

From green claims to market crashes: the moderating forces of climate risk

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Abstract

Purpose – From the perspective of the environmental, social and governance (ESG) mechanism, this study aims to investigate the impact of greenwashing reporting on stock price crash risk (SPCR). Further, we investigate the moderating role of climate risk on this relationship.

Design/methodology/approach – Using public companies listed on the Indonesia Stock Exchange from 2019 to 2023, the dataset includes 247 firm-year observations. We conduct an ordinary least squares approach, followed by coarsened exact matching and generalized least squares for the robustness test.

Findings – We find that greenwashing moderately affects SPCR, suggesting that companies that amplify their environmental claims are more susceptible to market crashes. The moderating analysis indicates the imperative role of climate risk, implying that greenwashing practices under high climate risk circumstances lead to a higher risk of stock price crashes. Overall, our evidence is consistent with the masking effect of socially responsible information and that ESG greenwashing increases SPCR, which is beneficial for market participants and policymakers by providing a reliable decision-making reference for the high-quality development of Indonesia-listed companies.

Research limitations/implications – Despite the regression results, this study has its own limitation: due to the missing data of some companies when sample selection, greenwashing index cannot be calculated correctly, as it focuses on companies that have both ESG performance and disclosure, which may not fully capture the real greenwashing effect on SPCR. As a result, this paper omits samples with missing data, which affects the overall findings by limiting its ability to fully capture the real impact of greenwashing on SPCR in Indonesia, thereby leaving several shortcomings for future investigation.

Practical implications – The practical implications are twofold. For policymakers, the results highlight the urgency of strengthening ESG reporting standards in Indonesia, moving beyond voluntary disclosure to frameworks aligned with global initiatives such as the EU CSRD or US Securities and Exchange Commission rules. For investors, the evidence suggests caution in interpreting ESG claims at face value and the importance of integrating ESG quality assessments and active engagement into portfolio strategies. In this way, both regulators and investors can reduce information asymmetry and limit systemic risks arising from greenwashing.

Social implications – The study highlights that misleading sustainability reporting not only threatens financial market stability but also erodes public trust in corporate ESG practices. By exposing the risks of greenwashing, the findings encourage greater transparency and accountability, which can foster more responsible corporate behavior and protect broader societal interests in sustainable development.

Originality/value – We contribute to the literature's discussion on the greenwashing and market crash risk nexus, which is still rarely found in the context of emerging economies. Furthermore, the inclusion of climate risk provides more insightful information for market participants.

Keywords Greenwashing, Climate risk, ESG disclosure, ESG performance, Stock price crash risk

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1. Introduction

Climate change presents significant issues for global society, requiring actions from both public and private sectors. Policymakers have begun to acknowledge that climate change and environmental degradation represent a significant threat to the future. The 2015 Paris

JEL Classification — G1, G3, G15

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Agreement is the inaugural comprehensive climate accord that expressly acknowledges the necessity of aligning financial flows with a trajectory toward low greenhouse gas emissions and climate-resilient development (Ardia *et al.*, 2023; Chan *et al.*, 2024a, b; Kim and Kim, 2023). The attention to climate change has led enterprises on a global scale to turning their attention towards environmental sustainability through the integration of environmental, social and governance (ESG) criteria in risk management (Cai *et al.*, 2023; Chen and Xie, 2022; Chung *et al.*, 2024).

Following regulators worldwide who initiated various actions to encourage firms to engage in ESG practices, Indonesia regulates this through the Financial Services Authority Regulation (POJK) Number 51/POJK.03/2017 on sustainable finance. This regulation requires financial services institutions (FSIs), issuers and public companies to publish sustainability reports. This sustainability reports then presents a substantial challenge for sustainable investing and raises critical questions about the reliability of these disclosures in guiding investment decisions (Agustin *et al.*, 2025). With investor's raising concern on sustainable investment, enterprises attempt to disclosed their social responsibility following the perspective of asymmetric information and stakeholder theory, where this information will increase firm's stock performance. To facilitate this, the rating agency creates an ESG performance rating to assess the seriousness of the company in implementing its social responsibility actions. Thus, investors then recognize two ESG assessment indicators, namely ESG disclosure and ESG Performance.

Various studies were then conducted to examine the relationship between ESG disclosure and stock performance (Anwer *et al.*, 2023; Cai *et al.*, 2023; Chen and Xie, 2022; Chung *et al.*, 2024; Murata and Hamori, 2021; Silva, 2022; Zhang *et al.*, 2022) as well as ESG performance and stock performance (Agustin *et al.*, 2025; Feng *et al.*, 2022; Hao *et al.*, 2025; Hu *et al.*, 2023; Li *et al.*, 2022; Wang *et al.*, 2023; Wu *et al.*, 2024; Xu *et al.*, 2021). However, existing studies only measure social responsibility information disclosure or ESG information from a single dimension, which is difficult to observe the specific motivation of management to disclose social responsibility information. What's more, corporate ESG disclosure information is different from institutional ESG rating information. In response to investors' strong demand for ESG information, enterprises tend to engage in "greenwashing" practices (Netto *et al.*, 2020). Greenwashing refers to the company's environmental claims which are not substantiated by its actual activities, generating a discrepancy between words and deeds with the aim of misleading investors (Li *et al.*, 2024a, b; Zhang *et al.*, 2022). This practice gained worldwide relevance at the beginning of the 2000s, when several multinational companies were found guilty of hiding their polluting activities behind green advertisements. Since then, greenwashing started being a fundamental topic for researchers and governments began to develop policies to identify and combat its diffusion (Zhang *et al.*, 2022).

Despite of strict disclosure regulations at the global level, such as the EU's Corporate Sustainability Reporting Directive (CSRD) and the US Securities and Exchange Commission (SEC) climate disclosure rules, sustainability reporting requirements in Indonesia remain largely voluntary. Nevertheless, Indonesian firms operating globally, particularly those with business ties to Europe or the USA may be influenced to adopt these standards either voluntarily or in response to expectations from international investors and trading partners. As a result, companies in Indonesia are encouraged to disclose their ESG practices in sustainability reports. From the perspective of sustainable investment, greenwashing increases a company's future stock price crash risk (SPCR) by masking sustainability issues and managerial opportunism, leading to a decline in investor confidence and potentially lower financial performance (Liu *et al.*, 2024a, b; Teti *et al.*, 2024).

Given the economic conditions, geopolitical factors and recurring financial crises, a potential danger that may emerge is the risk of SPCR, refers to a condition where the risk of extreme negative values in the distribution of firm specific returns, after adjusting for the return portions that co-move with common factors (Wang *et al.*, 2023). This can impose significant losses on investors. While the volatility risk encompasses both losses and gains, the SPCR refers to the likelihood of incurring huge losses that cannot be diversified away

(Fiordelisi *et al.*, 2023; Hao *et al.*, 2025). The condition of a market price crash was experienced by the Indonesia Composite Index several times particularly during the financial crisis such as subprime mortgage in 2008 (Tong and Wei, 2008), the COVID-19 outbreak (Baker *et al.*, 2020; Agustin, 2021), which leading to a trading halt. Recently, Indonesia experienced the market crash during the period of November 2024–March 2025, where the composite stock price had a negative tendency. This continued until the Indonesia Stock Exchange (IDX) had to impose a trading halt on March 19, 2025. The condition partly being triggered by uncertain global tensions and also caused by negative investor sentiment due to local policies considered controversial.

This study examines the relationship between greenwashing and the SPCR, a significant concern as ESG principles increasingly underpin investor decision-making in the stock market (Ferrón-Vílchez *et al.*, 2021; Ghitti *et al.*, 2024; Gregory, 2021; Huang *et al.*, 2022; Li *et al.*, 2022). Apart from studies examined the relationship between stock price crash risk and ESG performance or ESG disclosure, studies which determined the greenwashing practices in this area is scarcely found. Extending the studies by Liu *et al.* (2024a, b) and Huang *et al.* (2024) in China, this study focuses on companies in Indonesia's emerging economies that may behave differently from those in developed countries.

In addition to EU CSRD which mandates companies to disclose detailed, standardized information on ESG issues, including climate-related risks, transition plans, the debate raises when the SEC In USA has proposed new climate-related disclosure rules (first issued in March 2022), which would require public companies to provide standardized information on greenhouse gas emissions, climate-related risks and governance of climate issues in their registration statements and periodic reports. A key point of debate is whether firms should be required to disclose Scope 3 emissions (indirect emissions in the supply chain), which many corporations argue is costly and uncertain, while investors and regulators emphasize its importance for assessing climate risks.

On the other hand, some studies showed that there is a significant role of climate risk, in both physical and transition forms, on a company's stock price. Gan *et al.* (2024) explained that the continuing increase in global temperature could directly impact financial stability, especially regarding the company's stock price, due to disruptions in the supply chain. The findings indicate that physical climate risk has a significant positive effect on the likelihood of SPCR and this effect is more pronounced in countries with low economic development and in countries where disasters frequently occur (Dong and Liu, 2023; Liu *et al.*, 2024a, b; Saqib *et al.*, 2024; Zhao *et al.*, 2024). Moreover, transition climate risk, which arises from changes in policies, regulations and technologies in response to climate change, suggests that companies exposed to changes in policies and regulations tend to face higher SPCR as there may be revaluation from investors (Broeders *et al.*, 2023; Jin *et al.*, 2019; Luo and Zhang, 2020). The imperative literature that supports the conceptual framework and scope of this study is presented in Table 1.

Given the growing concern about greenwashing among investors, this study provides timely contributions in several ways. Firstly, this paper will focus on the relationship between the greenwashing effect and SPCR, as prior studies mainly focus on ESG disclosure and information or CSR effects on stock price (Li *et al.*, 2022; Wang *et al.*, 2023; Zhang *et al.*, 2024). By understanding the impact of greenwashing on price crash risk, this study is expected to provide meaningful insights for investors or fund managers in market decision-making. Secondly, this study fills the gap in the literature by adding physical and transition climate risk as moderator variables. Stricter disclosure regimes, such as the EU's CSRD and the US SEC climate disclosure proposals, are directly relevant to this study, as they aim to reduce information asymmetry and curb greenwashing practices. By enhancing the credibility and comparability of ESG reporting, such regulations could mitigate the risk of stock price crashes driven by misleading sustainability disclosures. Lastly, the results of this paper provide insightful information for market participants regarding greenwashing activities that influence

Table 1. Summary of literature review

Author	Context	Variable	Key findings
Wang <i>et al.</i> (2023)	A-shares listed on Shanghai and Shenzhen stock exchanges from 2015 to 2020	Crash Risk Index (CRI)	Stocks with higher ESG ratings experience lower crash risk, consistent with negative net spillover effects
Zhang <i>et al.</i> (2024)	All Chinese public firms from 2008–2023	ESG rating Stock Price Crash Risk Greenwashing	Greenwashing will increase a firm’s future stock price crash risk and have a greater impact on firms with low transparency and higher greenwashing behavior
Liu <i>et al.</i> (2024a, b)	Chinese A-share listed companies from 2014 to 2021	Stock Price Crash Risk Greenwashing	ESG report greenwashing has positive correlation with stock price crash risk as asymmetry information between investors
Li <i>et al.</i> (2023)	All Chinese firms listed on the Shanghai or Shenzhen stock exchanges from 2013 to 2017	Return on Assets Greenwashing	Greenwashing shows a positive correlation with financial performance and is difficult to identify due to high asymmetric information in emerging economies
Li <i>et al.</i> (2022)	Shanghai and Shenzhen A-shares from 2016 to 2020	Stock Price Crash Risk ESG rating	Stock prices of companies with high environmental scores have lower crash risk when ESG evaluations are good, so investors’ decision-making on environmental performance will pay more attention

Source(s): Authors’ own elaboration

investment decisions beyond the firm’s performance, particularly concerning Indonesia-listed companies.

2. Literature review and hypothesis development

2.1 Greenwashing and stock price crash risk

The greenwashing practices by a company arise from the pressure of various stakeholders, such as investors, consumers, governments and even corporate consumers, to disclose the company’s environmental performance during aggravated environmental issues (Ghitti *et al.*, 2024; Li *et al.*, 2024a, b; Netto *et al.*, 2020). According to Gregory (2021), greenwashing can be defined as a company’s strategic decision to present its products as environmentally friendly to enhance firm value, which is used as a tactic to attract investors and consumers. This definition is also supported by Ferrón-Vílchez *et al.* (2021), who define greenwashing as the disclosure of environmental information initiated by the company to mislead the public. Research by Cheng *et al.* (2024) and Netto *et al.* (2020) also concluded that greenwashing is a selective disclosure in which the firm only provides positive environmental information without disclosing negative performance, thereby lacking transparency about their environmental performance in these aspects.

Agency theory (Jensen and Meckling, 1976), stakeholder theory (Freeman and Phillips, 2002) and signaling theory (Spence, 1973) provide a complementary relationship between greenwashing, SPCR, climate risk and investor sentiment. Agency theory elucidates the conflicts between managers and stakeholders, positing that managers may resort to greenwashing to artificially boost the firm’s stock price in the short term by concealing negative information or overstating sustainability claims, thereby heightening the risk of stock price collapses upon the revelation of the truth. In this context, monitoring by large shareholders has long been considered an important governance solution to agency problems

(Shleifer and Vishny, 1986). Meanwhile, stakeholder theory suggests that companies face pressure from various stakeholders, including investors, to meet specific objectives. In response, companies may engage in greenwashing activities to satisfy these expectations, leading to reputational damage and contributing to crash risk. Lastly, signaling theory explains how companies may use misleading information to send signals to the public, creating a positive sentiment regarding their environmental efforts without making real changes in their practices.

Empirical research by Liu *et al.* (2024a, b) found that ESG report greenwashing has a significant positive effect on SPCR, and this increase is clearer in companies that voluntarily disclose their social responsibility information in sustainability reports. Wang *et al.* (2023) empirically found that companies with low ESG performance or high greenwashing activity tend to experience higher SPCR. These findings also impact companies with high ESG performance, especially those involved in operations that contribute to carbon emissions, as investors become more cautious with their investments. Further studies by Yang *et al.* (2023) exhibit that environmental information disclosure fails due to companies' greenwashing activity, while genuine environmental information disclosure has a significant positive effect on stock price synchronicity. Many companies disclosing false and low-quality information about their environmental performance disrupt stock price indications. In a recent study, the mechanism test found that companies' greenwashing activities will increase firms' future SPCR and this effect is larger in firms with greater greenwashing behaviors (Zhang *et al.*, 2024).

However, a study by Teti *et al.* (2024) revealed that greenwashing announcements do not significantly affect the cumulative abnormal returns (CAR) of companies in the days after the release of the news. This result goes against their initial hypothesis and demonstrates that the market does not react to greenwashing announcements by penalizing "liable" companies, but instead maintains the company valuation pre-exposure to the announcement. Agustin *et al.* (2025) found that environmental performance failed to predict stock returns but can be a strong signal for market volatility. This result supports the study by Johnson and Greenwell (2022), which found that greenwashing does not significantly affect stock market performance. Li *et al.* (2023) posit that the greenwashing effect on market performance weakened with stringent environmental regulations and reversed with low media favorability, underpinning the need for media coverage on greenwashing issues. Having said that, there are contradictory findings among recent studies on the greenwashing-market performance nexus; we propose the following hypothesis:

H1. Greenwashing increases the level of SPCR.

2.1.1 Climate risk. The significant impacts of climate change arise from physical events, such as floods, hurricanes and rising sea levels, as well as regulatory actions, including climate summits, pledges, policies and solutions. These factors generate considerable public attention in the news and on social media, making it reasonable to anticipate that the resulting physical and transition risks will disrupt financial markets (Fahmy, 2025). The World Economic Forum published the "Global Risk Report 2024," mentioning that climate risk, especially natural disasters caused by El Niño, will be the most serious risk in the next 10 years due to biodiversity loss and ecosystem collapse that can make a critical change to Earth systems. Climate risk can be identified as the main problem that will have a significant effect on financial markets and economic development (Kim and Kim, 2023). Climate risk can be measured by three types of events, such as natural disasters, global warming and climate policies (Li *et al.*, 2024a, b).

Empirical research by Kim and Kim (2023) explained that a company's climate risk, measured by greenhouse gas emissions and energy consumption in Korea, has a significant positive effect on stock crash risk but will weaken after the introduction of the emission trading scheme (ETS). Similarly, Zhao *et al.* (2024) found that climate risk, especially natural disasters affecting US companies, has a significant positive effect on SPCR in developing countries'

financial markets. In this case, the company may tend to hide bad news after climate risk events occur, leading to crash risk once bad news is released to the public. Also, this effect is more significant in countries with low economic development, high climate risk and poor corporate governance. This finding is also supported by research from [Dong and Liu \(2023\)](#) and [Liu et al. \(2024a, b\)](#), which indicates that climate risk has a significant effect on SPCR with firm characteristics, such as CEO performance, geographic distribution (disaster-prone countries) and effective governance. Companies with higher disclosure of information related to climate risk could reduce SPCR in the future ([Lin and Wu, 2023](#)).

These findings are also closely related to transition climate risk, which arises from changes in policies, regulations and technologies in response to climate change. Companies exposed to policy and regulation changes tend to face higher SPCR, as there may be revaluation from investors ([Broeders et al., 2023](#); [Jin et al., 2019](#); [Luo and Zhang, 2020](#)). Further results also support this research, indicating that policy shifts toward a low-carbon economy enhance market scrutiny, which will reduce companies' greenwashing practices due to high market attention with environmental-specific political risk acting as disciplinary action ([Rahman et al., 2024](#)). Lastly, when the interaction of transition climate risk occurs, it could weaken the effect of greenwashing on SPCR, as the accumulated negative news has already been priced in when high transition risk and greenwashing have been detected earlier ([Dunz et al., 2021](#)). Based on the information on the relationship between climate risk and SPCR, the following hypothesis is proposed as follows:

H2. Climate risk moderates the relationship between greenwashing and SPCR.

3. Sample and methodology

3.1 Data and sample

This study's research sample is conducted with secondary data from multiple reputable sources, which consist of all public companies on the IDX during 2019–2023. These time intervals are selected as the POJK regulation enforced sustainability reports as a mandatory requirement for all public companies in 2019, with the Global Reporting Index (GRI) serving as the main framework for ESG disclosure. Out of 938 listed companies in Indonesia, 94 companies met the sample requirement, having published their ESG performance and disclosure within the 2019–2023 period. These companies were identified through Refinitiv (Thomson Reuters) and Bloomberg, as well as sustainability reports, resulting in a total of 247 observations.

3.2 Variable measurement

Following previous studies, the dependent variable in this study is SPCR, which is measured by two metrics: negative skewness (NSKEW) and down-to-up volatility (DUVOL). The data were collected from [www.investing.com](#) by calculating the weekly returns of each company's stock closing price from 2019–2023, respectively.

$$NCSKEW_{i,t} = \frac{-\left[n(n-1)^{3/2} \sum W_{j,t}^3\right]}{(n-1)(n-2) \left(\sum W_{j,t}^2\right)^{3/2}}$$

DUVOL is measured by splitting a company's stock weekly returns within the year into two categories: weekly returns below the annual average (down weeks) and weekly returns above the annual average (up weeks). The standard deviation for each category is calculated separately and DUVOL is measured by taking the natural logarithm of both standard deviation ratios. According to [Liu et al. \(2024a, b\)](#), a higher level of negative skewness and DUVOL calculated from a company's stock weekly returns reflects an increased risk for the stock to

experience sharp price drops, even during positive stock price momentum, which could expose it to sudden price declines.

$$DUVOL_{i,t} = \ln \left[\frac{(n_u - 1) \sum_{DOWN} W_{i,t}^2}{(n_d - 1) \sum_{UP} W_{i,t}^2} \right]$$

Following the work of Yu *et al.* (2024), Liu *et al.* (2024a, b) and Ma *et al.* (2025), the Greenwashing index is defined by the difference between ESG disclosure and ESG performance (ESG score). The greater the difference between both ESG indexes, the greater the greenwashing carried out by the company (Li *et al.*, 2023; Liu *et al.*, 2024a, b). To obtain the required data for ESG disclosure and ESG performance (ESG score), the GRI was used as the main framework to identify ESG disclosure, with a total of 117 disclosures according to GRI standard 2021, although there are some minor adjustments from the previous version. Each disclosure item that aligns with the GRI standard found in a company's sustainability report is marked with 1 point; otherwise, it is marked as 0, reflecting a binary approach for each GRI indicator, whether it is present or absent. This measurement could verify whether companies listed on the IDX are engaging in greenwashing behavior, provided the ESG disclosure and ESG performance data are met. We use the difference between the industry-standardized ESG information disclosure score and the standardized ESG performance score to determine whether and to what extent a company greenwashes ESG information. The calculation for greenwashing can be explained as follows:

$$Greenwashing_i = \frac{D_i - \bar{D}}{\sigma_D} - \frac{P_i - \bar{P}}{\sigma_P}$$

As for the moderating variable, the Climate Risk Index (CRI) uses both physical and transition climate risk from the Factiva database www.policyuncertainty.com. This index, provided by Bua *et al.* (2024), uses text-based approaches and authoritative sources; the global physical and transition climate risk vocabularies provide fully relevance-ranked phraseologies associated with the two types of risks. Starting from authoritative and scientific texts on climate change, the authors screen and aggregate the content into two documents: a Physical Risk Document (PRD) and a Transition Risk Document (TRD). These documents encompass all the information about climate risks, which used to feed the text-based algorithms. PRD and TRD are converted into numerical vectors using the term frequency-inverse document frequency (tf-idf) method. The independent variable is controlled by several financial variables to ensure that the variables remain constant, such as return on assets (ROA), return on equity (ROE), net profit margin (NPM) and book value (BV). A detailed description of the variables, covering their types, definitions and abbreviations, is presented in Table 2.

3.3 Model specification

To address the research objectives, we ran three main models. The first model explains the relationship between greenwashing and SPCR without any moderator variables. Meanwhile, models 2 and 3, respectively, explain the roles of climate risk (physical and transition) as moderator variables.

Model 1

$$SPCR_{i,t+1} = \alpha_0 + \alpha_1 Greenwashing_{i,t} + \alpha_i \sum Controls_{i,t} + \varepsilon_{i,t}$$

Table 2. Variables definition

Variable type	Variable name	Symbol	Variable definition
Dependent Variable	Stock Price Crash Risk	NSKEW	Negative skewness coefficient from company's stock weekly returns within a year period
		DUVOL	Natural logarithm of company's stock weekly returns between below annual average and above annual average
Independent Variable	Greenwashing Index	Greenwashing	The difference between ESG disclosure and ESG performance (score)
Moderating Variable	Physical Climate Risk	PCR	Climate risk driven by extreme weather change that effect physical hazards
	Transition Climate Risk	TCR	Climate risk driven by indirect impact of policy and regulations change
Control Variables	Return on Assets	ROA	Percentage of net income compared to total assets
	Return on Equity	ROE	Percentage of net income compared to total equity
	Net Profit Margin	NPM	Percentage of company net profit compared to total revenue
	Book Value	BV	Net difference between total equity on common shares

Source(s): Authors' own elaboration

Model 2

$$SPCR_{i,t+1} = \alpha_0 + \alpha_1 Greenwashing_{i,t} + \alpha_2 PCR_{i,t} + \alpha_4 Greenwashing \times PCR_{i,t} + \alpha_i \sum Controls_{i,t} + \varepsilon_{i,t}$$

Model 3

$$SPCR_{i,t+1} = \alpha_0 + \alpha_1 Greenwashing_{i,t} + \alpha_3 TCR_{i,t} + \alpha_5 Greenwashing \times TCR_{i,t} + \alpha_i \sum Controls_{i,t} + \varepsilon_{i,t}$$

4. Empirical results

4.1 Descriptive statistics

Table 3 presents the descriptive statistics for each variable in this research. The greenwashing variable indicates the reliability of a company's actual performance compared to its ESG

Table 3. Descriptive statistics

	Obs	Mean	St.dev	Minimum	Maximum
Greenwashing	247	-0.080	1.160	-2.784	3.313
NSKEW	247	0.244	0.945	-5.102	4.103
DUVOL	247	0.053	0.023	0.016	0.134
PCR	247	-0.001	0.002	-0.007	0.000
TCR	247	-0.000	0.003	-0.005	0.003
ROE	247	0.247	1.414	-0.756	21.972
ROA	247	0.061	0.078	-0.106	0.557
NPM	247	0.117	0.296	-3.769	0.553
BV	247	3151.650	4582.360	13.599	26865.596

Source(s): Created by authors

report, with an average value of -0.08 and a high standard deviation of 1.16 . The negative value in this variable indicates that overall, companies report their actual performance in the ESG section, but the high variance, with a range wide from -2.78 to 3.31 , is influenced by differences in environmental impact and reporting standards relative to sector regulations. In terms of SPCR, two main metrics, NSKEW with an average value of 0.244 and a range from -5.102 to 4.103 , indicate that some companies may experience relatively balanced weekly returns, while others with left-skewed values will experience stock price crashes. Additionally, DUVOL, with an average value of 0.053 , also indicates similar volatility of a company's stock price during down weeks, which is below the annual average. Both NSKEW and DUVOL metrics provide results on how vulnerable a company's stock price is, which is relatively unstable for stakeholders.

Climate risk variables, PCR and TCR, show average values nearing zero with low variance, indicating that listed companies in Indonesia reported low awareness of their exposure to climate risk impacts. This is concerning, as climate changes in Indonesia are relatively high regarding both physical and transition risks associated with policy and regulatory shifts. The under-reporting of climate risk exposure in Indonesia could place both companies and governance in a weak position regarding sustainability.

4.2 Pearson correlation

Table 4 presents the Pearson correlation matrix results for greenwashing, SPCR, physical climate risk, transition climate risk and other control variables. Greenwashing is found to have a significantly positive correlation with both crash risk metrics, although the result is stronger and more significant at the 1% level for NSKEW with a coefficient of 0.171 , compared to the DUVOL metric. Furthermore, both crash risk metrics also exhibit significant correlation results with physical climate risk and transition climate risk, at the 10% and 1% significance levels, respectively. Interestingly, while NSKEW shows a marginally significant positive correlation with PCR and a strong correlation result with TCR, DUVOL presents a contrasting correlation result, which suggests that climate risk implications could be different depending on the SPCR metrics. NSKEW captures return asymmetry with the accumulation of bad news over the long term, which can lead to a sudden stock price decline. In contrast, DUVOL

Table 4. Pearson correlation

	NSKEW	DUVOL	GWI	PCR	TCR	ROE	ROA	NPM
DUVOL	0.112* (0.078)	1.000						
GWI	0.171*** (0.007)	0.002 (0.979)	1.000					
PCR	0.114* (0.074)	-0.417*** (0.000)	0.143** (0.025)	1.000				
TCR	0.193*** (0.002)	-0.421*** (0.000)	0.346*** (0.000)	0.739*** (0.000)	1.000			
ROE	-0.037 (0.566)	0.026 (0.684)	-0.046 (0.475)	0.048 (0.456)	0.076 (0.237)	1.000		
ROA	0.011 (0.866)	-0.077 (0.230)	-0.039 (0.540)	0.020 (0.759)	-0.014 (0.831)	0.145** (0.023)	1.000	
NPM	-0.069 (0.283)	-0.162** (0.011)	-0.037 (0.558)	0.054 (0.402)	0.024 (0.705)	0.028 (0.663)	0.260*** (0.000)	1.000
BV	-0.077 (0.227)	-0.041 (0.525)	0.051 (0.427)	0.011 (0.867)	0.001 (0.986)	-0.044 (0.496)	0.255*** (0.000)	0.087 (0.172)

Note(s): ***, **, * denotes significant at 1%, 5% and 10% level respectively

Source(s): Created by authors

captures short-term market fluctuations by comparing volatility during down weeks and up weeks, which may indicate lower stock price volatility despite long-term price declines.

Additionally, greenwashing shows a significantly positive correlation with both PCR and TCR, indicating that companies facing high-related climate risk may tend to engage in greenwashing practices to protect their stock price. Moreover, physical climate risk and transition climate risk are found to have a strong positive significant correlation, which means companies exposed to one type of climate risk may be likely to encounter the other climate risk as well.

4.3 Main results : regression analysis

Table 5 presents the regression results for all hypotheses around greenwashing, SPCR, physical climate risk and transition climate risk. models (1a) and (1b) show the results of the greenwashing variable on NSKEW and DUVOL proxies with positively significant effects at the 5% and 1% significance levels, respectively. These findings align with previous studies indicating that companies will be prone to experience sudden stock price crashes without notice when greenwashing practices are exposed to the public (Liu et al., 2024a, b; Nguyen et al., 2023; Teti et al., 2024; Silva, 2022). For instance, research by Liu et al. (2024a, b) reported that there was information asymmetry in the company’s sustainability report about greenwashing, which will not easily be detected by stakeholders, increasing SPCR. Similar research also found that the impact of greenwashing is more significant on companies with non-transparent governance, especially companies with stronger greenwashing practices (Li et al., 2023). Additionally, Li et al. (2024a, b) found that greenwashing behavior initially

Table 5. Regression results

	(1a) NSKEW	(2a) NSKEW	(3a) NSKEW	(1b) DUVOL	(2b) DUVOL	(3b) DUVOL
GWI	0.112** (1.99)	0.160** (2.43)	0.091 (1.55)	0.004*** (3.22)	0.003** (2.49)	0.003** (2.57)
PCR		-1.4e+03 (-1.47)			72.039*** (3.68)	
TCR			69.861* (1.89)			-3.054*** (-3.96)
GWI*PCR		33.746 (1.40)			-0.250 (-0.49)	
GWI*TCR			-27.907 (-1.30)			-0.877* (-1.97)
ROE	-0.033 (-0.79)	-0.032 (-0.76)	-0.036 (-0.86)	0.001 (1.30)	0.001 (1.29)	0.001 (1.20)
ROA	0.788 (0.96)	0.807 (0.98)	0.812 (0.99)	-0.007 (-0.43)	-0.008 (-0.44)	-0.007 (-0.39)
NPM	-0.250 (-1.21)	-0.243 (-1.19)	-0.259 (-1.26)	-0.010** (-2.43)	-0.011** (-2.43)	-0.011** (-2.51)
BV	-0.000 (-1.45)	-0.000 (-1.47)	-0.000 (-1.43)	-0.000 (-0.46)	-0.000 (-0.45)	-0.000 (-0.44)
_cons	0.029 (0.16)	0.520*** (2.85)	0.275** (2.24)	0.060*** (15.81)	0.037*** (9.61)	0.053*** (20.87)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
r2	0.088	0.096	0.095	0.295	0.296	0.307
r2_a	0.054	0.058	0.057	0.269	0.266	0.277
N	247	247	247	247	247	247

Note(s): ***, **, * denotes significant at 1%, 5% and 10% level respectively; Standard error in parentheses

Source(s): Created by authors

induces investors to embrace positive investment ideas in the near term; however, these impacts are not sturdy. Eventually, investors typically shift towards embracing gloomy investment ideas. These findings emphasize the important role of greenwashing reporting in sustainability reports for increasing company transparency and reducing stock price crashes.

DUVOL, which captures the relative volatility of returns in negative versus positive weeks, shows higher sensitivity to greenwashing. This outcome can be explained by the fact that once misleading sustainability claims are questioned or exposed, investors react swiftly, producing sharper fluctuations in “down weeks.” In contrast, NSKEW reflects the gradual accumulation of hidden negative information and its eventual release. While this mechanism is consistent with the theory of bad-news hoarding, our findings imply that investors in the Indonesian market may be quicker to adjust when sustainability misrepresentation is suspected, thereby amplifying short-term downside volatility. Thus, although both proxies confirm the risk-enhancing effect of greenwashing, the stronger results in DUVOL highlight that the market’s immediate reaction to greenwashing disclosures dominates over the longer-term build up of asymmetric information.

Model (2a) and (2b) with physical climate risk as a moderator variable shows that the interaction effect of greenwashing and PCR is not statistically significant, with a positive coefficient. Although physical climate risk shows a direct effect on SPCR with DUVOL metrics, this does not alter the greenwashing impact on SPCR. These findings indicate that companies facing physical climate risk are more vulnerable to experiencing SPCR, which is consistent with prior studies that emphasized environmental hazards from GHG emissions as climate physical risk to SPCR (Kim and Kim, 2023). Prior studies by Nguyen *et al.* (2023) found that companies participating in green practices based on environmental sustainability are less likely to experience SPCR, especially during periods of high climate risk.

Referring to models (3a) and (3b), transition climate risk as a moderating variable shows a negative significant effect on the interaction effect of greenwashing and transition climate risk. This implies that high transition climate risk can weaken the initially positive impact of greenwashing on SPCR. This effect may occur due to an increase in scrutiny and awareness, as investors become more sensitive to a company’s actual ESG performance in response to policy shifts towards a low-carbon economy. Consequently, companies are faced with greater pressure to maintain transparency in ESG reporting, driven by heightened market attention and scrutiny over climate-related disclosures (Dong and Liu, 2023; Dunz *et al.*, 2021; Gan *et al.*, 2024).

5. Additional test

5.1 Alternative measure of greenwashing index

Du (2015) and Teti *et al.* (2024) define greenwashing using a dummy variable, where a value of 0 indicates firms that do not engage in greenwashing and a value of 1 indicates firms that do. The use of this dummy variable serves as a signal of potential overclaims made by companies in disclosing their sustainability practices. This study adopts a similar measurement technique, assigning a value of 1 when a firm’s index is greater than 0 and a value of 0 when the index is less than 0.

Table 6 presents the regression analysis results using the Greenwashing Index in the form of a dummy variable. The findings are consistent with the baseline regression, showing that greenwashing significantly increases SPCR, particularly when measured by the DUVOL proxy. Similarly, the analysis of the moderating variable reveals that the interaction between greenwashing and transition climate risk yields a negative coefficient, indicating that higher transition climate risk can weaken the relationship between greenwashing and SPCR.

5.2 Robustness test – coarsened exact matching (CEM) analysis

Following the baseline regression results in Table 5, the robustness test is conducted with coarsened exact matching (CEM) presented in Table 7, aimed at addressing potential sample bias and further examining the relationship between greenwashing, SPCR, physical climate

Table 6. Dummy greenwash – alternative measure of greenwashing index

	(1a) NSKEW	(2a) NSKEW	(3a) NSKEW	(1b) DUVOL	(2b) DUVOL	(3b) DUVOL
GWI_D	0.164 (1.36)	0.209 (1.52)	0.123 (1.02)	0.005* (1.86)	0.004* (1.87)	0.004* (1.77)
PCR		-2.0e+03* (-1.71)			58.039*** (2.82)	
GWI*PCR		17.550 (0.72)			-0.621 (-1.44)	
TCR			84.962* (1.82)			-2.534*** (-3.26)
GWI*TCR			-31.319 (-1.25)			-1.016** (-2.12)
ROA	(-3.06) 0.740 (1.00)	(-2.98) 0.740 (0.99)	(-3.07) 0.776 (1.05)	(4.31) -0.010 (-0.51)	(4.10) -0.010 (-0.52)	(3.73) -0.008 (-0.47)
NPM	-0.266 (-1.12)	-0.267 (-1.13)	-0.273 (-1.12)	-0.011*** (-1.97)	-0.011** (-1.96)	-0.011* (-1.96)
BV	-0.000 (-1.54)	-0.000 (-1.50)	-0.000 (-1.57)	-0.000 (-0.21)	-0.000 (-0.28)	-0.000 (-0.27)
_cons	-0.127 (-0.46)	0.493** (2.10)	0.195 (1.10)	0.055*** (14.75)	0.037*** (6.37)	0.051*** (13.75)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
r2	0.080	0.082	0.089	0.272	0.277	0.288
r2_a	0.045	0.043	0.050	0.244	0.246	0.258
N	247	247	247	247	247	247

Source(s): Created by authors

risk and transition climate risk. In this robustness test, the dummy greenwashing sample is used to distinguish companies with high and low levels for testing the moderating variable. The robustness test found consistent results with the regression test in Table 5, indicating that greenwashing is positively significant at the 5% level for NSKEW. However, for DUVOL, the results were inconsistent with the regression results, where greenwashing becomes statistically insignificant. For Model (2a), the moderating physical climate risk variable and its interaction effect confirmed consistent results with SPCR at the significant 5% level. Moreover, the interaction variable in the robustness test became positively significant, supporting the earlier hypothesis, although this was not found in the earlier regression results.

In Model (3a), with transition climate risk as a moderator variable, the results are still consistent with earlier regression results, where both greenwashing and the interaction variable are not significant, while the moderating effect remains positively significant at the 5% level. Along with that, models (1b), (2b) and (3b) with the DUVOL metric only found a direct effect of the moderating variable on SPCR, which is inconsistent with prior regression results.

5.3 Robustness test – generalized least squares analysis

To ensure the robustness of the main findings, this study further employs the generalized least squares (GLS) estimation technique. GLS is particularly suitable in the presence of heteroskedasticity and autocorrelation, which are common characteristics in panel data involving financial performance and market risk. By allowing for panel-specific error structures, GLS provides more efficient and reliable estimates compared to ordinary least squares (OLS), especially when the classical assumptions of homoskedastic and uncorrelated errors are violated. The use of GLS in this context serves as a robustness check to examine

Table 7. Robustness test – CEM results

	(1a) NSKEW	(2a) NSKEW	(3a) NSKEW	(1b) DUVOL	(2b) DUVOL	(3b) DUVOL
GWI	0.143** (2.218)			−0.000 (−0.242)		
d_GWI		0.328** (2.206)	0.068 (0.561)		−0.001 (−0.265)	0.004 (1.242)
PCR		2.267 (0.059)			−3.500*** (−5.039)	
TCR			83.042** (2.105)			−2.979*** (−3.711)
c.d_GWI#c.PCR		129.136** (2.475)			−1.601 (−1.422)	
c.d_GWI#c.TCR			−27.831 (−0.555)			−1.675 (−1.609)
ROE	0.229 (1.096)	0.092 (0.457)	0.151 (0.734)	0.002 (0.330)	0.005 (0.652)	0.003 (0.479)
ROA	0.589 (0.554)	0.894 (0.815)	0.866 (0.811)	−0.009 (−0.362)	−0.016 (−0.641)	−0.015 (−0.594)
NPM	−0.856* (−1.663)	−0.968* (−1.907)	−0.994* (−1.807)	−0.035*** (−2.987)	−0.030*** (−3.108)	−0.033*** (−3.502)
BV	−0.000 (−1.646)	−0.000 (−1.564)	−0.000 (−1.435)	−0.000 (−0.585)	−0.000 (−0.558)	−0.000 (−0.619)
_cons	0.358*** (3.273)	0.276* (1.843)	0.366** (2.565)	0.058*** (22.957)	0.052*** (16.573)	0.055*** (16.585)
r2	0.061	0.075	0.076	0.068	0.236	0.261
r2_a	0.041	0.048	0.048	0.048	0.213	0.239
N	243	243	243	243	243	243

Source(s): Created by authors

whether the observed relationship between greenwashing and SPCR remains consistent when the potential issues of heteroskedasticity across firms and autocorrelation over time are addressed (Greene, 2003; Wooldridge, 2010). As presented in Table 8, the GLS results are consistent with the baseline regression, indicating that greenwashing increases SPCR.

6. Conclusions, implications and limitations

As the uncertainty level keeps growing in the financial market, causing the overall market to become more volatile and unpredictable, these uncertainty factors have recently forced companies to conceal all their negative information in response to the increasing scrutiny over sustainability, especially environmental claims. In the case where all negative information is revealed to the public, it will result in a market crash, which starts from an extreme downward movement of stock prices. Based on the regression test results and supported by robustness tests, it was found that the greenwashing variable has a positively significant effect on SPCR. When investors find out that the company's actual performance differs from its ESG disclosure report and engages in greenwashing practices, it will lead to a sudden stock price decline, as investors will withdraw all their investment funds. Furthermore, the physical climate risk moderating the greenwashing variable also found a positively significant result on SPCR, as proved by the robustness test results. However, greenwashing with the moderating transition climate risk variable only found a positively significant effect with DUVOL metrics.

Our findings confirm that greenwashing significantly increases SPCR, with stronger effects on DUVOL than NSKEW. This suggests that, while bad-news hoarding explains the long-term mechanism, the Indonesian market is especially sensitive to short-term volatility

Table 8. Generalized least squares results

	(1a) NSKEW	(2a) NSKEW	(3a) NSKEW	(1b) DUVOL3	(2b) DUVOL3	(3b) DUVOL3
GWI	0.111** (2.05)	0.160** (2.53)	0.091 (1.61)	0.004*** (3.26)	0.003*** (2.60)	0.003*** (2.60)
ROE	-0.033 (-0.80)	-0.032 (-0.78)	-0.036 (-0.87)	0.001 (1.32)	0.001 (1.22)	0.001 (1.22)
ROA	0.792 (0.98)	0.812 (1.01)	0.813 (1.01)	-0.008 (-0.45)	-0.007 (-0.42)	-0.007 (-0.42)
NPM	-0.249 (-1.24)	-0.242 (-1.21)	-0.258 (-1.29)	-0.010** (-2.45)	-0.011** (-2.54)	-0.011** (-2.54)
BV	-0.000 (-1.47)	-0.000 (-1.50)	-0.000 (-1.46)	-0.000 (-0.46)	-0.000 (-0.45)	-0.000 (-0.45)
PCR		-1.4e+03 (-1.52)				
GW*PCR		33.839 (1.47)				
TCR			72.272** (2.00)		-2.969*** (-3.89)	-2.969*** (-3.89)
GW*TCR			-26.142 (-1.27)		-0.838* (-1.93)	-0.838* (-1.93)
_cons	0.019 (0.11)	0.507*** (2.82)	0.264** (2.21)	0.060*** (15.98)	0.053*** (20.98)	0.053*** (20.98)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	247	247	247	247	247	247

Note(s): *t* statistics in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Source(s): Created by authors

once sustainability misrepresentation is suspected. The results support information asymmetry perspectives, showing how misleading ESG disclosure erode market confidence and accelerate downside reactions. From a theoretical perspective, the findings align with several key frameworks. Agency theory suggests managers may engage in greenwashing to protect their own interests by concealing negative information, but this behavior ultimately harms shareholders when the truth emerges. Stakeholder theory is reinforced by the evidence that misleading ESG practices undermine trust among investors, regulators and the public, creating reputational and financial penalties. Signaling theory further explains the mechanism: sustainability reports are intended as positive signals of firm quality, yet when those signals are deceptive, they lose credibility and heighten crash risk once exposed. The moderating role of transition climate risk emphasizes how institutional and regulatory pressures make these signals more heavily scrutinized, sharpening market reactions.

The practical implications are twofold. For policymakers, the results highlight the urgency of strengthening ESG reporting standards in Indonesia, moving beyond voluntary disclosure to frameworks aligned with global initiatives such as the EU CSRD or US SEC rules. For investors, the evidence suggests caution in interpreting ESG claims at face value and the importance of integrating ESG quality assessments and active engagement into portfolio strategies. In this way, both regulators and investors can reduce information asymmetry and limit systemic risks arising from greenwashing.

Despite the robustness of the regression results, this study has certain limitations. The greenwashing index employed relies on the availability of both ESG performance and disclosure data, leading to the omission of firms with incomplete information. Recent literature emphasizes that greenwashing is a multidimensional phenomenon encompassing selective disclosure, symbolic actions and the gap between apparent and real sustainability

performance. By relying solely on quantitative ESG scores, the index may overlook subtler forms of greenwashing, such as misleading textual self-representation, excessive green marketing or strategic virtue signaling. To address these shortcomings, future studies could incorporate alternative approaches, such as text-based content analysis of sustainability reports, sentiment analysis or AI-driven classification of corporate disclosures (Dorfleitner and Utz, 2024). Mixed-method designs, including qualitative case studies or interviews with stakeholders, may also help reveal the nuanced motivations behind greenwashing and strengthen the interpretation of its effects on SPCR.

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References

- Agustin, I.N. (2021), "How does the impact of the COVID-19 pandemic on Indonesia's Islamic stock returns?", *JEMA: Jurnal Ilmiah Bidang Akuntansi Dan Manajemen*, Vol. 18 No. 1, pp. 21-35, doi: [10.31106/jema.v18i1.9235](https://doi.org/10.31106/jema.v18i1.9235).
- Agustin, I.N., Safitri, D., Hesniati, H. and Robin, R. (2025), "Navigating market volatility: ESG and Islamic stock performance amidst Covid-19 stringency", *ETIKONOMI*, Vol. 24 No. 1, pp. 69-84, doi: [10.15408/etk.v24i1.38475](https://doi.org/10.15408/etk.v24i1.38475).
- Anwer, Z., Goodell, J.W., Migliavacca, M. and Paltrinieri, A. (2023), "Does ESG impact systemic risk? Evidencing an inverted U-shape relationship for major energy firms", *Journal of Economic Behavior and Organization*, Vol. 216, pp. 10-25, doi: [10.1016/j.jebo.2023.10.011](https://doi.org/10.1016/j.jebo.2023.10.011).
- Ardia, D., Bluteau, K., Boudt, K. and Inghelbrecht, K. (2023), "Climate change concerns and the performance of green vs. brown stocks", *Management Science*, Vol. 69 No. 12, pp. 7607-7632, doi: [10.1287/mnsc.2022.4636](https://doi.org/10.1287/mnsc.2022.4636).
- Baker, S.R., Bloom, N., Davis, S.J., Kost, K.J., Sammon, M.C. and Viratyosin, T. (2020), *The Unprecedented Stock Market Impact of COVID-19* (No. w26945), National Bureau of Economic Research.
- Broeders, D., Schouten, B., Tiems, I. and Verhoeven, N. (2023), "Pricing of climate transition risks across different financial markets", *Journal of Risk Management in Financial Institutions*, Vol. 16 No. 2, pp. 102-115, doi: [10.69554/peju2948](https://doi.org/10.69554/peju2948), available at: www.umlib.nl/taverne-license
- Bua, G., Kapp, D., Ramella, F. and Rognone, L. (2024), "Transition versus physical climate risk pricing in European financial markets: a text-based approach", *The European Journal of Finance*, Vol. 30 No. 17, pp. 2076-2110, doi: [10.1080/1351847x.2024.2355103](https://doi.org/10.1080/1351847x.2024.2355103).
- Cai, R., Lv, T., Wang, C. and Liu, N. (2023), "Can environmental information disclosure enhance firm value? An analysis based on textual characteristics of annual reports", *International Journal of Environmental Research and Public Health*, Vol. 20 No. 5, p. 4229, doi: [10.3390/ijerph20054229](https://doi.org/10.3390/ijerph20054229).

- Chan, T.H., Saqib, A. and Nuzula, A.I. (2024a), "Assessing the carbon footprints of income growth, green finance, institutional quality and renewable energy consumption in emerging Asian economies", *Capital Markets Review*, Vol. 32 No. 1, pp. 1-27.
- Chan, T.H., Saqib, A. and Lean, H.H. (2024b), "Asymmetric effects of investor sentiment on Malaysian sectoral stocks: a nonlinear autoregressive distributed lag approach", *Asian Academy of Management Journal of Accounting and Finance*, Vol. 20 No. 1, pp. 189-215, doi: [10.21315/aamjaf2024.20.1.6](https://doi.org/10.21315/aamjaf2024.20.1.6).
- Chen, Z. and Xie, G. (2022), "ESG disclosure and financial performance: moderating role of ESG investors", *International Review of Financial Analysis*, Vol. 83, 102291, doi: [10.1016/j.irfa.2022.102291](https://doi.org/10.1016/j.irfa.2022.102291).
- Cheng, H., Dong, D. and Feng, Y. (2024), "Corporate greenhushing and stock price crash risk: evidence from China", *Environment, Development and Sustainability*. Vol. 26 No. 5, doi: [10.1007/s10668-024-04935-5](https://doi.org/10.1007/s10668-024-04935-5).
- Chung, R., Bayne, L. and Birt, J. (2024), "The impact of environmental, social and governance (ESG) disclosure on firm financial performance: evidence from Hong Kong", *Asian Review of Accounting*, Vol. 32 No. 1, pp. 136-165, doi: [10.1108/ARA-07-2022-0165](https://doi.org/10.1108/ARA-07-2022-0165).
- Dong, X. and Liu, L. (2023), "Climate risk and future stock price crash: evidence from U.S. firms", *Journal of Climate Finance*, Vol. 3, 100012, doi: [10.1016/j.jclimf.2023.100012](https://doi.org/10.1016/j.jclimf.2023.100012).
- Dorfleiter, G. and Utz, S. (2024), "Green, green, it's green they say: a conceptual framework for measuring greenwashing on firm level", *Review of Managerial Science*, Vol. 18 No. 12, pp. 3463-3486, doi: [10.1007/s11846-023-00718-w](https://doi.org/10.1007/s11846-023-00718-w).
- Du, X. (2015), "How the market values greenwashing? Evidence from China", *Journal of Business Ethics*, Vol. 128 No. 3, pp. 547-574, doi: [10.1007/s10551-014-2122-y](https://doi.org/10.1007/s10551-014-2122-y).
- Dunz, N., Naqvi, A. and Monasterolo, I. (2021), "Climate sentiments, transition risk, and financial stability in a stock-flow consistent model", *Journal of Financial Stability*, Vol. 54, 100872, doi: [10.1016/j.jfs.2021.100872](https://doi.org/10.1016/j.jfs.2021.100872).
- Fahmy, H. (2025), "Empty pledges and powerless conventions: how transition climate risks are disrupting financial markets?", *International Review of Financial Analysis*, Vol. 105, 104384, doi: [10.1016/j.irfa.2025.104384](https://doi.org/10.1016/j.irfa.2025.104384).
- Feng, J., Goodell, J.W. and Shen, D. (2022), "ESG rating and stock price crash risk: evidence from China", *Finance Research Letters*, Vol. 46, 102476, doi: [10.1016/j.frl.2021.102476](https://doi.org/10.1016/j.frl.2021.102476).
- Ferrón-Vílchez, V., Valero-Gil, J. and Suárez-Perales, I. (2021), "How does greenwashing influence managers' decision-making? An experimental approach under stakeholder view", *Corporate Social Responsibility and Environmental Management*, Vol. 28 No. 2, pp. 860-880, doi: [10.1002/csr.2095](https://doi.org/10.1002/csr.2095).
- Fiordelisi, F., Galloppo, G., Lattanzio, G. and Paimanova, V. (2023), "Looking at socially responsible investment strategies through the lenses of the global ETF industry", *Journal of International Money and Finance*, Vol. 137, 102917, doi: [10.1016/j.jimonfin.2023.102917](https://doi.org/10.1016/j.jimonfin.2023.102917).
- Freeman, R.E. and Phillips, R.A. (2002), "Stakeholder theory: a libertarian defense", *Business Ethics Quarterly*, Vol. 12 No. 3, pp. 331-349, doi: [10.2307/3858020](https://doi.org/10.2307/3858020).
- Gan, K., Li, R. and Zhou, Q. (2024), "Climate transition risk, environmental news coverage, and stock price crash risk", *International Review of Financial Analysis*, Vol. 96, 103657, doi: [10.1016/j.irfa.2024.103657](https://doi.org/10.1016/j.irfa.2024.103657).
- Ghitti, M., Gianfrate, G. and Palma, L. (2024), "The agency of greenwashing", *Journal of Management and Governance*, Vol. 28 No. 3, pp. 905-941, doi: [10.1007/s10997-023-09683-8](https://doi.org/10.1007/s10997-023-09683-8).
- Greene, W.H. (2003), *Econometric Analysis*, Pearson Education, India.
- Gregory, R.P. (2021), "When is greenwashing an easy fix?", *Journal of Sustainable Finance and Investment*, Vol. 13 No. 2, pp. 919-942, doi: [10.1080/20430795.2021.1907091](https://doi.org/10.1080/20430795.2021.1907091).
- Hao, J., Sun, R., Gong, X. and Zhu, X.(R.) (2025), "ESG and stock price crash risk revisited: evidence from mandatory ESG disclosure policy in China", *Pacific-Basin Finance Journal*, Vol. 91, 102729, doi: [10.1016/j.pacfin.2025.102729](https://doi.org/10.1016/j.pacfin.2025.102729).

- Hu, J., Zou, Q. and Yin, Q. (2023), "Research on the effect of ESG performance on stock price synchronicity: empirical evidence from China's capital markets", *Finance Research Letters*, Vol. 55, 103847, doi: [10.1016/j.frl.2023.103847](https://doi.org/10.1016/j.frl.2023.103847).
- Huang, R., Xie, X. and Zhou, H. (2022), "'Isomorphic' behavior of corporate greenwashing", *Chinese Journal of Population Resources and Environment*, Vol. 20 No. 1, pp. 29-39, doi: [10.1016/j.cjpre.2022.03.004](https://doi.org/10.1016/j.cjpre.2022.03.004).
- Huang, J., Li, Y. and Han, F. (2024), "Walk well and talk well: impact of the consistency of ESG performance and disclosure on firms' stock price crash risk", *International Review of Economics and Finance*, Vol. 93, pp. 1154-1174, doi: [10.1016/j.iref.2024.03.067](https://doi.org/10.1016/j.iref.2024.03.067).
- Jensen, M.C. and Meckling, W.H. (1976), "Theory of the firm: managerial behavior, agency costs and ownership structure", *Journal of Financial Economics*, Vol. 3 No. 4, pp. 305-360, doi: [10.1016/0304-405x\(76\)90026-x](https://doi.org/10.1016/0304-405x(76)90026-x).
- Jin, X., Chen, Z. and Yang, X. (2019), "Economic policy uncertainty and stock price crash risk", *Accounting and Finance*, Vol. 58 No. 5, pp. 1291-1318, doi: [10.1111/acfi.12455](https://doi.org/10.1111/acfi.12455).
- Johnson, T.F. and Greenwell, M.P. (2022), "Are companies using Twitter to greenwash and hide bad environmental performance?", *Energy, Ecology and Environment*, Vol. 7 No. 3, pp. 213-226, doi: [10.1007/s40974-021-00237-y](https://doi.org/10.1007/s40974-021-00237-y).
- Kim, S.I. and Kim, Y. (2023), "Climate risk, stock crash risk, and greenhouse gas emission trading scheme: evidence from Korea", *Sage Open*, Vol. 13 No. 4, doi: [10.1177/21582440231199377](https://doi.org/10.1177/21582440231199377).
- Li, S., Yin, P. and Liu, S. (2022), "Evaluation of ESG ratings for Chinese listed companies from the perspective of stock price crash risk", *Frontiers in Environmental Science*, Vol. 10, 933639, doi: [10.3389/fenvs.2022.933639](https://doi.org/10.3389/fenvs.2022.933639).
- Li, W., Li, W., Seppänen, V. and Koivumäki, T. (2023), "Effects of greenwashing on financial performance: moderation through local environmental regulation and media coverage", *Business Strategy and the Environment*, Vol. 32 No. 1, pp. 820-841, doi: [10.1002/bse.3177](https://doi.org/10.1002/bse.3177).
- Li, T., Shu, X. and Liao, G. (2024a), "Does corporate greenwashing affect investors' decisions?", *Finance Research Letters*, Vol. 67, 105877, doi: [10.1016/j.frl.2024.105877](https://doi.org/10.1016/j.frl.2024.105877).
- Li, L., Zheng, X. and Wang, S. (2024b), "Renewable energy stocks' performance and climate risk: an empirical analysis", *Journal of Risk and Financial Management*, Vol. 17 No. 3, p. 121, doi: [10.3390/jrfm17030121](https://doi.org/10.3390/jrfm17030121).
- Lin, B. and Wu, N. (2023), "Climate risk disclosure and stock price crash risk: the case of China", *International Review of Economics and Finance*, Vol. 83, pp. 21-34, doi: [10.1016/j.iref.2022.08.007](https://doi.org/10.1016/j.iref.2022.08.007).
- Liu, G., Qian, H., Shi, Y., Zhang, Y. and Wu, F. (2024a), "Does ESG report greenwashing increase stock price crash risk?", *China Journal of Accounting Studies*, Vol. 12 No. 3, pp. 615-639, doi: [10.1080/21697213.2024.2303070](https://doi.org/10.1080/21697213.2024.2303070).
- Liu, X., Wang, D., Han, W. and Wu, S. (2024b), "Does the subsidiary's climate risk matter? Evidence from the stock price crash", *Economics Letters*, Vol. 244, 111952, doi: [10.1016/j.econlet.2024.111952](https://doi.org/10.1016/j.econlet.2024.111952).
- Luo, Y. and Zhang, C. (2020), "Economic policy uncertainty and stock price crash risk", *Research in International Business and Finance*, Vol. 51, 101112, doi: [10.1016/j.ribaf.2019.101112](https://doi.org/10.1016/j.ribaf.2019.101112).
- Ma, Y., Feng, G.F., Yin, Z.J. and Chang, C.P. (2025), "ESG disclosures, green innovation, and greenwashing: all for sustainable development?", *Sustainable Development*, Vol. 33 No. 2, pp. 1797-1815, doi: [10.1002/sd.3210](https://doi.org/10.1002/sd.3210).
- Murata, R. and Hamori, S. (2021), "ESG disclosures and stock price crash risk", *Journal of Risk and Financial Management*, Vol. 14 No. 2, p. 70, doi: [10.3390/jrfm14020070](https://doi.org/10.3390/jrfm14020070).
- Netto, S. V.de F., Sobral, M.F.F., Ribeiro, A.R.B. and Soares, G. R.da L. (2020), "Concepts and forms of greenwashing: a systematic review", *Environmental Sciences Europe*, Vol. 32 No. 19, 19, doi: [10.1186/s12302-020-0300-3](https://doi.org/10.1186/s12302-020-0300-3).
- Nguyen, D.T., Tran, V.T. and Phan, D.H.B. (2023), "Does green activity impact stock price crash risk? The role of climate risk", *Finance Research Letters*, Vol. 55, 103879, doi: [10.1016/j.frl.2023.103879](https://doi.org/10.1016/j.frl.2023.103879).

- Rahman, S., Sinnewe, E. and Chapple, L. (2024), "Environment-specific political risk discourse and expected crash risk: the role of political activism", *International Review of Financial Analysis*, Vol. 95, 103494, doi: [10.1016/j.irfa.2024.103494](https://doi.org/10.1016/j.irfa.2024.103494).
- Saqib, A., Hussain, I. and Mefteh-Wali, S. (2024), "Do stock returns respond to physical and transition climate risks? Evidence from emerging BRICS economies", *Journal of Environmental Management*, Vol. 372, 123303, doi: [10.1016/j.jenvman.2024.123303](https://doi.org/10.1016/j.jenvman.2024.123303).
- Shleifer, A. and Vishny, R.W. (1986), "Large shareholders and corporate control", *Journal of Political Economy*, Vol. 94 No. 3, Part 1, pp. 461-488, doi: [10.1086/261385](https://doi.org/10.1086/261385).
- Silva, P. P.da. (2022), "Crash risk and ESG disclosure", *Borsa Istanbul Review*, Vol. 22 No. 4, pp. 794-811, doi: [10.1016/j.bir.2022.04.001](https://doi.org/10.1016/j.bir.2022.04.001).
- Spence, M. (1973), "Job market signaling", *Quarterly Journal of Economics*, Vol. 87 No. 3, pp. 355-374, doi: [10.2307/1882010](https://doi.org/10.2307/1882010).
- Teti, E., Etro, L.L. and Pausini, L. (2024), "Does greenwashing affect company's stock price? Evidence from Europe", *International Review of Financial Analysis*, Vol. 93, 103195, doi: [10.1016/j.irfa.2024.103195](https://doi.org/10.1016/j.irfa.2024.103195).
- Tong, H. and Wei, S.J. (2008), *Real Effects of the Subprime Mortgage Crisis: Is it a Demand or a Finance Shock?* (No. w14205), National Bureau of Economic Research.
- Wang, L., Ji, Y. and Ni, Z. (2023), "Spillover of stock price crash risk: do environmental, social and governance (ESG) matter?", *International Review of Financial Analysis*, Vol. 89, 102768, doi: [10.1016/j.irfa.2023.102768](https://doi.org/10.1016/j.irfa.2023.102768).
- Wooldridge, J.M. (2010), *Econometric Analysis of Cross Section and Panel Data*, MIT Press, Cambridge, MA.
- Wu, F., Zhu, B. and Tao, S. (2024), "Can good ESG performance of listed companies reduce abnormal stock price volatility? Mediation effects based on investor attention", *PLoS One*, Vol. 19 No. 9, e0307535, doi: [10.1371/journal.pone.0307535](https://doi.org/10.1371/journal.pone.0307535).
- Xu, F., Ji, Q. and Yang, M. (2021), "The pitfall of selective environmental information disclosure on stock price crash risk: evidence from polluting listed companies in China", *Frontiers in Environmental Science*, Vol. 9, 622345, doi: [10.3389/fenvs.2021.622345](https://doi.org/10.3389/fenvs.2021.622345).
- Yang, Y., Zhang, J. and Li, Y. (2023), "The effects of environmental information disclosure on stock price synchronicity in China", *Heliyon*, Vol. 9 No. 5, e16271, doi: [10.1016/j.heliyon.2023.e16271](https://doi.org/10.1016/j.heliyon.2023.e16271).
- Yu, D., Meng, T., Zheng, M. and Ma, R. (2024), "ESG uncertainty, investor attention and stock price crash risk in China: evidence from PVAR model analysis", *Humanities and Social Sciences Communications*, Vol. 11 No. 1, 1152, doi: [10.1057/s41599-024-03621-1](https://doi.org/10.1057/s41599-024-03621-1).
- Zhang, W., Liu, Y., Zhang, F. and Dou, H. (2022), "Green credit policy and corporate stock price crash risk: evidence from China", *Frontiers in Psychology*, Vol. 13, 891284, doi: [10.3389/fpsyg.2022.891284](https://doi.org/10.3389/fpsyg.2022.891284).
- Zhang, X., Kong, L. and Hu, X. (2024), "Shades of green: the impact of greenwashing on stock price crash risk", *Finance Research Letters*, Vol. 70, 106285, doi: [10.1016/j.frl.2024.106285](https://doi.org/10.1016/j.frl.2024.106285).
- Zhao, R., Zhang, D. and Guo, M. (2024), "Do natural disasters affect stock price crash risk? Evidence from emerging markets", *Journal of International Financial Markets, Institutions and Money*, Vol. 93, 102001, doi: [10.1016/j.intfin.2024.102001](https://doi.org/10.1016/j.intfin.2024.102001).

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