New Energy Vehicle Financial Analysis and ROI- based Valuation: A Case Study of BYD

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Abstract: In recent years, the global commitment to sustainable development has significantly elevated the strategic importance of new energy development worldwide. Driven by government incentives and subsidies, consumer demand for new energy vehicles (NEVs) has experienced exponential growth. As a leading new energy vehicle company, BYD occupies a large market share, so it is of great significance for studying BYD. This paper reformulates the company's income statement and assesses accounting quality, conduces financial analysis, prospective analysis, and applied residual operating income valuation model based on data from 2019-2023 and then provides a investment recommendations and conclusion remarks for investors. Overall, our study is not only helps understand the overall development trend of the NEVs industry, but also provides valuable references for government decision- making, corporate strategy, and industry judgement.

***Keywords*:** new energy vehicle, financial analysis, ROI model, BYD

1. Introduction

With the emergence of global warming and environmental pollution, countries have begun to actively advocate a green economy and promote sustainable development. As an important way to solve the energy crisis and promote sustainable development, new energy projects have been attracted the attention of the whole world. For automobile enterprises, accelerating the research and development of new energy vehicle technology and product iteration and upgrading is the key strategy to realize the bend and win the competitive advantage. As a leading company of new energy vehicles, the analysis of BYD is of great practical significance. This paper takes BYD Auto as an example, and applies residual operating income model to the evaluation of BYD Auto's financial performance, and what else has been done.

2. The Residual Operating Income valuation model

2.1 Overview of the ROI model

Residual operaing income model, or EBO model, is a measure method based on accounting profit rather than cash flow, primarily used to assess a intrinsic value of a company[1]. In 1995, American scholar Ohlson [2] systematically elaborated on this method in his paper "Earnings, Book Values, and Dividends in Equity Valuation", establishing the relationship between a company's equity value and accounting variables. This led to renewed attention to the method in the academic community, making it one of the most popular research topics in the fields of finance and accounting.

2.2 ROI value assessment model

This paper mainly adopts the research method of case analysis, in order to truly reflect the company's value changes, select the financial data of 2019 ~ 2023, based on the ROI value calculation model to assess the enterprise value of BYD Company, the data needed in this paper are all from BYD's company financial statements. The ROI calculation formula is as follows:

$$V_0^{NOA} = NOA_0 + \frac{AOP}{1+WACC} + \frac{AOP_2}{(1+WACC)^2} + \ldots + \frac{AOP_T}{(1+WACC)^T} + \frac{CV_T}{(1+WACC)^T} \tag{1}$$

$$AOP_T = NOPAT_T - WACC * NOA_{T-1} = NOPM_T * Sales_t - WACC * \frac{Sales_T}{ATO_T} \tag{2}$$

3. Case study

3.1 Introduction of BYD and strategic analysis

Founded in 2003 by Wang Chuanfu, BYD Auto has become a leading manufacturer of passenger cars, buses, trucks,

electric bicycles, forklifts, and EV batteries. Its lineup includes battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs), collectively classified as new energy vehicles (NEVs) in China. In Q1 2024, BYD sold over 624,000 vehicles, maintaining a strong growth trajectory.Through technological advancements, strategic expansion, and ESG leadership, BYD has cemented its market dominance in China while enhancing its global competitiveness. With rising demand for sustainable transportation, BYD's future outlook remains strong, serving as a valuable model for the NEV industry[3][4].

3.2 The financial ratio analysis of BYD

3.2.1 Corporate profitability analysis

Table 1. Corporate Profitability

	2019	2020	2021	2022	2023
Gross profit margin	16.29%	19.38%	13.02%	17.04%	20.21%
Operating profit margin	1.66%	3.84%	1.84%	4.18%	5.20%
ROA	1.09%	3.03%	1.60%	4.49%	5.34%
ROE	3.44%	9.47%	4.70%	15.70%	23.06%
Sales	127738523	156597691	216142395	424060635	602315354

The graph shows an upward trend in BYD's overall profitability over the five-year period. From 2019 to 2023, BYD's ROE grows from 3.44% to 23.06%, while ROA also grows from 1.09% to 5.34%. The growth in these two metrics shows that the company has made significant progress in improving the efficiency with which it uses its assets and equity.The increase in profitability indicates that BYC has achieved significant results in improving efficiency and controlling costs. For investors and analysts, the continued improvement in these metrics suggests that the company's financial performance is healthy and is expected to sustain earnings growth in the future.

3.2.2 Corporate liquidity analysis

Table 2. Corporate Liquidity

	2019	2020	2021	2022	2023
Current ratio	0.99	1.05	0.97	0.72	0.67
Quick ratio	0.69	0.70	0.66	0.42	0.46

From the graph, we can see that the liquidity of BYD shows an downward trend over the five-year period. The current ratio declined from 0.99 in 2019 to 0.67 in 2023. In 2020, this ratio increased slightly but has continued to decline since then, suggesting that the company may be increasing its liabilities or its current assets are decreasing. The quick ratio declined from 0.69 in 2019 to 0.46 in 2023, which means that the company's ability to service its short-term debt without taking inventory into account is weakening.

3.2.3 Corporate efficiency analysis

Table 3. Corporate Efficiency

	2019	2020	2021	2022	2023
Inventory turnover days	87.29	90.77	84.17	82.07	66.59
Trade receivable turnover days	114.68	91.62	61.22	33.42	37.49
Trade payable turnover days	120.64	143.95	142.04	145.70	147.68

The graph shows that the turnover days for each metric of BYD is on a downward trend, that means there is a significant improvement in funds management and inventory control. The trade receivable turnover days decreased from 114.68 days in 2019 to 37.49 days in 2023. This improvement indicates that BYD has become more efficient in recovering sales collections, significantly reducing the time from sale to collection. The change of trade payable indicates that BYD has extended its payment cycle to its suppliers. Inventory turnover decreases from 87.29 days in 2019 to 66.59 in 2023, which shows that BYD has become more efficient in inventory management and is able to convert inventory for sale or use more quickly.

Overall, BYD has made remarkable achievements in improving operational efficiency over the past few years.

3.2.4 Corporate financial position analysis

Table 4. Corporate Financial Position

	2019	2020	2021	2022	2023
Gearing ratio	3.13	3.12	2.84	4.07	4.52
Interest cover	0.66	2.27	2.43	16.36	20.85

The graph shows that the interest cover has been on a significant upward trend since 2021, while the gearing has been on a flat trend.The gearing is essentially flat from 3.13 in 2019 to 3.12 in 2020, suggesting that the company's debt and equity funding structure is relatively stable over this period. The interest cover multiple has increased significantly from 0.66 in 2019 to 20.85 in 2023.This indicates a significant improvement in the company's operating profit in terms of its ability to cover interest expenses, which could be due to revenue growth, improved cost control or lower interest charges.

3.2.5 Comparison of New Energy Vehicle Industry

In order to assess BYD's market position, competitive advantages and future development potential from multiple dimensions, we compare BYD with other barands in new energy vehicle area. The result is as follows:

Table 5. Comparison of New Energy Vehicle Industry

	BYD	Tesla	SAIC
Profitibility			
ROA	5.34%	4.72%	2.01%
ROE	23.06%	23.74%	5.91%
GM	20.21%	14.37%	10.19%
Operating profit margin	5.20%	5.50%	2.69%
Liquidity			
Current ratio	0.67	1.73	1.13
Quick ratio	0.46	1.25	0.90
Efficiency			
Trade receivable turnover days	37.49	62.87	32.45
Trade payable turnover days	147.68	13.23	93.85
Inventory turnover days	66.59	73.26	51.65
Financial position			
Gearing	4.52	1.70	2.94
Interest cover	20.85	64.93	7.52

In terms of Profitability, the table shows that BYD has a higher ROA and ROE, which indicates a relatively better return on assets a As for Liquidity, the current and quick ratios of BYD are both lower than Tesla and SAIC, which may show the relative weakness of BYD in short-term solvency. In terms of accounts receivable turnover days, BYD is lower than both Tesla and SAIC, while the accounts payable turnover days of BYD is much higher than both companies. This could mean that BYD is quicker at collecting debts and has longer credit periods when it comes to paying its suppliers. Regarding the financial position, BYD has the highest Gearing of the three companies. Overall, BYD performs well in terms of profitability, especially in terms of ROE and gross margin. However, its liquidity metrics suggest the company may be facing some short-term financial pressure.

4. Calculation of BYD's value assessment based on ROI model

4.1 The Calculation of Net Operating Profit After Tax of BYD

The NOPAT calculation formula is as follows[5]:

NOPAT= Operating profit- Income tax

Table 6. NOPAT

The calculation of NOPAT			
	2023	2022	2021
Operating profit	32523461	21068297	6507963
Income tax	5170230	3370928	1034566
Net operating profit after tax (NOPAT)	27353231	17697369	5473397

4.2 Prospective analysis

Using linear regression model, we calculate the prospective results of BYD, the results are as follows:

Table 7. WACC

	2021	2022	2023	2024	2025	2026	2027	2028
Sales	216142395	424060635	602315354	860000000	1180000000	1560000000	2000000000	2500000000
NOPAT	5473397.06	17697369.48	27353231.12	56244.15	55509.51	60615.67	66175.31	72919.44
NOA	138213051	142837822	230325153	217870	239611	261351	283092	304833
NOPM	0.0253	0.0417	0.0454	0.0654	0.0470	0.0389	0.0331	0.0292
ATO	1.5638	2.9688	2.6151	3.9473	4.9246	5.9690	7.0648	8.2012
WACC	9.3%							

4.3 The calculation of WACC

The formula for calculating the weighted cost of capital WACC is:

$$\text{WACC} = \frac{D}{D+E} * R_d (1-\text{T}) + \frac{E}{D+E} * R_e$$

Where E denotes the total equity value of the company, D represents the toutal debt of comany, indicates the cost of debt, T is the corporate tax rate, R_e is the cost of equity, which is the return required by shareholders for investing in the company.After calculation, we can gain WACC equals 9.30%.

4.4 The valuation based on Residual operating income model

After calculation, the results are shown as follows:

Table 8. ROI Model

	2024	2025	2026	2027	2028
Sales	860000	1180000	1560000	2000000	2500000
NOA	217,870	239,611	261,351	283,092	304,833
NOPAT	56244.157	55509.511	60615.674	66175.314	72919.449
NOPM	0.0654	0.0470	0.0389	0.0331	0.0292
ATO	3.9473	4.9246	5.9690	7.0648	8.2012
WACC	9.30%				
g	2%				
AOP		35247.6011	38331.8510	41869.6709	46591.8926
Price per share	197.6896				

5. Stock recommendation and conclusion

We can retrieve that the current share price of BYD is 181(yuan) and the future valuation is 198 (yuan), so the future valuation is significantly higher than the present value of the share price. The study found that BYD has clear strategic objectives, leading sales, improving profitability, and the company share is investment-worthy. However, it also has some shortcomings. It has increasing competitive pressure from its industry peers, weak short-term debt servicing ability, and faces capital flow risks. However, there are several limitation of this study. First, the ROI model relies on assumptions

regarding cost of capital, growth rate, and profitability, which could introduce estimation errors if market conditions change unexpectedly. Second, while the study includes Tesla and SAIC as benchmark comparisons, a more comprehensive industry analysis involving other NEV manufacturers could provide a more holistic perspective. To further strenthen our study, we should refine assumptions, expanding benchmarks, integrating qualitative insights, and incorporating multiple valuation techniques. By doing this, we can improve the accuracy, depth, and applicability of our study in analyzing BYD's market position and the broader NEV industry trends.

References

[1] Dechow, P.M., Ge, W., Larson, C.R. and Sloan, R.G. (2011). Predicting material accounting misstatements. Contemporary accounting research, 28 (1), 17-82.

[2] Edwards, E. O., & Bell, P. W. (1961). The theory and measurement of business income. University of California Press.

[3] Ohlson, J. A. (1995). Earnings, book values, and dividends in equity valuation. Contemporary Accounting Research, 11(2), 661-687.

[4] Yan, Y. (2022). Research on enterprise valuation and risk of BYD. Progress in Applied Mathematics, 11(12), s15.

[5] Lai, Y., Li, D., Luo, Y., & Wu, G. (2023). Analysis of enterprise valuation and future development trends of BYD Company. Journal Name, Volume(1), 440-449.

[6] Penman, S. H. (2012). Financial statement analysis and security valuation (5th ed.). McGraw-Hill Education.