

Discussion on the Advantages and Disadvantages of the DCF Model in the Current Era and the Improvement of the Model

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Abstract: The discounted cash flow model is a company value evaluation method widely used by many domestic investors when investing company. However, under the background of the epidemic, due to factors like low benchmark interest rates that are not conducive to the valuation of the DCF model, the accuracy of the discounted cash flow model valuation has been questioned. In addition, the DCF model is not entirely applicable to the domestic market because of the multiple systems and the local capital market's imperfections, so the model needs to be improved. In this paper, the existing literature is summarized, and it was found that the time series analysis method can be used, which can predict the company's future cash flow more accurately, instead of the sales ratio analysis method, while the discount rate can be calculated more accurately by substituting each company's beta into the calculation instead of using the company's industry beta.

Keywords: enterprise valuation, DCF model, Pros and Cons, improvement

1. Introduction

In the current domestic market, on the premise that the enterprise has good solvency, profitability, operational ability, etc. for value evaluation, investors often like to use the discounted cash flow model, which is known as the DCF model, to value companies [1]. In the previous research on the DCF model, researchers have found the defects of the model in situations such as interest rate fluctuations. At low-interest rates, a large part of the calculated discount value will be uncertain, causing the value evaluation of enterprises inaccurate

The purpose of this paper is to conduct a theoretical analysis of the DCF model and propose a new improvement method based on the existing literature. The time series analysis method will be employed to get more accurate evaluation results. In this paper, a more reliable and accurate valuation model will be provided to domestic investors, so they can more accurately assess the enterprise value of domestic companies.

The advantages and disadvantages of the model will be analyzed by reviewing related research.

For the investment field, more accurate enterprise valuation can help investors identify whether the enterprise has investment value and the expected income investors can get from investing in the enterprise. In addition, after knowing the advantages and disadvantages of the DCF model, investors

can choose whether to use the DCF model as their enterprise valuation model according to their investment environment. At the same time, as a literature review, this paper can also help readers understand the DCF model, an excellent enterprise valuation model, and provide investors with a valuation idea

DCF model is mainly applied to assess the intrinsic value of a company by investors. If the market value of an enterprise is less than or even far less than the enterprise value estimated by the discounted cash flow model, the company has great investment potential and is suitable for investors to invest. For instance, Buffett used the DCF model to evaluate Coca-Cola in 1988. Its intrinsic value was 48 billion dollars, much higher than the market value of 14.8 billion dollars at that time, so Buffett bought a lot of shares of Coca-Cola. As it turns out, Coca-Cola achieved a 50 times P/E growth in the following period.

2. Related Formulas

The DCF model was proposed by the famous American investment theorist John Burr Williams [1], which is used to determine a company's value. The DCF model points out that investors can predict the company's future cash flow and consider the entire discounted future cash flows as representing the company's value. Its basic formula is as follows:

$$V = \sum_{t=1}^T \frac{FCF_t}{(1+WACC)^t} + \frac{P_T}{(1+WACC)^2} \quad (1)$$

Among them, FCF_t is the estimated free cash flow in the t year; T is the forecast period; P_T is the enterprise value in the stable growth stage [2]. And weighted average cost of capital which is known as WACC is usually seen as the discount rate.

First of all, enterprise free cash flow is equal to one minus income tax rate and then times earnings before interest and tax, known as EBIT, and then plus depreciation and amortization, minus capital expenditures and net working capital increase, which is used to measure the cash actually held by an enterprise that can return to shareholders. It refers to the maximum amount of cash that can be distributed to shareholders (and creditors) without endangering the survival and development of the company. The formula is as follows

$$\text{Free Cash Flow} = \text{EBIT} \times (1 - \text{income tax rate}) + \text{depreciation and amortization} - \text{capital expenditures} - \text{net working capital increase} \quad (2)$$

The weighted average cost of capital is then determined using the CAPM, or capital asset pricing model. WACC is calculated by multiplying the cost of equity by the enterprise's owner equity, dividing the result by the enterprise's total market value, and finally adding the cost of debt, which is multiplied by the total corporate debt and then divided by the enterprise's total market value.

$$WACC = \frac{K_e \times V_e + K_d \times V_d}{V_e + V_d} \quad (3)$$

K_e stands for the cost of common stock; K_d represents the cost of debt; V_e represents the owner's equity of the enterprise; V_d represents the value of debt. And the total market value of the enterprise equals plus V_d .

What must be realized is that the domestic A-share market does not implement a preferred stock policy, so when calculating the cost of equity, only the cost of common stock needs to be considered. In addition, the expected return on assets that we get from the CAPM model can be considered as the

required return on the common stock, which is equal to the cost of common stock. Here is the formula of the CAPM model:

$$E(R_i) = R_f + \beta_i \times [E(R_m) - R_f] \quad (4)$$

$$E(R_i) = \text{Expected return on asset} \quad (5)$$

$$R_f = \text{Risk-free rate of return} \quad \beta_i = \text{Beta of asset} \quad (6)$$

$$E(R_m) = \text{Expected market return} \quad (7)$$

At last, the enterprise value in the stable growth stage can be counted by the following formula:

$$PT = \frac{\text{Free cash flow in the first year of the stage period}}{(WACC-g)} \quad (8)$$

^g is the sustainable growth rate.

3. The Advantages and Disadvantages of the DCF Model

3.1. The Advantages of the DCF Model

As is known, regardless of whether a company provides any product or any service to consumers, the final result will be converted into the firm's cash flow. Therefore, free cash flow can be used as a good measure of the company's intrinsic value. And Discount Cash Flow Model is the valuation model proposed based on this understanding. After Graham put forward the value investment theory, the DCF model has been considered the value-added analysis method that best fits the theory and effectively reflects the intrinsic value [3]. Although few scholars and practitioners employ the DCF Model, Penman mentions that it is one of the most significant valuation methods, which is concurred by Copeland and other experts [4,5]. They emphasized that the discounted cash flow approach (DCF) covers all the factors that have an impact on the company's value thoroughly and honestly up until the very end [6]. Not only that, the world-renowned investor Warren Edward Buffett has achieved great success in the investment field through Graham's value investment theory, and he pointed out that the intrinsic value is the present value of the cash flow during the future operation of the enterprise, which fit well with DCF model. It includes a more comprehensive evaluation model with the most rigorous but very difficult framework when compared to other frequently used suggested evaluation models. The DCF model is more extensive, has a longer projection time, and takes into consideration many variables, including profit growth, capital costs, etc. It also requires more data and a more comprehensive viewpoint in order to account for the long-term nature of the company's development. The methodological framework of DCF valuation requires investors to consider not only the financial condition, product structure, and business structure of a company but also the development of the industry and the company's strategy, in order to form a comprehensive understanding of the listed company. A comprehensive analysis of listed companies is the essence of DCF valuation. Although the DCF model is ideal in theory, the execution is somewhat difficult. Diverse data are comparatively complete in developed country markets, and the business system is comparatively developed. A popular approach to valuation is now DCF.

After looking at the existing research on the DCF model, the DCF model can accurately estimate the enterprise value of those companies that can accurately measure future cash flows and discount rates. Specifically, in the current domestic market, investors can use the DCF model to more accurately estimate the enterprise value of industries such as medicine, new energy vehicles, and liquor [7-9]. It is not difficult to find that companies in the aforementioned industries have the ability to

operate continuously and profitably, making it convenient for investors to conduct valuations, which is also an important applicable condition for the DCF model.

3.2. The Disadvantages of the DCF Model

Although the DCF model has the above-mentioned advantages, for the current domestic market, investors still have great uncertainty in using the DCF model to evaluate the value of enterprises.

First of all, many parameters are introduced into the DCF model, and subjective elements are incorporated into both the growth rate and the discount rate. When investors subjectively assign different values to the parameters and substitute them into the formula for calculation, the results obtained will be very different. In general, investors are often unable to accurately consider changes in the future market environment and the impact of a series of risk factors such as policies, technological alternatives, interest rates, etc. on the market. To illustrate this problem, there is a concrete example. When investors evaluate a company's value, most domestic investors currently use the beta of the company's industry to calculate the company's WACC. However, even though they are in the same industry, the systemic risk or the volatility of different companies in this industry relative to the market is also very different. For instance, the beta of Build your dreams at the end of 2022 is nearly 0.99, but the beta of Dongfeng Motor is 1.25. What's more, in the actual calculation, the closer the time is set, the more accurate the parameters will be, and the more reliable the enterprise value obtained by using the DCF model will be. On the contrary, if the parameters are obtained farther away, the uncertainty of the obtained parameters will be greater, and the results obtained will also be inaccurate. For example, if it makes up a sizable amount of the total present value of the future cash flow, there will be a great deal of uncertainty in the portion of the present value that represents the discounted future cash flow after five years. Also, the earlier study discovered that the weighted average cost of capital rose in direct proportion to the part of the future cash flow that is currently valued in the first three or five years. Moreover, the Discount Cash Flow Model's determination of enterprise value will be significantly more accurate when the weighted average cost of capital is higher than 20% [10].

Secondly, free cash flow cannot effectively reflect the full value of the enterprise. Although the current free cash flow of some enterprises is at a relatively low growth rate, it needs more time to create a lot of wealth. In other words, it is not advisable to estimate its future free cash flow based on the current data. A typical example is the technology industry [11]. The technologies of these companies need to go through a long period of development before they can generate a large amount of cash flow after they mature [12]. Therefore, these technologies cannot currently be valued through models.

Finally, the DCF model employs the sales ratio approach to forecast growth rates in the future. However, the operating profit for each item in the financial statement may fluctuate for a considerable amount of time. Therefore, it is very likely that making use of the sales ratio to make predictions of future cash flow that each item can generate is not accurate.

3.3. Improvements to the DCF Model

Based on the above analysis of the shortcomings of the DCF model, the following two improvements to the DCF model are proposed.

The renowned time series forecasting model put forth by Bocks and Jenkins-ARIMA can be used to replace the sales ratio approach because it is too subjective [13]. Due to the subjectivity of the sales ratio method, the time series prediction model can be used to predict objectively through linear regression. An appropriate beta coefficient based on the unique business characteristics of each company to conduct valuation analysis on the company, instead of using a certain market or the entire securities market as the analysis object. For example, when we analyze the new energy automobile

industry, as an emerging industry, the development of each company is very different, so selecting its unique beta for each company to calculate is very important.

4. Conclusion

In the current environment, the DCF model has several flaws that are evident in the high degree of uncertainty of the valuation under the assumption of lower interest rates and the uncertainty of the company's cash flow estimate. Therefore, the time series analysis approach can be used in place of the sales ratio analysis method to forecast the company's future cash flow, and the discount rate can be calculated more accurately by using each company's beta rather than the industry beta for the company as a whole. And with the gradual improvement of China's capital market, the DCF model will also be more applicable to the domestic market, making it easier for investors to value companies more accurately.

At the current phase, the improved DCF model is still limited to theoretical analysis and remains to be fully discussed and tested in practice. Therefore, in future research, the model can be used to analyze the past data of different companies, which can be compared with its current stock price to verify whether the model has been improved.

References

- [1] Si Wang. *Research on Enterprise Value Evaluation Based on DCF Model*. *National Circulation Economy* (35),79-81 (2020). doi:10.16834/j.cnki.issn1009-5292.2020.35.026.
- [2] Williams, J.B. *The Theory of Investment Value*. Harvard University Press, Cambridge, MA. (1938)
- [3] Benjamin. Graham, David Dodd. *Securities Analysis [M]*. Beijing: Renmin University of China Press, (2009).
- [4] Penman, S. H & Sougiannis, T., *A comparison of dividend, cash flow, and earnings approaches to equity valuation*. *Contemporary Accounting Research*. 15, 3, 343 – 383 (1998).
- [5] Copeland, T., Koller, T. and Murrin, J., *Valuation: Measuring and managing the value of companies*. John Wiley & Sons Co. New York (1990).
- [6] Ahmed. S.Wafi Hassan Hassan Adel Mabrouk. *Fundamental Analysis Models in Financial Markets–Review Study*.*Procedia Economics and Finance*, Vol 30, 939-947 (2015). [https://doi.org/10.1016/S2212-5671\(15\)01344-1](https://doi.org/10.1016/S2212-5671(15)01344-1)
- [7] Zhengjun Min. *The Application of Discount Model in Enterprise Value Evaluation* (2014).
- [8] Shiwei Song. *Enterprise Value Evaluation of New Energy Vehicles Based on DCF Model—Taking BYD Co., Ltd. as an Example*. *Time-honoured Brand Marketing* (07), 89-90, (2021).
- [9] Chenglong Wei & Junzhi Chen, *A study on the valuation of listed companies based on the improved DCF model in Guizhou—Take Guizhou as an example*. *Research on Generalized Virtual Economy* (01), 57-68 (2017).
- [10] Yongqi Chen. *Research on the Applicability of the DCF Model in Different Interest Rate Environments*. *International Business Accounting* (14), 22-25 (2022).
- [11] Tianao Qu *Value evaluation of new energy battery companies based on DCF model: Taking CATL as an example*.*International Business Accounting* (14), 86-88 (2022).
- [12] Zheming Jiang. *Why DCF Model cannot Fairly Value Technology Giants Like Alibaba*. (eds.) *Proceedings of 2nd International Conference on the Frontiers of Innovative Economics and Management (FIEM 2021)* pp.8-14 (2021).
- [13] Gai Junyue *Buffett's Value Investment Theory Based on Improved DCF Model [J]* *Wireless Communications and Mobile Computing*, (2022).