Exploring the Dual Impact of Green Bond Issuance on Corporate Financial Performance and Environmental Performance - The Case of BYD

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Abstract. Green bonds have assumed a distinct and pivotal role in the global wave of sustainable development. As the green bond market continues to expand annually, it is imperative not to underestimate developing countries' influence. China has emerged as a dominant force in the global green bond market. This paper focuses on the Chinese market and analyses the financial and environmental effects of two successful green bond issues issued by BYD, a head of a new energy vehicle enterprise in China. Regarding the financial effect, this paper employs a three-dimensional analytical approach to assess the solvency, profitability, and operating capability of the enterprise, aiming to elucidate the positive impact of green bond issuance on its financial status. Concerning the environmental effect, several key environmental indicators from pollutant emissions, energy use efficiency, and water resource management are selected to scientifically assess the positive effect of green bond issuance on corporate environmental performance. It can be concluded that green bonds issuance can enhances both financial and environmental performance of enterprises, providing a useful reference for the green transformation of other enterprises.

Keywords: Green bonds; BYD; new energy vehicles.

1. Introduction

In the context of a growing global consensus on sustainable development, a diverse array of financial instruments has emerged to promote green development, with green bonds in particular. According to the 2021 iteration of the Green Bond Principles, a green bond refers to a financing instrument, which raises funds utilized to partly or wholely finance projects that are environmentally or sustainably oriented [1]. The concept of green bonds was first introduced when the European Investment Bank (EIB) issued the Climate Awareness Bond (CAB). However, this financial instrument has its roots in the inaugural release of the Green Bond Principles (GBP) in 2014. This pivotal document delineated the essential tenets of green bonds, enhanced transparency, and established a robust foundation for the subsequent evolution of green bonds. In 2015, the Paris Agreement further propelled its advancement, garnering the participation of 195 countries. Subsequently, some developing regions outside of Europe have also begun to issue green bonds, especially China [2]. As illustrated in Figure 1, the amount of green bonds issuance and its proportion of the total in Asia and Africa have been increasing on an annual basis since 2015, with China representing the predominant issuer of green bonds in these regions.

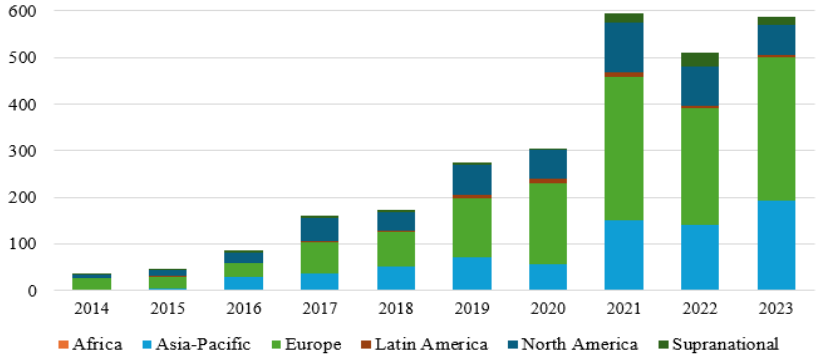

Fig 1. Amount of Green bond issued by region (billion dollars).

Since the Green Bond Issuance Guidelines were issued by the People's Bank of China (PBOC) in 2016, green bonds have rapidly attracted substantial capital inflows in the Chinese market, with their annual issuance volume demonstrating a yearly increase. By 2023, Chinese issuers are expected to have raised a total of approximately RMB 940 billion (approximately USD 131.25 billion) in both the domestic and overseas markets through labeled green bonds, thereby securing its status as the largest market for green bond issuances in the world for the second consecutive year. As illustrated in Figure 2, the cumulative issuance volume was the second highest. Despite holding only 2% of Chinese bond market, the continuous growth observed over recent years indicates a promising future for green bonds in the country. As indicated in the China Sustainable Bond Market Report 2023, energy and transportation are the primary sources of green bond investment, collectively representing over 84% of onshore green bond fundraising [3]. This is closely associated with China's recently released 14th Five-Year Plan, which prioritizes accelerating the low-carbon transformation of energy industry and further fostering the advancement of the new energy vehicle industry [4].

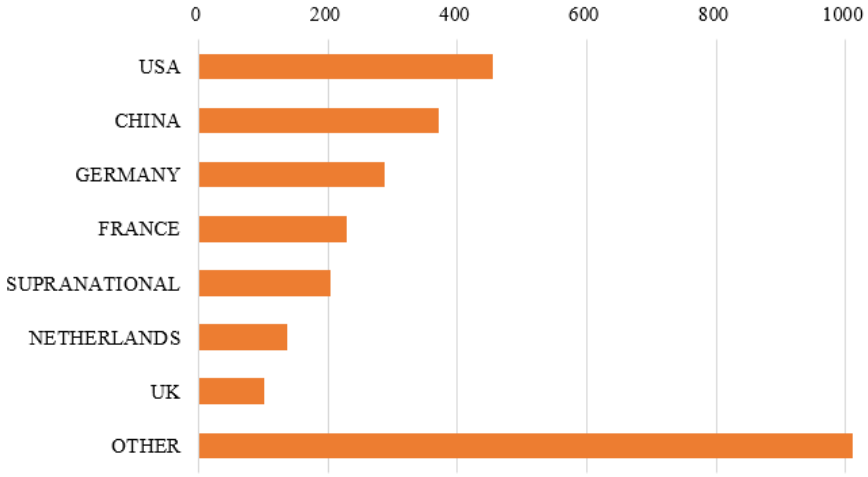

Fig 2. Amount of green bond issued by country (billion dollars).

From 2014 to 2023, the production of new energy vehicles in China saw significant growth, increasing from 79,000 to 9,587,000 units. Currently, new energy vehicles account for over 50% of domestic passenger car sales. Since 2016, the Chinese government has consistently revised and improved its subsidy policies for these vehicles, increasing the subsidy threshold and encouraging automakers to utilize green bonds for financing [5]. As China's new energy vehicle leader, BYD faced a higher debt level and huge capital demand in 2017-2018 due to the expansion of its main business and the need for project construction, so it successfully issued green bonds on two separate occasions, which also kick-started the subsequent green bonds issuance by non-financial industries.

This paper takes Shenzhen BYD Enterprise Limited (“BYD”) as the research object and analyze its financial performance and environmental performance after issuing the two green bonds. Although scholars have analyzed the positive impacts of green bonds based on this case in the context of China's dual-carbon background [6], this paper hopes to explore the dual performance of BYD's green bond issuance based on the global sustainable development goals and provide a reference for the transformation of other automotive enterprises.

2. BYD's Two Green Bond Issues

2.1. Introduction of BYD Auto

Since its founding, BYD has focused on battery technology R&D and innovation, taking advantage of China's abundant lithium resources, establishing lithium battery production bases in many places in China, and building a complete industrial chain including power batteries, battery positive and negative electrode materials, battery recycling, and other links. As early as 2008, BYD introduced the first dual-mode electric vehicle that does not rely on specialized charging stations - BYD F3DM,

marking its formal entry into the field of new energy vehicles. Subsequently, in 2013-2015, BYD successively launched several new energy vehicle development strategies. At present, more than 30 industrial parks around the world have been established by BYD, realized a strategic layout on six continents, and formed an industrial chain cluster with a new energy business as the core, covering electronics, automotive, rail transportation, batteries, raw materials, and other fields [7].

As the head enterprise of new energy vehicles, BYD not only dominates the domestic market but also opens the door to the European electric vehicle market. By 2023, BYD's passenger car sales volume of 3.013 million units, accounting for 11.6% of the total Chinese market share of the passenger car industry, and 33.5% of the market share of the new energy industry. In a horizontal comparison, as shown in Figure 3, its sales scale ranks third in the whole passenger car industry, only after SAIC Group and FAW Group, and is one of the few automobile companies that rely only on new energy models to achieve a leading sales scale.

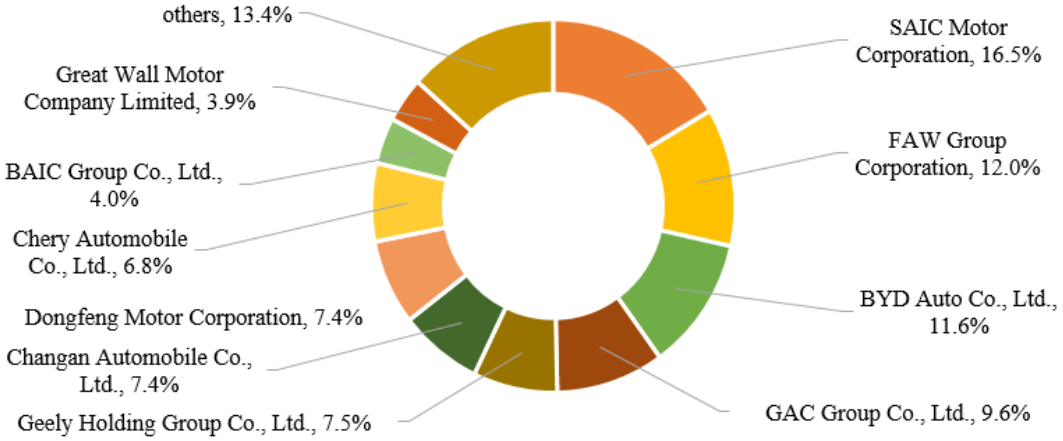

Fig 3. The proportion of passenger car sales of Chinese automobile brands in 2023.

2.2. Background and Motivation for the Issuance

The motivation for the issuance was twofold. First, as mentioned above, the Chinese government was raising the subsidy threshold and encouraging companies to issue green bonds, which would ease the government's financial pressure while promoting the sustainable development of the industry. As a leading enterprise in the industry, BYD prioritized responding to the state's call, which could maintain friendly relations with relevant departments while preserving its corporate image, thus prioritizing access to relevant information and resources in case of favorable policies in the future.

On the other hand, in 2017-2018, BYD's finances had a large debt gap, reporting short-term loans of 3577491.60 million yuan and 3778897.70 million yuan, which accounted for 30.28% and 28.23% of the total debt ratio; notes and accounts payable of 4027359.90 million yuan and 4628288.70 million yuan, which accounted for 34.09% and 34.57% of the total liabilities, and the asset-liability ratio was 66.33% and 68.81%. At that time, BYD was in a period of core business expansion and project construction, with a high debt level and a large demand for funds. Therefore, green bonds issuance can also alleviate its short-term debt pressure.

Additionally, the green bond has the advantages of high credit rating, low cost, and fast lending speed. Therefore, it can reduce the financing cost of enterprises, which is also an important reason why BYD chose to issue green bonds.

2.3. Issuance of Two Green Bonds

BYD issued two green bonds: "18 Yadi Green Bond 01" ("18 Yadi G1") in December 2018 and "19 Yadi Green Bond 01" ("19 Yadi G1") in June 2019. Both bonds had an issuance size of 1 billion yuan and a maturity of 5 years, with "18 Yadi G1" featuring a coupon rate of 4.98% and "19 Yadi G1" a slightly lower rate of 4.86%. Both received AAA credit ratings, reflecting strong market confidence in BYD.

The main uses of the proceeds from the two Green Bond issues are shown in Table 1 and Table 2.

Table 1. "18 Yadi Green Bond 01" Proceeds Utilization.

project	Planned use of raised funds (billion Yuan)	proportion
Construction project of lithium iron carbonate located in Qinghai	0.25	25%
Expansion project of the lithium-ion battery pole sheet production line located in Shanwei	0.08	8%
Manufacturing project for new energy bus parts located in Wuhan	0.17	17%
Replenishing the working capital	0.5	50%

Table 2. "19 Yadi Green Bond 01" Proceeds Utilization.

project	Planned use of raised funds (billion Yuan)	proportion
Power battery production project located in Baotou	0.07	7%
Power battery assembly project located in Taiyuan	0.15	15%
Power battery production project located in Xi 'an	0.28	28%
Replenishing the working capital	0.5	50%

Source: BYD Green Bond Prospectus

3. Pre- and Post-issuance Financial Performance

BYD has successfully issued two green bonds with a maturity of 5 years in 2018 and 2019, respectively. Considering the long-term characteristics of the benefits of green bonds, this paper adopts the data from 2015 to 2023 to analyze and evaluate BYD's solvency, profitability, and operating ability by selecting a set of reasonable financial indicators.

3.1. Solvency

Solvency can be categorized into short-term and long-term solvency. For short-term solvency, this paper uses the current ratio and quick ratio as key metrics, both of which are positively correlated with a company's capacity to fulfill its short-term obligations. For long-term solvency, this paper selects balance sheet ratio and equity ratio as the measurement indicators, both indicators are negatively correlated with the long-term debt capacity of enterprises.

Table 3. BYD Solvency Analysis.

year	2015	2016	2017	2018	2019	2020	2021	2022	2023
Current Ratio	0.83	1.02	0.99	1.00	1.01	1.07	0.97	0.72	0.67
Industry current ratio	1.05	1.10	1.07	1.11	1.09	1.12	1.12	1.02	0.99
Quick Ratio	0.59	0.79	0.80	0.77	0.77	0.77	0.72	0.49	0.47
Industry quick ratio	0.89	0.96	0.94	0.97	0.95	0.96	0.96	0.83	0.80
Asset-liability ratio	0.69	0.62	0.66	0.69	0.68	0.68	0.65	0.75	0.78
Industry asset-liability ratio	59.07	60.08	60.9	61.61	62.45	63.68	62.38	65	66.97
Equity Ratio	2.21	1.62	1.97	2.21	2.13	2.12	1.84	3.07	3.52

Source: Wind database.

As illustrated in Table 3, BYD's current and quick ratios exhibited a sustained upward trajectory in the years preceding 2018. Following the issuance in 2018 and 2019, BYD's current and quick ratios demonstrated resilience to the decline in ratios that were prevalent within the same industry. This indicates that green bonds issuance enhanced the enterprise's capacity to service its short-term debt obligations. As evidenced in Table 1, approximately 50% of the proceeds from both bond issues were utilized to replenish working capital, thereby substantiating the assertion that the enhancement in

short-term debt capacity is attributable to green bonds issuance. In the long term, despite the industry-wide challenge of rising gearing, BYD's gearing ratio remains unchanged following the issuance, while the equity ratio experiences consistent change. After 2021, both the gearing ratio and the equity ratio begin to rise, primarily due to the enterprise's expansion of liabilities for investment. However, a conclusion can still be drawn that green bonds issuance has contributed to an enhancement of the enterprise's debt servicing ability.

3.2. Profitability

In evaluating the profitability of BYD, four key performance indicators are selected: gross profit margin, net profit margin, return on total assets, and return on net assets. These indicators are all on their positive correlation with profitability.

Table 4. BYD Profitability Analysis.

year	2015	2016	2017	2018	2019	2020	2021	2022	2023
Gross profit margin(%)	16.87	20.36	19.01	16.40	16.29	19.38	13.02	17.04	20.20
Industry gross profit margin(%)	14.42	15.34	15.24	14.31	13.08	11.95	11.2	12.93	14.33
Net interest rate(%)	3.92	5.30	4.64	2.73	1.66	3.84	1.84	4.18	5.20
Industry net interest rate(%)	6.35	6.03	5.2	4.23	2.21	2.34	2.85	2.88	3.09
ROE(%)	3.00	4.21	3.04	1.91	1.09	3.03	1.60	4.49	5.34
Industry ROE(%)	16.49	15.85	12.56	9.1	3.67	4.01	5.48	6.17	8.02
ROA(%)	10.22	12.91	7.76	4.96	2.62	7.43	3.73	16.41	24.40
Industry ROA(%)	7.19	6.6	5.38	3.93	1.84	1.89	2.3	2.29	2.55

Source: Wind database.

As illustrated in Table 4, BYD's gross and net margin trends demonstrate consistency. Before green bonds issuance, there was a notable shift in both BYD's and the industry's profit margins, with the former experiencing a decline while the latter continued to grow. This shift was largely attributed to the gradual reduction of subsidies by the Chinese government. However, after issuing the green bonds, BYD's profit margins have exhibited a gradual deceleration compared to the sustained decline in industry margins. In the long term, profit margins continue to grow steadily as they emerge from the shadow of reduced government subsidies. From the point of return on assets, this trend is particularly noteworthy. Before 2018, BYD's return on total and net assets both declined sharply after 2016. However, following green bonds issuance, the return on assets remained relatively stable, and after 2022, it increased significantly. This evidence suggests that green bonds issuance has enhanced the enterprise's profitability.

3.3. Operational Capability

The operating capacity reflects the liquidity of the enterprise's assets and is a reflection of the enterprise's level of management. This paper selectthree indicators: total assets turnover, accounts receivable turnover, and accounts payable turnover, all of which are positively correlated with operating capacity.

Table 5. BYD Operating Capacity Analysis (unit: times).

year	2015	2016	2017	2018	2019	2020	2021	2022	2023
Total Asset Turnover	0.76	0.79	0.66	0.70	0.65	0.79	0.80	1.07	1.02
Industry Total Asset Turnover	1.13	1.10	1.03	0.93	0.83	0.81	0.81	0.80	0.83
Accounts Receivable Turnover	4.54	3.27	2.26	2.57	2.74	3.68	5.58	11.30	11.96
Industry Accounts Receivable Turnover	14.2	11.58	10.11	8.98	7.86	8.78	10.61	11.42	12
Inventory Turnover	5.17	4.97	4.61	4.71	4.12	4.43	5.03	5.75	5.76
Industry Inventory Turnover	11.7	12.57	12.61	11	9.77	8.75	8.47	7.47	6.81

Source: wind database

As illustrated in Table 5, BYD's capital turnover ratio is typically inferior to the industry average as evidenced by historical data. Then after green bonds issuance in 2018, the industry average of total

asset turnover accounts receivable turnover and inventory turnover exhibited a decline. However, BYD's total asset turnover basically fluctuates around 0.7, accounts receivable turnover is improving, and inventory turnover fluctuates around 4.4. Following the year 2021, the total asset turnover ratio and the accounts receivable turnover ratio will essentially align with the industry average. It can be postulated that green bonds issuance may enhance the overall operational efficiency.

4. Pre- and Post-issuance Environmental Performance

4.1. Inputs for Environmental Projects

As indicated in Tables 1 and 2, approximately half of the proceeds from the two bond haircuts were allocated to the developing and expensing the new energy tram project. Given that the products in the new energy vehicle industry are themselves environmentally friendly, it can be assumed that all of BYD's new energy vehicle projects are environmentally friendly. As a consequence of the positive advancements in new energy vehicle projects, in 2022, BYD became the inaugural automotive enterprise to declare its intention to cease the manufacture of conventional vehicles powered by fossil fuels and to concentrate on the production of trams [8]. Therefore, it is evident that green bonds issuance has facilitated the advancement of BYD's new energy vehicles and bolstered the growth of the green industry. It bears noting that lithium batteries, which are predominantly utilized and developed in BYD's projects, have been demonstrated by numerous parties to exert beneficial long-term environmental effects and are regarded as a vital source of energy for sustainable development [9].

4.2. The Efficacy of Environmental Projects

In examining the environmental advantages associated with green bonds issuance, three key indicators are employed: greenhouse gas emissions, electricity consumption, and industrial wastewater emissions. These indicators are selected from the three dimensions of pollutant emissions, energy use, and water use, respectively. Given that an enterprise's production scale expansion will invariably increase relevant indicators, this study focuses on greenhouse gas emissions, electricity consumption, and industrial wastewater emissions on a per-revenue basis and defined density indicators.

Table 6. BYC Environmental indicators 2016-2023.

index	Measurement Unit	2016	2017	2018	2019	2020	2021	2022	2023
greenhouse gas emission density	ton/ million Yuan	19.80	30.77	22.03	31.34	26.47	24.15	19.01	20.50
electricity consumption density	10,000kWh/million Yuan	2.91	3.14	3.03	3.14	2.66	2.39	1.87	2.00
industrial wastewater discharge density	10,000m³/million Yuan	26.73	39.53	37.94	35.80	25.57	18.30	13.77	18.41

Source: Social Responsibility Report of BYD Company Limited 2016-2023

As illustrated in Table 6, before 2018, the company's rapid expansion of new energy vehicle production resulted in a corresponding increase in pollution indicators. However, following green bonds issuance, a gradual decline was observed in all three pollution indicators. There is a decline, although there is a slight rebound in 2023 due to the doubling of the business scale. However, in the long run, it can be seen that BYD's environmental performance has been gradually improving since the green bonds were issued.

The aforementioned BYD's 2022 announcement to phase out its fuel-vehicle business is also an industry-leading move, with four global automakers announcing since April 2022 that they will phase out fuel-vehicle production.

5. Conclusion

This paper presents the argument that green bonds can enhance the debt servicing capacity, profitability, and operational efficacy of the issuing firms, as well as the environmental performance and ESG performance of the issuing firms. The evidence presented is drawn from the two successful green bond issues by BYD.

This paper suggests that domestic enterprises should pay close attention to policy trends and make prudent decisions regarding green bonds issuance, considering the actual market situation and their own financing needs. When deciding to issue green bonds, enterprises should be clear about their responsibilities, actively promote green development, ensure that funds are earmarked for specific purposes, and strictly prevent the occurrence of capital mismatch. Concurrently, government departments should enhance supervision and improve the transparency of the flow of green bond funds to genuinely and effectively promote green development. Additionally, they can further propose pertinent policies to incentivize enterprises to issue green bonds.

The global market has demonstrated the spillover effect of green bonds through the actions of numerous parties, particularly in industries where environmental considerations are financially significant to enterprise operations. While the volume and quality of green bonds are still developing in developed countries, they are experiencing year-on-year growth in developing countries. Considering the global climate goals that have been set, it is anticipated that there will continue to be a significant demand for green financing in the future. The development of green bonds also presents a promising avenue for further growth.

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