


The Effect of ESG News on the Chinese Stock Market

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ABSTRACT

The relation between corporate environmental, social, and governance (ESG) performance and firm value has received increasing attention. However, the recent literature on corporate ESG performance evaluation suffers from potentially biased data sources, incomplete coverage, and uncertainty among agencies. The objectivity, timeliness, and breadth of news allow the media to provide a good perspective on ESG instead. This study investigated the effects of ESG-related news on the stock market to confirm that news is a helpful complement to the assessment of ESG performance. The results show that 1) ESG news has a greater and more significant impact on the stock market than news unrelated to ESG. 2) Of the three fields of ESG news, environmental news has a greater and more significant impact, which varies widely by topic. 3) Environmental news has different impacts on listed firms in different regions. This study provides new ideas for a complete and objective assessment of corporate ESG performance and the management of a corporate media image from the use of ESG news.

KEYWORDS

ESG News, Event Study, Financial Mainstream Media, Sustainable Development

INTRODUCTION

Harmonious coexistence between people and nature is a long-standing topic in discussions of sustainability in the development of the economy and society. Through a series of relevant policies and regulations, governments around the world have urged firms to fulfill their corporate social responsibility (CSR) in terms of environmental, social, and governance (ESG) policies to promote the sustainable development of the economy and society.

Previous studies have tended to identify which ESG indicators are associated with firm values. For instance, Pedersen et al. (2020) used carbon intensity, non-sin stock indicators, and accruals as measures of environmental, social responsibility, and corporate governance measures, respectively, finding that proxy governance indicators lead to relatively positive returns. Moreover, Kim et al. (2019) used toxic chemical release as the primary measure of a firm's environmental performance and found that local institutional ownership is negatively related to toxic pollution.

As professional rating agencies attempt to score ESG performance across firms in aggregate, some studies have used ESG scores to examine the impact of ESG performance on firm values. The

DOI: 10.4018/JGIM.313916

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abovementioned rating agencies include Morgan Stanley Capital International (MSCI), Thomson Reuters, Bloomberg, Financial Times Stock Exchange (FTSE) Russell, and RobecoSAM (Yoon et al., 2018; Zhang et al., 2020; Yu et al., 2018; Aouadi and Marsat, 2018). The assessment of ESG scores by these rating agencies relies heavily on the annual and CSR reports¹ issued by the firms themselves. However, the information provided by firms is likely subjectively biased (Duque-Grisales and Aguilera-Caracuel, 2019). Indeed, Escrig-Olmedo et al. (2019) pointed out that rating agencies do not fully integrate sustainability principles into the ESG assessment process. In addition, in some developing countries, such as China, there are no strict regulations that require listed firms to release their CSR reports annually², making it more challenging for rating agencies to assess ESG scores. Moreover, Avramov et al. (2022) pointed out that there are significant differences in the ESG scores of certain firms across different rating agencies, which they define as uncertainty. Therefore, the assessment of ESG performance with external information that can be an effective complement to existing ESG scores is of great necessity.

The abovementioned deficiencies in ESG scoring can be remedied from the perspective of news reports, providing a viable option for obtaining more objective and accurate ESG reports. Specifically, news articles usually describe a firm's issues and events in a neutral and unbiased manner (Schudson, 2001). In addition, the media can cover all listed firms and report the associated news on a daily basis. Recent studies in behavioral finance have found a direct connection between firm-related news coverage and firm performance. For example, Yu et al. (2013) used an equilibrium model with empirical evidence that firm value is affected by media disclosures. Moreover, Mitchell and Mulherin (1994) found that relevant news reports from Dow Jones could reflect a firm's market performance to some extent. More recently, some studies have pointed out that the content of news articles is significantly associated with firm performance in the stock market (Tetlock, 2007; Tetlock et al., 2008; Carretta et al., 2011). ESG-related news can be used to assess the ESG performance of a firm, acting as a valuable supplement to ESG scores from a third-party perspective.

In this study, we explore the impact of ESG-related news about a firm in terms of different ESG categories, environmental news topics, and geographic regions of listed firms. We find that there is a significant relationship between firm performance and ESG-related news, and this relationship is significantly stronger than that of firm performance and ESG-unrelated news. Second, corporate environmental news has a greater impact than news about social responsibility or corporate governance. Third, the impact of environmental news varies significantly across topics, with news about pollution and waste having a greater negative impact than those of other news types. Finally, this study finds that news related to firms located in eastern China has a positive impact on firm performance, while that related to firms located in western China has a negative impact. Overall, this study provides valid evidence for the use of ESG news to further enhance the ESG assessment system.

RELATED WORKS

In recent years, regulators, firms, and investors have moved away from focusing solely on a firm's financial data and toward taking greater account of nonfinancial information, such as firm performance, on ESG. To explain why firms focus on ESG aspects, stakeholder theory posits that maximizing economic profit is no longer the ultimate goal of a firm and that in the long run, the overall value of a firm will be maximized when the interests of shareholders and other stakeholders are aligned (Laplume et al., 2008; Kim et al., 2019). Specifically, stakeholder theory makes up for the limitation of shareholder theory, which ignores the fact that human capital is an important value-added resource for firms and that the environment is a fundamental guarantee for the longevity of a firm's operations. The development of a firm cannot be achieved without the input and participation of all stakeholders. When the interests of all stakeholders in the firm are taken into account, the overall firm performance can be maximized in a long-term sustainable manner. These stakeholders include natural resources and climate conditions related to the natural environment; employees, consumers, and local residents

related to social responsibility; and shareholders, creditors, suppliers, and other actors related to governance. In fact, ESG assessment reflects the emphasis placed by a firm on social, environmental and other stakeholder interests. Therefore, it is of great importance for a firm to pay attention to its ESG performance for its long-term development strategy.

The measurement of the ESG performance of a firm has become a major difficulty in the existing research. The concept of ESG is derived from CSR (Gillan et al., 2021), and ESG research originated from the study of the impact of one aspect—environmental, social responsibility, and corporate governance—on firm performance. Kim et al. (2019) used data on toxic chemical releases as the primary measure of a firm’s environmental performance and found that local institutional investors’ earnings were negatively related to the toxic chemical release. Moreover, Edmans (2011) used employee satisfaction to measure performance in terms of CSR and found that higher employee satisfaction promotes higher firm profits. Additionally, Nini et al. (2012) measured corporate governance performance based on creditor-led interventions, noting that it could increase firm value. These studies have laid the foundation for research on ESG performance. With the evolution of the ESG concept, Pedersen et al. (2020) used low carbon intensity, non-sin stock metrics, and low accrual levels as measures of environmental, social responsibility, and corporate governance, respectively, and attempted to combine them, finding that doing so would yield relatively positive returns for the firm. To obtain a more comprehensive understanding of a firm’s ESG performance, many scholars have used the ESG composite score to study its impact on firm performance. These scores are taken mainly from specialized rating agencies, such as Thomson Reuters, Bloomberg, MSCI, Korea Corporate Governance Service, FTSE and RobecoSAM (Aouadi and Marsat, 2018; Baldini et al., 2018; Rehman et al., 2016; Do and Kim, 2020; Ionescu et al., 2019). However, ESG rating agencies base their ESG scores primarily on firms’ own CSR or ESG reports. Therefore, even though rating agencies communicate with firms to confirm data and obtain other supplementary materials, the results are usually subjectively biased. In addition, only approximately one-quarter of the more than 4,000 A-share listed firms in China publish CSR reports, leading directly to the fact that only some firms have ESG scores. Moreover, Avramov et al. (2022) pointed out that there are significant differences in the ESG scores of certain firms across rating agencies and defined such differences as uncertain in terms of the ESG ratings of firms. The potential bias caused by the provision of information from the firms themselves, the incompleteness induced by the fact that only some firms publish CSR or ESG reports, and the uncertainty in the ESG ratings of firms across rating agencies all prompt us to look for a more objective and wide-ranging perspective from which to more accurately describe the ESG performance of firms.

Figure 1. Word cloud plots for the ESG information extracted from news³



News is an easy and effective way for investors to obtain information, and the news content may contain information about ESG, as shown in Figure 1. In fact, both the efficient market hypothesis (Fama, 1965) and modern behavioral finance (Tetlock, 2007; Carretta et al., 2011) assume that new information can affect stock movements. News reports have become the main channel through which investors obtain new information (Mitchell and Mulherin, 1994; Ramnath, 2002; Tetlock, 2007). The impact of news on stock markets has been widely confirmed by economics, management, and computer science scholars (Li et al., 2018). For example, Teng and Yang (2021) used the number of daily news items to measure the impact of news and found a robust correlation between the number of daily news items and firm performance. With the advancement of text analysis techniques, Tetlock (2007) measured news sentiment in individual reports and found that pessimism in news articles predicted a downward trend in stock prices. In the computer science field, researchers have denoted news as a high-dimensional vector or matrix to explore the effective predictive power of news article content on stock trends. Moreover, Kraus and Feuerriegel (2017) used one-hot coding to transform the text of financial disclosures into 0-1 high-dimensional vectors, revealing a higher directional accuracy when predicting stock prices, while Hájek (2018) used the bag-of-words method to extract sentiment and financial information from annual reports to improve prediction quality. Additionally, Huang et al. (2020) used the word2vector method to apply public transfer description text data to improve the accuracy of the firm value assessment model, while Li et al. (2020, 2022) and Cheng and Li (2021) took such analysis a step further by quantifying market information, including transaction data and financial news, as a stream of matrices to capture the interactions of market factors on stock movements. ESG-related news similarly attract the attention of investors, making it timely reflected in stock prices. Furthermore, cognitive psychology posits that people's attention is a limited cognitive resource and that public attention to one aspect inevitably comes at the expense of less attention being paid to other aspects (Kahneman, 1973). As investors pay further attention to green corporate sustainable development, the limited attention theory implies that they focus their attention on the hotly discussed ESG topic. At the same time, does the increase in investors' attention to ESG news weaken their attention to ESG-unrelated news? On this basis, we propose the following hypotheses:

Hypothesis 1a (H1a): ESG news has a significant impact on the stock market.

Hypothesis 1b (H1b): ESG news is more impactful than ESG-unrelated news.

The concept of ESG integrates three main aspects: the environment, social responsibility, and corporate governance. The environmental aspect includes measures of carbon emissions, greenhouse gases, climate change, waste pollution, energy consumption, and natural resources (especially water); the social responsibility aspect covers policies related to gender equality, human rights, communities, health and safety, and product reliability; and the corporate governance aspect covers corruption and bribery policies, the management of fair competition, risk management, tax transparency, and incentive compensation. Andrews and Caren (2010) argued that of the three fields represented by ESG, the environment and social responsibility have received the most public and media attention. In a separate study of ESG, Pedersen et al. (2020) found that corporate governance indicators had a more prominent impact on firms than environmental and social responsibility indicators. Moreover, Ionescu et al. (2019) verified the discrepancy between the three aspects through the impact of ESG scores, revealing that the environmental score has little association with the market capitalization of the firm, while the social and governance scores have a negative and positive impact on the market capitalization of the firm, respectively. In addition, rating agencies tend to consider the impact of each ESG element as different and therefore assign distinct weights to these three fields when calculating a firm's overall ESG score (Brogi and Lagasio, 2019). All of these facts show the difference in the level of attention paid to the three ESG fields. This difference is also reflected in our experimental data (the number of news stories varies significantly by category). Therefore, combined with limited

attention theory, we assume that ESG-related news also has different impacts on the stock market, based on which we propose the following hypotheses:

Hypothesis 2a (H2a): Environmental, social responsibility, and corporate governance-related news has significant impacts on the stock market.

Hypothesis 2b (H2b): The impacts of environmental, social responsibility, and corporate governance-related news on the stock market differ significantly.

The research on media-aware stock movements has shifted from the number of news articles to news content as a way to quantify the impact of news. Schumaker and Chen (2009) represented news articles as word vectors to explore the impact of news content. Moreover, to refine the text vector dimension, Li et al. (2014a) studied the impact of news on the stock market by representing news as a vector through proper nouns and verified the validity of proper nouns for representing news content. Based on the argument in behavioral finance that the main news content can be measured by its emotional expressions, Tetlock (2007) used the proportion of emotional words to total words in the article to represent the content of news articles and found that pessimism in news articles predicted a downward trend in stock prices. As such, the impact of news is derived from investors' attention to its content (Li et al., 2018). Limited attention theory posits that the impact of different information on investors' attention varies (Chen et al., 2021). For example, Li et al. (2014b) found that news on topics such as penalties for violations, mergers, and acquisitions had a greater impact on the stock market than on topics such as executive and operational performance. In fact, different aspects of ESG news (E, S, and G news) contain various types of content. E news, for example, includes news on environmental opportunities, pollution and waste, natural resources, climate change, and other topics. Therefore, this study distinguishes different types of content according to the various topics of ESG news and proposes the following hypothesis:

Hypothesis 3 (H3): The impact of ESG-related news on the stock market varies with the content of news articles.

Sustainable development theory states that a collective must first meet the basic needs of its members before considering its long-term sustainable development (Gladwin et al., 1995). Similarly, when a country has reached a high level of development and economic capacity, it begins to pursue sustainable quality development. Calomiris and Mamaysky (2019) found significant differences in the impact of the news on stock market volatility between developed and developing countries, with news from the former being more impactful than that from the latter. The European Investment Expert Report (2016) highlighted that existing ESG rating factors are influenced by geography, with developed market firms generally having higher ESG scores than those of emerging market firms. Therefore, the importance of ESG may vary across countries at different stages of development. Although China is vast, its development is highly uneven. For example, Shanghai, in the eastern region, had the fourth-highest gross domestic product (GDP) in the world in 2021, surpassing both London and Paris, while provinces in the western region, such as Gansu and Guizhou, had only about one-quarter of Shanghai's GDP per capita. Thus, the phenomenon of disparity in the emphasis on ESG may also occur within China. In this study, we divide the locations of listed firms according to the eastern and western regions of China to investigate the differences in their ESG emphasis and propose the following hypothesis:

Hypothesis 4 (H4): The impact of ESG-related news on the stock market varies depending on the level of regional development.

RESEARCH DESIGN

Sample and Data

The analysis in this study combines two types of datasets, that on financial news text data and that on stock transaction data, both of which are aggregated into a single data set at the daily firm level. Both the news text and stock transaction data selected for the study span are from January 2015 to December 2018.

Firm-specific news conveys information about firm fundamentals, some of which may contain ESG disclosures. All the financial news data are obtained from 32 mainstream financial websites in China, including Securities Times, Sina.com, Sohu.com, QQ.com, Phoenix.com, and Hexun.com, using a focused crawler designed specifically for this purpose. Specifically, the crawler first downloads relevant news web pages from these websites and then extracts the titles, publishers, publication date, and the body of news articles from the acquired web page. Then, we adopt Bloom filters⁴ to detect and remove duplicate news articles. In total, we crawled 480,475 news items covering 3,423 listed firms.

Stock transaction data are obtained from the China Stock Market and Accounting Research database, the largest and most accurate financial and economic database in China. The main indicators used in this research are the daily stock price, circulating market value, turnover rate, circulating ratio, stock return, market return, and risk-free interest rate of all A-share listed firms.

Extraction of ESG-Related News

Zhao et al. (2018) classified ESG through an expert scoring method that combines 38 aspects, such as carbon dioxide emissions and energy consumption rates, from those CSR and ESG reports issued by firms. Moreover, Nugent et al. (2021) differentiated 3-5 topics for each ESG category in news texts through word distribution. Rating agencies such as MSCI use a scaling approach to refine text from firm annual reports, CSR reports, and firm interviews into three categories—environmental, social, and governance—and 10 subcategories (Rehman et al., 2016; Brogi and Lagasio, 2019). Therefore, this study refers to the classification criteria of the above studies and combines the machine learning and expert scoring methods to identify 750 ESG-related news items from 480,475 raw news items and categorizes them into 10 topics. Specifically, the Elasticsearch engine is first applied to extract the top 300 relevant news articles from 480,475 raw news data in each ESG aspect. Three ESG experts are further invited to evaluate these 900 selected news articles, and 753 ESG news items are judged as being related to ESG. Then, these 753 ESG news items, treated as positive samples, along with 2,247 ESG-unrelated news items, treated as negative samples, are fed into the one vs. rest-support vector machine (OVR-SVM) classifier (Chen and Wu, 2017). Furthermore, the well-trained model is applied to 480,475 news articles to identify ESG-related news. A total of 32,947 news articles are marked as being related to ESG. Finally, three experts screen these automatically tagged ESG news articles to filter out misclassified articles (ESG-unrelated news), and the prediction accuracy of the proposed model is approximately 83.8%. A total of 27,610 ESG news articles are obtained for this study. In addition, these three experts independently score each ESG news article to determine to which news group—G, S, and E—or subtheme of each group it should belong. The statistics of our experimental data are shown in Table 1.

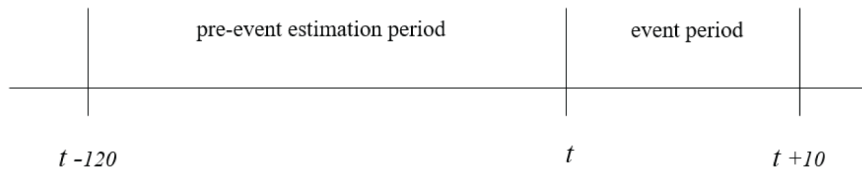
Table 1. Statistics of ESG news

ESG news	Topic	Number of news articles	Total
Environmental	Environmental opportunities (EO)	7,813	14,368
	Pollution & waste (PW)	4,279	
	Natural resources (NR)	1,987	
	Climate change (CC)	289	
Social	Human capital (HC)	1,889	6,344
	Product liability (PL)	2,030	
	Stakeholder opposition (SHO)	1,269	
	Social opportunities (SO)	1,156	
Governance	Corporate governance (CG)	3,258	6,898
	Corporate behavior (CB)	3,640	

METHODOLOGY

To examine the effects of ESG-related news on stock returns and, thus, the stock market, we follow the approach of Calomiris and Mamaysky (2019) and use a basic event study methodology. An event study is a statistical method that examines stock return changes after an event. According to Wang et al. (2019), specifically, the event study period is divided into a pre-event estimation period and an event period. In this study, each news item is treated as a firm event, and the day of the news report is recorded as the event day (t). The ten-day period after the event day, i.e., $[0, 10]$, is considered the event period, and the 120-day period before the event day, i.e., $[-120, -1]$, is considered the pre-event estimation period, as shown in Figure 2. The basic principle of the event study approach is to use data from the pre-event estimation period to calculate the expected return in the event period using classical asset pricing models and further obtain and evaluate the abnormal and cumulative abnormal returns in the event period.

Figure 2. Timeline for the event study



In this study, we use the Fama-French three-factor model (Fama and French, 1993) used in most studies to calculate the expected return, which is the profit or loss that an investor would expect on an investment with a known historical rate of return without any additional nonfinancial information. The Fama-French model is defined as follows:

$$R_{i,t} = \alpha_i + \beta_i (R_t^m - R_t^f) + \delta_i SMB_t + \eta_i HML_t + \varepsilon_{i,t} \quad (1)$$

where $R_{i,t}$ is the return of stock i on the t^{th} day. R_t^m is the market return on the t^{th} day. SMB_t denotes the scale factor for small market capitalization minus big market capitalization on the t^{th} day. HML_t represents the net asset market value ratio factor that stands for a high book-to-market ratio minus a low book-to-market ratio on the t^{th} day. All of these variables are measured using the pre-event estimation period.

The coefficients estimated from the pre-event estimation period and the three factors of the event period are used to calculate the expected return of stock i for the event period using equation (1). The abnormal return of stock i on the t^{th} day during the event period is defined as:

$$AR_{i,t} = R_{i,t}^a - R_{i,t}^{exp} \quad (2)$$

where $AR_{i,t}$ is the abnormal return of stock i on the t^{th} day. $R_{i,t}^a$ is the actual return of stock i on the t^{th} day. $R_{i,t}^{exp}$ is the expected return of stock i on the t^{th} day. All of these variables are measured using the event period. The average abnormal return ($\overline{AR_t}$) is obtained by averaging the abnormal returns of all stocks traded on the t^{th} day:

$$\overline{AR_t} = \frac{1}{n_t} \sum_{i=1}^{n_t} AR_{i,t} \quad (3)$$

where n_t is the number of stocks traded on the t^{th} day and $\overline{AR_t}$ is the average abnormal return. The cumulative abnormal return (CAR_{t_1,t_2}) between t_1 and t_2 is formulated as the sum of the average abnormal return:

$$CAR_{t_1,t_2} = \sum_{t=t_1}^{t_2} \overline{AR_t} \quad (4)$$

We also use the capital asset pricing model (CAPM) to calculate the expected return, making the results more robust, which is defined as follows:

$$R_{i,t} = \alpha_i + \beta_i (R_t^m - R_t^f) + \varepsilon_{i,t} \quad (5)$$

The CAPM model is used to estimate the expected return, and then, Equations (1) to (4) are repeated to obtain the average and cumulative abnormal returns based on the CAPM.

EMPIRICAL RESULTS

ESG is already a key global concern in terms of sustainable development, and many countries are promoting related research and practice. In this context, this study first investigates the effect of ESG-related news articles on the stock market. We also compared the effect of ESG-related news with that of ESG-unrelated news. This process is achieved mainly through an event study methodology. Second, the impact of ESG-related news on the stock market is discussed in detail for each of the three ESGs. Third, we verify that the impact of ESG-related news on the stock market varies with

the content of news articles. Fourth, we also examine the variation in the degree of influence of ESG news in regions with different levels of development.

ESG-Related News and ESG-Unrelated News

To investigate the short-term effect of ESG news on the stock market, we observe the abnormal returns 10 days after the news was reported. Specifically, we adopt the Fama-French three-factor model to calculate the expected returns and use the CAPM to test the robustness. Both methods can significantly explain price outperformance for most stocks (Fama and French, 1993). The results based on the CAPM model are essentially the same as those based on the Fama-French three-factor model, so in the following section, we illustrate only those results based on the Fama-French three-factor model unless explicitly stated otherwise.

Previous studies have revealed that press releases affect stock performance in several developing and developed stock markets around the world. In this study, we further revealed that ESG-related news has a significant impact on the stock market and is more impactful than ESG-unrelated news as shown in Table 2, presenting evidence consistent with H1a and H1b to some extent. There are several more interesting findings in this study. (1) The abnormal returns of firms with ESG-related news coverage are statistically significant on certain days in the [0, 9] event period after the ESG news was reported. (2) ESG-unrelated news causes only one day of significant abnormal return volatility, which is significantly less intense than that caused by ESG-related news. (3) The average abnormal returns caused by ESG-unrelated news are similar to random wandering with no pattern. However, ESG-related news leads to significant positive fluctuations on day 0, followed by successive negative average abnormal returns in the future. This result acts as an argument for the validity of stakeholder theory from an ESG news perspective. Firms that disclose more ESG news about their stakeholders attract more investors' long-term attention and promote firms' sustainable development compared to those firms that disclose ESG-unrelated news.

Specifically, ESG news reports elicited an average abnormal return of 0.8827 on the day of the event, followed by a decline of over 0.4 in the following days. According to our statistics, the likely reason for this result is that the media tends to report more positive ESG news than it does negative ESG news. Investors made a buying choice based on the good news on that day, causing positive stock price fluctuations. Subsequently, in the context of overheated and high-risk ESG topics, investors would reduce their buying preference after rational analysis following the news reports, which led to a sustained decline in stock prices. In addition, ESG-related news has a more significant impact than ESG-unrelated news, in terms of both the duration of the news impact and the significance level. These findings support the idea that ESG news can convey more information than just the fundamentals and macro factors included (Maniora, 2017).

Table 2. Abnormal and cumulative abnormal returns of ESG-unrelated and ESG-related news

Day	ESG-unrelated news		ESG-related news	
	AR	CAR	AR	CAR
0	-1.0952	-1.0952	0.8827***	0.8827***
1	-0.5138	-1.609***	-0.2442	0.6384***
2	0.117	-1.492**	-0.4465**	0.1919
3	-0.4626	-1.9546***	-0.4059*	-0.214
4	0.1693	-1.7853***	-0.45**	-0.6639***
5	-1.4499**	-3.2352***	-0.1541	-0.818***
6	-0.5007	-3.736***	-0.3675*	-1.1855***

Table 2 continued on next page

Table 2 continued

Day	ESG-unrelated news		ESG-related news	
	AR	CAR	AR	CAR
7	0.322	-3.414***	-0.09	-1.2755***
8	0.3208	-3.0932***	-0.3309	-1.6063***
9	0.3823	-2.7108***	-0.4992**	-2.1055***
10	-0.3011	-3.0119***	-0.2685	-2.374***

Notes: This table shows the results of the abnormal and cumulative abnormal returns (one basis point equals a daily return of 0.1%) within a certain period after the ESG-related news was reported. We estimate the abnormal returns and cumulative abnormal returns for the 10 days after the ESG-related news was reported based on the Fama-French three-factor model using an event study methodology. We set the pre-event estimation window to [-120, -1] trading days to fully conduct regression analysis.

*, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Figure 3. Cumulative abnormal returns caused by ESG-related and ESG-unrelated news after the events

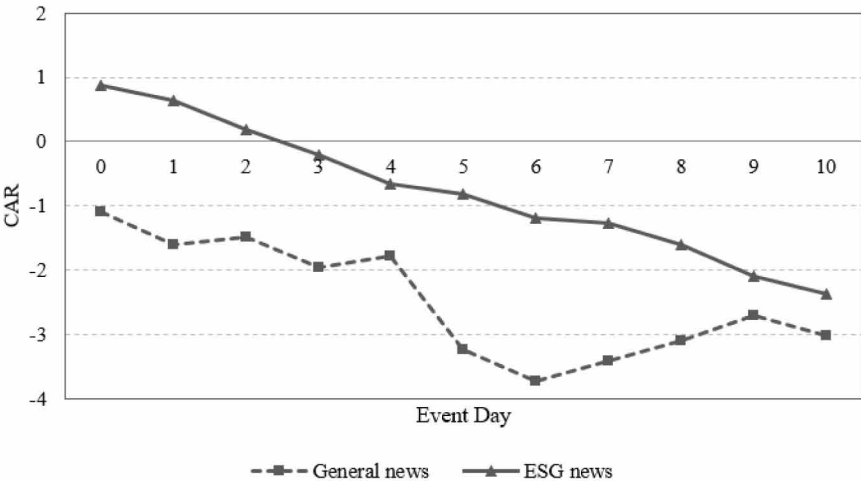


Figure 3 is plotted based on columns 3 and 5 in Table 2, showing the cumulative abnormal returns 10 days after the news was reported. We find a downward trend in cumulative abnormal returns caused by both ESG-related and ESG-unrelated news coverage. In contrast, ESG news caused positive cumulative abnormal returns the day after the event, followed by a continuous downward trend. A good explanation for this result is that the Chinese stock market, in general, underperformed from 2015 to 2018 and that the firms in focus have, on average, trended in line with the overall market. ESG-related news causes a positive shock due to the novelty of the topic and the additional information it can bring to investors. However, overall, such a shock remains in line with the whole market.

E News, S News, and G News

While sustainable development is a common concern across countries, the focus and direction of such attention varies. Generally, there are three main foci of sustainability, namely, environmental,

social responsibility, and corporate governance. Moreover, related studies have shown that the impact of news on stock performance may vary with the types of news articles (Li et al., 2014). Therefore, in this section, we examine the impact of ESG news on the stock market in more detail along three content dimensions: E news, S news and G news.

In Table 3, the empirical results support H2a and H2b, i.e., that E, S, and G news have significant impacts on the stock market, with the impacts of each category on the stock market differing significantly. The main findings are as follows. (1) The abnormal returns of firms with E news coverage are statistically significant for most days in the [0,10] event period after the E news was reported. (2) Similar to the effect of ESG-related news, E news also has a significant positive impact on the stock market on the event day, followed by sustained negative abnormal returns. (3) E news led to larger and more significant abnormal returns. Specifically, E news reports caused an average abnormal return of 1.3472 on the event day, which was greater than the return of 0.8827 elicited by ESG-related news in general. The abnormal returns continued to be negative for the next 10 days, and its absolute value was also more significant than that caused by ESG news. These results indicate that investors are concerned about ESG aspects, especially the environmental performance of firms (Song et al., 2017), essentially validating limited attention theory, which states that investors focus their limited attention on more interesting aspects. (4) S news and G news did not result in statistically significant average abnormal returns. These findings are, to some extent, consistent with the conclusion by Surroca et al. (2010) that corporate social responsibility has no significant relationship with firm financial performance. In addition, it is difficult for investors to obtain accurate information about corporate governance from news (Millar et al., 2005). In this study, therefore, the discussion on S news and G news is not further developed.

Table 3. Abnormal and cumulative abnormal returns of E, S, and G news

Day	E news		S news		G news	
	AR	CAR	AR	CAR	AR	CAR
0	1.3472***	1.3472***	0.7724**	0.7724**	-0.5639*	-0.5639*
1	-0.2019	1.1453***	-0.1839	0.5885*	-0.2812	-0.8451**
2	-0.9314***	0.2138	-0.5354*	0.053	-0.4911	-1.3362***
3	-0.8177***	-0.6039**	-0.3651	-0.3121	-0.4012	-1.7374***
4	-0.5174*	-1.1213***	-0.1572	-0.4693	-0.5147*	-2.2521***
5	-0.2509	-1.3721***	-0.1678	-0.6371*	0.4291	-1.823***
6	-0.8172***	-2.1893***	-0.3749	-1.012***	-0.4337	-2.2567***
7	-0.5041*	-2.6934***	-0.1689	-1.1809***	0.3758	-1.8809***
8	-0.4926*	-3.186***	-0.0414	-1.2223***	-0.3433	-2.2243***
9	-0.8984***	-4.0844***	-0.2127	-1.4349***	-0.4177	-2.6419***
10	-0.5143*	-4.5987***	0.0692	-1.3658***	-0.2594	-2.9013***

Notes: This table shows the results of the abnormal and cumulative abnormal returns (one basis point equals a daily return of 0.1%) within a certain period after the E, S, and G news were reported. We estimate the abnormal and cumulative abnormal returns for the 10 days after ESG-related news was reported based on the Fama-French three-factor model in the event study methodology. We set the pre-event estimation window to [-120, -1] trading days to fully conduct regression analysis.

*, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Figure 4. Cumulative abnormal returns caused by E, S, and G news after the event day

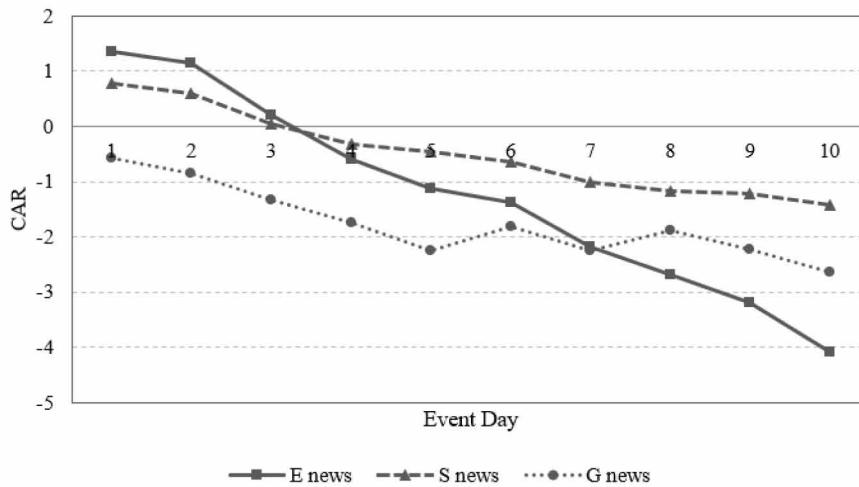


Figure 4 shows the cumulative abnormal returns caused by E, S, and G news. Similar to Figure 3, all cumulative abnormal return curves show a downward trend. E news had a significant positive shock effect on the day of news coverage, followed by a more extensive and sustained pullback. However, S news initially caused small positive swings in cumulative abnormal returns, and G news initially caused small negative swings. Furthermore, the effect of E news on cumulative abnormal returns was larger and more significant, suggesting that current Chinese investors' ESG concerns are more focused on environmental issues.

Different Topics of E News

In light of the preceding study, we find that the impacts of different types of news vary, with E news having the most significant impact on the stock market. In particular, a number of academic papers have aimed to assess shareholder reactions to various types of extra-financial information, particularly information that is environmentally harmful (Capelle-Blancard and Petit, 2019; Naumer and Yurtoglu, 2020). In this section, we address the subcategory of E news in terms of environmental issues. Specifically, we study E news in terms of various topics based on their textual content by referring to how MSCI classifies ESG indicators. Since the topics of E news were exceptionally unevenly distributed across the four topics, with only 2% of E news on climate change and 14% on natural resources, we select only the two topics with the most numerous news items for analysis: environmental opportunities, pollution, and waste.

Table 4. Abnormal and cumulative abnormal returns of E news items on different topics

Day	E news about environmental opportunities		E news about pollution & waste	
	AR	CAR	AR	CAR
0	3.3034***	3.3034***	-8.6668***	-8.6668***
1	-0.216	3.0873***	-2.857***	-11.5238***
2	-1.0467	2.0406***	-1.663**	-13.1869***
3	-1.9811***	0.0595	-1.3038*	-14.4907***

Table 4 continued on next page

Table 4 continued

Day	E news about environmental opportunities		E news about pollution & waste	
	AR	CAR	AR	CAR
4	-0.1023	-0.0428	-0.6028	-15.0935***
5	-0.6191	-0.6619	-3.0119***	-18.1053***
6	-1.8634***	-2.5253***	-1.6111***	-19.7165***
7	-1.1353**	-3.6606***	-1.3153**	-21.0317***
8	-0.1939	-3.8544***	1.1657*	-19.866***
9	-0.6226	-4.477***	-3.5393***	-23.4053***
10	-1.1105**	-5.5875***	-0.7061	-24.1114***

Notes: This table shows the results of the abnormal and cumulative abnormal returns (one basis point equals a daily return of 0.1%) within a certain period after the E news with different topics was reported. We estimate the abnormal and cumulative abnormal returns for the 10 days after ESG-related news was reported based on the Fama-French three-factor model in the event study methodology. We set the pre-event estimation window to [-120, -1] trading days to fully conduct regression analysis.

*, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

In Table 4, the empirical results are shown to be in accordance with H3. That is, the impact of E news on the stock market varies with the content of news articles. Several findings can be made as follows. (1) The abnormal returns of firms with E news about environmental opportunities are statistically significant for some of the days in the event period. (2) The abnormal returns of firms with E news about pollution and waste coverage are statistically significant for almost all days in the event period. (3) E news reports on environmental opportunities lead to a significant positive impact on the stock market on the event day, followed by sustained negative abnormal returns. (4) E news reports on pollution and waste caused continuous negative abnormal returns from the day reported, causing a great degree of change. Specifically, E news about environmental opportunities elicited an average abnormal return of 3.3034 on the event day. These findings may be due to the fact that news about environmental opportunities provides investors with positive information about opportunities and prospects for the firm's development (Fordham et al., 2017). E news about pollution and waste caused an unexpected 8.8668 drop in average abnormal returns on the event day. The significant and sustained decline in stock price shows that investors are generally less bullish on firms with more pollution and wasteful news (Kim et al., 2019) and tend not to invest in these firms after the relevant news breaks. Distinguishing the impact of news on different topics can help strengthen regulators' supervision of ESG news releases, with different regulatory priorities for companies in different regions, and can also encourage listed companies to increase their release of stakeholder information and capture the focus of different topics.

Figure 5. Cumulative abnormal returns caused by E news on different topics

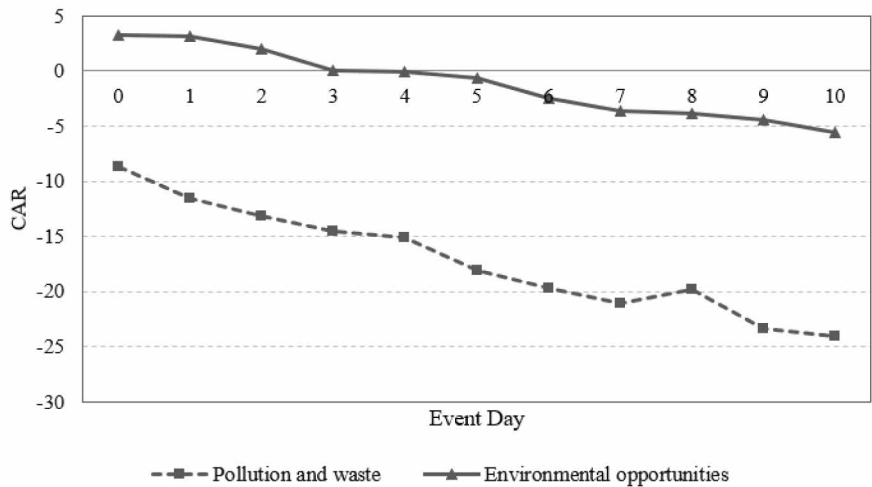


Figure 5 shows the cumulative abnormal returns caused by E news about environmental opportunities and pollution and waste. Similar to the overall stock market trend, both cumulative abnormal return curves show a downward trend. The E news reports on environmental opportunities had a significant positive impact on stock prices the day of news coverage, followed by a substantial and sustained pullback. However, E news about pollution and waste initially caused a large negative shock in cumulative abnormal returns, followed by a sustained decline. In addition, the effect of E news about pollution and waste on cumulative abnormal returns is larger and more significant, which shows a considerable difference in how investors view different E news topics.

Different Regions

As mentioned above, the importance of ESG for sustainable development varies across countries at different stages of development (Calomiris and Mamaysky, 2019). Due to historical reasons and geographical characteristics, the economic development of regions in China is quite uneven. In this section, we divide the locations of listed firms according to the eastern and western regions of China to investigate the differences in their ESG emphases. The empirical results in Table 5 support H4, i.e., that the impact of E news on the stock market varies depending on the level of regional development. We find that (1) the abnormal returns of firms in developed regions are statistically significant for several days in the event period after the E news was reported; (2) the abnormal returns of firms in developing regions with E news coverage are statistically significant for almost all days in the event period; (3) the E news of firms both in developed and developing regions has a significant positive impact on the stock market on the day. (4) abnormal returns for firms in developed regions alternate between positive and negative 1-10 days after the E news report, while abnormal returns for firms in developing regions are consistently negative.

Specifically, the E news of firms in developed regions elicits an average abnormal return of 4.803 on the event day and does not subsequently retrace or lose value. E news for firms in developing regions causes an average abnormal return of 1.6997 on the event day, followed by consistently significantly negative abnormal returns. A good explanation of these findings is that the coverage of E news from firms in both developed regions and developing regions contains certain good information. Due to the overall high ESG performance and credibility of firms in developed regions (European Investment Expert Report, 2016), their E-news-induced abnormal returns remain stable. In contrast, the E news of firms in developing regions is less credible and causes a persistent pullback after a positive shock.

These findings are also similar to those of the study by Zhou et al. (2020), which concluded that environmental policies have significantly different effects on the financial performance of firms in different regions. Given this result, investors can reasonably distinguish among the ESG information of different companies when incorporating ESG news into their investment process.

Table 5. Abnormal and cumulative abnormal returns of E news about firms from different regions

Day	Developed regions		Developing regions	
	AR	CAR	AR	CAR
0	4.803***	4.803***	1.6997***	1.6997***
1	0.798	5.6011***	-1.1183**	0.5814
2	-0.3872	5.2138***	-1.8342***	-1.2529**
3	0.1721	5.3859***	-2.4536***	-3.7065***
4	0.5978	5.9838***	-0.91*	-4.6164***
5	0.3114	6.2952***	-1.0517**	-5.6681***
6	-1.2909***	5.0043***	-0.903**	-6.5711***
7	-0.9173**	4.087***	-0.4669	-7.038***
8	0.1291	4.216***	-1.1973***	-8.2353***
9	-0.5963	3.6198***	-1.8594***	-10.0947***
10	-0.8918**	2.7279***	-0.3664	-10.4611***

Notes: This table shows the results of the abnormal and cumulative abnormal returns (one basis point equals a daily return of 0.1%) within a certain period after the E news about firms from different regions was reported. We estimate the abnormal and cumulative abnormal returns for the 10 days after ESG-related news was reported based on the Fama-French three-factor model in the event study methodology. We set the pre-event estimation window to [-120, -1] trading days to fully conduct regression analysis.

*, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Figure 6. Cumulative abnormal returns caused by E news about firms from different regions

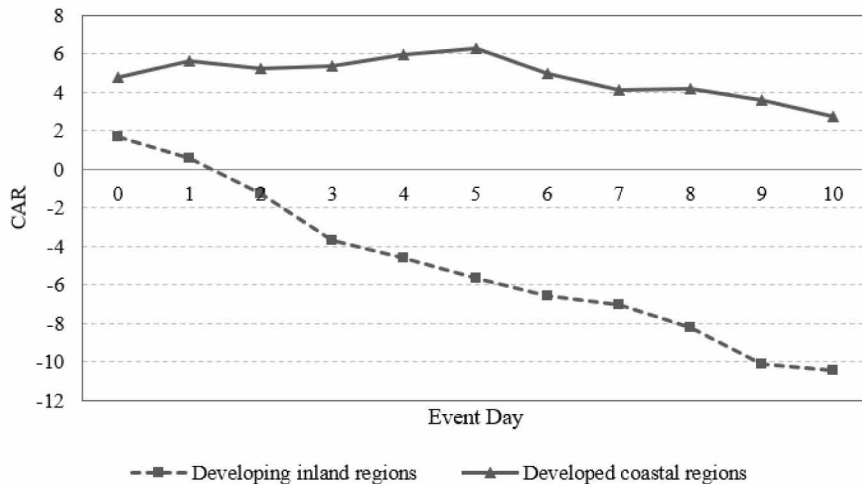


Figure 6 shows the cumulative abnormal returns caused by E news for firms in developed and developing regions. E news for firms in developed regions had a sizeable positive effect on cumulative abnormal returns, and this effect remained relatively stable and positive in the following days. In contrast, E news for firms in developing regions caused a positive shock to cumulative abnormal returns, followed by a large and sustained pullback. On the second day after the E news report, its cumulative abnormal returns became negative and continued to decline. These findings illustrate the validity and credibility of the information contained in E news for firms in developed regions.

CONCLUSION

This study systematically explores the interactions between ESG news content and stock market activity, finding significant fluctuations in the abnormal returns of the stock market by comparing actual and expected stock market returns when ESG news is reported, consistent with the models of DeLong et al. (1990) and Campbell et al. (1993) concerning noise and liquidity traders. The impact of ESG-related news is found to be greater and more significant than that of ESG-unrelated news. ESG news about companies tends to contain more information on stakeholders. When investors construe ESG news as an indication that a company is more stakeholder-focused, they believe that the company has long-term sustainability, which is consistent with the stakeholder theory that when the interests of all stakeholders in a company are taken into account, overall firm performance can be maximized in a long-term sustainable manner. While environmental, social, and governance are all part of the stakeholders, we find that E news led to larger and more significant abnormal returns than those caused by other news types. This finding is consistent with the limited attention theory, where investors prefer to place limited attention on more important aspects.

In practice, the data required by international rating agencies for ESG ratings rely mainly on the self-provision of the companies concerned. Moreover, the update frequency of ESG ratings is relatively slow, and most ESG rating reports are published once per year (Gillan et al., 2021). This study provides a relatively objective and timely information source with which agencies can assess corporate ESG performance in terms of the release of ESG news. In addition, given that the advancement of the web has made the impact of news on stock performance more apparent (Tetlock, 2007; Carretta et al., 2011), firms should be more active in broadcasting their ESG news so that investors can better understand their sustainability strategies and performance. This effective information delivery can help stock markets optimize resource allocation. At the same time, this study suggests that regulators pay attention to the regulation of news releases, especially those of ESG news, in their existing press discipline and regulatory policies.

However, it is slightly unfortunate that the study of S and G news has not yielded significant effects because objective information on social responsibility and corporate governance appears sparsely in financial news, while official media focus more on prevalent environmental topics. Investors, in contrast, may equally value more data sources, such as social media (e.g., blogs and Weibo) and digital interactive media (e.g., eHuDong and HuDongYi⁵), to obtain information. Therefore, we subsequently enrich the media data on social responsibility and corporate governance from these two source types and examine their impacts on the stock market from the investor perspective to provide a more comprehensive basis for the assessment of corporate ESG performance.

ACKNOWLEDGMENT

This study was supported by the National Natural Science Foundation of China (NSFC) (71873108, and 62072379), the Fundamental Research Funds for the Central Universities (JKB22FG03 and JBK2201041), the Financial Innovation Center of Southwestern University of Finance and Economics (FIC2022C0002), the Key Laboratory of Financial Intelligence and Financial Engineering of Sichuan Province, and the Research Center of Higher Financial Education.

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ENDNOTES

- ¹ On October 22, 2014, the European Union demanded that large companies reveal certain nonfinancial information regarding how they operate and meet the social and environmental challenges with which they are faced (Directive 2014/95/EU of the European Parliament and the council).
- ² According to the China Corporate Social Responsibility White Paper of the Hurun Research Institute, among the 4,140 A-share listed firms, only 1,021 listed firms issued social responsibility reports in 2020.
- ³ E news represents environmental-related news, S news represents corporate social responsibilities-related news, and G news represents corporate governance-related news.
- ⁴ A Bloom filter is a space-efficient probabilistic data structure, conceived by Burton Howard Bloom in 1970, that is used to test whether an element is a member of a set.
- ⁵ HuDongYi and eHuDong are the Shenzhen and Shanghai Stock Exchanges' interactive platforms regarding the relationship between listed corporates and investors, respectively.

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