

Public perception, identification, and market impact of ESG events

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Sustainable Investing is on the Rise

Westpac - 2022

The unstoppable rise of sustainable investment

#Investing #Sustainability

Financial Times - 2023

The rise and rise of sustainable investment

Investors' growing appetite for ESG investment is driving a broad range of new products and services.

Morgan Stanley - 2024

Individual Investors' Interest in Sustainability Is on the Rise

ISS Insights - 2024

Sustainable Funds Continue to Outgrow Peers in 2023

ESG data providers

Bloomberg

FitchRatings

FACTSET

MSCI

BEYOND
RATINGS

MORNINGSTAR

IHS Markit

REFINITIV

arabesque

Moody's

R RepRisk

S&P Global

SUSTAINALYTICS

TRUVALUE LABS

FTSE
Russell

CLARITY AI

covalence
ESG ratings

- **Many (70+)** providers with sustainable data across pillars:
 - Environmental
 - Social
 - Governance
- **Data format:** ESG ratings, media sentiment scores, ESG-related news, ESG events
- **Inside-out sources:** Sustainability reports, 10-K, Proxy reports
- **Outside-in sources:** News articles, Social Media posts, NGO Reports

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- B. Which pillar exert more influence on the market dynamics?

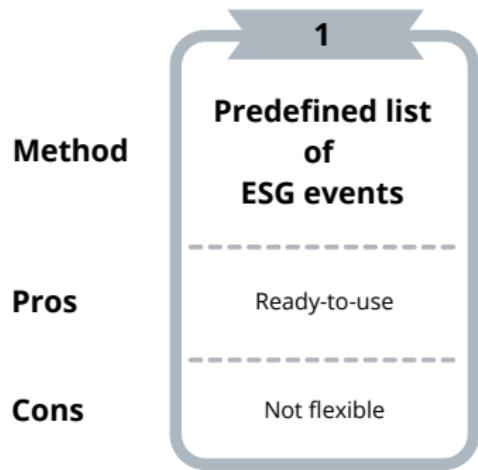
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- B. Which pillar exert more influence on the market dynamics?

Common approach: identify ESG specific events and perform an event study

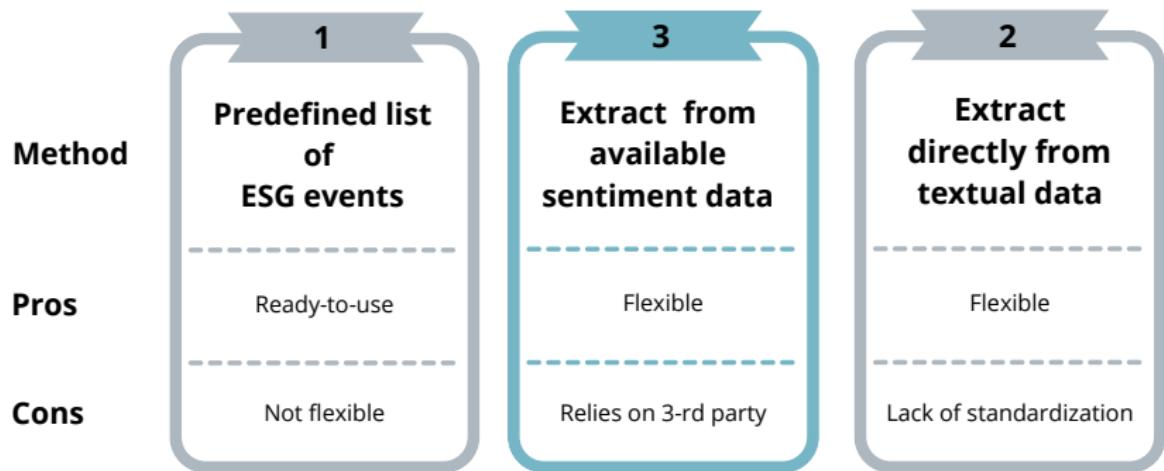
Three streams of Event Identification



Three streams of Event Identification



Three streams of Event Identification



REFINITIV[®] MARKETPSYCH ESG ANALYTICS

QUANTIFYING SUSTAINABILITY IN GLOBAL NEWS AND SOCIAL MEDIA

TradESG vs. MediaESG: Difference

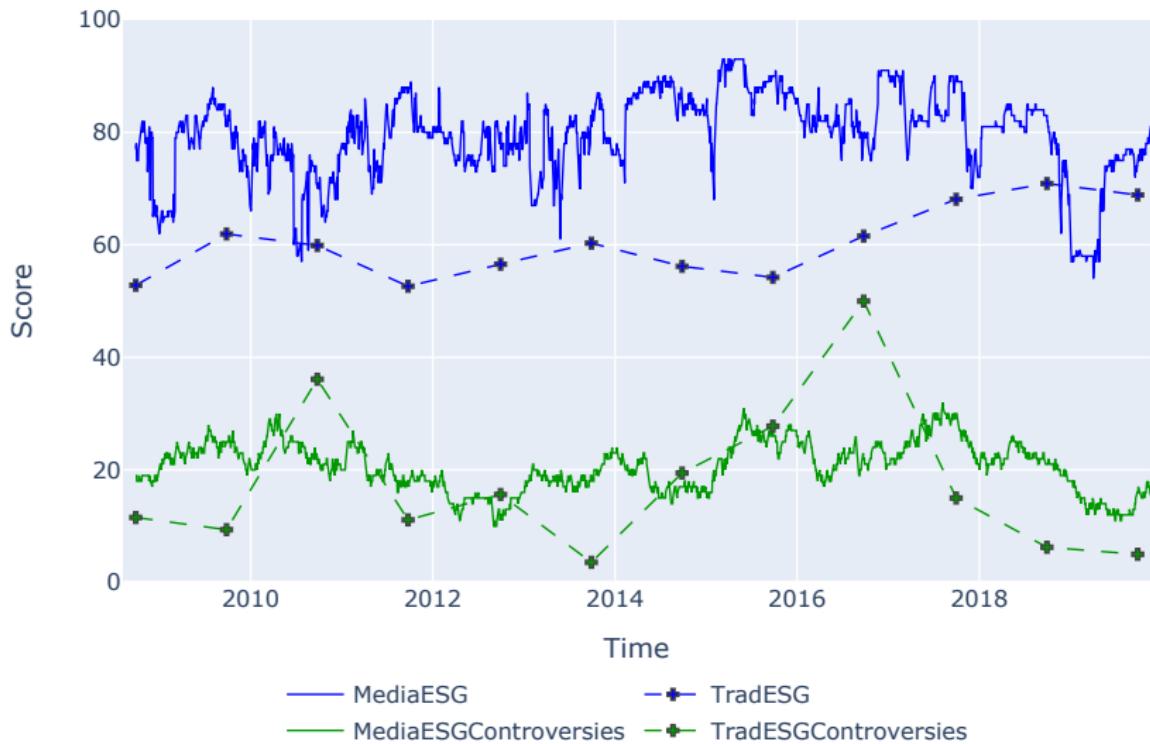
Traditional ESG scores (TradESG)

- Inside-out perspective => company disclosure data (e.g. annual reports, CSR reports, etc.)
- Constructed using human research analysts
- Infrequent - usually updated annually

Media ESG scores (MediaESG)

- Outside-in perspective => no company disclosure data (e.g. X/Twitter posts, news articles, etc.)
- Constructed using AI and NLP techniques
- Frequent - usually updated hourly/minutely

TradESG vs. MediaESG: Apple example



Research methodology

- **Step one** - develop an easy-to-use algorithm to extract ESG events from the MediaESG ratings from MarketPsych.

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- **Step two** - estimate market reaction to the identified MediaESG events in an event-study framework. Previous findings:
 - **Only positive ESG events are significant** [Serafeim and Yoon, 2022]
 - **Only negative ESG events are significant** [Capelle-Blancard and Petit, 2019]
 - **Positive and Negative ESG events are significant** [Flammer, 2013, Tanaka and Managi, 2023]

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This paper: significant impact of both positive and negative ESG events on stock market valuations.

The effect is asymmetric and heterogeneous across industries and time.

Dataset

Period: January 2000 - December 2022 [Details](#)

Companies: historical constituents of the S&P500 - 796 companies

Data sources:

- **MediaESG sentiment data** - MarketPsych ESG Analytics dataset by Refinitiv [Details](#)
 - **Pillar Scores:**
 - Environmental Score
 - Social Score
 - Governance Score
 - **Aggregate Scores:** [Hierarchy](#)
 - ESG - weighted pillar scores [Details](#)
 - **ESGControversies** - unweighted measure of unsustainable practices
 - **Buzz** - volume of media references to a particular company (**chatter**)
- **Other data**
 - Pricing data from CRSP
 - Risk Factors from Fama-French data library

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- **Condition 4:** There are no other events detected within a specified window preceding the event.

Event Detection Pipeline

Feature engineering

- For each company $i \in I$ and day $t \in T$ we define $X_{i,t}$ that is either:
 - **LogBuzz** - $B_{i,t} \in [0, \inf)$
 - **MediaESG score** - $S_{i,t} \in [0, 100]$
- $x_{i,t} = \Delta X_{i,t} = X_{i,t} - X_{i,t-1}$ is a daily change in variable $X_{i,t}$.
- $\tilde{x}_{i,t}^h = x_{i,t}/\sigma_h(x_{i,t})$ - standardized daily change in variable $X_{i,t}$:
 - $\sigma_h(x_{i,t})$ - standard deviation of the $x_{i,t}$ over the previous h days period, excluding current state: from $t - h - 1$ to $t - 1$.
- $Q_q^h(X_{i,t})$ - q -quantile value of $X_{i,t}$ in the h periods before t .
- $E_{i,t}$ - a MediaESG event on day t for company i .

Event Detection Pipeline

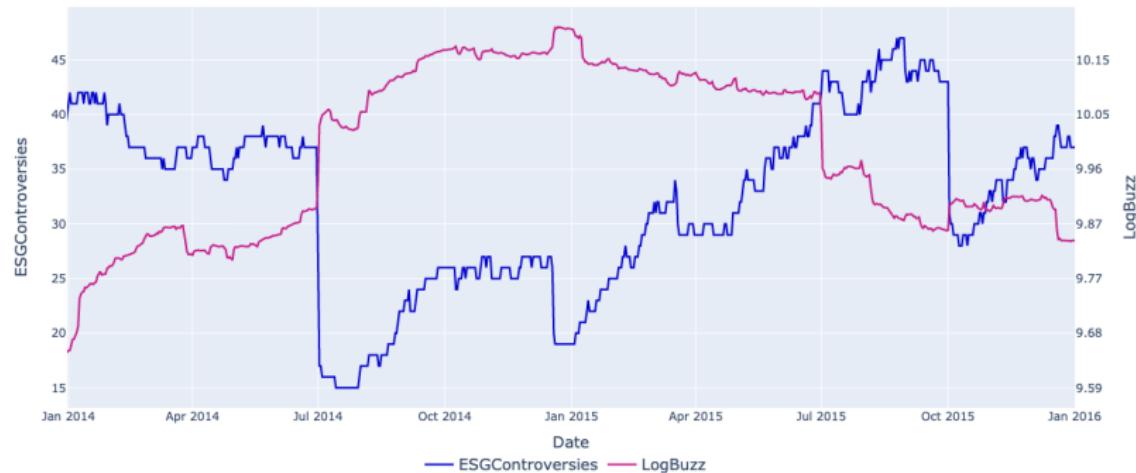
Main conditions

Given hyperparameters k (shock magnitude), q (quantile level), h (number of estimation days), and Z (number of look-back days), define:

- **Condition 1:** $\tilde{b}_{i,t}^h \geq k$ (Buzz shock condition)
- **Condition 2:** $B_{i,t} > Q_q^h(B_{i,t})$ (Buzz level condition)
- **Condition 3:** $|\tilde{s}_{i,t}^h| \geq k$ (Score shock condition)
- **Condition 4:** $\sum_{z=1}^Z E_{i,t-z} = 0$ (No re-occurrence condition)

Event Detection Pipeline Example: Step one

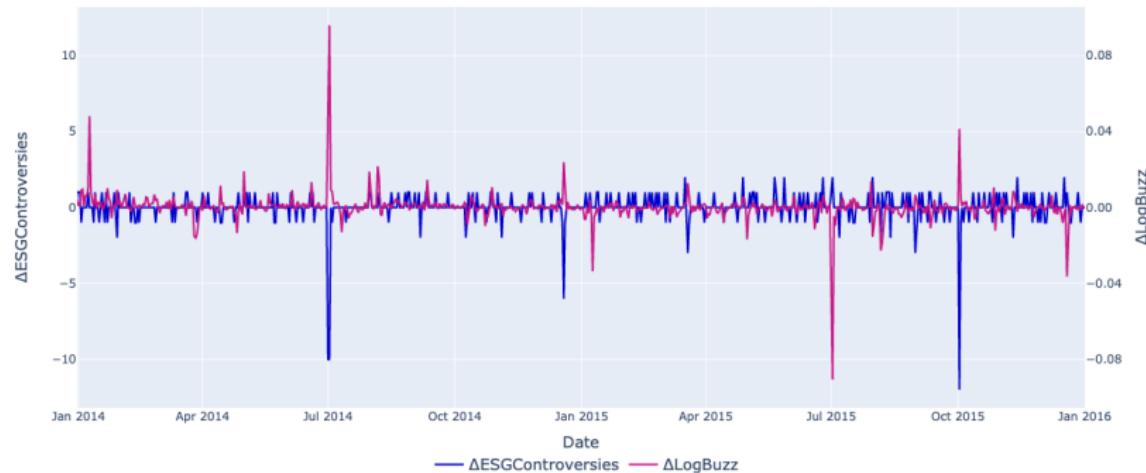
T-Mobile from January 2014 to January 2016



- $\text{LogBuzz} = B_{i,t} \in [0, \infty)$
- $\text{ESGControversies} = S_{i,t} \in [0, 100]$

Event Detection Pipeline Example: Step Two

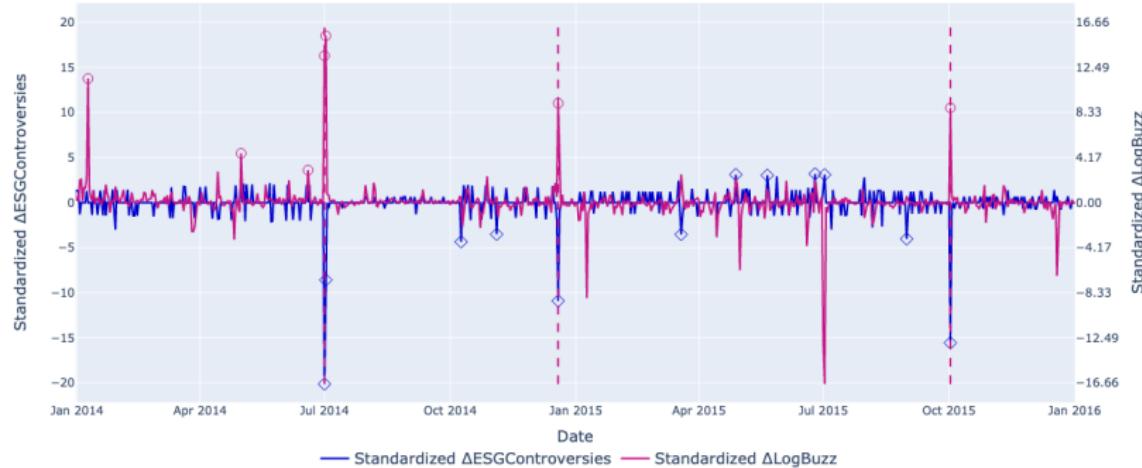
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- Daily change in logBuzz $b_{i,t} = \Delta B_{i,t} = B_{i,t} - B_{i,t-1}$
- Daily change in ESGControversies $s_{i,t} = \Delta S_{i,t} = S_{i,t} - S_{i,t-1}$

Event Detection Pipeline Example: Step Three

T-Mobile from January 2014 to January 2016



- Standardized Daily change in logBuzz $\tilde{b}_{i,t}$
- Standardized Daily change in ESGControversies $\tilde{s}_{i,t}$
- Notable spikes exceeding 3 STD are denoted by circles and diamonds
- Only 3 dates satisfy the simultaneous shock conditions for the Buzz and ESGControversies.

Joint Distribution

Event Detection Pipeline Example: Verification

T-Mobile from January 2014 to January 2016

Three dates identified also satisfy the Buzz-level and no re-occurrence conditions. Using the search engine, we were able to identify the particular media events associated:

- **Event 1** (July 1st, 2014) - accusations of applying bogus charges on customers without their consent.
- **Event 2** (December 19th, 2014) - fined by the US Government over the Cramming Case.
- **Event 3** (October 1st, 2015) - hackers stole personal data from 15 million individuals who had recently applied for T-Mobile service.

Descriptive statistics of the identified MediaESG events

| | Overall | | Per Company | | |
|------------------------|--------------|-------------|-------------|--------|------|
| | # Events | # Companies | Mean | Median | Max |
| Positive events | | | | | |
| Total unique | 19656 | 744 | 26.4 | 24.0 | 74.0 |
| ESG | 8332 | 732 | 11.2 | 9.0 | 41.0 |
| EnvironmentalPillar | 5368 | 696 | 7.2 | 6.0 | 38.0 |
| SocialPillar | 6783 | 724 | 9.1 | 7.0 | 39.0 |
| GovernancePillar | 6050 | 724 | 8.1 | 7.0 | 29.0 |
| ESGControversies | 10146 | 731 | 13.6 | 12.0 | 47.0 |
| Negative events | | | | | |
| Total unique | 14620 | 743 | 19.7 | 20.0 | 45.0 |
| ESG | 4757 | 721 | 6.4 | 6.0 | 24.0 |
| EnvironmentalPillar | 2231 | 633 | 3.0 | 3.0 | 13.0 |
| SocialPillar | 4788 | 708 | 6.4 | 6.0 | 25.0 |
| GovernancePillar | 3742 | 709 | 5.0 | 5.0 | 19.0 |
| ESGControversies | 8210 | 739 | 11.0 | 11.0 | 33.0 |

Details

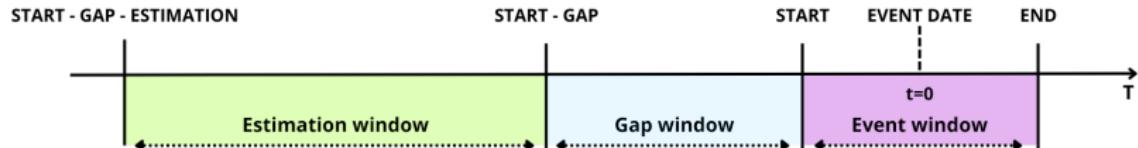
Corporate events

Co-occurrence matrix

Event time distribution

Event cross-section distribution

Event Study Framework



- Estimation window (200 days):
 - estimate normal returns $R_{i,t}$ for each event using Fama-French Five Factor model (FF5)
- Gap Window (50-days):
 - skip for robustness (e.g. data-leakage, market anticipation).
- Event Window (21-days):
 - calculate expected return $\widehat{R}_{i,t}$ using fitted FF5
 - calculate abnormal returns as $AR_{i,t} = R_{i,t} - \widehat{R}_{i,t}$
 - calculate cumulative abnormal returns $CAR_i[\tau_1, \tau_2]$
 - test significance through the t-statistics

Main Findings - Aggregate



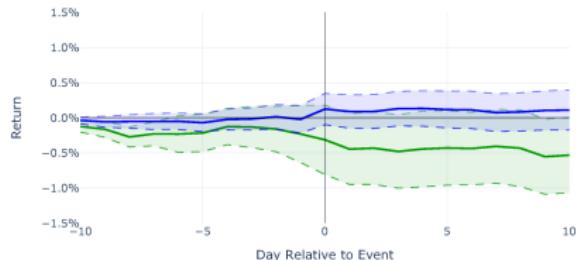
Positive events CAR[-10, 10]: Average $\approx 0.5\%$

Negative events CAR[-10, 10]: Average $\approx -1.0\%$

Main Findings - Pillars

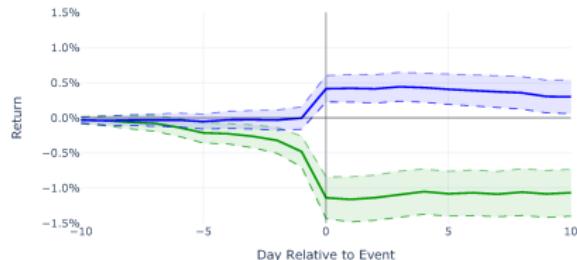
EnvironmentalPillar

Cumulative Abnormal Return: Mean & 95% Confidence Limits



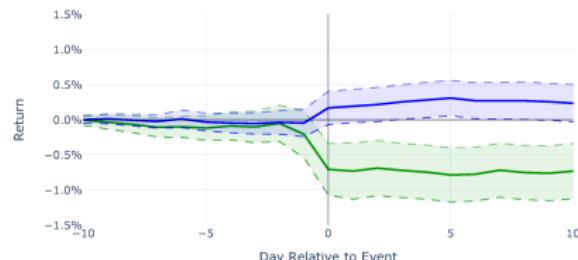
SocialPillar

Cumulative Abnormal Return: Mean & 95% Confidence Limits



GovernancePillar

Cumulative Abnormal Return: Mean & 95% Confidence Limits



Negative Events (3765 events)

- Mean
- Mean + 1.96SE
- Mean - 1.96SE

Positive Events (6063 events)

- Mean
- Mean + 1.96SE
- Mean - 1.96SE

Industry Decomposition

Details

| | ESG | Aggregate ESG Controversies | (E) | Pillars (S) | (G) |
|--|-----------|--------------------------------|----------|----------------|----------|
| Positive Events: MEAN CAR [-10, 10] | | | | | |
| Consumer cyclicals | 0.62%* | 1.42%*** | 0.26% | 1.41%*** | 1.07%** |
| Industrials | 0.40% | 0.51%** | 0.46% | -0.15% | -0.15% |
| Financials | 0.44% | 0.12% | 0.06% | -0.41% | 0.32% |
| Utilities | -0.17% | -0.15% | -0.24% | 0.14% | -0.59% |
| Real estate | -0.26% | -0.36% | -0.32% | -0.18% | -0.28% |
| Technology | 0.91%*** | 1.11%*** | 0.45% | 0.70%** | 0.28% |
| Energy | -0.14% | -0.22% | -0.13% | -0.89% | -0.64% |
| Basic materials | 0.93%** | 1.64%*** | 0.07% | 0.45% | 1.22%** |
| Healthcare | 0.16% | 0.92%*** | -0.11% | 0.93%** | 0.44% |
| Consumer non-cyclicals | 0.05% | 0.53%* | 0.29% | 0.36% | -0.20% |
| Negative Events: MEAN CAR [-10, 10] | | | | | |
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| Financials | -0.64% | -0.52%* | -1.36% | -0.37% | -0.27% |
| Utilities | -1.38%** | -1.67%*** | -1.33%** | -2.00%*** | -1.23%* |
| Real estate | -1.61%** | -1.18%** | -2.69%* | -1.17%** | -2.03%** |
| Technology | -1.75%*** | -1.38%*** | -0.92% | -1.82%*** | -1.15%** |
| Energy | -1.13% | -1.01%* | -0.88% | -1.25%* | -0.46% |
| Basic materials | -1.85%** | -1.17%** | -0.69% | -0.23% | -0.81% |
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| Utilities | -1.38%** | -1.67%*** | -1.33%** | -2.00%*** | -1.23%* |
| Real estate | -1.61%** | -1.18%** | -2.69%* | -1.17%** | -2.03%** |
| Technology | -1.75%*** | -1.38%*** | -0.92% | -1.82%*** | -1.15%** |
| Energy | -1.13% | -1.01%* | -0.88% | -1.25%* | -0.46% |
| Basic materials | -1.85%** | -1.17%** | -0.69% | -0.23% | -0.81% |
| Healthcare | -1.15%** | -1.21%*** | 0.37% | -1.56%*** | -0.36% |
| Consumer non-cyclicals | -0.70%* | -0.85%** | -0.57% | -0.68% | -1.06%** |

Industry Decomposition

Details

| | ESG | Aggregate ESGControversies | (E) | Pillars (S) | (G) |
|--|-----------|-------------------------------|----------|----------------|----------|
| Positive Events: MEAN CAR [-10, 10] | | | | | |
| Consumer cyclicals | 0.62%* | 1.42%*** | 0.26% | 1.41%*** | 1.07%** |
| Industrials | 0.40% | 0.51%** | 0.46% | -0.15% | -0.15% |
| Financials | 0.44% | 0.12% | 0.06% | -0.41% | 0.32% |
| Utilities | -0.17% | -0.15% | -0.24% | 0.14% | -0.59% |
| Real estate | -0.26% | -0.36% | -0.32% | -0.18% | -0.28% |
| Technology | 0.91%*** | 1.11%*** | 0.45% | 0.70%** | 0.28% |
| Energy | -0.14% | -0.22% | -0.13% | -0.89% | -0.64% |
| Basic materials | 0.93%** | 1.64%*** | 0.07% | 0.45% | 1.22%** |
| Healthcare | 0.16% | 0.92%*** | -0.11% | 0.93%** | 0.44% |
| Consumer non-cyclicals | 0.05% | 0.53%* | 0.29% | 0.36% | -0.20% |
| Negative Events: MEAN CAR [-10, 10] | | | | | |
| Consumer cyclicals | -0.56% | -1.03%*** | 1.43%* | -1.05%* | -0.35% |
| Industrials | -0.36% | -0.60%* | -0.82% | -0.41% | -0.44% |
| Financials | -0.64% | -0.52%* | -1.36% | -0.37% | -0.27% |
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Period Decomposition

| | Positive Events | | Negative Events | |
|---------------------------|-----------------|-----------|-----------------|-----------|
| | 2000-2011 | 2012-2022 | 2000-2011 | 2012-2022 |
| Mean CAR [-10, 10] | | | | |
| ESG | 0.34%** | 0.39%*** | -1.53%*** | -0.55%** |
| ESGControversies | 0.67%*** | 0.55%*** | -1.23%*** | -0.80%*** |
| EnvironmentalPillar | 0.13% | 0.09% | -1.09%** | -0.12% |
| GovernancePillar | -0.00% | 0.45%*** | -0.94%*** | -0.53%* |
| SocialPillar | 0.33%* | 0.26%* | -1.32%*** | -0.81%*** |
| Number of Events | | | | |
| ESG | 4265 | 4091 | 2460 | 2323 |
| ESGControversies | 4991 | 5174 | 4291 | 3951 |
| EnvironmentalPillar | 2315 | 3069 | 942 | 1300 |
| GovernancePillar | 2855 | 3208 | 1846 | 1919 |
| SocialPillar | 3685 | 3118 | 2439 | 2385 |

Period Decomposition

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Conclusion

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Conclusion

- We use recently developed yet not extensively used **ESG MarketPsych dataset by Refinitiv**.
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- We document **a heterogeneous effect of MediaESG events** on asset prices across ten industry sectors and across periods.

References I

Gunther Capelle-Blancard and Aurélien Petit. Every little helps? ESG news and stock market reaction. *Journal of Business Ethics*, 157:543–565, 2019.

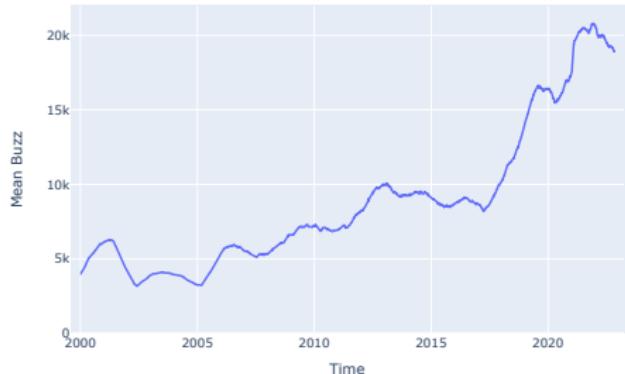
Caroline Flammer. Corporate social responsibility and shareholder reaction: The environmental awareness of investors. *Academy of Management Journal*, 56(3):758–781, 2013.

George Serafeim and Aaron Yoon. Stock price reactions to ESG news: The role of ESG ratings and disagreement. *Review of Accounting Studies*, pages 1–31, 2022.

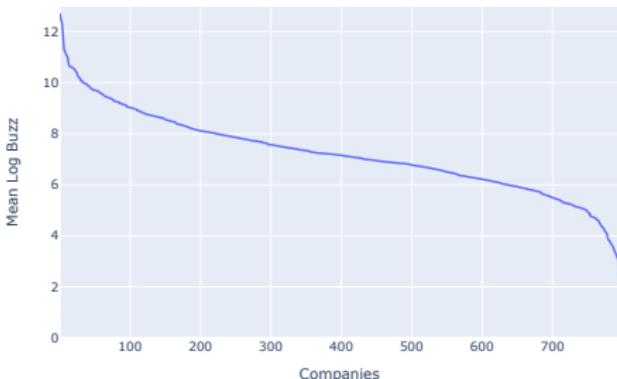
Yoshitaka Tanaka and Shunsuke Managi. Attention-Grabbing ESG. Available at SSRN 4432709, 2023.

Sample Figures

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(a) Buzz over time



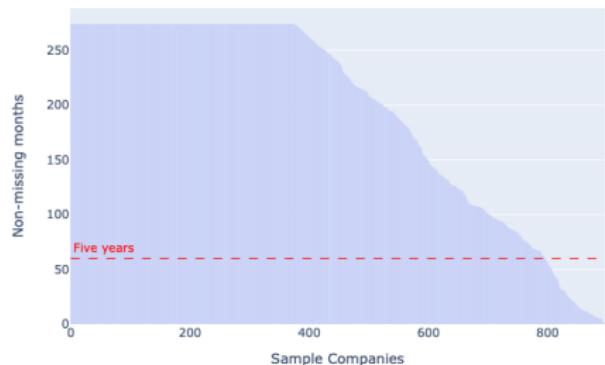
(b) LogBuzz in cross-section

Figure 4: Temporal and cross-sectional distribution of MediaESG Buzz.

The left plot illustrates the temporal distribution of mean buzz over the study period from January 2000 to December 2022. The right plot shows the distribution of mean LogBuzz for each company over the entire sample period ranked from the highest to the lowest buzz.

Data Availability

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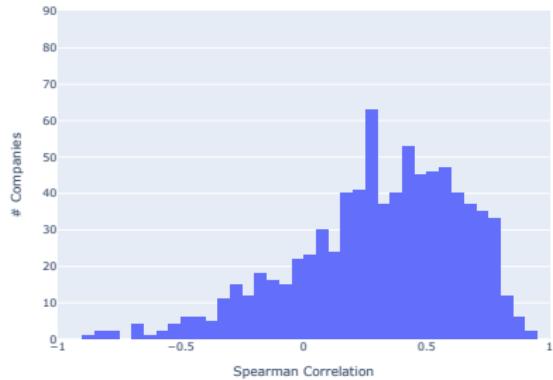
(a) Cross-section data availability



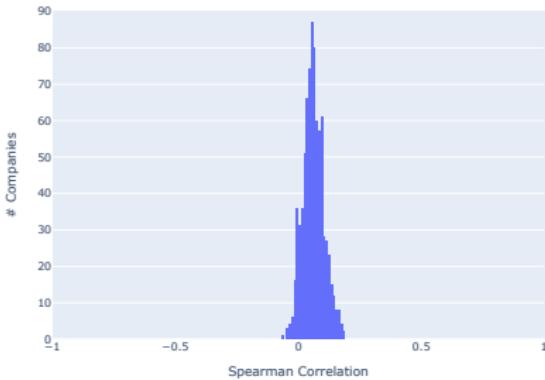
(b) Temporal data availability

Figure 5: Sample Data Availability. The left plot illustrates the number of months with both Core RM-ESG and CRSP data available for each company in the original sample. The right plot displays the count of companies with non-missing observations available for each month of the sample period. Only companies with a total number of non-missing months exceeding 60 are included in the graph.

Correlation analysis

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(a) LogBuzz vs. MediaESG score



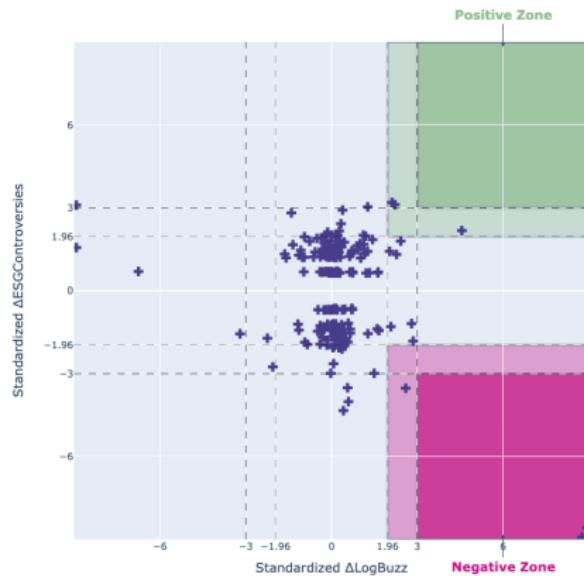
(b) Δ LogBuzz vs. Δ MediaESG score

Figure 6: Spearman Correlation between LogBuzz and Media ESG Rank.
Both plots illustrate the distribution of Spearman correlation coefficients across companies in the sample, with the left plot showing correlations in levels between LogBuzz and MediaESG rank, and the right plot displaying the distribution of the correlation in their daily change.

Event Detection Pipeline Example: Joint Distribution

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T-Mobile from January 2014 to January 2016

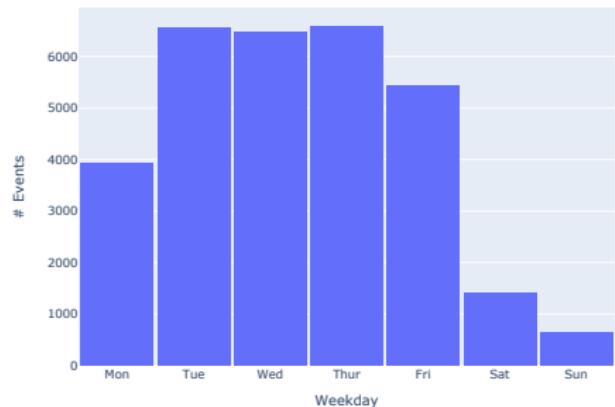


- **Crosses** - specific dates within the sample period. Days with zero changes in any variable are excluded for visualization purposes.
- **Positive Zone** - area with positive shock in ESGControversies and LogBuzz of magnitude > 3 .
- **Negative Zone** - area with negative shock in ESGControversies and postive shock in LogBuzz of magnitude > 3 .
- **Lighter green and violet squares** - "mild" MediaESG areas, with shocks ranging between 1.96 and 3.

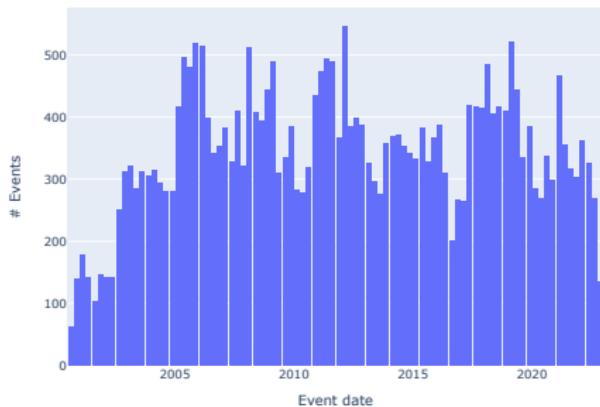
Co-occurrence matrix

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Temporal distribution of identified events

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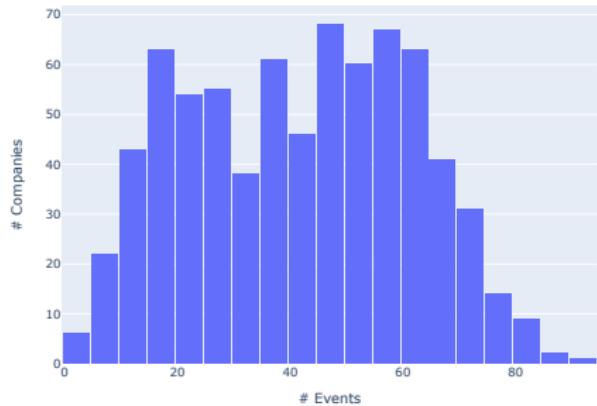
(a) Weekday distribution



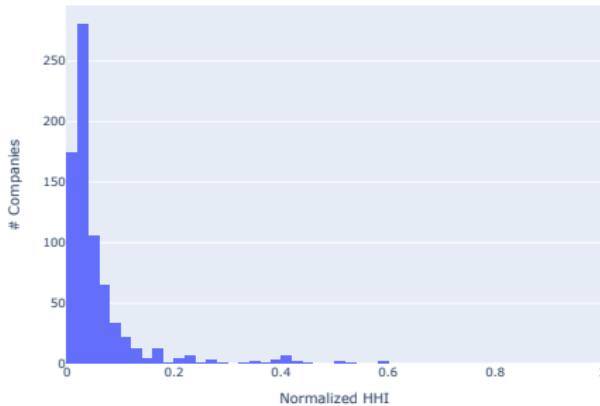
(b) Sample period distribution

Figure 7: Temporal distribution of identified events throughout the sample period. The left figure illustrates the distribution of events by the day of the week, while the right figure displays the frequency of events over time.

Cross-section distribution of identified events

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(a) Inter-Company Event Distribution



(b) Intra-Company Event Distribution

Figure 8: Cross-sectional distribution of events. The left figure displays a histogram showing the number of events per company. In the right figure, the histogram illustrates the distribution of the normalized Herfindahl Hirschman Index across companies, with lower values indicating lower concentration within each company's history.

Corporate events

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| Company Event Type | # Events | # Companies | Yearly Average |
|--|----------|-------------|----------------|
| EarningsReleases | 23991 | 671 | 4.0 |
| ConferencePresentations | 22875 | 659 | 4.5 |
| ExDividends | 15193 | 518 | 4.0 |
| ShareholderAndAnnualMeetings | 3683 | 588 | 1.1 |
| CorporateCallsAndPresentations | 3498 | 578 | 1.9 |
| EarningsCallsAndPresentations | 1961 | 382 | 1.8 |
| CorporateAnalystMeetings | 1397 | 383 | 1.2 |
| CorporateSalesRelease | 835 | 55 | 4.2 |
| Conferences | 520 | 90 | 3.4 |
| MergerAndAcquisitionCallsAndPresentations | 512 | 231 | 1.1 |
| SpecialDividendsCash | 450 | 76 | 3.3 |
| OtherCorporate | 426 | 32 | 4.9 |
| StockSplits | 367 | 256 | 1.1 |
| SalesConferenceCall | 158 | 16 | 4.3 |
| CompanyVisits | 120 | 42 | 2.4 |
| GuidanceCallsAndPresentations | 90 | 57 | 1.2 |
| BrokerageAnalystMeetings | 87 | 53 | 1.4 |
| ExtraordinaryShareholdersMeeting | 77 | 68 | 1.0 |
| RegularDividendsStock | 49 | 10 | 3.8 |
| CorporateInvestorRoadshow | 46 | 25 | 1.5 |
| BrokerageAnalystCalls | 37 | 30 | 1.1 |
| SyndicateRoadshows | 25 | 11 | 1.8 |
| CapitalGainsCash | 10 | 1 | 3.3 |
| GuidancePresentation | 9 | 7 | 1.3 |
| CorporatePresentation | 9 | 7 | 1.3 |
| SalesAndTradingStatementReleases | 8 | 7 | 1.0 |
| OtherDividendsCash | 7 | 3 | 2.3 |
| RegularDividendCashWithAlternative | 5 | 2 | 2.5 |
| IndustrySpecificCall | 4 | 4 | 1.0 |
| EarningsPresentation | 3 | 3 | 1.0 |
| M&APresentation | 2 | 2 | 1.0 |
| SalesPresentation | 2 | 2 | 1.0 |
| SecondaryFilings | 2 | 1 | 2.0 |
| IndustrySpecificPresentation | 1 | 1 | 1.0 |
| TradingStatementPresentation | 1 | 1 | 1.0 |

Industry distribution

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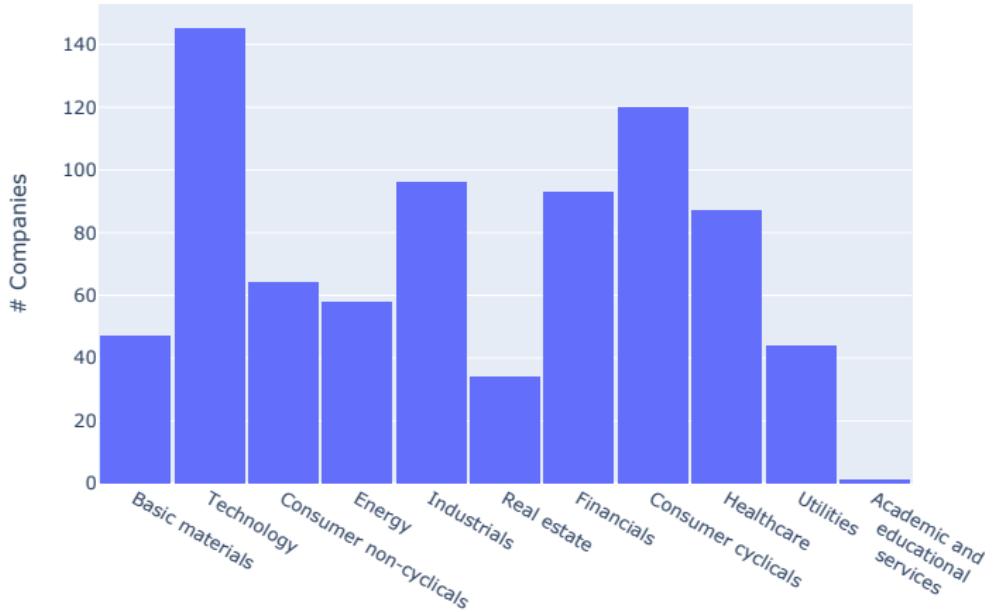
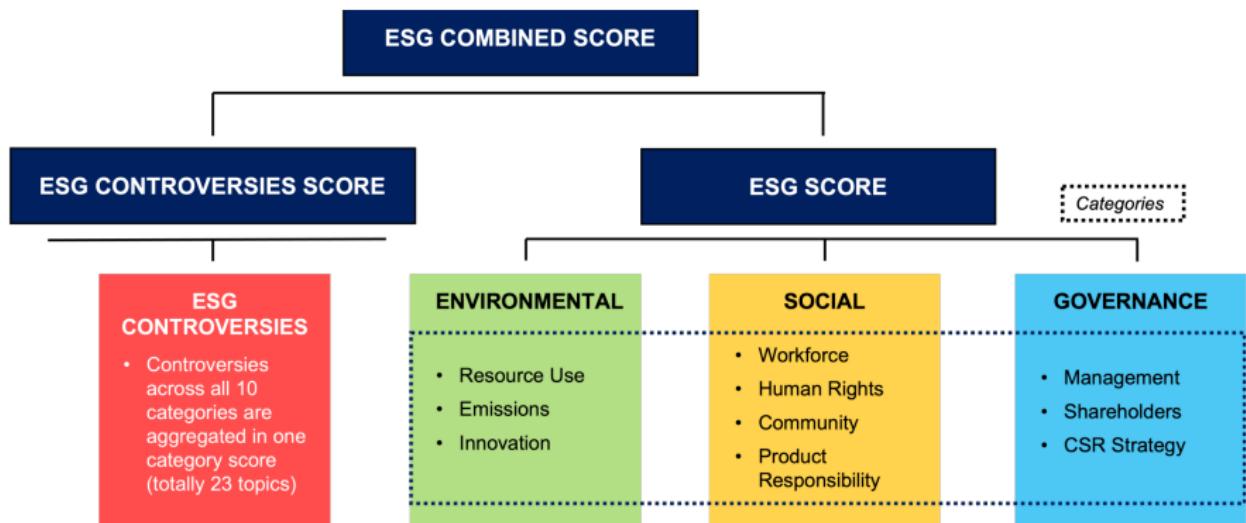


Figure 9: Industry Distribution. The distribution of sample companies across the 11 TRBC economic sectors.

Aggregate scores hierarchy

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Appendix C

The table below provides an indicative ESG category weights matrix based on assessment of sample ESG data. It is not a definitive matrix to be used in the final scoring.

| TRBC Industry Group Name | Industry Group code | Environmental | | | | Social | | | | Governance | | |
|----------------------------------|---------------------|---------------|------------|--------------|--------------|------------------------|-----------|-----------|------------|--------------|--------------|--|
| | | Emission | Innovation | Resource use | Human rights | Product responsibility | Workforce | Community | Management | Shareholders | CSR strategy | |
| Aerospace & Defense | 521010 | 0.09 | 0.09 | 0.06 | 0.15 | 0.07 | 0.11 | 0.11 | 0.22 | 0.06 | 0.04 | |
| Automobiles & Auto Parts | 531010 | 0.10 | 0.16 | 0.08 | 0.15 | 0.09 | 0.10 | 0.08 | 0.16 | 0.05 | 0.03 | |
| Banking Services | 551010 | 0.02 | 0.10 | 0.02 | 0.10 | 0.09 | 0.19 | 0.12 | 0.24 | 0.07 | 0.05 | |
| Beverages | 541010 | 0.12 | 0.04 | 0.13 | 0.15 | 0.12 | 0.10 | 0.08 | 0.17 | 0.05 | 0.03 | |
| Biotechnology & Medical Research | 562020 | 0.09 | 0.03 | 0.14 | 0.03 | 0.12 | 0.08 | 0.13 | 0.26 | 0.08 | 0.05 | |
| Chemicals | 511010 | 0.13 | 0.13 | 0.13 | 0.15 | 0.07 | 0.09 | 0.07 | 0.15 | 0.04 | 0.03 | |
| Coal | 501010 | 0.20 | 0.02 | 0.19 | 0.06 | 0.02 | 0.10 | 0.10 | 0.20 | 0.06 | 0.04 | |
| Collective Investments | 555010 | 0.03 | 0.03 | 0.03 | 0.03 | 0.08 | 0.09 | 0.17 | 0.34 | 0.10 | 0.07 | |

Based on the official documentation:

https://www.lseg.com/content/dam/data-analytics/en_us/documents/methodology/lseg-esg-scores-methodology.pdf