

WHITEPAPER

JUNE 2022

---

**Authors**

Douglas Dwyer – Managing Director, Research  
+1 212.553.4323  
[Douglas.Dwyer@moody.com](mailto:Douglas.Dwyer@moody.com)

Mateusz Giezek – Associate Director, Research  
+1 212.553.0378  
[Mateusz.Giezek@moody.com](mailto:Mateusz.Giezek@moody.com)

Richard Loeser – Director, Research  
+44 207.772.5411  
[Richard.Loeser@moody.com](mailto:Richard.Loeser@moody.com)

Maitena Pineiro – Assistant Director, Research  
+44 207.772.1755  
[Maitena.Pineiro@moody.com](mailto:Maitena.Pineiro@moody.com)

---

**Editor**

Chris Crossen – Associate Director, Research  
+1 415.609.6260  
[Christopher.Crossen@moody.com](mailto:Christopher.Crossen@moody.com)

---

**Acknowledgements**

We thank Moody's ESG and RepRisk for providing us with access to their ESG data.

---

**Contact Us**

Americas  
+1.212.553.1658  
[clientservices@moody.com](mailto:clientservices@moody.com)

Europe  
+44.20.7772.5454  
[clientservices.emea@moody.com](mailto:clientservices.emea@moody.com)

Asia (Excluding Japan)  
+85 2 2916 1121  
[clientservices.asia@moody.com](mailto:clientservices.asia@moody.com)

Japan  
+81 3 5408 4100  
[clientservices.japan@moody.com](mailto:clientservices.japan@moody.com)

---

## The Business Impact of ESG Performance

### Abstract

Considerations around the Environmental, Social, and Governance (ESG) aspects of companies have become a factor widely taken into account by investors and other market participants, consumers, and stakeholders. Using ESG controversies collected by Moody's ESG Solutions and ESG data from RepRisk, we analyze the effects of ESG performance on firm market value. Our findings show that ESG controversies lead to large, statistically significant negative abnormal equity returns, both in the short-run and over a one-year horizon. We find that moderate to severe ESG events generate abnormal stock market losses of -1.3% to -7.5% over twelve months, which represents a loss of approximately \$400 million for a typical-sized firm in the study.

## Table of Contents

<b>1. Introduction</b>	<b>3</b>
<b>2. Literature Review and Contribution</b>	<b>4</b>
<b>3. ESG Controversies Data</b>	<b>5</b>
3.1 Moody's ESG Solutions Controversies	5
3.2 Selected Controversies	5
<b>4. Event Study Methodology and Stock Return Data</b>	<b>6</b>
4.1 Abnormal Returns	6
4.2 Statistical Tests	7
4.3 Stock Return Data	7
4.4 Return Statistics	7
<b>5. The Value Impact of Individual Controversies</b>	<b>8</b>
5.1 Short-Run Effects	8
5.2 Long-Run Effects	9
<b>6. Using Events to Measure ESG Performance: A Controversy Frequency Score (CFS)</b>	<b>11</b>
6.1 Construction of the CFS	11
6.1.1 Controversy Characteristics	11
6.1.2 Time Discounting	12
6.1.3 Decreasing Marginal Contribution	12
6.2 Distribution of the CFS	12
6.3 Average CFS Values by Size and Sector	13
<b>7. Stock Price Effects of a Deterioration in ESG Performance</b>	<b>13</b>
7.1 The distribution of CFS Changes	14
7.2 Changes in CFS and Abnormal Returns	14
7.3 The Role of Previous Events for the Business Impact of CFS Increases	15
7.4 Results by Firm Size	16
7.5 Results by Sector	17
<b>8. Conclusion</b>	<b>19</b>
<b>9. Appendix: Results using RepRisk Data</b>	<b>20</b>
<b>References</b>	<b>23</b>

## 1. Introduction

The topic of ESG is omnipresent in the world of business and finance today. There are currently more than \$35 trillion assets under management in sustainable investments.<sup>1</sup> Executive pay is being tied to ESG performance.<sup>2</sup> Firms are being held responsible for the ESG quality of their supply chains.<sup>3</sup> In the age of social media, ESG-related events can reach a global audience overnight.

The moral component of ESG is certainly a strong argument for its relevance. Yet, many business and finance decision makers are tasked with a focus on more tangible outcomes in their day-to-day work, and it is not always clear why they should care about ESG. How does ESG actually affect the metrics that they are responsible for?

In this paper, we show that ESG performance is very relevant for firms' financial results and value. While this may not be a surprise for global events (such as the Volkswagen emissions scandal), our study is broad-based, taking into account 13,000+ ESG events ("controversies") worldwide collected by Moody's ESG Solutions. Measuring ESG performance using a Controversy Frequency Score (CFS) varying between 0 and 100, based on the events a firm experienced over the past two years, we find that a deterioration in performance driven by an increase in controversies is significantly related to stock market losses, both in the short-run and over a return horizon of one year.

The effects we find range from meaningful for events that happen rather frequently, to dramatic for the most severe, rarer events. Having at least one ESG controversy of any kind during a given month leads to an abnormal stock return (measured using a market model) of  $-0.37\%$  over two months. Monthly increases in the CFS by 30 or more points generate statistically significant abnormal returns of  $-0.91\%$  over two months, and  $-1.88\%$  over twelve months. CFS jumps of this magnitude occur 1,732 times in our sample of 3,468 firms, so that, statistically, over half of firms are affected once during our analysis period January 2015 to January 2019. Overall, moderate to severe ESG events generate abnormal stock market losses of  $-1.3\%$  to  $-7.5\%$  over twelve months. With the median market capitalization of firms in our sample at \$11.7 billion, the typical dollar value lost over one year is approximately \$400 million.

In addition to the analysis based on Moody's ESG Controversies, we also run tests using data provided by RepRisk, a Swiss ESG analytics firm. RepRisk calculates a score, the RepRisk Index (RRI), based on ESG incidents that they gather. The results reported in the Appendix confirm the strong relationship between ESG performance and stock returns over a horizon up to one year.

We also investigate whether a firm's prior ESG performance history has a bearing on our results. Large deteriorations in the Controversy Frequency Score occur more frequently for firms with few or no recent events recorded about them, because subsequent events do gradually less to raise the CFS. We find that firms with existing ESG concerns ( $CFS > 0$ ) are less vulnerable to losses from ESG events, controlling for the degree of performance deterioration. Stock investors seem to be pricing further events in for firms with a known ESG history, which remains in line with findings by Pineiro et.al (2021), that there is persistence in ESG incidents.

While there are differences in overall controversy rates across sectors, sizeable CFS jumps occur in all of them. However, we find variation in the impact on stock returns. In Construction, Consumer Products, Energy & Natural Resources, and Finance, firms suffer large negative abnormal returns over twelve months, ranging from  $-3.17\%$  to  $-5.72\%$ . We also find evidence of a negative value impact in Business Products, Utilities, Hi-Tech, and Trade, but, in the remaining sectors, there is little measurable effect of CFS increases.

The Controversy Frequency Score that we create summarizes controversies a firm has experienced during the past two years into a quantitative measure of the current ESG performance of a firm. ESG controversies are outcomes influenced both by the exposure of a firm to ESG risk as well as their ESG policies, and thus represent a direct measure of ESG performance.<sup>4</sup> The construction of the score is based on a number of intuitive principles, such as that more recent and more severe controversies receive a higher

<sup>1</sup> <https://www.bloomberg.com/company/press/esg-assets-rising-to-50-trillion-will-reshape-140-5-trillion-of-global-aum-by-2025-finds-bloomberg-intelligence/>

<sup>2</sup> <https://www.ft.com/content/b1bb86d9-40c1-44c1-86b2-11a57c9cbc49>

<sup>3</sup> <https://www.taylorwessing.com/en/insights-and-events/insights/2021/07/overview-of-the-german-supply-chain-due-diligence-act>

<sup>4</sup> Pineiro et.al. (2022) show that by adopting ESG policies, firms can influence the number of ESG controversies that they suffer.

weight, and that the marginal contribution of events is decreasing. Our key use case of the CFS in this paper is measuring deteriorations in ESG performance.

ESG events can affect firm value through a number of channels. A firm's balance sheet can be directly affected if an event involves property destruction or a fine. Many events entail costs, such as a product recall or a labor dispute involving a strike. Reputation can play a role, both with customers lowering demand for the firm's products, as well as with possible business partners reducing the firm's opportunities. Finally, market value can also be affected if morally-minded investors sell the stock.

Various approaches can be employed to create a quantitative score based on information regarding a firm's ESG events. For the Controversy Frequency Score, we use a weighted moving average (WMA) approach, taking into account events going back a fixed time interval and weighting recent events more strongly. WMA is a standard technique in quantitative finance, with applications including technical analysis and volatility modeling. Other quantitative scoring approaches include statistical models to predict future ESG events (see Pineiro et.al. (2022)) or event count-based measures.

The remainder of this paper is organized as follows. After a review of the literature in Section 2, we discuss the Moody's ESG controversies data in Section 3, and the event study methodology and our equity return data in Section 4. In Section 5, we investigate the stock market effects of individual ESG controversies, independent of firms' ESG history. In Section 6, we introduce the Controversy Frequency Score, before employing changes in the score as a measure of ESG performance deterioration in event studies in Section 7. Section 8 concludes. In the Appendix, we present an analysis using RepRisk incidents data.

## 2. Literature Review and Contribution

Various questions around the relationship between ESG and business outcomes have been studied in the literature. These include: Does a portfolio constructed using ESG criteria generate alpha? Glossner (2018) shows this to be true for a portfolio of high-risk firms. Serafeim (2018) finds significant alpha for a factor that goes long on firms with good ESG performance and negative sentiment momentum. Are firms with good ESG risk management more successful? Khan, Serafeim, and Yoon (2015) show that firms with strong performance on ESG criteria material to their business have superior stock returns. Eccles, Ioannou, Serafeim (2014) show that firms who adopted ESG policies early on did well in the long run. Is ESG performance relevant for a firm's credit risk? Devalle, Fiandrino, and Cantino (2017) show a positive effect on credit ratings for social and governance issues, but not for environmental ones.

There are a few papers which, like ours, focus on identifying the effects of ESG events on firm value. Krueger (2015), the work most similar to ours, uses ESG events based on public sources like news or NGO reports. In an event study of abnormal returns calculated with a market model, he finds an average effect of  $-1.3\%$  over 21 days. Events are classified into six categories, and Krueger finds the biggest effects (over  $-3\%$ ) for the stakeholder issues Community and Environment, smaller ones for Product and Employee Relations, and none for Human Rights and Diversity. Finally, he calculates the median cost over the 1,500 events studied to be \$76m. Another closely related paper is Lundgren and Olsson (2010), who study abnormal stock returns around environmental events, and find significant effects for European firms. Glossner (2018), even though the main focus of his paper is alpha, also provides evidence of the negative direct stock market effect of ESG events, with magnitudes similar to our findings below. La Torre, et.al. (2020) run firm-level monthly time-series regression of stock returns on changes in components of the "ESG Overall" score. They find significant relationships only for a small number of the 47 firms that they study, often in the energy and utilities sectors. Finally, Frooman (1997) in a meta-analysis of 27 studies reports that "illegal and illicit behavior" shifts abnormal returns by a full standard deviation.

Our present paper extends the literature in a couple of dimensions. In contrast to previous papers, we study the return impact of ESG events over a horizon of up to one year. We consider effects across different event qualities, ranging from "smaller" to the most serious, rare events. Last, our study is conducted on a global sample covering the majority of existing listed firms. While there is general agreement that ESG events can have a negative effect on shareholder value, open questions remain regarding how much damage which type of event does, over what time horizon, whether the effect is persistent, and which firms are most strongly affected. By quantifying the effects that ESG events can have on shareholder value along various dimensions, we aim to provide answers to these questions.

### 3. ESG Controversies Data

#### 3.1 Moody's ESG Solutions Controversies

Moody's ESG Solutions is a business unit of Moody's Corporation that serves the growing global demand for ESG and climate insights. Moody's identifies companies' involvements in ESG controversies, defined as public information or contradictory opinions from reliable sources that incriminate or make allegations against an issuer regarding how it handles ESG issues. Each controversy may relate to several facts or events, to their conflicting interpretations, legal procedures or non-proven claims. Moody's screens a pre-defined population of companies on a daily basis, currently covering 10,000+ companies regarding their involvement in ESG controversies across 38 ESG issues. The dataset currently contains over 22,000 entries with coverage going back to 2007.

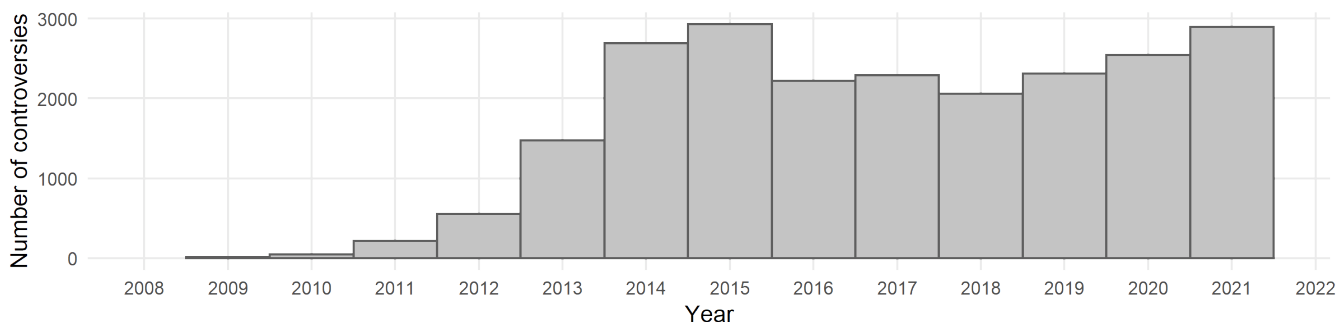
Moody's identifies controversies from a daily newsfeed that includes company sources, news, and stakeholder sources. Potential controversies are evaluated for their impacts on both companies and stakeholders. Once identified, each controversy is classified regarding severity and responsiveness. Severity is defined based on the scale, the scope, and the remedial/irremediable nature of the controversy for both stakeholders and companies, and possible values are "Minor," "Significant," "High," and "Critical." Responsiveness refers to a firm's reaction to a specific event, including measures to remedy the specific case and prevent reoccurrence in the future, with possible values "Proactive," "Remediative," "Reactive," "Non-communicative." The research team monitors each controversy's evolution and provides updates about significant developments.

In addition to firm name and identifier, date, severity, and responsiveness, the dataset contains the following information about each controversy:

- » Title (usually one sentence)
- » Description (usually multiple paragraphs)
- » Sources (publication name, date, title)
- » Location (list of countries)
- » Related topics (combination of E, S, and G)
- » Related detailed topics (combination from list of 171 topics)

Whenever Moody's provides updates to a controversy, there are multiple entries in the database for the same controversy identifier. For our analysis, we use the first entry for each controversy by date, with a tie-breaking logic for the rare event of two entries on the earliest date. Our final dataset contains 22,253 controversies for 3,486 firms between January 2008 and October 2021. Figure 1 shows the distribution by year.

Figure 1 Distribution of ESG controversies over time



Note: Controversies are dated by the first related entry in Moody's ESG Solutions' database.

#### 3.2 Selected Controversies

Controversies encompass a broad range of different events connected by the common theme of ESG, which we view as inclusive of any issues impacting a firm's stakeholders. By their nature, some controversies have a more direct relationship to a firm's equity holders than others. For example, a plant explosion constitutes a destruction of value, and a levied regulatory fine constitutes a cash outflow. Whereas an alleged water well contamination or a union's petition to address unhealthy working conditions may ultimately result in costs to the firm, but these are less direct. Our aim is to test the hypothesis that controversies of the former

kind have a greater impact on firm value than the latter. We are not aware of an accepted classification of ESG events with respect to their “financial relevance” and expected negative impact on shareholders.

Moody's assigns related topics to each controversy out of a list of 171 possible topics. To test our hypothesis, we classify these topics in an ad-hoc way based on our intuition into two groups, “direct financial impact” and “indirect financial impact.” Our approach is based on the assumption that for a large number of these topics such a categorization will be rather obvious. We believe that most people would understand that “Fraud” or “Product Recall” are directly financially relevant, while “Impact on Biodiversity” or “Damages for Local Employment” may have a more indirect financial impact. If our assumption is true, then an intuition-based distinction will generate a meaningful classification and allow us to test our hypothesis, even if for a number of topics the classification is debatable.

#### 4. Event Study Methodology and Stock Return Data

In order to measure the effects of ESG-related events on firm value, we conduct event studies using firms' abnormal stock market returns. This approach is well-established in financial econometrics (see e.g. Campbell, Lo, MacKinlay (1997)). Stock market value is a forward-looking measure that gauges firm value in real time, making it suitable for event studies, since it allows good association between timed events and firm value, limiting the effects of confounding factors. Furthermore, event studies rely on a sophisticated and well-established theoretical machinery that produces expected equity returns, against which observed value changes can be compared.

##### 4.1 Abnormal Returns

In a factor model, the expected return of a firm is a function of its exposures, or betas, to systematic risk factors. In this paper, we work with the so-called market model (see MacKinlay (1997)), which has as only risk factor, the overall market return (termed *MKT* in the following). We match the market factor to the location of the headquarters of the firm by region.<sup>5</sup>

We conduct our analysis monthly, and we estimate the parameters in rolling 60-month regressions. A firm's exposure to the market factor will thus vary from one month to the next. Specifically, firm *i*'s exposure at time *t*,  $\beta_{it}$ , is estimated using individual stock returns *R* and factor observations *MKT* in periods  $\tau = t - 60, \dots, t - 1$  in the time-series regression

$$R_{i\tau} = \alpha_{it} + \beta_{it}MKT_{\tau} + \varepsilon_{i\tau}.$$

All returns are log returns, and the regressions are estimated using OLS, requiring a minimum of 30 observations.

Abnormal returns are then calculated “out-of-sample” as the difference between a firm's stock return and its expected value, calculated using the *ex-post realized* market return and estimated coefficients. Following each rolling estimation window, returns are calculated for multiple subsequent months using the same estimated exposures. Specifically, we calculate the abnormal return *AR* in each period *t*, *t* + 1, *t* + 2, ... as follows:

$$AR_{i,t+x} = R_{i,t+x} - (\hat{\alpha}_{it} + \hat{\beta}_{it}MKT_{t+x}), \quad \text{for } x = 0, 1, 2, \dots$$

where  $\hat{\alpha}$  and  $\hat{\beta}$  are the estimated coefficients. The subscript *t* + *x* refers to the return from the start to the end of month *t* + *x*, e.g.,  $AR_{i,t+2}$  is the abnormal return of firm *i* in the third month after the end of the estimation period.

Cumulative abnormal returns (CAR) are obtained by adding up over multiple months, e.g. the three-month return from *t* to *t* + 2 is

$$CAR_{i,t+2} = AR_{it} + AR_{i,t+1} + AR_{i,t+2}$$

<sup>5</sup> The market return time series were obtained from Kenneth French's website, which distinguishes between five regions: North America, Europe, Japan, APAC ex Japan, Emerging markets.

Where, for a given CAR, only one set of estimated exposure parameters is used, namely the ones estimated using observations until the month prior to the return period.

We incorporate an adjustment to abnormal returns to ensure that they have an overall mean of zero in our sample. To achieve this, we subtract, at each return horizon, the overall mean CAR across the entire sample (or for size and sector groups), so that we have

$$CAR_{i,t+x}^* = CAR_{i,t+x} - \overline{CAR}_{t+x}$$

In the following, we will always be working with  $CAR^*$ , which, for convenience, we simply refer to as “abnormal returns.”

## 4.2 Statistical Tests

Our tests of statistical significance use standard errors around the average cumulative abnormal returns, where the average is always taken over returns that follow a certain type of event (to be defined below). Specifically, we look at returns from the beginning of the month in which an event occurs over a holding period of up to 12 months, and then calculate averages of cumulative abnormal returns (ACAR). The standard error for a given ACAR is calculated as

$$SE_{ACAR} = \sqrt{\frac{x}{N^2} \sum_i \hat{\sigma}_i^2},$$

where  $x$  is the return horizon,  $N$  is the number of firm-months  $i$  in which events are observed, and  $\hat{\sigma}_i^2$  is the estimated variance in the rolling regression used for the cumulative return starting in firm-month  $i$ . Standard errors thus account for the estimated volatility of each firm contributing to the average. The t-statistic for the test of an ACAR is

$$t_{ACAR} = \frac{\overline{CAR}^*}{SE_{ACAR}},$$

where  $\overline{CAR}^*$  is the average adjusted CAR, as discussed above.

## 4.3 Stock Return Data

We include in our empirical analysis all publicly listed firms that had a controversy since January 1, 2008.<sup>6</sup> We obtain monthly information on firms' equity returns, total assets, sector, and country of headquarters from Moody's Analytics public firm database, as well as region-matched stock index returns from Kenneth French's website.

All returns used in this study are log returns, and firm-level monthly raw equity returns are winsorized at  $\pm \log(2)$ . The rolling time-series regressions for the market model are estimated every month, generating a new set of intercepts and exposures whenever sufficient data for a firm is available. With each set of estimated parameters, we calculate cumulative abnormal returns over 1 to 12 months following the estimation period. We exclude observations in the 12 months after a default event. Our final dataset contains all firm-month observations with available 12-month abnormal return starting in the period, which are 147,731 observations for 3,486 firms spanning the period January 2015 to December 2019.

## 4.4 Return Statistics

In our event studies, we investigate both the short-run effect of ESG events (two-month return), as well as the long-run effect (12-month return). Table 1 documents the overall return distributions for the two horizons. Both returns are constructed to have a mean of zero across the entire sample (compare Section 4.1).

<sup>6</sup> We are not taking into account firms that were in principle covered by Moody's ESG Solutions but never had an incident. This is not an issue, because the abnormal returns methodology compares realized returns against a firm-specific expected return.

**Table 1** Statistics on full-sample average cumulative abnormal log-returns

MINIMUM	10%	20%	30%	40%	PERCENTILE					90%	MAXIMUM	MEAN
<b>Moments of 2-month abnormal returns</b>												
-1.42%	-0.14%	-0.08%	-0.05%	-0.02%	0.00%	0.02%	0.05%	0.08%	0.14%	1.43%	0.00%	
<b>Moments of 12-month abnormal returns</b>												
-4.12%	-0.39%	-0.23%	-0.13%	-0.06%	0.01%	0.07%	0.14%	0.23%	0.38%	3.95%	0.00%	

Note: Based on the final sample of 147,731 observations January 2015 to December 2019.

## 5. The Value Impact of Individual Controversies

In this section, we study the business impact of ESG controversies directly by using monthly controversy counts by severity and responsiveness as input to our event study methodology. In particular, our tests are independent of the previous ESG controversies that a firm may have experienced. We also define event counts for E, S, and G controversies separately, where a controversy is included if its topics include the respective one (so that a given controversy may be included for multiple topics).

We focus on abnormal returns over a horizon of 2 months to measure the short-run impact of controversies, and of 12 months to measure the long-run, persistent impact. In both cases, the return period starts in the event month. We use two months for the short-term impact to allow some time for details to emerge and for any stock market overreaction to fade.

### 5.1 Short-Run Effects

We find that ESG events lead to significantly negative returns in the short-run (Table 2 and Figure 2). If an ESG event of any kind occurs, firms, on average, experience a statistically significant abnormal return of  $-0.37\%$  over two months. During our sample period, this happens in 7,670 firm-months. The effect is generally greater the more events occur, at  $-0.73\%$  for two or more, and  $-1.40\%$  for four or more controversies.

**Table 2** Average 2-month abnormal returns.

Panel A.					Panel B.				
TOPIC	MINIMUM EVENTS	N	AVG RETURN	T-STAT	TOPIC	MINIMUM SEVERITY	N	AVG RETURN	T-STAT
All	1	7,670	-0.37%	-2.87	All	1	7,670	-0.37%	-2.87
All	2	1,058	-0.73%	-2.43	All	2	6,421	-0.40%	-2.85
All	3	266	-0.90%	-1.68	All	3	2,191	-0.53%	-2.07
All	4	99	-1.40%	-1.67	All	4	74	-1.39%	-0.93
All	5	38	-0.66%	-0.47					
Selected	1	5,275	-0.62%	-3.97	Selected	1	5,275	-0.62%	-3.97
Selected	2	610	-1.10%	-2.80	Selected	2	4,417	-0.68%	-3.91
Selected	3	130	-0.60%	-0.78	Selected	3	1,555	-0.92%	-3.02
Selected	4	41	-2.33%	-1.71	Selected	4	68	-1.46%	-0.93
E	1	1,417	-0.26%	-0.90	E	1	1,417	-0.26%	-0.90
E	2	81	-0.30%	-0.33	E	2	1,177	-0.53%	-1.63
E (selected)	1	200	-1.83%	-2.42	E	3	432	-0.01%	-0.01
G	1	3,014	-0.37%	-1.77	E (selected)	1	200	-1.83%	-2.42
G	2	241	-0.24%	-0.40	E (selected)	2	176	-2.00%	-2.40
G	3	41	-0.68%	-0.50	E (selected)	3	84	-3.38%	-2.78
G (selected)	1	2,746	-0.53%	-2.40	G	1	3,014	-0.37%	-1.77
G (selected)	2	203	-0.47%	-0.70	G	2	2,564	-0.30%	-1.29
G (selected)	3	26	-3.02%	-1.89	G	3	1,025	-0.41%	-1.07
S	1	4,881	-0.50%	-3.20	G	4	47	-1.20%	-0.67
S	2	540	-1.06%	-2.48	G (selected)	1	2,746	-0.53%	-2.40
S	3	109	-2.11%	-2.60	G (selected)	2	2,357	-0.49%	-2.03
S	4	36	-0.99%	-0.67	G (selected)	3	934	-0.63%	-1.58
S (selected)	1	3,202	-0.77%	-3.99	G (selected)	4	46	-1.23%	-0.67
S (selected)	2	296	-1.53%	-2.78	S	1	4,881	-0.50%	-3.20
S (selected)	3	61	-1.16%	-1.03	S	2	4,090	-0.61%	-3.56
S (selected)	4	21	-0.98%	-0.46	S	3	1,311	-0.95%	-2.94
					S	4	53	-6.36%	-3.71
					S (selected)	1	3,202	-0.77%	-3.99
					S (selected)	2	296	-1.53%	-2.78
					S (selected)	3	61	-1.16%	-1.03
					S (selected)	4	21	-0.98%	-0.46

Note: Panel A refers to events with any severity and responsiveness. Panel B requires at least one event (with any responsiveness) in a month.

Looking at E, S, and G events separately we observe differences. Even though always negative, average abnormal returns for E and G are quite small and not statistically significant. In contrast, the effect of S controversies is large and statistically significant. Firms that experience three or more S events in a month have an average abnormal return of  $-2.11\%$ .

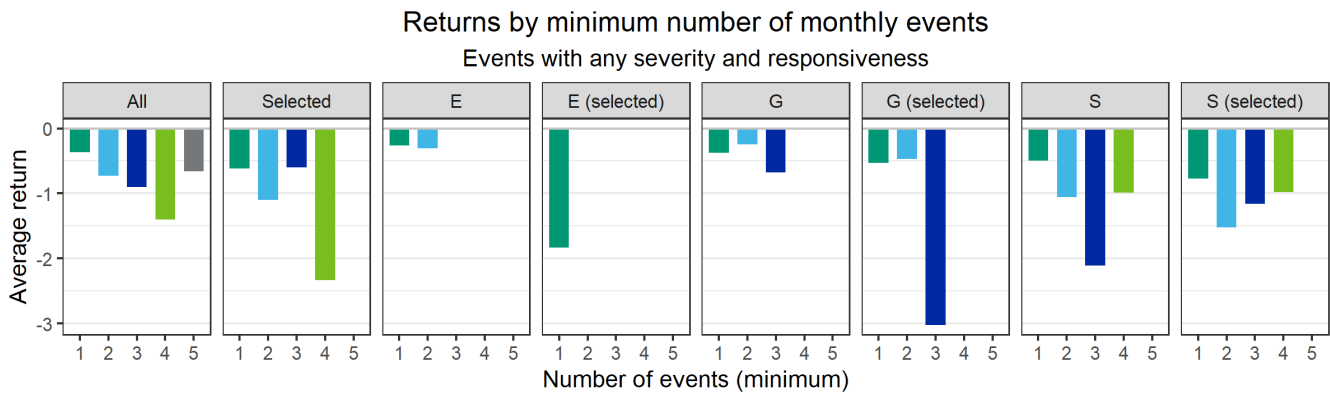


Figure 2 also shows results using selected controversies (see Section 3.2). In most cases, the negative average abnormal returns are around 40% larger when only considering selected controversies. E.g., the effect of having at least one selected controversy in a month is  $-0.62\%$ .

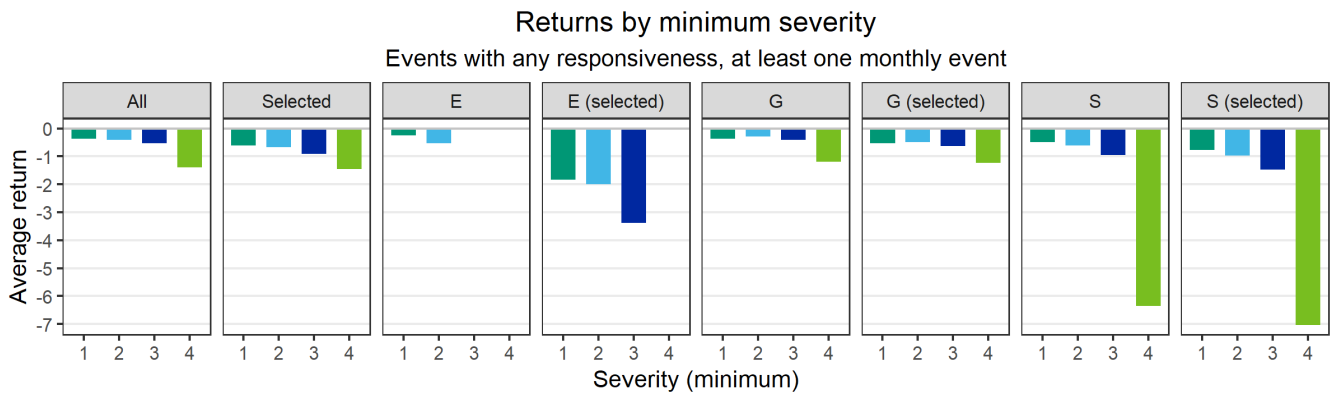
We also investigate the role of controversy characteristics. While effects are largely independent of responsiveness (unreported), a higher severity is associated with lower returns. E.g., having an event of the highest severity on average leads to an abnormal return of  $-1.39\%$ . The effect is most pronounced for S controversies, where having an event of the highest severity (4 = critical) leads to an average 2-month loss of  $-6.36\%$ .

Figure 2 Average 2-month abnormal returns.

Panel A.



Panel B.



Note: We require a minimum of 20 firm-month observations in each group (thus missing bars).

## 5.2 Long-Run Effects

Stock markets often quickly react to news. As more time passes, more information is revealed, and assessment of the impact of a controversy is updated. Even if in the short-run a given stock suffers a negative impact, there may be no difference in the long-run, because effects fade or are small relative to other value-relevant factors. In order to test whether ESG controversies have a negative effect on stocks beyond the short-run reaction, we investigate abnormal returns over a period of one year (Table 3 and Figure 3).

We find persistent negative valuation effects, when multiple ESG controversies occur. If three or more controversies occur in a month, firms on average have an abnormal return of  $-1.18\%$  over one year. For five or more controversies, losses are  $-6.47\%$ . Large losses are observed for G and S events. Controversies selected for their expected strong financial impact (see Section 3.2) indeed lead to more negative abnormal returns.

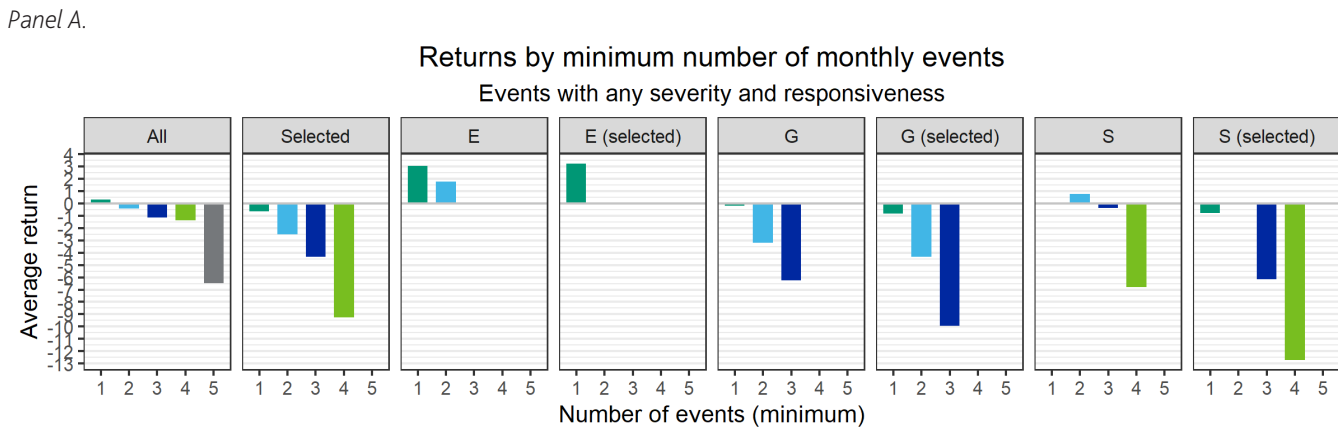
In contrast to the short-run, results over a one-year horizon do not show worse abnormal returns for higher severity (Panel B in Figure 3). A possible explanation for this finding is that firms that experience a controversy of the highest severity often have a history of previous ESG controversies, which may be muting the stock return impact. In our sample, when a firm experiences a critical (highest severity) controversy, the median number of previous controversies it has had is more than double compared to the case when a controversy with lower severity occurs. Furthermore, firms in our sample that ever experience a controversy with severity “high” or “critical” have more than five times as many controversies per period overall (0.11), compared with all other firms (0.02). In order to account for these factors, we study the valuation effects of ESG controversies considering firms' ESG history in Section 7.

**Table 3** Average 12-month abnormal returns.

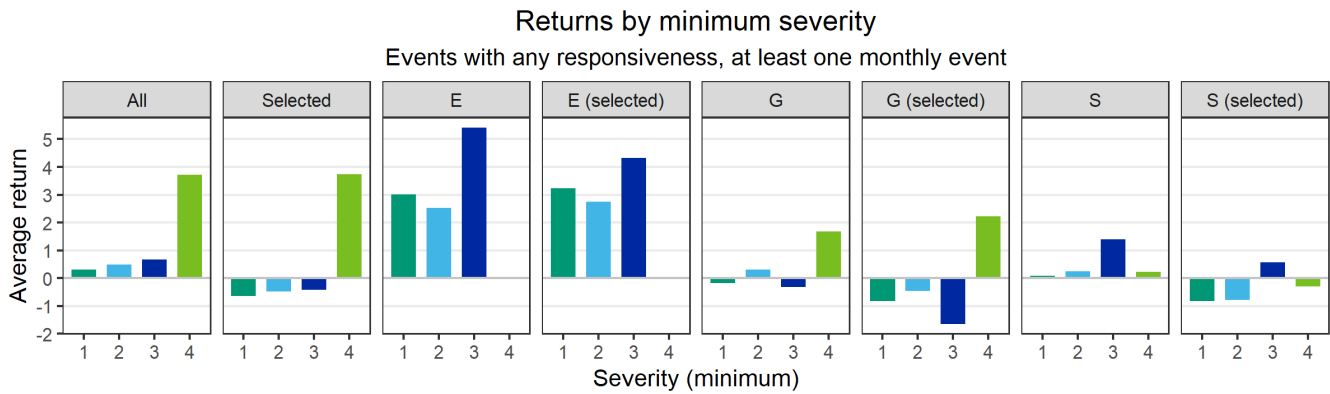
Panel A.					Panel B.				
TOPIC	MINIMUM EVENTS	N	AVG RETURN	T-STAT	TOPIC	MINIMUM SEVERITY	N	AVG RETURN	T-STAT
All	1	7,599	0.31%	0.98	All	1	7,599	0.31%	0.98
All	2	1,050	-0.43%	-0.60	All	2	6,361	0.48%	1.39
All	3	264	-1.18%	-0.90	All	3	2,168	0.66%	1.06
All	4	99	-1.38%	-0.67	All	4	74	3.71%	1.01
All	5	38	-6.47%	-1.86					
Selected	1	5,225	-0.63%	-1.66	Selected	1	5,225	-0.63%	-1.66
Selected	2	606	-2.51%	-2.61	Selected	2	4,372	-0.48%	-1.12
Selected	3	130	-4.32%	-2.30	Selected	3	1,538	-0.42%	-0.57
Selected	4	41	-9.23%	-2.75	Selected	4	68	3.75%	0.97
E	1	1,404	3.01%	4.31	E	1	1,404	3.01%	4.31
E	2	80	1.74%	0.76	E	2	1,166	2.52%	3.20
E (selected)	1	198	3.24%	1.75	E	3	429	5.42%	3.89
G	1	2,986	-0.18%	-0.35	E (selected)	1	198	3.24%	1.75
G	2	240	-3.22%	-2.19	E (selected)	2	174	2.75%	1.36
G	3	40	-6.24%	-1.99	E (selected)	3	83	4.32%	1.47
G (selected)	1	2,720	-0.81%	-1.51	G	1	2,986	-0.18%	-0.35
G (selected)	2	202	-4.36%	-2.69	G	2	2,541	0.30%	0.53
G (selected)	3	26	-9.91%	-2.54	G	3	1,015	-0.32%	-0.34
S	1	4,838	0.09%	0.23	G	4	47	1.69%	0.38
S	2	536	0.76%	0.73	G (selected)	1	2,720	-0.81%	-1.51
S	3	109	-0.38%	-0.19	G (selected)	2	2,335	-0.47%	-0.78
S	4	36	-6.79%	-1.89	G (selected)	3	924	-1.65%	-1.67
S (selected)	1	3,172	-0.81%	-1.71	G (selected)	4	46	2.22%	0.50
S (selected)	2	295	-0.08%	-0.06	S	1	4,838	0.09%	0.23
S (selected)	3	61	-6.15%	-2.22	S	2	4,051	0.24%	0.58
S (selected)	4	21	-12.72%	-2.44	S	3	1,295	1.39%	1.75
					S	4	53	0.23%	0.05
					S (selected)	1	3,172	-0.81%	-1.71
					S (selected)	2	2,627	-0.78%	-1.48
					S (selected)	3	865	0.58%	0.61
					S (selected)	4	48	-0.30%	-0.07

Note: Panel A refers to events with any severity and responsiveness. Panel B requires at least one event (with any responsiveness) in a month

**Figure 3** Average 12-month abnormal returns.



Panel B.



Note: We require a minimum of 20 firm-month observations in each group (thus missing bars).

## 6. Using Events to Measure ESG Performance: A Controversy Frequency Score (CFS)

A company's occurrence of ESG controversies reflects both the ESG risk exposure from its area of activity (industry, geography, etc.), as well as its ESG culture and policies aimed at mitigating these risks. We define ESG risks as negative effects of ESG controversies on a firm's financial performance and economic value. The frequency and characteristics of controversies represent tangible outcomes that can be used to assess firms. We aggregate the information about a company's recent ESG controversies into a score, the Controversy Frequency Score (CFS), which measures the company's current ESG performance.

The CFS is calculated daily on the individual-firm level, and calibrated to vary between 0 (optimal performance characterized by no recent controversies) and 100. The score's construction is guided by the following key considerations, each of which discussed in detail below: 1) Controversies that occurred longer ago are less relevant for the current performance assessment, 2) Controversies with higher severity and lower responsiveness have greater influence on measured ESG performance, and 3) The marginal effect of events on performance is decreasing.

### 6.1 Construction of the CFS

The core logic employed in constructing the CFS is expressed in the equation below. Individual controversies are assigned an event score based on their characteristics. The scores of all controversies on a given day are added up, and the sum is discounted based on the time period between the event day and the current score date. Summing up the discounted day scores produces a "raw" score, which is then transformed into the CFS using a concave function, incorporating the idea that events contribute less, the more (current and prior) events the firm has had.

$$CFS(T) = transform \left( \sum_{\text{Days } t \text{ from } T-730 \text{ to } T} discount(t) \cdot \left( \sum_{\text{Controversies } c \text{ at } t} eventscore(c) \right) \right)$$

#### 6.1.1 Controversy Characteristics

We assign a score to individual controversies based on their severity and responsiveness provided in our data. Intuitively, both these characteristics are relevant for measuring ESG performance. Severity directly measures an event's scale and scope, but the ultimate impact on the firm, on its stakeholders, and on third parties is also affected by the firm's response and subsequent behavior.

Moody's evaluates both severity and responsiveness on 4-degree scales. We use the numerical representation from 1 to 4, with 4 being the worst. We experimented with different ways of combining the two characteristics into an event score (sum, product, transformations, severity only), and ultimately found that applying a square root transformation to both factors works well.

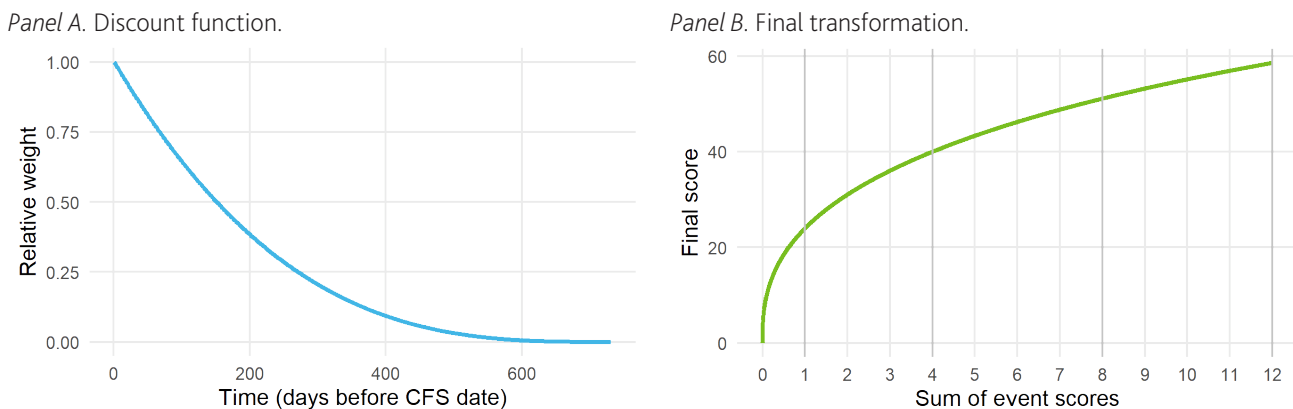
$$eventscore = \sqrt{severity \cdot responsiveness}$$

The concave transform attenuates the effect of characteristics relative to the number of controversies, in line with the findings in Section 5.

### 6.1.2 Time Discounting

We need to decide on the shape and time span of the discounting function. Convex discounting is appropriate, since it ensures that changes in measured performance will primarily arise due to new controversies, rather than from old controversies “dropping out.” The speed of discounting aims to strike a balance between not ignoring relevant information (by discounting too quickly, e.g., ignoring controversies more than six months ago) and missing to detect changes in firms’ ESG risk exposure and culture over time (by discounting too slowly). We opt for a maximum relevance of two years, based on internal research regarding the time it takes for firm policy changes to affect controversy numbers. Panel A in Figure 4 illustrates the discount function.

**Figure 4** CFS construction: Discount function and final transformation.



### 6.1.3 Decreasing Marginal Contribution

We design the CFS to be concave in events, meaning that the score increase (i.e., performance deterioration) resulting from a controversy with given characteristics will be smaller if the firm has more (previous or concurrent) other controversies. This setup is intuitive, because an event should affect the ESG risk assessment more strongly if it is a first for the firm, than if the firm has had a hundred or more prior controversies.

Concavity is achieved through the final transformation, which quantifies the marginal contribution of additional controversies. We calibrate it so that a number of simple quantitative relationships hold:

- » If a firm’s first event (in two years) is lightest (severity = responsiveness = 1), then the CFS jumps from 0 to 24
- » If a firm’s first event (in two years) is gravest (severity = responsiveness = 4), then the CFS jumps from 0 to 40
- » If a firm has three gravest controversies (first in two years), then the CFS jumps from 0 to 59

Panel B of Figure 4 shows the final transform.

### 6.2 Distribution of the CFS

As discussed in Section 3, Moody’s controversy coverage is strong, with more than 1,500 controversies reported on per year since 2013. As the CFS takes into account events going back up to two year, we calculate CFS values starting in December 2014. In order to remain in line with our returns, which exclude the Covid period, in the following study, we document CFS until January 2019. We also exclude CFS values for firms that defaulted up to one year before the CFS month.

Table 4 documents the distribution of CFS. In over one half of firm-months the score is 0, meaning that firms did not have any controversy recorded in the two years prior.

**Table 4** Distribution of Controversy Frequency Scores, percentiles.

MINIMUM	10%	20%	30%	40%	50%	60%	70%	80%	90%	MAXIMUM
0	0	0	0	0	0	10	20	28	36	91

Note: An observation is a firm-month. The period considered is January 2015 to January 2019.

### 6.3 Average CFS Values by Size and Sector

Panel A of Table 5 documents average CFS values by size quartiles (formed on year-month book assets in USD), and shows that average CFS levels vary strongly with size, indicating a poorer overall ESG performance by large firms. This finding is driven by the greater number of ESG controversies for large firms in our database. There are several reasons for this pattern. Large firms receive a greater public interest because are better known, and therefore receive more coverage. Events concerning large firms also have a greater extent on average, making them more noteworthy. It is debatable whether more recorded events of large firms are an accurate reflection of the poorer ESG performance of these companies, or whether it is a data and measurement artifact that should be remedied, e.g., by measuring performance relative to similar-sized peers.

**Table 5** Average CFS by size and sector.

<i>Panel A.</i>			<i>Panel B.</i>			
SIZE QUARTILE	N	AVG CFS	SECTOR	N	AVG CFS	MEDIAN BOOK ASSETS (USD)
0-25%	36,942	5.6	Agriculture	740	8.3	2,717
25-50%	36,924	8.6	Business Products	14,461	10.2	6,311
50-75%	36,932	12.3	Services	5,342	10.5	2,531
75-100%	36,933	22.0	Business Services	9,210	10.8	3,865
			Health Care	1,549	11.0	2,939
			HiTech	19,012	11.1	4,336
			Construction	6,491	11.2	4,991
			Finance	29,290	11.4	34,137
			Trade	10,544	11.7	4,998
			Communication	6,502	11.9	8,174
			Transportation	6,648	13.4	7,370
			Consumer Products	14,897	14.5	5,451
			Energy & Natural Resources	13,236	14.6	5,563
			Utilities	9,483	15.2	12,947

We also observe differences in average CFS across sectors, albeit less pronounced than by size. Average CFS values range from 8.3 in Agriculture to 15.2 for Utilities. As Panel B of Table 5 indicates, some of this variation is related to differences in firm size.

## 7. Stock Price Effects of a Deterioration in ESG Performance

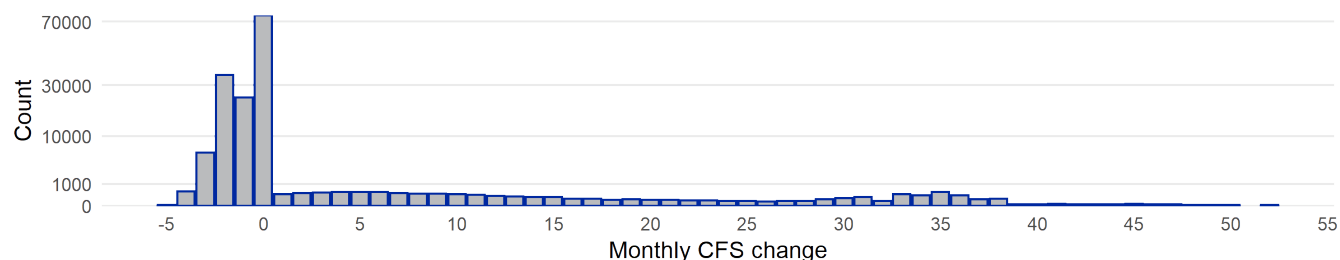
We employ our Controversy Frequency Score to investigate the stock price effects of deteriorations in ESG performance in the event-study framework of Section 4, with events defined as monthly increases in the CFS by different thresholds. The approach resembles the controversy count studies in Section 5, in that events are driven by the controversies that a firm experiences over a month, but it differs, as using changes in CFS take into account firms' ESG histories.

After describing the data characteristics of CFS changes, we present results using the full sample. We then explore the dependence of our findings on the start-of-month CFS level, which reflects previous ESG events a firm has experienced. We also present results within specific groups of firms, focusing on size and sector as two important dimensions.

## 7.1 The distribution of CFS Changes

Figure 6 documents the distribution of monthly changes in CFS for our sample between January 2015 and January 2019.

Figure 5 Distribution of changes in the Controversy Frequency Score.



Note: Based on 147,731 firm-months of 3,486 firms during the period February 2015 to January 2019.

## 7.2 Changes in CFS and Abnormal Returns

Table 6 and Figure 7 present average cumulative abnormal returns, measured starting in the month when a change in the CFS happens, and extending over a period of up to twelve months. We look at a range of successively higher thresholds for CFS changes. The dominant pattern in the results is that increases in CFS are associated with negative abnormal returns, and that returns are more negative the larger the CFS jump. Furthermore, for CFS increase thresholds of 15 points or higher, stock losses grow bigger with return horizon. At the 12-month horizon, the effects we find range from  $-1.15\%$  for CFS jumps of 15 or more, to  $-11.74\%$  for jumps of 44 or more.

As a benchmark, we focus on CFS increases of 30 or more. Such events happen 1,732 times in our dataset, thus statistically affecting over half of firms in our sample once over the sample period January 2015–January 2019. Starting in firm-months when the CFS goes up by at least 30 points, 2-month abnormal returns are on average  $-0.91\%$ , and the average 12-month return is  $-1.88\%$ , both of which are statistically significant. Given that the median market capitalization of firms in our sample when such an event occurs is \$11.1bn (compared to \$11.7bn overall), this implies a value loss of \$208m over one year, representing a sizeable effect. For moderate to severe ESG events generating abnormal stock market losses of  $-1.3\%$  to  $-7.5\%$  over twelve months, the typical dollar value lost is approximately \$400 million.

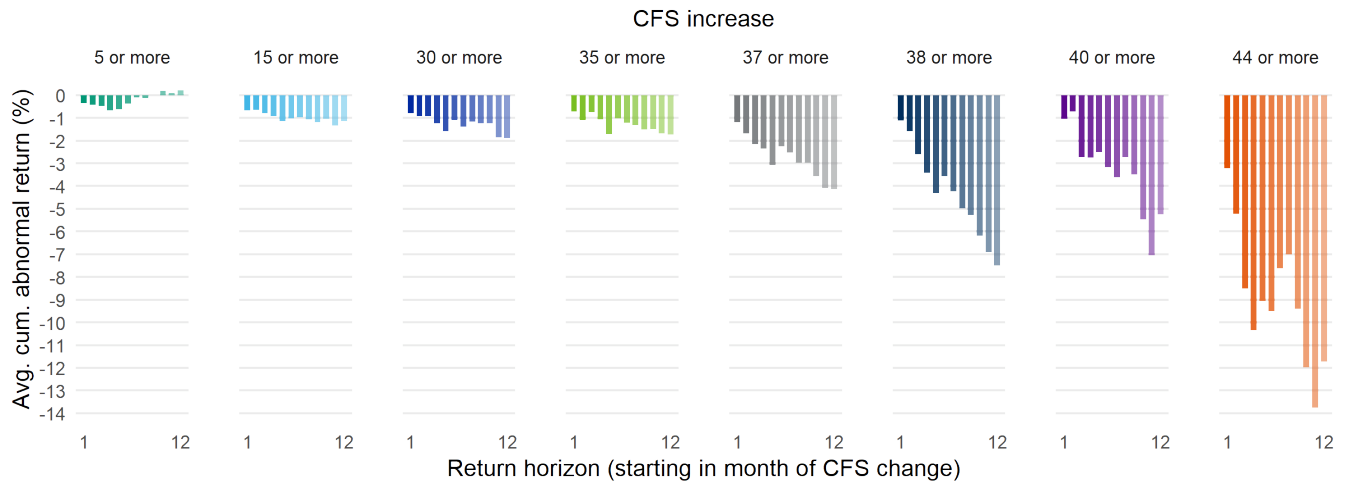
Large CFS increases occur across firms with all characteristics. As we show below, the 1,732 increases by 30 or more points are almost equally distributed across size quartiles, and they are broadly distributed across all sectors and geographic regions.

Table 6 Monthly CFS increases and returns, full sample.

CFS INCREASE	N	AVG 2-M RETURN	T-STAT	AVG 12-M RETURN	T-STAT
or more	6,778	-0.39%	-2.86	0.23%	0.70
5 or more	5,675	-0.43%	-2.83	0.21%	0.55
10 or more	3,940	-0.53%	-2.79	-0.36%	-0.78
15 or more	2,870	-0.64%	-2.85	-1.13%	-2.04
20 or more	2,342	-0.77%	-3.02	-1.30%	-2.10
30 or more	1,732	-0.91%	-3.02	-1.88%	-2.55
35 or more	874	-1.08%	-2.49	-1.74%	-1.63
36 or more	475	-1.10%	-1.79	-1.83%	-1.22
37 or more	257	-1.69%	-2.14	-4.13%	-2.13
38 or more	166	-1.58%	-1.64	-7.51%	-3.18
40 or more	51	-0.73%	-0.44	-5.24%	-1.29
42 or more	39	-1.73%	-0.89	-5.36%	-1.13
44 or more	28	-5.21%	-2.34	-11.73%	-2.15

Note: Returns are average cumulative abnormal returns. We require a minimum of 20 firm-month observations in each group.

Figure 6 Monthly CFS increases and returns, full sample.



### 7.3 The Role of Previous Events for the Business Impact of CFS Increases

Large jumps in CFS occur more frequently if firms had few or no recent events. This follows because of the concavity in the CFS construction, by which the first events strongly affect ESG performance, and subsequent events do so gradually less. An event with given characteristics can thus have a different effect on the CFS, depending on the firm’s history. A sizeable CFS jump can be driven by a single event if the firm had a recent “clean slate,” whereas, for a firm with a large number of recent events, it would take many events to elicit the same CFS reaction.

Table 7 documents that the frequency of CFS increase dependent on whether the beginning-of-month CFS level is zero or positive. A majority of the largest CFS increases (35 or more) occur for firms with an initial CFS of zero, meaning they had no event recorded over the two years prior. On the other hand, the minority of jumps by 10 or more had starting CFS equal to zero. Significant deteriorations in ESG performance are thus statistically more likely to happen to firms with a previous impeccable score, because no events have been recorded about them, at least not recently.

Table 7 Number of monthly CFS changes, by starting CFS.

STARTING CFS	CFS INCREASE THRESHOLD					
	40 OR MORE	35 OR MORE	30 OR MORE	20 OR MORE	15 OR MORE	10 OR MORE
Zero	42	835	1,522	1,599	1,599	1,599
Greater than zero	9	39	210	743	1,271	2,341

We conduct abnormal return event studies separately by beginning-of-month CFS level, distinguishing four groups. The results in Table 8 and Figure 8 show the most consistent abnormal return patterns for CFS jumps starting at 0, with 1-year abnormal returns of –2.57% for increases by 30 or more (occurs 1,522 times), and –7.38% for increases by 38 or more (152 times). But large performance deteriorations also lead to sizeable negative 12-month returns in the other groups, of –4.57%, –14.55%, and –4.49% respectively, with the jump threshold smaller the larger the initial CFS.

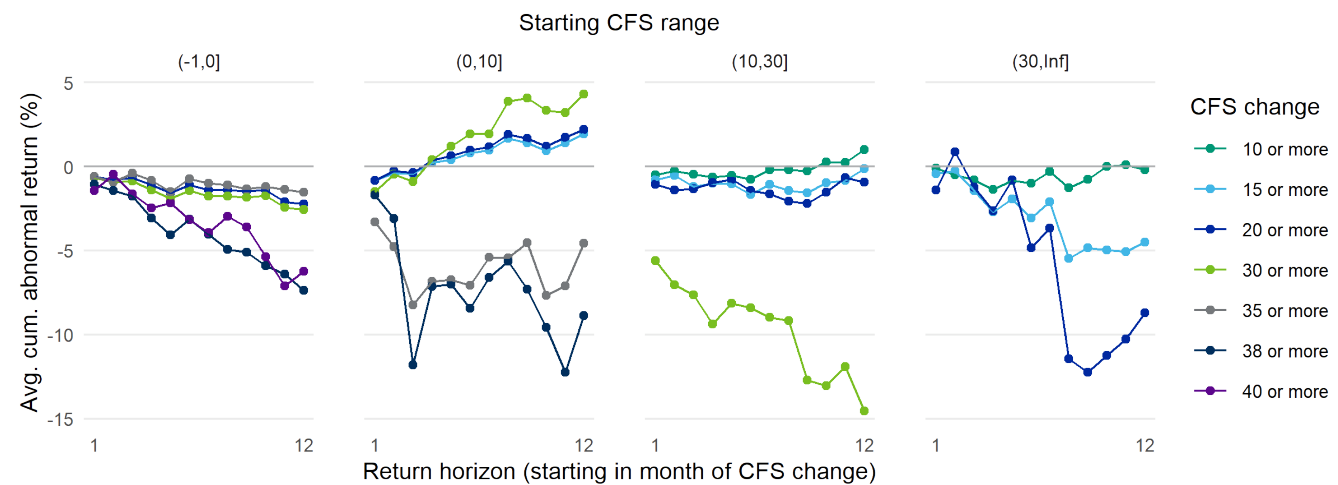
Overall, the results indicate that firms with existing ESG concerns (CFS > 0) are less vulnerable to losses from ESG events. As evidenced by fewer number of observations in groups with sizeable negative average returns (even though CFS jump thresholds are lower), having had recent previous events shields firms from some of the negative consequences that firms with CFS = 0 suffer from ESG events. Stock investors seem to be pricing further events in for firms with a known history, which is in line with findings by Pineiro et.al. (2022) that firms with many past events are expected to experience more in the future.

Table 8 Monthly CFS increases and returns, by starting CFS.

CFS INCREASE	STARTING CFS	N	AVG 2-M RETURN	T-STAT	AVG 12-M RETURN	T-STAT
10 or more	(-1,0]	1,599	-0.79%	-2.52	-2.22%	-2.88
15 or more	(-1,0]	1,599	-0.79%	-2.52	-2.22%	-2.88
20 or more	(-1,0]	1,599	-0.79%	-2.52	-2.22%	-2.88
30 or more	(-1,0]	1,522	-0.92%	-2.85	-2.57%	-3.26
35 or more	(-1,0]	835	-0.92%	-2.07	-1.53%	-1.40
38 or more	(-1,0]	152	-1.44%	-1.44	-7.38%	-3.00
40 or more	(-1,0]	42	-0.46%	-0.25	-6.25%	-1.42
10 or more	(0,10]	417	-0.39%	-0.70	1.93%	1.40
15 or more	(0,10]	417	-0.39%	-0.70	1.93%	1.40
20 or more	(0,10]	414	-0.25%	-0.45	2.21%	1.60
30 or more	(0,10]	197	-0.45%	-0.52	4.29%	1.99
35 or more	(0,10]	35	-4.77%	-2.20	-4.57%	-0.86
38 or more	(0,10]	14	-3.11%	-0.89	-8.87%	-1.04
10 or more	(10,30]	1,421	-0.28%	-0.91	0.99%	1.33
15 or more	(10,30]	764	-0.52%	-1.21	-0.15%	-0.14
20 or more	(10,30]	313	-1.40%	-2.07	-0.92%	-0.55
30 or more	(10,30]	13	-7.02%	-2.29	-14.55%	-1.94
10 or more	(30,Inf]	503	-0.49%	-1.03	-0.20%	-0.17
15 or more	(30,Inf]	90	-0.26%	-0.27	-4.49%	-1.87
20 or more	(30,Inf]	16	0.86%	0.43	-8.69%	-1.76

Note: Returns are average cumulative abnormal returns. Note: Returns are average cumulative abnormal returns. We require a minimum of 10 firm-month observations in each group.

Figure 7 Monthly CFS increases and returns, by starting CFS.



#### 7.4 Results by Firm Size

We group the firm-month observations in our sample into size quartiles based on firms' book assets in US dollars. Table 9 shows that large CFS increases occur across firms of all sizes. This is true despite the fact that average CFS levels vary significantly with size (see Table 5 above).

Table 9 Number of CFS increases, by size quartile.

SIZE QUARTILE	30 OR MORE	15 OR MORE
0-25%	426	519
25-50%	466	668
50-75%	447	796
75-100%	393	887

We find that increases in CFS are associated with negative abnormal stock returns across firms of all sizes. Table 10 and Figure 9 show that, for jumps thresholds starting at 15, almost all average returns are negative for horizons between one and twelve months. Firms that experience a CFS increase by 38 or more suffer average losses between -3.3% and -17.3%.



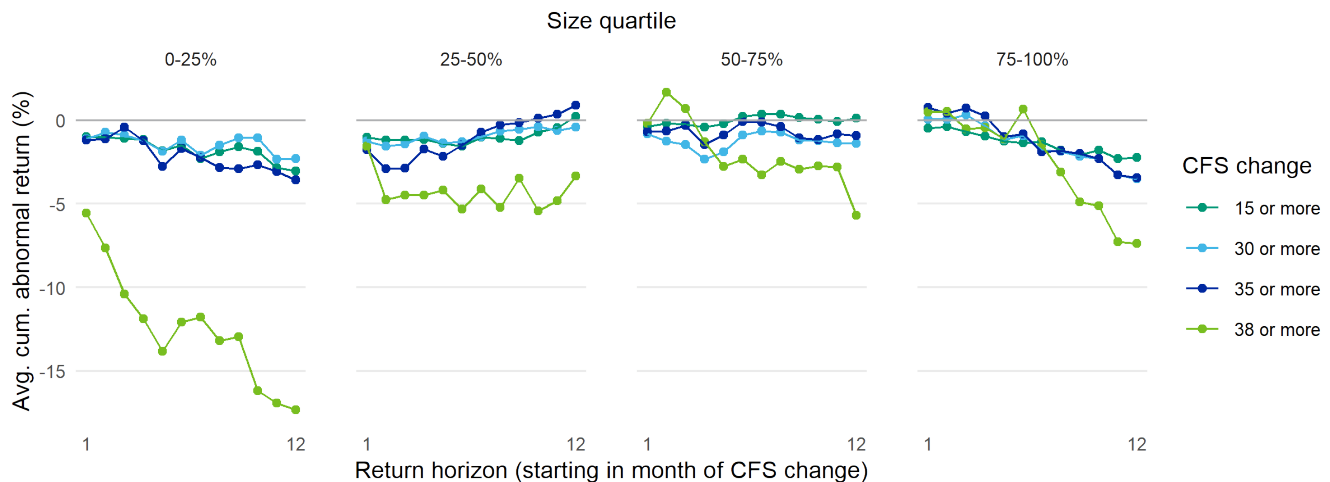
Table 10 Monthly CFS increases and returns, by size quartile.

CFS INCREASE	STARTING CFS	N	AVG 2-M RETURN	T-STAT	AVG 12-M RETURN	T-STAT
0-25%	15 or more	519	-1.00%	-1.50	-3.04%	-1.86
0-25%	30 or more	426	-0.71%	-0.95	-2.30%	-1.25
0-25%	35 or more	208	-1.12%	-1.01	-3.59%	-1.32
0-25%	38 or more	26	-7.63%	-2.53	-17.34%	-2.35
25-50%	15 or more	668	-1.18%	-2.40	0.22%	0.18
25-50%	30 or more	466	-1.55%	-2.62	-0.42%	-0.29
25-50%	35 or more	220	-2.92%	-3.16	0.88%	0.39
25-50%	38 or more	36	-4.76%	-2.23	-3.32%	-0.64
50-75%	15 or more	796	-0.17%	-0.41	0.11%	0.11
50-75%	30 or more	447	-1.26%	-2.42	-1.39%	-1.08
50-75%	35 or more	233	-0.66%	-0.93	-0.93%	-0.54
50-75%	38 or more	50	1.65%	0.99	-5.68%	-1.39
75-100%	15 or more	887	-0.39%	-1.14	-2.22%	-2.66
75-100%	30 or more	393	0.06%	0.11	-3.52%	-2.79
75-100%	35 or more	213	0.42%	0.59	-3.45%	-2.00
75-100%	38 or more	54	0.54%	0.35	-7.36%	-1.98

Note: Returns are average cumulative abnormal returns. Note: Returns are average cumulative abnormal returns. We require a minimum of 20 firm-month observations in each group.

The largest effects are observed for the smallest size quartile. One possible explanation lies in the fact that smaller firms receive less media coverage and have fewer events overall. Controversies of small firms are thus more likely to convey new information about ESG performance, leading to an update of investor perceptions, and corresponding stock losses.

Figure 8 Monthly CFS increases and returns, by size quartile.



### 7.5 Results by Sector

By the nature of their operations, firms vary across economic sectors in their risk exposure to suffering different types of ESG controversies. This is reflected in average CFS values, although some of that might be explained by firm size. Figure 10 shows that there is variation in the rate that firms across sectors experience large CFS increases. Whereas, in Healthcare and Agriculture, the CFS increases by 30 or more only in around every 150<sup>th</sup> firm-month, the frequency in Transportation is every 66<sup>th</sup>. The frequency of jumps by 15 or more varies between every 63<sup>rd</sup> in Healthcare and more than every 40<sup>th</sup> in Transportation. Yet despite these differences, CFS jumps are broadly distributed across all sectors.

Figure 9 Frequency of CFS increases, by sector.

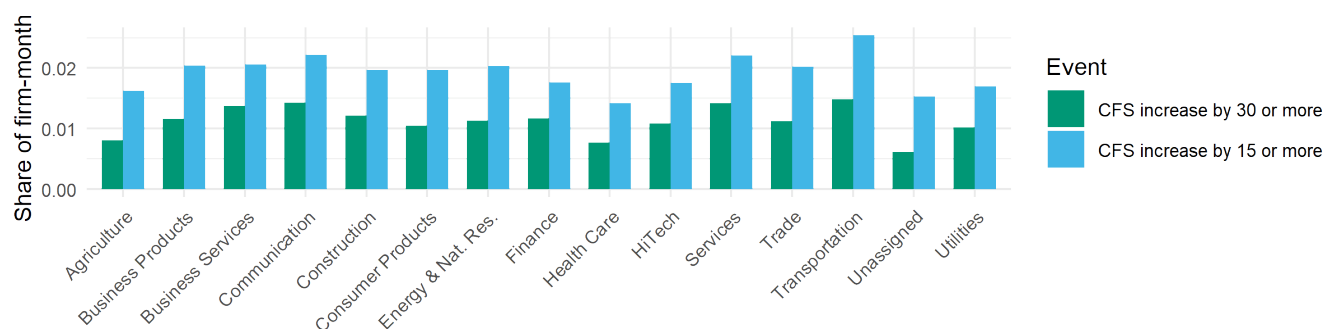


Table 11 and Figure 11 document event study results by sector, where we require a minimum of 20 firm-months observation in each case, excluding Agriculture and some jump thresholds in other sectors. There is strong heterogeneity in return patterns. For a number of sectors, such as Construction, Consumer Products, Energy & Natural Resources, and Finance, firms suffer large negative returns over the 12-month period starting with CFS increases. For jumps of 30 or more, which happen between 79 and 342 times in these four sectors, 1-year abnormal returns range from -3.17% to -5.72%. We also find evidence of negative stock returns in Business Products and Utilities, even though with somewhat less consistency, and to a lesser degree in Hi-Tech and Trade. In all other sectors, either short-term losses are reversed over twelve months, or there is little measurable impact of CFS increases overall.

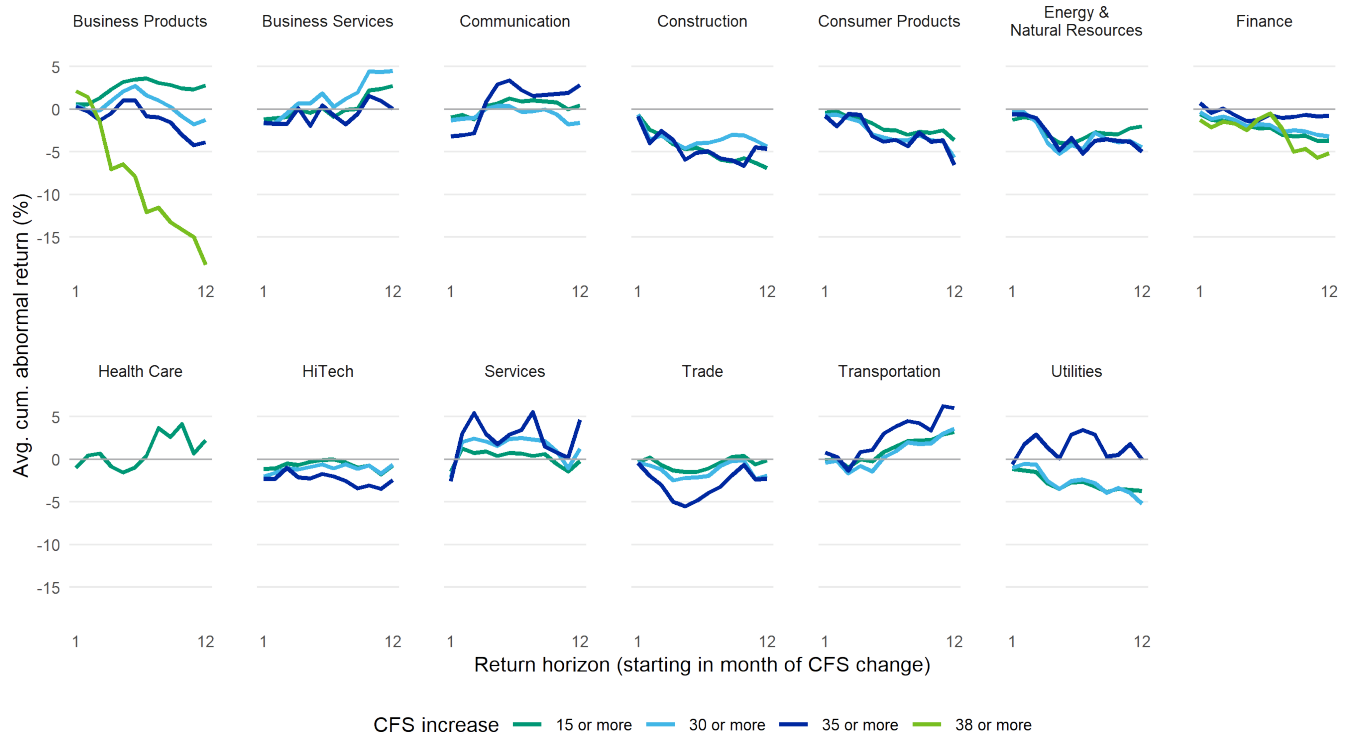
Table 11 Monthly CFS increases and returns, by sector.

CFS INCREASE	SECTOR	N	AVG 2-M RETURN	T-STAT	AVG 12-M RETURN	T-STAT
15 or more	Business Products	295	0.58%	0.79	2.77%	1.55
30 or more	Business Products	168	-0.17%	-0.17	-1.24%	-0.51
35 or more	Business Products	92	-0.23%	-0.17	-3.88%	-1.15
38 or more	Business Products	22	1.42%	0.50	-18.25%	-2.60
15 or more	Business Services	190	-1.11%	-1.26	2.74%	1.28
30 or more	Business Services	127	-1.68%	-1.45	4.48%	1.58
35 or more	Business Services	58	-1.75%	-0.94	0.06%	0.01
15 or more	Communication	144	-0.69%	-0.75	0.45%	0.20
30 or more	Communication	93	-1.15%	-0.97	-1.58%	-0.55
35 or more	Communication	47	-3.05%	-1.79	2.84%	0.68
15 or more	Construction	128	-2.41%	-2.41	-6.93%	-2.84
30 or more	Construction	79	-3.56%	-2.66	-4.37%	-1.33
35 or more	Construction	44	-4.01%	-2.26	-4.65%	-1.07
15 or more	Consumer Products	293	-0.29%	-0.49	-3.64%	-2.52
30 or more	Consumer Products	156	-0.67%	-0.80	-5.72%	-2.78
35 or more	Consumer Products	66	-2.03%	-1.51	-6.55%	-1.99
15 or more	Energy and Natural Resources	269	-0.96%	-0.99	-1.98%	-0.84
30 or more	Energy and Natural Resources	150	-0.37%	-0.27	-4.46%	-1.34
35 or more	Energy and Natural Resources	69	-0.60%	-0.30	-5.02%	-1.02
15 or more	Finance	517	-1.24%	-2.50	-3.70%	-3.04
30 or more	Finance	342	-1.16%	-2.00	-3.17%	-2.23
35 or more	Finance	200	-0.45%	-0.60	-0.78%	-0.42
38 or more	Finance	42	-2.10%	-1.12	-5.16%	-1.12
15 or more	Health Care	22	0.47%	0.17	2.28%	0.33
15 or more	HiTech	334	-1.06%	-1.42	-0.75%	-0.41
30 or more	HiTech	206	-1.59%	-1.55	-0.61%	-0.24
35 or more	HiTech	113	-2.29%	-1.60	-2.41%	-0.69
15 or more	Services	118	1.24%	1.14	-0.21%	-0.08
30 or more	Services	76	2.02%	1.45	1.29%	0.38
35 or more	Services	35	3.05%	1.53	4.63%	0.95
15 or more	Trade	213	0.21%	0.27	-0.16%	-0.09
30 or more	Trade	119	-0.70%	-0.63	-1.92%	-0.71
35 or more	Trade	54	-1.97%	-1.22	-2.28%	-0.58
15 or more	Transportation	169	-0.02%	-0.02	3.17%	1.40
30 or more	Transportation	99	-0.19%	-0.16	3.62%	1.22
35 or more	Transportation	46	0.24%	0.12	6.00%	1.22
15 or more	Utilities	161	-1.32%	-1.72	-3.71%	-1.98
30 or more	Utilities	97	-0.54%	-0.50	-5.23%	-1.98
35 or more	Utilities	40	1.76%	1.04	-0.01%	0.00

Note: Returns are average cumulative abnormal returns. We require a minimum of 20 firm-month observations in each group.

These results are intuitive. By their nature, many firms in Energy & Natural Resources must manage the environmental consequences of their operations, the relevance of their activities for climate change, and the physical scale of their enterprises and associated dangers for people and communities. Financial institutions are under great scrutiny, both from the regulatory and from the societal point of view, and there have been various instances of settlements, fines, and lawsuits. Finally, consumer product firms are under special scrutiny, because of the attention they receive from the general public, which can amplify the reputational impact of ESG controversies.

Figure 10 Monthly CFS increases and returns, by sector.



## 8. Conclusion

Recent years have seen increased attention of company's ESG-related performance as part of a comprehensive risk assessment by lenders, investors, and other stakeholders. In this paper, we propose a quantitative measure of ESG performance based on the controversies a firm experiences and study the relationship between performance and stock market returns. We show that ESG performance matters strongly for firms' value, with ESG events leading to large negative abnormal returns. This finding remains robust for firms of all sizes, and holds particularly for firms in the Energy & Natural Resources, Consumer Products, Finance, and Construction sectors. Finally, the largest losses are observed in cases where a firm suffers its first ESG event in two years, consistent with investors viewing these new incidents as potentially indicative of broader issues at the company. In the Appendix, we show that our results are robust to an alternative data source.

There are a number of promising routes for further research. In addition to the implications for equity holders, we would like to extend the results to incorporate the implications for holders of debt, as well as for the enterprise value of firms as a whole, in addition to its market capitalization. Another question is whether our results can inform a profitable trading strategy. Due to their forward-looking nature, equity returns are generally expected to fully incorporate all anticipated consequences of ESG events relevant for firm value. However, our results show that losses consistently grow over time. Investors thus seem to be, in the short run, underestimating the total cost of ESG performance to firms, a pattern traders could potentially exploit. An application of the results in this paper would be to derive the implications of ESG risk for equity price volatility. Our stock loss estimates can serve as

a key input for such an estimation. Finally, these results could be suggestive for how a lender may want to incorporate ESG considerations into traditional credit risk assessment.

## Appendix: Results using RepRisk Data

We also carry out tests on the business impact of ESG events using data from RepRisk, a Zürich-based ESG data science firm. The core of RepRisk's data are ESG incidents, gathered by screening more than 100,000 media and stakeholder sources in 23 languages daily, using artificial intelligence combined with expert judgement. Incidents are defined as criticisms, adverse business conduct issues, controversies, scandals, etc. that can have a reputational, compliance, or financial impact on a company, and that involve a violation of at least one of 28 Issues that RepRisk tracks.<sup>7</sup> These Issues are based on international standards related to ESG issues and business conduct.<sup>8</sup> In addition to an incident's date, relevant Issues, and related countries, RepRisk assigns scores regarding Severity, Reach, and Novelty that characterize an incident.

RepRisk produces a score, the RepRisk Index (RRI), which summarizes all incidents that a firm has experienced during the past two years into a quantitative measure of reputational risk exposure to ESG issues. The RRI score varies between 0 (lowest risk) to 100, and the assessment is updated daily. The effect of an individual incident on the RRI depends on its severity, reach, and novelty, as well as on the previous incidents a firm has experienced. The RRI generally moves up on days when incidents happen, and it falls on days when no incident occurs. In our empirical tests, we use monthly changes in the RRI as measure of ESG performance and relate them to abnormal stock returns. We use the event study methodology in Section 4.

The sample of firms studied in this section is based on the universe of publicly listed firms that have ever been rated by Moody's Investors Service. In addition, we require firms to have at least one incident recorded in RepRisk's database. This is the case for roughly 75% of the rated universe, or 3,268 firms. Our final dataset contains all firm-month observations with available 12-month abnormal return starting in the period, 209,851 returns for 2,987 firms spanning the period January 2010–June 2019.

We find that monthly changes in the RepRisk Index show a strong relationship between RRI increases and abnormal stock returns estimated using a market model, with larger RRI increases associated with more negative returns. Moreover, the losses we find are persistent over (at least) a 12-month period, and, in fact, become larger over time. Using a global dataset, we show negative value impacts of ESG incidents to be a broad-based phenomenon, occurring across firms of all sizes and in most sectors.

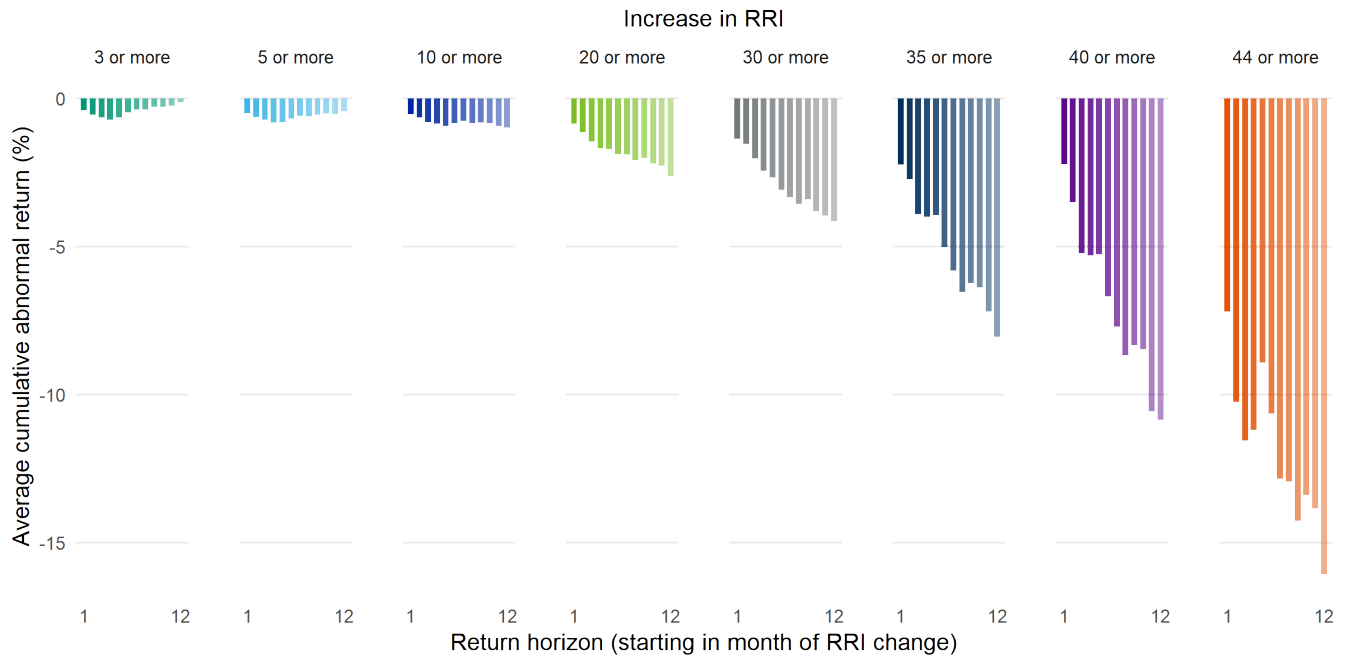
The magnitude of effects we find ranges from meaningful, for events that happen rather frequently, to dramatic, for the most severe, rarer events. Figure 12 shows results for the full sample. We estimate that jumps in RRI by 30 or more points over one month on average lead to abnormal returns of –1.4% in the month of the jump, and –4.1% cumulatively over one year. RRI jumps of this size happen over 1,000 times in our sample of around 3,000 firms over 10 years, meaning roughly one in every thirty firms experiences such a jump in any given year. For jumps of 10 or more, the smallest threshold where we find a persistent and significant effect, average abnormal returns are –0.5% (one month) and –0.9% (one year). Overall, the ESG events we identify are shown to have lasting consequences, which tend to unfold over time, and we confirm these effects occur across firm of all size categories.

---

<sup>7</sup> RepRisk AG, "RepRisk Methodology Overview," Privileged, April 2021, [reprisk.com](https://www.reprisk.com).

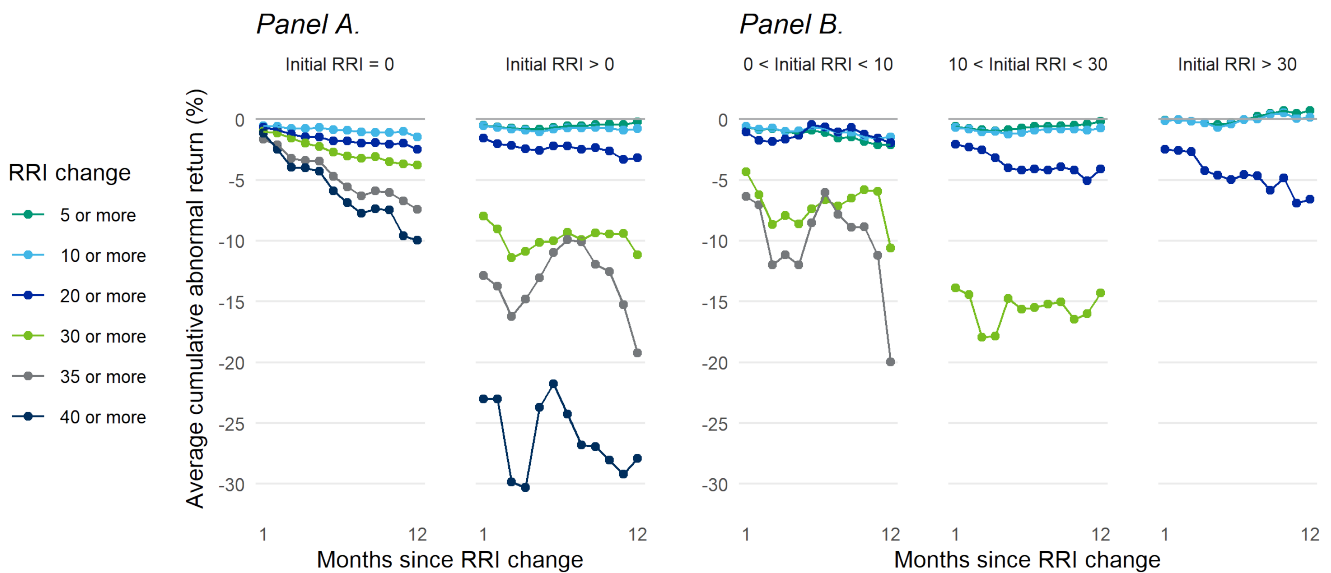
<sup>8</sup> These standards include: The World Bank Group Environmental, Health, and Safety Guidelines; The International Finance Corporation Performance Standard; the Equator Principles; The OECD Guidelines for Multinational Enterprises; and The International Labour Organization Conventions. In addition, the Ten Principles of the UN Global Compact, the Sustainability Accounting Standards Board Materiality Map; and the United Nations Sustainable Development Goals can be mapped to RepRisk's research scope and RepRisk's 28 Issues.

Figure 11 Monthly RRI increases and returns, full sample.



Jumps starting at an RRI level of zero are usually caused by a small number of incidents, whereas more incidents are needed to cause a jump from higher starting RRI levels. We test how these two types of jumps differ regarding their impact on firm value, and, in both cases, find significant effects (see Figure 13). They are larger starting from RRI > 0, meaning the firm already had incidents during the two years prior. However, because of the RRI's concavity in the number of incidents, large index jumps occur much more frequently to firms at low RRI levels. Thus, firms with a previously clean ESG slate are statistically more at risk of suffering reputational damage that leads to a negative value shock, but when reputation slips for firms with a history of incidents the value effect is generally larger.

Figure 12 Monthly RRI increases and returns, by starting RRI.



We find that the effects of ESG events differ by sector. In most sectors, a short-term effect is visible, but its size and persistence over time vary. The biggest drops in market capitalization following ESG incidents happen for firms in the Energy & Natural Resources and Trade sectors. A number of other sectors, including Business Products and Finance also display large and lasting effects. In Agriculture and Health Care, short-term negative stock price effects are mostly recovered over a 12-month horizon. In some sectors, no negative effects of ESG events are detectable, most notably in Construction. In order to explain our findings, we look for patterns in the specific RepRisk ESG Issues that occur for firms in a given sector, but find no helpful relationships. Our results thus suggest that firms in certain sectors are more vulnerable to negative consequences of ESG incidents given the nature of their operations.

Figure 13 Monthly RRI increases and returns, by sector.



## References

- Campbell, John Y., Andrew W. Lo, and Archie Craig MacKinlay. "The Econometrics of Financial Markets." Princeton University Press, Princeton, NJ, 1997.
- Devalle, Alain, Simona Fiandrino, and Valter Cantino, "The Linkage between ESG Performance and Credit Ratings: A Firm-Level Perspective Analysis." *International Journal of Business and Management*, Vol. 12, No. 9, 2017.
- Eccles, Robert G., Ioannis Ioannou, and George Serafeim, "The Impact of Corporate Sustainability on Organizational Processes and Performance." *Management Science*, Vol. 60, No. 11, pp. 2835-2857, 2014.
- Frooman, Jeff, "Socially Irresponsible and Illegal Behavior and Shareholder Wealth: A Meta-Analysis of Event Studies." *Business & Society*, Vol. 36, No. 3, 221-249, September 1997.
- Glossner, Simon, "The Price of Ignoring ESG Risks." Catholic University Eichstätt-Ingolstadt, Germany (Doctoral Dissertation Chapter), May 2018.
- Khan, Mozaffar, George Serafeim, and Aaron Yoon, "Corporate Sustainability: First Evidence on Materiality." *The Accounting Review*, Vol. 91, No. 6, pp. 1697-1724, 2015.
- Krueger, Philipp, "Corporate goodness and shareholder wealth." *Journal of Financial Economics*, vol. 115, issue 2, 304-329, 2015.
- La Torre, Mario, Fabiomassimo Mango, Arturo Cafaro, and Sabrina Leo, "Does the ESG Index Affect Stock Return? Evidence from the Eurostoxx50." *Sustainability*, 12, 6387, 2020.
- Lundgren, Tommy, and Rickard Olsson, "Environmental Events and Firm Value: International Evidence using a Multi-Factor Event Study Framework." *CERE Working Paper*, 2010:3, Umeå University, 2010.
- MacKinlay, A. Craig, "Event Studies in Economics and Finance." *Journal of Economic Literature*, Vol. XXXV, pp. 13-39, March 1997.
- Pineiro, Maitena, Mateusz Giezek, Richard Loeser, David Zhong, and Douglas Dwyer, "Measuring Persistence in ESG Risk Management Culture." *Moody's Analytics Whitepaper*, 2022.
- RepRisk AG, "RepRisk Methodology Overview." Privileged, reprisk.com, April 2021.
- Serafeim, George, "Public Sentiment and the Price of Corporate Sustainability." *Financial Analysts Journal*, Vol. 76, No. 2, pp. 26-46, 2018.

© 2022 Moody's Corporation, Moody's Investors Service, Inc., Moody's Analytics, Inc. and/or their licensors and affiliates (collectively, "MOODY'S"). All rights reserved.

CREDIT RATINGS ISSUED BY MOODY'S INVESTORS SERVICE, INC. AND/OR ITS CREDIT RATINGS AFFILIATES ARE MOODY'S CURRENT OPINIONS OF THE RELATIVE FUTURE CREDIT RISK OF ENTITIES, CREDIT COMMITMENTS, OR DEBT OR DEBT-LIKE SECURITIES, AND MATERIALS, PRODUCTS, SERVICES AND INFORMATION PUBLISHED BY MOODY'S (COLLECTIVELY, "PUBLICATIONS") MAY INCLUDE SUCH CURRENT OPINIONS. MOODY'S INVESTORS SERVICE DEFINES CREDIT RISK AS THE RISK THAT AN ENTITY MAY NOT MEET ITS CONTRACTUAL FINANCIAL OBLIGATIONS AS THEY COME DUE AND ANY ESTIMATED FINANCIAL LOSS IN THE EVENT OF DEFAULT OR IMPAIRMENT. SEE MOODY'S RATING SYMBOLS AND DEFINITIONS PUBLICATION FOR INFORMATION ON THE TYPES OF CONTRACTUAL FINANCIAL OBLIGATIONS ADDRESSED BY MOODY'S INVESTORS SERVICE CREDIT RATINGS. CREDIT RATINGS DO NOT ADDRESS ANY OTHER RISK, INCLUDING BUT NOT LIMITED TO: LIQUIDITY RISK, MARKET VALUE RISK, OR PRICE VOLATILITY. CREDIT RATINGS, NON-CREDIT ASSESSMENTS ("ASSESSMENTS"), AND OTHER OPINIONS INCLUDED IN MOODY'S PUBLICATIONS ARE NOT STATEMENTS OF CURRENT OR HISTORICAL FACT. MOODY'S PUBLICATIONS MAY ALSO INCLUDE QUANTITATIVE MODEL-BASED ESTIMATES OF CREDIT RISK AND RELATED OPINIONS OR COMMENTARY PUBLISHED BY MOODY'S ANALYTICS, INC. AND/OR ITS AFFILIATES. MOODY'S CREDIT RATINGS, ASSESSMENTS, OTHER OPINIONS AND PUBLICATIONS DO NOT CONSTITUTE OR PROVIDE INVESTMENT OR FINANCIAL ADVICE, AND MOODY'S CREDIT RATINGS, ASSESSMENTS, OTHER OPINIONS AND PUBLICATIONS ARE NOT AND DO NOT PROVIDE RECOMMENDATIONS TO PURCHASE, SELL, OR HOLD PARTICULAR SECURITIES. MOODY'S CREDIT RATINGS, ASSESSMENTS, OTHER OPINIONS AND PUBLICATIONS DO NOT COMMENT ON THE SUITABILITY OF AN INVESTMENT FOR ANY PARTICULAR INVESTOR. MOODY'S ISSUES ITS CREDIT RATINGS, ASSESSMENTS AND OTHER OPINIONS AND PUBLISHES ITS PUBLICATIONS WITH THE EXPECTATION AND UNDERSTANDING THAT EACH INVESTOR WILL, WITH DUE CARE, MAKE ITS OWN STUDY AND EVALUATION OF EACH SECURITY THAT IS UNDER CONSIDERATION FOR PURCHASE, HOLDING, OR SALE.

MOODY'S CREDIT RATINGS, ASSESSMENTS, OTHER OPINIONS, AND PUBLICATIONS ARE NOT INTENDED FOR USE BY RETAIL INVESTORS AND IT WOULD BE RECKLESS AND INAPPROPRIATE FOR RETAIL INVESTORS TO USE MOODY'S CREDIT RATINGS, ASSESSMENTS, OTHER OPINIONS OR PUBLICATIONS WHEN MAKING AN INVESTMENT DECISION. IF IN DOUBT YOU SHOULD CONTACT YOUR FINANCIAL OR OTHER PROFESSIONAL ADVISER.

ALL INFORMATION CONTAINED HEREIN IS PROTECTED BY LAW, INCLUDING BUT NOT LIMITED TO, COPYRIGHT LAW, AND NONE OF SUCH INFORMATION MAY BE COPIED OR OTHERWISE REPRODUCED, REPACKAGED, FURTHER TRANSMITTED, TRANSFERRED, DISSEMINATED, REDISTRIBUTED OR RESOLD, OR STORED FOR SUBSEQUENT USE FOR ANY SUCH PURPOSE, IN WHOLE OR IN PART, IN ANY FORM OR MANNER OR BY ANY MEANS WHATSOEVER, BY ANY PERSON WITHOUT MOODY'S PRIOR WRITTEN CONSENT.

MOODY'S CREDIT RATINGS, ASSESSMENTS, OTHER OPINIONS AND PUBLICATIONS ARE NOT INTENDED FOR USE BY ANY PERSON AS A BENCHMARK AS THAT TERM IS DEFINED FOR REGULATORY PURPOSES AND MUST NOT BE USED IN ANY WAY THAT COULD RESULT IN THEM BEING CONSIDERED A BENCHMARK.

All information contained herein is obtained by MOODY'S from sources believed by it to be accurate and reliable. Because of the possibility of human or mechanical error as well as other factors, however, all information contained herein is provided "AS IS" without warranty of any kind. MOODY'S adopts all necessary measures so that the information it uses in assigning a credit rating is of sufficient quality and from sources MOODY'S considers to be reliable including, when appropriate, independent third-party sources. However, MOODY'S is not an auditor and cannot in every instance independently verify or validate information received in the rating process or in preparing its Publications.

To the extent permitted by law, MOODY'S and its directors, officers, employees, agents, representatives, licensors and suppliers disclaim liability to any person or entity for any indirect, special, consequential, or incidental losses or damages whatsoever arising from or in connection with the information contained herein or the use of or inability to use any such information, even if MOODY'S or any of its directors, officers, employees, agents, representatives, licensors or suppliers is advised in advance of the possibility of such losses or damages, including but not limited to: (a) any loss of present or prospective profits or (b) any loss or damage arising where the relevant financial instrument is not the subject of a particular credit rating assigned by MOODY'S.

To the extent permitted by law, MOODY'S and its directors, officers, employees, agents, representatives, licensors and suppliers disclaim liability for any direct or compensatory losses or damages caused to any person or entity, including but not limited to by any negligence (but excluding fraud, willful misconduct or any other type of liability that, for the avoidance of doubt, by law cannot be excluded) on the part of, or any contingency within or beyond the control of, MOODY'S or any of its directors, officers, employees, agents, representatives, licensors or suppliers, arising from or in connection with the information contained herein or the use of or inability to use any such information.

NO WARRANTY, EXPRESS OR IMPLIED, AS TO THE ACCURACY, TIMELINESS, COMPLETENESS, MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE OF ANY CREDIT RATING, ASSESSMENT, OTHER OPINION OR INFORMATION IS GIVEN OR MADE BY MOODY'S IN ANY FORM OR MANNER WHATSOEVER.

Moody's Investors Service, Inc., a wholly-owned credit rating agency subsidiary of Moody's Corporation ("MCO"), hereby discloses that most issuers of debt securities (including corporate and municipal bonds, debentures, notes and commercial paper) and preferred stock rated by Moody's Investors Service, Inc. have, prior to assignment of any credit rating, agreed to pay to Moody's Investors Service, Inc. for credit ratings opinions and services rendered by it fees ranging from \$1,000 to approximately \$2,700,000. MCO and Moody's investors Service also maintain policies and procedures to address the independence of Moody's Investors Service credit ratings and credit rating processes. Information regarding certain affiliations that may exist between directors of MCO and rated entities, and between entities who hold credit ratings from Moody's Investors Service and have also publicly reported to the SEC an ownership interest in MCO of more than 5%, is posted annually at [www.moody.com](http://www.moody.com) under the heading "Investor Relations — Corporate Governance — Director and Shareholder Affiliation Policy."

Additional terms for Australia only: Any publication into Australia of this document is pursuant to the Australian Financial Services License of MOODY'S affiliate, Moody's Investors Service Pty Limited ABN 61 003 399 657 AFSL 336969 and/or Moody's Analytics Australia Pty Ltd ABN 94 105 136 972 AFSL 383569 (as applicable). This document is intended to be provided only to "wholesale clients" within the meaning of section 761G of the Corporations Act 2001. By continuing to access this document from within Australia, you represent to MOODY'S that you are, or are accessing the document as a representative of, a "wholesale client" and that neither you nor the entity you represent will directly or indirectly disseminate this document or its contents to "retail clients" within the meaning of section 761G of the Corporations Act 2001. MOODY'S credit rating is an opinion as to the creditworthiness of a debt obligation of the issuer, not on the equity securities of the issuer or any form of security that is available to retail investors.

Additional terms for Japan only: Moody's Japan K.K. ("MJKK") is a wholly-owned credit rating agency subsidiary of Moody's Group Japan G.K., which is wholly-owned by Moody's Overseas Holdings Inc., a wholly-owned subsidiary of MCO. Moody's SF Japan K.K. ("MSFJ") is a wholly-owned credit rating agency subsidiary of MJKK. MSFJ is not a Nationally Recognized Statistical Rating Organization ("NRSRO"). Therefore, credit ratings assigned by MSFJ are Non-NRSRO Credit Ratings. Non-NRSRO Credit Ratings are assigned by an entity that is not a NRSRO and, consequently, the rated obligation will not qualify for certain types of treatment under U.S. laws. MJKK and MSFJ are credit rating agencies registered with the Japan Financial Services Agency and their registration numbers are FSA Commissioner (Ratings) No. 2 and 3 respectively.

MJKK or MSFJ (as applicable) hereby disclose that most issuers of debt securities (including corporate and municipal bonds, debentures, notes and commercial paper) and preferred stock rated by MJKK or MSFJ (as applicable) have, prior to assignment of any credit rating, agreed to pay to MJKK or MSFJ (as applicable) for credit ratings opinions and services rendered by it fees ranging from JPY125,000 to approximately JPY250,000,000.

MJKK and MSFJ also maintain policies and procedures to address Japanese regulatory requirements.