

# An Evaluation of the Startup Valuation Methods

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**Abstract.** As societal interest and enthusiasm for venture capitals remains stable and strong currently, the valuation methods play a more and more important role in assisting the venture capitalists to make more informed investment decisions. Based on this background, this research will focus on two typical valuation methods. They are Discounted Cash Flow (DCF) Analysis and Venture Capital (VC) Method and the applicability and challenges of these two valuation methods in venture capital investment area will be explored. This paper will also offer both theoretical insights and practical applications to analyze these two approaches by using case studies and empirical figures. The final results of the research show that each method has its own advantages and limitations so that the choice of which method to select depends on the specifics of the startups being evaluated. Lastly, the paper will end a summary of the main points made about each of the approaches and an outlook for future research directions in venture capital valuation field.

**Keywords:** Venture Capital, Startup, Valuation, Discounted Cash Flow.

## 1. Introduction

The valuation methods are significant for the venture capitalists to attempt to minimize the risk and maximize their returns. Also to make the investment decisions like the specific amount of money to invest or the percentage of ownership of company to request in exchange for their investment [1]. Moreover, valuation can be applied to evaluate the operational situation and potential of different startups as well, which will impact the further decision making of both the startups and the venture capitalist in firm's management and investment strategy. Besides these, the return that venture capitalists will earn is heavily depended on the valuation at exit like IPO. Because greater potential earnings when the stake is sold are indicated by a greater valuation. And when a sale or merger is involved, valuation is a crucial negotiating leverage point. A robust valuation may advantageously position the company to attract increased offers. However, within the domain of venture capital, the process of valuing new ventures is filled with obstacles [2]. And one of the most significant challenges is the subjective nature of the valuation. Due to the speculative nature of future projections and the lack of established financial history for most startups, the valuation process is fraught with considerable uncertainty. The above-mentioned ambiguity is further exacerbated by the unpredictable and fluctuations in market conditions, which have the potential to significantly impact valuation result. The fluctuating regulatory environments, specifically within industries such as healthcare, introduce further intricacies that have challenging- to-predict and quantify problems on valuations. Therefore, the purpose of the paper is to conduct a critical evaluation of two classical valuation approaches - Discounted Cash Flow (DCF) and Venture Capital (VC) Method in order to find out the applicability in the practical situations and from the further comparison of these two methods to further delve into the suitability of these two methods in different scenarios.

The brief outline of this paper is listed as below: The research is focus on valuation methods in venture capital and starts with an abstract which will provide an overview of valuation approaches and discusses the primary discoveries. The introduction part establishes the framework by elucidating the importance of valuation in venture capital, acknowledges the difficulties in valuation methodologies, articulates the aims of the paper, and provides an outline. Subsequently, the paper delves into a detailed examination of two valuation techniques: Discounted Cash Flow (DCF) Analysis and Venture Capital (VC) Method. Every part comprises the theoretical foundation and actual implementation. Besides, a comparison analysis will be conducted to assess situations in which

one approach may be more advantageous and the limitations of both two methods at the same time. The conclusion outlines significant discoveries in this research and proposes potential directions for future research.

## 2. Discounted Cash Flow (DCF) Valuation Method

DCF is one of the most commonly used valuation method employed by investors [3].

### 2.1. Theoretical Insight and Formula Derivation of DCF

The time value of money is a quite important concept in the concept of DCF valuation and it states that the current worth of specific amount of money will be higher than its future value due to the money's ability to create more value in the future [4]. This idea is the foundation of the fundamental concept of discounting future cash flows. The valuation of a firm can be calculated by using the discounted cash flow (DCF) method. It involves estimating the present value of its estimated future cash flows and taking into account the time value of money by applying a suitable discount rate [5]. The general mathematical formula of DCF is listed as below:

$$\text{DCF Value} = \sum_{t=1}^n \frac{\text{FCF}_t}{(1+r)^t} + \frac{\text{Terminal Value}}{(1+r)^n} \quad (1)$$

At the beginning of the analysis of this mathematical model, some key terms and symbols in the formula should be pre-interpreted. First of all, Free Cash Flow (FCF) shows the projected revenue that a business is likely to achieve in the future. It can be calculated according to a company's historical financial performance and  $\text{FCF}_t$  represents the free cash flow in year  $t$ . In addition, the Discounted rate ( $r$ ) is used to calculate the present value of future cash flows by applying a discount and riskier investments typically entail higher discount rates. Next,  $n$  is the number of years in the projection periods and Terminal Value means the value of the firm's cash flows beyond the forecast period, discounted back to present value. Then, the entire process begins by considering the projected future free cash flows (FCF) that a company is anticipated to produce. Following that, each of these future cash flows is discounted to its present value which is completed by using  $\frac{\text{FCF}_t}{(1+r)^t}$  and the sum of present values of all the future cash flows are calculated over the specified time period. Often the lifespan of a company tends to exceed the projected time period. The terminal value incorporates all the future cash flows that occur beyond the current period, under the assumption of a consistent growth rate. This value is also discounted to its present value. In a word, the DCF value of a company is the sum of all discounted future cash flows and the discounted terminal value. The whole sum shows the inherent worth of the company at present.

### 2.2. The Empirical Test of DCF

In order to understand how DCF works in real life, it's important to analyze the empirical test of it. Behr, Mielcarz, and Osiichuk conducted a practical empirical investigation that doubts the assumptions made that support DCF models. This study examined the stability and predictability of Free Cash Flow (FCF) which is a crucial factor in determining the terminal value in Discounted Cash Flow (DCF) models. For it, they analyzed the data from 970 companies listed on the Warsaw Stock Exchange and OTC markets [6]. The result of this study uncovers substantial fluctuations in revenues, cash flows, and investment ratios across Polish firms. This goes against the usual idea that there's constant growth in discounted cash flow (DCF) analysis. When examining revenue stability, only a small percentage of companies satisfied the criteria of having revenue oscillates within  $\pm 4\%$  year-over-year. Specifically, according to the real data, just 2.83% of companies met this condition in a 3-year time series. Furthermore, in a 4-year series, the percentage decreased to 1.06%. And in a 5-year series, it was only 0.47%. These figures show a big difference from the steady growth assumption of DCF model. It also shows how earnings can change and be uncertain in real life situations. In addition,

an analysis was conducted on the stability of Free Cash Flow for Firm (FCFF). The results indicate that despite a significant fluctuation range of  $\pm 100\%$ , there were very few instances when FCFF remained steady. Only a small number of firms were able to maintain such stability over a period of 3 to 5 years [6]. In summary, these empirical results questioned the basic assumptions of the DCF models. And they also emphasize the necessity for a more sophisticated approach to tackle the inherent volatility and complexity of the real financial world. The findings of this study can be considered as a fundamental basis for any discussion regarding the practical application of DCF models because they emphasize the disparity between theoretical assumptions and empirical facts of this method in the real-world application. This is also a main challenge for all the mathematical models in dealing with the real-world scenarios.

### 3. Venture Capital Method

The Venture Capital (VC) Method for valuing startups entails predicting the future exit value of a company (eg. IPO) and then applying a discount to bring it back to the present day.

#### 3.1. Theoretical Basis and General Approach of VC Method

The VC technique is based on its emphasis on prospective future returns rather than present financial performance, as the latter is frequently not a reliable indicator of future success for startups. Also, the VC Method entails the determination of the terminal value of the company, followed by the calculation of its Discounted Terminal Value (DTV) [7]. More specifically, this method generally involves the following steps: Firstly, calculate the anticipated monetary worth of the company upon its exit. This involves estimating the company's future financial performance and employing appropriate valuation multiples. Subsequently, select a discount rate that accurately represents the risk profile and anticipated return of the venture capital investment. The rate is typically greater than conventional investment discount rates because of the greater risk of startups. The DTV is determined by applying a discount to the Future Exit Value in order to bring it to its present value, following the formula:  $DTV = \frac{\text{Future Exit Value}}{(1+\text{Discount rate})^n}$  where n here represents the number of years until exit occurs.

Then, by applying the present value of company calculated by DTV, the pre-money valuation can be determined, which is the company's valuation before investment and pre-money valuation is instrumental in calculating the post-money valuation at the same time. Lastly, the venture capitalist's ownership percentage in the company is calculated by dividing the amount of investment by the valuation of the company before the investment (pre-money valuation). This stage is essential as it determines the proportion of the firm that the venture capitalist will possess.

#### 3.2. Real Application of VC Method

An exemplification of the VC Method's practical application can be observed in the assessment of a hypothetical biotechnology enterprise, 'DNA Therapeutics.' The company was estimated to have a terminal value of \$250 million and the Discounted Terminal Value (DTV) was computed by applying a discount rate of 50% over a period of five years, yielding a DTV of \$32,925,000 [7]. Sammut's following calculation process of VC method shows how investors and businesses deal with this high-risk, high-reward situation by showing the capital needs through different funding rounds. In the beginning, the "A" round might need \$10 million, and then rounds of \$10 million, \$20 million, and \$50 million could be needed for different stages of clinical research. In addition, he discusses the effects of dilution, where each funding round tends to reduce ownership by a certain proportion. This highlights the crucial significance of comprehending these factors within the biotechnology industry. From this real implementation, the applicability of this method has been demonstrated to some extents. But VC method also exposed a limitation that is assumptions about future growth rates and company performance play a crucial role in the whole application. But these assumptions can be highly subjective and prone to error or bias.

## 4. Applicability and Limitation Comparison

In this part, in order to provide a clearer understanding of strengths and limitations of previously mentioned two valuation methods, the comparison of the Discounted Cash Flow (DCF) method and the Venture Capital (VC) method in terms of their applicability and suitability for different scenarios will be discussed.

### 4.1. The Analysis of DCF

Begin with DCF, it is quite optimal for companies with stable, predictable flows of cash and is especially ideal for mature company in established industries. And DCF method entails modifying the discount rate to align with the company's risk profile; this is comparatively easier for established market position holders.

Besides this, specific financial forecasting is required when applying the DCF, which makes it more suitable for firms which possess a track record of financial data. Therefore, DCF is applicable in the scenarios when determining the worth of a company operating in a sector characterized by consistent and foreseeable expansion, such as utilities or when evaluating the worth of a new venture or expansion within a mature company. Additionally, DCF is suitable in merger and acquisition scenarios where the target company has a long history of stable earnings as well [8]. Nevertheless, DCF is significantly dependent on the precision of forthcoming cash flow forecasts, a process that can be exceedingly speculative, particularly in volatile or uncertain market environments. Furthermore, the process of figuring out the suitable discount rate, which reflects the investment's risk profile, can be difficult and subjective, potentially resulting in valuation inaccuracies [9]. And DCF may fail to sufficiently consider intangible assets, including intellectual property and brand value, and may also disregard market and competitive dynamics. Plus, DCF method is less efficacious when used to startups and early-stage enterprises that have uncertain cash flows or are now operating at a loss.

### 4.2. The Analysis of VC Method

When it comes to VC method, it is well designed for nascent enterprises exhibiting substantial growth prospects but minimal or nonexistent present profitability since it emphasizes the importance of future returns and exit valuation, making it appropriate for industries where the potential for future growth is a key factor in determining value [10]. Meanwhile, VC method is especially tailored for investments that show a higher risk-return profile, which is a hallmark of venture capital investments. Therefore, it does well in assessing the worth of biotechnology companies throughout their research and development stage, where future potential is a crucial factor. Because of these merits, some limitations are hard to avoid. For instance, since the VC technique is most commonly employed for startups and firms experiencing rapid growth. It is unsuitable for well-established enterprises that have consistent cash flows and a distinct risk profile. This is because the VC technique uses higher discount rates to take in the substantial risk linked to investing in nascent enterprises. Well-established enterprises, due to their reduced risk profiles, are unable to justify the use of such elevated discount rates. Utilizing the high discount rates commonly employed in the VC approach for a well-established company that generates consistent cash flows would probably lead to substantial underestimation of its value. For another limitation of VC method, future growth rates, market conditions, and the company's performance assumptions are crucial factors of this valuation method. These assumptions are very subjective and susceptible to inaccuracy or bias. As the above result of real application of VC mentioned, the outcome of the VC method is very dependent on the underlying assumptions which reflects its sensitivity. Minor fluctuations in growth forecasts or market circumstances might have a substantial impact on the valuation.

By and large, it is obvious to discover the key difference between these two methods that is the VC approach is mostly suitable for the first phases of the development of a business, whereas the DCF method is better suited for established enterprises. Furthermore, in the VC method, a higher

discount rate is commonly employed to account for the higher level of risk associated with investing in startups, as opposed to the relatively lower risk profiles in DCF.

## 5. Conclusion

This paper concentrates on explaining the foundation and analyzing the real application of the Discounted Cash Flow (DCF) approach and the Venture Capital (VC) method in the field of venture capital. What's more, it delves into the detailed evaluation of the suitability and limits of the DCF approach and VC method. In a word, the decision between employing Discounted Cash Flow (DCF) or Venture Capital (VC) methodologies is mainly contingent upon the specific characteristics of the company under evaluation, its current stage of development, and the intended objective of the valuation. DCF is better suited for well-established enterprises that have consistent cash flows, whereas the VC technique is designed for high-risk, high-reward situations commonly found in early-stage startups, particularly in fast-changing industries. Besides, there exists more exploration spaces in the venture capital valuation field, like examining the potential of emerging technologies such as AI and machine learning to enhance the accuracy of valuation projections. Also, it is meaningful to conduct an investigation on how to incorporate sustainability and social impact considerations into the process of determining the value of companies, with a particular focus on socially-driven businesses. It is truly excited to expand comprehension and application of venture capital valuation techniques in a rapidly evolving business environment.

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