMB			-0.166	-2.02			-0.234	-2.45
UMD			-0.020	-0.32			0.028	0.40
HML			-0.018	-0.24			-0.147	-1.34

Portfolios are formed according to $ESG5_{INT1}$ and $ESG5_{INT2}$ factor, defined in the Appendix. Data span the period from 1st of January 2010 to 30th of June 2018 and are measured monthly. The number of data points is 102 monthly observations. The table shows estimates of models where the dependent variable is for each month the return on the ESG factor and independent variables are factor-mimicking portfolios for market (Market), size (SMB), momentum (UMD) and value (HML). The estimates on the factor-mimicking portfolios are sourced from Ken French's website and they represent the estimates for the global excluding the US universe of stocks. Alpha is the excess return earned by the ESG portfolio after accounting for the other factors. Before the four-factor model the table shows the average monthly raw return and the t-statistic measuring whether it is significantly different from zero. Panels A and B show results for all international firms in the sample split by low and high ESG sentiment.