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Analysis of the Effects of BYD's Green Bond Issuance Using Event Study Methodology

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Abstract: *Green bonds have proven highly effective in meeting the strategic needs of corporate green transformation and reducing financing costs. Therefore, studying the motivations for issuing green bonds in the new energy vehicle (NEV) industry and their resulting effects carries practical significance. This paper focuses on BYD, the only private enterprise in the NEV sector that has issued green bonds, utilizing stock price data from January to May 2019 and applying event study methodology to examine the relationship between green bond issuance and stock price fluctuations. Empirical findings reveal: (1) Green bond issuance generates immediate short-term positive stock price effects, as companies aligning their development directions with national policies through green bonds gain investor support. To some extent, this research provides references for NEV enterprises exploring green financing models and contributes to advancing China's green bond market development.*

Keywords: *Green Bonds, Event Study Methodology, Stock Price Effect*

1. Introduction

This paper focuses on green bonds within the realm of green finance, investigating how emerging green bonds facilitate the development of the new energy vehicle industry. Through the application of event study methodology, we analyze BYD's historical stock price trends, financial report data, and environmental performance indicators. The study aims to explore the potential impacts of green bond issuance on the financial performance and stock returns of new energy vehicle enterprises, providing innovative financing strategy recommendations for industry players. Furthermore, it discusses future prospects and existing challenges regarding green bond support for the new energy vehicle sector under China's "dual carbon" goals (carbon peaking and carbon neutrality), while addressing current implementation barriers.

1.1 Research Background

Amid escalating global challenges such as the energy crisis, environmental degradation, and population growth, sustainable development has increasingly become an unavoidable priority in national development strategies worldwide. The new energy vehicle (NEV) industry has emerged to address these imperatives, presenting three critical strategic advantages compared to traditional fuel-powered vehicles:

First, the NEV industry aligns with the global environmental conservation agenda and the urgent decarbonization goals of the dual-carbon strategy. It enables China to enhance its environmental governance framework to better respond to shifting global energy patterns while managing the nation's expanding vehicle fleet[1]. Second, as a major petroleum importer, China's development of NEVs mitigates energy security risks in the transportation production sector. Third, the NEV industry demonstrates tremendous global growth potential.

Technological advancements in battery management systems and power configurations are enabling NEVs to steadily capture market share from conventional vehicles. According to China Association of Automobile Manufacturers data, Chinese NEV production reached 9.587 million units in 2023, accounting for 31.6% of domestic automotive sales with a 35.8% year-on-year increase. Globally, China's NEV production and sales represent approximately two-thirds of total industry volume, commanding substantial market dominance.

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1.2 Significance of the study

The development of emerging industries relies on financial support. Building upon this foundation, green finance plays a crucial role in guiding resource allocation, optimizing risk management, and enhancing environmental performance within the new energy vehicle (NEV) industry[2][4]. Currently, China's green financial bond system demonstrates continuous innovation in product categories and structural optimization, gradually aligning with international market standards. However, the NEV sector faces multiple challenges including excessive investment in the industry, uneven production quality, lack of guidance for new business models, underdeveloped economies of scale across the industry, lengthy supply chains complicating credit evaluations for small NEV enterprises[3], along with its inherent high dependence on financing. These issues collectively indicate that financial support mechanisms have yet to fully realize their potential in promoting the NEV industry.

Against this backdrop, this study selects BYD, the only privately-owned enterprise in China's NEV sector that has issued green bonds, as the research subject. Employing event study methodology, the paper analyzes BYD's historical stock performance, financial statements, and environmental metrics to investigate the impact of green bond issuance on corporate financial performance. It aims to demonstrate that green bond issuance generates positive market reactions for BYD while enhancing environmental performance, thereby proving that such instruments serve substantive environmental purposes rather than functioning as mere greenwashing tools.

Notably, green bond adoption within China's NEV industry remains limited and progress has been slow. The most recent case dates back to 2019 with BYD's first green bond issuance. To date, only three NEV manufacturers have issued green bonds, among which BYD stands out as both the most recent issuer and the sole private enterprise in this category. This unique position makes BYD's case particularly representative and valuable for studying green bond implementation in the NEV sector.

2. Literature Review

2.1 Foreign Literature Review

2.1.1 Theoretical Foundations and Research on Motivations for Green Bond Issuance

In terms of internal motives, Zerbib (2018)[4] analyzed from the perspective of financing costs. By comparing the costs of various financing channels, it was observed that green bonds demonstrated lower costs in the issuance process and information disclosure compared to other financing methods. This feature can significantly reduce the economic burden that enterprises bear during the fundraising process. At the same time, green projects often have a longer expected investment payback period. Basten et al. (2018)[5] pointed out in their research that medium- and long-term green bonds optimize the debt structure of enterprises and alleviate their debt pressure, thereby making the operation of enterprise funds more stable. Scholtens (2006)[6] divided target enterprises into those adopting sustainable development strategies and those not adopting such strategies in his research. Through statistical calculations, it was found that enterprises adopting sustainable development strategies can gain more social recognition and improve company performance.

In terms of external motives, Mathews and Kidney (2012)[7] found that government support is indispensable for the continuous and healthy development of green bonds. Policy preferences help accelerate the rapid development of the green securities industry. Inderst et al. (2012)[8] argued that as the green bond market continues to develop, its relatively lower investment risks and more stable investment returns compared to other securities markets have gained favor among investors. In a poor economic environment, investors tend to choose green bonds more often, which enables enterprises to obtain financing funds more quickly after issuing green bonds.

2.1.2 Theoretical Basis and Research on the Effects of Green Bond Issuance

The theory of externalities reveals the phenomenon of welfare transfer to non-trading parties caused by economic activities. When the production or consumption activities of market entities result in the non-participants' free gains, it forms a positive spillover effect; if it leads to uncompensated losses for unrelated individuals, it constitutes a negative spillover effect. Based on this theory, green and environmental factors have become one of the evaluation criteria for enterprises' investment decisions, exerting a positive spillover effect on the public environment. For enterprises, when the public prefers financial tools with environmentally friendly features, the ecological label attribute of green bonds

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transforms into a market signal mechanism - not only highlighting the social responsibility commitment of the issuer but also guiding capital flow to form a virtuous cycle. This two-way incentive significantly optimizes the sustainable business ecosystem of enterprises and generates a positive spillover effect on them. If empirical results show that green bonds present a continuous positive market premium, stock price growth, and improved financial capabilities after issuance, it indicates that the issuance of green bonds can produce a positive spillover effect; otherwise, it suggests that the issuance of green bonds is detrimental to the enterprise's operation and development. Based on the above theoretical foundation, the research on the effects of green bond issuance at home and abroad is divided into three aspects: stock price effect, financial effect, and environmental effect.

In terms of the stock price effect, Tang & Zhang (2020)[9] conducted a correlation analysis of the announcement date and issuance benefits of green bonds in their study, using data from 28 countries' enterprises as samples. The empirical results ultimately showed that the announcement of green bond issuance had a positive effect on the stock price of enterprises. Xi Bin et al. (2021)[10] used event analysis as the main research method to analyze the stock prices of enterprises that issued green bonds from 2016 to 2018. They found that the stock price effect brought by multiple issuances of green bonds was more significant than that of a single issuance, and the stock price effect brought by public issuance was more significant than that of private issuance. Cioliet al. (2021)[11] selected data from over 400 listed companies, calculated their stock prices before and after the issuance of green bonds, and finally found that the stock prices of companies showed a significant upward trend after the announcement of the first green bond issuance, thus concluding that the issuance of green bonds has a positive stock price effect on listed companies.

In terms of the environmental effect, Britta et al. (2018)[12] proposed that the issuance of green bonds helps enterprises achieve green transformation in external image and project orientation, bringing environmental benefits. In terms of social public benefits, Flammer (2021)[13] found that after enterprises issue green bonds, they can improve their environmental protection disclosure level through corporate social responsibility disclosure reports, thereby enhancing the public's perception of their green image, improving their reputation, and achieving social benefits.

In terms of financial effects, Wulandari et al. (2018) [14] found an inverse U-shaped relationship between the liquidity of green bonds and the financing costs incurred by the issuing companies. Specifically, for green bonds with a longer issuance term and lower liquidity, the costs that enterprises have to bear at the time of issuance are higher.

2.2 Domestic Literature Review

2.2.1 Research on the Motivations for Issuing Green Bonds

Regarding internal drivers, Li Jianfeng and Chen Shuo (2021)[15] identify green bonds as a long-term, stable financing channel that, while offering low-cost advantages, also helps reduce mismatch risks for corporate green projects. Chen Xiao and Zhang Ming (2022)[16] propose that companies issuing green bonds to directly or indirectly participate in green projects can accelerate their green structural transformation and enhance corporate reputation. Additionally, Li Conghui (2025)[17] finds that issuing green bonds can improve corporate green innovation capabilities and executives' green awareness, while reducing financing difficulties, thereby effectively boosting new quality productivity. This positive effect is particularly pronounced among private enterprises, large-scale firms, and companies in carbon-intensive industries.

Regarding external drivers, Lu Xunfa et al. (2025)[18] observe that, under financing constraints, government subsidies remain critical for new quality productivity and R&D output in the new energy vehicle industry. The subsidy phase-out policies in the new energy vehicle sector have led to declines in corporate revenue and net profits, negatively impacting return on assets. Chen Xiao and Zhang Ming (2022)[16], analyzing government policy support, conclude that governments have implemented measures such as fiscal subsidies and interest rate reductions to support green bond issuers. These policies aim to lower bond issuance costs and reduce funding acquisition expenses, incentivizing greater corporate use of green bonds for financing. An Guojun et al. (2022)[19] argue that green finance can facilitate corporate transitions to green production, gaining social recognition and capital market support, ultimately achieving sustainable green development for enterprises.

2.2.2 Research on the Effects of issuing green Bonds

In terms of stock price effects, Hu Tianyang (2022)[20] found that after the initial issuance of green

ISSN 2616-7433 Vol. 7, Issue 7: 34-43, DOI: 10.25236/FSST.2025.070706

bonds, stock prices generate abnormal cumulative returns. Additionally, as capital flows into green projects, enterprises' total factor productivity increases. Li Mengya et al. (2023)[21] employed event study methodology and a multi-period difference-in-differences (DID) model to analyze stock prices, revealing significant post-issuance price increases. The DID term in their model showed a positive correlation with corporate value, indicating that green bond issuance enhances corporate value more effectively than conventional bond issuance.

Regarding environmental effects, Li Jiawei (2024)[22] discovered that BYD's green bond issuance not only heightened public awareness of the company's environmental protection measures but also directly improved resource utilization efficiency in daily production activities, thereby enhancing the company's environmental performance.

3. Case Analysis

3.1 19 Yadi Green Bond 01 Information Introduction

Byd Company issued two green bonds in 2018 and 2019. This article selects the green bond "19 Yadi Green Bond 01" officially issued by BYD Company on June 12, 2019 for specific analysis. However, in the subsequent financial indicator analysis, it is still necessary to clarify that the data of 2018 was also affected by the issuance of green bonds. Its specific information is as follows in Table 1:

Table 1: 19 Brief Introduction of Yadi Green Bond 01

Bond Name	19 Yadi Green Bond 01
Bond types	Green corporate bonds
Release date	June 12, 2019
The bond term	5 years
The coupon rate	4.86%
The issuance scale	1,000,000,000
The actual fundraising amount	996,000,000
The interest calculation method	annual interest payment and principal repayment at maturity
Credit rating	AAA

3.2 Analysis of the Motivations for Issuing Green Bonds

3.2.1 Internal Motivation Analysis

Firstly, the issuance of green bonds meets the strategic development and financing needs of enterprises. Against the backdrop of continuous improvements in the "Dual Carbon" policy system, the clean energy transition in public transportation has significantly accelerated, with urban mobility structures demonstrating distinct low-carbon transformation characteristics. Driven by surging market demand, BYD has persistently optimized its production system and enhanced its industrial chain layout. As shown in Table 2, over the three-year period from 2017 to 2019, BYD's total cash flow from financing activities achieved a 71.5% growth rate. The proportion of financing cash flow in total cash flow rapidly increased from 27.8% in 2017 to 37.4% in 2019. Meanwhile, total cash outflow surged from RMB 153.2 billion in 2017 to RMB 195.4 billion in 2019. The year-on-year increase in capital expenditures has intensified BYD's financing pressure, as traditional financing channels have proven inadequate to support the pace of its strategic development. Establishing a diversified capital supply system has become imperative. Consequently, to ensure BYD's sustainable development, pursuing low-cost financing methods has become an urgent necessity.

Table 2: Cash Flow Statement of BYD from 2017 to 2019

Unit: Ten thousand yuan	2017	2018	2019
Cash outflow from operating activities	9,094,551	10,003,750	9,898,138
Cash outflow from investment activities	1,959,581	2,040,680	2,328,250
Cash outflow from financing activities	4,266,503	6,315,930	7,318,605
Total cash outflow	15,320,635	18,360,360	19,544,993

ISSN 2616-7433 Vol. 7, Issue 7: 34-43, DOI: 10.25236/FSST.2025.070706

Secondly, the issuance of green bonds has generated positive impacts on corporate reputation across multiple dimensions: First, 50% of funds raised through its green bonds issued in 2018 and 2019 were allocated to green industrial upgrades in low-carbon projects such as battery R&D and production of electric bus components. By transparently disclosing fund utilization, the company reinforced its environmentally responsible corporate image. Second, through overseas green bond issuances aligning with international standards, BYD has attracted ESG-focused international capital. This strategy not only reduced financing costs but also enhanced global brand influence. The company's inclusion in international sustainability indices and high ESG ratings have significantly strengthened its international competitiveness.

3.2.2 Analysis of External Drivers

Green bonds, as a market-oriented financial instrument, align closely with the national green development strategy through their issuance and promotion. By specifically supporting green projects such as clean energy and ecological restoration, green bonds directly serve the goals of China's ecological civilization construction. As shown in Table 3 below, the government has introduced a series of policies in recent years to support green bond development. The gradual standardization of issuance criteria and information disclosure requirements not only strengthens environmental impact constraints on capital allocation but also effectively channels funds into low-carbon and environmentally friendly sectors through complementary measures like fiscal subsidies and priority approval processes.

Table 3: Green Bond Policy Table from 2015 to 2021

Year	issuing unit,	Policy name
2015	The People's Bank of China	Catalogue of Green Bond-Supported Projects
2016	Shanghai Stock Exchange, Shenzhen Stock Exchange	Notice on Conducting Pilot Programs of Green Corporate Bonds
2017	The People's Bank of China	Business Guidelines for Green Debt Financing Instruments of Non-Financial Enterprises
2018	The People's Bank of China	On Strengthening the Supervision and Management of Green Bonds during Their Duration
2021	The People's Bank of China, the National Development and Reform Commission, the China Securities Regulatory Commission	Catalogue of Green Bond-Supported Projects (2021 Edition)

Meanwhile, the phase-out of government subsidies has forced BYD to explore new financing approaches. As shown in Table 4 for the subsidy reduction scale from 2017 to 2019, BYD saw its subsidies plummet by nearly 35% while maintaining stable operating revenue, with government subsidies accounting for a diminishing proportion of total revenue. The subsidy cutbacks manifested across various operational dimensions: The company's 2018 net profit decreased by 31.63% year-on-year, while non-recurring net profit nosedived by 80.39%, primarily attributable to the subsidy phase-out that caused business gross margin to contract from 24.31% to 19.78%. During the 2019 transition period, per-vehicle subsidies were slashed by over 50%, compelling BYD to cover the price difference out of its own pocket, resulting in monthly profit reductions amounting to hundreds of millions of yuan. Although this subsidy withdrawal intensified short-term operational pressure, it crucially compelled BYD to complete its strategic transition from "policy reliance" to "technology-driven development", thereby laying critical groundwork for its subsequent market-oriented growth phase.

Table 4: The Impact of BYD's Subsidy Reduction from 2017 to 2019

Unit/100 million yuan	2017	2018	2019
Operating Profit	54.11	42.42	23.12
Operating Revenue	1059	1300	1277
Government Subsidies	12.49	23.28	17.24
Proportion of Subsidies	1.18%	1.79%	1.35%

ISSN 2616-7433 Vol. 7, Issue 7: 34-43, DOI: 10.25236/FSST.2025.070706

3.3 Analysis of the Stock Price Effect of BYD's Issuance of Green Bonds

3.3.1 Sample data

This paper selects June 3, 2019, the date of the first announcement of BYD's issuance of "10 BYD Green Bond 01", as the benchmark period T0 for the research event. The event window is set as 15 trading days before and after the benchmark date, that is, [-15, 15] (May 13, 2019 - June 25, 2019). The estimation window is set as 120 trading days before the event window, that is, [-135, -16]. The trend of BYD's stock price changes during the estimation window and the event window is shown in Figure 1. As can be seen from the figure, the fluctuations in BYD's closing price mainly occurred in three concentrated periods. From December 13, 2018 to February 11, 2019, BYD's stock price showed an overall downward trend. From February 11, 2019 to April 17, 2019, it showed an overall upward trend and reached the highest point of 62.4 yuan. After that, until the end of the event window, it showed a fluctuating downward trend.

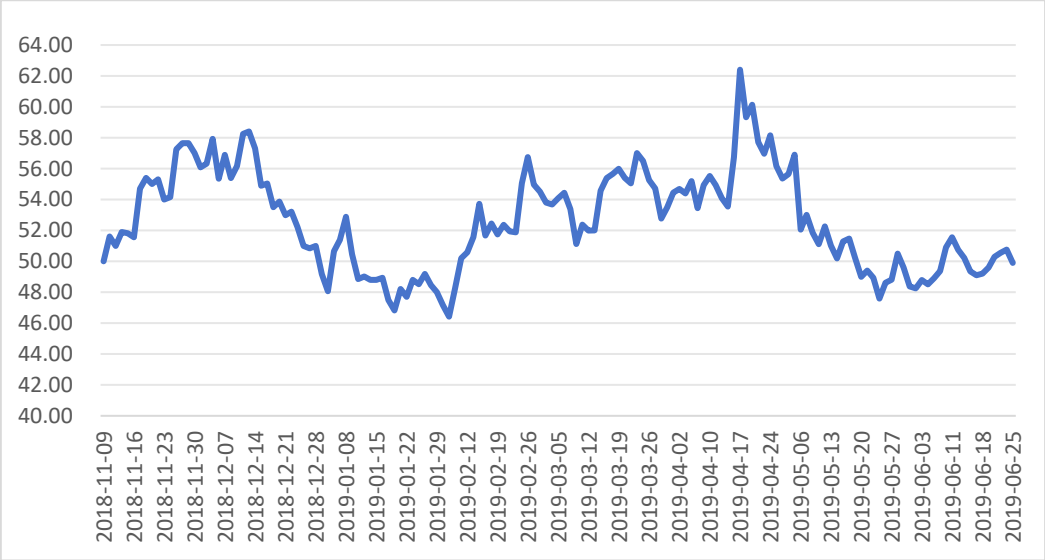

Figure 1: Trend of BYD Stock Price Changes during the Window Period

3.3.2 Data calculation process

Assuming the yield of BYD on the t-th day is, the closing price of BYD on the t-th day is, the yield of the Shenzhen Component Index is, and the closing price of the Shenzhen Component Index on the t-th day is, then the actual yield of BYD's individual stocks and the yield of the Shenzhen Component Index are as follows:

Actual return rate of BYD individual stocks:

$$R_b = \frac{P_t}{P_{t-1}}$$

Shenzhen Component Index Yield:

$$R_{st} = \frac{SP_t}{SP_{t-1}}$$

Establish a linear regression equation based on the market modeling method:

$$ER_t = \alpha + \beta R_{st} + \varepsilon_t$$

Among them, ER_t represents the expected return rate of BYD's individual stocks and R_{st} represents the market return rate of the Shenzhen Component Index. Based on market data, the least squares method is used to estimate the constant and slope values, and the regression equation for the expected return rate of BYD's individual stocks is finally estimated as follows：

$$ER_t = -0.0005 + 0.8086R_{st}$$

Based on the above formula, we can plot the regression graph of BYD's individual stock expected return within the window period, as shown in Figure 2.

ISSN 2616-7433 Vol. 7, Issue 7: 34-43, DOI: 10.25236/FSST.2025.070706

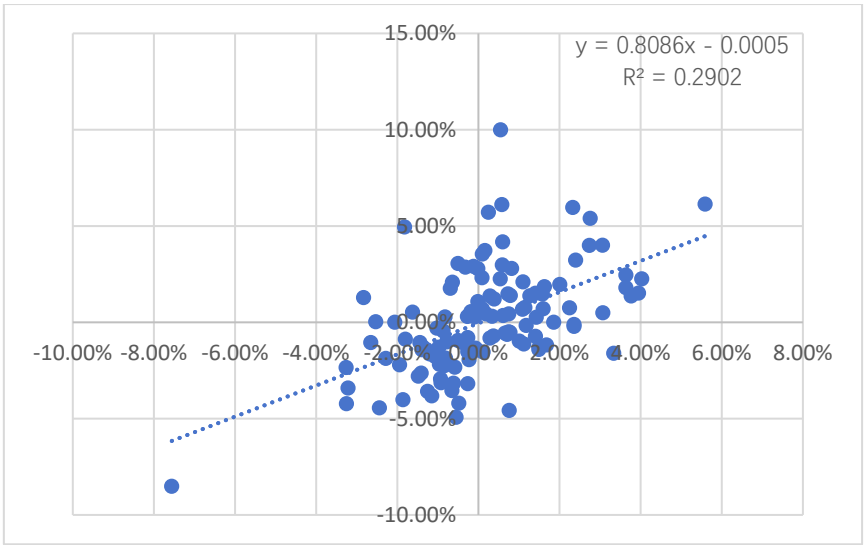

Figure 2: Regression chart of expected return on BYD individual stocks during the window period

We can calculate the abnormal return (AR_t) and cumulative abnormal return (CAR_t) within the window period using the following formula. The resulting data are presented in Table 5, and Figure 3 is plotted based on these data:

$$AR_t = R_b - ER_t$$

$$CAR_t[t_1, t_2] = \sum_{t=t_1}^{t_2} AR_t$$

3.3.3 Data result analysis

Table 5: [-15,15] AR_t and CAR_t of BYD during the Window Period

Window Period	AR_t	CAR_t
-15	-1.16%	-1.16%
-14	-1.01%	-2.17%
-13	0.27%	-1.90%
-12	0.10%	-1.80%
-11	0.17%	-1.63%
-10	-1.63%	-3.26%
-9	-0.68%	-3.95%
-8	-0.49%	-4.43%
-7	-0.62%	-5.05%
-6	2.49%	-2.56%
-5	-1.41%	-3.97%
-4	3.01%	-0.96%
-3	-1.50%	-2.47%
-2	-1.83%	-4.30%
-1	-0.01%	-4.31%
0	1.77%	-2.54%
1	0.47%	-2.07%
2	0.87%	-1.19%
3	2.50%	1.30%
4	1.95%	3.26%
5	-1.69%	1.56%
6	-0.76%	0.81%
7	-0.97%	-0.16%
8	-0.40%	-0.56%
9	-0.19%	-0.76%
10	0.03%	-0.72%
11	-0.26%	-0.98%
12	-0.45%	-1.43%
13	-0.13%	-1.57%
14	0.49%	-1.08%
15	-0.82%	-1.89%

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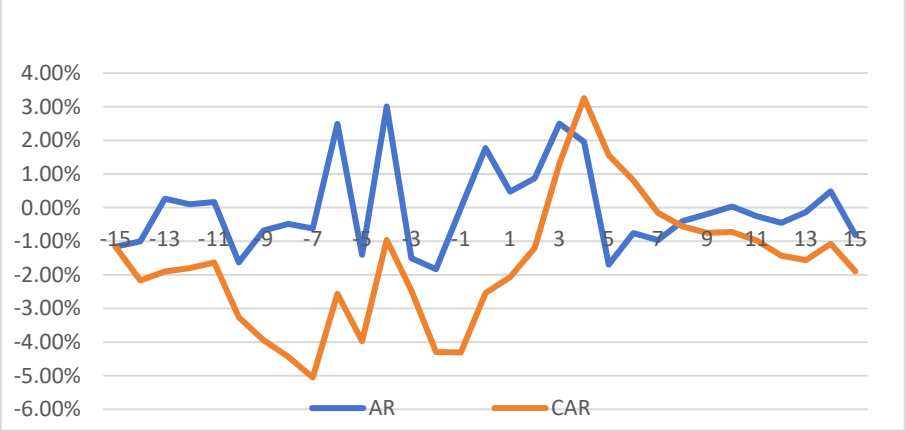

Figure 3: [-15,15] AR_t and CAR_t of BYD during the Window Period

Based on the data analysis before and after BYD's issuance of green bonds, the event generated a positive investor response to the stock price in the short term. In the fifteen days before the event date [-15, -1], the market showed a continuous negative expectation, with the cumulative abnormal return (CAR) dropping from -1.16% to -4.31%. Particularly, there was a significant sell-off in the ten days before the event window [-10] (AR = -1.63%) and the two days before [-2] (AR = -1.83%), which might reflect information leakage in advance, market concerns about the event, or the cumulative impact of external negative factors. On the event day, the market responded rapidly to the issuance of green bonds, with the abnormal return (AR) significantly rising by 1.77%, pushing the cumulative abnormal return (CAR) from -4.31% before the event to -2.54%, indicating investors' recognition of the green financing behavior. It is speculated that the market may have interpreted BYD's issuance of green bonds as a positive signal of strengthening its sustainable development strategy, broadening financing channels, or enhancing its ESG image.

In the three days after the event [1, 3], the CAR further climbed to 1.30%, rising by 3.84% compared to the event day (day 0), reflecting the continuation of short-term optimism and the market's initial expectations for the long-term value of green bonds in supporting new energy technology research and development and capacity upgrades. Although the CAR declined in the subsequent window period [4, 15] due to overall market fluctuations and industry policy adjustments, the positive fluctuations within the event window still indicated that the issuance of green bonds conveyed a clear strategic signal, attracting short-term capital attention and boosting investor confidence. Furthermore, when compared with the overall downward performance of the Shenzhen Component Index during the same period, it becomes clearer that BYD achieved relative resilience through the issuance of green bonds. As shown in Table 5, both AR and CAR experienced significant fluctuations within the event window, with AR fluctuating between -1.83 and 3.01, and CAR fluctuating more significantly between -5.05 and 3.26. In summary, the issuance of green bonds played a supportive role in the stock price within the critical time window, providing positive incentives for BYD's low-carbon transformation at the capital market level.

3.4 Case summary

This case first briefly introduces the basic situation of BYD's green bond "19 Yadi Green Bond" issued in 2019, and then analyzes the reasons for BYD's issuance of green bonds. In terms of internal motivation, the issuance of green bonds meets BYD's strategic development and financing needs, while the green attributes of green bonds can also enhance BYD's corporate reputation; In terms of external factors, issuing green bonds not only responds to national policies but also helps BYD reduce the impact of subsidy refunds. Finally, the case study analyzed the impact of BYD's issuance of green bonds on stock price, and concluded that issuing green bonds can support the company's stock price in the short term and bring positive stock price effects.

4. Conclusions

This article focuses on the green bond practice of BYD, a leading enterprise in the new energy vehicle industry. By analyzing its green bond issuance case in 2019, the article studies the stock price effect of green bond issuance by new energy vehicle enterprises. The conclusion reveals that the issuance of green bonds has a positive effect on the stock price of enterprises, which can directly bring a short-term and

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rapid positive stock price effect, play a supporting role in the stock price within the key time window, and has a certain degree of relative anti-fallibility.

Based on the above conclusion, this article puts forward the following suggestions: (1) Increase policy guidance and support. Currently, the policy support for green bond financing in China is relatively low. For related industry enterprises, there is a lack of incentive mechanisms for using green bonds for financing. In the new energy vehicle industry, which is highly related to green projects, only BYD, a private enterprise, has issued two small-scale green bonds for financing in 2018-2019. Therefore, it is still necessary to improve relevant laws and regulations, increase the publicity of green bonds, and encourage enterprises and investors to widely participate in green bond investment and financing. (2) Strengthen the information disclosure of green bonds and cultivate a positive green bond investment atmosphere. A complete green bond information disclosure mechanism can enhance market confidence in enterprises and thereby increase their attractiveness to green investment-oriented investors. At the same time, an accurate information disclosure mechanism can also help green bond-issuing enterprises manage the flow of financing funds, clarify the development situation of the enterprise, and make appropriate decisions.

Therefore, enterprises should strengthen the information disclosure of green bonds and build a transparent management system covering the entire cycle of fundraising and investment projects. Specifically, they should: (1) Clearly define quantitative environmental benefit indicators before bond issuance, and regularly calculate these indicators and release reports;(2) Engage third-party institutions to audit project progress, conduct pre-assessment and monitoring of risks, and promptly revise project plans that deviate significantly from the estimated values; (3) Innovate the information management and disclosure mechanisms for green securities, and add "bet-on" clauses (or "performance-linked clauses") to securities issuance agreements. This will not only enhance the credibility of enterprises' green bonds but also force enterprises to strictly abide by their green and environmental protection commitments.

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