Proceedings of ICMRED 2026 symposium: The Future of Work: Strategy, Workforce Transformation, and Organizational Renewal
DOI: 10.54254/2754-1169/2026.LD33106

Quantitative Impact of ESG Factors on the Valuation of A-Share Listed Companies Using R: A Case Study of BYD

Shukai Zhan

The Faculty of Business and Economics, Monash University Clayton Campus, Clayton, Australia
szha0330@student.monash.edu

Abstract. The relevance of Environmental, Social, and Governance (ESG) performance in corporate valuation has been growing, in tandem with investors' increasing focus on sustainability and non-financial risks. As a leading enterprise in China's new energy vehicle industry, BYD plays a pivotal role in the A-share market, making it a suitable case study for examining how ESG-related information is priced by the capital market. This study adopts a case firm approach, focusing on BYD, to investigate the quantitative impact of ESG factors on firm valuation. To this end, an event-based analytical framework implemented in R is utilised. ESG-related disclosure events are identified based on publicly available announcements from the CNINFO platform and third-party ESG rating updates. The present study employs an event study approach to examine market reactions around these events by calculating abnormal returns and cumulative abnormal returns within specified event windows. The empirical evidence indicates that the stock market demonstrates discernible valuation responses in the vicinity of ESG-related disclosure events, thereby suggesting that ESG information is indeed a relevant factor in investor valuation decisions.

Keywords: ESG, BYD, Event study methodology, Cumulative abnormal returns, Chinese A-share market

1. Introduction

There has been an increasing focus in academic research and investment practice on Environmental, Social, and Governance (ESG) considerations recently. This is because traditional financial indicators often fail to fully reflect firms' long-term value and non-financial risks. A plethora of studies have been conducted on the subject of the relationship between ESG performance and firm valuation. However, empirical findings in this area remain inconclusive and context-dependent [1]. Evidence suggests that ESG information is more likely to be incorporated into market prices when it is material to firms' risk exposure or future cash flows [2]. However, in emerging markets such as China, ESG research faces notable data constraints. Third-party ESG scores for A-share listed companies are often discontinuous over time, and ESG disclosures are frequently irregular—factors that limit the applicability of conventional panel data approaches. Nevertheless, recent evidence based on Chinese firms indicates that ESG-related information may still exhibit valuation relevance, highlighting the need for alternative empirical strategies [3]. In light of the aforementioned context, the present study concentrates on BYD and investigates whether information pertaining to ESG

DOI: 10.54254/2754-1169/2026.LD33106

issues is capable of eliciting quantifiable responses in the capital market. The present paper employs a quantitative case-study design, utilising an event study framework implemented in R to analyse market reactions to ESG-related disclosure and rating-update events. Utilising the semi-strong form of market efficiency, abnormal returns and cumulative abnormal returns are calculated around event dates to capture the temporal pattern of valuation responses [4,5]. By following this approach, the present study establishes a feasible and reproducible framework for ESG valuation analysis in the context of realistic data availability constraints. Furthermore, it offers insights into corporate sustainable development and ESG disclosure practices.

2. Methodology

2.1. Data sources and event identification

The present study investigates the impact of Environmental, Social and Governance (ESG)-related information on firm valuation in China's A-share market. The investigation adopts a quantitative case-study design, with BYD designated as the focal firm. The core identification logic adheres to the event study tradition: when a well-defined information event occurs and the market is semi-strong form efficient, stock prices should adjust quickly to incorporate the event's information content. Consequently, abnormal returns measured around ESG-related disclosure dates can be interpreted as market-based valuation responses to ESG information [4-6].

This event-based strategy is particularly suitable for the Chinese ESG research setting for two reasons. Firstly, third-party ESG scores for A-share firms are often not consistently available as a continuous annual panel, thus limiting conventional long-horizon panel regressions. Secondly, ESG information in practice tends to enter the market through discrete announcements (e.g., annual report disclosures, ESG rating updates, sustainability-related disclosures) rather than through smooth year-by-year score changes. By focusing on observable information releases and market reactions around them, the event study approach provides a feasible and reproducible empirical design under realistic data constraints.

The empirical objective is not to claim universal causality, but rather to test whether ESG-related information events for BYD are associated with statistically and economically meaningful abnormal valuation responses. In a single-firm setting, this design offers greater transparency in data construction and result interpretability, while still producing quantitative evidence comparable to that from broader empirical finance research.

2.2. Event definition and data sources

2.2.1. ESG-related events

Events are defined as dates on which ESG-related information is plausibly released to market participants. In this study, the primary event category consists of BYD's annual report disclosure dates, which represent significant, highly visible information releases and typically include governance and responsibility-related disclosures. A secondary category comprises ESG rating update dates from third-party providers when such dates are publicly observable. Each event is recorded with its announcement date and aligned to the nearest trading day if the announcement occurs on a non-trading day. This alignment is standard practice in event studies, ensuring that measured price responses correspond to trading opportunities rather than calendar dates [5].

DOI: 10.54254/2754-1169/2026.LD33106

The daily closing prices for BYD are collected from publicly accessible financial data sources [7]. Market returns are proxied by the CSI 300 Index, a widely used benchmark that represents the performance of large-cap A-shares in Shanghai and Shenzhen [8]. The use of the CSI 300 Index is deemed appropriate because BYD is a large, highly traded firm, and the index captures comprehensive market conditions relevant to systematic risk adjustments in the market model [3,9]. Daily returns are computed as log differences of closing prices in order to enhance comparability and mitigate issues arising from scaling.

2.3. Estimation window, event window, and abnormal return model

2.3.1. Return construction

Let $R_{i,t}$ denote BYD's daily log return and $R_{m,t}$ denote the market index return on day t. The analysis uses log returns:

$$R_t = \ln(P_t) - \ln(P_{t-1}) \tag{1}$$

where P_t is the closing price (or index level) on day t.

2.4. Market model

The estimation of expected returns is derived from the market model, which utilises a regression analysis to predict firm returns on market returns over a pre-event estimation window. The market model can be expressed as:

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + \varepsilon_{i,t} \tag{2}$$

where $\varepsilon_{i,t}$ is the error term.

The parameters, denoted by the letters α_i and β_i , are estimated using an estimation window of [-250, -30] trading days relative to the event date. A buffer period (the 30 trading days immediately preceding the event) is excluded to minimise potential contamination from anticipatory trading or information leakage. The computation of abnormal returns (AR) within the designated event window is conducted as follows: First, the abnormal return on day t is calculated as:

$$AR_{i,t} = R_{i,t} - (\widehat{\alpha_i} + \widehat{\beta_i} R_{m,t}) \tag{3}$$

Cumulative abnormal returns (CAR) over a specified time period $[\, t_1, t_2 \,]$ are calculated by summing the abnormal returns:

$$CAR_{i,[t_1,t_2]} = \sum_{t=t_1}^{t_2} AR_{i,t} \tag{4}$$

2.4.1. Baseline and robustness windows

The baseline event window is set to [-5, +5], a common choice that captures short-horizon information incorporation while limiting confounding influences [5,10]. Two additional windows, [-1, +1] and [-10, +10], are utilised as robustness checks. The shorter time frame is characterised by its emphasis on immediate reactions, while the longer time frame is more conducive to the capture

DOI: 10.54254/2754-1169/2026.LD33106

of gradual adjustments, though it should be noted that it may also encompass unrelated news. The reliability of the valuation relevance is reinforced by the consistency of the results obtained across these time periods.

2.4.2. Implementation in R

All calculations, event alignment, AR/CAR construction, and visualisations are implemented in R, ensuring reproducibility. Figure outputs are generated directly from the computed CAR series, and tables are exported as CSV files to facilitate seamless integration into manuscript formatting.

3. Results and analysis

3.1. CAR dynamics around ESG-related events

As illustrated in Figure 1, the average CAR pattern around BYD's ESG-related events is presented. The CAR trajectory demonstrates a predominantly positive valuation response within the designated event window, thereby signifying that the dissemination of ESG-related information is concomitant with advantageous market pricing. It is noteworthy that CAR increases in the pre-event period (approximately Day -10 to Day -3), suggesting that ESG-related information may be partially anticipated or that information diffusion occurs gradually prior to formal disclosure. In the context of event study settings, such pre-event accumulation can be attributed to a variety of factors, including investor expectations, staged disclosure processes, analyst interpretation, or partial information leakage. This phenomenon does not inherently invalidate the event design, but rather underscores the market's anticipatory behaviour [6].

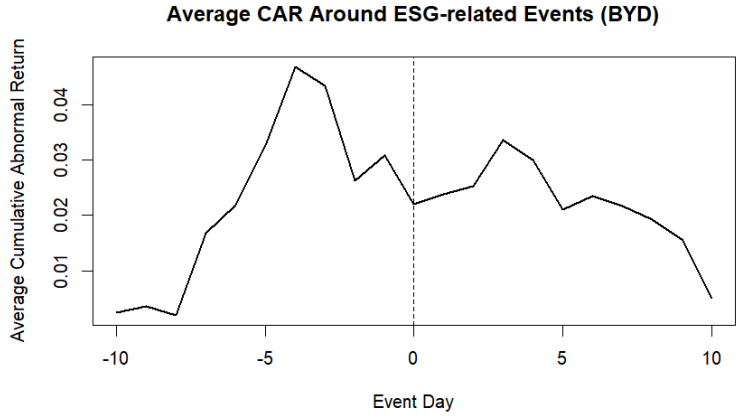

Figure 1. Average cumulative abnormal returns (CARs) around BYD's ESG-related events

On the day of the event (Day 0), the average CAR remains positive without an abrupt change. This phenomenon aligns with a gradual information incorporation mechanism, suggesting that investors may have already formed expectations about BYD's ESG stance prior to the announcement, with the announcement itself serving as a confirmation of these expectations. The post-event pattern indicates a mild correction, yet the CAR remains positive over the remaining days, suggesting that the valuation impact is not purely transitory. This finding is consistent with the extant literature, which suggests that the market may offer incentives for credible ESG signals,

DOI: 10.54254/2754-1169/2026.LD33106

particularly for firms whose sustainability profile is deemed to be material to long-term risks and cash flows [2].

The dynamic evidence presented herein supports the interpretation that ESG-related events contain value-relevant information for BYD, with market pricing taking place over multiple days rather than instantaneously.

3.2. Cumulative abnormal returns across event windows

Table 1 reports mean CARs across the three event windows specified earlier. The results indicate positive CARs for [-1, +1], [-5, +5], and [-10, +10]. It is important to note that the baseline [-5, +5] window produces the largest mean CAR. This ranking is informative: a peak in the mid-length window suggests the market response is strongest during a short adjustment phase after information becomes salient, while the longer window can dilute the pure ESG effect due to other concurrent macro or firm news.

Table 1. Mean cumulative abnormal returns (CARs) across different event windows

Event_Window	Mean_CAR
[-1, +1]	0.02550
[-5, +5]	0.03048
[-10, +10]	0.02225

From an economic interpretation perspective, positive CARs imply that ESG-related information events are associated with incremental increases in BYD's equity value beyond what is explained by broad market movements. This finding aligns with the mounting consensus that ESG can mitigate perceived non-financial risk, enhance stakeholder trust, and optimise long-term expectations, potentially leading to a reduction in the required return and an increase in valuation [1,11]. For BYD —an enterprise operating in an environmentally sensitive and policy-relevant industry—ESG-related disclosures may also be interpreted as signals of regulatory compliance, governance quality, and sustainability credibility, all of which are relevant to investors' risk assessments. These findings are consistent with evidence from the Chinese context, which shows that ESG-related performance and disclosure can be associated with valuation benefits, particularly when disclosures improve transparency and reduce information asymmetry [9].

3.3. Robustness, interpretation caveats, and implications

3.3.1. Robustness across windows

The uniformity of positive CARs across short, baseline, and extended timeframes serves to reinforce the hypothesis that ESG-related occurrences are predominantly correlated with advantageous pricing. While the absolute magnitude differs by window length, the direction remains stable, indicating that the result is not driven solely by a narrow timing choice. This approach is consistent with established best practices in event study reporting, where the examination of multiple windows is employed to guard against specification sensitivity [10].

DOI: 10.54254/2754-1169/2026.LD33106

3.3.2. Interpretation caveats

Notwithstanding the supportive evidence, several caveats must be considered. Firstly, events such as annual reports may bundle ESG information with financial performance disclosures. This can result in difficulties in isolating ESG content from other news items released concurrently. Secondly, preliminary CAR run-ups indicate that market expectations may be established prior to the dissemination of official announcements. While this does not invalidate the relevance of valuation, it does imply that the "information shock" may be dispersed over time rather than concentrated strictly at Day 0. It is recommended that future research endeavours incorporate text-based ESG content measures with a view to enhancing the distinction between ESG narratives and financial disclosures.

3.3.3. Practical implications

The findings suggest that environmental, social and governance (ESG) information is not merely symbolic but can be relevant to valuation in China's A-share market. For firms, enhancing the transparency and quality of environmental, social and governance (ESG) disclosures can facilitate a more comprehensive evaluation of long-term risks and sustainability capacity by investors. The extant literature supports the efforts of regulators and market institutions to standardise ESG reporting. It is posited that clearer disclosure may facilitate more efficient market pricing of sustainability-related information.

4. Conclusion

The present study employs a market-model event study framework to examine the valuation impact of ESG-related disclosures on BYD. The empirical evidence suggests a positive correlation between ESG-related events and consistently positive cumulative abnormal returns. The most significant valuation effect is observed within the [-5, +5] window, suggesting that investors actively revise their expectations after ESG disclosures. The upward trend in cumulative abnormal returns prior to the event day suggests the possibility of partial anticipation or gradual incorporation of ESG information into stock prices. On the day of the event itself, no sudden price increase is detected, indicating that the market response is progressive rather than instantaneous. Although mild adjustments occur in the post-event period, cumulative abnormal returns remain positive throughout the event window. The findings indicate that ESG-related information provides economically meaningful and value-relevant signals to investors, contributing to a moderate yet persistent enhancement of firm valuation.

However, it is important to acknowledge the limitations of the study. The present study focuses exclusively on BYD, and the limited number of events limits the generalisability of the results. It is recommended that future research extend the analysis to a broader sample of A-share listed companies across different industries in order to examine cross-sectional heterogeneity in ESG valuation effects. Furthermore, incorporating alternative ESG metrics or longer-term performance measures could provide a more comprehensive understanding of the long-term impact of ESG performance on corporate value.

References

[1] Friede, G., Busch, T., & Bassen, A. (2015). ESG and Financial performance: Aggregated Evidence from More than 2000 Empirical Studies. Journal of Sustainable Finance & Investment, 5(4), 210–233. https://doi.org/10.1080/20430795.2015.1118917

DOI: 10.54254/2754-1169/2026.LD33106

[2] Khan, M., Serafeim, G., Yoon, A. (2016) Corporate sustainability: First evidence on materiality. Harvard Business School Working Paper, No. 15-073, Boston. https: //www.hbs.edu/faculty/Pages/item.aspx?num=50344
[3] Yu, X., & Xiao, K. (2022). Does ESG Performance Affect Firm Value? Evidence from a New ESG-Scoring Approach for Chinese Enterprises. Sustainability, 14(24), 16940. https: //doi.org/10.3390/su142416940
[4] Fama, E. F. (1991). Efficient Capital Markets: II. The Journal of Finance, 46(5), 1575–1617. https: //doi.org/10.1111/j.1540-6261.1991.tb04636.x
[5] MacKinlay, A. C. (1997). Event Studies in Economics and Finance. Journal of Economic Literature, 35(1), 13–39. https: //www.bu.edu/econ/files/2011/01/MacKinlay-1996-Event-Studies-in-Economics-and-Finance.pdf
[6] Binder, J. J. (1998). The event study methodology since 1969. Review of Quantitative Finance and Accounting, 11, 111–137. https: //doi.org/10.1023/A: 1008295500105
[7] Yahoo Finance. (2025). BYD Company Limited (002594.SZ) historical price data. Retrieved March 20, 2025, from https: //finance.yahoo.com
[8] Yahoo Finance. (2025). CSI 300 Index historical data. Retrieved March 20, 2025, from https: //finance.yahoo.com
[9] Broadstock, D. C., Chan, K., Cheng, L. T. W., & Wang, X. (2021). The role of ESG performance during times of financial crisis: Evidence from COVID-19 in China. Finance Research Letters, 38, 101716. https: //doi.org/10.1016/j.frl.2020.101716
[10] Kothari, S. P., & Warner, J. B. (2006). Econometrics of event studies. In Handbook of Corporate Finance: Empirical Corporate Finance (Vol. 1, pp. 3–36). https: //www.bu.edu/econ/files/2011/01/KothariWarner2.pdf
[11] Lins, K. V., Servaes, H., & Tamayo, A. (2017). Social capital, trust, and firm performance. Journal of Finance, 72(4), 1785–1824. https: //doi.org/10.1111/jofi.12505