

Financial Analysis of China's New Energy Vehicle Industry under the Harvard Analytical Framework: A Case Study of BYD Company Limited and NIO Inc.

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Abstract. As the climate conditions continue to deteriorate, countries around the world are joining the ranks of energy conservation and emission reduction, bringing more energy-saving and environmentally friendly new energy products into the public eye. Enterprises represented by new energy vehicles have thus received considerable attention. This paper is based on the Harvard Analysis Framework and focuses on BYD Company Limited (hereafter referred to as BYD) and NIO Inc. (hereafter referred to as NIO) as research subjects. It delves into the new energy industry from four dimensions: strategy, accounting, finance, and development, in the context of the broader environment. The analysis reveals similarities and differences in some key financial indicators between the two companies, explains the reasons behind these differences, summarizes the current industry situation, and forecasts future development prospects. By comprehensively applying the Harvard Analysis Framework, the article not only understands the financial performance of BYD and NIO but also provides a reliable basis for decision-making for investors and governments. Through this analysis, the paper aims to support the sustainable development of the new energy vehicle industry, further promoting its healthy growth.

Keywords: Harvard Analytical Framework, Financial Analysis, New Energy Vehicles, BYD, NIO.

1. Introduction

New energy vehicle enterprises mainly produce automobiles powered by non-traditional fuels (such as electricity) instead of conventional fuels (like gasoline or diesel). This approach is inseparably linked to the improvement and development of the ecological environment. China proposed the "Dual Carbon" goals in 2020, aiming to achieve "carbon peak" by 2030 and "carbon neutrality" by 2060. The role of the new energy vehicle industry in reducing carbon emissions has been further emphasized in this low-carbon revolution, offering development opportunities for enterprises in this field, while also posing challenges.

This paper selects BYD and NIO as samples to roughly represent the financial situation of the entire new energy vehicle industry through the financial conditions of these two entities. The reasons for choosing these two companies are as follows: BYD is one of the earliest Chinese enterprises to invest in the new energy vehicle field, boasting a complete new energy vehicle industry chain. It has not only achieved the highest electric vehicle sales in China but also has certain influence in the international market. Therefore, BYD can represent all the frontrunners in the industry to a certain extent. NIO, on the other hand, is one of China's emerging electric vehicle brands in recent years, focusing on luxury and technology as its main themes, and can to some extent represent all the newcomers in the industry. Additionally, through continuous market promotion and sound brand building, both companies have gained high public recognition and good reputations.

There is no shortage of research on the financial conditions of the new energy vehicle industry. Qiu conducted a financial analysis of new energy vehicle enterprises from a strategic perspective, using BYD as an example [1]; Liang analyzed the financial condition of new energy vehicle enterprises based on the Harvard Analytical Framework, with BYD as the case study [2]; Li et al analyzed BYD's finances based on the DuPont analysis method [3]; Zhang and Hu conducted a financial analysis of NIO based on the Harvard Analytical Framework [4]. These studies mainly focus on the leaders or new entrants in the new energy vehicle industry, without combining the two for

discussion, lacking an in-depth study of the overall financial condition of the new energy vehicle industry.

This paper adopts the Harvard Analytical Framework, first introduces the theoretical basis of this framework, and then progresses step by step in the order of strategic analysis, accounting analysis, financial analysis, and prospects analysis, analyzing and evaluating the financial conditions of BYD and NIO. Based on the analysis results, it summarizes the current development situation and future prospects of the new energy vehicle industry [5].

2. The Harvard Analytical Framework and Its Composition

The Harvard Analytical Framework was first introduced in the 1980s by three professors at Harvard Business School. The essence of this framework is the integration of non-financial factors into a company's financial analysis, enhancing the objectivity and completeness of the evaluation results [6].

2.1. Strategic Analysis

Strategic analysis is the foremost component of the Harvard Analytical Framework, focusing on analyzing a company's macro and micro environments. The aim is to comprehensively understand the company's competitive advantages and disadvantages, assess its competitiveness, and propose corresponding adjustment strategies [7]. Common models used for this analysis include the PEST model, SWOT model, and Porter's Five Forces model.

2.2. Accounting Analysis

Accounting analysis forms a crucial foundation for financial analysis. This segment starts with key accounting items from the most intuitive financial statements, analyzing and judging whether they comply with accounting standards and industry practices, thereby ensuring the reliability of accounting information [6, 8].

2.3. Financial Analysis

Financial analysis is the core of the Harvard Analytical Framework, mainly involving a comprehensive analysis of a company's financial condition [6]. It employs a series of key indicators scientifically to conduct horizontal and vertical comparative analyses of the company's debt-paying ability, profitability, operating ability, and growth potential. The goal is to identify existing problems and risk points, thereby developing targeted optimization measures [6, 9].

2.4. Prospects Analysis

Prospects analysis involves forecasting the future direction and potential of a company from both qualitative and quantitative perspectives. It is beneficial for internal managers to adjust strategic plans and for external investors to make informed decisions [8, 10].

3. Financial Analysis of the New Energy Vehicle Industry Based on the Harvard Analytical Framework

3.1. Strategic Analysis

3.1.1 Macro Environmental Analysis – PEST Analysis

(1) Political Environment Analysis

In September 2017, China issued the "New Energy Vehicle (NEV) Points System and Parallel Management Measures" and in September 2015, the "Guidelines for Promoting the Construction of New Energy Vehicle Charging Infrastructure" were released. In recent years, the Chinese government has intensified restrictions and control over pollutant emissions from traditional fuel vehicles.

Consequently, many automotive companies have gradually shifted towards producing new energy vehicles, expanding production bases and capacities, and increasing R&D and production investments in pure electric and hybrid vehicles. Companies continuously improve the production efficiency of their new energy vehicles, optimize production processes, and enhance product performance and competitiveness through technological innovation. Furthermore, as environmental issues and climate change gain increasing attention globally, many countries have stepped up efforts to reduce pollution from traditional fuel vehicles and advance energy transition. Given China's advantages in new energy vehicle technology and markets, many countries actively cooperate with China's new energy vehicle industry. However, international trade tensions and trade frictions have led some countries to impose tariffs on Chinese new energy vehicle products and adopt non-tariff barriers. These measures have increased the cost and competitive pressure of product exports, to some extent hindering the industry's development. In a rapidly changing and complex international situation, only new energy vehicle enterprises that respond flexibly, strengthen technological innovation, quality improvement, and international cooperation can meet challenges and seize opportunities, driving the healthy development of the industry.

(2) Economic Environment Analysis

In recent years, China's GDP growth has fluctuated but has overall maintained a stable growth trend. With the upgrade and transformation from traditional fuel vehicles to new energy vehicles, the market share of new energy vehicles continues to expand. As China pursues high-quality economic development, per capita income and disposable income have increased, and the concept of green development has become deeply rooted in people's hearts. People are willing to pay higher prices for environmentally friendly and energy-saving products, which is favorable for the development of the new energy vehicle industry. However, it also faces risks from complex factors, such as the impact of pandemics, which may add a lot of uncertainty to investment and financing in new energy vehicles and cause significant declines in demand.

(3) Social Environment Analysis

On one hand, new energy vehicles face several limitations, such as range, charging time, and insufficient charging facilities, and cooperation with local governments and enterprises needs to be improved. On the other hand, strengthened environmental awareness among consumers has led them to place more importance on green travel options, including choosing cleaner, more energy-efficient new energy vehicles.

(4) Technological Environment Analysis

Currently, the technical level of China's new energy vehicle industry has significantly improved, achieving many world-leading technological breakthroughs. However, there remains considerable potential and space for further development. The future should focus on talent introduction, continue to increase investment in technology R&D, strengthen technological innovation, and promote industry-academia-research cooperation. It's crucial to develop green and environmentally friendly travel products and adhere to the concept of green development.

3.1.2 Micro Environmental Analysis – SWOT Analysis

This section analyzes the internal strengths and weaknesses, as well as the external opportunities and threats to the new energy vehicle industry, based on the SWOT model.

(1) Strengths

China entered the new energy field earlier than most countries, accumulating more extensive experience and achieving certain technological advantages. It has a gradually improving new energy vehicle industry chain. Additionally, as the most populous country, China also represents the largest potential consumer market, offering vast space for the development of new energy.

(2) Weaknesses

On one hand, in the early stages of development, many enterprises in the new energy vehicle industry might engage in substantial investments to expand their scale. However, hefty investments could lead to overexpansion, resulting in financial strain and difficulties in operation and management.

On the other hand, the industry has a high demand for skilled professionals. However, due to the rapid development of the industry and technological updates, there may be a shortage of talent supply.

(3) Opportunities

Firstly, as a highly populous country, China provides a broad market for the development of the new energy vehicle industry, creating favorable conditions. Secondly, with China's green development goals, public environmental awareness is also upgrading, which will enhance future market demand for green travel products. Thirdly, the government has introduced more policies and measures to support the development of new energy vehicles, offering more opportunities and convenience for the industry's growth.

(4) Threats

Firstly, the fast pace of technological change and high risk in the new energy vehicle sector mean it could face challenges from new technologies at any time. Secondly, traditional fuel vehicles might pose significant threats in terms of price, range, and convenience, leading to their continued dominance in market sales over new energy vehicles.

3.2. Accounting Analysis

3.2.1 Main Operating Revenue

As depicted in Table 1, the total revenues of new energy vehicle companies—BYD and NIO—showed an upward trend from 2018 to 2022. Notably, NIO's annual operating income was almost double that of the previous year. This significant increase can be attributed to three main factors. Firstly, throughout the period from 2018 to 2022, the state introduced a series of policies to support the development of new energy vehicles, such as tax exemptions and purchase subsidies, which fueled consumers' desire to purchase. At the same time, as environmental consciousness increasingly permeated society, consumer demand for eco-friendly transportation options steadily grew. Moreover, the rapid advancement in new energy technologies has enhanced the performance of new energy vehicles to the point where they can match or even exceed that of traditional fuel vehicles, further bolstering operating revenue growth. However, BYD's total operating revenue significantly surpasses that of NIO, which can be attributed to BYD's advantages in scale, operating history, and market influence, among other aspects.

Table 1. Operating Revenue of BYD and NIO from 2018 to 2022 (Unit: CNY Billion)

Year	2018	2019	2020	2021	2022
BYD	1301	1277	1566	2161	4241
NIO	49.51	78.25	162.6	361.4	492.7

3.2.2 Operating Costs

As illustrated in Table 2, the operating costs and expenses of BYD and NIO have been increasing year by year from 2018 to 2022, with a significant rise observed in 2021, where the figures roughly doubled, indicating substantial investments in business expansion by both BYD and NIO in recent years. Additionally, the ratio of the primary operating costs to other business costs for both BYD and NIO has remained relatively stable, suggesting a relatively stable cost structure within the companies. This stability in cost management could be attributed to the companies maintaining a consistent business structure.

Table 2. Operating Costs and Expenses of BYD and NIO from 2018 to 2022 (Unit: CNY Billion)

	Year	2018	2019	2020	2021	2022
Main Operating Costs	BYD	1087	1069	1263	1880	3518
	NIO	49.3	80.96	132.6	265.2	392.7
Other Operating Costs	BYD	183	187	227	246	494
	NIO	2.769	9.277	11.29	27.98	48.53
Total Operating Costs	BYD	1270	1256	1490	2126	4012
	NIO	52.07	90.24	143.8	293.1	441.2

3.2.3 Net Profit

According to Table 3, BYD experienced a significant decline in both gross margin and net margin in 2020, followed by a sharp increase in 2022. This fluctuation was due to the global economic impact of the COVID-19 pandemic in 2020, which led to increased production costs, operational disruptions, and insufficient market demand for BYD. The substantial recovery in 2022 can be attributed to the economic rebound, as well as BYD's successful business expansion and cost control strategies. Over the past five years, NIO's gross margin has shown an upward trend with a notable increase, yet the company has faced increasing annual losses, with persistently high loss figures. This may be due to the fact that the infancy of the new energy vehicle industry necessitates continuous substantial financial investments in product development and technological innovation. Moreover, the industry is characterized by a prolonged period before initial investments yield returns and a low rate of return on investment, thus predisposing it to potential losses. Additionally, NIO's limited production scale has prevented it from achieving the same economies of scale as BYD. Notably, NIO's net profit saw a particularly sharp decline in 2022, which may have been influenced by two main factors: the intense market competition from BYD and Tesla as the market began to recover, which squeezed out other electric vehicle brands lacking the brand influence of the former two, and the rise in raw material prices. In summary, although both companies saw an increase in gross profit, the base figures for their gross profits were quite different, and the trends in net profit varied. These discrepancies may stem from BYD's longer operational history, richer experience, greater market influence, and higher demand. Moreover, BYD's higher operational efficiency during the management process has resulted in significantly lower period costs and expenses compared to NIO.

Table 3. Gross Profit and Net Profit of BYD and NIO from 2018 to 2022 (Unit: CNY Billion)

	Year	2018	2019	2020	2021	2022
Gross Profit	BYD	213.3	208.1	303.5	281.4	722.4
	NIO	-2.559	-11.99	18.73	68.21	51.44
Net Profit	BYD	35.56	21.19	60.14	39.67	177.1
	NIO	-96.39	-113	-53.04	-40.17	-144.4

3.3. Financial Analysis

3.3.1 Solvency Analysis

This paper selects the current ratio and the cash ratio (after excluding inventory, prepaid accounts, and receivables due to their lower liquidity) to analyze short-term solvency, and uses the debt-to-asset ratio to assess long-term solvency. As derived from Table 4, from 2018 to 2022, BYD's current ratios hovered around 1, indicating a healthy financial status but relatively low compared to the overall new energy vehicle industry, suggesting certain risks and challenges in its short-term debt repayment capacity. The previous accounting analysis mentioned BYD's recent business expansions. Coupled with the characteristics of the new energy vehicle industry, such as high investment, long initial return cycles, and low return on investment, it is inferred that due to tight cash flow and high short-term debt, current assets are not sufficient to cover short-term liabilities, resulting in a lower current ratio. Compared to BYD, NIO's current ratio fluctuated more significantly, likely reflecting greater uncertainty and risk in its short-term debt repayment capacity and financial operations. However, NIO's current ratio was generally above the industry average, particularly reaching 3.31 and 2.18 in 2020 and 2021, respectively. Similarly, BYD's debt-to-asset ratio was slightly above the new energy vehicle industry standard, while NIO, albeit slightly below the standard, did not exhibit the same financial stability as BYD. From 2018 to 2022, NIO's cash ratio exceeded the industry average by 15%-20%, suggesting NIO might be preparing for future large-scale expansions. In contrast, BYD's cash ratio fluctuated around the industry average.

Therefore, NIO's solvency appears marginally stronger than BYD's, but with greater variability and less stability in its financial indicators. Going forward, BYD should increase its current assets and reduce liabilities and reliance on financing, while NIO should enhance its assessment and

response to market and credit risks, and regularly monitor fluctuations in financial indicators to ensure the company remains within a controllable risk range.

Table 4. Debt Solvency Analysis of BYD and NIO

	Year	2018	2019	2020	2021	2022
Current Ratio (%)	BYD	0.988	0.99	1.049	0.97	0.722
	NIO	1.42	0.52	3.31	2.18	1.29
Cash Ratio (%)	BYD	0.112	0.117	0.136	0.327	0.216
	NIO	0.36	0.09	2.75	0.53	0.43
Debt to Assets Ratio (%)	BYD	68.81%	68%	67.94%	64.76%	75.42%
	NIO	56.75%	133.07%	41.69%	54.08%	71.28%

3.3.2 Profitability Analysis

Profitability reflects the ability of a company to generate profit and enhance the value of funds. This paper employs the net profit margin and return on equity (ROE) to measure the level of profitability. As seen from Table 5, BYD's profitability is in a stable state and at a high level; meanwhile, NIO's profitability is in an unstable state and at a lower level. Specifically, BYD's profitability showed an upward trend from 2018 to 2022, with a slight increase in 2022; NIO's profitability showed a downward trend during the same period, with a significant decrease in 2022. The reason may be that BYD possesses strong capabilities and a large market share in the battery technology and electric vehicle sectors, enabling it to more easily maintain a leading position in market competition, thereby imposing significant competitive pressure on NIO.

Table 5. Profitability Analysis of BYD and NIO

	Year	2018	2019	2020	2021	2022
Net Profit Margin (%)	BYD	2.73%	1.66%	3.84%	1.84%	4.18%
	NIO	-194.68%	-144.36%	-32.62%	-11.12%	-29.30%
Return on Equity (%)	BYD	4.96%	2.62%	7.43%	3.73%	16.14%
	NIO	-129.74%	-4247.88%	-53.77%	-34.17%	-49.71%

3.3.3 Operating Capability Analysis

Operating capability reflects a company's efficiency in utilizing and turning over assets. This paper selects accounts receivable turnover, total asset turnover, days sales outstanding (DSO), and total asset turnover days to analyze operating capability. As indicated in Table 6, both BYD and NIO have gradually strengthened their operating capabilities. Specifically, the number of days for accounts receivable turnover is on a declining trend, and the accounts receivable turnover rate is continuously rising, showing that both BYD and NIO have strong cash realization capabilities from receivables and high management efficiency. The total asset turnover days are consistently decreasing, and the total asset turnover rate is on an upward trend, indicating that both BYD and NIO have high asset operation efficiency, and their significant investment in assets has yielded favorable revenue outcomes.

Table 6. Operational Capability Analysis of BYD and NIO

	Year	2018	2019	2020	2021	2022
Accounts Receivable Turnover (times)	BYD	2.405	2.741	3.678	5.58	11.3
	NIO	6.5	7.42	13.13	18.43	12.45
Total Asset Turnover (times)	BYD	0.698	0.655	0.79	0.87	1.074
	NIO	0.34	0.47	0.47	0.53	0.55
Total Asset Turnover (times)	BYD	149.7	131.4	97.88	64.51	31.87
	NIO	56.15	48.51	27.41	19.53	28.92
Total Assets Turnover Days (days)	BYD	515.8	549.9	455.9	413.7	335.2
	NIO	1065.59	768.88	766.41	685.03	654.51

3.3.4 Growth Capability Analysis

Growth capability measures the future trend and potential for development in a company's production and business activities, which is crucial for shareholders, investors, managers, and other stakeholders. This paper selects the revenue growth rate and net profit growth rate to analyze growth capability. As can be seen from Table 7, during the period from 2018 to 2022, BYD's revenue saw a considerable increase. The reasons for this include the Chinese government's support for the new energy vehicle industry and the rapid growth of the global electric vehicle market, from which BYD, as a frontrunner, has significantly benefited. Meanwhile, due to an increase in sales volume and the effectiveness of cost control strategies, BYD's net profit also showed an upward trend. Between 2018 and 2022, NIO's launch of new models, along with the rapid increase in demand for electric vehicles within the industry, led to a significant expansion of NIO's product lineup and a marked increase in business revenue. However, as an emerging high-tech electric vehicle manufacturer, NIO made substantial investments in research and development and market expansion in its early stages, leading to net profit losses. Overall, BYD has strong growth capability with potential for further rise. NIO's growth capability is weaker, even though there has been some improvement in the net profit loss situation, the company still faces financial shortfalls and needs to control costs. However, with the maturation of technology and expansion of scale, NIO is expected to improve its cost structure and thereby increase its net profit.

Table 7. Growth Capability Analysis of BYD and NIO

	Year	2018	2019	2020	2021	2022
Revenue Growth Rate (%)	BYD	22.85%	-1.84%	22.63%	37.99%	96.25%
	NIO	92%	58.04%	107.77%	122.27%	36.34%
Net Profit Growth Rate (%)	BYD	-27.68%	-40.41%	183.81%	-34.04%	346.43%
	NIO	-91.97%	-17.23%	53.04%	24.27%	-259.40%

3.4. Prospective Analysis

Companies such as BYD and NIO, operating within the new energy vehicle sector, embrace green innovation as their core philosophy, focusing on the manufacturing and sales of electric vehicles, which constitute the majority of their stable revenue. Moving forward, these enterprises are expected to leverage their strengths, consolidate their core businesses, expand their business scale, and explore partnerships with other industries. By fully utilizing green resources and policy advantages, they aim to align with the global low-carbon revolution and venture into the sharing economy. The brand value and market influence of the new energy vehicle industry are on an upward trend, indicating that seizing opportunities, maintaining fluid access to capital markets, offering more personalized and customized services, and enhancing the overall strength of the industry are critical steps for future success.

4. Conclusion

As new energy vehicles increasingly enter the public's field of vision, the interest in their future trends grows. This paper, through strategic, accounting, financial, and prospective analyses of two representative new energy vehicle companies, arrives at the following conclusions: From a strategic analysis perspective, the overall economic environment is propelling the progress of the new energy vehicle industry. The continuation of national policies supporting and encouraging the green industry, combined with the ongoing enhancement of human environmental protection concepts, suggests significant development potential for the new energy vehicle industry. From an accounting analysis perspective, the industry is experiencing a fierce increase in revenue growth, with a stable cost structure. Companies may face financial shortfalls in the initial stages, but substantial profits are possible later on. From a financial analysis perspective, the industry has poor debt repayment capacity, with companies showing weak profitability initially but strong profitability later, gradually improving

operational capabilities and relatively stable growth potential. From a prospective analysis perspective, there is considerable room and prospects for development in the new energy vehicle industry. By applying the Harvard analysis framework to BYD and NIO, and examining financial metrics from 2018 to 2022, we can identify some deficiencies in the new energy vehicle industry's daily operations from a data level. Accordingly, addressing these issues can provide decision-making bases for managers in the industry, thereby enhancing its development capacity. However, analyzing the entire new energy vehicle industry based solely on BYD and NIO lacks representativeness. A comprehensive analysis involving other relevant enterprises and attention to national policies is necessary to provide a scientific basis for the industry's healthy development.

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