Article

Identification of ESG Greenwashing and Its Economic Consequences --A Dual Case Study of Luckin Coffee and Nayuki

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Abstract: Against the backdrop of booming environmental, social, and governance (ESG) investment, corporate greenwashing and inconsistent rating methodologies significantly weaken the validity of ESG information. To address this critical issue, this study utilizes Luckin Coffee (representing governance-dimension fraud) and Nayuki (representing social-dimension food safety scandals) as dual case studies. By adopting a novel "claims-behavior-incidents" analytical framework, this paper systematically compares greenwashing identification mechanisms, market rating reactions, and subsequent economic outcomes across different ESG dimensions. The empirical findings reveal distinct behavioral patterns: governance-dimension fraud is highly verifiable, triggering abrupt rating downgrades and severe capital market punishments. In contrast, social-dimension incidents exhibit rating stickiness, leading to a more gradual release of market risks. Furthermore, the analysis uncovers two hidden rating divergences within current ESG evaluation systems: absent coverage for certain critical issues and cross-dimension divergence in scoring methodologies. These insights highlight the limitations of existing ESG rating agencies in capturing nuanced corporate misconduct. Ultimately, this research provides valuable implications for investors, regulators, and rating agencies to improve ESG information disclosure, refine evaluation frameworks, and mitigate the adverse economic consequences of corporate greenwashing in emerging markets. This comprehensive approach not only enriches the theoretical literature on ESG performance but also offers practical guidance for enhancing market transparency and sustainable development.

Keywords: esg; greenwashing; esg ratings; corporate governance; social responsibility

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1. Introduction

1.1. Research Background

With the progressive implementation of ESG disclosure requirements, rating agencies adopt varying methodological approaches and weighting schemes, leading to notable inconsistencies in ESG assessments. Enterprises adjust their disclosure practices within the permissible framework to enhance stakeholder perceptions, resulting in growing concerns about greenwashing. A well-known coffee chain encountered serious governance-related irregularities, while a prominent tea beverage brand has faced multiple food safety incidents [1]. Although these two companies share similarities in business model and financial structure, their adverse events pertain to distinct ESG dimensions—governance and social—making them suitable for comparative analysis. This paper addresses three research questions: (1) How do identification mechanisms for greenwashing differ between governance-related irregularities and social dimension incidents such as food safety issues? (2) What are the rating agency responses to major negative events across different ESG dimensions, and what patterns of rating divergence emerge? (3) Following public disclosure of such incidents, how do short-term capital

market reactions and medium- to long-term operational impacts differ in terms of transmission pathways, magnitude, and duration?

1.2. Research Significance and Innovation

Theoretical significance: This study bridges the research domains of ESG greenwashing and ESG rating divergence, enriching dimension-specific empirical evidence on the transmission pathway from negative events to greenwashing identification and subsequently to rating divergence, and offering event-level insights into whether rating divergence reflects informational content or measurement noise [1].

Innovations: First, a conceptual innovation—integrating greenwashing and rating divergence within a unified analytical framework to examine differential impacts of events across the G and S dimensions [2]. Second, a methodological innovation—developing a three-tier greenwashing identification framework grounded in claims, behavioral patterns, and incident-level evidence. Third, an evidentiary innovation—detecting two latent forms of rating divergence that conventional metrics fail to capture.

1.3. Research Content and Research Methods

This paper adopts a theory–cases–comparison–conclusion research framework, employing a dual-case comparative approach supplemented by literature review and event-rating cross-reference analysis. Case data include corporate annual reports and ESG reports, regulatory penalty announcements from China and the United States, authoritative media coverage, and publicly available Huazheng Index rating results [3, 4].

2. Literature Review, Theoretical Basis, and Analytical Framework

2.1. Literature Review

ESG greenwashing refers to the practice whereby enterprises project a sustainability image superior to their actual performance through selective disclosure, vague embellishment, or even false statements [5, 6]. This concept was initially defined in foundational work and has since been extended to encompass strategic disclosure behaviors. Domestic research has confirmed that, once identified, greenwashing erodes corporate value through reputational damage, regulatory penalties, and increased financing costs. ESG rating divergence refers to the phenomenon whereby different agencies evaluate the same enterprise inconsistently. Its sources have been systematically categorized into scope, measurement, and weighting dimensions, with measurement differences found to contribute most significantly. Existing studies have extensively verified the effects of rating divergence on stock returns, information disclosure quality, corporate behavior, and financing costs; however, most treat divergence as an exogenous outcome of rating agency practices and rarely examine how the intrinsic dimensional attributes of negative events themselves influence divergence patterns.

2.2. Theoretical Basis and Analytical Framework

Information asymmetry theory: Financial information in the G dimension is well documented and readily verifiable, whereas food safety information in the S dimension is dispersed across numerous retail outlets, resulting in high verification costs; this leads to differing levels of difficulty in detecting greenwashing across the two dimensions [7].

Signaling theory: In the S dimension, claims are inexpensive to replicate but costly to verify, leading the signaling market toward a pooling equilibrium; consequently, the emergence of adverse events serves as an ex post mechanism for differentiation [4].

3. Case Selection and Corporate Background

3.1. Case Selection Rationale and Comparability Justification

This paper selects Luckin Coffee and Nayuki as the comparative cases, based on a rationale of "four matches and one contrast": Industry matching: Both operate in the chain made-to-order beverage sector, with similar risk structures in supply chain and store management; Capital structure matching: Both are incorporated in the Cayman Islands and listed overseas through red-chip structures, with comparable disclosure

environments; Risk event matching: Both have confirmed ESG-related incidents subject to regulatory scrutiny and public reporting, with complete timelines and official records; Disclosure obligation matching: Both maintain well-regulated periodic disclosure practices suitable for textual analysis [7].

The core contrast lies in the ESG dimensional attributes of the incidents: Luckin Coffee's case pertains to governance-related financial irregularities, while Nayuki's relates to food safety under the social dimension [8]. The dimensional distinctions are clearly delineated, supporting precise attribution analysis.

3.2. Corporate Overview and Industry Risk Characteristics

Luckin Coffee was founded in 2017, listed on Nasdaq in 2019, and was delisted after disclosing accounting irregularities in 2020. Following governance restructuring, it returned to profitability; in 2023, its net revenue reached RMB 24.903 billion, with a total of 16,218 stores.

Nayuki was founded in 2015 and listed on the Hong Kong, China Stock Exchange in 2021, positioned in the premium made-to-order tea beverage segment. After a brief period of profitability in 2023, it has suffered consecutive losses; in 2025, its revenue was RMB 4.331 billion, with 1,646 stores.

4. Dual-Case Comparative Analysis

4.1. Luckin Coffee: Narrative-Type Greenwashing in the G Dimension

4.1.1. Event Overview

The primary financial misreporting incidents, along with the corresponding supervisory penalty outcomes, administrative interventions, and subsequent corporate corrective measures concerning Luckin Coffee, are comprehensively summarized, chronologically organized, and detailed in Table 1.

Table 1. Key Timeline of the Financial Fraud Incident of Luckin Coffee

Date	Key Event	Key Consequences/Data	Source
2019-05	Nasdaq IPO	Listing marked the start of rapid expansion	Form20-F
2020-01-31	Muddy Waters issued a short-selling report	Alleged inflation of store sales	Muddy Waters short-selling report
2020-02-03	Luckin Coffee denied short-selling allegations in an official announcement	Stock prize briefly recovered	SEC announcement
2020-04-02	Self-disclosure of financial fraud	Inflated transaction value by approximately RMB 2.2 billion;stock price plunged by 75.57% in a single day	Company announcement
2020-06	Nasdaq delisting	Delisted and ceased U.S.stock trading	Nasdaq announcement
2020-09	Penalized by China's State Administration for Market Regulation	Total fines of RMB 61 million	SAMR announcement
2020-12	Reached a settlement with the SEC	USD 180 million civil penalty	SEC settlement documents
2021	Settlement of investor class actions	USD 187.5 million in compensation	Court settlement documents
2022-04	Completed debt restructuring	Concluded bankruptcy proceedings	Company announcement

2022-07	Established a board-level Sustainability Committee	Improved corporate governance structure	Governance report

Sources: Luckin Coffee Inc.'s Form 20-F annual reports for fiscal years 2020-2023 (disclosure documents filed with the U.S. SEC); the Ministry of Finance of the People's Republic of China: Announcement of the Inspection Results on the Quality of Accounting Information of the Domestic Operating Entities of Luckin Coffee (July 2020); the State Administration for Market Regulation: Administrative Penalty Decision on Luckin Coffee for Unfair Competition (September 2020); the U.S. Securities and Exchange Commission (SEC): Announcement of the USD 180 Million Settlement with Luckin Coffee (December 2020); Luckin Coffee: Transformation and Rebuilding- 2020-2022 Corporate Governance Report of Luckin Coffee (November 2022).

4.1.2. Greenwashing Identification under the "Claims-Behavior-Incidents" Framework

Luckin has not published a dedicated ESG report, so there is no G-dimension claim at the level of narrow ESG text. This paper classifies it as broad ESG greenwashing in the G dimension for the following reason: in the capital market, the high-growth narrative implicitly carries expectations about the effectiveness of the company's internal control and governance, and investors treat operating performance as an indirect signal of governance quality [9]. By misrepresenting financial results, the company indirectly shaped market perceptions of its governance practices; it therefore falls within the scope of broad ESG greenwashing analysis, in contrast to Nayuki's narrow S-dimension greenwashing based on ESG report texts.

Examined under the "claims-behavior-incidents" framework, Luckin's public narrative during the relevant period constituted a set of "high-growth myths": the number of stores expanded by roughly a thousand stores per quarter, and the company positioned itself as a data-driven retail technology company [10, 11]. Some alternative risk data had already signaled elevated governance risk prior to the disclosure of accounting irregularities, yet had not been incorporated into the formal assessments of mainstream ESG rating agencies—reflecting the structural challenge in G-dimension risk identification: evidence of accounting irregularities resides within internal financial systems, beyond the scope of conventional rating methodologies.

4.1.3. ESG Rating Responses and Forms of Divergence

The Luckin case illustrates a pronounced form of divergence—the lack of rating coverage. Prior to the disclosure of irregularities, the company had not been subject to routine assessment by major ESG rating agencies: it had been publicly listed for a relatively short period and provided minimal ESG-related disclosures; additionally, Chinese concept stocks were generally underrepresented in the coverage scope of these agencies. Investors encountered not a discrepancy among evaluations from different agencies, but rather an absence of formal evaluation altogether: certain alternative data providers indicated elevated risk levels, whereas mainstream agencies issued no public assessments [12].

4.2. Nayuki: Execution-Gap-Type Greenwashing in the S Dimension

4.2.1. Event Overview

Nayuki published a detailed ESG report with comprehensive quality-management-related disclosures, which later proved inconsistent with multiple real-world incidents shown in Table 2.

Table 2. Timeline of Nayuki's Key Events and Operational Milestones

Date	Event Type	Brief Event Description	Regulatory/Market Outcome
2021-08	Undercover exposure of store hygiene	Xinhua News Agency undercover found food hygiene violations in stores	Fines imposed on involved stores; stock price dropped over 10% intraday

2024-04	Compliance dispute over semi-finished product labeling	"Homemade" labels on store products inconsistent with actual purchased semi-finished goods	Exposed by media; no large administrative penalty imposed
2024-06	Consumer association warning notice	Inadequate implementation of food safety responsibilities in stores	Public warning issued by Beijing Consumers Association
2025-06	Foreign-object incident in prepackaged tea bags	Consumer found foreign object in commissioned prepackaged tea product	Mediated by market regulator; company compensated RMB 1,000

Sources: Annual reports of Nayuki Holdings Limited for fiscal years 2023, 2024, and 2025, and its 2021 Environmental, Social and Governance (ESG) Report (via HKEXnews); Xinhua News Agency: Investigative report on hygiene problems at Nayuki stores by "undercover" reporters (August 2, 2021); Beijing Municipal Administration for Market Regulation: Notice of administrative penalties against the stores involved; Shaoxing Shangyu District Administration for Market Regulation: Mediation information on the "6·21 Nayuki foreign-object-in-beverage incident" (June 2025).

4.2.2. Greenwashing Identification under the "Claims-Behavior-Incidents" Framework

Negative events related to Nayuki in the social (S) dimension unfolded as a sequence of incidents. The initial incident occurred in August 2021, when undercover reporters from a national news agency visited two Nayuki stores in Beijing and observed unsanitary conditions, including cockroaches near food preparation areas, use of mangoes with visibly spoiled sections after trimming, and unauthorized alteration of product time labels prior to resale. Following publication of the report, the company's stock price declined by over 10% within a single trading session; local market regulation authorities imposed the statutory maximum fine of RMB 100,000 on each store, levied individual fines of RMB 250,000 and RMB 280,000 against the respective store managers, and conducted inspections across 1,811 similar outlets in the affected regions [10].

Applying the three-layer 'Claims–Behavior–Incidents' framework: at the claims layer, documented systems and reporting mechanisms appear comprehensive; at the behavior layer, practices such as arbitrary modification of shelf-life labels and continued use of deteriorated fruit indicate significant deviations from stated standards, particularly within franchise and commissioned manufacturing operations; at the incident layer, media investigations and official enforcement actions consistently contradicted public commitments [13]. The alignment of discrepancies across all three layers supports identification of greenwashing. This case exemplifies the 'execution-gap' pattern—systems exist in principle, but their operational scope falls substantially short of what is publicly represented, and ESG disclosures omit or underreport adverse occurrences. Given the fragmented nature and verification challenges associated with S-dimension issues, greenwashing cannot be confirmed based on isolated incidents and instead requires corroboration through multiple, temporally clustered events.

4.2.3. ESG Rating Responses and Forms of Divergence

The ESG rating trajectory of the Huazheng Index for Nayuki indicates that, across six consecutive rating periods from April 2024 to October 2025, the overall rating remained unchanged at BB, while the industry ranking declined from 11th to 23rd. At the component level, the Social (S) score decreased from 81.39 in October 2024 to 78.97 in April 2025 and remained at BB; the Governance (G) score fell from 86.23 (A) to 83.72 (BBB), then recovered to 85.04 (A); and the Environmental (E) score remained consistently in the CC range, fluctuating narrowly between 61.8 and 62.6. Notably, following the foreign-object incident on June 21, 2025, the S score in the subsequent July 31 rating period stayed unchanged at 78.97—the same value recorded in April—while the overall rating only improved to BBB in the July 2026 cycle, with the S score declining marginally to 78.07. Dimensional adjustments were asymmetric: the G score was upgraded in recognition of

governance enhancements, and the E score rose due to improved disclosure practices, yet the S score—the dimension most directly tied to core operational and stakeholder practices—remained static over an extended period. This intra-firm pattern of "G up, E up, S stagnant" represents a form of dimensional-level rating divergence [14]. In contrast to cases where ESG rating systems are entirely absent, the Nayuki case reflects a system that is present but functionally muted: ratings are issued, yet fail to meaningfully respond to material events, resulting in a persistent disconnect between rating outcomes and real-world developments.

4.2.4. Economic Consequences: Persistent Value Erosion

The consequences of the S-dimension events are manifested not as a single violent shock, but as persistent value erosion in both operations and valuation. On the capital market side, the stock broke its IPO issue price on the first day of listing; on the day of the August 2021 incident, the stock price fell more than 10% intraday; thereafter, the stock declined for a prolonged period, at one point in March 2025 falling below HKD 1 and becoming a "penny stock," with a cumulative decline of approximately 95% from the issue price and a market value erosion of over 90%, before being removed from the Stock Connect list. On the operating side, after the only profitable year of 2023 (a net profit of RMB 11.166 million), the company recorded a loss of RMB 926 million in 2024; in 2025, revenue fell to RMB 4.331 billion with a loss of RMB 243 million. In 2024, the average order value at directly operated stores fell from RMB 29.6 to RMB 26.7, and average daily orders per store fell from 344.3 to 270.5.

4.3. Comprehensive Comparison of Events in the G and S Dimensions

4.3.1. Comparison of Event Attributes

The negative events associated with the two companies contrast along three fundamental attributes. In terms of verifiability, the accounting misconduct at Luckin is evidenced by accounting vouchers and bank statements, and enforcement by domestic financial regulators and the SEC can yield quantitative determinations precise to the level of hundreds of millions of yuan; conversely, Nayuki's food safety incidents are evidenced by on-site store scenes and case-by-case products, and apart from the qualitative conclusions in administrative penalties, the degree of quality-control failure is difficult to quantify and calibrate. In terms of attributability, the misconduct at Luckin was explicitly attributed to the systematic conduct of the chief operating officer and his subordinates, with the chain of responsibility pointing directly to the governance core; for Nayuki's 2025 foreign-object incident, part of the responsibility was shifted outward to the commissioned processing manufacturer, making the attribution more dispersed. In terms of repairability, rectifying accounting misconduct requires a change of control, substantial compensation payments, and the comprehensive rebuilding of the internal control system—highly costly yet with a clear path; a single food safety incident is inexpensive to remediate, but the extensive scale of the store network means that the probability of recurrence of similar incidents cannot be reduced to zero (As shown in Table 3).

Table 3. Comparison of the Attributes of the Negative Events in the Two Cases

Comparison Dimension	Luckin Coffee (Financial fraud in G dimension)	Nayuki (Food safety scandal in S dimension)
Type of greenwashing	Narrative greenwashing	Execution-gap greenwashing
Core incident	Inflated transaction volume of approx. RMB 2.2 billion in Q2–Q4 2019	2021 store hygiene incident; 2025 foreign object in prepackaged tea incident
Type of evidence	Hard evidence (accounting vouchers, bank statements, etc.)	Soft evidence (undercover reports, regulatory notices, consumer complaints, etc.)

Degree of regulatory confirmation	Quantitative penalty determinations by multiple authorities	Scattered administrative penalties and mediation records for individual cases
Attributability of liability	Responsibility concentrated on executives and internal control	Responsibility dispersed among stores, franchisees and contract manufacturers
Repairability	Clear remediation path, but huge cost in capital and control rights	Single incident easy to rectify, but systemic risk hard to eliminate
Form of rating divergence	Absence of rating coverage (enterprise exits rating scope)	Sticky divergence and cross-dimensional divergence
Short-term market reaction	75.57% single-day stock plunge, triggering delisting	Short-term stock price drop on incident day, no delisting risk

Sources: Compiled from Luckin Coffee's Form 20-F annual report for fiscal year 2020, the Ministry of Finance's announcement of the inspection results, the SEC settlement announcement, Xinhua News Agency reports, the penalty notices issued by the Beijing market regulatory authorities, and the mediation information of the Shaoxing Shangyu District Administration for Market Regulation.

4.3.2. Comparison of Rating Responses and Divergence Forms

Two cases jointly reveal two forms of implicit rating divergence that conventional indicators fail to capture. First, rating coverage absence: a company was not covered by mainstream rating agencies and exited the rating scope immediately following the disclosure of a major incident. The divergence manifests as a binary distinction between 'being rated' and 'not being rated'. Second, sticky divergence: another company remains within rating coverage, yet its ratings exhibit delayed responses to sustainability-related incidents, accompanied by silent divergence reflected in cross-dimensional inconsistency [12]. This indicates that rating divergence encompasses not only cross-sectional disparities among agencies but also adjustment inertia over time and uneven coverage across structural dimensions.

4.3.3. Comparison of Economic Consequences

The economic consequences of the two cases exhibit contrasting patterns along the "intensity-persistence" dimension. Core operational and capital market indicators are compared in the table below (As shown in Table 4).

Table 4. Comparison of Key Operational and Capital Market Indicators

Indicator Category	Indicator Item	Luckin Coffee	Nayuki
Direct penalty cost	Total expenditure of fines + settlements	Over RMB 2.5 billion	Small fines + thousand-yuan level consumer compensation
Capital market impact	Largest single-day stock price decline	75.57% (directly triggered delisting)	Max 10% intraday drop per incident, no delisting risk
Market cap change	Outcome after major incident	Delisted, then restructured and resumed operation	Market value evaporated by over 90% since listing
Operational performance	Representative annual revenue	RMB 24.903 billion in 2023	RMB 4.331 billion in 2025

Sources: Luckin Coffee's Form 20-F annual reports for fiscal years 2020–2023; Annual reports of Nayuki Holdings Limited for 2021–2025; Announcement of Inspection Results on Accounting Information Quality of Luckin Coffee, Ministry of Finance; Administrative Penalty Decision on Luckin Coffee, State Administration for Market Regulation; SEC settlement announcement; Penalty and mediation records of local market regulatory authorities on food safety incidents.

Luckin Coffee experienced high-intensity, concentrated enforcement actions: its market value declined by approximately 4.8 billion US dollars in a single day. Delisting,

a fine from the U.S. Securities and Exchange Commission amounting to 180 million US dollars, and a settlement of 187.5 million US dollars were implemented within two years. These measures were rapidly reflected in capital market adjustments and monetary compensation. Nevertheless, the company achieved value recovery following its market exit through governance restructuring and operational improvement, following an evolutionary path of "severe enforcement-market exit-revival". In contrast, Nayuki encountered low-intensity, sustained adverse impacts [13]. Each incident led to a stock price decline of approximately 10% and minimal financial penalties. However, the progressive weakening of consumer confidence undermined its premium brand positioning. Since its initial public offering, its market value has contracted by over 90%, and it reported losses for two consecutive fiscal years, with no discernible resolution point for these challenges. In other words, G-dimension incidents resemble acute severe illnesses: highly consequential but with defined intervention pathways. S-dimension incidents are analogous to chronic conditions: non-critical in isolation, yet progressively diminishing corporate value over time. They interact negatively with deteriorating business fundamentals, forming a reinforcing cycle that complicates diagnosis and remediation.

5. Research Conclusions, Policy Implications and Limitations

5.1. Research Conclusions

This paper examines the financial misconduct of Luckin Coffee and the food safety incident involving Nayuki as controlled cases, applying a three-tier framework of "claims-actions-events" to analyze the differentiated impacts and economic consequences of negative incidents in the G and S dimensions on ESG ratings, yielding four conclusions. First, ESG greenwashing is not confined to the E dimension. Luckin Coffee emphasized governance shortcomings through a high-growth narrative, resulting in "narrative greenwashing", while Nayuki masked deficiencies in quality control execution behind comprehensive ESG reporting, producing "implementation-gap greenwashing". Identification of the latter typically requires cumulative exposure across multiple incidents. Second, the nature of the event shapes rating responses. G-dimension issues involve verifiable evidence and clear accountability, prompting an abrupt "cliff response" — often reflected in rating withdrawal upon confirmation. S-dimension issues involve less definitive evidence and diffuse responsibility, leading to "rating stickiness" within the system. Third, rating divergence manifests beyond inter-agency standard deviation; absence of rating coverage and intra-dimensional inconsistency also signal information failure. Fourth, economic consequences follow an "intensity-persistence" mirrored structure: penalties for G-dimension issues are concentrated and severe but permit exit and value recovery; penalties for S-dimension issues are milder yet persistent, unfolding gradually through erosion of consumer trust and operational fundamentals — with cumulative wealth impact potentially comparable.

5.2. Policy Implications

For rating agencies: Implement a mandatory review mechanism for major negative incidents to ensure timely responses to soft S-dimension events; disclose dimensional scores and records of major risk incidents separately; expand basic ESG rating coverage to red-chip enterprises and chain consumption industries.

For investors: Avoid overreliance on aggregate ESG ratings. Apply the three-tier "claims–actions–events" analytical framework, differentiate hard evidence for G-dimension issues from soft signals for S-dimension issues, and actively consult alternative information sources such as regulatory notices, consumer complaints, and media investigations.

For chain tea enterprises: Align ESG disclosures with verifiable internal control capacity and refrain from unsubstantiated claims. Prioritize resource allocation toward operational weak points—including franchised stores and outsourced supply chains—and substitute formal policy statements with auditable operational data.

5.3. Research Limitations and Future Research Directions

This study has four limitations. First, the external validity of the two-case design is limited. The chain tea industry receives high media attention, so the reputational impact of S-dimension incidents may be amplified relative to other sectors; generalization to industries with lower public visibility should therefore be approached cautiously. Second, the rating analysis relies exclusively on data from a single provider—China Securities Index (Huazheng)—and lacks cross-provider validation. Third, case-based methods cannot fully control for confounding influences such as industry-wide fluctuations and firm-specific strategic decisions; consequently, the isolated effect of food safety scandals on Nayuki's performance remains unquantifiable. Fourth, the cases differ in listing venues and regulatory frameworks, which may affect comparability.

Future research can advance along three lines. First, large-sample panel data incorporating ratings from multiple providers could empirically examine how negative incidents across different ESG dimensions influence rating divergence. Second, novel metrics—including rating coverage absence and rating stickiness—can be formally defined and measured. Third, textual analysis techniques can be applied to systematically analyze corporate ESG reporting responses to adverse events.

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