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Shocks, stocks and ratings: The financial community response to global environmental and health controversies

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ABSTRACT

The financial community suggests it increasingly accounts for the environmental and social performance of the companies it invests in. To investigate this claim, we study how stock market participants and credit rating agencies respond to environmental and health controversies with internationally operating companies. Stock returns and rating changes are the most prominent financial signals regarding the appreciation of news by the financial community. The actions of numerous investors who trade on public information determine firm value. Credit rating agencies produce ratings based on private information, in part to support these evaluations. Ratings focus directly on a firm's default and business risk which itself is increasingly associated with global environmental and health controversies. Financial investors show a timely and significant response to measures of such controversies, but this response is highly generic and is small from an economic point of view. Credit ratings do not immediately respond in a significant way. Thus, markets and raters respond in a different way to the controversies. We conclude that the response of the financial community to global environmental and health controversies is limited. Therefore, the financial community seems unable to discipline the economic agents behind the controversies.

1. Introduction

Financial agents and markets play a key role in economic activities around the world, as well as in current efforts to avoid dangerous climate change (Galaz et al., 2018). Financial institutions have the potential to bolster as well as undermine the stability of Earth systems by supporting and facilitating business. Business activity can stimulate wellbeing and development (Heal, 2017), but can also result in environmental pollution, loss of biodiversity, health damage, and climate change (Krausmann et al., 2018). Moe (2010) warns against a prominent role for business in addressing societal challenges as it may block structural change to protect its interests. There are several initiatives in the business community to articulate the importance of responsible business conduct and sustainable development, which view business as a herald of change (for an historical overview, see Jones, 2017). This has resulted in institutions like the Earth Charter, the UN Global Compact, and the World Business Council for Sustainable Development. Their presence assumes a leading role for business in such transformation. Alongside business enterprises, financial institutions are particularly important in this regard, despite the fact that their direct environmental

footprint is very limited (Gonenc and Scholtens, 2017). They see themselves as central to this wider business response in terms of their core business activities. Examples of how this role is articulated in a formal sense are the Principles for Responsible Investing, the Principles for Responsible Banking, the Sustainable Banking Network, the Network for Greening the Financial System, the Global Alliance for Banking on Values, the Equator Principles, and the Sustainable Stock Market Initiative. This institutionalization has resulted in new financial products and growing interest in responsible investing, which is thought to make up about 25% of all financial assets under management (Global Sustainable Investment Alliance, 2018).

In this study, we investigate the sensitivity of key agents in the financial community to environmental and health controversies. Oil spills are an example of the former, products containing carcinogens are an example of the latter. In particular, we assess how rating agencies and investors perceive news about corporate conduct regarding environment and health controversies. As such, we try to assess the way in which they play their role as change agent when it comes to sustainable development (Mathiesen, 2018). Controversies have been studied in relation to several global changes. Matus et al. (2012) examine how increasing air

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pollution in China affects public health. [Amelung et al. \(2019\)](#) study how people's concern about health affects climate change mitigation in France, Germany, Norway and Sweden. [Few \(2007\)](#) and [Few and Tran \(2010\)](#) conceptualizes how floods, windstorms, drought and wildfires relate to human health. We focus on environmental and health controversies to come to grips with the rather generic qualifications of 'corporate responsibility' and 'sustainable business' that are used in the business and finance initiatives. Studying specific accidents, pollution levels, etc. may provide evidence whether there is a significant responsiveness from the financial community. This might be responsiveness to particular situations only or be based on the natural character of the risk resulting from the controversies. Therefore, we will investigate how financial agents (investors, rating agencies) respond when environmental and health controversies occur in the corporate sector, such as fines for breaching emission rules, pipeline leaks, radioactive sludge spills, or drugs being linked to cancer or heart failure. We also study if investors respond in a different way to environmental and health controversies than credit rating agencies do.

Finance theory assumes market participants swiftly account for all value relevant unexpected information in stock prices ([Malkiel and Fama, 1970](#)). This also relates to non-financial information, such as information about the environmental impact of companies and their vulnerability to environmental shocks. New information will be appreciated and can be used to assess the value of the firm. Here, firm value is estimated as the discounted value of the expected cash flows of the firm. Firm value only changes when unexpected information arrives at the market. Risk enters the valuation via the discount factor. If perceived risk increases, this will reduce firm value. Studies examining environmental controversies often focus on their effect on stock prices and find they have a straightforward negative effect (e.g., [Capelle-Blancard and Laguna, 2010](#); [Carpentier and Suret, 2015](#)). Credit ratings agencies assess the solvency of firms and organizations, and their sensitivity to shocks ([White, 2010](#)). The focus of these agencies primarily is with default risk. In contrast to stock prices, credit ratings are based on private information ([Harper et al., 2019](#)). A small number of agencies dominates this rating industry, especially Moody's and Standard & Poor's. In the 21st century, credit rating agencies have come to play a pivotal role in the assessment of business risk in general ([Claessens et al., 2018](#)), where they traditionally focused on assessing the default risk of debt ([Partnoy, 2002](#)). Complementary to stock markets, the analysis of the short-term effect of controversies on debt markets can be done with the help of bond prices and yield (spreads) ([Fodor and Stowe, 2012](#)). Credit ratings play a crucial role in financial regulation as well, as the capital adequacy of banks is partly calculated on the basis of the credit ratings in their portfolio ([Altman et al., 2002](#)). Specialized rating agencies have emerged that focus on corporate social responsibility ([Escrig-Olmedo et al., 2019](#)). Standard & Poor's, a credit rating agency, claims risks regarding corporate social responsibility are incorporated into their ratings as an extra factor that determines to what extent a firm will be able to meet its financial obligations ([Williams and Wilkins, 2017](#)). In this regard, [Attig et al. \(2013\)](#) and [Jiraporn et al. \(2014\)](#) claim that corporate social responsibility of firms is positively associated with their credit rating. These findings are based on opinions regarding corporate social responsibility and credit standing, but they do not investigate how credit ratings actually relate to non-financial risk. Here is where we aim to complement the literature. To this extent, we also contribute to the event study methodology by developing an approach that assesses "abnormal rating changes", complementary to the analysis of "abnormal stock market returns". We assess and compare the response of financial investors and rating agencies to about one hundred environmental and health controversies with the help of the event study methodology.

2. Materials and methods

2.1. Methods

To allow for a comparison between the response of investors and rating agencies to environmental and health controversies, we use the event study methodology. While this method was developed to assess the reaction of stock market investors to unexpected news, we will amend it to investigate the reaction of credit ratings agencies to environmental and health controversies. Thus, we regard news about the controversies as the event.

We use the market and risk adjusted returns model ([Brown and Warner, 1985](#)). This model requires an estimation window and an event window. The estimation window is used to estimate the expected returns for the event window. The expected returns are compared with the observed returns in the event window and the differences between these returns are the abnormal returns (ARs; averaged over all the events they are the average abnormal returns: AARs). In line with the literature ([MacKinlay, 1997](#)), the estimation window consists of 120 stock market trading days. The event window is 11 days: five days prior to the event date, the event date itself, and five days past the event date. Thus the estimation window ranges from $[-125; -6]$ and the event window from $[-5; +5]$, with day zero the event day, i.e., the day the news about the environmental and health controversies is available for market participants. As our sample includes a variety of non-financial risk events with some being more unexpected than others, we chose to include five pre-event days in the event window. We include pre-event days to establish whether some leakage of information could have occurred. Post-event days are included to establish whether market responses are delayed or become more severe as more information might become known after the event date. The (average) abnormal returns can be accumulated over segments of the event window to cumulative (average) abnormal returns: C(A)ARs.

To test whether the event (i.e, the news about the controversies) is value relevant, we test whether the AARs and CAARs significantly differ from zero ([Campbell et al., 2010](#)). To do so, we use the Student t-test with the AARs as this allows a comparison with the existing literature (see [Capelle-Blancard and Laguna, 2010](#)). For the CAARs, we use the Wilcoxon signed-rank test, because these returns are non-normally distributed. This test considers the sign and magnitude of the abnormal returns. These returns are ranked based on their absolute value and these rank numbers are then multiplied by the signs of the abnormal returns. All positive and negative ranks are added up and the difference between these sums is then tested with a Z-statistic.

There is ample research on how to conduct an event study with stock returns ([MacKinlay, 1997](#)). However, this is not the case for event studies that try to investigate the response to controversies by credit rating agencies. Therefore, we need to amend the conventional event study methodology: To be able to compare the results of the event study on stock prices with the event study on credit ratings, we use the same event window and compute the (cumulative) average abnormal 'returns' for these windows. However, instead of abnormal returns, we now calculate abnormal rating changes (ARCs). The method to compute the ARCs is the same as previously described for ARs. The difference is that we look at calendar days instead of market trading days, because credit rating changes need not be limited to trading days. To determine whether the event has led to abnormal changes in credit ratings, we account for firms that operate in the same industry and have the same credit rating on the day before the event day as the sample firms and study their change over the event window. This is appropriate as credit ratings agencies update their information almost 24/7. We consider the average credit rating changes for these firms to be the expected credit rating change for the sample companies. To convert the changes in credit ratings to numbers, we used S&P's scale system. Every step up (higher firm quality) or down (lower firm quality) is assigned with step +1 or -1 respectively. For example, a firm going from a BBB- rating to a

BB+ rating, is assigned step -1 as its change in numbers.

Then, we investigate whether there are (average) abnormal changes, where the (average) abnormal credit rating change ((A)ACRC) in terms of steps is equal to the observed credit rating change for firm *i* over window *t* minus the average credit rating change for the benchmark companies *b* over the same window *t*. As with abnormal stock market returns, we also engage in cumulating steps (resulting in the cumulative (average) abnormal credit rating change: C(A)ACRC). To test the significance of these abnormal credit rating changes, we perform the Wilcoxon (1945) signed-rank test. As the data are confined by the system used by S&P, only non-parametric testing is possible. The Wilcoxon test is particularly suitable for this event study, because we want to consider both the sign and magnitude of the credit rating changes.

2.2. Data

The environmental and health controversies can be identified as events where a company’s operations impact the external environment of that company, specifically the natural environment and/or public health. Events were collected using Thomson Reuters Eikon Database. This database is used in several other academic papers as well (e.g., Tarmuji et al., 2016; Gonenc and Scholtens, 2017; Hübel and Scholz, 2020). More specifically, we access the sample sheet “ESG Asset4 – Sector Industry Analysis”, which lists companies and their environmental, social and governance score. For each company, we check whether the company had any controversies listed. Eikon lists the controversies in 23 categories, so to limit the events to controversies that impact the environment or health, we used controversies from the following categories: consumer health and safety controversies, environmental controversies, employee health and safety controversies, and public health controversies (see Table A.1 in the Appendix). In addition, we select the events based on the following criteria: the firm is listed on a stock exchange, it has a credit rating, and the event has an identifiable event date. We search for events from 2010 onwards, as the controversy classification was only available since this year, until year-end 2018. We do not exclude particular regions, countries, or industries, as we want to arrive at a heterogeneous sample. Several previous studies sample on the basis of prominence of the event and/or focus on a single type, which both might result in a bias. Regarding the event date, some controversies are reported multiple times, so we chose the earliest dates. When the event date is on a non-trading day, we change the event date to the next trading day. As some controversies were listed under multiple categories, we decided whether it should be classified as harmful to the

environment, health or both. This method results in a sample of 133 controversies. After checking for overlapping event windows and confounding events (stock splits, CEO transition, profit warnings, and announcements of mergers and acquisitions), and consequently deleting 35 events, the sample ends up consisting of 98 controversies. Table A.2 in the Appendix lists the controversies with their generic classification and a brief description.

2.3. Sample characteristics

With the 98 controversies, there are 47 environmental controversies, 34 health controversies, and 17 controversies that relate to both (hereafter ‘mix’) (see Fig. 1). These mixed controversies make up the largest group (17) and public health controversies are the second largest (16 controversies). With health controversies, worker safety controversies is the second largest group (8 controversies). Most environmental controversies are oil spills (14), followed by waste spills (12). Unfortunately, the subsamples are too small to warrant more detailed analysis at the level of subcategories (see MacKinlay, 1997, p. 29).

More than half (54%) of the controversies are from the US, which is well in line with the relative size of US financial markets. Canada ranks second (8%), and Germany third (5%) (see left hand bar in Fig. 2). The sample composition is well in line with the composition of their stock market capitalization (see right hand bar in Fig. 2); the correlation coefficient between the two is 0.94. This suggests that the sample is representative of the financial market.

We retrieve stock price data for the companies in the sample and the equity indices used for the market returns from Thomson Reuters’ Datastream. For the stock price data, we use the closing return index and we calculate daily returns. As this is a multi-country event study, we use a national market index instead of a global or US index (Campbell et al., 2010). For the event study on credit ratings, we use Thomson Reuters’ Eikon, a proprietary database, to find the historical credit ratings for each company and used the S&P ratings. For each event, we take the firm’s credit rating on the day of the event, day 0, and the credit rating on the end day of the window. We use the same controversies and firms as in the event study with stock returns.

As with a conventional event study, we want to compare the changes after events with the normal changes in the market to isolate the effect of the event. To do so, we use benchmark firms that operate in the same industry and that have the same credit rating on the day before the actual event date. We derive these benchmark firms from the same sample sheet that was used to arrive at the events, as it lists a large

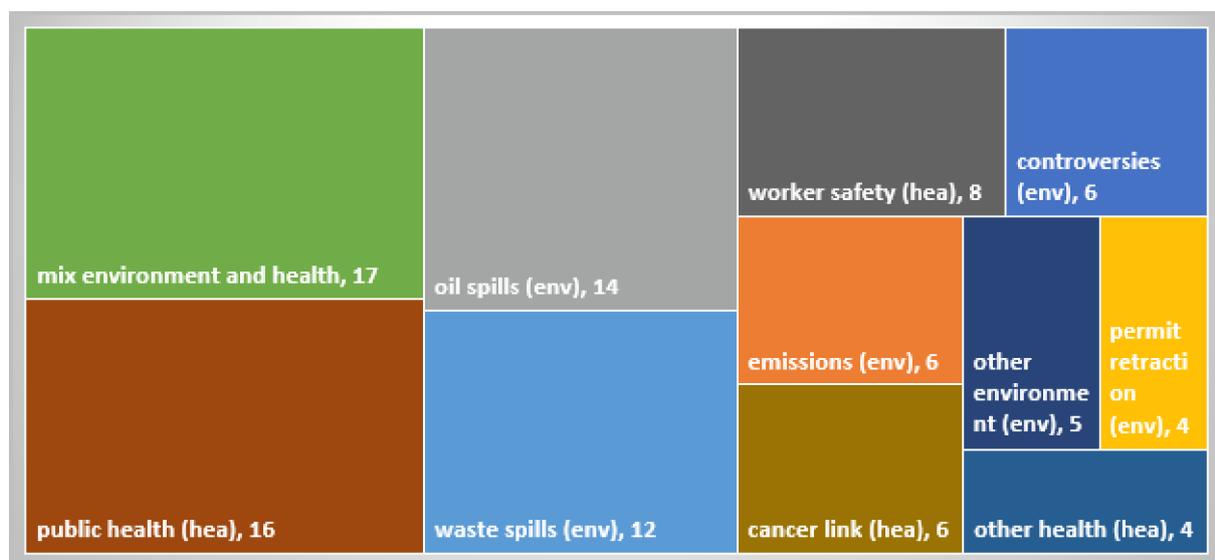


Fig. 1. Controversies categorized along main types. (Environmental controversies 47 (‘env’); Health controversies 34 (‘hea’); Combination of the two 17).

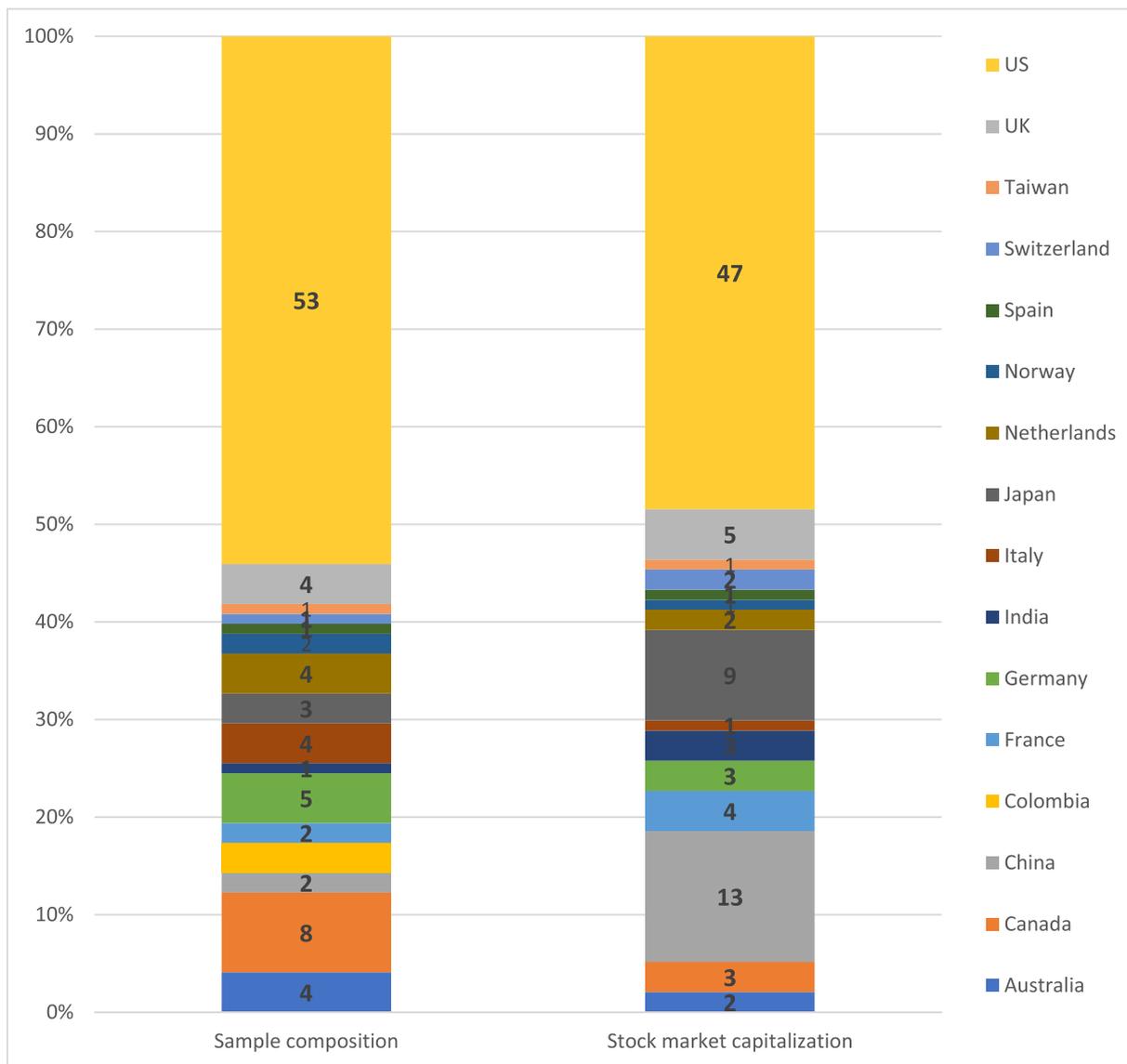


Fig. 2. Geographic distribution of the sample (N = 98; sample composition and stock market capitalization in percentages).

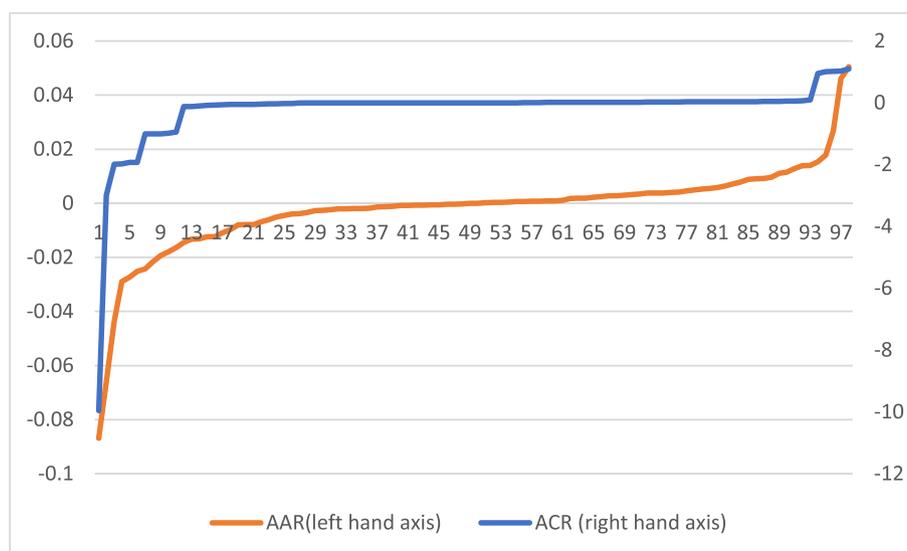


Fig. 3. Distribution average abnormal returns (AAR, percentage) and abnormal credit rating changes (ACR, steps) on the event day.

number of companies within the same industry. Firms that are included in the sample can also be included as benchmark firms for other events and the benchmark companies are not limited to being from the same country. For sample firms we check whether they had the same credit rating on day -1 as firms in the same industry from the sample. If they do, they are added as a benchmark company and their credit rating changes were used to compute the expected credit rating change. Most firms have between 5 and 10 benchmark firms, but for firms that do not have the minimum of 5 benchmark firms, we use the average change of all other benchmark companies within the industry. For the benchmark firms, we also use Eikon to find their historical credit ratings to arrive at expected rating changes.

The distribution of the average abnormal returns (AARs, percentage) and the abnormal credit rating changes (ACRs, steps) on the event day is very different (Fig. 3). The latter is skewed and has a substantial number of zero changes. The pattern of AARs is highly symmetric and centralizes around zero, the distribution of ACRs is much more skewed to the left. This motivates the use of parametric test statistics when studying AARs and nonparametric ones for ACRs.

3. Results

3.1. Financial investor response

We estimate the stock market response to the 98 environmental and health controversies, calculate the (cumulative) average abnormal returns ((C)AAR's), and perform significance tests. The AAR's are negative during most of the event window (Panel A of Fig. 1). On day 1 and 2, they are statistically significant. On day 1 after the event, investors experience an average loss of 0.4%, which is small from an economic point of view. The presence of statistically significant AAR's on day 1 following the environmental and health controversies rejects the null hypothesis that these events lead to no abnormal returns.

Our findings are well in line with the literature that studies the response of financial investors to prominent environmental accidents (Capelle-Blancard and Laguna, 2010), but our abnormal returns are somewhat smaller. This might be due to the fact that the controversies are heterogeneous, whereas other event studies in this field predominantly sample high-profile cases. The cumulative average abnormal returns are negative in all windows and statistically significant in the [0; 3] and [0; 1] windows (see Panel B of Table 1). On day 1 after the event, investors experience a cumulative average loss of 0.8% in a two day window, which increases to a total loss of 1% in a four day window. The

Table 1
(Cumulative) Average Abnormal Returns of Environmental and Health Controversies (N = 98).

| Panel A | | |
|---------|----------|-----------------|
| Day | AAR (%) | Student p-value |
| -5 | -0.0012 | 0.2570 |
| -4 | -0.0019 | 0.1376 |
| -3 | 0.0010 | 0.2937 |
| -2 | 0.0007 | 0.3436 |
| -1 | -0.0008 | 0.3269 |
| 0 | -0.0020 | 0.1262 |
| 1 | -0.0042 | 0.0028 |
| 2 | -0.0041 | 0.0034 |
| 3 | -0.0000 | 0.3970 |
| 4 | -0.0001 | 0.3957 |
| 5 | 0.0021 | 0.0973 |
| Panel B | | |
| Period | CAAR (%) | Wilcoxon |
| [-5;5] | -0.0106 | 0.4008 |
| [0;1] | -0.0044 | 0.0332 |
| [0;3] | -0.0104 | 0.0326 |
| [0;5] | -0.0084 | 0.2762 |

presence of these significant CAAR's following environmental and health controversies further supports rejection of the null hypothesis that such risk leads to no abnormal returns. Hence, we conclude that stock market investors respond to these non-financial events. However, they do not provide a straightforward and immediate response, as suggested by financial market theory (Malkiel and Fama, 1970), and the response is too limited to discipline the firms involved. In addition, we cannot establish a relationship between the type or size of the controversies and the response from financial investors. As such, the claim that is articulated in several finance initiatives, such as the Principles for Responsible Investing, that financial investors account for responsibility, is not substantiated on the basis of this evidence.

3.2. Credit rating agencies

Next, we analyze the response of credit rating agencies to news about environmental and health controversies. We estimate the (cumulative) average abnormal credit rating changes ((C)AACRC's) and perform the nonparametric Wilcoxon test for 98 controversies. In contrast to Section 3.1, where we report percentage returns, we analyze credit rating steps.

On most days in the event window, the response of the credit rating agency is negative (Table 2). However, this is only (marginally) significant so on day 1. This result differs from the findings of Attig et al. (2013) and Jiraporn et al. (2014) who study corporate social responsibility ratings, where we focus on corporate conduct. For the accumulation of the response to the shocks, we find there is a negative response from the ratings, which proves insignificant. As such, we cannot reject the null hypothesis of no response of ratings to environmental and health controversies. We conclude that credit rating agencies do not respond to these non-financial events in the event period.

3.3. Comparing investors and raters

We relate the response of financial investors to that of credit rating agencies to the news about 98 controversies on the event day (day 0). The response of the former is in return percentages and of the latter in rating steps, so we cannot provide a direct comparison. The average AAR on the event day decreases with 0.02% and the average ACR drops by 0.2 steps. The correlation coefficient between the response of financial investors and that of credit rating agencies to the controversies is -0.01, suggesting they are uncorrelated. This implies that the opinions of financial investors and rating agencies are very different from one each

Table 2
(Cumulative) Average Abnormal Rating Changes of Environmental and Health Controversies in the Event Window (N = 98).

| Panel A | | |
|---------|-------------------|------------------|
| Day | AACRC (in steps) | Wilcoxon p-value |
| -5 | -0.1019 | 0.9854 |
| -4 | -0.1624 | 0.3406 |
| -3 | 0.0813 | 0.7247 |
| -2 | 0.0996 | 0.2005 |
| -1 | -0.0718 | 0.3015 |
| 0 | -0.2107 | 0.5852 |
| 1 | -0.5293 | 0.0974 |
| 2 | -0.4913 | 0.1171 |
| 3 | -0.2915 | 0.6391 |
| 4 | -0.1777 | 0.9508 |
| 5 | 0.3709 | 0.6704 |
| Panel B | | |
| Period | CAACRC (in steps) | Wilcoxon p-value |
| [-5;5] | -1.48 | 0.4410 |
| [-5;0] | -0.37 | 0.3964 |
| [0;1] | -0.74 | 0.3964 |
| [0;3] | -1.52 | 0.4410 |
| [0;5] | -1.33 | 0.4410 |

other.

The left hand axis is for the average abnormal returns (percentage); the right hand axis is for the step change for the abnormal credit rating change. The horizontal axis depicts all the events (number of step changes).

We compare the response to news about all 98 controversies (on the horizontal axis in Fig. 4) by financial investors (i.e., AARs on the left hand axis; orange line) with that of credit rating agencies (i.e., ACRs on the right hand axis; blue line). There very often is no response from the credit rating agencies, whereas there usually is a response from the financial investors. The line ‘ACR’ shows some clear spikes, e.g., with event 44 (Deepwater Horizon accident with BP in Gulf of Mexico, US) and event 85 (Fukushima nuclear power plant of TEPCO hit by tsunami in Japan). However, it also shows that the credit ratings do not change at all. More specifically, there are 25 cases in which the rating does not change in the event window. The line ‘AAR’ in Fig. 4 is the response of the financial investors on the event day. Here, the spikes are less pronounced. Exceptions are event 10 (Plant explosion with Tata Steel India), event 29 (Fine for Conagra Brands US), event 52 (Oil spill with Exxon US), and event 89 (Gas pipeline explosion with NiSource in the US). We conclude that financial market investors seem more sensitive to news about environmental and health controversies than credit rating agencies.

3.4. Financial community sensitivity to global environmental and health controversies

Financial investors and credit rating agencies play a crucial role in society. Investors value business and provide funding and market liquidity, raters assess business and default risk. This information helps allocate capital resources in an efficient and effective way. However, the environment as such is not priced and is not accounted for in this economic and financial analysis (Capelle-Blancard and Laguna, 2010; Carpentier and Suret, 2015). As a consequence, the allocation of capital will be inefficient and/or ineffective. The fact that the pricing mechanism is imperfect as it ignores the social (i.e., external to the firm) costs and benefits is a classical economic problem (Heal, 2017). Traditionally, the government tried to solve this by taxing activities where the social costs are above the private costs, and by subsidizing activities whose social benefits are larger than their private benefits. Evidently, policies have not been successful in avoiding loss of biodiversity and climate change (Few, 2007; Matus et al., 2012).

The financial industry argues it can account for externalities by behaving in a responsible way. The mushrooming of sustainability initiatives suggests that business has come to realize it often does more harm than good and, therefore, needs to change course. Key agents like investors and raters claim to integrate responsibility and to account for it in their business practices. However, our study shows their timing is not precise and the response is very limited; investors perform only slightly better than raters in this regard. Therefore, the financial community’s claim of accounting for responsibility and being sensitive to environmental and social issues is not substantiated for our sample.

This is important to realize as increasingly financial institutions are given a prominent role in restructuring the economy. For example, credit rating agencies became central in assessing credit quality in financial markets after the global financial crisis of 2007–2009, and the European Union sees a prominent role for them in assessing responsible investing. Together with financial institutions, they are central in several proposals to achieve the Sustainable Development Goals and in programs to reinvigorate the economy after the Covid-19 crisis. Our study implies their role should be carefully defined as they do not seem to successfully discipline the companies that are behind the controversies. To this extent, science-based evidence could have a more prominent role in policy making and needs to replace vested business interest (see also Moe, 2010).

4. Conclusion

We compared the response of key agents in the financial community, namely financial investors and credit rating agencies, to news about environmental and health controversies. To do so, we came up with a novel methodology to assess “abnormal rating changes”. We established that there are significant negative (cumulative) average abnormal stock market returns following such news, controlling for the financial market in general. This implies that investors act as if such risk is reducing firm value, as it overall harms companies. However, investors’ responses are not substantial, and the timing is problematic as their response is short-lived. Further, the response to the news about the controversies was smaller than with previous studies. This relates to our systematic sampling strategy, which does not filter out the high-profile events that generally are studied in the existing literature. Furthermore, the response could not be related to type or size of the controversy. For example, the immediate response of stock markets to the Deepwater Horizon oil spill or the Fukushima nuclear power plant accident proved

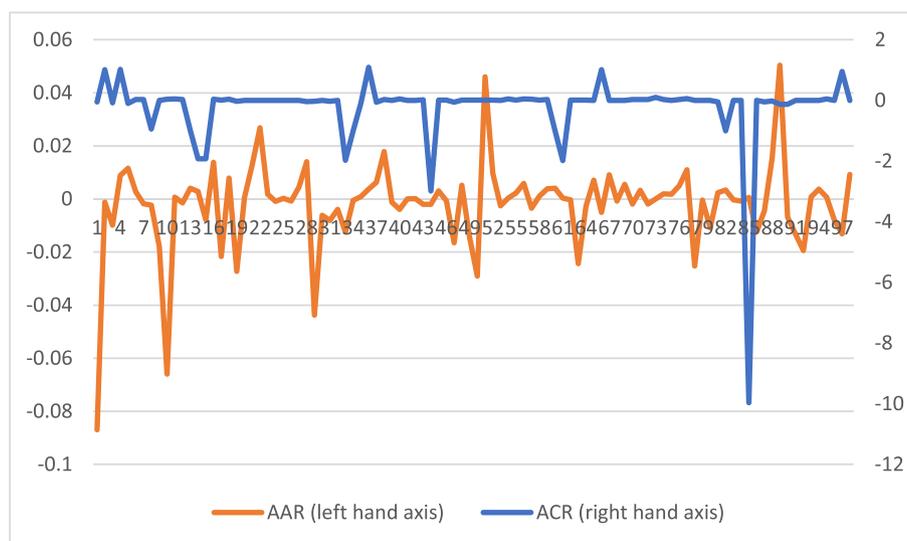


Fig. 4. Response from financial investors (average abnormal return – AAR – percentage) and credit rating agencies (abnormal credit rating change – ACR – step change) on the event day.

to be very moderate (see also [Carpentier and Suret, 2015](#)). We complemented this analysis with an event study on the relationship between the same controversies and rating changes as provided by credit rating agencies. Here, it shows that news about environmental and health controversies is not associated with short-term changes in credit ratings. Rating changes do not significantly associate with such news.

Financial investors are slightly more sensitive to news about the environmental and health controversies than credit rating agencies. This could also mean that such investors have a different opinion about the value relevance of environmental and health controversies than credit rating agencies. However, the latter seems unlikely as these agencies argue the ratings also account for companies' environmental and social performance ([Kernan et al., 2017](#); [Williams and Wilkins, 2017](#)). The results cast doubt on the claims of financial investors and credit rating agencies that they already capture environmental and health controversies. This is reminiscent of critical studies regarding the role of financial markets ([Hart and Zingales, 2017](#); [Mayer, 2017](#)) and rating agencies ([Partnoy, 2002](#); [White, 2010](#); [Escrig-Olmedo et al., 2019](#)).

These findings are relevant for regulators and policy makers. In particular, they suggest policy makers should not put too much trust in the opinion and claims of financial investors and credit rating agencies. Instead, policy makers need to look into more direct and science-based indicators regarding environmental and health controversies to inform policy action.

Appendix A

Table A.1. Event controversy categories. All controversies were found in the Eikon database and fall into one or more of the following ESG controversy categories.

| Category | Definition |
|--|---|
| Controversies Customer Health & Safety | Number of controversies published in the media linked to customer health and safety |
| Environmental Controversies | Number of controversies related to the environmental impact of the company's operations on natural resources or local communities |
| Employee Health & Safety Controversies | Number of controversies published in the media linked to workforce health and safety |
| Public Health Controversies | Number of controversies published in the media linked to public health or industrial accidents harming the health and safety of third parties (nonemployees and noncustomers) |

Table A.2. Key characteristics of the controversies.

| Date | Company | Category | Description in Eikon |
|------------|--------------------------------|-------------|--|
| 20-4-2010 | BP | Environment | Deepwater Horizon oil spill |
| 31-7-2010 | Mosaic Co. | Environment | Mine permit retracted for environmental concerns |
| 12-9-2010 | DSM Koninklijke | Health | Workers die by asphyxiation |
| 27-10-2010 | Xcel Energy | Environment | Plan to reduce emissions rejected |
| 30-11-2010 | Waste Management Inc. | Both | Fine for toxic waste dump California |
| 1-12-2010 | Arconic | Environment | Revoked permit for not meeting environmental standards |
| 10-1-2011 | ExxonMobil | Both | Cleanup of toxins causes new health problems |
| 3-2-2011 | Merck & Co. Inc. | Health | Plant exposes residents to toxic chemicals |
| 23-2-2011 | Coca Cola | Health | Fine for Plachimada operations harming residents |
| 11-3-2011 | Tokyo Electric Power Company | Both | Fukushima nuclear radiation leak |
| 15-4-2011 | Rio Tinto | Health | Pollution from copper mine causes premature deaths |
| 29-4-2011 | Plains All American Pipeline | Environment | Oil spill |
| 26-5-2011 | Diageo | Health | Chemical release: sulfur dioxide and hydrogen |
| 10-6-2011 | Takeda Pharmaceutical Co. | Health | Diabetes drug Actos linked to cancer |
| 22-6-2011 | Domtar Corp. | Both | Lawsuit to close plant: fear of air pollution |
| 8-8-2011 | Orica | Health | Leak carcinogen: hexavalent chromium |
| 16-9-2011 | Johnson Controls International | Health | China shuts plant over lead poisoning |
| 9-11-2011 | Orica | Health | Plant shut down after carcinogen leak |
| 6-12-2011 | PPL Corp. | Health | Natural gas explosion |
| 21-5-2012 | Royal Dutch Shell | Both | Oil spill pollutes river and kills 5 children |
| 14-6-2012 | ExxonMobil | Health | Baton Rouge naphtha leak |
| 25-6-2012 | Endesa | Environment | Thermo plant suspended over environmental concerns |
| 12-7-2012 | Tokyo Electric Power Company | Both | Accumulated radioactive water found during cleanup |
| 25-7-2012 | BHP Group | Both | Spill toxic copper concentrate |
| 6-8-2012 | Chevron | Health | Refinery fire, thousands in hospital |

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| Date | Company | Category | Description in Eikon |
|------------|----------------------------------|-------------|--|
| 23-11-2012 | NiSource | Both | Gas explosion |
| 11-12-2012 | Nisource | Health | Gas pipeline explosion |
| 6-3-2013 | Davita | Health | Lawsuits negative side effects GranuFlo, Naturalyte |
| 18-3-2013 | Honeywell | Health | Sued for dumping waste Onondaga Lake |
| 29-3-2013 | ExxonMobil | Environment | Mayflower oil spill |
| 10-4-2013 | Barrick Gold | Environment | Pascua Lama environmental controversies |
| 6-6-2013 | Merck & Co. Inc. | Health | Report: drug Januvia increases thyroid, pancreatic cancer risk |
| 24-6-2013 | Canadian Natural Resources | Environment | Primrose field plant leaks bitumen crude |
| 15-7-2013 | Heidelbergement | Health | Subsidiary CEMENCO faces lawsuit for pollution |
| 15-8-2013 | Nestle SA | Environment | Issues water permit during drought |
| 14-11-2013 | Tata Steel | Health | Plant explosion |
| 29-11-2013 | Philips | Health | Federal lawsuits claiming hazardous wastes spills endangered public health |
| 5-12-2013 | General Mills | Health | Chemical contamination causes damage to houses |
| 17-12-2013 | Conagra Brands | Health | Fined to fix California homes with lead paint |
| 17-1-2014 | Empresas Copec | Environment | Green liquid waste spill |
| 28-1-2014 | Pepsico | Health | Report: Pepsi cola contains carcinogen |
| 3-2-2014 | Duke Energy | Environment | Dan River coal ash spill |
| 13-2-2014 | Chesapeake Energy Corp. | Environment | Lawsuit for causing earthquakes by natural gas waste fluid injections |
| 13-3-2014 | Consolidated Edison | Health | Gas leak causes explosion, killing 6 |
| 2-4-2014 | Amazon.com | Health | Fine leaking shipment flammable adhesive |
| 14-4-2014 | American Water Works Corporation | Health | Improper disposal of arsenic |
| 19-5-2014 | Ameren Corp | Environment | Power line hurts interferes with farming and potential environmental hazards |
| 29-9-2014 | Eli Lilly | Health | Report: Drug Cymbalta linked to birth defects |
| 14-10-2014 | Pfizer | Health | Report: Drug Zithromax increases heart attack risk |
| 12-11-2014 | Coca Cola | Environment | Water usage at plant Gujarat |
| 3-4-2015 | General Electric | Both | Appliance Park fire |
| 19-5-2015 | Plains All American Pipeline | Environment | Oil spill Refugio |
| 22-6-2015 | Ecopetrol SA | Environment | Pipeline bombing causes oil to spill in Colombian river |
| 5-8-2015 | Kinross Gold | Environment | Spill toxic wastewater with arsenic, mercury and lead |
| 19-8-2015 | Cameco | Both | Radioactive sludge spill |
| 22-9-2015 | Volkswagen | Environment | Cars equipped with software that cheat emission tests |
| 23-10-2015 | Chevron | Environment | Hydrocarbon spill at Pascagoula |
| 5-11-2015 | BHP Group | Both | Dam burst, killing 12, leaking toxic mud |
| 13-11-2015 | Freeport McMoran | Environment | Regulators order purge/shut down California pipeline |
| 2-12-2015 | Sempra Energy | Both | California methane leak |
| 17-12-2015 | Coca Cola | Environment | Fabricating pollution data |
| 11-1-2016 | Empresas Copec | Environment | Fine over green liquid waste spill |
| 1-2-2016 | ENI | Both | Bomb attack causes oil spill in Nigeria |
| 8-2-2016 | Anglo American PLC | Environment | Pipe leak - ore mixed with water |
| 1-3-2016 | Bayer | Both | EPA stops sales insecticide |
| 21-3-2016 | Kinross Gold | Environment | Water system shut down in drought |
| 13-4-2016 | Teck resources ltd. | Environment | Water containing metal spilled at Canada plant |
| 12-5-2016 | Shell | Environment | Oil spill Golf of Mexico |
| 20-5-2016 | Fiat | Environment | Suspiciously high emission tests |
| 8-6-2016 | Imperial Oil Ltd. | Environment | Wildfire cuts oil output |
| 30-6-2016 | Formosa Plastics | Environment | Formosa plastics admits guilt in Vietnamese dead fish issue |
| 15-7-2016 | Daimler | Environment | EU limits truck emission |
| 20-7-2016 | China Petrol. & Chem. Corp. | Both | Pipeline fire kills two, section is shut down |
| 3-8-2016 | Crescent Point Energy | Environment | Pipeline leaks oil emulsion |
| 12-8-2016 | McDonalds | Health | MD pressured to ban antibiotics |
| 24-8-2016 | Delta Airlines | Environment | Crude oil in international waters |
| 16-9-2016 | Mosaic Co. | Both | Florida sinkhole leaks radioactive water |
| 5-10-2016 | Johnson & Johnson | Health | Insulin pump can be cyberhacked |
| 24-10-2016 | Enterprise products partners | Environment | Seaway crude pipeline spill |
| 15-11-2016 | Link Real Estate | Environment | Fined for dumping wastewater in river |
| 25-11-2016 | Norsk Hydro ASA | Environment | Diesel spill Aardal |
| 6-12-2016 | Apple | Environment | Hazardous waste |
| 13-1-2017 | HSBC | Environment | Report: environmental concerns wrt. financing palm oil companies |
| 25-1-2017 | Apple | Health | Sued for not using patented fix to stop distracted driving |
| 23-3-2017 | Dominion Energy | Environment | Illegal flowing of arsenic, pollutes Virginia water |
| 6-4-2017 | China Petrol. & Chem. Corp. | Environment | Plant shut down environmental concerns |
| 19-4-2017 | Carnival Corp. | Environment | Fine for pollution scheme |
| 27-6-2017 | Ford Motor | Environment | Chemical spill into Lake Erie, Ohio |
| 20-7-2017 | Yum! Brands | Health | Fecal bacteria found in ice |
| 30-8-2017 | Arkema | Both | Explosions in flooded plant. Hurricane Harvey |
| 28-9-2017 | Enel | Environment | Illegal waste probe |
| 23-10-2017 | Enbridge | Environment | Natural gas leak Louisiana coast |
| 9-11-2017 | BMW | Environment | Fine for emission rule breach |
| 27-2-2018 | Cardinal Health | Health | Sued for helping fuel opioid epidemic |
| 5-3-2018 | Norsk Hydro ASA | Environment | Force majeure Brazil alumina plant, fear water contamination |
| 6-4-2018 | Imerys | Health | Lawsuit: cancer from exposure to asbestos in talc-based products |
| 14-6-2018 | Walgreens | Health | Fueling opioid epidemic |
| 17-8-2018 | Atlantia | Health | Investigation for Genua bridge collapse |

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.gloenvcha.2021.102245>.

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