

Application of DCF Financial Valuation Model - Taking BYD as an Example

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Abstract: With the rapid development of modern financial industry, the valuation methods for modern enterprises are becoming more and more diverse. However, the DCF financial model is still a relatively common and accurate one. This paper will adopt the DCF valuation method, which is one of the cash flow discounting-based methods, to value a Chinese new energy enterprise called BYD. The result of the valuation is 7.39 trillion yuan, which is about 0.6 trillion from the actual result. The result is slightly different from the normal valuation, because it is still affected by the fixed debt and the estimation error of the future inflation rate and China's growth rate.

Keywords: WACC, BYD, valuation, Discounted Cash Flow (DCF)

1. Introduction

The value of the company has an important impact on the study and research of its financial direction. With the rapid development of the financial industry, many valuation models and theories have been proposed by financiers and economists. Common and popular valuation methods for companies include balance-sheet methods, income statement methods, mixed methods, and cash flow discounting-based methods [1]. In this paper, we will use DCF to evaluate a Chinese company, BYD. DCF model is one way of cash flow discounting-based methods. The purpose of this paper is to evaluate the convenience and accuracy of this model in the actual application process by using easy-to-collect data to evaluate the company. In addition, this paper will make an objective evaluation of the model and its overall valuation and analyze its advantages and disadvantages. So as to provide investors and scholars with appropriate path reference for valuation.

2. Theoretical Framework and Data Source

2.1. Theoretical Framework

The valuation model is a widely used company valuation method in the financial sector. The commonly used valuation models include DCF, P/E, and EV/EBITDA. Among them, the most accurate valuation method in theory is the discounted cash flow (DCF model), which is to discount all the cash flows of the enterprise in the future to today, and the value obtained is the intrinsic value of the enterprise. The subjective analysis and judgment of some parameters by financial analysts may

lead to a deviation from the model valuation value. On average, every error will change by - 2% to 14% [2]. However, its scientific nature is still indelible.

The formula is shown as follows:

$$EV = \frac{FCF1}{(1 + WACC)} + \frac{FCF2}{(1 + WACC)^2} + \dots + \frac{FCFn}{(1 + WACC)^t} + \frac{TV}{(1 + WACC)^t} \quad (1)$$

$$TV = \frac{FCF_{t+1}}{(WACC - g)} \quad (2)$$

$$TV0 = \frac{TV1}{(1 + WACC)^t} \quad (3)$$

EV represents the enterprise value of the company. FCF represents free cash flow in a certain year in the future. WACC means weighted average cost of capital. TV stands for terminal value. G represents the growth of free cash flow in the forecast period (growth of rate). T represents the number of years in the forecast period (time). TV0 represents the discounted final present value.

The weighted average cost of capital (WACC) represents a firm's average after-tax cost of capital from all sources, including common stock, preferred stock, bonds, and other forms of debt. WACC is the average rate that a company expects to pay to finance its assets [3]. In most cases, a lower WACC indicates a healthy business that's able to attract investors at a lower cost. By contrast, a higher WACC usually coincides with businesses that seem like riskier and need to compensate investors with higher returns.

2.2. Data Source

Due to the busy and diverse business of BYD, its business will be classified by valuation. Data sources are from its 2021 financial report [4]. In addition, for some ratios that may be encountered, such as depreciation rate, amortization rate, etc., the data source is the domestic authoritative financial website, Gurufocus [5]. In particular, we hereby declare.

3. Application of DCF Valuation in the Company

3.1. Overview of BYD

BYD is a high-tech enterprise committed to "satisfying people's yearning for a better life through technological innovation". BYD was founded in February 1995. After more than 20 years of rapid development, it has set up more than 30 industrial parks around the world, realizing the strategic layout of six continents in the world [6]. BYD's business layout covers the fields of electronics, automobiles, new energy, and rail transit, and plays a pivotal role in these fields. From the acquisition, storage, and application of energy, BYD is a listed company in Hong Kong and Shenzhen, with a turnover and total market value of more than 8 trillion yuan. The figure below shows the proportion of sales of BYD in various fields by product classification in 2020 and 2021.

REVENUE BREAKDOWN BY PRODUCT CATEGORIES



Figure 1: BYD's revenue breakdown by product categories [4].

3.2. Process of Valuation

The company's main business is divided into three major areas: The automobiles, and related products; handset components, assembly service, and other products; and rechargeable batteries and photovoltaics business. Since relevant institutions speculate that the company will still have a rapid development in the years after 2022, we rated the sales in 2022 as 160% of those in 2021, and then 130%, 119% and 110% respectively. The company will develop steadily and maturely in 2026 and 2027, so the growth rate of the company will be roughly consistent with China's long-term GDP growth rate of 5%. The Revenue calculation formula is shown as follow.

$R1 = R0 * \text{growth rate}$ where R0 stands for the revenue of the previous year and R1 is the revenue of the next year.

Table 1: Revenue of BYD in 2021 [4].

Revenue	Unit (thousand)	
The automobiles and related products, and other products Revenue	¥'000	112,489,200.00
The handset components, assembly service and other products Revenue	¥'000	85,546,800.00
The rechargeable batteries and photovoltaics business	¥'000	18,107,000.00
Total Revenue	¥'000	216,143,000.00

Table 2: Revenue of BYD in 2022 to 2027(forecast).

Revenue	Unit (thousand)	2022	2023	2024	2025	2026	2027

Table 2: (continued).

The automobiles and related products, and other products Revenue	¥'000	176,127,120.0 0	228,03 7,056. 00	271,36 4,096. 64	298,50 0,506. 30	313,42 5,531. 62	329,09 6,808. 20
The handset components, assembly service and other products Revenue	¥'000	222,421,680.0 0	314,81 2,224. 00	389,68 2,783. 36	444,66 5,422. 66	477,48 5,965. 76	501,36 0,264. 04
The rechargeable batteries and photovoltaics business	¥'000	28,971,200.00	37,662 ,560.0 0	44,818 ,446.4 0	49,300 ,291.0 4	51,765 ,305.5 9	54,353 ,570.8 7
Total Revenue	¥'000	427,520,000.0 0	580,51 1,840. 00	705,86 5,326. 40	792,46 6,220. 00	842,67 6,802. 97	884,81 0,643. 12

Then, we calculate the FCF. FCF in our case will be calculated by $FCF = \text{net income} + D\&A - CAPEX - \text{change in WC}$. D&A represents depreciation and amortization. CAPEX represents capital expenditure, and WC stands for working capital.

For net income in 2021, we can obtain the data directly from the financial report. For the rest of years, the calculation formula is $\text{net income} = EBITDA - D\&A - \text{interest} - \text{profit tax}$. Among them, the asset tax rate is about 12%, which is the average figure disclosed in the financial statements for many years.

Table 3: Net income of BYD in 2021 [4].

Date	2021
Net Income	12158000

Table 4: Net income of BYD in 2022 to 2027(forecast).

	2022	2023	2024	2025	2026	2027
EBITDA	114418418.2	161317723.7	191879180.5	209633791.3	211500542.4	200925132.9
D&A	19495011.66	27552906.16	34133707.97	39678202.91	43311720.75	45485555.14
Interest	1908000	1908000	1908000	1908000	1908000	1908000
Profit tax	232,585.20	232,585.20	232,585.20	232,585.20	232,585.20	232,585.20
Net Income	81676828.46	115783471.5	136840884.7	147562587.4	146011189.5	134816078.5

Next, the FCF of BYD can be calculated by $FCF = \text{net income} + D\&A - CAPEX - \text{change in WC}$. D&A represents depreciation and amortization. CAPEX represents capital expenditure, and WC stands for working capital.

Table 5: FCF of BYD in 2021 [4].

	2021
Net Income	12,158,000.00
D&A	14,079,000.00
CAPEX	3,734,400.00
Change in WC	-
Cash Flow	28,123,000.00

Table 6: FCF of BYD from 2022 to 2027 (forecast).

	2022	2023	2024	2025	2026	2027
Net Income	81,676,828.46	115,783,471.47	136,840,884.67	147,562,587.38	146,011,189.53	134,816,078.46
D&A	19,495,011.66	27,552,906.16	34,133,707.97	39,678,202.91	43,311,720.75	45,485,555.14
CAPEX	7,386,455.67	10,029,764.62	12,195,553.29	13,691,795.95	14,559,306.82	15,287,272.16
Change in WC	-3,218,977.19	-8,121,733.56	-8,441,433.17	-5,886,597.10	-4,979,373.07	-7,419,163.95
Change in Debt	-	-	-	-	-	-

Table 6:(continued).

Cash Flow	97,004,36 1.64	141,428,34 6.56	167,220,47 2.52	179,435,59 1.45	179,742,97 6.53	165,014,36 1.45
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Then the WACC can be calculated. WACC is a common way to determine the required rate of return (RRR) because it expresses, in a single number, the return that both bondholders and shareholders demand to provide the company with capital. It is also useful for analysts, investors, and company management to estimate its net present value. The formula is $WACC = (E/V) \times Re + (D/V) \times Rd \times (1 - Tc)$. Where, Re =cost of equity; Rd =cost of debt; E =market value of the company's share capital; D =market value of corporate debt; $V=E+D$; E/V =share capital as a percentage of total financing; D/V =percentage of debt in total financing. Tc is the income tax rate. In our case, company β the coefficient will represent Re and cost of debt will be represented by the average debt rate of the company.

During this period, many factors were considered, such as China's inflation rate [7], future economic growth rate [8] and China's 10-year national debt rate [9]. The detail of the rates relevant is shown in Table7. In the following table, we use the Shanghai Stock Exchange Index, an index that covers most of China's stocks, to measure the average return of the market. And because it is a listed company, the β coefficient can be found to be 0.87.

Table 7: Parameters of WACC.

China risk free rate	2.92%
Beta	0.87
Growth rate	3%
Makert Premium	5%
D/E	1.837381528
Cost of Equity	7.096000%
Cost of Debt	4.35%
WACC	0.04974414

To combine the above data and analysis, The result of WACC is 4.97% and the valuation of the company is 8.02 trillion yuan, which is about 0.63 trillion from the actual value.

3.3. Analysis of Advantages and Disadvantages

The advantages of this DCF valuation model are reflected in its speed, convenience and accuracy. All data about the company's business can be clearly reflected in the company's financial statements. Some common commercial ratios, such as depreciation rate and amortization rate, can be found quickly, making the whole valuation convenient and quick. The disadvantage is that many valuation parameters are speculative due to insufficient understanding of the company's internal business and limited information.

For example, we have to treat the number of liabilities as unchanged. In addition, China's future economic growth rate and inflation rate can only be predicted, resulting in errors in the results and accuracy of valuation.

Through the DCF financial pricing model, the market value evaluation of BYD was completed. The error rate is 7.86% compared to professional financial institutions [10], mainly due to inaccurate

estimation of parameters and some assumptions inconsistent with the financial website. In the future, we expect to have a more comprehensive and complete evaluation of the company by referring to the financial reports of more years. Also, the website mentioned that it is difficult to estimate for private companies because of the lack of publicly available data [11]. In a word, it is the most reliable to find a balance of multi-dimensional and multiple methods to evaluate the company.

4. Conclusion

This paper builds a DCF model to analyze the valuation of BYD for a specific company. After our analysis and calculation, the valuation result of the enterprise is 8.02 trillion, which is about 0.63 trillion from the actual value. Due to the limited data sources of many parameters, the valuation of BYD in this paper is not very accurate. However, this also reflects the side that even with limited information, the DCF model still shows excellent basic accuracy and provides important support for those who want to invest in or understand the company. For future valuation, we should actively develop new models, improve and expand existing models such as DCF, and strive to provide more convenient and efficient valuation methods and ideas in the future.

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