



Which investor sentiment drives the ESG–return link? A multi-dimensional sentiment perspective on ESG changes

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ABSTRACT

This paper studies the impact of various dimensions of investor sentiment on the stock price response to changes in environmental, social and governance (ESG) ratings. In contrast to most of the existing literature that relies on a single aggregate proxy of sentiment, the present study decomposes investor sentiment into five components such as positive tone, negative tone, risk, volatility and management-related sentiment. The multidimensional design can better pinpoint the channel through which ESG-related information is incorporated into prices. The empirical results show that ESG downgrades are followed by economically meaningful negative cumulative abnormal returns, whereas upgrades generate only weak and short-lived effects. In addition, the pricing response is not conditioned equally by all sentiment dimensions. Positive sentiment is found to be the most important moderating channel. We show that the negative valuation effect of ESG downgrades is significantly stronger in a more optimistic surrounding informational environment, while the other sentiment dimensions play relatively limited roles. Our result is especially pronounced for large firms and for firms with strong pre-event ESG profiles, both of which are likely to attract greater investor attention and to be held more widely by institutional and ESG-oriented investors. The paper contributes to the literature by showing that investor sentiment should not be treated as a single conditioning variable in ESG pricing. Instead, stock price reactions reflect a multidimensional sentiment mechanism in which optimism plays the central role.

1. Introduction

The growing importance of environmental, social and governance (ESG) information has altered the handling of capital markets of nonfinancial signals of corporate conduct, long-term risk and firm reputation (Pinto-Gutiérrez et al., 2025). ESG rating agencies often update firm-level sustainability assessments, which have become salient information events that can alter investor beliefs about expected cash flows, downside risk, and reputational standing (Ryu et al., 2025). Existing literature on ratings and governance evaluations suggests that downgrades produce more pronounced abnormal return effects than upgrades, as negative revisions provide more salient signals of deteriorating firm quality and future downside risk exposure (Chen & Pottier, 2017; Tai, 2023). Previous research on ESG shows that bad news and poor sustainability signals are punished more than good signals are rewarded, but the magnitude and persistence of such effects vary across firms and informational contexts (Ning et al., 2025).

The informational environment is neutral to the inflow of ESG information into financial markets (Quotb et al., 2026). The

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qualitative, forward-looking and open-to-competing-interpretations nature of ESG signals implies that the same downgrade may have different pricing consequences for different belief states (Baker & Wurgler, 2007; Tetlock, 2007). This view is particularly relevant in the ESG context, where recent evidence suggests that stock-price responses are strongly related to ESG news sentiment, and that the valuation impact of sustainability-related information depends on the informational environment it is embedded in, and not solely on the sign of the event (Banerjee et al., 2025; Dorfleitner & Zhang, 2024). The central issue then moves beyond the simple question of whether ESG downgrades matter and becomes whether the stock-market penalty associated with ESG downgrades is conditioned by investor sentiment and if so, which sentiment channel plays the dominant role.

Previous studies have not yet resolved that issue satisfactorily. An increasing number of studies have documented that ESG news sentiment affects stock returns, return predictability and other market variables. Nevertheless, most of the prior evidence is based on one-dimensional indicators such as a single sentiment score, a net tone indicator or a positive versus negative classification (Banerjee et al., 2025; Dorfleitner & Zhang, 2024; Jeong et al., 2025). Such measures are useful for establishing the relevance of sentiment, but they are less informative about the underlying transmission mechanism. In a narrow tonal sense an ESG downgrade could be seen as bad news, but it may also be associated with higher perceived uncertainty, more concerns about future volatility, or a re-assessment of managerial credibility and the quality of governance (Audrino et al., 2020; Ferreira et al., 2025). The literature is unable to distinguish whether market reactions are mainly driven by tone, risk-based narratives, or management-specific interpretations of the same ESG shock when these channels are aggregated into a single proxy (Banerjee et al., 2025; Jeong et al., 2025).

On this basis, the study is structured around a single central question: *'How are ESG downgrades priced in the stock market? To what extent is that pricing conditioned by investor sentiment?'* The objective of the analysis is not to reconfirm that ESG downgrades matter that proposition is already established by recent research (Jeong et al., 2025). More importantly, we want to demonstrate that the stock market penalty of ESG downgrades is state dependent and that positive sentiment is the most robust conditioning channel across sentiment dimensions (Dorfleitner & Zhang, 2024).

This research agenda is strongly anchored in the event-study tradition. Event studies continue to be the standard method to identify the stock-price reaction of discrete information events, when abnormal returns are properly benchmarked and the statistical challenges of announcements are carefully addressed (Binder, 1998). In addition, methodological research has demonstrated that the credibility of inference is very sensitive to the choice of benchmarks, the treatment of variance induced by the event, and the robustness of the results to changes in event windows and model specifications (Boehmer et al., 1991). In climate and sustainability contexts, green policy announcements are associated with significant cumulative abnormal returns, but the effects are not uniform and depend on sectors, countries and policy categories (Borghesi et al., 2022). Events related to climate policy have also been examined as shocks that alter expectations of future policy action and affect returns based on firms' exposure to policy risk (Barnett, 2019). In this context, this paper moves the analytical focus from policy announcements to firm-level ESG downgrades and from average event effects to the conditional role of investor sentiment in shaping market responses.

This study contributes to the literature in three ways. *First*, our paper adds to the ESG event study literature by demonstrating that the stock market penalty of ESG downgrades is state dependent and not uniform across informational environments (Dorfleitner & Zhang, 2024; Jeong et al., 2025). This result is further reinforced by the finding that downgrades generate larger and more persistent negative cumulative abnormal returns for large firms and for firms with stronger pre-event ESG standing, which are typically more visible to investors, more widely held by institutional and ESG-oriented investors, and more likely to be perceived as responsible or relatively safe assets (Dorfleitner & Zhang, 2024; Jeong et al., 2025). *Second*, the study contributes to the sentiment literature by going beyond a single aggregate sentiment proxy and directly comparing different sentiment channels within the same event-study framework (Audrino et al., 2020; Banerjee et al., 2025). This distinction matters because standard behavioural accounts predict mispricing happens when optimism or pessimism drives prices away from fundamentals and limits to arbitrage slow subsequent correction (Baker & Wurgler, 2007; Tetlock, 2007). Our empirical evidence suggests that positive sentiment is the most robust channel through which ESG downgrades lead to abnormal returns, implying that the market reaction is primarily driven by correcting prior optimistic beliefs, rather than solely by risk, volatility or management-related sentiment (Dorfleitner & Zhang, 2024; Jeong et al., 2025). *Third*, the paper contributes to the broader event-study literature by placing the analysis within a framework that emphasizes benchmark selection, event-induced variance, and robustness across alternative windows and specifications (Binder, 1998; Boehmer et al., 1991; Borghesi et al., 2022).

The remainder of the paper is structured as follows. Section 2 reviews the relevant literature, while Section 3 describes the econometric framework and data. Section 4 reports and interprets the empirical results and Section 5 concludes with key findings and policy implications.

2. Literature review

2.1. ESG changes and stock price reactions

The literature on sustainability-related information has burgeoned in finance, accounting and management in parallel to the increasing significance of ESG factors in corporate valuation and capital allocation (Contreras Cruz et al., 2024). The key question in asset pricing is not whether ESG matters but whether discrete ESG information events have incremental content not already priced in (Dorfleitner & Zhang, 2024). The event-study framework is particularly well suited to this question, since the framework is designed to measure security-price reactions to identifiable information releases relative to a benchmark model of normal returns (Binder, 1998).

In this sense, rating revisions are especially informative because they are a public, high-profile summary of revised assessments of firm quality (Chen & Pottier, 2017; Tai, 2023). Existing literature on credit and related ratings indicates that downgrades tend to

generate larger abnormal-return effects than upgrades, since they communicate more salient information about declining fundamentals and downside risk (Chen & Pottier, 2017). Moreover, recent studies on ESG build on this logic and apply it to adverse sustainability-related signals that have also economically meaningful effects on stock prices (Dorfleitner & Zhang, 2024; Jeong et al., 2025). In particular, negative ESG news results in larger and more persistent abnormal returns than positive ESG news. Similar asymmetries have been identified in studies on ESG news sentiment and related market outcomes (Dorfleitner & Zhang, 2024; Jeong et al., 2025). The broader evidence remains mixed in institutional settings, suggesting conditional rather than universal pricing of ESG events (Danila, 2026; Huang, 2025).

This interpretation is also consistent with the event study literature on climate and policy. The evidence shows that green policy announcements induce significant cumulative abnormal returns, but the magnitude and direction of these effects vary across sectors, countries and policy categories (Borghesi et al., 2022). Climate policy events have also been studied as shocks that change expectations about future policy action, with cumulative abnormal returns systematically varying with firms' climate policy exposure (Barnett, 2019). This literature shows that sustainability-related events do affect asset prices, but the magnitude of the response depends on the environment in which the event is received and understood, not just the sign of the event (Barnett, 2019; Borghesi et al., 2022).

Another line of research looks at the disagreement among ESG rating providers, rather than revisions within a single rating system. Consistent with heterogeneous interpretations of the same underlying sustainability information (Gibson et al., 2021), persistent divergence across providers has been shown to impact portfolio construction and expected returns. This insight is particularly relevant for the current study as it suggests that the market consequences of ESG events are not only a function of the event itself but also depend on the informational state in which it is processed. In other words, the existing literature provides strong evidence that ESG changes matter for stock prices, but still offers limited guidance on which sentiment channel most directly translates ESG changes into cumulative abnormal returns (Dorfleitner & Zhang, 2024; Jeong et al., 2025).

2.2. Investor sentiment and asset pricing

The main theoretical foundation for understanding why otherwise similar ESG downgrades may generate different stock-price reactions stems from the literature on investor sentiment. Baker and Wurgler (2007) define investor sentiment as "beliefs about future cash flows and risk that are not justified by fundamentals" and show that "sentiment has stronger pricing effects when there is limited arbitrage". In addition, Tetlock (2007) shows that media pessimism predicts short-horizon market movements and the subsequent reversals, linking the news tone directly to temporary mispricing. Refinements to this argument are provided in later work that shows how sentiment extracted from financial text adds incremental information beyond traditional market indicators and accounting variables. Loughran and McDonald (2011) find that sentiment measures specific to financial text outperform generic dictionaries and Audrino et al. (2020) show that sentiment and attention variables help to predict realized volatility. These studies suggest that sentiment is especially relevant when dealing with qualitative, ambiguous and hard-to-price information immediately, which closely characterizes ESG events. This body of literature generally argues that the market response to new information is a function not only of the information itself, but also of the beliefs, narratives and informational states through which the information is being processed (Baker & Wurgler, 2007; Tetlock, 2007). This insight is especially relevant in the ESG setting, where sustainability-related signals are typically qualitative, long-horizon, and difficult to translate into expected cash flows in the short-term (Dorfleitner & Zhang, 2024; Huang, 2025).

This view is directly supported by recent ESG applications. Dorfleitner and Zhang (2024) show that stock price reactions are closely related to the sentiment of ESG news and that the market punishes negative ESG news more strongly than it rewards positive news. Similar to the results of the present study, Jeong et al. (2025) also find differences in investor responses to ESG news sentiment across returns and related risk outcomes. This interpretation implies that a downgrade issued in an optimistic informational environment can lead to a more drastic repricing in the sense that it runs counter to positive prior beliefs, but the same downgrade can have a milder impact when it was issued in a more negative or risk sensitive environment (Baker & Wurgler, 2007; Dorfleitner & Zhang, 2024).

Moreover, sentiment should not be too loosely interpreted as a direct proxy for irrationality. In this vein, the interpretation of sentiment as a firm-specific informational state, which can include both rational and non-fundamental components, is more defensible (Dorfleitner & Zhang, 2024; Tetlock, 2007). This distinction is important because it aligns the theory with what an event-study design can credibly identify. The empirical question is not whether sentiment is irrational in itself, but whether the market prices the same ESG downgrade differently if the surrounding environment is more optimistic, more negative, more risk focused, more volatility oriented or more management centred.

2.3. ESG news sentiment and sustainability pricing

Most relevant recent literature is focused on the intersection of ESG information and sentiment analysis. Dorfleitner and Zhang (2024) make an important contribution by building a large-scale dataset of ESG news sentiment with a BERT-based classifier and showing that abnormal returns are more strongly related to news sentiment than to the mere occurrence of an ESG event. Their results also suggest that firms with a better ESG reputation history are partially insulated from negative ESG news. In a related vein, Jeong et al. (2025) construct ESG news sentiment measures for US firms and find that negative ESG news sentiment has stronger implications for returns and crash risk than positive sentiment, with substantial heterogeneity across industries. Banerjee et al. (2025) also use a predictive approach and find that including ESG-related factors along with investor sentiment enhances the predictions of stock prices of companies that are part of major United States indices. Taken together, this body of work demonstrates that the informational environment around ESG news is an important ingredient in market pricing.

Nevertheless, a methodological gap still exists. Most of the previous studies still rely on a single sentiment score, a net tone measure, or a simple positive-versus-negative classification (Banerjee et al., 2025; Dorfleitner & Zhang, 2024; Jeong et al., 2025). This approach is useful to establish the relevance of sentiment, but it provides little insight into the mechanism through which sentiment affects valuation. Although an ESG downgrade may serve as an indication of some negative news, it may also, for example, increase the level of uncertainty, accentuate concerns about downside risk, or modify the perception of governance quality and managerial credibility (Audrino et al., 2020; Ferreira et al., 2025). Huang (2025) indirectly lends support to the more general assertion that the timing of official ESG disclosure is associated with cumulative abnormal returns, implying that the information content is processed differently depending on the timing and manner of the disclosure reaching the market. Equally, Ferreira et al. (2025) also report that ESG outcomes are often conditional rather than universal. Other equity-market research is pointing in the same direction. Audrino et al. (2020) show that attention, optimism and fear have heterogeneous effects on realized volatility and that the combination of these dimensions leads to better predictive performance than single-index specifications. Other work on sectoral indices suggests that sentiment-driven volatility may vary across industries, and risk-related sentiment channels may matter more for some industries than for others. However, ESG studies have just started to tap into such multidimensional sentiment data. Dorfleitner and Zhang (2024) and Jeong et al. (2025) employ sophisticated natural language processing to derive ESG news sentiment, yet they still reduce the outcome to a single sentiment score per news item or per ESG dimension. Banerjee et al. (2025) instead of using separate indices for tone, risk, volatility and sentiment related to management, use an aggregate investor sentiment index in their machine learning models. There is thus absence of systematic research in the literature on which elements of sentiment are most relevant to investors revaluing firms in the wake of changes in ESG ratings. This under-utilization is remarkable especially as ESG information naturally affects a number of psychological channels. An ESG downgrade can be spun as bad news, changing the tone from positive to negative. Moreover, ESG downgrade can also trigger concerns about long-term environmental or social risks that affect the risk and uncertainty sentiment. It could also be a sign of poor governance or lack of management oversight, and sentiment related to management would be affected. They have a combined net tone measure that integrates these channels. But that hides the mechanism. In these circumstances it is difficult to know whether the market reaction to a downgrade is one of disappointment against prior optimism, increased risk perceptions or a reassessment of management credibility. The open question, therefore, is no longer in general relevance of sentiment for ESG pricing, but rather which sentiment channel matters most when the rating event hits the market.

2.4. Hypothesis development

ESG rating changes have a more significant impact on stock prices than positive revisions, as the former contains more salient information on reputational damage, exclusion risk, and future downside exposure, compared to the incremental improvement in the latter (Chen & Pottier, 2017; Dorfleitner & Zhang, 2024; Jeong et al., 2025). Prior research on ESG ratings and ESG news also shows that adverse sustainability signals are penalized more strongly than favorable signals are rewarded, which is consistent with the view that downgrades trigger sharper revisions in investor beliefs about long-run firm quality and risk (Danila, 2026; Galema & Gerritsen, 2025). As a result, ESG downgrade should be associated with lower CARs. Hence, we propose the following research hypothesis.

Hypothesis 1. ESG rating changes negatively affect CARs.

In addition, existing ESG studies usually rely on one-dimensional sentiment proxies, but such measures cannot distinguish whether the pricing effect arises from evaluative tone, perceived uncertainty, or managerial credibility (Dorfleitner & Zhang, 2024; Jeong et al., 2025). The breakdown into individual factors, such as positivity, negativity, risk, volatility and management, is theoretically meaningful because each channel reflects a different mechanism through which investors can interpret the same ESG event. Positive and negative sentiment reflect immediate framing of good- and bad-news, risk and volatility sentiment capture perceptions of uncertainty and downside instability, and management-related sentiment capture beliefs about leadership quality and credibility (Audrino et al., 2020; Ferreira et al., 2025). The above discussion implies that the effect of ESG downgrades on the stock market is unlikely to be consistent across informational environments. If the same ESG downgrade is interpreted differently across informational states, then investor sentiment should condition the magnitude of the downgrade effect (Baker & Wurgler, 2007; Tetlock, 2007). In this respect, the information content of the downgrade is not substituted by the sentiment, but characterizes the manner in which such content is priced in (Dorfleitner & Zhang, 2024; Jeong et al., 2025). Thus, the core moderation hypothesis can be expressed in general form, while the separate sentiment dimensions are treated as alternative empirical channels, not as independent research questions. Hence, the following research hypothesis is proposed.

Hypothesis 2. Investor sentiment moderates the relationship between ESG downgrades and CARs.

3. Model and data

3.1. Sample construction and data sources

This study uses unbalanced data from S&P 500 firms for the period 2010-2024. These firms operate in the most visible segment of the US equity market, receive intensive coverage from ESG rating agencies, financial media, and institutional investors, and therefore provide the most suitable setting for examining how investor sentiment conditions the pricing of ESG rating changes (Garbuio et al., 2026). In an event study framework, this choice is also methodologically advantageous because large and liquid firms reduce microstructure noise in daily returns and allow cleaner identification of abnormal return responses around discrete information events

(Kothari & Warner, 2007; MacKinlay, 1997). More importantly, because the paper seeks to identify which dimension of sentiment matters for the pricing of ESG news, the S&P 500 offers a setting in which such revisions are likely to be salient, widely disseminated, and rapidly processed by the market. In addition, the S&P 500 should not be viewed as a narrow or idiosyncratic sample. As the principal benchmark for large capitalization US equities, it captures the segment of the market in which ESG information has become most institutionalized in portfolio construction, fund flows, and corporate disclosure practices (Hartzmark & Sussman, 2019). For that reason, the sample provides a strong empirical setting for testing whether sentiment conditions the pricing of ESG rating changes in a mature and information-rich market. The results are therefore likely to be informative for other large capitalization firms in developed markets where ESG ratings are widely followed (Baker & Wurgler, 2007).

3.2. Identification of ESG rating events

The core events in this study are firm specific changes in ESG ratings between 2010 and 2024. Each event is identified by the announcement date and classified as an upgrade or a downgrade according to whether the new rating rises above or falls below the previous one. To minimise overlapping windows and contamination from clustered disclosures, only the first rating change within any ninety-day interval is retained, and events coinciding with major corporate actions such as mergers, stock splits, or bankruptcy filings are excluded. These filters follow standard practice in the event study literature and are intended to isolate the abnormal return response to ESG rating news as cleanly as possible (Kothari & Warner, 2007; MacKinlay, 1997).

A related concern is that broad macroeconomic shocks may coincide with ESG rating events and impact stock prices independently of the focal announcement. The sample period covers major shocks such as the Covid-19 pandemic, supply chain disruptions, inflationary pressures and episodes of unconventional monetary policy. These are unlikely to drive the main findings. Abnormal returns are measured over short event windows relative to expected returns from a Fama and French three-factor benchmark, which helps remove broad market-wide shocks and is one of the main reasons short-horizon event studies are well-suited to identifying firm-specific valuation effects (Kothari & Warner, 2007; MacKinlay, 1997). In addition, the identifying variation comes from firm-specific rating changes rather than aggregate shifts in market conditions. For a macroeconomic shock to be the explanation, the systematic association with the timing, direction, and sentiment interactions of individual rating revisions across a broad cross-section of firms would be necessary, which is highly unlikely. This concern is further alleviated by the use of firm-specific ESG-related sentiment measures in the analysis, instead of a single market-wide sentiment index. Dorfleitner and Zhang (2024) argue that confounding non-ESG news would need to be systematically aligned with ESG disclosures to generate the observed relation, which appears implausible in a large cross-sectional setting. Finally, year fixed effects absorb common time-specific shocks affecting all firms in a given period. Overall, the design features suggest that although broad exogenous shocks may influence the background market environment, they are unlikely to explain the main result that stock price reactions to ESG downgrades are conditioned by different dimensions of investor sentiment, with positive sentiment being the dominant moderating channel (Dorfleitner & Zhang, 2024; Kothari & Warner, 2007; MacKinlay, 1997).

3.3. Investor sentiment measures

Investor sentiment is measured using firm-specific news and social media indices from Refinitiv MarketPsych Analytics. The use of firm level sentiment data is important in the present setting because event studies aim to identify the stock price response to firm specific announcements. This objective is better supported by sentiment measures matched directly to the focal firm and the event date than by aggregate mood indicators that may primarily reflect broader macroeconomic conditions (Kothari & Warner, 2007; MacKinlay, 1997). Generally, the finance literature suggests that large-scale textual sentiment provides additional information to return and volatility dynamics beyond traditional accounting variables and market-based indicators, thus supporting the use of high-frequency news-based sentiment data in asset pricing research (Audrino et al., 2020; Tetlock, 2007).

Previous studies show that sentiment impacts the pricing of ESG information. However, the most prior studies use a single sentiment proxy or a net tone measure, which makes it hard to identify the channel through which sentiment affects stock price reactions (Banerjee et al., 2025; Dorfleitner & Zhang, 2024; Jeong et al., 2025). This limitation is particularly relevant in the present setting where a change in an ESG rating can be interpreted as either good or bad news, as a signal of higher uncertainty and tail risk, or as a signal of managerial quality and credibility. The analysis will be able to test through decomposition whether the stock price reactions are driven mainly by tone or risk-related stories or management-related explanations of the same event (Dorfleitner & Zhang, 2024; Jeong et al., 2025). Each sentiment dimension is interpreted in a specific way. Positive and negative sentiment (favorable and unfavorable tone) in the surrounding information environment. In addition, risk sentiment reflects language regarding uncertainty, downside exposure, and adverse future scenarios. Furthermore, volatility sentiment is a measure of the fears of instability and fluctuation in the firm's prospects. Management sentiment is a measure of the quality and credibility of the leadership in relation to the firm. This multidimensional structure is especially useful in an ESG context as sustainability-related information tends to be qualitative, forward-looking and amenable to interpretation, meaning that different sentiment channels can influence the same rating event in different ways (Jeong et al., 2025).

To ensure comparability across firms and over time, each sentiment index is standardized at the firm level. For each firm and sentiment dimension, the daily score is demeaned and divided by the firm-specific standard deviation. The resulting variables are denoted positive sentiment, negative sentiment, risk sentiment, volatility sentiment, and management sentiment. This transformation allows us to interpret the coefficients as the effect of a one-standard-deviation change in sentiment and reduces the influence of outliers, which is important in text data, as textual data can have a large dispersion (Audrino et al., 2020; Tetlock, 2007). These

measures also help to delineate (but not completely solve) the difference between sentiment-driven pricing and rational repricing. The empirical design does not aim at disentangling behavioral and rational channels in a strict structural way. Instead, it estimates the incremental role of sentiment around ESG rating changes by estimating whether the same downgrade is priced differently across different sentiment states after controlling for firm characteristics and fixed effects. In this framework, the downgrade indicator measures the average response to new rating information. The interaction terms in the meantime indicate if that response is systematic for positive, negative, risk, volatility or management-related sentiment. Some part of sentiment may still proxy for salience, ambiguity, or perceived credibility in the information environment (Dorfleitner & Zhang, 2024; Tetlock, 2007), but this design isolates the conditional pricing role of sentiment more precisely than studies that rely on a single aggregate measure of sentiment.

3.4. Measurement of abnormal returns

Using the standard event study methodology, we investigate market reactions to changes in ESG ratings. The daily abnormal returns are the realized stock returns minus the expected returns estimated from the Fama-French three-factor model over the pre-event estimation window from trading day $[-120; +21]$ relative to the announcement date (Berkowitz et al., 2015). The benchmark for the expected return is based on the standard Fama-French factor data set that includes the excess market return, the size factor, and the value factor. The risk-free rate is assumed to be the one-month United States Treasury bill rate. We adopt this specification because it provides a well established and parsimonious benchmark for expected returns in equity event studies and improves on the simple market model by controlling for systematic variation related not only to broad market movements but also to size and value effects, which is particularly relevant in a sample of large listed firms with heterogeneous characteristics (Fama & French, 1993; Kothari & Warner, 2007). At the same time, it is more transparent and less parameter-intensive than broader multifactor alternatives, which is desirable in short-horizon event settings where the primary objective is to isolate firm-specific abnormal performance around a clearly identified announcement (Kothari & Warner, 2007; MacKinlay, 1997).

For each event we compute CARs for two symmetrical windows around the announcement date, $[-7; +7]$ and $[-14; +14]$. In event study design, we select these windows to balance two competing considerations. On the one hand, the window has to be narrow enough to limit contamination from other firm-specific and market-wide news. However, it needs to be wide enough to capture information leakage before the announcement and the delayed price adjustment after the event, particularly for ESG information that is often qualitative, forward-looking and harder to process than the traditional financial disclosures (Dorfleitner & Zhang, 2024; Jeong et al., 2025; MacKinlay, 1997). Consistent with the common practice in event studies for rating changes and governance announcements (Chen & Pottier, 2017; MacKinlay, 1997; Tai, 2023), we use a window of $[-7; +7]$ to capture the immediate market response, preannouncement leakage and short-run adjustment. Moreover, the window $[-14; +14]$ is selected to capture the slightly slower information integration and the short horizon drift, without crossing into horizons where unrelated factors are more likely to dominate the cumulative returns, as suggested in behavioral finance and ESG news studies (Dorfleitner & Zhang, 2024; Jeong et al., 2025). In this sense, the two windows are not intended to represent an exhaustive set of short event windows, but rather two complementary horizons that allow us to compare the immediate and slightly more persistent pricing effects of ESG rating changes. Table 1 reports definitions for all variables used in the analysis.

3.5. Research model

The central question of this paper is whether and how investor sentiment moderates the relationship between ESG changes and CARs. To address this, we estimate a series of panel regressions with industry-year fixed effects. Industry fixed effects control for unobserved time invariant characteristics, while year fixed effects absorb common shocks and time trends in sentiment and ESG investing (Baker & Wurgler, 2007). Standard errors are clustered at the firm level to account for serial correlation in residuals. The baseline specification relates CARs in each event window to the downgrade indicator, the level of sentiment and a vector of control variables:

Table 1
Description of variables and measurements.

Variable	Definition
CAR $[-7; +7]$	Cumulative abnormal return over the window from trading day -7 to trading day $+7$ around the ESG changes.
CAR $[-14; +14]$	Cumulative abnormal return over the window from trading day -14 to trading day $+14$ around the ESG changes.
Downgrade	Indicator variable that equals one for ESG score downgrades and zero for ESG score upgrades.
SENT_POS	Firm specific positive ESG sentiment index.
SENT_NEG	Firm specific negative ESG sentiment index.
SENT_RISK	Firm specific ESG risk sentiment index capturing references to long term risk and uncertainty.
SENT_VOL	Firm specific ESG volatility sentiment index capturing references to short term volatility and turbulence.
SENT_MGMT	Firm specific management sentiment index capturing managerial tone and communication about ESG issues.
SIZE	Natural logarithm of total assets
LEV	Ratio of total liabilities to total assets
ROA	Return on assets
AGE	Firm age
NIC	Natural logarithm of net income

$$CAR_{i,e} = \alpha + \beta_1 Downgrade_{i,e} + \beta_2 Sentiment_{i,e} + \gamma' X_{i,e} + \lambda_k + \lambda_t + \varepsilon_{i,e}, \quad (1)$$

Where: $CAR_{i,e}$ denotes cumulative abnormal returns for firm i around event e , $Downgrade_{i,e}$ is an indicator equal to 1 for rating downgrades and 0 for upgrades, $Sentiment_{i,e}$ is one of the standardized sentiment indices. The vector $X_{i,e}$ contains firm-level controls, including firm size, leverage, return on assets, firm age and net income. The terms λ_k and λ_t capture, respectively, industry fixed effects based on GICS classifications and year fixed effects, which absorb time-invariant sector characteristics and common shocks across years.

In the second step, we augment this specification with the interaction terms between the downgrade indicator and each of the standardized sentiment indexes, one at a time. This way it is possible to estimate the change in the effect of a downgrade on CARs when sentiment shifts from low to high levels, ceteris paribus (Dorfleitner & Zhang, 2024).

$$CAR_{i,e} = \alpha + \beta_1 Downgrade_{i,e} + \beta_2 Sentiment_{i,e} + \beta_3 (Downgrade_{i,e} \times Sentiment_{i,e}) + \gamma' X_{i,e} + \lambda_k + \lambda_t + \varepsilon_{i,e}, \quad (2)$$

Where: The interaction term indicates how the effect of sentiment differs for ESG change events.

4. Empirical results and discussions

4.1. Descriptive statistics

Table 2 reports descriptive statistics for the cumulative abnormal returns (CARs), the ESG downgrade indicator and the different sentiment and control variables. The average CAR over the short window $[-7, +7]$ is -2.0 per cent, while the mean CAR over the wider $[-14, +14]$ window is slightly more negative at -3.2 per cent. This pattern suggests that, on average, firms experience economically meaningful value losses around ESG rating changes and that these losses tend to accumulate when the event window is extended. Downgrade has a mean of 0.413, implying that approximately 41 per cent of the ESG rating events in the sample are downgrades and the remainder are upgrades. This split is generally in line with the distribution of ESG changes reported in earlier studies using commercial ESG scores, and indicates that the analysis is not dominated by one type of ESG news (Dai et al., 2025). The variation in CARs conditional on this mixture of upgrades and downgrades motivates the next focus on the role of investor sentiment in the pricing of negative ESG shocks. All sentiment indices are standardised and demeaned by construction. Accordingly, their sample means are essentially zero and their standard deviations are close to one, with the exception of the volatility sentiment index whose standard deviation is around 0.29, reflecting the more compressed scaling of this series. The ranges of the sentiment indicators are wide: for example, negative sentiment varies from -1.40 to 2.55 , while risk sentiment spans from -2.96 to 3.13 . These ranges point to pronounced time variation in investors' beliefs and risk perceptions, which is a precondition for sentiment to have meaningful asset pricing implications.

Table 3 presents the Pearson correlations among CARs, ESG downgrades, the different sentiment indices, and firm characteristics. Overall, most coefficients remain well below the conventional thresholds that would raise concerns about unstable regression estimates (Huang et al., 2016). This provides reassurance that the subsequent regression models can simultaneously include multiple sentiment dimensions without generating undue collinearity, allowing a sharper assessment of which sentiment channel, including tone, risk, volatility or management communication, plays the dominant role in shaping market reactions to ESG downgrades.

For the continuous variables in the model, we use the Fisher-type panel unit root tests of augmented Dickey–Fuller and Phillips–Perron procedures suitable for unbalanced panels (Choi, 2001; Fisher, 1932). The results of the unit root tests are presented in Table 4, which confirms the level stationarity of the main return and sentiment variables used in the analysis (Habimana, 2016). The

Table 2
Descriptive statistics.

	Observations	Mean	Std. Dev.	Skewness	Kurtosis	Min	Max
CAR[-7,+7]	6241	-0.020	0.109	0.198	5.950	-0.616	0.837
CAR[-14,+14]	6241	-0.032	0.196	0.557	5.427	-0.846	1.239
Downgrade	6765	0.413	0.492	0.353	1.125	0.000	1.000
SENT_POS	6765	0.000	1.000	0.026	2.224	-1.694	2.209
SENT_NEG	6765	0.000	1.000	0.466	2.460	-1.402	2.553
SENT_RISK	6765	0.000	1.000	0.144	4.410	-2.962	3.129
SENT_VOL	6765	0.000	0.288	2.258	8.881	-0.212	1.300
SENT_MGMT	6765	0.000	1.000	1.218	9.445	-3.139	4.418
SIZE	6751	23.788	1.434	0.407	3.442	19.433	29.018
LEV	6751	0.649	0.249	3.092	36.851	0.032	4.350
ROA	6765	0.079	0.095	-22.134	1213.777	-5.020	0.838
AGE	6765	40.916	33.081	1.518	5.170	1.000	206.000
NIC	6328	20.828	1.319	-0.005	4.002	13.690	25.367

Notes: CAR: cumulative abnormal returns around ESG changes over the windows $[-7, +7]$, and $[-14, +14]$; Downgrade: is one for ESG downgrades and zero for upgrades; SENT_* is investor sentiment, including positive, negative, risk, volatility and management; SIZE is the natural logarithm of total assets; LEV is total liabilities over total assets; ROA is return on assets; AGE is firm age; NIC is the natural logarithm of net income.

Table 3

Correlation matrix.

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]
CAR[-7,+7] [1]	1.000												
CAR[-14,+14] [2]	0.868***	1.000											
Downgrade [3]	-0.049***	-0.061***	1.000										
SENT_POS [4]	-0.021	-0.034**	0.026*	1.000									
SENT_NEG [5]	-0.045***	-0.096***	0.020	0.417***	1.000								
SENT_RISK [6]	0.011	0.011	-0.011	0.226***	-0.209***	1.000							
SENT_VOL [7]	0.014	0.004	-0.008	0.199***	0.288***	-0.045***	1.000						
SENT_MGMT [8]	0.005	0.006	0.026*	0.114***	-0.065***	0.086***	0.009	1.000					
SIZE [9]	-0.028*	-0.021	0.066***	0.332***	0.356***	-0.027*	0.150***	0.014	1.000				
LEV [10]	-0.029*	-0.020	0.009	0.078***	0.094***	-0.012	0.043**	-0.012	0.236***	1.000			
ROA [11]	0.014	-0.004	-0.015	0.167***	0.096***	0.028*	0.029*	0.006	-0.387***	-0.110***	1.000		
AGE [12]	-0.017	-0.014	0.054***	-0.031*	-0.013	0.001	-0.017	-0.021	0.111***	0.011	-0.031*	1.000	
NIC [13]	-0.042**	-0.040**	0.074***	0.440***	0.415***	-0.010	0.170***	0.014	0.743***	0.126***	0.139***	0.138***	1.000

Notes: CAR: cumulative abnormal returns around ESG changes over the windows $[-7, +7]$, and $[-14, +14]$; Downgrade: is one for ESG downgrades and zero for upgrades; SENT_* is investor sentiment, including positive, negative, risk, volatility and management; SIZE is the natural logarithm of total assets; LEV is total liabilities over total assets; ROA is return on assets; AGE is firm age; NIC is the natural logarithm of net income.

*, **, and *** indicate significance at the 10 per cent, 5 per cent, and 1 per cent levels, respectively.

Table 4
Panel unit root tests.

Variables	Augmented Dickey–Fuller		Phillips–Perron	
	Inverse chi-squared	p-value	Inverse chi-squared	p-value
CAR[-7,+7]	3120.540	0.000	3238.526	0.000
CAR[-14,+14]	3375.796	0.000	2699.981	0.000
Downgrade	-	-	-	-
SENT_POS	1882.350	0.000	3788.386	0.000
SENT_NEG	2389.292	0.000	3850.683	0.000
SENT_RISK	2934.095	0.000	5602.663	0.000
SENT_VOL	2924.049	0.000	5491.825	0.000
SENT_MGMT	3430.114	0.000	5730.433	0.000
SIZE	1356.571	0.000	1115.642	0.000
LEV	1407.536	0.000	1451.675	0.000
ROA	2133.820	0.000	2687.687	0.000
AGE	0.5141	1.000	0.5648	1.000
NIC	1359.656	0.000	2160.301	0.000

Notes: CAR: cumulative abnormal returns around ESG changes over the windows $[-7, +7]$, and $[-14, +14]$; Downgrade: is one for ESG downgrades and zero for upgrades; SENT_* is investor sentiment, including positive, negative, risk, volatility and management; SIZE is the natural logarithm of total assets; LEV is total liabilities over total assets; ROA is return on assets; AGE is firm age; NIC is the natural logarithm of net income.

only exception is firm age, which is not surprising given the deterministic upward trend over time. We do not include Downgrade in the root unit tests because it is a dummy variable.

In addition, Fig. 1 provides descriptive evidence on the time variation of abnormal returns around the ESG rating change event period. Average abnormal returns are quite small before the announcement date in panel A, but the difference between upgrades and downgrades is more evident around and after day 0. In accordance with recent findings that negative ESG information is more likely to be penalized than positive information rewarded in equity markets (Piccioni et al., 2024; Galema & Gerritsen, 2025), downgrades are related to systematically weaker abnormal daily returns than upgrades. Panel B, which summarizes the daily response, supports this result. The cumulative average abnormal return for downgrades is consistently lower than those for upgrades and the full sample, and the gap keeps widening in the post-event period. This pattern indicates that the market reaction is not fully reflected on the day of the announcement, but rather develops over time as investors process the consequences of the rating revision. This finding is consistent with recent studies which indicate that ESG information is mostly incorporated gradually due to its qualitative, forward looking and interpretative nature (Dorfleitner & Zhang, 2024; Galema & Gerritsen, 2025). Fig. 1 also shows a small pre-event drift, especially in the cumulative series, possibly suggesting some limited information leakage or anticipatory trading before the formal rating date. The more pronounced divergence after day 0 simultaneously indicates that the rating revision continues to provide incremental information for prices, and the bad pricing of downgrades is already present in the raw event time data before the inclusion of controls (Dorfleitner & Zhang, 2024; Wang et al., 2026).

4.2. Baseline effects of ESG changes and investor sentiment on cumulative abnormal returns

Table 5 presents baseline fixed-effects estimates of cumulative abnormal returns around ESG rating changes. Our Hausman test strongly rejects the random-effects estimator in favor of the fixed-effects estimator (Tran & Vo, 2022). Our results show that the

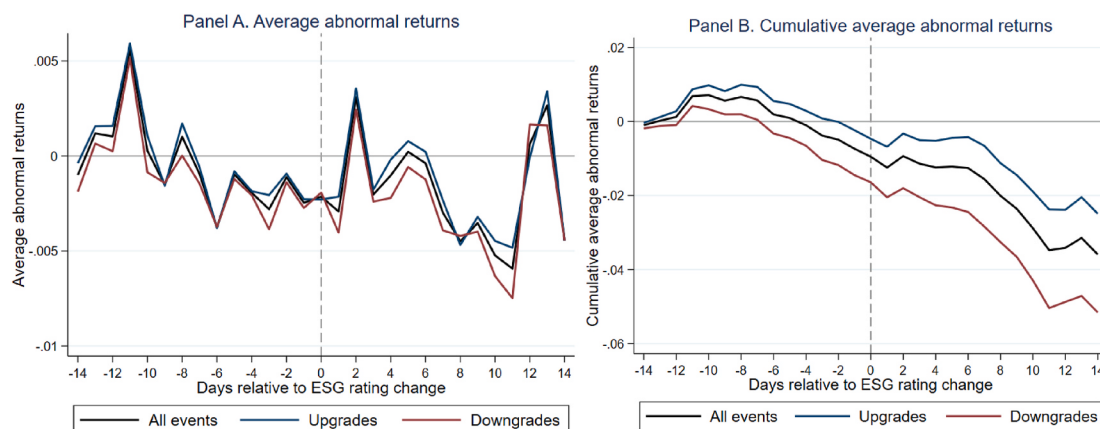


Fig. 1. Standardized cumulative average abnormal returns.

Table 5

Impact of ESG changes and investor sentiment on CAR[-7,+7] and CAR[-14,+14].

Cumulative abnormal returns	CAR[-7,+7]					CAR[-14,+14]				
Sentiment	POS	NEG	RISK	VOL	MGMT	POS	NEG	RISK	VOL	MGMT
Downgrade	-0.008*** (0.003)	-0.008*** (0.003)	-0.008*** (0.003)	-0.008*** (0.003)	-0.008*** (0.003)	-0.020*** (0.005)	-0.021*** (0.005)	-0.020*** (0.005)	-0.020*** (0.005)	-0.020*** (0.005)
SENT_POS	0.002 (0.002)					0.006* (0.005)				
SENT_NEG		-0.010*** (0.002)					-0.031*** (0.003)			
SENT_RISK			0.003* (0.001)					0.005* (0.003)		
SENT_VOL				0.003 (0.005)					0.003 (0.010)	
SENT_MGMT					0.001 (0.001)					0.002 (0.003)
SIZE	0.021*** (0.004)	0.023*** (0.004)	0.021*** (0.004)	0.021*** (0.004)	0.021*** (0.004)	0.034*** (0.008)	0.043*** (0.008)	0.036*** (0.008)	0.036*** (0.008)	0.036*** (0.008)
LEV	0.027* (0.014)	0.030** (0.014)	0.028** (0.014)	0.028* (0.014)	0.028** (0.014)	0.036 (0.024)	0.045* (0.024)	0.037 (0.024)	0.037 (0.024)	0.037 (0.023)
ROA	0.103* (0.062)	0.110* (0.061)	0.105* (0.061)	0.106* (0.061)	0.106* (0.061)	0.148 (0.098)	0.168* (0.097)	0.153 (0.097)	0.156 (0.097)	0.156 (0.097)
AGE	-0.008*** (0.000)	-0.007*** (0.000)	-0.008*** (0.000)	-0.007*** (0.000)	-0.007*** (0.000)	-0.013*** (0.001)	-0.012*** (0.001)	-0.012*** (0.001)	-0.012*** (0.001)	-0.012*** (0.001)
NIC	-0.007** (0.003)	-0.008** (0.003)	-0.007** (0.003)	-0.007** (0.003)	-0.007** (0.003)	-0.010* (0.006)	-0.010* (0.006)	-0.010* (0.006)	-0.009* (0.006)	-0.009 (0.006)
Constant	-0.0676 (0.084)	-0.1378* (0.078)	-0.0847 (0.080)	-0.0823 (0.080)	-0.0847 (0.080)	-0.1558 (0.146)	-0.3700*** (0.135)	-0.2058 (0.138)	-0.2024 (0.139)	-0.2064 (0.139)
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5852	5852	5852	5852	5852	5852	5852	5852	5852	5852
Adj. R-squared	0.062	0.066	0.062	0.061	0.061	0.050	0.063	0.050	0.050	0.050
Hausman test Prob > chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Notes: CAR: cumulative abnormal returns around ESG changes over the windows [-7, +7], and [-14, +14]; Downgrade: is one for ESG downgrades and zero for upgrades; SENT_ is investor sentiment, including positive, negative, risk, volatility and management; SIZE is the natural logarithm of total assets; LEV is total liabilities over total assets; ROA is return on assets; AGE is firm age; NIC is the natural logarithm of net income.

*, **, and *** indicate significance at the 10 per cent, 5 per cent, and 1 per cent levels, respectively.

coefficient on the downgrade indicator is negative and highly significant across all specifications, suggesting that ESG downgrades are viewed as bad news by the market. A downgrade causes an average abnormal return of about -0.8 percentage points for $CAR[-7,+7]$, and the effect is even larger, at about -2.0 percentage points, for $CAR[-14,+14]$. These estimates clearly support [Hypothesis 1](#) that predicts that ESG downgrades reduce cumulative abnormal returns. The greater coefficient in the longer window also suggests that the valuation effect of the ESG downgrades is not fully impounded into the stock price at the announcement day but develops when investors revise their perception of the quality of the firm and its future downside risk over a couple of trading days ([Binder, 1998](#); [Dorflleitner & Zhang, 2024](#)).

At the same time, our results also show that not all sentiment dimensions matter equally for the pricing of ESG news. For the short window, negative sentiment is the only tone measure that enters significantly. A one-standard-deviation increase in negative sentiment reduces $CAR[-7,+7]$ by about 1.0 percentage point, while the coefficient on positive sentiment is close to zero and statistically insignificant. This asymmetry is consistent with prior evidence from the media that high pessimism leads to temporary downward pressure on stock prices while optimism is weaker in its contemporaneous effects ([Gao & Tian, 2025](#); [Tetlock, 2007](#)). Over the longer $CAR[-14,+14]$ window, the role of sentiment becomes stronger: negative sentiment now has a much larger coefficient (-0.031), and positive sentiment turns significantly positive. These estimates imply that the long-run effect of ESG downgrades is exacerbated in pessimistic news while a more positive tone partly offsets the price drop as information is gradually incorporated. The larger size of the long-horizon coefficients is consistent with evidence in earlier studies ([Baker & Wurgler, 2007](#); [Pham et al., 2025](#)) that sentiment-induced mispricing can be persistent and even cumulative when arbitrage is limited.

Risk-related sentiment displays a different pattern. The risk sentiment is positively related to CAR in both windows and is statistically significant, albeit at the ten per cent level. In periods when the risk measure is elevated, ESG rating changes are followed by less negative, or even slightly more positive, abnormal returns. This result is consistent with the notion that in “risk-on” environments investors are more willing to bear risk and are less punitive when confronted with adverse non-financial information. Similar findings are reported in studies showing that risk appetite and volatility sentiment interact with news to shape market reactions, particularly during periods of high uncertainty ([Hui et al., 2013](#)).

Conversely, neither the volatility nor the sentiment indices for management are significantly related to CAR for any specification. The lack of a clear effect of volatility sentiment implies that the general perception of market turbulence does not lead to systematic differences in the way investors price ESG events once risk appetite is controlled for. Our result in management sentiment suggests that tone in firm-level communications does not affect CARs around ESG rating changes even after controlling for market-wide sentiment and firm fixed effects. This is in contrast to evidence that the managerial tone in earnings announcements can influence short-term returns ([Doey & de Jong, 2025](#); [Ning et al., 2025](#)), suggesting the need to explore interaction terms and sub-samples to uncover more nuanced effects.

In terms of control variables, firm size and leverage are positively related to the CARs, suggesting that larger and more leveraged firms experience slightly more favorable abnormal returns around ESG events. This may be due to the fact that they are more visible to investors and benefit more from information resolution. Profitability is also positively associated with CARs while the coefficients of firm age and net income (in logarithm) are negative. These results are generally in line with the standard asset-pricing theory that younger and more profitable firms with growth opportunities respond more strongly to news prices, while mature firms with high current earnings are more likely to have much of their value priced in ([Hasan & Al-Najjar, 2025](#)).

4.3. The moderating role of investor sentiment in the relationship between ESG changes and cumulative abnormal returns

[Table 6](#) examines the moderating role of investor sentiment by including interactions between downgrades and the alternative sentiment measures. Our results show that the downgrade coefficient is negative and highly significant for all specifications, with point estimates close to those in [Table 5](#). This stability confirms that the adverse valuation effect of ESG downgrades is robust to the inclusion of interaction terms and thus reinforces the conclusion that [Hypothesis 1](#) is fully confirmed. However, the evidence for [Hypothesis 2](#) is partially supported. The results do not support a general statement that all the dimensions of sentiment systematically moderate the downgrade effect. Rather, the results offer direct evidence for [Hypothesis 2](#), but only via the positive-sentiment channel.

The interaction of downgrades and negative sentiment is statistically insignificant for the short window, but the main effect of negative sentiment on $CAR[-7,+7]$ is negative and highly significant. In other words, pessimistic tone dampens abnormal returns around ESG events generally, but does not disproportionately penalize downgrades relative to upgrades. Our findings are consistent with the wider sentiment literature that negative media tone is a depressant of contemporaneous returns ([Pinto-Gutiérrez et al., 2025](#)), but that its role as a state variable which conditions the response to specific news is often weaker than its direct pricing effect ([Doey & de Jong, 2025](#)). Likewise, the interactions between downgrades and risk, volatility or management sentiment are not statistically different from zero. This finding implies that these dimensions of sentiment predominantly affect CARs through parallel shifts, rather than changing the slope of the relation between ESG news and returns ([Coban et al., 2025](#)).

By contrast, positive sentiment has a robust and economically meaningful moderating effect, especially over the longer CAR window. The interaction between downgrades and positive sentiment is negative and significant for both $CAR[-7,+7]$ (at the ten percent level) and $CAR[-14,+14]$ (at the five percent level). The estimates suggest that the incremental effect of a downgrade on CAR is more negative when the surrounding news environment is more optimistic. This asymmetric pattern is in line with a ‘disappointment’ or ‘contrast’ mechanism: in a generally positive sentiment environment, a downgrade in rating is a greater negative surprise and thus triggers a more substantial revision of beliefs ([Muktadir-Al-Mukit & Ali, 2025](#)). This result has a natural interpretation in behavioural models with investors who overreact to news contrary to the current sentiment or prior beliefs ([Bottemanne et al., 2025](#)). Our results are also consistent with evidence suggesting that bad earnings or sustainability news released during bull markets can lead

Table 6

Moderating role of investor sentiment in the relationship between ESG changes and cumulative abnormal returns.

Cumulative abnormal returns	CAR[-7,+7]					CAR[-14,+14]				
Sentiment	POS	NEG	RISK	VOL	MGMT	POS	NEG	RISK	VOL	MGMT
Downgrade	−0.008*** (0.003)	−0.008*** (0.003)	−0.008*** (0.003)	−0.008*** (0.003)	−0.008*** (0.003)	−0.019*** (0.005)	−0.021*** (0.005)	−0.020*** (0.005)	−0.020*** (0.005)	−0.020*** (0.005)
SENT_POS	0.004 (0.003)					0.011** (0.005)				
SENT_NEG		−0.009*** (0.002)					−0.031*** (0.004)			
SENT_RISK			0.004* (0.002)					0.009** (0.004)		
SENT_VOL				0.004 (0.007)					0.006 (0.012)	
SENT_MGMT					0.001 (0.002)					0.005 (0.003)
Downgrade*SENT_POS	−0.005* (0.003)					−0.012** (0.005)				
Downgrade*SENT_NEG		−0.002 (0.003)					−0.001 (0.005)			
Downgrade*SENT_RISK			−0.002 (0.003)					−0.009 (0.005)		
Downgrade*SENT_VOL				−0.004 (0.010)					−0.006 (0.018)	
Downgrade*SENT_MGMT					−0.002 (0.003)					−0.007 (0.005)
Constant	−0.069 (0.085)	−0.138* (0.078)	−0.084 (0.080)	−0.082 (0.080)	−0.084 (0.080)	−0.158 (0.147)	−0.370*** (0.135)	−0.202 (0.138)	−0.203 (0.139)	−0.205 (0.139)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5852	5852	5852	5852	5852	5852	5852	5852	5852	5852
Adj. R-squared	0.062	0.066	0.062	0.061	0.061	0.051	0.063	0.051	0.050	0.050
Hausman test Prob > chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Notes: CAR: cumulative abnormal returns around ESG changes over the windows [− 7, + 7], and [− 14, + 14]; Downgrade: is one for ESG downgrades and zero for upgrades; SENT_ * is investor sentiment, including positive, negative, risk, volatility and management; SIZE is the natural logarithm of total assets; LEV is total liabilities over total assets; ROA is return on assets; AGE is firm age; NIC is the natural logarithm of net income.

*, **, and *** indicate significance at the 10 per cent, 5 per cent, and 1 per cent levels, respectively.

to particularly harsh price corrections (Loang, 2025). For the long horizon CAR $[-14,+14]$, the main effects of sentiment remain significant after the addition of interaction terms. Positive sentiment is positively associated with higher CARs, negative sentiment negatively associated with lower CARs, and risk sentiment mildly positively associated with more favorable returns (Hasan & Al-Najjar, 2025). This result is consistent with the possibility that sentiment-induced mispricing might persist beyond the event window, either because of limits to arbitrage or because of investors' slow reassessment of the implications of ESG news as more information is obtained.

The moderating regression results identify positive sentiment as the most important conditioning channel in the pricing of ESG rating changes. Fig. 2 complements this evidence by showing how positive sentiment evolves around the event date for all events, upgrades, and downgrades, thereby providing additional context for the interaction effects reported in Table 6. Fig. 2 shows that standardized positive sentiment is not a fixed background characteristic, but a time-varying feature of the information environment around ESG rating events. The paths for all events, upgrades, and downgrades move on both sides of the announcement date, which suggests that investor optimism is already present before the event and continues to evolve afterward. This finding is significant as it supports the notion that positive sentiment is a conditioning factor in price discovery and not a static firm attribute (Dorfleitner & Zhang, 2024; Jeong et al., 2025).

From an economic point of view, this is in line with the idea that a downgrade in an optimistic environment is more likely to be inconsistent with prior beliefs and thus lead to a more intense valuation adjustment. This interpretation is consistent with recent evidence that market reaction to ESG news is driven by not only the sign of the event but also the sentiment environment of the event (Jeong et al., 2025; Wang et al., 2026). The results in Fig. 2 are consistent with the view that positive sentiment not only acts as an additional control, but also as a potential channel through which the impact of ESG rating changes on stock price reactions (Dorfleitner & Zhang, 2024; Galema & Gerritsen, 2025).

Fig. 3 visualises how the marginal effect of ESG downgrades on CARs varies across the distribution of positive firm-level sentiment, conditional on the fixed-effects estimates in Table 6. Tetlock (2007) argues that investor sentiment affects the level and persistence of mispricing, particularly for hard-to-value or hard-to-arbitrage stocks. Fig. 3 demonstrates that, in the ESG context, it is specifically the positive, "optimistic" component of sentiment that matters for the reaction to downgrades. When sentiment is muted, the downgrade effect is modest; when sentiment is elevated, the same downgrade triggers much larger negative CARs over both event windows (Bartov & Kim, 2004). This pattern is consistent with the evidence that negative ESG news tends to elicit asymmetric market reactions, with large losses but small gains from positive news, as it requires a repricing of previously inflated valuations (Capelle-Blancard & Petit, 2019).

4.4. Robustness tests

Table 7 investigates whether the impact of ESG rating downgrades and positive sentiment differs between small and large firms. Baker and Wurgler (2007) argue that sentiment shocks have stronger price effects on securities that are hard to value and difficult to arbitrage, such as small, young or low-liquidity firms. In the short-horizon window CAR $[-7,+7]$, our results show that ESG downgrades are associated with significantly negative CARs for small firms, but the effect for large firms is smaller in magnitude and less statistically significant. This suggests that when sustainability information deteriorates, investors penalize smaller issuers more strongly, possibly because these firms rely more on reputation and external finance, and have less analyst coverage to quickly correct mispricing. The results of the study are in line with previous studies (Kruger, 2015; Rim & Zha Giedt, 2025) that have found that

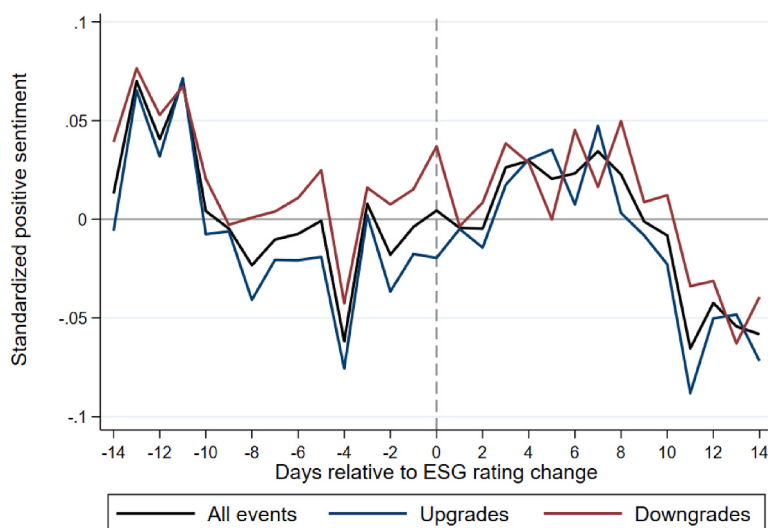


Fig. 2. Positive sentiment dynamics around ESG rating changes.

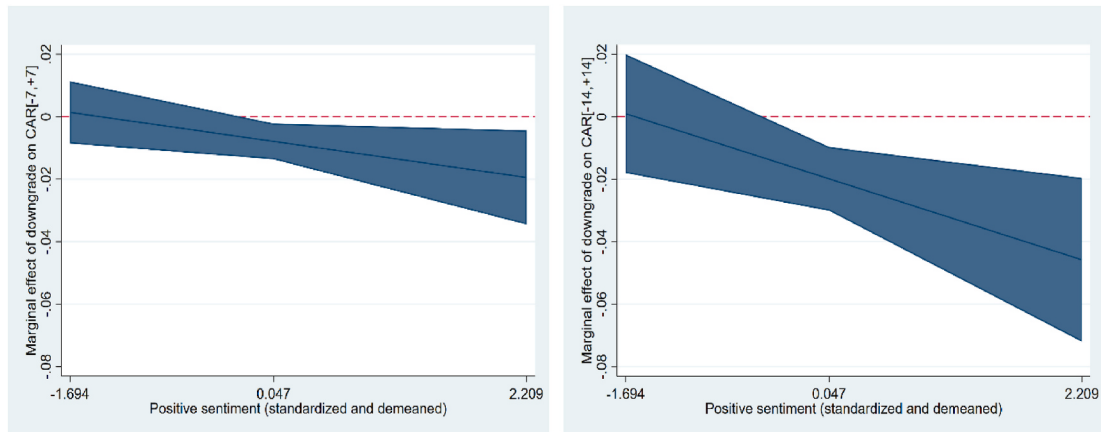


Fig. 3. Marginal effect of ESG changes on cumulative abnormal returns across positive sentiment.

Table 7

Heterogeneity by size.

Cumulative abnormal returns	CAR[-7,+7]		CAR[-14,+14]	
Firm size	Small	Large	Small	Large
Downgrade	-0.008*	-0.005	-0.017**	-0.018**
	(0.004)	(0.004)	(0.008)	(0.008)
SENT_POS	0.008**	0.002	0.021***	0.001
	(0.004)	(0.004)	(0.007)	(0.008)
Downgrade*SENT_POS	-0.001	-0.009**	-0.004	-0.017**
	(0.004)	(0.004)	(0.008)	(0.008)
SIZE	0.007	0.027***	0.017	0.047***
	(0.008)	(0.009)	(0.014)	(0.017)
LEV	-0.010	0.081***	-0.016	0.117**
	(0.015)	(0.031)	(0.025)	(0.056)
ROA	-0.011	0.188	0.018	0.195
	(0.064)	(0.150)	(0.098)	(0.239)
FIRM_AGE	-0.007***	-0.008***	-0.013***	-0.013***
	(0.001)	(0.001)	(0.001)	(0.001)
NIC	-0.005	-0.008	-0.002	-0.012
	(0.004)	(0.005)	(0.008)	(0.010)
Constant	0.176	-0.224	0.127	-0.454
	(0.147)	(0.196)	(0.269)	(0.342)
Observations	2875	2977	2875	2977
Adj. R-squared	0.0516	0.0642	0.0482	0.0513
Hausman test Prob > chi2	0.000	0.000	0.000	0.000

Notes: CAR: cumulative abnormal returns around ESG changes over the windows $[-7, +7]$, and $[-14, +14]$; Downgrade: is one for ESG downgrades and zero for upgrades; SENT_POS is positive sentiment; SIZE is the natural logarithm of total assets; LEV is total liabilities over total assets; ROA is return on assets; AGE is firm age; NIC is the natural logarithm of net income.

*, **, and *** indicate significance at the 10 per cent, 5 per cent, and 1 per cent levels, respectively.

markets react more strongly to negative events of corporate responsibility than to positive events, especially when the investor's attention is focused on downside information.

Positive sentiment enters with a significant positive coefficient for small firms over both CAR windows, while it is weaker or insignificant for large firms. In other words, optimistic language in news and communications is more strongly capitalised into short-term returns of smaller issuers. This is again in line with the idea that sentiment-induced mispricing is more pronounced where arbitrage is limited and information is more opaque (Ryu et al., 2025). The interaction between downgrades and positive sentiment is negative and statistically significant for large firms, particularly over the wider CAR $[-14,+14]$ window, whereas it is small and statistically insignificant for small firms. This pattern indicates that for large firms, favorable sentiment does not shield the stock from the negative price impact of an ESG downgrade. It is clearly that downgrades are an obvious, attention-grabbing jolt for large firms, widely held issuers that go against the grain of prior optimism, causing selling by retail and institutional investors (Beyer, 2025). This mechanism is consistent with evidence that attention-grabbing negative news can reverse prior optimism and create large trade imbalances (Liu & Lee, 2026).

Next, we examine whether the impact of ESG downgrades and positive sentiment varies with firms baseline ESG profiles. The

sample is split into low- and high-ESG firms and estimated separately for the short event window CAR $[-7,+7]$ and the longer window CAR $[-14,+14]$, as shown in Table 8. For high-ESG firms, downgrades are associated with economically large and statistically significant negative CARs in both windows, while positive sentiment has neither a significant main effect nor a significant interaction with downgrades. This pattern suggests that when a firm with a strong ESG reputation is downgraded, the downgrading itself is the main piece of information and is perceived as a salient negative surprise, irrespective of the general sentiment. The result is consistent with evidence that markets respond particularly strongly to “bad” ESG or CSR news, especially when it contradicts previous perceptions of corporate goodness. Kruger (2015) shows that negative CSR events trigger sizeable negative abnormal returns, whereas positive events are priced weaker. Similarly, recent research on ESG disasters shows that firms with high ESG reputation are severely punished when ESG failure exposes that their perceived strengths were overestimated (Chao et al., 2025; Tan et al., 2025). In this regard, our subsample of high ESG is akin to the “reputation loss” channel as emphasized in the CSR literature.

By contrast, market reactions to downgrades of low-ESG firms are more conditional on sentiment. In neutral conditions, the downgrade dummy is small and not statistically significant, indicating that downgrades for already weak ESG performers are close to “non-events.” However, positive sentiment has a significantly positive main effect on CAR for low-ESG firms in both event windows, while the interaction term Downgrade $\times$ SENT_POS is significantly negative. Our results imply that when the overall ESG-related sentiment is optimistic, investors reward low-ESG firms in general (perhaps because optimistic investors expect future improvement or chase high-beta names), but they react particularly negatively when one of these firms is downgraded. The pattern echoes the “offsetting CSR” mechanism documented by Kruger (2015), who shows that positive CSR news is especially valued for firms with a poor CSR history, whereas negative news for such firms tends to be discounted unless it arrives in a favorable environment. The high positive sentiment in our setting seems to raise the bar for low-ESG firms. A downgrade thus violates investors' heightened expectations and leads to a stronger negative price revision. Our findings speak to the wider debate as to whether better ESG performance creates a ‘reservoir of goodwill’ that protects firms from shocks, or simply increases the reputational cost of failure. Luo and Bhattacharya (2009) argue that strong social performance can reduce idiosyncratic risk by building goodwill with stakeholders, but that unexpected negative events can still trigger substantial value losses when they contradict that goodwill. Our results suggest that for high-ESG firms, the second mechanism dominates: downgrades are uniformly penalized, irrespective of sentiment. For low-ESG firms, however, the reaction is more in line with an “expectations channel” driven by investor sentiment. When sentiment toward ESG is relatively buoyant, investors may temporarily extrapolate future ESG improvements even for low-ESG issuers. The downgrade is a corrective signal and the negative interaction term captures the fast unwinding of those optimistic beliefs (Wang, 2025). Our results are consistent with the prediction of mispricing in mispricing-based pricing models with limited arbitrage, which amplifies mispricing.

We also test robustness with shorter event windows. Table 9 shows the main findings are not driven by the mechanical choice of the baseline window, but also points to an interesting timing pattern in how the market processes ESG downgrades. Our results in the tightest window of $[-1,+1]$ show that the coefficient on Downgrade is small and insignificant for all five sentiment specifications, indicating that the market penalty is not fully captured in the immediate response. However, when the window expands to $[-3,+3]$

Table 8
Heterogeneity by baseline ESG.

Cumulative abnormal returns	CAR $[-7,+7]$		CAR $[-14,+14]$	
ESG level	Low ESG	High ESG	Low ESG	High ESG
Downgrade	−0.003 (0.004)	−0.030*** (0.008)	−0.011 (0.008)	−0.030*** (0.008)
SENT_POS	0.007* (0.004)	0.004 (0.008)	0.018** (0.008)	0.004 (0.008)
Downgrade*SENT_POS	−0.009** (0.004)	−0.001 (0.008)	−0.020*** (0.007)	−0.001 (0.008)
SIZE	0.019** (0.008)	0.058*** (0.013)	0.030** (0.014)	0.058*** (0.013)
LEV	0.016 (0.024)	0.104** (0.049)	−0.021 (0.039)	0.104** (0.049)
ROA	0.118 (0.103)	0.141 (0.133)	0.165 (0.158)	0.141 (0.133)
FIRM_AGE	−0.006*** (0.001)	−0.017*** (0.001)	−0.010*** (0.002)	−0.017*** (0.001)
NIC	−0.013*** (0.005)	−0.001 (0.009)	−0.018** (0.009)	−0.001 (0.009)
Constant	0.006 (0.146)	−0.687** (0.283)	−0.010 (0.259)	−0.687** (0.283)
Observations	2840	2899	2840	2899
Adj. R-squared	0.0335	0.0619	0.0252	0.0619
Hausman test Prob > chi2	0.000	0.000	0.000	0.000

Notes: CAR: cumulative abnormal returns around ESG changes over the windows $[-7,+7]$, and $[-14,+14]$; Downgrade: is one for ESG downgrades and zero for upgrades; SENT_POS is positive sentiment; SIZE is the natural logarithm of total assets; LEV is total liabilities over total assets; ROA is return on assets; AGE is firm age; NIC is the natural logarithm of net income.

*, **, and *** indicate significance at the 10 per cent, 5 per cent, and 1 per cent levels, respectively.

Table 9

Heterogeneity by window.

Cumulative abnormal returns	CAR[-1,+1]					CAR[-3,+3]				
Sentiment	POS	NEG	RISK	VOL	MGMT	POS	NEG	RISK	VOL	MGMT
Downgrade	−0.001 (0.001)	−0.001 (0.001)	−0.001 (0.001)	−0.001 (0.001)	−0.001 (0.001)	−0.003** (0.002)	−0.003** (0.002)	−0.003** (0.002)	−0.003** (0.002)	−0.003** (0.002)
SENT_POS	0.003*** (0.001)					0.003** (0.001)				
SENT_NEG		−0.000 (0.001)					−0.002 (0.001)			
SENT_RISK			0.001* (0.001)					0.002** (0.001)		
SENT_VOL				0.001 (0.002)					0.007* (0.004)	
SENT_MGMT					0.000 (0.001)					0.000 (0.001)
Downgrade*SENT_POS	−0.001 (0.001)					−0.002 (0.002)				
Downgrade*SENT_NEG		0.001 (0.001)					0.001 (0.002)			
Downgrade*SENT_RISK			−0.001 (0.001)					−0.001 (0.002)		
Downgrade*SENT_VOL				0.005 (0.003)					0.003 (0.005)	
Downgrade*SENT_MGMT					−0.001 (0.001)					−0.001 (0.002)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5852	5852	5852	5852	5852	5852	5852	5852	5852	5852
Adj. R-squared	0.031	0.029	0.030	0.030	0.029	0.037	0.037	0.038	0.038	0.037
Hausman test Prob > chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Notes: CAR: cumulative abnormal returns around ESG changes over the windows $[-1, +1]$, and $[-3, +3]$; Downgrade: is one for ESG downgrades and zero for upgrades; SENT_* is investor sentiment, including positive, negative, risk, volatility and management; SIZE is the natural logarithm of total assets; LEV is total liabilities over total assets; ROA is return on assets; AGE is firm age; NIC is the natural logarithm of net income.

*, **, and *** indicate significance at the 10 per cent, 5 per cent, and 1 per cent levels, respectively. Standard errors in parentheses.

the coefficient is negative and significant in all models, indicating that the adverse pricing effect seems to be manifest over several trading days, not just on the announcement day. This finding suggests that ESG downgrades are incorporated gradually as investors process the signal and re-evaluate firm quality and future risk. This is consistent with recent evidence that ESG information is often processed over time due to its qualitative, forward-looking and interpretive nature (Galema & Gerritsen, 2025; Huang, 2025). Our results also provide an explanation for why the wider windows used in the main analysis are substantively appropriate. The interaction effects between Downgrade and the five sentiment measures are still not significant for both $[-1,+1]$ and $[-3,+3]$. But, some sentiment variables, particularly positive sentiment and risk sentiment, are directly related to CARs. This finding suggests that sentiment has little impact on the first-round market reaction in the shortest windows. Its moderating role is played on a slightly longer horizon, as reflected by the main results for $[-7,+7]$ and $[-14,+14]$. The negative pricing effect of ESG downgrades is amplified via sentiment, but this occurs more gradually as investors digest the broader informational and reputational content of the event, consistent with prior studies (Dorfleitner & Zhang, 2024; Galema & Gerritsen, 2025; Jeong et al., 2025).

We also examine robustness by dividing the sample by sector. As shown in Table 10, the moderating effect of sentiment is sector-specific rather than market-wide, with the negative interaction between downgrades and positive sentiment being most pronounced in Communication Services and Health Care, and the reinforcing effect of risk-related sentiment being most pronounced in Communication Services and Materials. This finding is consistent with the filtering of ESG downgrades through sector-specific information environments and reputational structures, and with recent evidence that the market impact of ESG news sentiment varies materially across industries and ESG dimensions (Jeong et al., 2025). On the other hand, the interaction terms for negative sentiment, volatility and management sentiment are less stable across sectors, which supports the paper's main conclusion that positive sentiment is the most consistent conditioning channel in the pricing of ESG downgrades (Dorfleitner & Zhang, 2024).

Table 11 further indicates that the adverse return effect of ESG downgrades is driven mainly by the environmental and social pillars. In contrast, the governance pillar does not exhibit a comparably strong and robust penalty in the short event window. After the analysis is done separately for E, S and G, the interaction terms between downgrades and sentiment are weaker and less systematic than in the aggregate ESG specification. This suggests that investor sentiment is most influential when the Downgrade is interpreted as a broad reputational signal as opposed to an isolated revision within one pillar. Economically, this result implies that environmental and social downgrades are more salient for short horizon valuation. However, changes in governance could be implemented in a more gradual or nuanced way. This finding consistent with current studies indicating that negative ESG signals are penalized asymmetrically and the pricing of ESG information is context-dependent, disclosure setting, and event salience (Danila, 2026; Huang, 2025).

As a further robustness check, Table 12 redefines investor sentiment over the $[-2,+2]$ window to capture information that may emerge during weekends and market holidays, thereby allowing us to assess whether the main moderation results remain stable when sentiment is measured over a broader event-related window. The central result of the paper remains unchanged. The coefficient on Downgrade is negative and statistically significant across all specifications and both return windows. We also find that the moderating role of sentiment is still concentrated in the longer return horizon. Therefore, this robustness test enhances the contribution of the paper. The negative pricing effect of ESG downgrades is robust under both narrow and broad measures of sentiment that are likely to absorb news from the weekend and holiday. It is not the existence of the downgrade penalty that changes, but the horizon over which sentiment interacts meaningfully with it. Our results suggest that the market is relatively quick to recognize the downgrade. In addition, the amplification effect of the surrounding sentiment environment is more pronounced over a longer cumulative return window, in line with prior works (Danila, 2026; Dorfleitner & Zhang, 2024).

Our findings yield clear implications for policymakers, regulators, and ESG standard setters. As ESG downgrades create economically significant negative CARs, and the penalty is larger in a more positive sentiment environment, ESG rating revisions should be viewed as information events that move the market where timing, transparency and methodological consistency are important for the orderly process of price discovery (Dorfleitner & Zhang, 2024; Jeong et al., 2025). Our main results are robust to other return and broader sentiment measurement windows, indicating that investors do not fully incorporate negative ESG signals immediately, and may continue to reprice them as more information about the event becomes available (Galema & Gerritsen, 2025; Huang, 2025). In this context, regulators and rating providers should enhance the transparency of rating methodologies, require more transparent communication of the reasons for downgrades and cut unnecessary opaqueness in revision practices, as ambiguous reassessments can increase repricing when investors need to revise previous optimistic beliefs (Christensen et al., 2022). Heterogeneity across sectors and pillars also indicates that a one-size-fits-all regulatory approach is unlikely to be fully effective. Environmental and social downgrades appear to be more important for short-horizon valuation than governance downgrades, and sentiment effects are not equally strong across industries (Jeong et al., 2025). Thus, policy endeavors to enhance the quality of ESG disclosure and comparability of ratings should be coupled with sector-specific guidance and more precise reporting standards at the pillar-specific level so that sustainability-related information can be priced in more consistently and be less susceptible to sentiment-driven over-reaction (Huang, 2025; Jeong et al., 2025).

5. Concluding remarks and policy recommendations

In this paper, we revisit the question "does sentiment matter in ESG pricing?" by going beyond one dimensional sentiment indices and by systematically contrasting a number of distinct sentiment channels around ESG rating changes. We use a large panel of S&P 500 firms over the period 2010-2024, combining Refinitiv ESG rating events with firm-level MarketPsych indices measuring positive and negative tone, risk, volatility and management sentiment. We then examine how these sentiment dimensions affect CARs around ESG upgrades and downgrades in both short and long event windows. Our findings emphasize the significance of the sentiment environment in influencing the effect of ESG downgrades, with certain dimensions of sentiment playing a more prominent role compared to

Table 10
Heterogeneity by sector (*).

CAR[-7; +7]	GICS1	GICS 2	GICS 3	GICS 4	GICS 5	GICS 6	GICS 7	GICS 8	GICS 9	GICS 10	GICS 11
Downgrade	0.0006 (0.015)	0.0081 (0.009)	-0.0194 (0.011)	-0.0250 (0.028)	-0.0026 (0.008)	-0.0014 (0.006)	-0.0124* (0.007)	-0.0099 (0.008)	-0.0029 (0.014)	-0.0145 (0.012)	-0.0111 (0.007)
SENT_POS	0.0120 (0.018)	0.0081 (0.009)	-0.0025 (0.010)	-0.0019 (0.026)	0.0058 (0.007)	0.0025 (0.007)	0.0094 (0.006)	0.0000 (0.007)	0.0037 (0.013)	0.0022 (0.007)	-0.0006 (0.008)
Downgrade × SENT_POS	-0.0265* (0.013)	-0.0095 (0.012)	0.0042 (0.011)	-0.0031 (0.023)	-0.0061 (0.008)	-0.0217*** (0.008)	0.0049 (0.007)	-0.0013 (0.008)	-0.0021 (0.017)	-0.0067 (0.008)	-0.0026 (0.008)
Downgrade	-0.0049 (0.014)	0.0064 (0.010)	-0.0194 (0.012)	-0.0331 (0.026)	-0.0036 (0.008)	-0.0048 (0.007)	-0.0147** (0.007)	-0.0110 (0.008)	-0.0001 (0.013)	-0.0132 (0.014)	-0.0103 (0.007)
SENT_NEG	-0.0185 (0.012)	-0.0109* (0.006)	-0.0133** (0.006)	0.0015 (0.019)	-0.0115** (0.005)	0.0025 (0.005)	-0.0078 (0.005)	-0.0171*** (0.005)	-0.0156 (0.010)	-0.0096 (0.007)	-0.0109 (0.006)
Downgrade × SENT_NEG	0.0030 (0.012)	-0.0087 (0.010)	0.0039 (0.012)	0.0128 (0.020)	-0.0003 (0.008)	-0.0133* (0.007)	-0.0054 (0.007)	0.0047 (0.007)	0.0084 (0.014)	-0.0057 (0.013)	-0.0024 (0.009)
Downgrade	-0.0190 (0.013)	0.0058 (0.011)	-0.0188* (0.010)	-0.0289 (0.025)	-0.0033 (0.008)	-0.0045 (0.007)	-0.0136* (0.007)	-0.0099 (0.008)	-0.0018 (0.012)	-0.0108 (0.009)	-0.0100 (0.006)
SENT_RISK	0.0077 (0.010)	0.0022 (0.007)	0.0096** (0.004)	-0.0177 (0.013)	0.0086* (0.005)	0.0005 (0.005)	-0.0048 (0.005)	0.0038 (0.005)	0.0160* (0.008)	0.0051 (0.005)	0.0048 (0.005)
Downgrade × SENT_RISK	-0.0437*** (0.011)	0.0154 (0.010)	0.0016 (0.007)	-0.0054 (0.016)	-0.0072 (0.007)	0.0009 (0.009)	0.0074 (0.007)	-0.0053 (0.007)	-0.0314*** (0.010)	-0.0043 (0.008)	-0.0058 (0.006)
Downgrade	-0.0042 (0.013)	0.0080 (0.011)	-0.0183* (0.010)	-0.0384 (0.026)	-0.0030 (0.008)	-0.0054 (0.007)	-0.0131* (0.007)	-0.0102 (0.008)	-0.0008 (0.012)	-0.0064 (0.010)	-0.0111* (0.006)
SENT_VOL	-0.0079 (0.046)	0.0267 (0.019)	-0.0070 (0.026)	-0.0860 (0.062)	-0.0057 (0.017)	0.0067 (0.023)	0.0304* (0.018)	0.0326* (0.019)	-0.0234 (0.018)	-0.0361** (0.017)	-0.0283 (0.017)
Downgrade × SENT_VOL	-0.0419 (0.056)	-0.0478 (0.033)	0.0148 (0.045)	0.1684** (0.071)	-0.0084 (0.021)	-0.0394 (0.030)	-0.0227 (0.024)	0.0045 (0.029)	0.0383 (0.034)	0.0484* (0.028)	0.0082 (0.028)
Downgrade	-0.0085 (0.014)	0.0058 (0.011)	-0.0189* (0.010)	-0.0210 (0.025)	-0.0033 (0.008)	-0.0041 (0.007)	-0.0141** (0.007)	-0.0097 (0.008)	-0.0031 (0.012)	-0.0111 (0.009)	-0.0109* (0.006)
SENT_MGMT	-0.0111* (0.006)	0.0009 (0.007)	0.0028 (0.005)	-0.0186 (0.024)	0.0004 (0.005)	0.0006 (0.004)	0.0034 (0.004)	0.0094 (0.006)	0.0110* (0.006)	0.0015 (0.008)	-0.0013 (0.005)
Downgrade × SENT_MGMT	-0.0027 (0.013)	0.0191* (0.010)	0.0018 (0.007)	-0.0453 (0.032)	0.0073 (0.006)	-0.0066 (0.008)	-0.0141** (0.006)	-0.0100 (0.009)	-0.0173* (0.009)	-0.0019 (0.010)	-0.0074 (0.011)

Notes: CAR[-7; +7]: cumulative abnormal returns around ESG changes over the windows [- 7, + 7]; Downgrade: is one for ESG downgrades and zero for upgrades; SENT_* is investor sentiment, including positive, negative, risk, volatility and management; SIZE is the natural logarithm of total assets; LEV is total liabilities over total assets; ROA is return on assets; AGE is firm age; NIC is the natural logarithm of net income.

*, **, and *** indicate significance at the 10 per cent, 5 per cent, and 1 per cent levels, respectively. Standard errors in parentheses.

(*) Detailed list of sectors is presented in [Appendix A](#).

Table 11
Heterogeneity by E, S, G pillars.

CAR[-7,+7]	POS	NEG	RISK	VOL	MGMT
Environmental Pillar					
Downgrade	-0.0058* (0.003)	-0.0069** (0.003)	-0.0064** (0.003)	-0.0063** (0.003)	-0.0064** (0.003)
Sentiment	0.0042 (0.003)	-0.0095*** (0.002)	0.0047** (0.002)	0.0014 (0.008)	-0.0001 (0.002)
Downgrade × Sentiment	-0.0056* (0.003)	-0.0024 (0.003)	-0.0034 (0.003)	0.0036 (0.011)	0.0025 (0.003)
Social Pillar					
Downgrade	-0.0059** (0.003)	-0.0062** (0.003)	-0.0061** (0.003)	-0.0061** (0.003)	-0.0061** (0.003)
Sentiment	0.0028 (0.003)	-0.0096*** (0.002)	0.0038* (0.002)	0.0012 (0.007)	0.0010 (0.002)
Downgrade × Sentiment	-0.0019 (0.003)	-0.0017 (0.003)	-0.0015 (0.003)	0.0041 (0.011)	-0.0001 (0.003)
Governance Pillar					
Downgrade	0.0044 (0.003)	0.0045 (0.003)	0.0044 (0.003)	0.0045 (0.003)	0.0043 (0.003)
Sentiment	0.0019 (0.003)	-0.0087*** (0.002)	0.0033* (0.002)	0.0061 (0.008)	-0.0005 (0.002)
Downgrade × Sentiment	0.0002 (0.003)	-0.0035 (0.003)	-0.0006 (0.003)	-0.0063 (0.011)	0.0029 (0.003)

Notes: CAR[-7, +7]: cumulative abnormal returns around ESG changes over the windows $[-7, +7]$; Downgrade: is one for ESG downgrades and zero for upgrades; SENT_* is investor sentiment, including positive, negative, risk, volatility and management; SIZE is the natural logarithm of total assets; LEV is total liabilities over total assets; ROA is return on assets; AGE is firm age; NIC is the natural logarithm of net income.

*, **, and *** indicate significance at the 10 per cent, 5 per cent, and 1 per cent levels, respectively. Standard errors in parentheses.

others. This study shows that the ESG downgrades are penalized in all sentiment states, but the penalty is the most severe when the general tone is optimistic. Thus, the positive sentiment is the main state variable that conditions the market reactions to the ESG rating changes, while the negative, risk and volatility sentiment have strong unconditional effects but do not significantly change the downgrade-CAR slope (Baker & Wurgler, 2007). Furthermore, our heterogeneity analysis implies that this optimism channel is not homogeneous across firms. Our results show that the largest downgrade boost comes from positive sentiment for small firms and those with weaker baseline ESG profiles, with less of an impact on large, high-ESG firms. This suggests that the sentiment-driven mispricing is stronger in regions where informational frictions, such as limited coverage, uncertainty about the quality of the ESG factor, are likely to be greater. This is consistent with the general evidence that sentiment effects are stronger for stocks that are harder to value and arbitrage. This heterogeneity points to the important finding that ESG rating changes matter not only for short-horizon returns, but that the channels through which they are transmitted, through sentiment and market frictions, systematically differ across firm types (Beyer, 2025; Ryu et al., 2025).

This study makes several contributions to behavioural finance by unpacking which dimensions of investor sentiment matter for ESG-related price formation and by showing how these sentiment channels interact with firm characteristics. *First*, the results refine sentiment-based asset pricing theories by moving beyond a one-dimensional sentiment index. Classic models argue that mispricing arises when optimistic or pessimistic investors push prices away from fundamentals and limits to arbitrage prevent full correction (Bartov & Kim, 2004). By contrast, our horse-race across positive, negative, risk, volatility and management sentiment demonstrates that general optimism is the dominant channel through which ESG downgrades translate into abnormal returns. In addition, this study indicates that ESG downgrades primarily correct over-optimistic beliefs rather than changes in perceived risk or volatility. This is consistent with models in which investors overreact to good narratives and subsequently revise beliefs sharply when negative information arrives (Rim & Zha Giedt, 2025). *Second*, the marginal-effects evidence in this study shows that the price impact of an ESG downgrade becomes more negative as positive sentiment moves from low to high values. When sentiment is subdued, the marginal effect of a downgrade is close to zero; when sentiment is strongly positive, the same downgrade generates economically large negative CARs. This asymmetric pattern suggests that ESG downgrades operate as catalyst events that trigger corrections after periods of exuberance, a mechanism in line with behavioural accounts of overpricing and subsequent reversals (Mukhtadir-Al-Mukit & Ali, 2025). In the ESG context, this implies that investors treat downgrades not merely as incremental information about sustainability, but as signals that previously optimistic ESG valuations were excessive (Derrien et al., 2025). *Third*, the heterogeneity results for size and baseline ESG strengthen the behavioural interpretation. Our results show that downgrades attract stronger and more persistent negative CARs for large firms and for firms with high pre-event ESG scores. These are precisely the firms that are more visible, more widely held by institutional and ESG-oriented investors, and more often used as “safe” or “responsible” assets. The stronger sentiment channel in these segments suggests that rich ESG narratives and reputational capital invite over-optimism, so that a subsequent downgrade prompts sharper disappointment and price corrections (Chao et al., 2025; Kruger, 2015). This complements evidence that high-CSR firms enjoy valuation premia and downside-risk protection in normal times by showing that, when the ESG story is revised downward, the same firms can experience pronounced sentiment-driven losses (Tan et al., 2025).

Table 12

Heterogeneity by investor sentiment [-2, +2] window.

Cumulative abnormal returns	CAR[-7,+7]					CAR[-14,+14]				
Sentiment	POS	NEG	RISK	VOL	MGMT	POS	NEG	RISK	VOL	MGMT
Downgrade	-0.008*** (0.003)	-0.008*** (0.003)	-0.008*** (0.003)	-0.008*** (0.003)	-0.008*** (0.003)	-0.019*** (0.005)	-0.020*** (0.005)	-0.020*** (0.005)	-0.020*** (0.005)	-0.020*** (0.005)
SENT_POS	0.009*** (0.002)					0.019*** (0.005)				
SENT_NEG		-0.005** (0.002)					-0.020*** (0.004)			
SENT_RISK			0.002 (0.002)					0.004 (0.003)		
SENT_VOL				0.003 (0.002)					0.007* (0.004)	
SENT_MGMT					-0.000 (0.002)					0.003 (0.003)
Downgrade*SENT_POS	-0.004 (0.003)					-0.010* (0.005)				
Downgrade*SENT_NEG		-0.001 (0.003)					0.001 (0.005)			
Downgrade*SENT_RISK			-0.003 (0.003)					-0.009* (0.005)		
Downgrade*SENT_VOL				-0.002 (0.003)					-0.003 (0.005)	
Downgrade*SENT_MGMT					-0.000 (0.003)					-0.003 (0.005)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5852	5852	5852	5852	5852	5852	5852	5852	5852	5852
Adj. R-squared	0.064	0.063	0.061	0.062	0.061	0.053	0.056	0.050	0.050	0.050
Hausman test Prob > chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Notes: CAR: cumulative abnormal returns around ESG changes over the windows [- 7, + 7], and [- 14, + 14]; Downgrade: is one for ESG downgrades and zero for upgrades; SENT * is investor sentiment, including positive, negative, risk, volatility and management; SIZE is the natural logarithm of total assets; LEV is total liabilities over total assets; ROA is return on assets; AGE is firm age; NIC is the natural logarithm of net income.

*, **, and *** indicate significance at the 10 per cent, 5 per cent, and 1 per cent levels, respectively. Standard errors in parentheses.

Our findings have several managerial implications. The results underscore the importance of managing ESG communication with an explicit eye on prevailing investor sentiment for corporate managers and investor-relations teams. When a firm is surrounded by very positive market commentary and news flow, an ESG downgrade or even the expectation of one can lead to disproportionately negative market reactions. This “exuberance correction” channel is particularly relevant for firms with high ESG reputations or high market capitalisation. Proactive and transparent communication on ESG risks, setting realistic targets and not being overly promotional in sustainability narratives can help to curb excess optimism and reduce the potential for sharp corrections post-downgrade. This is in line with recent evidence that credible ESG engagement reduces downside risk by anchoring investors’ expectations more firmly in the fundamentals. The findings suggest that investors and portfolio managers should not interpret ESG signals independently of sentiment conditions. Trading strategies that bet on downgrades may perform poorly when those downgrades arrive during periods of high positive sentiment, as prices then are readjusting from a too-optimistic starting point. On the other hand, when sentiment is already downbeat, the marginal information content of downgrades appears smaller. Therefore, the use of sentiment indicators at the dimension level in event-study or risk-management frameworks may improve timing around ESG news, in addition to the more traditional use of aggregate sentiment indices. Finally, the analysis highlights that the market impact of rating actions can be significantly different depending on the sentiment environment, for ESG rating agencies and regulators. In times of buoyant ESG enthusiasm, abrupt downgrades of high-profile, high-ESG issuers are especially likely to trigger sharp price adjustments. This strengthens the case for transparent methodologies, advance guidance on potential changes and clear communication of the uncertainty around ESG assessments.

This study has several limitations. The first empirical design investigates the effect of investor sentiment on stock price reaction to changes in ESG ratings. It does not consider the possibility that ESG releases can impact sentiment thereafter. This is important because textual sentiment and market reactions tend to co-move around salient and interpretable news events, implying that future research could more directly investigate the bidirectional relationship between ESG signals and investor sentiment using dynamic panel, vector autoregressive, or local projection techniques (Dorfleitner & Zhang, 2024; Jeong et al., 2025; Tetlock, 2007). Second, the event study design controls for general confounding effects by using short windows and abnormal returns with respect to a benchmark of expected returns. But the sample period was characterized by significant macroeconomic shocks including the coronavirus pandemic, supply chain disruptions, inflationary pressures and episodes of unconventional monetary policy. Short-horizon event studies are less exposed to these common shocks than long-horizon designs. However, these forces may still influence the background information environment and further research may investigate whether the moderating role of sentiment is different under different macro-economic regimes (Kothari & Warner, 2007; MacKinlay, 1997). Third, because CARs are calculated on the basis of realized returns around rating events, some sentiment-related pricing may already be embedded in the return measure itself. The current design does find if firm-specific sentiment moderates the pricing of the same downgrade event but does not fully disentangle sentiment driven mispricing from rational repricing. This opens a room for future works to develop sentiment adjusted abnormal returns or orthogonalized return measures to isolate better the incremental role of sentiment (Audrino et al., 2020; Tetlock, 2007).

CRedit authorship contribution statement

Ngoc Phu Tran: Writing – original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Ariful Hoque:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Resources, Conceptualization. **Thi Le:** Writing – review & editing, Supervision, Conceptualization.

Appendix A. List of sectors

- GICS 1: Communication Services
- GICS 2: Consumer Discretionary
- GICS 3: Consumer Staples
- GICS 4: Energy
- GICS 5: Financials
- GICS 6: Health Care
- GICS 7: Industrials
- GICS 8: Information Technology
- GICS 9: Materials
- GICS 10: Real Estate
- GICS 11: Utilities

Data availability

Data will be made available on request.

References

- Audrino, F., Sigrist, F., & Ballinari, D. (2020). The impact of sentiment and attention measures on stock market volatility. *International Journal of Forecasting*, 36(2), 334–357.
- Baker, M., & Wurgler, J. (2007). Investor sentiment in the stock market. *The Journal of Economic Perspectives*, 21(2), 129–151.
- Banerjee, S., Aggarwal, D., & Sengupta, P. (2025). Do stock markets care about ESG and sentiments? Impact of ESG and investors' sentiment on share price prediction using machine learning. *Annals of Operations Research*, 1–40. <https://doi.org/10.1007/s10479-025-06480-4>
- Barnett, M. (2019). *Measuring the impact of climate policy risk*. University of Chicago. Working paper.
- Bartov, E., & Kim, M. (2004). Risk, mispricing, and value investing. *Review of Quantitative Finance and Accounting*, 23(4), 353–376.
- Berkowitz, D., Lin, C., & Ma, Y. (2015). Do property rights matter? Evidence from a property law enactment. *Journal of Financial Economics*, 116(3), 583–593.
- Beyer, M. (2025). Gambling for market recovery? European insurers' corporate bond investments during market stress. *Journal of Risk & Insurance*, 92(4), 857–908.
- Binder, J. (1998). The event study methodology since 1969. *Review of Quantitative Finance and Accounting*, 11(2), 111–137.
- Boehmer, E., Musumeci, J., & Poulsen, A. B. (1991). Event-study methodology under conditions of event-induced variance. *Journal of Financial Economics*, 30(2), 253–272.
- Borghesi, S., Castellini, M., Comincioli, N., Donadelli, M., Gufler, I., & Vergalli, S. (2022). European green policy announcements and sectoral stock returns. *Energy Policy*, 166, Article 113004.
- Bottemanne, H., Frileux, S., Sevoz-Couche, C., Pelloux, Y., Colle, R., & Corruble, E. (2025). How mood shapes belief updating bias in depression. *Cognitive, Affective, & Behavioral Neuroscience*, 25, 889–903.
- Capelle-Blancard, G., & Petit, A. (2019). Every little helps? ESG news and stock market reaction. *Journal of Business Ethics*, 157(2), 543–565.
- Chao, W., Yifei, X., & Shuai, Y. (2025). Aggravating effect: ESG performance and reputational penalty. *Finance Research Letters*, 72, Article 106515.
- Chen, L., & Pottier, S. W. (2017). The impact of a rating agency's private information and disclosed causes of rating downgrades on insurer stock returns. *North American Actuarial Journal*, 21(2), 297–304.
- Choi, I. (2001). Unit root tests for panel data. *Journal of International Money and Finance*, 20, 249–272.
- Christensen, D. M., Serafeim, G., & Sikochi, A. (2022). Why is corporate virtue in the eye of the beholder? The case of ESG ratings. *The Accounting Review*, 97(1), 147–175.
- Coban, S., Uçar, M., Ulusay, N., & Kaya, N. (2025). Investigating the impact of social media-driven sentiment on the electric vehicle stock market using quantile regression. *International Journal of Economics and Financial Issues*, 15(4), 299.
- Contreras Cruz, M., Messeghem, K., & Catanzaro, A. (2024). Environmental entrepreneurship: A bibliometric perspective of the field. *The International Entrepreneurship and Management Journal*, 20(1), 451–477.
- Dai, H., Lee, D., Liang, Y., & Litt, B. (2025). ESG ratings and CEO charitable stock donations: Is firm ESG aligned with CEO personal philanthropy? *Journal of Corporate Accounting & Finance*, 36(3), 29–48.
- Danila, N. (2026). Do ESG factors matter? An analysis of abnormal stock returns in ASEAN-5 countries. *Asian Journal of Accounting Research*, 1–17. <https://doi.org/10.1108/AJAR-08-2025-0385>
- Derrien, F., Krueger, P., Landier, A., & Yao, T. (2025). ESG news, future cash flows, and firm value. *The Journal of Finance*, 80(6), 3499–3554.
- Doey, B., & de Jong, P. (2025). How negative tones in earnings calls shape media narratives. *Review of Behavioral Finance*, 17(3), 406–423.
- Dorflleitner, G., & Zhang, R. (2024). ESG news sentiment and stock price reactions: A comprehensive investigation via BERT. *Schmalenbach Journal of Business Research*, 76(2), 197–244.
- Fama, E. F., & French, K. R. (1993). Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics*, 33(1), 3–56.
- Ferreira, L., Torres, P., & Augusto, M. (2025). The moderating effect of power distance on the relationship between CEO career horizon and ESG performance. *Sustainable Technology and Entrepreneurship*, 4(3), Article 100107.
- Fisher, R. A. (1932). *Statistical methods for research workers* (4th ed.). Edinburgh: Oliver and Boyd.
- Galema, R., & Gerritsen, D. (2025). ESG rating changes and stock returns. *Journal of International Money and Finance*, 154, Article 103309.
- Gao, Y., & Tian, L. (2025). Media sentiment, investor attention, and market volatility. *Finance Research Letters*, 86, Article 108987.
- Garbuio, M., Leeson, C., & Gheno, G. (2026). ESG improvement as a critical driver of improved shareholder returns: A study of comparative portfolios. *Finance Research Letters*, 99, Article 109905.
- Gibson, B. R., Krueger, P., & Schmidt, P. S. (2021). ESG rating disagreement and stock returns. *Financial Analysts Journal*, 77(4), 104–127.
- Habimana, O. (2016). Asymmetric nonlinear mean reversion in real effective exchange rates: A fisher-type panel unit root test applied to Sub-Saharan Africa. *The Journal of Economic Asymmetries*, 14, 189–198.
- Hasan, F., & Al-Najjar, B. (2025). Calendar anomalies and dividend announcements effects on the stock markets returns. *Review of Quantitative Finance and Accounting*, 64(2), 829–859.
- Huang, J. (2025). Impact of official ESG disclosure timing on the effectiveness of the Chinese stock market. *Innovation and Green Development*, 4(6), Article 100314.
- Huang, C. L., Jou, Y. J., & Cho, H. J. (2016). A new multicollinearity diagnostic for generalized linear models. *Journal of Applied Statistics*, 43(11), 2029–2043.
- Hui, E. C. M., Zheng, X., & Wang, H. (2013). Investor sentiment and risk appetite of real estate security market. *Applied Economics*, 45(19), 2801–2807.
- Jeong, S. H., Han, J. J., Jun, S., Kim, S., & Kim, J. W. (2025). Investor responses to ESG news sentiment: Exploring differential effects and industry moderation. *Corporate Social Responsibility and Environmental Management*, 32(3), 3944–3964.
- Kothari, S. P., & Warner, J. B. (2007). Econometrics of event studies. In *Handbook of empirical corporate finance* (pp. 3–36). Elsevier.
- Kruger, P. (2015). Corporate goodness and shareholder wealth. *Journal of Financial Economics*, 115(2), 304–329.
- Liu, Y. Y., & Lee, P. S. (2026). Influence of sustainability report disclosure and assurance on environmental, social and governance performance persistence: A survival analysis. *Pacific Accounting Review*, 38(2), 253–272.
- Loang, O. K. (2025). *Why do Investors Act irrationally? Behavioral biases of herding, overconfidence, and overreaction*. Vernon Press.
- Loughran, T., & McDonald, B. (2011). When is a liability not a liability? Textual analysis, dictionaries, and 10-Ks. *The Journal of Finance*, 66(1), 35–65.
- Luo, X., & Bhattacharya, C. B. (2009). The debate over doing good: Corporate social performance, strategic marketing levers, and firm-idiosyncratic risk. *Journal of Marketing*, 73(6), 198–213.
- MacKinlay, A. C. (1997). Event studies in economics and finance. *Journal of Economic Literature*, 35(1), 13–39.
- Muktadir-Al-Mukit, D., & Ali, M. H. (2025). The dynamics of stock market responses following the cyber-attacks news: Evidence from event study. *Information Systems Frontiers*, 1–18. <https://doi.org/10.1007/s10796-025-10639-6>
- Ning, J., Zhang, L., Mi, B., Yang, J. H., & Tao, L. (2025). Signalling through managerial tone and analysts' response. *Accounting Forum*, 49(4), 803–829. Routledge.
- Pham, Q., Pham, H., Pham, T., & Tiwari, A. K. (2025). Revisiting the role of investor sentiment in the stock market. *International Review of Economics & Finance*, 100, Article 104089.
- Pinto-Gutiérrez, C., Neudörfer, P., & Isaías, S. (2025). ESG controversies, greenwashing, and value-destroying acquisitions. *Journal of Sustainable Finance & Investment*, 1–26. <https://doi.org/10.1080/20430795.2025.2581647>
- Quotb, M., Keasey, K., Li, P., & Mascia, D. V. (2026). ESG ratings disagreement and trading behaviour. *European Financial Management*, 32(1), 206–231.
- Rim, H. J., & Zha Giedt, J. (2025). Mistaking bad news for good news: Investor optimism and mispricing of strategic alternatives announcements. *Review of Accounting Studies*, 1–43. <https://doi.org/10.1007/s11142-025-09917-0>
- Ryu, D., Ryu, D., & Yang, H. (2025). Investor sentiment, mispricing, and limited arbitrage in the futures market. *Journal of Futures Markets*, 45(8), 879–895.
- Tai, Y. H. (2023). The relation between the corporate governance evaluation and abnormal returns: The role of company financial performance. *Asia-Pacific Journal of Accounting & Economics*, 30(4), 1086–1103.
- Tan, W., Liu, Y., Shen, M., Xu, C., & Sun, Y. (2025). ESG reputation risk and corporate investment and financing maturity mismatch: Evidence from ESG news sentiment. *Journal of Accounting Literature*. <https://doi.org/10.1108/JAL-07-2024-0166>

- Tetlock, P. C. (2007). Giving content to investor sentiment: The role of media in the stock market. *The Journal of Finance*, 62(3), 1139–1168.
- Tran, N. P., & Vo, D. H. (2022). Do banks accumulate a higher level of intellectual capital? Evidence from an emerging market. *Journal of Intellectual Capital*, 23(2), 439–457.
- Wang, J. (2025). Textual analysis reveals ESG initiatives linked to idiosyncratic risk in China. *Discover Sustainability*, 6(1), 862.
- Wang, F., Silaghi, F., Ongena, S., & García-Cestona, M. (2026). ESG ratings, ESG news sentiment, and firm credit risk perception. *Financial Analysts Journal*, 82(1), 128–148.