

Comparison of The Dividend Discount Model and The Discounted Cash Flow Model Valuation of Stock Kweichow Moutai

Qiuru Tang *

The First Affiliated High School of Central China Normal University, 430073, Wuhan, China

* Corresponding author: qiurutang@ldy.edu.rs

Abstract. Stock valuation is an essential element of investment analysis, aiding investors in gauging a company's true worth. This essay conducts a literature review and a thorough demonstration of the calculation process, focusing on the Discounted Cash Flow (DCF) Model and the Dividend Discount Model (DDM), as key tools in stock valuation. The research examines the valuation of Kweichow Moutai Co., Ltd., a prominent Chinese company in the beverage industry. The results yielded significant disparities from the market price, with the DCF model indicating potential overvaluation by approximately -33.39%, while the DDM model pointed to an even greater overvaluation of about -77.94%. These findings underscore the complexity of stock valuation and the need for a comprehensive approach. Investors should not solely rely on market sentiment but should combine these models with extensive research and a diversified portfolio strategy.

Keywords: Stock valuation, Discounted Cash Flow Model, Dividend Discount Model.

1. Introduction

Stock valuation is a fundamental aspect of investment analysis and decision-making, providing investors with insights into the true worth of a company's shares. This literature review delves into the various methods and theories employed in stock valuation, focusing on the Discounted Cash Flow (DCF) Model and the Dividend Discount Model (DDM). These models serve as critical tools for determining the intrinsic value of stocks, enabling investors to make informed decisions in a dynamic and often unpredictable financial market.

To illustrate the practical application of these valuation models, the essay concludes with a case study of Kweichow Moutai Co., Ltd., one of China's most renowned companies, and a dominant player in the beverage industry. The case study employs both the DCF and DDM methods to estimate the enterprise value and per-share value of Kweichow Moutai, providing an empirical perspective on the efficacy of these valuation models. In doing so, the essay showcases the significance of stock valuation as a critical tool in guiding investment decisions and evaluating a company's true worth in today's ever-evolving financial markets.

2. Literature Review

2.1. Definition of Concepts and Related Theories

2.1.1. Definition of stocks

Companies have often needed to raise funds in the market to ensure good financials for better operations and growth. The shares issued by a company have had intrinsic value. In contrast, investors who have purchased the shares have owned the shares, the right to participate in the company's shareholders' meetings, the right to vote in the company's decision-making, and the right to receive dividend income [1]. However, buying stock has also meant taking on various risks associated with the company's malfunctioning. The main purpose of most investors in purchasing stocks has been to gain income.

2.1.2. Background of the discounted cash flow model

The discounted cash flow method has been used to discount the free cash flow generated by an asset in the future according to a reasonable discount rate to get the asset's value [2]. The discounted cash flow method is not needed to calculate the cash flow related to the debt, so it has had objectivity and accuracy [3]. The growth rate of revenue and discount rate have been two important factors affecting the results of enterprise value assessment, which have also been the core of discounted cash flow valuation [4]. When the growth rate of a company's free cash flow has closely approximated the company's weighted average cost of capital, the value derived from the company's free cash flow steady growth model has drifted towards infinity [5]. Furthermore, it has been important to note that the interplay between capital expenditures and depreciation has influenced the stable growth model of corporate free cash flow. This connection has had to adhere to the premise of stable growth [5].

2.1.3. Background of the dividend discount model

Equity has been expressed in the form of shares, from which investors have received two types of cash flows: cash dividends from the company and cash flows from the sale of shares [6]. In the case of a going concern, the value of the stock has been equal to the present value of its future dividends. The discounted dividend model has encompassed several extended variants, one of which has been the Gordon growth model. This model has been used to evaluate a firm's intrinsic value during a stable growth period. The Gordon valuation model has incorporated the dividend growth factor as a crucial component in determining an asset's value. The future dividend growth rate has greatly influenced the valuation outcomes. Specifically, when the future dividend growth rate has approached the discount rate, the enterprise value estimated using the Gordon valuation model has tended to approach infinity [5].

2.2. Research Related to Stock Valuation

2.2.1. Overseas research

Research on corporate valuation theory has been more developed abroad. Fetter (1907) first proposed that the value of all existing assets has been determined by how much future expected monetary income they could generate. Based on this, as research has delved deeper, it has been believed that the estimated value of an asset could be obtained by discounting the expected income that it could generate [7]. William (1938), building on the research of previous scholars, introduced the idea of using cash flow models to evaluate corporate value and suggested an evaluation model based on dividends as data. However, due to the continuous fluctuations in the market, estimating corporate value solely based on cash flow has been found to be biased [8]. In recent years, additional factors have been considered to make corporate valuation more accurate. Mukhtar Uddin (2019) has proposed that companies have faced various risks and adjustments in their operations and must establish a good corporate image to enhance their value [9]. Jorge Rodrigues and Pedro Ruivo (2020) have developed a new corporate valuation model and, through relevant research and surveys, have demonstrated the importance of their valuation model [10].

2.2.2. Domestic research

As the necessity and importance of value assessment for the long-term development of businesses have become increasingly evident, Chinese scholars have been delving deeper into related research. Many scholars have analyzed and improved methods of business value assessment, taking into account the specific circumstances in China, making them more suitable for Chinese enterprises. Although the Olson valuation model has been relatively more applicable for assessing the value of businesses compared to traditional valuation methods, practical challenges still need to be solved, such as the complexity of adjusting accounting earnings and the difficulty of estimating residual earnings. Huan Zhao (2019) has improved the residual earnings estimation method in the Olson valuation model using the DuPont financial analysis method [11]. Linghan Li and Yan Feng (2020) have addressed the shortcomings of value assessment methods based on user value theory, providing

new insights to enhance the accuracy of assessing business value [12]. When conducting business value assessments using the discounted cash flow method, the calculation results of the perpetual cash flows have significantly impacted the accuracy of the value assessment. After analyzing the effectiveness of a model that improves the volatility of cash flows during the perpetual period in business value assessment, Jingping Nong (2020) has concluded that this model noticeably enhances the rationality of value assessment results [13].

2.2.3. Literature review

In the process of reading and organizing relevant domestic and foreign literature, foreign research on the theoretical framework of corporate valuation has been more comprehensive and mature. At the same time, Chinese scholars have undertaken empirical research on corporate valuation across various industries. When selecting models or methods for evaluating a company's value, it has been essential to consider not only industry-specific characteristics but also the company's unique attributes. Modifications to the models have had to be made by these specific characteristics to obtain reasonable and accurate results.

3. Research Methods

3.1. Introduction to Descriptive Quantitative Research

Descriptive analysis aims to provide a concise and detailed quantitative description and summary of data in order to reveal patterns, relationships, and trends within the data [14]. This approach helps researchers and analysts better understand the nature of the dataset, facilitating objective and accurate descriptions of the data.

3.2. DCF Calculation Process

The Discounted Cash Flow Method used in this paper is the Free Cash Flow Method, specifically employing the Two-Stage Free Cash Flow to Firm Model. The Two-Stage FCFF model separates the high-growth period from the stable-growth period to more accurately consider the company's growth prospects.

The calculation steps for the Free Cash Flow to Firm Model are as follows:

Step 1. Determine the time period for the first stage, which is the high-growth phase, and the later stages will be the stable-growth phase.

Step 2. Calculate the Cost of Capital of Equity Capital

The Cost of Capital of Equity Capital can be calculated using the Capital Asset Pricing Model (CAPM). This model is widely used in asset pricing to assist investors in making asset allocation decisions that balance risk and return.

The formula for calculating the Cost of Capital of Equity Capital is as follows:

$$R_e = R_f + \beta(R_m - R_f) \quad (1)$$

Information:

R_e = Expected Return on a Specific Asset

R_f = Risk-free Rate

β = Asset's Beta Coefficient

R_m = Expected Return on the Overall Market

$R_m - R_f$ = Market Risk Premium

R_f generally, refers to the long-term government bond yield rate in the respective country, can be obtained from authoritative financial databases, can be the historical average return rate of a representative index in the market.

Step 3. Calculate the Estimate the Discount Rate

The Discount Rate can be estimated using the Weighted Average Cost of Capital (WACC) model, which takes into account the weights of different sources of capital (debt and equity) and calculates the overall cost of capital for a company.

The formula for calculating the Discount Rate is as follows:

$$WACC = (1 - \text{Income Tax Rate})(W_d * R_d) + (W_e * R_e) \quad (2)$$

Information:

WACC = Weighted Average Cost of Capital

W_d = Weight of Debt Capital

R_d = Cost of Capital of Debt Capital

W_e = Weight of Equity Capital

R_e = Cost of Capital of Equity Capital

R_d can be obtained by referring to the long-term treasury bond yield of the host country. The Income Tax Rate, W_d , and can be estimated from the company's previous financial statements. The value of is calculated from the previous step.

Step 4. Based on the data on the growth rate of the company's historical free cash flow, predict the growth rate of FCFF for the high-growth phase, r_1 , and, based on the industry scenario, predict the growth rate of annual operating revenues for the steady-growth phase, r_2 . Subsequently, calculate the FCFF for each year in the high-growth phase.

Step 5. Calculate the Present Value of Free Cash Flow in the High Growth Phase

The formula for calculating the Present Value of Free Cash Flow in the High Growth Phase is as follows:

$$V_1 = \sum_{t=1}^t \frac{FCFF_t}{(1+WACC)^t} \quad (3)$$

Information:

V_1 = Present Value of Free Cash Flow in High Growth Phase

t = Number of Periods in Each Stage

$FCFF_t$ = Free Cash Flow to the Firm for the t Stage

WACC = Weighted Average Cost of Capital

The value of is referred to the first step, the value of is derived from the third step, and is derived from the fifth step of prediction calculation.

Step 6. Calculate the Present Value of Free Cash Flow in the Perpetual Growth Phase

The formula for calculating the Present Value of Free Cash Flow in the Perpetual Growth Phase is as follows:

$$V_2 = \frac{FCFF_t(1+r_2)}{(WACC-r_2)(1+WACC)^t} \quad (4)$$

Information:

V_2 = Present Value of Free Cash Flow in Perpetual Growth Phase

$FCFF_t$ = Free Cash Flow to the Firm for the t Stage

t = Number of Periods in Each Stage

r_2 = Growth Rate of Free Cash Flow in Perpetual Growth Phase

WACC = Weighted Average Cost of Capital

The value of is referred to the first step, the value of is derived from the third step, is predicted by the fourth step, and is derived from the fifth step of prediction calculation.

Step 7. Calculate the Total Present Value of Free Cash Flow

The formula for calculating the Total Present Value of Free Cash Flow is as follows:

$$V = V_1 + V_2 \quad (5)$$

Information:

V = Total Present Value of Free Cash Flow

V_1 = Present Value of Free Cash Flow in High Growth Phase

V_2 = Present Value of Free Cash Flow in Perpetual Growth Phase

The value of is derived from the fifth step and the value of is derived from the sixth step.

3.3. DDM Calculation Process

In this paper, the Dividend Discount Model (DDM) used is the Gordon Growth Model, also known as the Constant Growth Dividend Discount Model. This model assumes that future dividends will grow at a constant rate and is used to estimate the intrinsic value of a stock.

The calculation steps for the Gordon Growth Model are as follows:

Step 1. Calculate the Growth Rate of Dividends and Earning

The Growth Rate of Dividends and Earnings can be estimated using the Sustainable Growth Rate method, which is based on the company's profitability and dividend policy.

The formula for calculating the Growth Rate of Dividends and Earning is as follows:

$$g = ROE * b = ROE * (1 - DPR) \quad (6)$$

Information:

g = Growth Rate of Dividends and Earnings

ROE = Return on Equity

b = Retention Ratio

DPR = Dividend Payout Ratio

ROE and DPR values can be obtained from the company's financial statements.

Step 2. Calculate the Estimated Dividend Payout

Estimated Dividend Payout represents the dividend that the company expects to pay to its shareholders.

The formula for calculating the Estimated Dividend Payout is as follows:

$$D_t = D_0 * (1 + g) \quad (7)$$

Information:

D_t = Estimated Dividend Payout

D_0 = Dividend per Share

g = Growth Rate of Dividends and Earnings

The value of can be obtained from the company's financial statements and the value of is calculated from the previous step.

Step 3. Calculate the Intrinsic Value

The Intrinsic Value represents the actual value of the company estimated by the Gordon Growth Model.

The formula for calculating the Intrinsic Value is as follows:

$$P_0 = \frac{D_t}{r - g} \quad (8)$$

Information:

P_0 = Intrinsic Value

D_t = Estimated Dividend Payout

r = Expected Return

g = Growth Rate of Dividends and Earnings

The value of P_0 is derived from the first step, P_1 is derived from the second step, and the value of P_2 can be obtained from the value of P_1 in the third step of the previous subsection.

4. A Case Study in the Chinese Stock Market

4.1. Stock Introduction

Kweichow Moutai Co., Ltd. was established on November 20, 1999, with its headquarters located in Maotai Town, Kweichow Province, China. The company's primary business is the production and sale of Kweichow Maotai liquor, renowned nationwide. On August 27, 2001, the company's stock was listed for trading on the Shanghai Stock Exchange. Kweichow Maotai's stock has performed exceptionally well on the A-share market and has long been considered one of the leading stocks in the Chinese A-share market. Its stock price has generally shown a stable upward trend, consistently attracting high investor attention.

4.2. Stock Valuation Calculation Process

4.2.1. DCF calculation process

In this section, a Two-Stage FCFF model is employed as the estimation model. Using December 30, 2022, as the base point, an evaluation of the enterprise value of Kweichow Moutai Co., Ltd. is conducted.

Follow the calculation steps outlined in Part 3 of this essay:

1) This estimation assumes that Kweichow Maotai will experience a high-growth phase from 2023 to 2032, followed by a stable-growth phase starting in 2027.

2) The cost of equity capital for Kweichow Moutai Co., Ltd. is calculated using the Capital Asset Pricing Model (CAPM).

i. Risk-free Rate (R_f)

This paper selects the 10-year government bond interest rate in China as the risk-free rate, which was 2.84% in 2022.

ii. Beta Coefficient (β)

In this paper, for Kweichow Moutai Co., Ltd. β is obtained from the GuruFocus database and is found to be 1.34.

iii. Market Return (R_m)

In this paper, the 5-year average return rate of the Shanghai and Shenzhen 300 Index is used as the R_m , which is 11.20%.

Finally, by plugging these values into Formula (1), the cost of equity capital for Kweichow Moutai Co., Ltd. is calculated as:

$$R_e = 2.84\% + 1.34(11.20\% - 2.84\%) = 14.04\%$$

3) In this paper, the Weighted Average Cost of Capital (WACC) model is selected as the basis for calculating the discount rate.

i. Income Tax Rate

According to the company's financial statements, the effective income tax rate for Kweichow Moutai Co., Ltd. is approximately 25.00%

ii. Cost of Capital of Debt Capital (R_d)

This paper selects the 10-year government bond interest rate in China as the cost of capital of debt capital, which was 2.84% in 2022.

iii. Weight of Debt Capital (W_d) and Weight of Equity Capital (W_e)

This paper calculates the capital structure of Kweichow Moutai Co., Ltd. based on its owner's equity and liabilities from 2018 to 2022 and averages it, resulting in a debt capital weight of 22.57% and an equity capital weight of 77.43%.

iv. Cost of Capital of Equity Capital (R_e)

The value of the cost of capital of equity capital is calculated from the previous step, which is 14.04%.

Based on the above calculations, substituting the above values into Formula (2), the weighted average cost of capital for Kweichow Moutai Co., Ltd. is calculated as:

$$WACC = (1 - 25.00\%)(22.57\% * 2.84\%) + (77.43\% * 14.04\%) = 11.35\%$$

4) Observing a stable and increasing growth rate over the company's recent years, this paper predicts a $r_1 = 20\%$ FCFF growth rate from 2023 to 2032. After 2032, Kweichow Moutai Co., Ltd. faces increasingly fierce competition as the company's market share becomes saturated with competitors, and there is more uncertainty about the development of the beverage industry. Based on the annual growth rate of China's Gross Domestic Product and the likelihood of future development of the beverage industry, this paper assumes that Kweichow Moutai Co., Ltd. will have a stable FCFF growth rate of $r_2 = 4\%$ after 2032.

5) Using the rate, r_1 and r_2 , calculated in the fourth step, the FCFF values for Kweichow Moutai Co., Ltd. from 2023 to 2032 are estimated, and then as shown in Table 1. (below).

At the same time, according to formula 3, the calculation results are shown in Table. 1 below.

Table 1. Estimated Discounted Free Cash Flows to Firm of Kweichow Moutai Co., Ltd., 2023-2032

Time (Year)	FCFF (Billion CNY)	Discount Rate	Discount Factor	Present Value in the High Growth Phase (Billion CNY)	V_1 (Billion CNY)
2023	37.67	11.35%	0.90	33.83	484.70
2024	45.20	11.35%	0.81	36.46	
2025	54.24	11.35%	0.72	39.29	
2026	65.09	11.35%	0.65	42.34	
2027	78.11	11.35%	0.58	45.63	
2028	93.73	11.35%	0.52	49.17	
2029	112.48	11.35%	0.47	53.00	
2030	134.97	11.35%	0.42	57.11	
2031	161.96	11.35%	0.38	61.54	
2032	194.36	11.35%	0.34	66.33	

6) The value of the enterprise is determined by both the forecast period and the perpetual growth period. In this paper, after 2032 is the perpetual growth period. The FCFF predicted for 2032 (as shown in Table 1.) is taken as the base value for the perpetual growth period. Therefore, substituting the above values into Formula (4), the value of is calculated as:

$$V_2 = \frac{194.36(1 + 4\%)}{(11.35\% - 4\%)(1 + 11.35\%)^{10}} = 938.54 \text{ Billion CNY}$$

7) The overall value of a company is the same as the total present value of free cash flow to firm. Hence, according to Formula (5), the overall value of Kweichow Moutai Co., Ltd., V , is calculated as:

$$V = 484.70 + 938.54 = 1423.24 \text{ Billion CNY}$$

According to the annual report data disclosed by Kweichow Moutai Co., Ltd. on December 31, 2022, the number of outstanding shares was 1,256.04 billion shares. Therefore, the per-share value of the company is:

$$\text{Per Share Value} = \frac{1423.24 \text{ Billion}}{1256.04 \text{ Million}} = 1133.12 \text{ CNY}$$

Based on data from Eastmoney, it is known that the closing price of Kweichow Moutai Co., Ltd. on December 30, 2022, was 1,701.09 CNY per share, resulting in a difference of -33.39% between the estimated per-share value and the market price.

4.2.2. DDM calculation process

In this section, the Gordon Growth Model is used to estimate the enterprise value of Kweichow Moutai Co., Ltd., with December 30, 2022, as the reference date.

Follow the calculation steps outlined in Part 3 of this essay:

1) This paper estimates the growth rate of dividends and earnings using the Sustainable Growth Rate method.

The ROE and DPR data are obtained from the company's financial statements. For Kweichow Moutai Co., Ltd., the ROE in 2022 is 32.41%, and the DPR in 2022 is 83.75%. Based on the above information, substituting these values into Formula (6), the Sustainable Growth Rate is calculated as follows:

$$g = 32.41\% * (1 - 83.75\%) = 5.27\%$$

2) In the Gordon Growth Model, data for Dividend per Share can be obtained from the company's financial statements.

For Kweichow Moutai Co., Ltd., the Dividend per Share in 2022 is 21.68 CNY, the growth rate of dividends and earning was calculated in the previous step as 5.27%. Therefore, according to Formula (7), the Estimated Dividend Payout for the company is:

$$D_t = 21.68 * (1 + 5.27\%) = 22.82 \text{ CNY}$$

3) Intrinsic Value represents the actual value of the company estimated using the Gordon Growth Model.

The expected rate of return that investors require can be determined based on the company's WACC. Use the WACC calculated in section 4.2.1 in this model, which is 11.35%. The estimated payout and the growth rate of dividends and earnings were calculated in the previous step as 22.82 CNY and 5.27%. Therefore, according to Formula (8), the Intrinsic Value for the company is:

$$P_0 = \frac{22.82}{11.35\% - 5.27\%} = 375.33 \text{ CNY}$$

Based on data from Eastmoney, it is known that the closing price of Kweichow Moutai Co., Ltd. on December 30, 2022, was 1,701.09 CNY per share, resulting in a difference of -77.94% between the estimated intrinsic value and the market price.

4.3. Results of Stock Valuation

This section will present the results of the stock value assessment and analyze them. In this paper, two different methods are used to estimate the enterprise value of Kweichow Moutai Co., Ltd.: the Discounted Cash Flow Model and the Dividend Discount Model.

The result reveals that the estimated per-share value from the DCF model was approximately -33.39% lower than the market price. This suggests that, according to the DCF model, the stock may have been overvalued in the market at that time. The estimated intrinsic value from the DDM model was approximately -77.94% lower than the market price. This suggests that, according to the DDM model, the stock was significantly overvalued in the market at that time. This may raise concern among investors as both methods indicate that the stock is undervalued.

At the same time, there is a significant difference between the results of the DDM method and the DCF method. The DDM method yields a higher value, probably because it takes into account different growth phases and provides detailed estimates for high and stable growth periods, whereas the DCF method only takes into account stable growth periods.

All things considered, the DCF model performed better. However, it's essential to note that the choice between these models depends on the specific characteristics of the company being valued, investor preferences, and the availability of relevant data. Additionally, investors should consider a broader range of factors and perform sensitivity analyses when making investment decisions.

5. Conclusion

This comprehensive essay explored the intricate world of stock valuation, focusing on two prominent methods: the Discounted Cash Flow Model and the Dividend Discount Model. This essay underscores the importance of robust research and analysis in the investment process. The significant differences between the estimated values and the market price indicate that stock valuation is a

complex task influenced by various factors. Investors should not rely solely on market sentiment but should conduct thorough due diligence to assess a company's true worth.

In conclusion, stock valuation is a critical aspect of investment decision-making, and the DCF and DDM models provide valuable tools for assessing a company's intrinsic value. However, the complexity of financial markets and the uniqueness of each company demand a nuanced approach to valuation. Investors should combine these models with comprehensive research and a diverse portfolio strategy to make well-informed investment decisions in today's dynamic financial landscape.

References

- [1] Du Chaoli. Excess return valuation model based on improved DCF model [D]. Beijing University of Posts and Telecommunications, 2022.
- [2] Song Dongjing. Valuation Research of CRO Enterprises Based on the DCF Model [D]. Jingdezhen Ceramic University, 2021.
- [3] Ni Jie. Enterprise Value Assessment of Company X Based on the Free Cash Flow Discounted Model [D]. Northeast Agricultural University, 2020.
- [4] Li Jikai, Han Min. Value assessment analysis of small home appliance enterprises based on the DCF model: A case study of Joyoung Corporation [J]. Commercial Exhibition Economy, 2023, (10): 157 - 160.
- [5] Li Lei, Zhou Hui. Comparative Analysis of Valuation of Listed Companies by DCF Method and DDM Method [J]. China Commerce, 2008, (08): 39 - 40.
- [6] Maik Ge. TJX'S Stock Valuation: a Comparison between DDM and DCF [J]. Journal of Sociology and Ethnology, 2022, 4 (1).
- [7] Fetter, F. A. The Nature of Capital and Income [J]. Journal of Political Economy, 1907, 15 (3): 129 - 148.
- [8] J. B Williams. Theory of Investment Value [M]. Princeton University Press, 1938: 15 - 20.
- [9] Mukhtaruddin Mukhtaruddin, Ubaidillah Ubaidillah, Kencana Dewi, Arista Hakiki, NopriyantoNopriyanto. Good Corporate Governance, Corporate Social Responsibility, Firm Value, and Financial Performance as Moderating Variable [J]. Indonesian Journal of Sustainability Accounting and Management, 2019, 3 (1): 206 - 325.
- [10] Jorge Rodrigues, Pedro Ruivo, Tiago Oliveira. Mediation role of business value and strategy in firm performance of organizations using software-as-a-service enterprise applications [J]. Elsevier B.V, 2020, 7 (16): 364.
- [11] Zhao Huan. Application of Improved Ohlson Model in the Valuation of Internet Companies [J]. Financial Communication, 2019 (08): 13 - 17.
- [12] Li Linghan, Feng Yan. Research on Enterprise Value Evaluation Based on Improved CVBC Model [J]. Financial Communication, 2020 (20): 96 - 99.
- [13] Nong Jingping. Application Research on Enterprise Value Evaluation - Based on the Improved Model of Cash Flow Volatility during the Perpetual Period [J]. Financial Communication, 2020 (04): 115 - 118+123.
- [14] Nassaji, H. Qualitative and descriptive research: Data type versus data analysis. Language Teaching Research, 19 (2), 2015, 129 – 132.