Application of DCF Model in Enterprise Valuation

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Abstract: The home appliances industry is an important manufacturing industry that reflects the consumption level of Chinese residents. Midea Group is the leading enterprise in the household appliances industry and one of the enterprises with high brand value in China. For Midea Group in the home appliance industry, this paper will apply the DCF model for enterprise valuation. This paper mainly uses the financial information of Midea Group and the discounted cash flow model for enterprise valuation. Then, the advantages and disadvantages of the DCF valuation model are analyzed through practical cases, and the overall valuation process is summarized. The company value of Media that valued by the DCF model is 384,922.89 million RMB. The analysis results show that the DCF model can better reflect the status quo of enterprise value, but in the process of DCF valuation model, it is not easy to predict the accurate amount of future cash flow. It also has limitations in industry and product selection, and its estimation of the risk rate is not accurate enough.

Keywords: discount cash flow (DCF) model, enterprise valuation, midea group, future cash flow, discount factor

1.   Introduction

Enterprise valuation is very important, especially in business activities. The valuation of enterprise value can provide a reliable basis for enterprise managers to make business decisions in the future, and it also enables external investors and stakeholders to provide a reasonable valuation for both parties when making decisions. With the continuous improvement of the capital market, the valuation model has gradually formed a relatively complete theoretical framework system. As one of the most widely used valuation models, the DCF (discounted cash flow) model has important research significance. This paper takes Midea as an example, analyzes the historical financial statement data in recent years, and, according to the domestic and foreign market trends in recent years, uses the DCF model to forecast the market value valuation. Then, compared with the published market value of American companies, the advantages and disadvantages of the DCF model are analyzed.

2.   Theoretical Framework and Data Sources

2.1.   DCF Model

The DCF method is intended to accumulate the expected cash flow of an enterprise to its current present value for a particular period in the future. The essence of enterprise value is its ability to make profits in the future, only when the enterprise has this ability, its value will be recognized by the

market. Therefore, the theory usually takes the discounted cash flow method as the preferred method of enterprise value evaluation.

The particular application process of the DCF method can be separated into three steps: first, predict the accurate amount of free cash flow of an enterprise, then make a calculation of the discount rate, and finally calculate the total value of the enterprise by using DCF model. Then using the formula: $\sum_{t=1}^{\infty} \frac{FCF_1}{(1+WACC)^t} + \frac{FCF_{t+1}}{(WACC-g)(1+WAAC)^{t+1}}$, where FCF is the free cash flow in a particular period in the enterprise, WACC is the weighted average cost of capital; g is the growth rate in the period; and t is the income forecast period [1].

2.2. Data Source

Most of the figures are derived from Midea's published financial statements, while some (such as depreciation and amortization) are extrapolated from other figures in the financial statements.

The growth rate forecast of the industry is based on the forecast data of the future income of Midea Group made by two well-known domestic securities brokerages.

3. The Application of DCF Model in the Valuation of Midea Group

3.1. Midea Group Fundamental Introduction

Midea Group now has a leading position in the production of home appliances. At present, its distribution is in consumer appliances, HVAC, robotics, and automation systems, intelligent supply chain, four types of business, is transforming from a home appliances company to a large technology group providing multiple products and services. Among the main business segments of the company, the consumer appliances business mainly includes kitchen appliances, refrigerators, washing machines, and various small household appliances; the Hvac business includes home air conditioning, central air conditioning, heating and ventilation systems; the robot and automation system business is centered on the Kuka Group and Yaskawa Robot Joint venture company acquired by the company; and the intelligent supply chain plate is provided to Ande Zhaopin as a service platform to provide integrated solutions [2].

Midea has established about 200 subsidiaries worldwide, 12 strategic business units, 14 domestic production bases, and 18 overseas production bases. Under the strategy of Transforming Technology Group, the company actively builds a globally competitive research and development system. In the last five years, it has invested 20 billion yuan in research and development, and the number of invention patents in the field of home appliances has ranked first in the world for three consecutive years. The Midea brand occupies a leading position in many categories in the domestic household appliance market, and its competitiveness in the international market has been rapidly improved in recent years [2].

3.2. Valuation the Midea Group by DCF Model

3.2.1. Future Cash Flow

Net Operating Profits Less Adjusted Taxes (NOPLAT). The operating profit can be found in the income statement and it is used to time inflation rate to be the operating profit presented in the table 1 [3, 4].

For the sales growth rate, in general, the home appliance business of Midea Group, including refrigerators, air conditioners and washing machines, has been in the mature stage, which is mainly based on renewal demand, but it is still possible for kitchen appliances and various small appliances to improve a lot. In addition, Midea Group is a global enterprise and still has a good market.

Therefore, it is assumed that the growth rate of sales volume will change stably from 2021 to 2023 because, in recent years, all markets have still been affected by the epidemic. Also, since home appliances become more mature and popular and are less affected by the epidemic as time passes, it is assumed that the sales volume is expected to increase dramatically from 2024 to 2026. As the growth rate of these products is predicted by analysts in investment banks, which released the data on an authoritative website called "carrot investment", it is used as the standard and the basic rate. On the following steps we adjust it based on this rate, and the result also times the inflation rate [4, 5]. As a result, the same sales volume growth revenue is used to estimate the sales volume growth rate in each business segment. Although there are some differences in the industry, the differences are not obvious.

$$NOPLAT = Operating\ profit * (1 - income\ tax\ rate)$$

Table 1: NOPLAT predicted future cash flow (Unit: million RMB).

Year	2021	2022	2023	2024	2025	2026
Operating Profit	30,057.00	32,720.62	39,527.35	53,721.48	81,182.07	134,484.06
Income tax rate	25%	25%	25%	25%	25%	25%
NOPLAT	22,542.75	24,540.47	29,645.51	40,291.11	60,886.55	100,863.04

Working capital. The account receivable and account payable are calculated based on the balance sheet, and multiplied by the inflation rate [3, 4].

It is assumed that the receivable should increase at the same rate as the revenue, because if revenue increases, it means more orders for the company, and if the proportion of the orders that will be paid in the delay is the same, then the amount of the account receivable is expected to increase at the same rate as the revenue at the basic rate, which is almost the average growth rate. For accounts payable, it is assumed that they increase at the same rate as the basic growth rate of revenue. Since the revenue increased, the number of orders increased as well. If we assume that the company's operation funds increase at the same level of total revenue, then there are no extra funds to operate for the orders from suppliers. Thus, the accounts payable should increase at the same level of revenue. Under our assumptions of account receivables and accounts payable, the working capital should be the receivables minus the payable, which is negative. As the growth rates of these two remain the same in the following years, the working capital should also be negative and decrease continuously. So as the change in working capital.

Table 2: Working capital predicted future cash flow (Unit: million RMB).

Year	2021	2022	2023	2024	2025	2026
Account Receivable	24,636.44	26,063.97	29,065.66	32,383.39	36,235.07	40,544.86
Account Payable	65,983.56	69,806.91	77,846.29	86,732.13	97,048.05	108,590.95
Working Capital	-41,347.12	-43,742.93	-48,780.63	-54,348.74	-60,812.98	-68,046.08
Change in WC	-	-2,395.82	-5,037.70	-5,568.11	-6,464.24	-7,233.10

Capital expenditure (CAPEX). The investment rate between 2022 and 2023 is predicted to the

average of that between 2020 and 2021. And for the future two years between 2024 and 2026, it is calculated as the average of investment rate in the previous four years between 2018 and 2021 [6].

The formula: CAPEX = Revenue * Investment rate is used to calculate the value of CAPEX. As the rate experienced an obvious increase during 2020 and 2021, it could be analyzed as a result of having a pandemic. Since COVID-19, Midea might have purchased more automated machines to replace the lack of labor or replace more machines because of the unused machines caused by the long-time lockdown. Therefore, in the first two years, the investment rate is predicted to be the average of that in 2020 and 2021, while in the following three years, CAPEX is predicted to keep a similar increasing rate as the average investment rate in the past four years.

Table 3: Historic data and calculation of capital expenditure (Unit: million RMB) [6].

Year	2018	2019	2020	2021
Amount	21,996.81	20,797.48	25,732.65	31,149.44
Revenue	261,819.64	279,380.51	285,709.73	343,360.83
rate	8.40%	7.44%	9.01%	9.07%
Average rate 2022-2023				9.04%
Average rate 2024-2026				8.48%

Table 4: Prediction of future cash flow in Capital expenditure.

Year	2022	2023	2024	2025	2026
Revenue	366,879.10	412,169.53	468,899.27	545741.11	654,297.75
Average rate	9.04%	9.04%	8.48%	8.48%	8.48%
CAPEX	33,165.87	37,260.125	39,762.66	46,278.85	55,484.45

Depreciation & Amortization (D&A). Since accurate depreciation and amortization of Midea Group in 2021 cannot be found from the official website and annual report, it is available to use the depreciation and amortization of 2018-2020 and the calculated average growth rate of the four years [6].

Table 5: Historic data and calculation of D&A growth rate (Unit: million RMB) [6].

Year	2018	2019	2020
Amount	4,817.46	5,168.26	5,020.26
Growth rate		7.28%	-2.86%
Average growth rate			2.21%

Then, the average growth rate was used to calculate the 2021-2026, which is assumed to be the prediction of future depreciation and amortization.

Table 6: Prediction of future cash flow in D&A.

Year	2021	2022	2023	2024	2025	2026
Growth rate	2.21%	2.21%	2.21%	2.21%	2.21%	2.21%
Depreciation and Amortisation	5,001.99	5,112.49	5,225.43	5,340.87	5,458.85	5,579.45

Calculation of the Future cash flow. Future cash flow is a forecast that estimates the amount of cash that will flow in and out of the country at a certain time in the future. There are two kinds of

forecasting methods, namely the traditional method and the expected cash flow method. This paper uses the traditional method to evaluate Midea Group. It only uses a single set of estimated cash flows and does not consider the expected value of all possible cash flows.

$$FCF = NOPLAT + D\&A - CAPEX - Change\ in\ Working\ Capital$$

Table 7: Prediction of future cash flow (Unit: million RMB).

Year	2021	2022	2023	2024	2025	2026
NOPLAT	22,542.75	24,540.47	29,645.51	40,291.11	60,886.55	100,863.04
D&A	5,001.99	5,112.49	5,225.43	5,340.87	5,458.85	5,579.45
CAPEX	31,149.44	33,163.12	37,257.03	39,767.53	46,284.51	55,491.24
Change in Working Capital		-2,395.82	-5,037.70	-5,568.11	-6,464.24	-7,233.10
FCF		-1,114.34	2,651.61	11,432.56	26,525.13	58,184.34

3.2.2. Cost of Capital (Discount Factor)

Cost of debt. Concerning the interest expense, as the epidemic had a large influence on the global economy and it is assumed to be affected in the next few years, the interest rate should also take COVID-19's effects into account [6]. Therefore, it is expected that the interest rate will be the average of the prior four years.

Table 8: Calculation of the income tax rate (Unit: million RMB) [6].

Year	2018	2019	2020	2021
Interest expense	703.99	880.70	1,305.59	1,357.56
Interest Rate	2.13%	1.87%	2.47%	5.37%
Average interest rate				2.96%
Income tax rate				25%

Cost of debt (K_{dat})= Average Interest rate * (1-Income tax rate) = 2.22%

Cost of equity. The risk-free rate (R_f) is the treasury bond of the Chinese government for ten years [7].

Cost of equity (K_e) = $R_f + \beta R_{premium}$=15.93%. [8]

Cost of Capital. According to the CAPM model, **weighted average cost of capital (WACC)** $= K_{dat} * \frac{V_d}{V_e + V_d} + K_e * \frac{V_e}{V_e + V_d}$ =13.62%.

3.2.3. Valuation

By using the equation, **NPV forecast period** $= \sum_{t=2021}^{t=2026}$ **FCF * cost of capital.**

Because the growth rate is considered to be the same as the GDP in China, it should be 4.56% [8].

According to the formula, NPV continuation value $= \frac{(1+\text{growth rate})}{(\text{cost of capital}-\text{growth rate})} *$ discounted cash flow, Enterprise's valuation=NPV forecast period+NPV continuation period. Therefore, the enterprise's valuation should be ¥384,922.89 million.

Table 9: Calculation of enterprise's valuation (Unit: million RMB).

Year	2021	2022	2023	2024	2025	2026
FCF		-1,114.34	2,651.61	11,432.56	26,525.13	58,184.34
Discount factor	0.94	0.83	0.73	0.64	0.56	0.50
Discounted cash flow		-920.14	1,927.08	7,312.89	14,933.40	28,831.23
NPV Forecast Period	52,084.46					
NPV Continuation Period	332,838.43					
Enterprise's valuation	384,922.89					

3.3. Analysis of the Valuation

Then, the shortcomings of the DCF model are exposed by the valuation of Midea Group. The data for the two items (depreciation and amortization) in the formula cannot be directly derived from the management financial statements. The depreciation and amortization items which is refer to the depreciation amount of the current period and are listed in the notes to the financial statements. Capital expenditures are comprised of long-term net operating asset increases and current depreciation and amortization data, which are still not readily available. The DCF model adopts the method of calculating weighted percentage of sales to predict future free cash flow, assuming that the ratio of each item in the financial statement to the operating income remains unchanged, estimates the future growth rate of the enterprise, determines the sales revenue in the forecast period according to the growth rate, and uses the predicted sales revenue and the assumed constant percentage to predict each item in the future annual financial statements [9]. And then forecast the future free cash flow. The prediction of the future growth rate of the company is often subjective, and the growth rate of each item in the financial statement to the operating income may not be stable for a long time, so the forecast results may be subjective to a certain extent.

In addition, the digital transformation of enterprises is a long process, and each stage of the transformation requires a large cost, and satisfactory results may not appear within one or two years. Furthermore, after the transformation of enterprises, it is difficult to accurately judge which achievements are generated by digital measures, and only vague estimations can be made. Therefore, when evaluating enterprises engaged in digital transformation, it is difficult to conduct specific quantitative analysis on the benefits brought by digital transformation [10].

4. Conclusion

In this paper, the DCF model is used to estimate the 2021 market value of Midea Group at RMB 384,922.89 million, which is 1,783.89 million RMB more than the actual market value. Therefore, it reflects that the DCF model can roughly reflect the market value of the company, but it is not accurate enough.

Among them, there are some limitations in the model itself, resulting in an inaccurate final valuation that cannot be avoided. In addition, there will be inaccuracies in data acquisition, which can be predicted in more detail through a large number of data queries and comparisons. For example, because depreciation and amortization didn't get the numbers right when valuing the US group for 2021, there may be errors in the future cash flow estimates. Secondly, when estimating CAPEX, the

investment rate uses the average value plus some adjustments, so the valuation of future cash flows may not be accurate enough. By paying attention to the annual report and financial statement of Midea Group, the valuation of the company can be more accurate. Therefore, after Midea publishes other financial data in 2021, the valuation data will be adjusted to make the valuation of the company more accurate.

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