

ESG news-based public sentiment, media attention and stock price crash risk

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Abstract

Purpose – This study aims to examine whether media-driven public perception of a firm's environmental, social and governance performance (i.e. ESG news sentiment) and its media attention are associated with subsequent stock price crash risk. Using public sentiment formed from ESG news alone – separate from firms' self-reported ESG performance – study investigates whether media-based ESG information provides incremental informational content about crash risk beyond disclosure-based ESG metrics.

Design/methodology/approach – The authors analyse more than 34,000 semi-annual firm-level observations for US-listed firms from 2011 to 2021, using Refinitiv MarketPsych ESG sentiment and media attention data. They conduct cross-sectional and channel tests and use firm/industry and time fixed effects, propensity score matching, generalised method of moments and instrumental two-stage least squares to mitigate concerns related to selection, simultaneity and omitted-variables.

Findings – Greater negative ESG news sentiment is associated with higher crash-risk measures, indicating that ESG narratives affect investors' perceptions of downside risk. Higher ESG-related media attention is also associated with higher crash-risk measures and a stronger relation between ESG news sentiment and crash risk, consistent with an attention-amplification mechanism. Channel analyses indicate that ESG news sentiment is primarily directly associated with crash risk through risk perception, whereas the association between media attention and crash risk appears more strongly related to stock liquidity and return volatility channels. These associations weaken when firms face stronger external monitoring and intensify when firms operate in more opaque reporting environments.

Practical implications – The results suggest that ESG news sentiment and ESG-related media attention may provide useful contextual signals for investors and risk managers when assessing downside-risk exposure, particularly for firms with weaker monitoring or more opaque reporting. For firms and regulators, the findings underscore the potential importance of ESG disclosure credibility and monitoring of sustained ESG scrutiny.

Originality/value – This study distinguishes ESG news sentiment (tone) from ESG-related media attention (breadth of dissemination) and shows that they are conceptually and empirically distinct, exhibiting different time dynamics in their associations with crash-risk measures. The findings contribute to ESG, media and



crash-risk research by highlighting the role of external information flows in shaping ESG perceptions relevant to downside-risk exposure.

Keywords ESG, News sentiment, Media attention, Stock price crash risk, Disclosure, Stock liquidity, Stock return volatility

Paper type Research paper

1. Introduction

High-profile environmental, social and governance (ESG) controversies, when amplified by intensive media coverage, often trigger sharp stock price declines that erode shareholder value [1]. Yet we know little about the longer-term financial effects of sustained, perception-shaping ESG information coverage. We fill this gap by testing whether media-driven public perception of a firm's ESG performance (hereafter ESG news sentiment) and media attention on that performance are related to the likelihood of its stock price crashing (hereafter crash risk).

We focus on ESG sentiment derived from external news coverage and distinguish it from ESG-related media attention (coverage intensity) and firms' self-reported ESG performance. This separation allows us to examine whether ESG-related narratives highlighted in the media contain incremental informational content about crash risk beyond disclosure-based ESG measures, particularly in settings characterised by voluntary, non-standardised disclosures and greater scope for managerial obfuscation. Consistent with this motivation, recent evidence by Jeong *et al.* (2025) shows that ESG-specific news tone conveys information that general news does not, underscoring the distinct informational content of ESG-related narratives for understanding downside-risk exposure.

We obtain ESG news sentiment data from Refinitiv MarketPsych ESG Analytics (RMA), which use a natural language processing engine to analyse ESG-related content from global news sources and social media. ESG news sentiment for a specific firm is measured on an industry-relative scale from 1 (most negative) to 100 (most positive). The RMA's Buzz score measures the intensity of media attention by capturing the frequency of ESG-related mentions for a firm. We use two measures of crash risk:

- (1) the negative skewness of firm-specific weekly stock returns; and
- (2) the asymmetric volatility of negative and positive firm-specific weekly stock returns.

We test our hypotheses using more than 34,000 semi-annual observations of US-listed firms between 2011 and 2021. First, we find that negative (positive) ESG news sentiment is associated with an increase (decrease) in crash risk by 2.8% of a standard deviation. This finding supports the risk perception view (see Section 2.1) that negative ESG news sentiment signals hidden risks, while positive ESG news fosters investor confidence. Second, high media attention to ESG news is related to a 12.1% standard-deviation increase in crash risk, likely by promoting bad-news hoarding and attracting greater attention from short-term, transient investors (see Section 2.1). Third, high media attention moderates the relationship between negative ESG news sentiment and crash risk, nearly doubling it from 2.8% to 5.4%. Additionally, we find that the social pillar of news sentiment has the greatest negative association with crash risk. Further, while the association between media attention and crash risk is greater in smaller firms, the relationship between ESG news sentiment and crash risk does not vary significantly by firm size. We perform various robustness tests, including subsample analyses, alternative measures of crash risk and several endogeneity tests, such as propensity score matching, generalised method of moments (GMM) and instrumental

variable two-stage least squares models. Our results consistently hold, mitigating concerns about endogeneity influencing our findings.

We examine two channels through which ESG news sentiment and media attention can be associated with stock price crash risk: stock liquidity and return volatility, both empirically linked to higher crash risk (Bauer *et al.*, 2021; Chen *et al.*, 2001). We show that ESG news sentiment is more strongly associated with crash risk directly, whereas high media attention is primarily channelled through the indirect paths of stock liquidity, potentially reflecting greater information availability and transient investor attraction (Ni *et al.*, 2021) and stock return volatility, plausibly driven by greater information accessibility and amplified investor reactions (Cao *et al.*, 2022; Edmans *et al.*, 2022). The predominantly direct association between ESG news sentiment and crash risk further suggests that managerial withholding of adverse information is more strongly signalled by ESG news than by media attention.

Given evidence that managerial bad news hoarding drives the link between ESG news sentiment, media attention and crash risk, we examine whether two governance-related factors, external monitoring and financial reporting opacity, moderate these relationships. Strong external monitoring limits managers' ability to conceal adverse information (Hong *et al.*, 2017), and we find that it weakens the association between ESG news sentiment and crash risk. Conversely, high financial reporting opacity facilitates concealment (Kim *et al.*, 2021), increasing the chance that the eventual release of negative information will trigger a crash. Consistent with this mechanism, the associations of both ESG news sentiment and media attention with crash risk are stronger in more opaque firms, where managers have greater scope to hoard bad news.

Our study makes several incremental contributions to research on ESG information and crash risk. First, we contribute to the ESG and crash-risk literatures by providing evidence that media-based ESG sentiment contains incremental informational content about subsequent crash-risk measures beyond firms' self-reported ESG disclosures (Feng *et al.*, 2022; Kim *et al.*, 2014). Second, we advance media research by distinguishing ESG news sentiment, which reflects how ESG news is perceived, from media attention, which reflects how widely it is disseminated (Chen *et al.*, 2018; Kong *et al.*, 2023). We show that these constructs are conceptually and empirically distinct, associated with crash risk in different ways, and exhibit different time dynamics: media attention shows a temporal association with crash-risk measures that changes over time, whereas ESG news sentiment displays a more persistent association over horizons of up to two years. Finally, we contribute to research on managerial bad news hoarding by showing that the associations between both ESG news sentiment and media attention and crash-risk measures are stronger in firms with weak external monitoring and high reporting opacity, consistent with media acting as an external monitoring channel that can amplify scrutiny of concealed ESG risks.

2. Literature review

Stock price crash risk has been extensively linked to managerial bad-news hoarding, whereby managers delay or downplay adverse information to protect careers and compensation, resulting in eventual release of information in lumps and triggering extreme downside returns (Hussain *et al.*, 2025; Jin and Myers, 2006). Crash risk rises with financial reporting opacity, which facilitates concealment (Hsu *et al.*, 2021; Jin and Myers, 2006), and does not symmetrically produce positive jumps, consistent with selective withholding of bad news (Hutton *et al.*, 2009). Empirical evidence suggests that stronger corporate governance (Hong *et al.*, 2017; Zhou *et al.*, 2024), better quality audits (Han *et al.*, 2023), close scrutiny by revenue authorities (Bauer *et al.*, 2021) and institutional investors (Callen and Fang, 2013) and effective internal controls (Chen *et al.*, 2016) can mitigate this behaviour.

While traditional monitoring mechanisms mitigate crash risk by constraining managerial opportunism, emerging research underscores media attention's dual role as both a disciplining force and a catalyst for short-termism. On one hand, media attention (measured by news volume) can act as a disciplining force by diminishing information asymmetry and amplifying litigation and reputational threats, thereby deterring managerial bad news hoarding (An *et al.*, 2020; Xu *et al.*, 2021). On the other hand, heightened media scrutiny can prompt managers to strategically withhold bad news, particularly for unregulated or non-earnings-related disclosures, as they seek to protect short-term stock performance (Ni *et al.*, 2021). Chen *et al.* (2018) untangle this paradox by distinguishing between media coverage of regulated earnings disclosures (which do not affect crash risk) and unregulated disclosures (which affect crash risk), showing that managerial opacity is more prevalent in less-scrutinised domains. Extant literature highlights that the effect of media coverage on crash risk remains underexplored, particularly for voluntary and unstandardised information categories such as ESG information (Aluchna *et al.*, 2023).

Building on the need to study ESG-specific narratives, a parallel literature uses aggregate ESG ratings or CSR performance scores as determinants of crash risk. Studies generally find that higher ESG ratings or CSR performance measures, both of which only capture firms' self-reported ESG information, are associated with lower crash risk (Feng *et al.*, 2022; Kim *et al.*, 2014), often attributed to greater transparency and reduced bad-news hoarding. However, these measures of ESG information are slow-moving, rely on firm disclosures that are vulnerable to greenwashing and emphasise transparency and agency-cost channels while largely overlooking the role of media as an independent pathway shaping ESG perceptions.

To overcome limitations of disclosure-based measures, recent research has begun to focus on news-based sentiment and media coverage. While social media and other non-professional online intermediaries often circulate rumours and unfounded speculation (Drake *et al.*, 2017; Lee *et al.*, 2015), the business press and the professional or semi-professional online intermediaries that cover firms – the primary sources for our ESG news sentiment measure [2] – provide original investigation and analysis (Miller, 2006) and are associated with positive capital-market effects (Drake *et al.*, 2017). Despite sometimes being noisy (Joe *et al.*, 2009), media reduces firms' control over how public perceptions are formed (Lee *et al.*, 2015). Joe *et al.* (2009) show that while retail investors may overreact to noisy signals, sophisticated institutional investors interpret them correctly and arbitrage away mispricing over a short horizon. Fang and Peress (2009) further find that media attention can alleviate informational frictions and influence security prices even if it does not provide genuine news. More broadly, the media enhances market efficiency by providing timely and relevant insights (Engelberg and Parsons, 2011), including information not captured in firms' voluntary disclosures (Fang and Peress, 2009).

Generic investor sentiment measures, which are typically constructed from historical trading behaviour and market volatility (e.g. Baker and Wurgler, 2006; Fu *et al.*, 2021), do not directly reflect the tone of ESG-related news about individual firms and therefore cannot capture ESG-specific narratives that shape beliefs about downside risk. Recent studies that use natural language processing to measure COVID-19-related sentiment show that the tone of news about salient topics such as the pandemic amplifies crash risk, underscoring the power and topical specificity of news-driven sentiment (Duan and Lin, 2022; Jin *et al.*, 2022; Kong *et al.*, 2023). ESG news sentiment can be viewed as a topic-specific form of news-driven sentiment, but unlike pandemic-related sentiment, which is typically short-lived, it aggregates a broad and persistent stream of firm-specific ESG narratives disseminated by media. By reshaping investor beliefs overtime, ESG news sentiment may elevate crash risk

over a longer horizon, highlighting the need to investigate the capital market consequences of public perception formed through ESG-specific news.

Research on ESG news and crash risk remains limited. [Teng and Yang \(2021\)](#) show that repeated media coverage of ESG failures exacerbates crash risk in an emerging market context (Taiwan), suggesting firms under sustained negative ESG scrutiny may resort to obfuscation tactics to mitigate short-term reputational damage. However, they focus narrowly on media coverage of specific corporate social irresponsibility events, ignoring the breadth of ESG information, both positive and negative, that shapes public sentiment. These limitations leave open whether media-driven ESG sentiment and the breadth of media coverage add incremental, real-time information about crash risk, through which mechanisms they operate, and over what time horizons their effects persist.

2.1 Hypothesis development

The relationship between ESG news sentiment and crash risk is ambiguous *ex ante*. Positive ESG news sentiment may signal transparency, stakeholder alignment, effective governance, ethical managerial behaviour and sustainable business practices, thereby reducing crash risk ([Feng et al., 2022](#); [Kim et al., 2014](#)). Alternatively, positive ESG news sentiment could increase crash risk if it masks underlying risks or fuels inflated expectations among investors ([Fu et al., 2021](#)). To reconcile these competing predictions, we distinguish between a risk perception channel and a behavioural response/monitoring channel.

Under risk perception, negative ESG news sentiment reveals hidden risks and weak governance, raising crash risk, whereas positive sentiment reduces crash risk by fostering credibility and trust. Consistent with this view, evidence in related contexts links adverse ESG or topic-specific news tone to higher crash risk ([Kong et al., 2023](#); [Teng and Yang, 2021](#)). Behavioural finance provides complementary reasons why, under the risk perception view, negative ESG news sentiment may amplify perceived downside risk. Salient negative ESG events can trigger availability bias ([Hillert et al., 2014](#); [Tversky and Kahneman, 1973](#)), and investors may generalise isolated incidents into broader firm failure risks via representativeness ([Chen and Yang, 2020](#)). In addition, media incentives often favour negative coverage ([Miller, 2006](#); [Mullainathan and Shleifer, 2005](#)), which can reinforce negative preferences in information consumption ([Trussler and Soroka, 2014](#)), particularly in ESG settings where controversies tend to dominate coverage relative to steady performance ([Miller, 2006](#); [Pikatz-Gorrotxategi et al., 2024](#)). Conservatism and gradual information diffusion can also delay full incorporation of ESG risks, creating sharper subsequent price corrections ([Barberis et al., 1998](#); [Harrison Hong and Stein Jeremy, 2000](#)) [3].

In contrast, under the behavioural response/monitoring view, negative ESG news sentiment could reduce crash risk if scrutiny discourages managerial bad news hoarding and induces corrective disclosure behaviour ([An et al., 2020](#); [Joe et al., 2009](#); [Ni et al., 2021](#)). This explanation is consistent with evidence that public scrutiny can curb managerial opportunism ([Dyck et al., 2008](#); [Yu et al., 2023](#)) and that faster incorporation of negative information (analogous to the role of short selling) can reduce the likelihood of abrupt crashes ([Callen and Fang, 2015](#)). Overall, the existing ESG-crash-risk literature places greater weight on the risk perception rationale than on the disciplining role of negative ESG news ([Feng et al., 2022](#); [Kim et al., 2014](#)), leading us to expect that the risk-perception effect will dominate in our setting. Accordingly, we hypothesise:

H1. ESG news sentiment is negatively associated with stock price crash risk.

Media attention is conceptually distinct from news sentiment and can influence crash risk via behavioural response and market reaction channels. As per the behavioural response,

high ESG-related media attention can increase crash risk if managers withhold bad news to protect legitimacy and short-term performance under scrutiny (Deegan *et al.*, 2000; Vourvachis *et al.*, 2016). Under the market-reaction channel, heightened ESG media attention can attract transient investors by reducing information acquisition costs, increasing liquidity and return volatility – both empirically linked to higher crash risk (Ni *et al.*, 2021). Although media attention can deter hoarding by strengthening external monitoring (An *et al.*, 2020; Xu *et al.*, 2021), this disciplining role appears more salient for regulated disclosures such as earnings announcements, where reporting is standardised and closely scrutinised (Chen *et al.*, 2018). Given the largely voluntary and non-standardised nature of ESG information, we expect the hoarding and attention-amplification mechanisms to dominate in ESG settings, so that heightened ESG media attention exacerbates managerial incentives to delay adverse information and amplifies downside risk. We hypothesise:

H2. High media attention on ESG news is positively associated with stock price crash risk.

Finally, media attention may moderate the sentiment–crash-risk relation by amplifying salience and the intensity of investor and managerial responses. When ESG news sentiment is paired with high media attention, the narrative becomes more visible and can strengthen risk perception and behavioural reactions, increasing the sensitivity of crash risk to sentiment. Consistent with evidence that coverage intensity is non-random and skewed toward large, visible firms (Barkemeyer *et al.*, 2023; Fang and Peress, 2009; Miller, 2006), separating sentiment from attention and modelling their interaction is important. We therefore hypothesise:

H3. High media attention intensifies the association between ESG news sentiment and stock price crash risk.

3. Research design and sample selection

3.1 Data sources and sample period

We obtain ESG news sentiment and media attention data from RMA and ESG scores from Refinitiv ESG Ratings (formerly Asset4). All other data for calculating crash risk measures and control variables are obtained from Refinitiv Datastream. We use the investor sentiment index developed by Baker and Wurgler (2006) to account for overall market sentiment. The total sample in the study includes around 34,000 unique semi-annual firm observations between 2011 and 2021 [4]. We eliminate observations with a stock price of less than one dollar to mitigate the influence of penny stocks.

3.2 Key variables of interest

3.2.1 Esq news sentiment and media attention. RMA's ESG news sentiment and media attention scores are measured by analysing millions of daily news and global media outlets in real-time using natural language processing. This process excludes corporate regulatory filings, press releases and corporate websites to preserve the outsider perspective and reduce the impact of corporate greenwashing (Brewster and Weakley, 2021). RMA provides an overall ESG score, individual pillar scores (Environmental, Social, Governance), as well as an ESG buzz score. We use the overall ESG score to proxy ESG news sentiment. These scores range from 1 (highly negative) to 100 (highly positive) and are computed as exponentially weighted 12-month averages, allowing recent information to be prioritised

while smoothing daily fluctuations. This method balances timeliness and long-term sentiment capture. We use the ESG buzz score to represent media attention, which captures the frequency of ESG-related media mentions for a firm. Beginning at 0, the score increases with the number of mentions, capturing both the volume and intensity of ESG-related coverage over time.

3.2.2 Crash risk measures. We define crash risk as the conditional negative skewness of stock return distribution [5]. We use two main measures of crash risk for firms:

- (1) the negative skewness of firm-specific weekly stock returns; and
- (2) the asymmetric volatility of negative and positive firm-specific weekly stock returns.

$R_{i,t}$ denotes the firm-specific weekly return calculated as the natural logarithm of one plus the residual return for firm i in week t as in the following equation:

$$R_{i,t} = \ln(1 + \varepsilon_{i,t}) \quad (1)$$

The expanded market model regression below is used to estimate the residual return ($\varepsilon_{i,t}$) used in equation (1):

$$r_{i,t} = \beta_0 + \beta_{1,i}r_{m,t-2} + \beta_{2,i}r_{m,t-1} + \beta_{3,i}r_{m,t} + \beta_{4,i}r_{m,t+1} + \beta_{5,i}r_{m,t+2} + \varepsilon_{i,t} \quad (2)$$

where $r_{i,t}$ is the return on stock i in week t and $r_{m,t}$ is the return on the value-weighted market index in week t . In line with previous studies (Bauer *et al.*, 2021; Kim and Zhang, 2016) we incorporate the lead and lag terms for the market index to account for nonsynchronous trading. The following equation (3) calculates the first measure of crash risk, i.e. negative conditional skewness (NCSKEW) of firm-specific weekly stock returns over any six months (Chen *et al.*, 2001) [6]:

$$NCSKEW_{i,t} = - \left(n(n-1)^{3/2} \Sigma R_{i,t}^3 \right) / \left((n-1)(n-2) \left(\Sigma R_{i,t}^2 \right)^{3/2} \right) \quad (3)$$

n is the number of observations of weekly returns during the period. As per Chen *et al.* (2001), scaling (the sample analog to) the third moment of return distribution by (the sample analog to) the standard deviation cubed enables comparison across stocks with diverse variances. The minus sign at the beginning of the third moment indicates that an increase in NCSKEW corresponds to a greater likelihood of a crash.

The following equation computes the second measure of crash risk: down-to-up volatility (DUVOL):

$$DUVOL_{i,t} = \log \left\{ (n_u - 1) \sum_{Down} R_{i,t}^2 / (n_d - 1) \sum_{Up} R_{i,t}^2 \right\} \quad (4)$$

In this measure, firm-specific weekly stock returns are separated into ‘down’ weeks (returns below the six-month mean) and ‘up’ weeks (returns above the six-month mean). DUVOL is calculated as the natural logarithm of the value after dividing (the sample analog to) the standard deviation on the “down” weeks by (the sample analog to) the standard deviation on

the “up” weeks. n_u and n_d are the number of up and down weeks in any six months t , respectively. When the value of DUVOL is high (low), crash likelihood is high (low). DUVOL has less tendency to be excessively affected by extreme weekly returns as it does not entail third moments (Chen *et al.*, 2001).

3.2.3 Other control variables. The control variables used are known to be determinants of crash risk from past studies. Controls include Return on Assets (ROA), the number of analysts that issue earnings forecasts for the company (ANALYSTS), financial leverage (LEV), firm size (LNSIZE), change in trading volume (DTURNOVER), past returns (RET), market-to-book ratio (MB), stock volatility (SIGMA), the kurtosis of firm-specific weekly returns over a six-month period (KURTOSIS), CEO-chair duality (CEO_CHAIR) [7], investor sentiment to control for overall market sentiment (INVESTOR_SENTIMENT) and self-reported ESG performance (ESGP).

Following prior literature (Feng *et al.*, 2022; Kim *et al.*, 2014), we control for self-reported ESG performance. For this, we use Refinitiv ESG ratings drawn from public company disclosures. These scores range from 1 to 100 within industries, where 50 is the median, above 50 indicates high performance and below 50 reflects low performance – making them directly comparable to ESG news sentiment scores (Refinitiv, 2021). While ESG performance scores are annual and voluntary disclosure-based, ESG news sentiment scores (from RMA) are derived from external media sources and updated more frequently (daily, weekly or monthly). All the control variables except for dummy variables are winsorised at the 1% and 99% levels. Detailed definitions of all the variables are presented in Table 1.

3.3 Descriptive statistics

Table 2 reports the descriptive statistics for the sample. Panel A shows the summary statistics. The mean values of the main crash risk measures, NCSKEW and DUVOL are 0.040 and 0.037, respectively. The positive mean value of NCSKEW suggests that, on average, the firm-specific weekly returns are more left-skewed. The positive mean value of DUVOL suggests that, on average, the firm-specific weekly returns of down weeks are slightly more volatile than those of up weeks (Zaman *et al.*, 2021). These statistics are consistent with prior studies on crash risk (Kim *et al.*, 2011; Kim *et al.*, 2014; Zaman *et al.*, 2021). The average values of ESG news sentiment, ESG performance and ESG news buzz are 60.421, 42.791 and 6.762, respectively. A typical firm in the sample has 2.063 analyst forecasts, a market-to-book ratio of 1.746, a log firm size of 8.074, a Return on Assets of 0.013 and a financial leverage of 0.263. All these reported summary statistics are approximately comparable to prior studies (Demers *et al.*, 2021; Kim *et al.*, 2014; Serafeim and Yoon, 2022a).

Panel B of Table 2 presents the correlation matrix. The crash risk measures, NCSKEW and DUVOL, are significantly and positively correlated with each other as expected. ESG news buzz is significantly and positively correlated with all crash risk measures. This result provides formative evidence that ESG-related media attention increases crash risk.

Further, consistent with prior literature, all crash risk measures are significantly and positively correlated with the control variables log firm size, Return on Assets, analyst forecasts and detrended share turnover (Callen and Fang, 2015; Fang *et al.*, 2021). The magnitude of the correlation values indicates no serious multicollinearity issue, as the highest correlation coefficient among control variables is equal to 0.64, between ESG performance score and log firm size [8].

Table 1. Variable definitions

Variable	Definition
<i>Dependent variables</i>	
NCSKEW	= Negative conditional skewness of firm-specific weekly stock returns over six months. NCSKEW is calculated as the negative of (the sample analog to) the third moment of firm-specific weekly returns for every six months, divided by (the sample analog to) the standard deviation of firm-specific weekly returns raised to the third power, for a given firm in those six months. See equation (3) for details
DUVOL	= Down-to-up volatility is the asymmetric volatility of negative and positive firm-specific weekly stock returns. DUVOL is calculated as the natural logarithm of the value after dividing (the sample analog to) the standard deviation on the “down” weeks by (the sample analog to) the standard deviation on the “up” weeks. See equation (4) for details
<i>Independent variables</i>	
ESG news sentiment	= Refinitiv MarketPsych ESG analytics (RMA) ESG score
ESG performance	= Refinitiv’s EIKON ESG score
High ESG news buzz	= A dummy variable that takes a value of 1 if the ESG buzz score capturing media attention (number of ESG-relevant references to a given company in the media) is above the industry median
High ESG news buzz × ESG news sentiment	= Interaction between ESG news sentiment and high ESG news buzz calculated by multiplying demeaned Refinitiv MarketPsych ESG analytics (RMA) ESG score by the high ESG news buzz dummy variable
Environmental news sentiment	= Refinitiv MarketPsych ESG analytics (RMA) environmental pillar score
Governance news sentiment	= Refinitiv MarketPsych ESG analytics (RMA) governance pillar score
Social news sentiment	= Refinitiv MarketPsych ESG analytics (RMA) social pillar score
<i>Control variables</i>	
ROA	= Return on assets is the income before extraordinary items over the book value of total assets
Analysts	= Natural logarithm of one plus the number of analysts that issue earnings forecasts for a given firm during the fiscal year
Financial leverage	= Total debt divided by total assets
Log firm size	= Natural logarithm of end-of-the-previous-month market capitalization
SIGMA	= Stock return volatility (SIGMA) is measured as the standard deviation of firm-specific weekly returns over a six-month period
RET	= The mean (average) of firm-specific weekly returns over a six-month period
KURTOSIS	= The kurtosis of firm-specific weekly returns over a six-month period
DTURNOVER	= Detrended share turnover is calculated as the average monthly share turnover in year (t) minus the average monthly share turnover in the previous year (t – 1). Share turnover is calculated as the trading volume over shares outstanding
CEO chair duality	= CEO duality is a dummy variable that is set to “1” if the CEO is also Chairman of the board, and “0” otherwise
MB	= The market value of equity over the book value of equity
Investor sentiment	= Six-monthly averaged investor sentiment index as defined by Baker and Wurgler (2006) . We obtain the data, from https://pages.stern.nyu.edu/~jwurgler/

(continued)

Table 1. Continued

Variable	Definition
<i>Variables in additional analyses</i>	
Stock turnover	= Total number of shares traded to the number of shares outstanding
Illiquidity	= The absolute value of the stock returns divided by trading volume multiplied by 1,000
Stock volatility	= The standard deviation of firm-specific weekly returns
High analyst	= A dummy variable that takes a value of one for firms with a number of analysts following above the cross-sectional industry median or zero otherwise
High opaque	= A dummy variable that takes a value of one for firms with opacity above the cross-sectional industry median or zero otherwise. Opacity is measured as the prior three years' moving sum of the absolute value of discretionary accruals, measured using the modified jones model

3.4 Empirical tests

We estimate the following panel regression to examine the individual impacts of ESG news sentiment and media attention on crash risk, as well as the potential combined effect of these two independent variables on crash risk:

$$\begin{aligned} CRASH_RISK_{i,t} = & \beta_0 + \beta_1(ESG_NS_{i,t-1}) + \beta_2(HIGH_ESG_BUZZ_{i,t-1}) \\ & + \beta_3((ESG_NS_{i,t-1})(HIGH_ESG_BUZZ_{i,t-1})) \\ & + \beta_4'(CONTROLS_{i,t-1}) + \varepsilon_t \end{aligned} \quad (5)$$

CRASH_RISK is proxied by *NCSKEW* or *DUVOL*. The primary independent variable in equation (5) is the *ESG_NS*, i.e. ESG news sentiment score measured over a six-month period to align with the crash risk measurement intervals [9]. *HIGH_ESG_BUZZ* score, i.e. high media attention for ESG news, is a dummy variable that takes a value of 1 if the ESG buzz score capturing media attention is above the industry median during the measurement period [10]. The interaction of ESG news sentiment and high media attention on ESG news captures whether media attention strengthens or weakens the relationship between ESG news sentiment and crash risk.

The previous period (six-month) crash risk is included to account for potential serial correlation of the crash risk measures. All control variables are lagged by one period. All regression models include time fixed effects and either industry (defined at the two-digit SIC level) or firm time fixed effects, depending on the specification. Standard errors are double clustered at the firm and time level and robust to heteroscedasticity unless specified otherwise [11].

4. Results

4.1 Impact of ESG news sentiment and media attention on crash risk

Table 3 shows the regression results from equation (5) concerning the impact of ESG news sentiment and media attention on crash risk. Models (1)–(3) and (5)–(7) include industry and time fixed effects, while Models (4) and (8) include firm and time fixed effects. The coefficients of ESG news sentiment are negative and statistically significant at least at the 5% level across all models, indicating that negative ESG news sentiment is associated with

Table 2. Descriptive statistics

Variable	N	Mean	SD	p25	Median	p75
Panel A: Summary statistics						
NCSKEW	37,913	0.040	1.205	-0.735	0.029	0.781
DUVOL	37,892	0.037	1.118	-0.678	0.032	0.740
ESG news sentiment	37,958	60.421	16.992	47.936	61.043	73.772
ESG news buzz	37,958	6.762	1.737	5.660	6.723	7.847
ESG performance	34,107	42.791	20.392	26.730	39.170	57.690
SIGMA	36,580	0.046	0.033	0.026	0.037	0.056
RET	36,602	-0.001	0.023	-0.006	-0.001	0.004
KURTOSIS	36,556	1.634	2.780	-0.089	0.770	2.319
DTURNOVER	37,958	-0.440	0.482	-0.621	-0.497	-0.071
CEO chair duality	34,107	0.542	0.498	0.000	1.000	1.000
MB	37,041	1.781	10.177	1.150	2.048	3.852
Analysts	34,107	2.073	0.798	1.461	2.100	2.735
Log firm size	34,107	8.140	1.721	6.948	8.132	9.329
ROA	34,107	0.016	0.142	0.006	0.030	0.072
Financial leverage	34,107	0.265	0.217	0.082	0.238	0.393
Investor sentiment	37,958	-0.185	0.188	-0.326	-0.226	-0.059
Panel B: Correlation matrix						
1 NCSKEW	1					
2 DUVOL	0.94	1				
3 ESG news sentiment	0.00	0.00	1			
4 ESG news buzz	0.02	0.62	0.62	1		
5 ESG performance	0.01	0.45	0.49	1		
6 SIGMA	-0.03	-0.16	-0.03	-0.24	1	
7 RET	0.05	0.02	0.00	0.01	-0.14	1
8 KURTOSIS	0.00	-0.02	0.03	-0.06	0.27	-0.06
9 DTURNOVER	0.04	0.01	0.02	-0.02	0.05	0.01
10 CEO chair duality	0.00	0.06	0.03	-0.07	-0.09	0.01

(continued)

Table 2. Continued

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
11 MB	0.03	0.03	0.08	0.13	-0.06	-0.07	0.01	0.01	0.06	0.11	1					
12 Analysts	0.02	0.02	0.43	0.51	0.31	-0.19	0.02	0.01	-0.05	0.15	0.06	1				
13 Log firm size	0.05	0.05	0.51	0.62	0.64	-0.46	0.05	-0.08	0.00	0.08	0.03	0.58	1			
14 ROA	0.01	0.01	0.13	0.06	0.18	-0.44	0.07	-0.03	-0.09	0.09	0.02	0.14	0.34	1		
15 Financial leverage	0.00	0.00	0.00	0.06	0.05	0.03	-0.02	-0.02	0.00	0.01	-0.05	0.05	0.08	-0.04	1	
16 Investor sentiment	-0.02	-0.02	-0.02	0.03	0.01	0.12	-0.02	0.00	0.12	-0.03	0.09	-0.07	-0.08	-0.07	-0.02	1

Note(s): Panel A in this table shows the summary statistics for the sample in this study. Panel B presents the correlation matrix. All the control variables are winsorised at the 1 and 99% levels. Correlations significant at the 5% level are in italic

Source(s): Authors' own work

elevated crash risk, supporting *H1* and the notion that ESG news sentiment primarily shapes investor *risk perception* rather than driving a *behavioural response*. Economically, Model (3) shows that a one standard deviation drop in ESG news sentiment is associated with an approximately 2.8% ($-0.0020 \times 16.992/1.205$) standard deviation increase in NCSKEW [12]. Similarly, in Model (7), where DUVOL is the dependent variable, a one standard deviation drop in ESG news sentiment is also associated with an approximately 2.8% ($-0.0016 \times 16.992/1.118$) standard deviation increase in DUVOL. Given that Jin *et al.* (2022) report a 6–12% effect on crash risk from pandemic-related negative news, these magnitudes are notable for investors, highlighting that ESG news has an economically significant effect, even after controlling for such market-wide investor sentiment.

Table 3 further shows that media attention also exerts a stronger positive association with crash risk and supports *H2*. For instance, if a firm has relatively high media attention reflected by the high ESG buzz score, its crash risk, denoted by NCSKEW, increases by 12.1% ($0.1457/1.205$) of a standard deviation, a substantially larger effect than the 6.1% documented by Chen *et al.* (2018) for general news coverage. Similar results are observed when using DUVOL as the crash risk measure [13]. These findings indicate that high media coverage amplifies crash risk in the context of ESG-related news, likely by encouraging managerial bad news hoarding and attracting short-term investors.

Models (3)–(4) and (7)–(8) report a negative and significant coefficient for the interaction term (*HIGH_ESG_BUZZ* $\times$ *ESG_NS*), indicating that high media attention intensifies the negative association between ESG news sentiment and crash risk, supporting *H3*. In Model (3), the coefficient for the interaction term is -0.0019 and statistically significant at the 5% level. For companies experiencing high media attention, one standard deviation drop in ESG news sentiment increases NCSKEW by approximately 5.4% [(coefficient of $-0.0020 \times 16.992/1.205$) + (coefficient of $-0.0019 \times 16.992/1.205$)], nearly doubling the effect of ESG news sentiment alone, which was earlier estimated at 2.8%.

The signs of the control variables are mostly as expected. Consistent with prior literature (Feng *et al.*, 2022; Kim *et al.*, 2014), reported ESG performance is negatively associated with crash risk, with a coefficient of -0.0012 ($p < 0.01$) in Model 7. Altogether, the findings support all three hypotheses, reinforcing the importance of both the tone and coverage of ESG information in assessing crash risk.

5. Additional analyses

5.1 Path analysis for channel tests

We use path analysis via structural equation modelling (SEM) to examine whether stock liquidity and return volatility mediate the association between source variables (ESG news sentiment and high media attention) and the outcome variable (crash risk). Prior studies show that higher stock liquidity (turnover), particularly when driven by sentiment-motivated trading and transient investors, is associated with greater crash risk (Chang *et al.*, 2017; Fang *et al.*, 2014; Ni *et al.*, 2021) and that elevated idiosyncratic return volatility predicts crash risk (Cao *et al.*, 2022). SEM allows us to decompose the total effect of ESG news sentiment and media attention on crash risk into direct and indirect components operating through these liquidity and volatility channels.

ESG news sentiment and media attention may influence stock liquidity by altering investor participation and information asymmetry. Negative ESG news sentiment revises beliefs about perceived risks, prompting some investors to exit and others to trade on disagreement or perceived mispricing, thereby increasing turnover in the short run. High ESG media attention makes ESG information more salient and lowers search costs,

Table 3. Main tests on the effects on ESG news sentiment and media attention on crash risk

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>ESG_NS</i> _t	-0.0025***	-0.0029*** 0.0339***	-0.0020*** 0.1457**	-0.0023*** 0.2292***	-0.0024***	-0.0029*** 0.0357**	-0.0016** 0.1260**	-0.0021** 0.1885***
<i>HIGH_ESG_BUZZ</i> _t × <i>ESG_NS</i> _t			-0.0019**	0.0031***			-0.0019**	-0.0026**
<i>ESGP</i> _{t-1}	-0.0010**	-0.0007*	-0.0007	-0.0018**	-0.0013***	-0.0009**	-0.0012***	-0.0009
<i>CRASH_RISK</i> _{t-1}	-0.0080	-0.0070	-0.0072	-0.0897***	-0.0143*	-0.0123	-0.0145*	-0.0832***
<i>DTURNOVER</i> _{t-1}	0.1253***	0.1109***	0.1110***	0.1360***	0.1172***	0.1000***	0.1178***	0.1236***
<i>RET</i> _{t-1}	5.6308***	5.7029***	5.7044***	3.3002***	4.8922***	5.0317***	4.8988***	3.5722***
<i>MB</i> _{t-1}	0.0024***	0.0025***	0.0025***	0.0014	0.0023***	0.0024***	0.0023***	0.0015
<i>LNSIZE</i> _{t-1}	0.0582***	0.0482***	0.0482***	0.6665***	0.0597***	0.0482***	0.0585***	0.6575***
<i>SIGMA</i> _{t-1}	-0.3457	-0.1258	-0.1575	-0.4317	-0.2251	0.0490	-0.2900	-0.0981
<i>LEV</i> _{t-1}	-0.0159	-0.0102	-0.0127	-0.0872	-0.0126	-0.0058	-0.0154	-0.0442
<i>ROA</i> _{t-1}	-0.1435**	-0.1418**	-0.1422**	-0.7032***	-0.1138**	-0.1128**	-0.1111*	-0.6943***
<i>ANALYST</i> _{t-1}	-0.0019	-0.0096	-0.0109	0.0108	-0.0047	-0.0136	-0.0067	0.007
<i>KURTOSIS</i> _{t-1}	0.0042	0.0042	0.0041	-0.0016	0.0011	0.0011	0.0010	-0.0039
<i>CEO_CHAIR</i> _{t-1}	-0.0016	-0.0021	-0.0012	-0.0019	0.0042	0.0036	0.0052	-0.008
<i>INVESTOR_SENTIMENT</i>	-0.2653***	-0.1295***	-0.1284***	-0.3238***	-0.2297***	-0.0694**	-0.2282***	-0.2699***
Constant	-0.1646***	-0.0638	-0.1129*	-5.1214***	-0.1802***	-0.0661	-0.2125***	-5.1023***
Double clustered at the firm and time level	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry and time fixed effects	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Firm and time fixed effects	No	No	No	Yes	No	No	No	Yes
No. of observations	34,061	34,061	34,061	34,061	34,051	34,051	34,051	34,051
Adjusted <i>R</i> ²	0.0104	0.0090	0.0106	0.0651	0.0119	0.0093	0.0120	0.0723

Note(s): This table presents the regression results of the impact of ESG news sentiment and media attention on crash risk. The dependent variables in Models 1, 2, 3 and 4, 5, 6 are the crash risk measures, NCSKEW and DUVOL, respectively. All variables are defined in Table 1. ***, ** and * indicate statistical significance at the 1, 5 and 10% levels, respectively

Source(s): Authors' own work

attracting attention-constrained and short-term investors and concentrating trading around ESG-salient periods (Fang and Peress, 2009; Ni *et al.*, 2021).

ESG news sentiment and media attention can also influence crash risk through stock return volatility. Negative ESG sentiment increases uncertainty about firm value and disperses investor beliefs, as ESG criticism often signals latent regulatory or litigation risk whose magnitude and timing are hard to assess, leading to increased disagreement among investor valuations and short-term price deviations (Edmans *et al.*, 2022). Heightened ESG media attention amplifies these reactions by attracting attention-constrained and transient investors and acting as a risk signal before its economic consequences are fully understood (Hirshleifer and Teoh, 2003), thus raising short-term return volatility (Cao *et al.*, 2022).

Consistent with prior literature (Cao *et al.*, 2022; Chang *et al.*, 2017; Fang *et al.*, 2014; Ni *et al.*, 2021), we assume a causal ordering in which ESG-related information (sentiment and media attention) as information shocks precedes and influences trading behaviour and market conditions (i.e. stock liquidity and stock return volatility), which in turn affect crash risk.

Following prior literature (Bhattacharya *et al.*, 2012; Ni *et al.*, 2021), we specify structural equations linking the source, mediating and outcome variables, as detailed in equations (6)–(8):

$$\begin{aligned} STOCK_TURNOVER_{i,t} = & \beta_0 + \beta_1(ESG_NS_{i,t-1}) + \beta_2(HIGH_ESG_BUZZ_{i,t-1}) \\ & + \beta_3'(CONTROLS_{i,t-1}) + \varepsilon_t \end{aligned} \quad (6)$$

$$CRASH_RISK_{i,t} = \beta_0 + \beta_1(STOCK_TURNOVER_{i,t-1}) + \beta_2'(CONTROLS_{i,t-1}) + \varepsilon_t \quad (7)$$

$$\begin{aligned} CRASH_RISK_{i,t} = & \beta_0 + \beta_1(ESG_NS_{i,t-1}) + \beta_2(HIGH_ESG_BUZZ_{i,t-1}) \\ & + \beta_3(STOCK_TURNOVER_{i,t-1}) + \beta_4'(CONTROLS_{i,t-1}) + \varepsilon_t \end{aligned} \quad (8)$$

STOCK_TURNOVER is the proxy for stock liquidity, measured as the ratio of the number of shares traded to the number of shares outstanding in a six-month period (Fu *et al.*, 2021; Ni *et al.*, 2021) [14]. We replace *STOCK_TURNOVER* with *STOCK_VOLATILITY* when conducting the second path analysis. *STOCK_VOLATILITY* is measured as the standard deviation of firm-specific weekly returns over a six-month period, consistent with prior studies (Christensen *et al.*, 2022; Edmans *et al.*, 2022). All other variables are as defined in equation (5).

5.1.1 Stock liquidity channel. Models (1)–(4) in Panel A of Table 4 present the estimation results for equations (6) – (8), respectively. Model (1) indicates that *ESG_NS* is significantly negatively associated with *STOCK_TURNOVER* (coefficient = −0.0024, $p < 0.05$) and *HIGH_ESG_BUZZ* is significantly positively associated with *STOCK_TURNOVER* (coefficient = 0.4829, $p < 0.01$). Models (2)–(4) show that *STOCK_TURNOVER* is significantly positively associated with crash risk (NCSKEW, coefficient = 0.0468, $p < 0.01$). These findings indicate that negative ESG news sentiment and high media attention increase stock liquidity, and stock liquidity increases crash risk.

To further lend support to this causal ordering of the effects, we perform the path analysis in Panel B. The direct path from ESG news sentiment to crash risk is significant and negative (coefficient = −0.0028, $p < 0.01$), supporting *H1* that ESG news sentiment is negatively

Table 4. ESG news sentiment, high media attention and stock turnover

Variable	NCSKEW		STOCK_TURNOVER		DUVOL			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Panel A: the effect of ESG news sentiment and media attention on stock turnover								
ESG_NS t	-0.0024**		-0.0028***	-0.0038***	-0.0024**		-0.0028***	-0.0034***
HIGH_ESG_BUZZ t	0.4829***		0.0112	0.0235	0.4809***		0.0138	0.0121
STOCK_TURNOVER t			0.0468***	0.0770***			0.0456***	0.0779***
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Double clustered at the firm and time level	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry and time fixed effects	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Firm and time fixed effects	No	No	No	Yes	No	No	No	Yes
No. of observations	34,061	34,061	34,061	34,061	34,053	34,053	34,053	34,053
Adjusted R ²	0.1825	0.0161	0.0171	0.0748	0.1832	0.0175	0.0186	0.0843
For ESG news sentiment								
	NCSKEW		DUVOL					
		Coefficient		t-statistic		Coefficient		t-statistic
Panel B: Path analysis on stock turnover								
Direct path for stock turnover								
R[ESG_NS, CRASH_RISK]					-0.0029***		-0.0029***	-6.36
P[ESG_NS, CRASH_RISK]					-0.0028***		-0.0028***	-6.13
Mediated path for stock turnover								
R[ESG_NS, CRASH_RISK] - P[ESG_NS, CRASH_RISK]					-0.0001		-0.0001	
Or:								
P[ESG_NS, STOCK_TURNOVER]					-0.0024***		-0.0024***	-2.30
P[STOCK_TURNOVER, CRASH_RISK]					0.0468***		0.0456***	13.9
Total mediated path for stock turnover								
P[ESG_NS, STOCK_TURNOVER] * P[STOCK_TURNOVER, CRASH_RISK]					-0.0001***		-0.0001***	
(continued)								

(continued)

Table 4. Continued

For ESG news sentiment	NCSKEW		DUVOL	
	Coefficient	t-statistic	Coefficient	t-statistic
Direct Path percentage [−0.0028/(−0.0028−0.0001)]	96%		96%	
Indirect Path Percentage [−0.0001/(−0.0028−0.0001)]	4%		4%	
<i>For high media attention</i>				
Direct path for stock turnover				
$R[HIGH_ESG_BUZZ, CRASH_RISK]$	0.0339**	2.10	0.0357**	2.43
$P[HIGH_ESG_BUZZ, CRASH_RISK]$	0.0112	0.70	0.0138	0.94
<i>Mediated path for stock turnover</i>				
$R[HIGH_ESG_BUZZ, CRASH_RISK] - P[HIGH_ESG_BUZZ, CRASH_RISK]$	0.0226		0.0219	
Or;	0.4829***	14.1	0.4809***	14.07
$P[HIGH_ESG_BUZZ, STOCK_TURNOVER]$	0.0468***	13.09	0.0456***	13.90
$P[STOCK_TURNOVER, CRASH_RISK]$				
<i>Total mediated path for stock turnover</i>				
$P[HIGH_ESG_buz, STOCK_TURNOVER] * P[STOCK_TURNOVER, CRASH_RISK]$	0.0226***		0.0219***	
Direct Path percentage [0.0112/(0.0112 + 0.0226)]	33%		39%	
Indirect Path Percentage [0.0226/(0.0112 + 0.0226)]	67%		61%	
Note(s): This table reports the regression results concerning the channel (i.e. stock liquidity) through which ESG news sentiment and media attention affect crash risk. Stock liquidity is measured by stock turnover. Panel A presents regression results for the effect of ESG news sentiment and media attention on stock liquidity. In Model (1), we regress $STOCK_TURNOVER$ on the ESG_NS and $HIGH_ESG_BUZZ$. In Models (2)–(3), we regress crash risk (measured by NCSKEW and DUVOL) on $STOCK_TURNOVER$, ESG_NS and $HIGH_ESG_BUZZ$ to test the mediated path. Panel B reports path analyses of the link between ESG news sentiment and crash risk and high media attention and crash risk. The direct link and the link mediated by stock liquidity are separately reported. R [] indicates regression coefficients and P [] indicates path coefficients. The indirect effects are estimated following Sobel (1982). Control variables are included in all the regressions but are not reported for brevity. ***, ** and * indicate statistical significance at the 1, 5 and 10% levels, respectively				
Source(s): Authors' own work				

associated with crash risk. Path analysis further shows that 96% of the total effect is direct $[-0.0028/(-0.0028-0.0001)]$, while the mediated or indirect path through stock liquidity accounts for the remaining 4% $[-0.0001/(-0.0028-0.0001)]$. These findings are consistent for both crash risk measures, NCSKEW and DUVOL.

For media attention, Panel A results indicate that the direct path between high media attention and crash risk is positive but not statistically significant (coefficient = 0.0112), suggesting that its effect on crash risk is primarily indirect through stock liquidity. Panel B further shows that the direct effect accounts for only about 33% of the total effect $[0.0112/(0.0112 + 0.0226)]$, while the mediated or indirect path through stock liquidity is significant and positive (coefficient = 0.0226), representing the remaining 67% $[0.0226/(0.0112 + 0.0226)]$. These results are robust across both measures of crash risk (NCSKEW and DUVOL) and consistent across alternative measures of stock liquidity, reinforcing the reliability of the mediation channel.

Overall, the findings suggest that ESG news sentiment is more directly associated with crash risk, whereas high media attention is predominantly channelled through the indirect path of stock liquidity, possibly by increasing information availability and attracting transient investors (Ni *et al.*, 2021).

5.1.2 Stock return volatility channel. Table 5 presents the results for stock return volatility channel, which are comparable to those of the *stock liquidity* channel. Panel A shows that both negative ESG news sentiment and high media attention increase stock return volatility, and stock return volatility increases crash risk. Then we perform path analysis in Panel B to further examine the causal ordering of these associations. In summary, 94% of ESG news sentiment's impact on crash risk is direct, with 6% mediated via increased *STOCK_VOLATILITY*. In contrast, high media attention influences crash risk mainly indirectly, i.e. 65% through *STOCK_VOLATILITY*, while its direct effect is smaller (35%) and statistically insignificant. These identified relationships remain consistent across alternative crash risk measures and specifications with either industry or firm fixed effects, supporting the robustness of these results.

Overall, the findings suggest that ESG news sentiment is more directly associated with crash risk, rather than via return volatility. In contrast, high media attention is associated with crash risk both directly and indirectly, while it is largely directed through increased volatility linked to greater information accessibility and amplified investor reactions (Cao *et al.*, 2022; Edmans *et al.*, 2022).

5.2 Cross-sectional tests

To explore the factors underlying our findings, we examine whether external monitoring and firms' financial reporting opacity moderate the associations between ESG news sentiment/high media attention and crash risk. Stronger external monitoring constrains managerial bad news hoarding (Hong *et al.*, 2017; Teng and Yang, 2021), making these associations less pronounced. External monitoring is measured by the number of analysts following the firm.

Financial reporting opacity, reflected in discretionary accruals, reduces transparency and limits the availability of firm-specific information relevant to stock returns (Fang *et al.*, 2024; Kim *et al.*, 2021). Opaque firms are more prone to crashes when concealed negative information is suddenly revealed (Hong *et al.*, 2017). Thus, we posit that the relationship between ESG news sentiment/media attention and crash risk is more pronounced for companies with higher opacity. Following previous literature, we measure opacity using the three-year moving sum of the absolute value of discretionary accruals via the Modified Jones Model (Hong *et al.*, 2017; Hsu *et al.*, 2021). We construct two dummy variables, *High_Analyst* and *High_Opaque*. *High_Analyst* (*High_Opaque*) takes a value of one for

Table 5. ESG news sentiment, high media attention and stock return volatility

Variable	NCSKEW			DUVOL				
	STOCK_VOLATILITY (1)	(2)	(3)	(4)	STOCK_VOLATILITY (1)	(2)	(3)	(4)
Panel A: The effect of ESG news sentiment and high media attention on stock volatility								
ESG_NS t	-0.00003***		-0.0028***	-0.0037***	-0.00003***		-0.0027***	-0.0034***
HIGH_ESG_BUZZ t	0.0038***		0.0117	0.011	0.0038***		0.0168	0.0045
STOCK_VOLATILITY t		5.8530***	5.8467***	6.0172***		5.0510***	5.0381***	5.1534***
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Double clustered at the firm and time level	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry and time fixed effects	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Firm and time fixed effects	No	No	No	Yes	No	No	No	Yes
No. of observations	34,061	34,061	34,061	34,061	34,053	34,053	34,053	34,053
Adjusted R ²	0.5287	0.0193	0.0202	0.0742	0.5301	0.0181	0.0191	0.0801
For ESG news sentiment								
Panel B: Path analysis on stock volatility								
Direct path for stock volatility								
R[ESG_NS, CRASH_RISK]								
P[ESG_NS, CRASH_RISK]								
Mediated path for stock volatility								
R[ESG_NS, CRASH_RISK] - P[ESG_NS, CRASH_RISK] Or;								
P[ESG_NS, STOCK_VOLATILITY]								
P[STOCK_VOLATILITY, CRASH_RISK]								
Total mediated path for stock volatility								
P[ESG_NS, STOCK_VOLATILITY] * P[STOCK_VOLATILITY, CRASH_RISK]								
								(continued)

Table 5. Continued

<i>For ESG news sentiment</i>	NCSKEW		DUVOL	
	Coefficient	t-statistic	Coefficient	t-statistic
Direct path percentage $[-0.0028/(-0.0028-0.0002)]$	94%		95%	
Indirect path Percentage $[-0.0002/(-0.0028-0.0002)]$	6%		5%	
<i>For high media attention</i>				
Direct path for stock volatility				
$R[HIGH_ESG_BUZZ, CRASH_RISK]$	0.0339**	2.1	0.0357**	2.43
$P[HIGH_ESG_BUZZ, CRASH_RISK]$	0.0117	0.73	0.0168	1.15
<i>Mediated path for stock volatility</i>				
$R[HIGH_ESG_BUZZ, CRASH_RISK] - P[HIGH_ESG_BUZZ, CRASH_RISK]$	0.0222		0.0189	
Or;				
$P[HIGH_ESG_Buzz, STOCK_VOLATILITY]$	0.0038***	10.76	0.0038***	10.74
$P[STOCK_VOLATILITY, CRASH_RISK]$	5.8530***	11.44	5.0510***	10.97
<i>Total mediated path for volatility</i>				
$P[HIGH_ESG_BUZZ, STOCK_VOLATILITY] * P[STOCK_VOLATILITY, CRASH_RISK]$	0.0222***		0.0190***	
Direct Path percentage $[0.0117/(0.0117 + 0.0222)]$	35%		47%	
Indirect Path Percentage $[0.0222/(0.0117 + 0.0222)]$	65%		53%	

Note(s): This table reports the regression results concerning the channel (i.e. stock volatility) through which ESG news sentiment and media attention affect crash risk. Stock volatility is the standard deviation of the firm's weekly returns over the past six months. Panel A presents regression results for the effect of ESG news sentiment and media attention on stock volatility. In Model (1), we regress *STOCK_VOLATILITY* on the *ESG_NS* and *HIGH_ESG_BUZZ*. In Models (2)–(3), we regress crash risk (measured by NCSKEW and DUVOL) on *STOCK_VOLATILITY*, *ESG_NS* and *HIGH_ESG_BUZZ* to test the mediated path. Panel B reports path analyses of the link between ESG news sentiment and crash risk and media attention and crash risk. The direct link and the link mediated by stock volatility are separately reported. R [] indicates regression coefficients, and P [] indicates path coefficients. Control variables are included in all the regressions but are not reported for brevity. ***, ** and * indicate statistical significance at the 1, 5 and 10% levels, respectively

Source(s): Authors' own work

firms with number of analysts following (opacity) above the cross-sectional industry median or zero otherwise. We then augment [equation \(5\)](#) with the interaction terms of ESG news sentiment (or ESG media attention) with these dummy variables.

[Table 6](#), Panel A, shows that the interaction between ESG news sentiment and high analyst coverage is positive and significant across both crash risk measures. For instance, Model (1) reports a significant interaction coefficient at the 1% level (coefficient = 0.0011). This implies that one standard deviation drop in ESG news sentiment is associated with approximately 3.2% ($-0.0023 \times 16.992/1.205$) standard deviation increase in NCSKEW. For firms with high analyst coverage, the effect is reduced to 1.7% ((coefficient of $-0.0023 \times 16.992/1.205$) + (coefficient of $+0.0011 \times 16.992/1.205$)). These results indicate that high analyst coverage weakens the association between negative ESG sentiment and crash risk, supporting the view that external monitoring deters managerial bad news hoarding and lowers the likelihood of abrupt market corrections following negative ESG news.

Table 6. Moderating effects of analysts following and financial opacity

Variable	NCSKEW (1)	DUVOL (2)	NCSKEW (3)	DUVOL (4)
<i>Panel A: Analyst coverage as moderating variable</i>				
ESG_NS t	-0.0023***	-0.0024***	-0.0026***	-0.0025***
HIGH_ESG_BUZZ t	0.1727***	0.1527***	0.2648***	0.2292***
HIGH_ESG_BUZZ t × ESG_NS t	-0.0022**	-0.0018**	-0.0030**	-0.0025***
High_ANALYST t – 1	-0.0331**	-0.0429***	0.0142	0.0108
ESG_NS t × HIGH_ANALYST t – 1	0.0011***	0.0013***	0.0005**	0.0006***
HIGH_ESG_BUZZ t × HIGH_ANALYST t – 1	-0.0313	-0.0304	-0.0782	-0.0895
Controls	Yes	Yes	Yes	Yes
Double clustered at the firm and time level	Yes	Yes	Yes	Yes
Industry and time fixed effects	Yes	Yes	No	No
Firm and time fixed effects	No	No	Yes	Yes
No. of observations	34,061	34,051	34,061	34,051
Adjusted R ²	0.0093	0.0098	0.0652	0.0725
<i>Panel B: Opacity as moderating variable</i>				
ESG_NS t	-0.0017**	-0.0018***	-0.0025**	-0.0024***
HIGH_ESG_BUZZ t	0.1323**	0.1070**	0.1871**	0.1380*
HIGH_ESG_BUZZ t × ESG_NS t	-0.0020**	-0.0016*	-0.0025**	-0.0019*
HIGH_OPAQUE	0.0405**	0.0377**	0.0529***	0.0509***
ESG_NS t × HIGH_OPAQUE	-0.0005	-0.0006**	-0.0004	-0.0005
HIGH_ESG_BUZZ t × HIGH_OPAQUE	0.0510**	0.0571**	0.0331*	0.0468*
Controls	Yes	Yes	Yes	Yes
Double clustered at the firm and time level	Yes	Yes	Yes	Yes
Industry and time fixed effects	Yes	Yes	No	No
Firm and time fixed effects	No	No	Yes	Yes
No. of observations	34,061	34,051	34,061	34,051
Adjusted R ²	0.0093	0.0096	0.0730	0.0815

Note(s): This table presents the regression results on moderating variables through which ESG news sentiment and media attention affect crash risk. The moderating variable is high analyst coverage (*High_ANALYST*) in Panel A and high financial opacity (*HIGH_OPAQUE*) in Panel B. Models in this table include industry and time fixed effects and the standard errors are clustered at the firm and time levels. Control variables are included in all the regressions but are not reported for brevity. ***, ** and * indicate statistical significance at the 1, 5 and 10% levels, respectively

Source(s): Authors' own work

Panel B reports that for opaque firms, high media attention increases NCSKEW by 15.2% ((coefficient of 0.1323/1.205) + (coefficient of 0.0510/1.205)) of a standard deviation, while this effect is only 11% (coefficient of 0.1323/1.205) for low-opacity firms. For the interaction term of ESG news sentiment and high opacity, the coefficients are negative in both models, albeit only statistically significant in Model (2). These results suggest highly opaque firms are more likely to hoard bad news; thus, opacity strengthens the negative (positive) relation between ESG news sentiment (media attention) and crash risk. All inferences are similar in Model (2) when using DUVOL as the crash risk measure.

5.3 ESG news sentiment sub-pillar analysis on crash risk

ESG news sentiment comprises environmental, social and governance subcomponents, which may impact financial outcomes differently (Nollet *et al.*, 2016; Petitjean, 2019; Velte, 2017). Table 7 reports the impact of ESG news sentiment sub-pillars on crash risk. Results indicate that the negative relationship between ESG news sentiment and crash risk is predominantly driven by the social pillar. Recall that Model (2) in Table 1 shows that one standard deviation drop in overall ESG news sentiment is associated with approximately 4.1% (coefficient of $-0.0029 \times 16.992/1.205$) of a standard deviation increase in NCSKEW. Table 7 Model (2) demonstrates that the majority of this effect, approximately 2.7% (coefficient of $-0.0019 \times 16.992/1.205$), is attributable to social news sentiment. Our inferences are consistent across all crash risk models, including specifications with either industry or firm fixed effects and with or without controlling for media attention.

This result is consistent with evidence that media disproportionately emphasises social issues due to their emotional and conflict-driven nature (Serafeim and Yoon, 2022b). Further, disclosure in the social domain is less standardised and more opaque, creating larger information gaps (Christensen *et al.*, 2022). As a result, news related to society may carry greater incremental information, leading to stronger adjustments in investor expectations and a more pronounced effect on crash risk.

6. Endogeneity tests

6.1 Instrumental variable two-stage least squares regression

We use instrumental variable two-stage least squares (IV 2SLS) regression to mitigate possible endogeneity concerns. In the first stage, we regress the ESG news sentiment (endogenous variable) on an instrumental variable that has an impact on ESG news sentiment but is not likely to be correlated with the crash risk. Following prior literature (An *et al.*, 2020; Yu *et al.*, 2023), we use the industry median of ESG news sentiment, excluding the focal firm (*MEDIAN_ESG_NS*), as an instrument for firm-level ESG news sentiment. The instrument is economically relevant because firms' ESG news sentiment is likely influenced by peers in the same industry, as they face similar ESG regulations, technologies, supply-chain dependencies and stakeholder pressures that shape a common ESG information environment for benchmarking. However, *MEDIAN_ESG_NS* is unlikely to be directly linked to firm-specific crash risk. The exclusion restriction rests on the assumption that *MEDIAN_ESG_NS* affects firm-level crash risk primarily through the focal firm's own ESG news sentiment, rather than through omitted industry-level shocks. This assumption is plausible because the instrument is constructed from peer firms excluding the focal firm. In addition, our crash-risk measures are estimated from firm-specific weekly returns derived from the residuals of an expanded market model that controls for industry-level stock returns, which reduces the likelihood that *MEDIAN_ESG_NS* is directly associated with these firm-specific returns and, consequently, with crash risk.

Table 7. ESG news sentiment sub-pillars and crash risk

Variable	NCSKEW			DUVOL		
	(1)	(2)	(3)	(4)	(5)	(6)
<i>ENVIRONMENTAL_NS</i> t	-0.0003	-0.0006	-0.0011	-0.0004	-0.0006	-0.001
<i>SOCIAL_NS</i> t	-0.0019***	-0.0019***	-0.0020**	-0.0017***	-0.0017***	-0.0017**
<i>GOVERNANCE_NS</i> t	-0.0002	-0.0004	-0.0007	-0.0003	-0.0005	-0.0009
<i>HIGH_ESG_BUZZ</i> t		0.0353**	0.0678**		0.0361*	0.0574**
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Double clustered at the firm and time level	Yes	Yes	Yes	Yes	Yes	Yes
Industry and time fixed effects	Yes	Yes	No	Yes	Yes	No
Firm and time fixed effects	No	No	Yes	No	No	Yes
No. of observations	32,733	32,733	32,733	32,723	32,723	32,723
Adjusted R ²	0.0098	0.0084	0.0679	0.0112	0.0088	0.0761

Note(s): This table reports regression results of the impact of ESG news sentiment sub-pillars on crash risk. Control variables are included but are not tabulated for brevity.***, ** and * indicate statistical significance at the 1, 5 and 10% levels, respectively

Source(s): Authors' own work

The diagnostic tests support the empirical relevance and strength of the instrument. The *F*-statistics for the first-stage regression exceed 10 (4,341), suggesting that our regression does not suffer from a weak instrument issue (An *et al.*, 2020; Yu *et al.*, 2023). This suggests that the second-stage coefficient estimates and associated *t*-statistics are reliable for inference. The Anderson canon test is significant (1585.684), rejecting the null hypothesis of under-identification. In terms of the strengths of the instrument, the value of the Cragg–Donald Wald *F*-statistics (1662.181) exceeds the Stock–Yogo critical values (maximum 16.38 at the 10% level), indicating that the instrument is strong. Overall, these tests indicate the instrumental variable is correctly identified and sufficiently strong [15]. To assess the endogeneity of the first-stage model, we first conduct Hausman (1978) test by regressing crash risk on ESG news sentiment and on the residuals from the first-stage regressions. The test rejects the null hypothesis of exogeneity at the 5% level, confirming that ESG news sentiment is endogenous.

The predicted values from the first stage regression are used in the second stage regression. Table 8 tabulates the results: In the first stage, *MEDIAN_ESG_NS* is positively related to ESG news sentiment, and in the second stage, the predicted ESG sentiment negatively associates with crash risk, consistent with the main results. These findings help mitigate endogeneity concerns relating to omitted-variable bias and simultaneity, further lending support to the main results.

6.2 Two-step GMM regression

We perform a two-step GMM to mitigate the issues of reverse causality and dynamic endogeneity following Zaman *et al.* (2021). As such, we re-estimate equation (5) using GMM and report the output in Table 9. Following Arellano and Bond (1991), we assess the validity of the instruments using the standard dynamic panel diagnostics. The AR (1) test is statistically significant ($p < 0.05$), indicating the existence of first-order serial correlation and supporting the inclusion of lagged dependent variables in the model. In contrast, the AR (2)

Table 8. IV 2SLS regressions

Variable	NCSKEW		DUVOL	
	<i>ESG_NS</i> t	NCSKEW	<i>ESG_NS</i> t	DUVOL
	1st Stage (1)	2nd Stage (2)	1st Stage (3)	2nd Stage (4)
<i>MEDIAN_ESG_NS</i>	0.3828***		0.3839***	
<i>ESG_NS</i> t		−0.0039***		−0.0056***
<i>HIGH_ESG_BUZZ</i> t	−46.6079***	0.2218***	−46.6049***	0.1960***
<i>HIGH_ESG_BUZZ</i> t × <i>ESG_NS</i> t	0.8814***	−0.0034***	0.8815***	−0.0031***
Controls	Yes	Yes	Yes	Yes
Industry and time fixed effects	Yes	Yes	Yes	Yes
No. of observations	34,061	34,061	34,051	34,051
Adjusted R^2	0.6964	0.0090	0.6964	0.0096
F -statistics (p -value)	4341.18	19.24	4341.02	20.36
i) F -test for excluded instrument in first stage				
Sanderson-Windmeijer F -test	1662.18		1660.66	
ii) under-identification test Anderson canon.				
Corr. LM statistic	1585.684		1584.28	
iii) Weak identification test Cragg–Donald				
Wald F -statistic	1662.181		1660.66	
Stock–Yogo weak ID test 10% max IV size	16.38		16.38	
15% max IV size	8.96		8.96	
20% max IV size	6.66		6.66	
25% max IV size	5.53		5.53	

Note(s): This table reports the regression results of the instrumental variable two-stage least squares regression for the impact of ESG news sentiment and media attention on crash risk. The F -statistics for our models exceed 10, suggesting that our regression does not have a weak instrument issue (An *et al.*, 2020; Yu *et al.*, 2023). Control variables are included but are not tabulated for brevity. ***, ** and * indicate statistical significance at the 1, 5 and 10% levels, respectively

Source(s): Authors' own work

test is not statistically significant, suggesting the absence of second-order serial correlation in the differenced residuals. In addition, both the Hansen J test and the Difference-in-Hansen test produce statistically insignificant p -values ($p > 0.10$) in Columns (1) and (2), suggesting that the instrument set is appropriate and valid.

The key findings are qualitatively and statistically similar to Table 1. In both models, ESG news sentiment is negatively related to crash risk, ESG media attention increases crash risk, and the interaction of ESG news sentiment and media attention produces negative coefficients. Overall, this section provides evidence supporting that reverse causality and dynamic endogeneity are unlikely to be a major concern in our research design.

6.3 Propensity score matching (PSM)

To mitigate potential endogeneity arising from sample selection bias, specifically from control variables and model misspecification (Zaman *et al.*, 2021), we conduct a PSM test. For example, large well-known companies may have positive ESG news sentiment and thus may be less prone to stock price crashes. We construct a balanced sample in which half of the observations exhibit negative ESG news sentiment (treated group) and the other half positive ESG news sentiment (control group), matched on all control variables used in our main analysis. Nearest neighbour matching with replacement is used to ensure comparability.

Table 9. GMM regression

Variable	NCSKEW (1)	DUVOL (2)
<i>ESG_NS</i> <i>t</i>	−0.0015**	−0.0016***
<i>HIGH_ESG_BUZZ</i> <i>t</i>	0.1490***	0.1260**
<i>HIGH_ESG_BUZZ</i> <i>t</i> × <i>ESG_NS</i> <i>t</i>	−0.0022**	−0.0019**
Controls	Yes	Yes
Industry and time fixed effects	Yes	Yes
No. of observations	34,061	34,051
Adjusted <i>R</i> ²	0.0111	0.0125
Number of groups	2947	2944
Number of instruments	24	24
Hansen <i>J</i> test (<i>p</i> -value)	0.507	0.388
Diff in Hansen <i>J</i> (<i>p</i> -value)	0.313	0.148
AR(1)	0.045	0.043
AR(2)	0.860	0.321

Note(s) This table reports the regression results of the two-step generalised method of moments (GMM) for the impact of ESG news sentiment and media attention on crash risk. The dependent variables in Models 1 and 2 are the crash risk measures, NCSKEW and DUVOL, respectively. Control variables are included but are not tabulated for brevity.***, ** and * indicate statistical significance at the 1, 5 and 10% levels, respectively

Source(s): Authors' own work

The results of the balance tests are presented in Table S2 in the Supplementary material. Panel A reports pre-matching results, while Panel B shows results after matching. As expected, the post-matching sample exhibits no significant differences (at the 5% level) across control variables between the treated and control groups, showing sample balance. In contrast, the mean differences for the dependent variables – NCSKEW and DUVOL – remain statistically significant at the 1% level, indicating the success in creating a balanced sample with similar firm fundamentals.

We re-estimate [equation \(5\)](#) using the propensity score matched sample of 24,147 observations. [Table 10](#) reports the regression results, which remain consistent with the main findings. ESG news sentiment continues to be negatively associated with crash risk, significant at the 5% level in both models. High media attention is positively associated with crash risk (e.g. NCSKEW, coefficient = 0.1669, $p < 0.05$), while it significantly moderates the ESG sentiment–crash risk relationship (coefficient = −0.0024, $p < 0.05$). Taken together with the IV 2SLS and GMM results, these findings indicate that the ESG sentiment–crash risk relationship is robust to observable selection bias, dynamic endogeneity and simultaneity, consistent with the interpretation of our main results.

7. Robustness tests

7.1 Regressions for longer-run windows of crash risk

ESG news sentiment and ESG media attention are likely to affect crash risk through different temporal mechanisms. ESG news sentiment, unlike short-lived topic-specific sentiment – such as that observed during COVID-19 ([Duan and Lin, 2022](#); [Jin et al., 2022](#); [Kong et al., 2023](#)) – reflects a persistent stream of firm-specific narratives that shape investor perceptions and arguably exert more enduring effects on crash risk, highlighting the need to examine its capital market implications over longer horizons. We posit that negative ESG news

Table 10. PSM regression based on balanced dataset with high and low ESG news sentiment

Variable	NCSKEW (1)	DUVOL (2)
<i>ESG_NS</i> <i>t</i>	−0.0016**	−0.0018***
<i>HIGH_ESG_BUZZ</i> <i>t</i>	0.1669**	0.1295**
<i>HIGH_ESG_BUZZ</i> <i>t</i> × <i>ESG_NS</i> <i>t</i>	−0.0024**	−0.0017**
Controls	Yes	Yes
Industry and time fixed effects	Yes	Yes
No. of observations	24,147	24,141
Adjusted <i>R</i> ²	0.0102	0.0101

Note(s): This table presents the results of Propensity Score Matching (PSM) tests, where regressions are conducted on a balanced data set with positive and negative ESG news sentiment. Control variables are included but are not tabulated for brevity. ***, ** and * indicate statistical significance at the 1, 5 and 10% levels, respectively

Source(s): Authors' own work

sentiment has a persistent positive association with future crash risk, as it gradually updates investor beliefs and reveals underlying firm-specific risks (Chen and Yang, 2020; Kong *et al.*, 2023). In contrast, ESG media attention captures a different information mechanism: the visibility and intensity of coverage. In the short term, high ESG media attention can positively relate to crash risk due to the attraction of transient investors, intensified trading pressure and strengthened managerial incentives to withhold bad news due to career or compensation concerns (Hanlon *et al.*, 2023; Ni *et al.*, 2021; Vourvachis *et al.*, 2016). However, over longer horizons, sustained attention can become a monitoring mechanism. Continued media scrutiny enhances external monitoring and facilitates more efficient information dissemination, thereby reducing information asymmetry (An *et al.*, 2020) and raising the expected cost of managerial concealment. Accordingly, while ESG media attention may positively relate to crash risk in the short term, its incremental effect should weaken or reverse over time as scrutiny improves external monitoring and information dissemination.

Following prior literature (Callen and Fang, 2013; Callen and Fang, 2015; Kim and Zhang, 2016), we test the long-term relations of ESG news sentiment and media attention with crash risk using lagged and differenced variables across 1-period (12 months), 2-period (18 months) and 3-period (24 months) forecast windows. This approach also mitigates potential endogeneity concerns relating to reverse causality and simultaneity (Callen and Fang, 2013). Table S3 in the Supplementary material shows that the coefficients for *ESG_NS* *t* − 2, *ESG_NS* *t* − 3 and *ESG_NS* *t* − 4 and their changes (Δ *ESG_NS* *t* − 2, Δ *ESG_NS* *t* − 3 and Δ *ESG_NS* *t* − 4) are consistently negative and significant across models. For instance, a decline in ESG news sentiment over the past 12 months is associated with an 8% increase ($-0.0057 \times 16.992/1.205$), over the past 18 months a 4.8% increase ($-0.0034 \times 16.992/1.205$) and over the past 24 months a 4.2% increase ($-0.0030 \times 16.992/1.205$) in NCSKEW. Although below the 6–12% effects reported by Jin *et al.* (2022) for pandemic-related news, these results underscore that ESG news sentiment has a long-run association with crash risk.

Similarly, changes in ESG media attention (Δ *ESG_Buzz*) are positively and significantly associated with crash risk. For instance, an increase in ESG media attention over the past 12 months is related to a 10.9% increase ($0.0756 \times 1.737/1.205$), over the past 18 months a 7.6% increase ($0.0524 \times 1.737/1.205$) and over the past 24 months a 5% increase ($0.0347 \times$

1.737/1.205) in NCSKEW. Overall, these magnitudes exceed the 6.1% effect reported by [Chen et al. \(2018\)](#) for general news coverage, underscoring the stronger and more persistent relation of ESG media attention with crash risk. The positive coefficient on the change in ESG media attention suggests that attention shocks amplify crash risk in the short run, consistent with transient investor attraction and heightened managerial concealment incentives under sudden scrutiny ([Hanlon et al., 2023](#); [Ni et al., 2021](#); [Vourvachis et al., 2016](#)). In contrast, lagged ESG media attention – $ESG_BUZZ\ t - 2$, $ESG_BUZZ\ t - 3$ and $ESG_BUZZ\ t - 4$ – shows negative and significant coefficients, indicating that sustained prior coverage negatively relates to crash risk, consistent with the view that persistent media scrutiny enhances external monitoring, raising the expected cost of concealment and reducing information asymmetry over time ([An et al., 2020](#)).

7.2 Crash risk measures on annual intervals

Given the lack of theoretical guidance on selecting time intervals to measure crash risk ([Chen et al., 2001](#)), we compute crash risk measures on a six-monthly horizon in our main analysis. As a robustness check, we re-estimate [equation \(5\)](#) using crash risk measures (and all corresponding variables) calculated on annual intervals. Table S4 in the Supplementary material tabulates the output. The results indicate that the main findings are robust to alternative time horizons.

7.3 Subsample analysis

We conduct large- vs small-cap subsample analysis using [equation \(5\)](#); first to check whether the primary inferences are robust to firm size; and second to check whether the crash risk of small-cap firms is more sensitive to ESG news sentiment and media attention than large-cap firms. Prior research suggests that investor sentiment has a stronger effect on small-cap firms due to their higher risk and lower arbitrage potential ([Baker and Wurgler, 2006](#); [Edmans et al., 2022](#)). We partition the sample into two subsamples, small-cap and large-cap, based on the annual median market capitalisation and re-perform [equation \(5\)](#) for each subsample.

As shown in Table S5 in the Supplementary material, ESG news sentiment has an economically similar negative association with the crash risk for large and small firms. However, the direct and moderating impacts of media attention on crash risk are significant only for small-cap firms, suggesting media attention has a greater association with the crash risk of small firms.

7.4 Effect of COVID-19

In a further robustness test, we exclude the years 2020 and 2021 from our sample due to the possible impact of COVID-19. The results of the tests excluding the years 2020 and 2021 are presented in Table S6 of the Supplementary material. The results of the analysis excluding the year impacted by COVID-19 are consistent with our main results, alleviating the concern that our findings are distorted by the impact of the pandemic.

8. Summary and conclusions

This study focuses on the novel concepts of ESG news-based public sentiment and media attention, contributing to the growing literature on news-based investor sentiment and crash risk. We show that these two distinct, yet interrelated aspects of media communication can shape investors' risk perception and managerial disclosure behaviour.

Supporting investors' *risk perception* rationale, we show that more negative ESG news sentiment is associated with greater crash risk. This effect is amplified in firms with high

reporting opacity and mitigated by strong external monitoring, indicating that ESG news sentiment serves as a governance signal of hidden risks, prompting investors to reassess firm fundamentals. High media attention is also associated with higher crash risk, potentially because managerial incentives to withhold bad news intensify under public scrutiny. This is supported by the finding that the association between high media attention and crash risk is also pronounced for firms with more opaque financial reporting. Moreover, media attention magnifies the relation of ESG news sentiment with crash risk, underscoring its role in amplifying investor reactions. We further show that both negative ESG news sentiment and heightened media attention increase stock liquidity and return volatility, two channels empirically linked to crash risk. While ESG news sentiment is more directly associated with crash risk through a signaling mechanism, media attention operates largely indirectly by driving liquidity and volatility, likely due to attracting short-term traders and heightening market uncertainty.

We find that the social pillar of news sentiment has the strongest association with crash risk. This aligns with evidence that media outlets display systematic bias and selectivity in the ESG topics they amplify, giving disproportionate attention to social-related issues because they are more vivid, conflict-laden and emotionally charged (Serafeim and Yoon, 2022b). Media organisations tend to prioritise coverage of events with high human-interest value, reputational stakes or moral overtones, making social controversies especially salient in shaping investor beliefs. At the same time, the information gap between firms' voluntary disclosures and media reporting tends to be largest in the social domain, where disclosure standards are less formalised, measurement is more subjective, and firms face greater incentives to withhold or downplay damaging information (Christensen *et al.*, 2022). The combination of heightened media salience and weaker firm-side transparency means news about social issues carries incremental informational content, which can sharply recalibrate investors' downside expectations and therefore exert a stronger impact on crash risk.

Then, we show that ESG news sentiment is related to crash risk up to two years ahead, whereas high media attention shows a dynamic association with crash risk: it positively relates to crash risk in the short run due to transient investor attraction and intensified managerial incentives to conceal bad news, but negatively relates to crash risk in the long run, lowering information asymmetry as ESG information becomes more fully reflected in prices, while sustained scrutiny strengthens external monitoring and raises the cost of concealment. Further, we find that the association between media attention and crash risk is greater for small firms, consistent with evidence that media-based momentum effects are more pronounced among small, neglected stocks (Hillert *et al.*, 2014). This is because smaller firms suffer from greater information asymmetry, limited analyst following, and lower investor attention, making them more sensitive to any incremental media signal. In contrast, the association between ESG news sentiment and crash risk does not differ by company size, suggesting that ESG-related information carries relatively uniform informational content across the market and reflects a type of public scrutiny that is less dependent on firm visibility or information scarcity. These findings further support our main results showing that media attention and ESG news sentiment operate through different mechanisms. Our results are resilient to a variety of robustness checks and endogeneity tests that control for reverse causality, simultaneity, and dynamic endogeneity.

Our findings have significant implications for investors, corporations and regulators aiming to understand and mitigate crash risk. For investors, our regression evidence indicates that variation in ESG news sentiment and ESG media attention is associated with economically meaningful movements in subsequent crash-risk measures, and that these associations are stronger when external monitoring is weaker or financial reporting is more

opaque. For example, within our sample, a one-standard-deviation decline in ESG news sentiment is associated with an approximately 2.8% increase in crash risk in the short term, and changes over the past 12, 18 and 24 months are associated with 8%, 4.8% and 4.2% increases, respectively. While these magnitudes are below the 6–12% effects reported by [Jin et al. \(2022\)](#) for pandemic-related news, they suggest that ESG news sentiment contains information associated with firms' downside-risk exposure after controlling for market-wide sentiment. Because we do not evaluate incremental out-of-sample predictive performance (e.g. forecasting accuracy tests or portfolio exercises), these implications should be interpreted as suggestive rather than as validated screening or early-warning tools.

For corporations, the findings highlight the potential importance of transparent ESG reporting and proactive management of ESG-related risks, as adverse ESG news sentiment and heightened media scrutiny are linked to higher crash risk through market conditions such as volatility and liquidity. For regulators, our results suggest that ESG-related news flows and attention may help prioritise monitoring attention toward firms facing sustained ESG scrutiny – particularly where reporting opacity is high – while recognising that we do not test the effectiveness of specific disclosure mandates or enforcement interventions.

Our study is subject to a few caveats. First, our control variables primarily draw from research on ESG performance and crash risk. We also use insights from the limited literature on ESG news sentiment to build our models. However, due to the nascent and underexplored nature of ESG news sentiment, some relevant controls may have been omitted. Second, biases, misrepresentations, and omissions in the media content itself can impact the accuracy of public sentiment of corporate ESG performance. While professional media enhances price formation, non-professional sources may introduce noise ([Drake et al., 2017](#)). Nevertheless, we posit that the external flow of information can improve market perceptions of ESG performance. Future research can study whether the perceptions built via professional and non-professional media sources influence crash risk differently. These caveats notwithstanding, we believe that our findings can open venues for future research that explores the determinants of crash risk and identifies alternative information channels to overcome information asymmetry built via management bad news hoarding. Future studies could further examine how the impact on crash risk varies across countries and industries, between traditional and social media, as ESG sentiment is formed dynamically. Such extensions would deepen understanding of the information channels affecting market outcomes and inform policies aimed at improving transparency and market efficiency. Finally, future research could assess whether ESG news sentiment and media attention provide incremental out-of-sample predictive power for crash events or tail-risk outcomes and whether these signals translate into implementable investment or supervisory strategies.

Notes

- [1.] A prominent example is the 2018 Cambridge Analytica scandal, where investigations by The New York Times and The Guardian exposed major lapses in Facebook's (now Meta) data. Ten days following the news, Facebook's market value plummeted by approximately \$80bn ([Hern, 2019](#); [Rodriguez, 2018](#)). Similarly, the DWS Group, part of Deutsche Bank, faced financial and reputational damage after media reported misrepresentation of sustainable investing, resulting in police raids and its CEO's resignation ([Arons et al., 2022](#); [Segal, 2022](#)).
- [2.] As detailed in Section 3.2.1, we use ESG news sentiment constructed excluding corporate disclosures to maintain the outsider perspective and reduce greenwashing bias ([Brewster and Weakley, 2021](#)) and using highly credible sources including Reuters, major news outlets and curated ESG-focused social media and NGO content (Refinitiv, 2021).

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- [3.] The behavioural finance dimension of our analysis is grounded in the dual phenomena of investor underreaction and overreaction, as articulated in [Barberis et al. \(1998\)](#) and [Harrison Hong and Stein Jeremy \(2000\)](#). These models suggest that investors may initially underreact to isolated adverse ESG news due to availability bias, representativeness heuristic, conservatism or limited attention driven gradual information diffusion, followed by overreaction to consistent patterns due to representativeness of systemic governance failures, increasing crash risk.
- [4.] The exact number of observations used in the regression analyses varies, depending on the data required for the analysis.
- [5.] This approach follows the seminal paper by [Chen et al. \(2001\)](#) and subsequent literature on crash risk.
- [6.] As a robustness check, we conduct additional tests using crash risk measures calculated on annual intervals.
- [7.] CEO duality is included as a proxy for managerial power and potential entrenchment ([Kim et al., 2014](#); [Zaman et al., 2021](#)). While other governance variables, such as board size and board independence, are considered in studies focused on board effects, prior evidence indicates that these variables do not consistently influence crash risk ([Cao et al., 2019](#)). Accordingly, CEO duality is included as the primary governance control in our models.
- [8.] We also measure Variance Inflation Factors (VIFs), where a VIF value exceeding 10 indicates potential serious multicollinearity issues ([Velte, 2017](#)). Specifically, the VIF values for the ESG news sentiment and ESG news buzz variables, which may be moderately correlated, are below 3. The highest VIF among all variables in our models is 3.613, which is well below the threshold of 4, at which further investigation may be needed. Therefore, our regression models are unlikely to suffer from multicollinearity. For brevity, these results are not tabulated but are available from the corresponding author upon request.
- [9.] The measurement of ESG news sentiment involves lagged sentiment over the last 12 months, as discussed in the research design and sample selection section. For the purposes of this study, however, ESG news sentiment is sampled at six-month intervals (January–June and July–December) to align with the crash risk measurement window. We later perform additional tests exploring the impact of ESG news sentiment lagged by 12, 18 and 24 months on future crash risk.
- [10.] Untabulated results using ESG news buzz as a continuous variable (measured as the natural logarithm of the number of ESG-relevant media references to a given company) yield qualitatively similar findings. These results are available from the corresponding author upon request.
- [11.] Models that do not incorporate industry and time fixed effects, and where standard errors are not clustered by firm or time levels, align qualitatively with the reported results. These unreported results are available upon request from the authors.
- [12.] Following prior literature, we calculate economic significance by multiplying the coefficient of the independent variable by the standard deviation of the independent variable, divided by the standard deviation of the respective crash risk measure ([Feng et al., 2022](#); [Ni et al., 2021](#); [Xu et al., 2021](#)).
- [13.] Media attention is measured as a binary indicator (*HIGH_ESG_BUZZ*), whereas ESG news sentiment is a continuous variable. As such, their estimated economic magnitudes are not directly comparable. When using a continuous measure of media attention, the estimated effect becomes comparable to that of ESG sentiment (untabulated results are available upon request from the corresponding author).
- [14.] As an alternative proxy, we use *ILLIQUIDITY*, which is measured as the absolute value of the stock returns divided by trading volume multiplied by 1,000 ([Amihud et al., 2021](#);

Xu *et al.*, 2021). The results of the tests using ILLIQUIDITY are presented in Table S1 in the Supplementary material, and these results are qualitatively similar to the results based on stock turnover.

- [15.] Untabulated placebo tests (available upon request from the corresponding author) further support the validity of the instrumental variable, showing that it is not related to crash risk.

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Supplementary material

The supplementary material for this article can be found online.

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