How to Improve the Valuation of DCF Model - a Closer Examination on the Depreciation Rate

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Abstract. Along with the Capital Asset Pricing Model (CAPM), the Discounted Cash Flow Model (DCF) has been widely applied to estimate the common equity of a company. Despite the simplicity of DCF, this valuation model also bears criticism regarding the uncertainty of the estimations and restrictive assumptions that cannot be overlooked while forecasting the free cash flow. However, instead of adopting a more delicate and objective valuation model, this paper emphasizes a simple change within the DCF calculation process. This paper extracts financial information from Zoom Video Communications, Inc., estimates their free cash flows, and compares the DCF price per share with its market price per share as of February 1 2022 and July 1 2022. The conclusion reached by performing the valuation is that in order to achieve a price that is closer to the market expectation under the DCF model, users are suggested to consider encoding the company's depreciation rate when calculating the unleveraged free cash flow, especially when forecasting a company that is still growing and faces numerous uncertainties.

Keywords: Discounted Cash Flow, Depreciation, Unleveraged Free Cash Flow, Financial Statements, Market Value, Zoom Video Communications, Inc.

1 Introduction

Often, analysts use the DCF model to perform the valuation for firms with a constant growth rate. Based on the explicit forecast period, which takes into account the financial results of the previous 10-15 years, analysts assume that the firms will enter a steady-state, thus estimating the cash flows of their post-horizon years with the value derived from the last year of the explicit forecast period [1]. Thus, DCF has been considered more suitable for companies or industries that have matured over time. Regarding this common acknowledgement, the inspiration and purpose of this research paper are to test the application of the DCF model to unstable companies.

In detail, the subject used in this paper is Zoom Video Communications, Inc. Zoom has experienced significant growth since the pandemic: its revenue jumped from approximately 0.6 billion in 2020 to 2.7 billion in 2021, and in the year ended January 31, its revenue was 4.1 billion [2]. Due to lockdowns and stay-at-home policies, many companies and schools have grown accustomed to using this video conferencing platform

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[3]. However, even though some may argue that Zoom may not continue to experience increasing participants and clients after the pandemic and lockdowns, this application will not be out of sight. Enjoying the benefit of video conferencing during COVID, many companies, schools, and students have witnessed and learned that a more cost-efficient and convenient way of communication is available; a hybrid form of physical and online connection will become the norm [4]. In general, these increases in revenue and shifts show an undetermined prospect and growth for Zoom.

Under this specific context, this paper uses Zoom as an illustration to apply the DCF model in calculating its price per share and therefore observes the discrepancy between the price per share calculated by DCF and its actual share price in the market. This paper aims to explore and examine the compatibility of the DCF model. This paper tries to answer the question that valuing a firm that is not yet at its sound stage or is far from becoming stabilized and has a constant growth rate in the foreseeable future, what are the elements that can be adjusted in the DCF model so that the price per share can better reflect the market situation.

2 Problems associated with the DCF model regarding depreciation estimation

When forecasting the depreciation and amortization expense into the future years, users usually apply the general cash flows growth rate, which reflects the growth of cash flows over the past five or ten years. However, adjustments may be required in an unstable industry or organization to account for the practical realities more precisely. As Ekaterina (2012) discussed, even though adjustments may sometimes be inconsistent with the traditional model usage, they are crucial for the model to be performative, which acts as an effective channel for users to express their judgements for decision making [5]. Applying the DCF model, users should be mindful of the industries of their targeted company. Li and Hall (2020) concluded that for industries requiring intensive R&D, the depreciation rate is higher than the conventional rate of 15%; the depreciation rate can vary across industries depending on market competitiveness and the rate of technology upgrading [6]. Regarding this matter of fact, the DCF model overlooks or is indifferent to the impact of depreciation amount especially when targeting companies that are highly mobile and are prone to being affected by external forces.

According to Forbes (2022), Zoom is in the business of IT software and services; its primary product is the video communication platform [7]. This industry is widely agreed to feature a high growth rate and a high speed of technological obsolescence [8]. Therefore, given the nature of the IT industry, the depreciation rate for IT software businesses is expected to be higher than those requiring less R&D. The depreciation rate may not always align with the cash flow growth rate used in the DCF model. However, the DCF model disregards this idea, applying the cash flow growth rate to forecast future depreciation expenses for all types of organizations. This is an inherent assumption that users may agree upon without thoroughly considering the market and industry conditions. Without making suitable changes to calculate the depreciation expense, the

price per share calculated under the DCF model may fail to reflect real-world situations. This notion will be further illustrated in the next section.

In the case of Zoom, its depreciation expenses are closely tied to the equipment used in its R&D, and the amortization expenses are allocated to the capitalized software development costs [2]. As Zoom has claimed, it will invest more funds in R&D to upgrade its current platform and create a higher quality software service for its customers. Therefore, its depreciation and amortization expenses are believed to increase with those investments correspondingly.

3 The application of DCF model on Zoom Video Communications, Inc

The assumption regarding time is that the fiscal year of 2022 is the last year of the explicit forecast period, and Zoom's financial year end is of January 31 2021. Therefore, this paper uses the effective tax rate of -24.9% based on its 2022 financial statements [2].

Furthermore, according to Novet from CNBC (2019), Zoom issued its IPO in 2019 [12]. And its revenue in fiscal year of 2020 was roughly double that of 2019 [2]. Regarding its young age and the unconventional revenue growth due to the global pandemic, the revenue for the financial year of 2023 is determined by using the estimated revenue of 4.54 billion [10]. And the growth rate for 2023 is calculated as follows:

2023E revenue 4,540,000 / 2022 revenue 4,099,864 – 1 = 0.107. This rate is thus applied to the EBIT, depreciation expense, and capital expenditure in the financial year of 2023.

For the year 2024, the estimated revenue is 5.14 billion based on Yahoo Finance as for the fiscal year of 2023 [10]. Onward to 2027, the cash flows growth rate is calculated as:

2024E revenue 5,140,000 / 2023E revenue 4,540,000 – 1 = 0.132. This rate is used in calculating the unleveraged free cash flow for the year from 2024 to 2027.

For simplicity of calculation and a focus on the depreciation expense only, this paper does not calculate the weighted average cost of capital (WACC) for Zoom. Both WACC and the long-term growth rate are extracted from ValueInvesting (2022).

Table 1. Assumptions of the DCF Model

Assume we are creating the DCF as of 1 Feberury 2022		
Tax rate		-0.249[2]
WACC		0.083[9]
Growth Rates:		
2023E revenue		4,540,000[10]
2023 growth rate:		0.107
2024E revenue		5,140,000[10]

2024 growth rate		0.134
Terminal growth rate:		0.035[11]

Table 2. Unleverged Free Cash Flow without Applying the Depreciation Rate

Calculate Free Cash Flow	2022	2023	2024
Revenue	4,099,864	4,540,000	5,140,000
EBIT (income from operations):	1,063,591	1,177,772	1,333,424
(-) Taxes	(274,007)	(293,265)	(332,023)
New operating profit after tax	1,337,598	1,471,037	1,665,447
(+) Depreciation:	48,188	53,361	60,413
(-) Capital expenditure:	(132,590)	(146,824)	(166,228)
(-) change in working capital:	(1,071,217)	(1,178,082)	(1,333,775)
unleveraged free cash flow	181,979	199,492	225,857
Calculate Free Cash Flow	2025	2026	2027
Revenue	5,819,295	6,588,365	7,459,074
EBIT (income from operations):	1,509,648	1,709,161	1,935,041
(-) Taxes	(375,902)	(425,581)	(481,825)
New operating profit after tax	1,885,550	2,134,741	2,416,866
(+) Depreciation:	68,397	77,437	87,671
(-) Capital expenditure:	(188,197)	(213,068)	(241,227)
(-) change in working capital:	(1,510,045)	(1,709,610)	(1,935,550)
unleveraged free cash flow	255,706	289,500	327,759

In this DCF model, all financial amounts are in thousands. The depreciation rate calculated based on the historical depreciation expenses is not applied here. The depreciation amount is forecasted using the growth rates.

The unleveraged free cash flow after the fiscal year of 2027 is 327,759 * (1+0.035) = 339,231 (in thousands). The terminal value is 339,231/ (WACC-Terminal growth rate) = 339,231/ (0.083-0.035) = 7,067,312 (in thousands).

To calculate the total present value of the future free cash flows, the unleveraged free cash flow for each year must be discounted to its present value using the WACC rate. The present value for unleveraged free cash flow in 2023 is 199,492/ (1+0.083) = 184,203. For the year 2024, the present value is 225,857/ (1+0.083) ^2 = 192,565. The exponent increases year by year. Below are the present values for the free cash flow of each year:

Table 3. Present values for the Unleveraged Free Cash Flows

	2022	2023	2024
Unleveraged FCF	181,979	199,492	225,857
Present value (FCF)	181,979	184,203	192,565

	2025	2026	2027	After 2027
Unleveraged FCF	255,706	289,500	327,759	7,067,312
Present value (FCF)	201,305	210,443	219,995	4,743,643

The summation of these present values gives a total present value of the future free cash flows of 5,752,154 (in thousands). Zoom's consolidated balance sheet does not have any long-term debt shown under the liability section [2]. Therefore, the debt amount is considered to be zero in this paper. The value of equity is thus the total present value of future cash flows minus the debt amount: (5,752,154 – 0) * 1000 = 5,752,153,710. At the year-end of January 31 2022, Zoom has 296,334,894 shares outstanding [2]. Therefore, the DCF price per share is Value of Equity / Shares Outstanding = 5,752,153,710 / 296,334,894 = $19. However, this result is far from the market price per share as of January 31 2022, which is $144.10 [10]. This deviation can be explained by the impractical estimation of the depreciation amount.

Table 4. DCF Price Per Share

Total PV Future FCF (2023-2027)		1,008,511	(in thousands)
Total PV Future Cash Flows		5,752,154	(in thousands)
(–) Debt*		0	(in thousands)
Value of Equity		5,752,153,710	
Shares Outstanding		296,334,894	
DCF Price Per Share		19	
Market Price Per Share (1/31/2022)		144.1 [10]	

As this paper has pointed out in the beginning sections, Zoom has yet to enter its stable state. The industry is also featured with unconventional growth and excessive R&D, which indicates higher depreciation than traditional businesses. Therefore, the depreciation growth rate used in the performance of the DCF model should be carefully reviewed.

Below are the depreciation and amortization expenses from the fiscal year of 2018 to 2022. The depreciation amount for these five years is in thousand. And to calculate the depreciation growth rate, for example, from 2018 to 2019, the growth rate is 7,008/2,786 – 1 = 1.515.

Table 5. Zoom's depreciation rate

In the fiscal year of:	depreciation	growth rate
2018	2,786	
2019	7,008	1.515
2020	16,449	1.347
2021	28,857	0.754
2022	48,188	0.670

Although the depreciation growth rate is decreasing year by year, it may bounce back if Zoom continues to invest more in research and development, such as more sophisticated equipment. It has expressed such a proposal in its financial statements that in the foreseeable future, it plans to spend more on R&D to innovate and develop its

platform [2]. Hence, this paper uses the average of the four growth rates listed above to predicate its future depreciation amount. The depreciation growth rate applied for the second DCF performance is thus (1.515 + 1.347 + 0.754 + 0.670)/4 = 1.072.

Under this forecast, the unleveraged free cash flow for the foreseeable future becomes larger:

Table 6. Unleverged Free Cash Flow applying the depreciation rate

Calculate Free Cash Flow	2022	2023	2024
Revenue	4,099,864	4,540,000	5,150,000
EBIT (income from operations):	1,063,591	1,177,772	1,336,018
(-) Taxes	(274,007)	(293,265)	(332,669)
New operating profit after tax	1,337,598	1,471,037	1,668,687
(+) Depreciation:	48,188	99,846	206,880
(-) Capital expenditure:	(132,590)	(146,824)	(166,552)
(-) change in working capital:	(1,071,217)	(1,178,082)	(1,336,370)
unleveraged free cash flow	181,979	245,977	372,645
Calculate Free Cash Flow	2025	2026	2027
Revenue	5,841,960	6,626,893	7,517,291
EBIT(income from operations):	1,515,527	1,719,156	1,950,143
(-) Taxes	(377,366)	(428,070)	(485,586)
New operating profit after tax	1,892,894	2,147,225	2,435,729
(+) Depreciation:	428,655	888,174	1,840,296
(-) Capital expenditure:	(188,930)	(214,314)	(243,110)
(-) change in working capital:	(1,515,926)	(1,719,608)	(1,950,657)
unleveraged free cash flow	616,693	1,101,477	2,082,258

Plus, the corresponding present values of the free cash flows also become larger. The calculation process for discounting is the same as shown in the first application.

Table 7. Present values for the Unleveraged Free Cash Flows

	2022	2023	2024	
Unleveraged FCF	181,979	245,977	372,645	
Present value (FCF)	181,979	227,125	317,716	
	2025	2026	2027	After 2027
Unleveraged FCF	616,693	1,101,477	2,082,258	44,898,698

Present value (FCF)	485,494	800,685	1,397,630	30,136,406

Adding the present values of future cash flows, the total present value is 227,125 + 317,716 + 485,494 + 800,685 + 1,397,630 + 30,136,406 = 33,365,056 (in thousands). Since there is zero debt amount and that the total present value is rounded to the nearest integer, the value of equity is (33,365,056.296 – 0) * 1000 = 33,365,056,296. Using the value of equity divided by the number of shares outstanding, the DCF price per share is thus 33,365,056,296/296,334,894 = $113 price per share. The DCF price per share is more aligned with the market price per share as at the end of January 2022.

Table 8. DCF Price per Share after applying the Depreciation Rate

Total PV Future FCF (2023-2027)	3,228,650	(in thousands)
Total PV Future Cash Flows	33,365,056.296	(in thousands)
(–) Debt*	0	(in thousands)
Value of Equity	33,365,056,296	
Shares Outstanding	296,334,894	
DCF Price Per Share	113	
Market Price Per Share (1/31/2022)	144.10 [10]	

4 Discussion

The DCF model illustrated in this paper may be considered relatively easy, because the intent is to unravel one simple element that may account for the discrepancy. The numerical proximity does not indicate absolute accuracy, instead, this paper merely proposes a change that users may find convenient to adopt when using the DCF pricing model for unstable, high-tech companies. In detail, the future for Zoom is highly unassured as it depends on global circumstances. Nevertheless, users can still apply the DCF model to perform estimations. Although this model is modified to better suit the situation for the firm and the industry, it does offer financial analysts or freshmen a unique view of exploring the model and appreciating its advantages. For Zoom, depreciation constitutes a great proportion of its business operations, the change in its depreciation growth rate thus made a material difference in calculating its price per share. The same concept can also be applied to companies in distinctive conditions.

The focus of this paper has been solely on Zoom Video Communications, Inc. as it is a typical example to illustrate the fast-growing IT software and services industry. Nevertheless, the valuation approach described above can be conducted on other companies that fall within the same industries or also show significant requirements for R&D. Only if multiple applications and experiments reflect the same case in this previous section can a proper and universal conclusion be drawn.

5 Conclusion

With the application of the DCF model, this paper has presented valuation on Zoom Video Communications, Inc. Concerning that not only Zoom itself, but also the whole video conferencing industry is still unstable, this essay has used the market share price to evaluate the performance and applicability of the DCF model. Its DCF price per share was calculated twice, applying one simple change the second time. Instead of applying the constant cash growth rate to forecast future depreciation, using the growth rate of depreciation based on the financial information from the previous five years derives a closer price to the market price per share eventually. Users may obtain an estimate that resonates more with the market expectation by applying a company's unique depreciation growth rate in the DCF model, especially for an organization that may require continuous R&D and operates depending on higher levels of technology. Therefore, this model is not as strictly confined to stable companies or industries, and users can implement this simple change in their spreadsheet valuation process so that this model is able to express more of the pragmatic considerations.

In Zoom's case, R&D expenditure can affect its effective tax rate as Zoom is granted R&D credits for tax purposes. For example, for the year ended January 31, 2022, the amount of its R&D credits is 13 times the credits in the fiscal year of 2021 [2]. However, since this paper emphasizes the effect of the DCF price per share concerning the change in depreciation rates, the effective tax rate is not deeply examined as to what extent it may affect the share price. But given that its effective tax rate is negative for the financial year of 2022, R&D credits can contribute even more to the benefit received from income taxes if Zoom continues to be granted such credits. More research and experiments can be done to improve the preciseness of DCF in the future study. For example, sensitivity analysis of depreciation can be conducted for different industries. This way the relationship between certain types of operating expenses and depreciation rates can be discerned from a more holistic perspective. Moreover, for IT industry precisely, the effective tax rates for organizations can be decomposed as the change in tax rates determines the benefit from or provision for income taxes.

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