ERASMUS UNIVERSITY ROTTERDAM
ERASMUS SCHOOL OF ECONOMICS
Bachelor Thesis Economics & Business

Estimating Startup Valuation

A Case Study in Snowflake Inc.

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Finish date: 08/07/2023

ABSTRACT

Valuing young and innovative companies, commonly referred to as startups, presents various challenges due to their unique characteristics. This study delves into the complexity surrounding startup valuation by exploring numerous methods, challenges and implications associated with assessing the worth of these enterprises. Traditional valuation techniques, designed for mature and stable companies, often fall short in capturing the true value of startups, hence requiring the adoption of alternative methodologies. This research addresses the challenges posed by uncertainty, high interest rates and the impact of external factors on startup valuation. By providing a comprehensive overview of the startup ecosystem, the study aims to enhance understanding and inform decision-making within this complex environment. In addition, a case study is presented to assess the effectiveness of each valuation method in predicting the value of a prominent startup. Lastly, valuable insights into the process of valuing startups are gained, thereby assessing the challenges faced by investors and providing potential improvements to the process.

Keywords: startups, valuation methods, technology-based, case study, Snowflake Inc.

JEL codes: G32

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CHAPTER 1 - Introduction

1.1 Thesis Motivation

The Yahoo-Tumblr acquisition in 2013 serves as a significant example of the importance of utilizing accurate valuation methods. The original acquisition value of $1.1 billion was significantly overestimated, Yahoo later wrote down the value to $230 million due to Tumblr's inability to generate substantial profits (Smith, 2016). Valuation is a crucial element in determining the potential success of startups, especially given their high risk, lack of publicly available information and limited financial history. Despite the high failure rate of startups, there are almost 900 unicorn startups globally in 2022 with a combined economic value of $3.5 trillion (Statista, 2022). With over 700 unicorn startups based in the US alone, the rapid expansion of the startup ecosystem provides a compelling case to assess the accuracy and significance of current startup valuation methods.

Nasser (2016) determines 9 different valuation methods to assess pre-money valuation. These methods comprise both traditional approaches such as Discounted Cash Flows (DCF), Relative Valuation and Real Options method, as well as alternative valuation methods like Venture Capital and First Chicago. According to early research, as presented in Aswath Damodaran's (2009) paper, the use of Relative Valuation provides a more accurate valuation by using data from relative market peers. However, the uncertainty and risks that come with startups make it difficult to forecast future cash flows accurately through the DCF approach. In contrast, other studies suggest that while the Relative Valuation method may be simpler to compute, it does not entirely capture crucial financial and market aspects, such as discount rates and growth projections (Dastkhan, 2022). Although comparative studies may have similar perspectives on the effectiveness of different startup valuation methods, it is important to acknowledge that results obtained from one country cannot be easily generalized to other countries, as valuation methods and information used can significantly differ from one country to another (Ge et al. 2005).

Although there is no clear consensus on which startup valuation method better predicts the enterprise and share value of the startup, there is an ongoing discussion between the effectiveness of methods that rely on qualitative factors (i.e., Berkus method) and those that rely on quantitative factors (i.e., DCF). For example, a study by Gonzalez et al. (2017) found that combining quantitative and qualitative factors was the most effective approach for valuing high-tech startups. Similarly, a study by Puigderrajols (2022) found that while qualitative factors, such as the team's experience and the quality of the business plan, were important in the early stages of a startup, quantitative factors, such as the amount of funding raised and revenue growth, became more relevant as the startup matured. Drawing on the findings of previous studies, the present study will conduct a case study analysis to assess the performance of different

valuation methodologies in determining the value of Snowflake Inc. in September 2020, when they went public through an IPO. Therefore, in this study, the research question this paper aims to answer is:

Which startup valuation methods are more effective in predicting the enterprise value and share price of Snowflake's IPO date?

To ensure that the results of this study align with its objective, the analysis will focus on Snowflake Inc., a company in the US Software as a Service (SaaS) industry. The US and SaaS industry were selected because they have over 700 unicorns (tech-startups) worldwide, and hence it is considered significant. The study will use September 2020 as a reference date because it was when they became a publicly traded company through an IPO. Therefore, the enterprise value and share price on this date will be evaluated using five different startup valuation methods including the (1) DCF method, (2) Relative Valuation method, (3) Real Options method, (4) Venture Capital method and (5) First Chicago method, by implementing their respective formulas and established structures. Data on financial and forecasted information will be obtained from two different sources. Financial and forecasted information will be obtained from Bloomberg Terminal and I/B/E/S via Capital IQ. Furthermore, to assess the complexity of the thesis, further insights will be gained from estimations made by different investment bank equity research reports, which are also obtained through the Bloomberg Terminal.

From the author's point of view, I hypothesize that this paper will demonstrate that certain startup valuation methods will exhibit a lower degree of variability/lower variance when predicting both the actual enterprise value and share price of Snowflake on its IPO day. The study will offer insightful information about the advantages and disadvantages of each approach, allowing an improved understanding of the startup valuation process. Through this study, others will gain awareness of the significance of choosing the right startup valuation approach and the different elements to consider when determining the value of a startup. While the study may not offer a conclusive opinion on the optimal valuation technique, it will present an overview of the most useful approaches and provide valuable insights for future debate and decision-making in startup valuation.

This thesis is mainly structured into four sections. The first part, (*2. Theoretical Framework*) involves an in-depth literature review of the concepts that revolve around the startup ecosystem, including its general definition, funding types, and maturity stages. The second part, (*4. Startup Valuation Methodology*) describes both traditional and alternative valuation methods for valuing startups. The third part (*5. Case Study: Snowflake Inc.*) focuses on the valuation of Snowflake using the methods described in section *4. Startup Valuation.* Finally, the fourth and last part (*6. Conclusion*) aims to clarify and justify which startup valuation methods are more accurate and suitable for the selected case study.

1.2 Case Study Motivation

The main objective of conducting a case study is to prove how difficult the task of an investor is when performing a valuation on a startup, given the uncertainty and high risks associated with startups. In addition, this paper aims to test which valuation methods are more appropriate when there is a lack of financial and historical information in the market, as well as the main upsides and downsides of each of them. Through this analysis, we will examine how the different valuation methods diverge in their ability to assess the right share price and enterprise value of the corresponding firm. To this effect, the most suitable approach is to conduct a valuation of an existing startup, using the valuation methods presented in *4. Startup Valuation Methodology*.

For this case study, Snowflake Inc. has been chosen as the ideal company for conducting a startup valuation. Although being a large and consolidated company, there are several reasons why Snowflake is the most suitable company for this study.

1. Largest IPO and Underpricing in the SaaS Industry – Snowflake's IPO[1] in September 2020 became the largest IPO ever registered in the software industry. On the first trading day, the company issued 28 million shares at a price of $120 per share. However, the stock opened at a much higher price of $250, more than doubling its offering price. This substantial underpricing resulted in Snowflake raising around $3.4 billion and achieving a market valuation of over $70 billion with its IPO. As a result, Snowflake positioned itself as one of the most valuable software companies in the market.

2. An IPO within 3 years – Snowflake's IPO date was in September 2020. Hence, despite its status as a publicly traded company, Snowflake still preserves many attributes that can define it as a startup. Additionally, one benefit of Snowflake is that being a public company, its financials can be found. This significantly simplifies the valuation process compared to private companies that often lack financial transparency.

Given the aforementioned context, this paper will focus on conducting a real case study to assess the valuation of Snowflake as of September 16th, 2020, when the company went public through an IPO. To address this, the study will rely on data gathered from broker equity reports and other publicly available sources for analysis and evaluation purposes. Having that, the price paid for Snowflake IPO will be assessed by comparing it with the calculated price range derived from various existing startup valuation methods. The ultimate goal is to draw conclusions on whether the IPO price was potentially underpriced or accurately priced. Accordingly, all information provided will be as of October 2020 latest.

[1] Initial Public Offering (IPO) is the process by which a private company offer its shares to the public for the first time, thereby becoming a publicly traded company.

CHAPTER 2 - Theoretical Framework

2.1 Startups

Startups are newly established or young companies that emerge with the goal of developing innovative products or services. Most startups actively seek out innovation in order to attain a competitive advantage over other established firms. Often referred to as "disruptors", these newborn companies have obstructed entrenched ways of thinking, by addressing deficiencies in existing products, or by pioneering entirely new categories of goods and services (Baldridge, 2022). For instance, well-known businesses such as Airbnb and Uber have demonstrated their disruptive potential and are nowadays considered industry unicorns[2]. Startups pose challenges when it comes to assessing their value. The absence of readily available historical and financial data in the market significantly complicates the task of investors (Damodaran, 2009). Many startups generate little or no revenue and often experience operating losses. Even those that manage to survive regularly have short stories. Less than one-third of startups survive in the long run (Vesper, 1990). As a result, the traditional methods that we use to estimate cash flows, growth rates and discount rates either do not work or yield unrealistic outcomes.

Startup valuation is not an easy task. Investors need to know which companies are worth investing in. Prior to making investment decisions, investors require a thorough understanding of the startup's industry, business model, competitive landscape, and growth potential. In addition, to make well-informed investment decisions, investors must employ a combination of quantitative and qualitative analysis to precisely assess the viability and potential return on investment of the startup (Köhn, 2018). Nonetheless, there are many reasons why this can become a challenging assignment. On one hand, young companies face significant challenges when it comes to achieving growth and obtaining financial support, especially during the early stages of their lifecycle. Secondly, the lack of publicly available financial and historical information further complicates the valuation process, as most startups have not yet reached the stage of IPO. Hence, the valuation process becomes a delicate and complex task, given the diverse range of factors and high level of uncertainties involved (Brealey et al. 2007). Still, to assess the accuracy of the predictions on startup valuation, certain approaches are worth considering. Dittmann et al. (2004) highlights how incorporating multiple valuation methods plays a significant role in reducing variability when determining the true enterprise value of a specific firm. According to their findings, employing various valuation techniques in combination proves beneficial for investors who wish to have an accurate and robust assessment of startup value. In contrast, Grinblatt & Hwangs (1989) differs to this perspective by arguing that while integrating multiple valuation methods onto a startup may seem tempting it can actually introduce additional complexity and a higher risk of valuation errors ultimately making the valuation process more challenging.

[2] Refers to any startup (1) founded after 2003 and reaching (2) 1-billion-dollar market value or more.

According to Dastkhan (2022), who explores the different valuation methods across industries, the optimal valuation method does not exist. Findings cannot be generalized from one industry to another due to variations in information and valuation techniques (Ge et al. 2005; Robbie 1998). For instance, the most widely used method in the UK is to multiply past or potential future earnings by price-to-earnings. In Netherlands and Belgium, venture capitalists frequently use the DCF techniques. In contrast, the net book value of assets is often employed in France (Manigart et al. 2000). According to Dastkhans study, the DCF method is considered the most appropriate when valuing a startup. This is because it takes into account the specific risks and uncertainties associated with emerging markets. However, it should be noted that the DCF method does not adequately handle the investors' risk. To address this issue the authors suggest utilizing the Return on Capital (ROC) ratio as a discount rate. In contrast Herbst et al. (2009) utilize a Real Options framework when evaluating pre-IPO high growth firms in the software industry. Their findings show that compared to traditional approaches the Real Options framework results in a higher valuation for the company.

Taking a venture capital standpoint, Miloud et al. (2012) investigate significant qualitative criteria in startup valuation. These include the quality of the management team, the industry in which the startup operates and the stage of the startup’s development. In addition, the study shows that venture capitalists tend to use a combination of both traditional and alternative valuation methods, such as the DCF approach, Relative Valuation analysis and Real Options approach. However, the authors point out that venture capitalists tend to give more emphasis to Relative Valuation. In a similar manner, Damodaran (2009) prioritize the estimation of cash flows as a crucial component when valuing young startups and growth companies. The author discusses the existing techniques that can be used to forecast cash flows, including the top-down and bottom-up approach and the Monte Carlo simulation. While the top-down approach starts by considering the overall market demand for the company's product or service and then assesses the firm's revenue and earnings based on that market size, the bottom-up approach focuses on the firm's internal capabilities and limitations. It estimates the number of units the company can sell and calculates revenues, earnings, and cash flows based on those projected unit sales. Furthermore, Milanesi (2013) makes use of the Monte Carlo simulation to predict a range of future outcomes based on historical data and a predetermined choice of action. On the other hand, Damodaran acknowledges the challenges that arise when valuing a startup. Among all, the limited publicly available data and the high volatility in valuation multiples pose the biggest challenge when assessing the accuracy of the valuation. Moreover, Montani et al. (2020) further deepen the discussion of the challenges faced by investors in assessing startup valuation. The authors stress that traditional valuation methods often yield inaccurate results when applied to startups. Consequently, they highlight the importance of incorporating uncertainty and risk into the valuation process by using alternative approaches. Lastly, the study briefly touches upon current trends in the startup industry and the impact of high interest rates on startup valuation, as well as what instruments are required to effectively finance a startup.

2.2 Trends

Starting with the dot-com bubble[3] in the late 1990s and the subsequent startup boom, along with the rise in popularity of Silicon Valley[4], the startup ecosystem continues to grow exponentially every year. With over 1,150 startup unicorns globally, investments in these young companies have recently become very popular. Investors have realized the unique potential that lies in making the optimal investment in the right startup. *Figure 1* depicts the number of unicorns announced every year between 2010 to 2020.

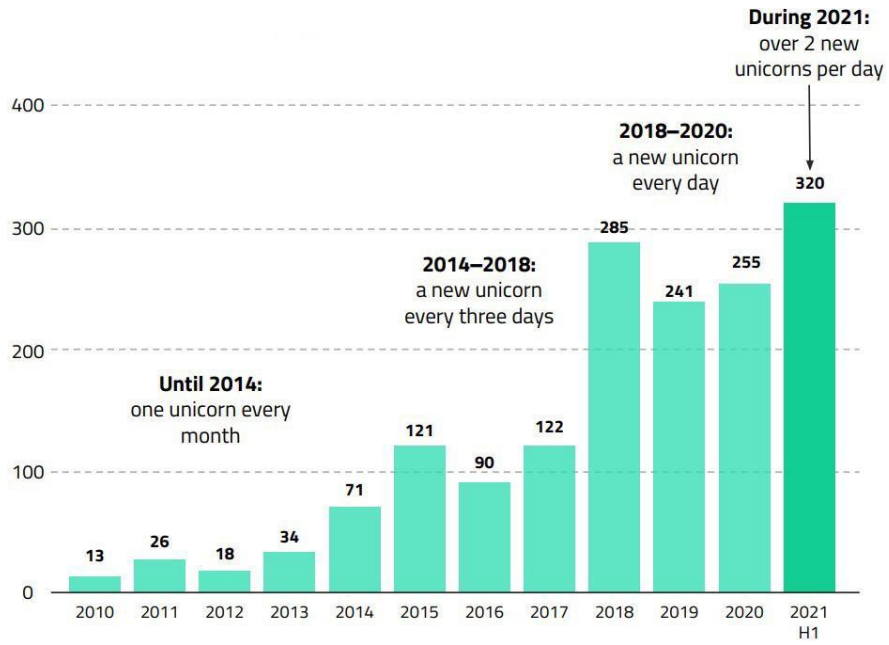

Figure 1: New unicorns announced per year

Source: Startup Cities in the Entrepreneurial Age, Dealrrom.com (July 2021)

As depicted in the illustration above, it is evident that the launching of startups has become a noteworthy trend over the past decade. Even with the challenging circumstances caused by the pandemic, the number of unicorns announced in just the first half of 2021 exceeded the total number of unicorns declared in 2020. Consequently, there were over two new unicorn announcements per day worldwide in 2021.

In light of the widespread reliance on remote platforms during the lockdown period, many businesses shifted their focus towards industries rooted in technology. *Figure 2* draws on an analysis published by Statista in 2022 where it can be seen that SaaS dominates as the leading industry globally with respect to unicorns, accounting for a proportion of close to 30%. Further bolstering this trend is the financial services sector representing nearly 14% of this unicorn population. On average, most sectors are highly related to the tech industry. The emergence of unicorns such as Zoom, has disrupted the industry making it highly profitable and creating potential opportunities for any new firm willing to enter the industry.

[3] The stock market bubble in the late 1990s in the US coincided with massive growth in Internet adoption.
[4] Serves as a global centre of technological innovation in San Francisco, US, with over 40,000 startups.

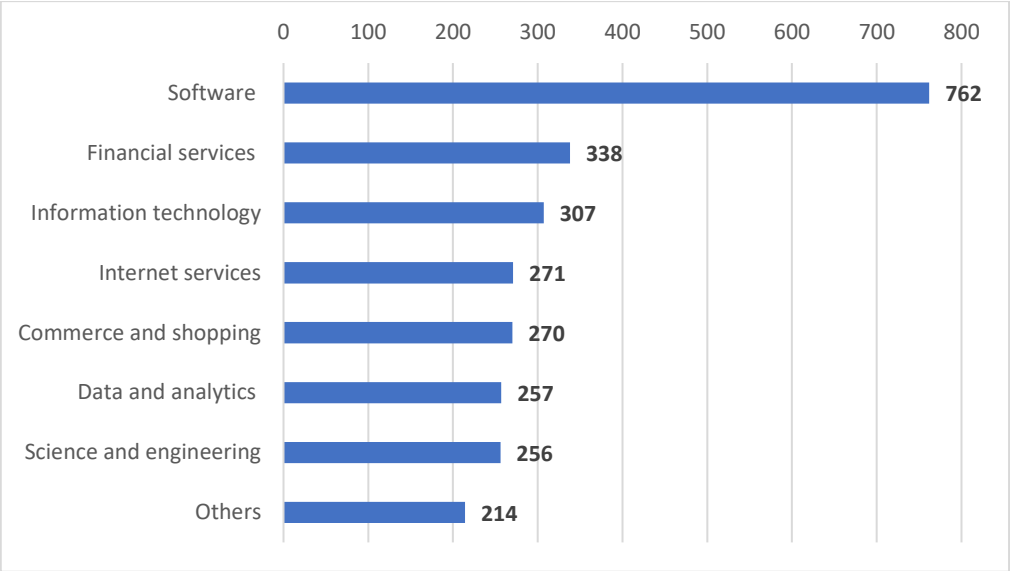

Figure 2: Number of unicorns worldwide by industry, as of November 2022

Source: Statista (2022)

Looking at the economic breakdown during the Coronavirus and the massive concentration of new startups in technological industries, it is key to mention where these startups are located. As a matter of fact, more than half of the unicorns worldwide (52.61%) in November 2022 were from the United States. In terms of market valuation, SpaceX, Stripe and Instacart were the biggest of these American companies. Subsequently, as indicated in *Figure 3*, China is the second most powerful country in these terms, with almost 20% of unicorns globally. On the other hand, 73 of all unicorns reside in European countries, which account for almost 11% of the total. The United Kingdom is the leader in this region.

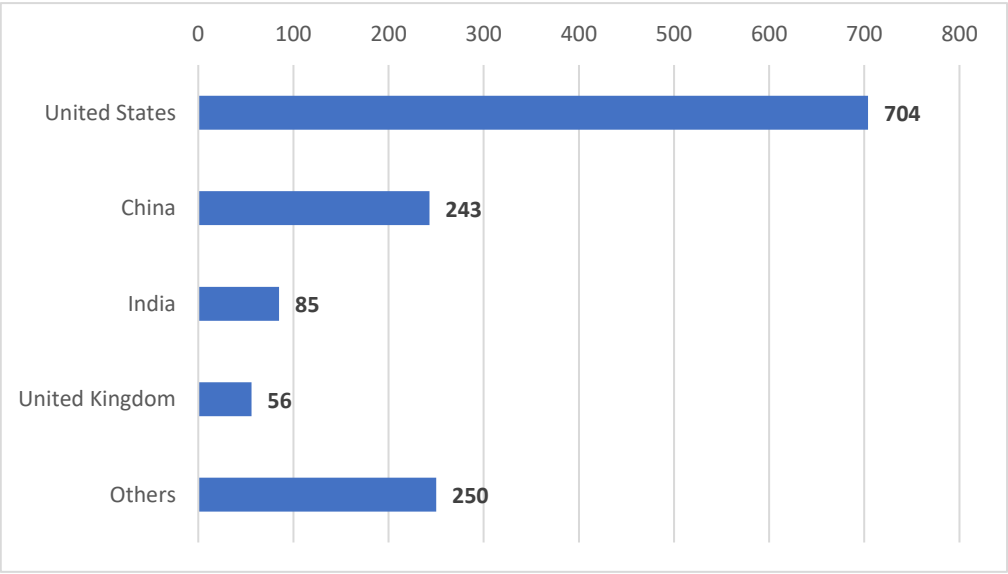

Figure 3: Number of unicorns worldwide by country, as of November 2022

Source: Statista (2022)

2.3 Impact of high interest rates on startup valuation

So far, the startup valuation has mainly been oriented toward the startup itself and the investors that are interested in financing it. Nevertheless, there are additional external factors that significantly contribute to the valuation process of a startup. In general, high interest rates often lead to lower valuations; however, it is worth looking into it closely. For instance, among all publicly traded companies, the DCF approach is the most used valuation method. It calculates the present value of all the company's expected future cash flows discounted by the appropriate cost of capital. The latter term is a mix of debt and equity times the cost of equity and cost of debt. Hence, a rise in interest rates, and consequently, a higher cost of capital, results in a higher discount rate, which leads to a lower firm valuation. This section analyses the potential impact of high interest rates on startup valuation, both from a company and investor's perspective.

Interest Rates and Risk Premiums from a Company's Perspective:

In the very early stages, startups have a great dependence on external financing. Considering their necessity to borrow large amounts of money, the level of interest rates will significantly affect this process, as they represent the cost of borrowing money. As mentioned earlier, a higher interest rate subsequently leads to an increase in the company's cost of capital. Therefore, in order to avoid diminishing returns and subsequent decrease in total profit resulting from high interest expense it is crucial for companies to aim for consistent performance levels. To assess the cost of equity, the popularly used Capital Asset Pricing Model (CAPM), which focuses on establishing how expected risk connects with potential returns on investments, is employed.

$$E(r_i) = r_f + \beta_i * Risk\ Premium = r_f + \beta_i * [E(r_m) - r_f] \quad (1)$$

In the formula above, the risk-free rate (r_f) represents what an investor can expect to earn from an investment that has zero risk. Typically, this rate is determined based on the Treasury note rate of the respective country. Consequently, if the risk-free rate rises due to a rise in the US Treasury note rate, for instance, while keeping everything else remains unchanged (i.e., Risk Premium), the share price will fall. For this reason, investors usually encourage the US Federal Reserve to reduce interest rates.

Interest Rates and Risk Premiums from an Investor's Perspective:

In fact, a very high interest rate can pose difficulties for a company in repaying its debt, leading to increased risk for investors who, consequently, will demand a higher risk premium. Furthermore, high interest rates are normally attributed to a stagnant economy and inflation, making investors reluctant to invest in such a risky company. As a result, both the share price and the respective sales and profit will decrease. Finally, considering that the US Treasury rate is the return guaranteed by the US government, a rational investor will never make an investment whose return is lower than this rate.

2.4 Financing a Startup: Debt vs. Equity

One of the most crucial drivers of startup success, especially in its early stages of development, is how effectively they seek financial resources to fuel its growth and enhance its long-term prospects. Like any other company, startups can either finance through equity or debt. However, due to their limited ability to generate positive cash flows in the early stages and the uncertainty surrounding their success, debt financing is often quite unsuitable for startups. Before going into detail of each source of financing, it is worth noting that the level of investment and risk undertaken by investors decreases as a startup progresses and reaches a more advanced or established stage of development.

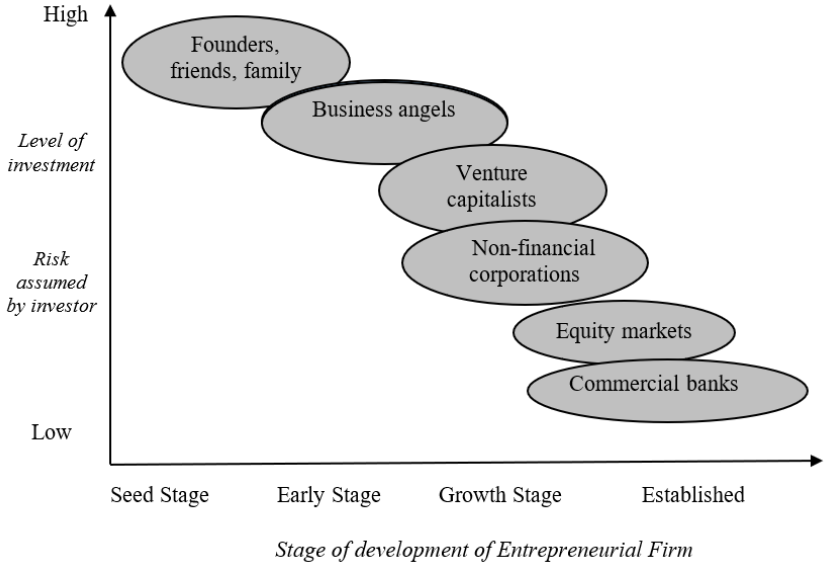

Figure 4: Founding sources of a startup throughout its stage of development

Source: Potential Financial Engines for Startups, Laura Giurca (2009)

Figure 4 provides an overview of the primary funding sources for startups. As previously mentioned, the risk of failure for startups is at its peak during the early stages of maturity. Consequently, investors face a greater level of risk, which also corresponds to higher potential returns on their investment (ROI). In fact, different sources of funding are related to each stage of maturity. In the Seed and Early Stages, startups raise funds from sources such as founders, friends, and family (FFF), as well as business angels, to finance projects and boost their growth. As the startup progresses, non-financial corporations and venture capitalists (VCs) will further contribute to the success and prosperity of the startup throughout its lifecycle. Nonetheless, less than 1% of startups have raised capital through VCs (Davila et al., 2003). VCs typically invest in startups that demonstrate growth potential, disruptive technology, or unique market opportunities. As an alternative, startups can also raise capital for their business through equity-crowdfunding, however; only 39% of crowdfunding projects are fully funded (Mazur, 2022). Finally, when a startup has achieved a well-established position and successfully exits through an IPO or buyout, funding is typically obtained from equity markets or commercial banks.

2.4.1 Equity

Startups mainly finance themselves through equity issuances. Investors provide financial support in exchange for shares of stock or ownership in the company. The funding rounds can be divided into five key phases, depending on the maturity stages outlined. *Figure 5* shows the same funding sources as illustrated in *Figure 4* but adds the time perspective and the revenue on the axis.

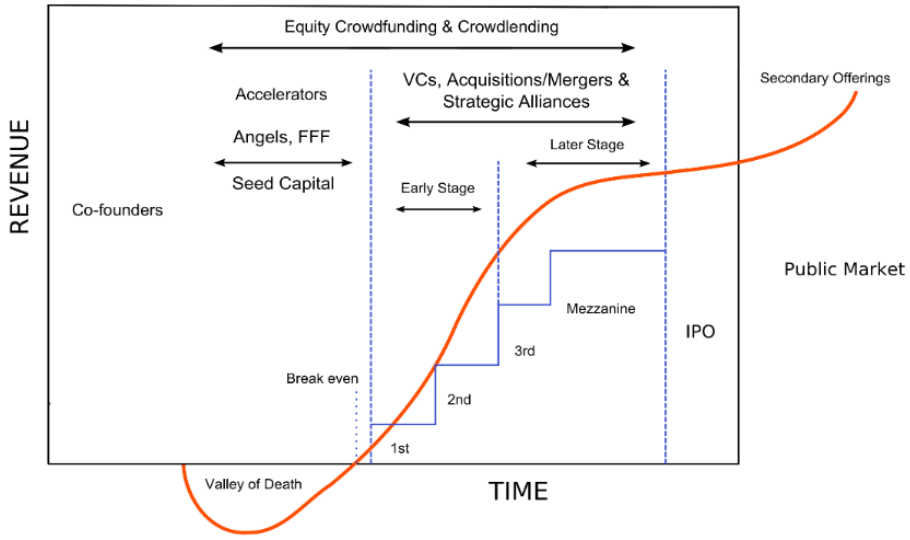

Figure 5: Startup Financing Cycle

Source: Startup Valuation (Ramon Puigderrajols, 2022)

2.4.1.1 Self-funding

During the early stages of a business life, it is common for financing to come from FFF, also known as bootstrapping. Typically, individuals using this type of funding depend on their personal savings or the operating profits of their new company to raise funds and fully establish their initial business concept.

2.4.1.2 Crowdfunding

Crowdfunding is a way of funding a venture, wherein many individual investors contribute small amounts of capital, usually through an internet platform (e.g., Kickstarter, Patreon). It enables the startup to validate their ideas with potential customers, to raise awareness about their product or service, to test marketing strategies, and to identify early adopters. In exchange, investors are granted an ownership stake in the business as compensation. There are four types of crowdfunding:

1. **Reward-based** – investors receive the product the venture sells.
2. **Equity-based** – investors receive a share of the venture's equity, based on the amount pledged.
3. **Debt-based** – investors can acquire a fraction of the venture's debt.
4. **Donation-based** – investors do not receive anything for their donations (i.e., charities)

2.4.1.3 Venture Capital

Venture Capital (VC) funds are aimed at those early-stage ventures who have demonstrated high growth potential and promising returns on investment. In contrast to crowdfunding, VCs are considered active investors since they participate in both the profits and risks involved in the venture. Investors do not only provide financial means at the disposal of the startup, but they also take an active role in closely monitoring and managing the companies they invest in. The participation of VCs in the ownership of startups is temporary. VC's goal is to monetize its investment by achieving an exit strategy, typically through either an IPO or an acquisition. There are four main different rounds of funding with VC, which correspond respectively with the maturity stages of the firm: Seed Round, Series A, Series B, and Series C or more. In general terms, these funding rounds mainly differ in the amounts raised and the valuation of the startup. As the startup progresses along its growth trajectory, both the amount raised and the valuation tend to increase with each subsequent funding round. For instance, while during the seed round, the money raised typically falls between $250k and $3m, in Series C or more the investment made by VCs can range between $20 to more than $250m (Fundz.net, 2020).

2.4.2 Debt

Although the most important and prevailing approach to funding for startups is through equity financing, issuing debt serves as an alternative means for raising capital. Nonetheless, as previously mentioned, debt issuance is not well-suited for young companies with unpredictable and volatile cash flows since it entails regular payments to repay both the principal amount and the accrued interest. Therefore, it is considered a less attractive type of funding for startups. On the other hand, issuing debt also has its advantages, as the lenders are exempted to give ownership of the company or a share of the overall profits. Their entitlement is limited to repayment of the borrowed amount. As a result, debt issuance often incurs lower costs than equity financing and prevents dilution of the firm's ownership. The main debt instruments used by startups during their early stages are the following:

2.4.2.1 Venture Debt

Venture debt is the most common debt financing option, particularly for venture-backed[5] startups. These loans are structured with specific terms and conditions that address the risk and demands of those companies that are not yet profitable and do not have enough assets to use as collateral.

2.4.2.2 Convertible Debt Notes

Convertible debt notes offer a financing option that aligns with the idea presented when issuing equity, as investors have the choice to convert the debt into an ownership stake at a later stage. This allows startups to access capital immediately without the need for an immediate company valuation.

[5] Refers to companies that have received financial backing from venture capitalists (VCs).

CHAPTER 3 - Data

As mentioned in *1.2. Case Study Motivation*, all the information and data used in this paper are based on the data available as of October 2020. This timeframe was chosen because the available equity research and broker reports, specifically addressing the Snowflake IPO on September 16th, were published during that time. Throughout the case study, the following company's broker and equity reports have been incorporated: BTIG and Mizuho equity research and J.P. Morgan, Barclays, and Credit Suisse broker reports. Additionally, other relevant information used in this study was obtained from publicly available and reliable sources such as Bloomberg or Capital IQ. In this section, we will briefly summarize the data variables that have been used to examine the efficiency of the five startup valuation approaches to calculate the corresponding enterprise value and share price of Snowflake on its IPO day. Nonetheless, a detailed summary of the formulas and methodology employed in this study will be presented in *4. Startup Valuation Methodology*.

Discounted Cash Flow

For the DCF approach, the cash flow statement from the J.P. Morgan broker report is used. Firstly, we derive the Unlevered Free Cash Flow for the period from 2020A to 2030E. Following the Snowflake definition, we calculate the Free Cash Flow (FCF) by subtracting capital expenditures and capitalized internal-use costs from the operating cash flow. To determine the Weighted Average Cost of Capital (WACC), we rely on a Q4 2020 prediction sourced from the Bloomberg database. Next, we compute the terminal value using the Unlevered FCF projected for 2030E (the last forecasted period), the WACC and the perpetuity growth rate obtained from Finbox.com. Finally, the enterprise value is calculated by discounting the Unlevered FCF and terminal value using their respective discount rate. Subsequently, two sensitivity tables are constructed to depict the range of enterprise values and share prices depending on the WACC and growth rate chosen.

Relative Valuation

With the Relative Valuation approach, two different groups are analysed. First, Snowflake is compared to its peers in the Data Analytics sector, considering similar enterprise value and market capitalization. Secondly, a comparison is made with peers in the High Growth Software sector, which represent more mature and consolidated firms that have shown significant potential in the past. The selection of peers in both sectors has been provided by the BTIG Equity Research report. To conduct this analysis, the EV/Revenue ratio is calculated for the period from 2020 to 2023. The median multiple of the selected peers is then multiplied by Snowflake's revenue for each corresponding year to determine the range of enterprise value. Then, the equity value is divided by the number of shares outstanding in 2020 to obtain the final share price. All the necessary data for this approach has been gathered from the Bloomberg database.

Real Options

In the Real Options method, the Black-Scholes framework is applied. All the data needed for this approach has been collected from the Bloomberg database, except the Outstanding Debt, which is obtained from a J.P. Morgan broker report. Additionally, the volatility used in the calculations is derived from the variable Hist Vol (50), which represents a 50-day observation period of price variability after Snowflake's IPO on September 16th. The author believes that using a 50-day perspective period helps smooth out short-term fluctuations and provides a more stable measure of volatility. Furthermore, two scenarios have been set to determine the share price and enterprise value range, considering 5 and 10 years of debt maturity. The author also employs the cumulative normal distribution table to obtain the corresponding probabilities for the Black-Scholes formula. Other parameters such as debt value or the spread of corporate debt are calculated using alternative variations of the same formula.

Venture Capital

In this case, certain assumptions regarding the required investment amount and the timing of exit have been made based on previous research. The data used in this method, except for the total number of shares outstanding (shares issued + current shares), has been collected from the Bloomberg database. The information regarding the shares outstanding is obtained from BTIG equity research. To determine the share price and enterprise value range, we calculate the average exit value of peers in both the Data Analytics and High Growth Software sectors. Subsequently, the average exit value from these two scenarios is used to derive the post-money and pre-money valuations, as well as the Venture Capital (VC) ownership percentage.

First Chicago

This approach considers three different scenarios to assess the future value of the investment. The first scenario, which accounts for 25% weightage, assumes the best-case outcome. The second scenario, weighted at 50% represented a mid-case outcome. Lastly, the worst-case scenario is weighted at 25%. Each scenario takes into account the two groups of peers previously mentioned. Within each scenario, the terminal value is determined by multiplying the projected revenue for 2023 with the corresponding median multiple of peers in each sector. As a result, an average terminal value is calculated for each group of peers. Considering the previously calculated annual expected return and an investment horizon of 3 years, a range for both share price and enterprise value is obtained. It is important to note that all data used in this approach has been gathered from the Bloomberg database, while the forecasted values are sourced from Capital IQ.

CHAPTER 4 - Startup Valuation Methodology

The process of valuing a company entails estimating its economic value through the application of one or more specific methods (Borsa Italiana, 2014). Accurately measuring the value of a company hold significant importance in various business scenarios, such as mergers and acquisitions, IPOs for stock market listings and investment in unlisted companies. When examining unlisted companies, particularly startups, the process of valuing a firm becomes highly significant for both the founders and the investors involved. Founders rely on valuation to determine the ownership percentage they need to offer investors in exchange for capital. Meanwhile, investors seek a thorough economic assessment of the companies they consider investing in, as their objective is to generate profits through future increases in the company's share price. Nonetheless, as stated before in this paper, valuing a startup is a very complex task (Damodaran, 2009). The lack of financial history can reduce the investors' confidence when making estimations as it increases the investment risk associated with the project.

Another important consideration is that startups emerge from innovation, which often means they operate in new markets without direct competition. As a result, analysts lack comparable companies to serve as benchmarks for their studies (Spender et al. 2017). Furthermore, there can be a certain degree of secrecy surrounding its initial development. This creates an information asymmetry between the founders and the investors, thus leading to an underestimation of the project's potential. In addition, the high failure rate commonly associated with startups poses a considerable risk for investors, as it implies the potential loss of their entire investment. On this basis, traditional valuation approaches are not always suitable when valuing startups since these methods are typically designed for mature and stable firms. Therefore, the valuation process can be approached in two main groups: Traditional Valuation Methods and Alternative Valuation methods (Engel, 2003). *Figure 6* provides an illustration of the valuation methods examined in this paper and a brief explanation of each of them.

	Valuation Method	Valuation Principle
Traditional	Discounted Cash Flow	Present value of future cash flows
	Relative Valuation	Comparable companies and precedent transaction ratios
	Real Options	The premium for an option that emulates the firm
Alternative	Venture Capital	Investor's expected rate of return
	First Chicago	A weighted average of different valuation scenarios

Figure 6: Startup Valuation Methods

Source: Own elaboration and Marino (2022)

The selection of these specific methods for analysis in this study is based on extensive research, which has demonstrated their efficacy and reliability when valuing young companies (Puigderrajold, 2022).

4.1 Traditional Valuation Methods

4.1.1 Discounted Cash Flow

The DCF is a widely used method for valuing companies, especially those that are mature and publicly traded and have accessible, stable, and predictable financials. However, when it comes to early-stage startups, the DCF method is less popular due to the challenges in accurately predicting their future cash flow prospects. The DCF approach determines the enterprise value of a company by evaluating the present worth of its projected future free cash flows. These cash flows are summed and discounted using a discount rate that considers the company's risks and financing costs, including both equity and debt. The following formula depicts the present value of a firm at time zero:

$$EV_0 = \frac{FCF_1}{(1+WACC)^1} + \frac{FCF_2}{(1+WACC)^2} + \cdots = \sum_{t=1}^{\infty} \frac{FCF_t}{(1+WACC)^t} \quad (2)$$

Where:

FCF_t: Free Cash Flows at period t

WACC: Weighted Average Cost of Capital

4.1.1.1 Free Cash Flows (FCF)

The FCF refers to the cash a company generates to repay creditors or pay dividends to investors – pay its debt and equity holders. There are two types of FCF: Leveraged FCF and Unlevered FCF. The first one also referred to as "Free Cash Flow to Equity", represents the amount of cash accessible to equity investors after settling interest payments to debt holders. The second also denoted as "Free Cash Flow to the Firm", refers to cash flow available to both equity and debtholders once all operating expenses, capital expenditures and working capital investments have been accounted for (Corporate Finance Institute, n.d.). When applying the DCF approach, the Unlevered FCF is used instead of the Leverage FCF. In the early stages, startups often have limited or no debt, thereby reducing the significance of leverage in the calculation. By employing the Unlevered FCF, the valuation is based solely on the intrinsic value of the company, without taking into account any debt-related factors. The Unlevered FCF can be obtained through the following formula:

$$Unlevered\ FCF = (1-t) * EBIT + D\&A - CapEx - \Delta NWC \quad (3)$$

Where:

t: Corporate Tax Rate

EBIT: Earning Before Interest and Taxes

D&A: Depreciation and Amortization

CapEx: Capital Expenditure

ΔNWC: Change in Net Working Capital

In our case, the computation of Unlevered FCF deviates slightly from the standard methodology due to Snowflake's unique approach. Nonetheless, the result remains the same as the previous equation.

$$Snowflake's\ Unlevered\ FCF = \ OCF - CapEx - capitalized\ s/w\ dev\ cost \quad (4)$$

Where:

OCF: Operating Cash Flow

CapEx: Capital Expenditure

Capitalized s/w dev cost: capitalized software development cost

4.1.1.2 Terminal Value (TV)

The TV represents a significant portion of the company's enterprise value, as it includes all the FCFs for time periods greater than N. The calculation of the TV is determined using the Gordon Growth Method (GGM), which assumes a constant growth rate in the company's future free cash flows (Gordon, 1959). While assuming a constant growth rate, it is significant to mention that the discount rate should always exceed the growth rate. That being said, the TV_N calculation using the GGM is as follows:

$$TV_N^{GGM} = FCF_N * \frac{1+g}{WACC-g} \quad (5)$$

Where:

FCF_N: FCF on the last forecasted year n = N

WACC: Weighted Average Cost of Capital

g: perpetual growth rate

4.1.1.3 Weighted Average Cost of Capital (WACC)

An essential factor when calculating the present value of future cash flows is the discount rate used. This rate represents the projected earnings from a venture with comparable risk to that being evaluated. For company valuation, analysts rely upon the WACC to capture both operational and financial risks involved in a firm's functions and structure respectively. By calculating the WACC, one can estimate anticipated returns on an investment portfolio consisting of all securities held by said firm. The calculation for the WACC is as follows:

$$WACC = \frac{D}{D+E} * (1-t) * r_D + \frac{E}{D+E} * r_E \quad (6)$$

Where:

D: Market Value of Net Debt (Debt – Cash)

E: Market Value of Equity (Stock Price * Number of Shares)

t: Corporate Tax Rate

r_D: Cost of Debt

r_E: Cost of Equity

In the case of startups, where equity is the primary source of funding, the cost of equity is equivalent to the WACC. The cost of equity represents the anticipated return expected by shareholders considering the company's risk and leverage. For its calculation, the CAPM formula is used, as depicted in *Equation (1).*

4.1.1.4 Enterprise Value

Typically, the calculation of the FCF is performed for a limited number of periods (e.g., eight years), as estimating their growth becomes challenging for distant time periods. Therefore, a new variable called TV_N needs to be defined to account for the number of periods for which FCF will be computed.

$$EV_0 = \sum_{t=1}^{\infty} \frac{FCF_t}{(1+WACC)^t} = \sum_{t=1}^{\infty} \frac{FCF_n + TV_N}{(1+WACC)^n} = \sum_{t=1}^{\infty} \frac{FCF_n}{(1+WACC)^n} + \frac{TV_N}{(1+WACC)^N} \quad (7)$$

Where:

FCF_t: Free Cash Flows at period t

WACC: Weighted Average Cost of Capital

TV_N: Terminal Value of the firm at time at n = N

n: Number of periods, from n = 1 to n = N

4.1.1.5 Share Price

In order to obtain the final share price using the DCF approach, the Equity Value (EqV) must be determined first. The corresponding formula is used:

$$EqV = EV_0 - Net\ Debt \quad (8)$$

Where:

EV_0: Enterprise Value

Net Debt: Financial Debt – Cash & Equivalents

Once the equity value is determined, the next and final step is to obtain the share price, which is the most relevant information when comparing different valuation methods.

$$Share\ Price = \frac{Equity\ Value}{Number\ of\ Shares} \quad (9)$$

4.1.2 Relative Valuation

One way to determine the value of a company is by using multiples, averages and benchmarks of similar companies that are already valued in the market. The main goal is to access companies with comparable characteristics by considering various factors such as EV, market capitalization, share price, and the respective EV/Revenue multiple for each year. The key strength of this approach lies in its simplicity since it relies on a straightforward application of multiples and does not require extensive financial forecasting.

Nonetheless, a limitation of this approach is the limited availability of truly comparable companies. As mentioned earlier, startups tend to emerge from innovation and lack direct competition in the market. The primary valuation technique used in Relative Valuation is called Comparable Companies.

4.1.2.1 Comparable Companies

This method estimates the EV of a company by comparing the ratios of similar companies in the market. The process involves examining the financial metrics and market multiples of comparable firms and using them as benchmarks for estimating the value of the target company. The EV/Revenue and EV/EBITDA ratios are the prevailing measures when conducting a comparable valuation. In our valuation, we have chosen to rely solely on the EV/Revenue ratio. This decision is driven by the fact that startups, especially in their early stages, often experience negative or uncertain earnings, leading to unstable profitability. Consequently, using EBITDA as a valuation metric may not effectively capture the financial performance of startups. Once the ratios for each peer company are determined, the average and median ratios are computed. These will serve as the multiples used in the valuation process. Finally, the median ratio of the comparable peers is multiplied by the corresponding revenue figures of each year (2020A-2023E). The enterprise value of the target firm using relative valuation is computed as follows:

$$EV_{Target\ Firm} = \left(\frac{EV}{Revenues}\right)_{Peers} * Revenues_{Target\ Firm} \tag{10}$$

$$EV = \max\left(peers\ average\ ratio * revenue, peers\ median\ ratio * revenue\right) \tag{11}$$

In the case study of this paper, two groups of peers are examined – Data Analytics Peers and High Growth Software Peers. The corresponding share price for each group and each year is obtained using *Equation (8)* and *(9)* respectively.

4.1.3 Real Options

In contrast to the DCF approach, the Real Options method relies on the active involvement of a company's management team and its ability to adapt to evolving market conditions. The Real Options framework often results in higher valuations compared to other methods, as it considers the management's ability to adapt quickly to different scenarios. This flexibility allows the firms to handle uncertainties effectively, reducing risks in unfavourable situations and maximizing potential gains in favourable ones by adjusting their strategies and exposure accordingly. Consequently, the higher the level of uncertainty or ambiguity in the outlook, the more valuable the flexibility becomes (Vicén, 2020). In the case of startups, this flexibility holds significant worth considering the intrinsic uncertainties that characterize the startup ecosystem. Therefore, in comparison to the aforementioned traditional valuation methods, the Real Options approach provides a more accurate estimation of the company's share price and enterprise value, particularly in the case of early-stage ventures characterized by high levels of uncertainty.

4.1.3.1 Black & Scholes

The Black & Scholes model revolutionized the valuation of Options by introducing a widely adopted mathematical approach. In addition, the model allows a direct comparison between the valuation of options and equities, establishing an analogy that enhances understanding and analysis.

Symbol	Financial Option	Real Option
S	Stock Price	Enterprise Value on the valuation date
E	Strike Price	Debt to be repaid on the expiration date
σ	Underlying Asset Volatility	Enterprise Value Volatility
t	Time to Expiration	Debt Maturity (zero-coupon)
r'	Risk-free rate	Interest rate

Figure 7: Link between Financial and Real Options

Source: Own elaboration and Marino (2022)

The following formula to obtain the option premium is presented:

$$C = S * \phi(d_1) - E * e^{-r't} * \phi(d_2) \quad (12)$$

Where:

S: Spot Price of the Underlying Asset

E: Strike Price

r': Risk-free rate in Continuous time

t: Time to Expiration

ϕ(x): Normal Cumulative Density function

Following *Figure 7*, the equity value of the company is equivalent to the value of the option.

$$Equity\ Value = Enterprise\ Value * \phi(d_1) - Debt * e^{-r't} * \phi(d_2) \quad (13)$$

In order to compute the corresponding equity value of the project using the formula above, some previous calculations need to be performed first. The following formulas are used:

$$r' = \ln(1 + r) \quad (14)$$

$$d_1 = \frac{ln\frac{S}{E} + \left(r' + \frac{\sigma^2}{2}\right) * t}{\sigma * \sqrt{t}} \quad (15)$$

$$d_2 = d_1 - \sigma * \sqrt{t} \quad (16)$$

Where:

r: Risk-free rate in Discrete time

σ: Underlying Asset Volatility

4.2 Alternative Valuation Methods

4.2.1 Venture Capital

The VC approach is particularly suitable for valuing startups in their early stages, especially those that have not yet generated revenue. It focuses on evaluating high-risk and long-term investments that VCs are willing to undertake, by considering the projected return on investment upon exit from the target company (Sahlman, 1987). In essence, the VC method is a simplified net present value calculation that takes into account the investor's perspective (i.e., venture capitalist), rather than the company itself. First, the pre-money valuation is calculated by initially calculating the post-money valuation. To put into context, pre-money valuation represents the value of a company prior to external funding, whereas post-money valuation considers after such investments have been incorporated.

$$Pre\text{-}Money\ Value = Post\text{-}Money\ Value - Investment \tag{17}$$

Additionally, it is crucial to calculate the VC Ownership, typically represented as a percentage of the post-money valuation or as a ratio of the pre-money valuation. In this particular case, the former approach is employed. The VC Ownership proportion holds significant importance when it comes to distributing the proceeds during the exit process. It is calculated as follows:

$$VC\ Ownership = \frac{Investment}{Post\text{-}Money\ Value} \tag{18}$$

Once the VC Ownership is computed, the number of shares outstanding (NOSH) purchased and issued by the VC can be obtained as follows:

$$VC\ Ownership = \frac{NOSH_{Issued}}{NOSH_{Current} + NOSH_{Issued}} \tag{19}$$

Lastly, the share price of the newly issued shares outstanding is computed as follows:

$$Share\ Price = \frac{Investment}{NOSH_{Issued}} \tag{20}$$

The VC approach does have some limitations, similar to other traditional valuation techniques. Firstly, it heavily relies on forecasted growth and revenues to determine the terminal value of the firm. This can be very challenging when it comes to valuing startups, due to its limited publicly available information. Moreover, the VC method makes use of relative valuation in order to derive the terminal value, which is usually not recommended when performing startup valuation. Finally, instead of discounting the Exit Value (post-money valuation) using the cost of capital, this method relies on the investors' ROI, which tends to be much higher. Despite these limitations, the VC approach remains a powerful tool for valuing startups as it reflects the perspective of the investors, who ultimately provide the necessary funding.

4.2.2 First Chicago

The First Chicago method is a widely used approach by VC and Private Equity investors when valuing early-stage ventures. Unlike the VC method, First Chicago adopts a post-revenue that focuses on the valuation of dynamic growth companies. Furthermore, it considers all possible future scenarios a startup might encounter, considering the probability of success for each scenario. This poses an advantage when valuing young early-stage ventures since uncertainty is incorporated into the valuation process. In addition, startups often have a high failure rate during their early stages, thus, it is worth considering all potential scenarios. First, the valuation for each scenario can be computed with the same methodology as presented in the DCF approach. Nonetheless, the terminal value is obtained in a different manner. The median value of the EV/Revenue ratio from the chosen comparable companies is multiplied by the forecasted revenue at the time of exit of the project (i.e., 3 years).

$$Valuation_s = \sum_{t=1}^{h} \frac{CF_t^S}{(1+r_d)^t} + \frac{TV_s}{(1+r_d)^h} \quad (21)$$

Where:

CF_t^S: Cash flow at period t and under scenario S

TV_s: Terminal Value under scenario S

r: Requited rate of return

h: Investment horizon

Once each scenario has its corresponding valuation, probabilities can be allocated. William Sahlman and Daniel Scherlis (1989) present the typical scenario probabilities from the perspective of VC investors.

Scenario	Probability
Best-case scenario	25%
Mid-case scenario	50%
Worst-case scenario	25%

Figure 8: Sahlman & Scherlis First Chicago Method Scenario Probabilities

Source: William Sahlman & Daniel Scherlis; "The Venture Capital Method"; HBS

Finally, the enterprise value can be computed by accounting for each scenario probability.

$$EV = \sum_{s=1}^{N} p_s * Valuation_s \quad (22)$$

Where:

N: Number of scenarios

p_s: Probability of scenario S

$Valuation_s$: Valuation under scenario S

CHAPTER 5 - Case Study: Snowflake Inc.

5.1 Company Valuation

With a thorough understanding of the different valuation methods applicable for startups and an assessment of the respective strengths and weaknesses, this section will now evaluate the share price and enterprise value of Snowflake on its IPO day in September 2020. The case study will assess whether the price paid in the IPO was reasonable and determine if it adequately reflected the true value of the company. In this manner, the opening price for Snowflake's IPO - $120 and enterprise value - $34300 will be compared to the values derived from the methodology discussed in *4. Startup Valuation Methodology*. In addition, the level of variability exhibited by the results will be examined. All calculations in this study are expressed in millions of dollars ($Mn).

5.2 Traditional Valuation Methods

1. Discounted Cash Flow

As mentioned earlier, the first step of the DCF method is to compute the Unlevered FCF for the periods in which the company is evaluated. To fully capture Snowflake's growth potential, a 10-year DCF model has been chosen as the forecasted time horizon for this study. Given that short-term horizons are typically employed for mature companies in a steady-state phase, it would not be appropriate for Snowflake, considering its stage of growth and development on its IPO date. The Unlevered FCF calculation can be found in *Table A1.1*. Furthermore, the WACC serves as the discount factor, and in this case, considering Snowflake's limited use of debt financing during its IPO, the WACC is equivalent to the Cost of Equity.

Table 1: WACC Calculation

WACC	
Cost of Equity	9.1%
Weight of Equity (E/D+E)	99.7%
Cost of Debt	1.1%
Weight of Debt (D/D+E)	0.3%
WACC	9.1%

Note. Own elaboration and Bloomberg database

Having computed the WACC, the Terminal Value can be derived by considering the Unlevered FCF for the last forecasted year in the study, factoring in the growth rate, and discounting it using the WACC.

Table 2: Terminal Value Calculation

Terminal Value	
Unlevered FCF - 2030E	4630.00
WACC	9.1%
Perpetuity Growth	2.5%
Terminal Value	71663.27

Note. Own elaboration, Bloomberg database and Finbox.com

Next, all the Unlevered FCF for the selected period must be discounted using the appropriate discount factor, which is the WACC. The Discounted FCF calculations can be found in *Table A1.2*. Finally, Snowflake's enterprise value can already be computed by summing up the Discounted FCF. The share price is derived using *Equation (8)* and *(9)* respectively.

Table 3: DCF Valuation

Valuation	
Enterprise Value	**32403.94**
(-) Net Debt - 2020	(472)
Equity Value	32875.94
(÷) Shares Outstanding - 2020	221
Share Price ($)	**148.76**

Note. Own elaboration and J.P. Morgan Equity Research

With the share price and enterprise value already computed, two sensitivities tables have been constructed to analyse how adjustments in the WACC and perpetuity growth rate affect the determined share price and enterprise value. These can be found in *Table A1.3* and *A1.4*.

2. Relative Valuation

Given the innovative nature of startups and their limited direct competition, it becomes highly challenging to find comparable publicly traded companies in the market. Moreover, based on the forecasted EBITDA provided in *Table A2.*, it is evident that Snowflake is not expected to be profitable until 2029. Hence, to derive a more precise estimation of both the share price and enterprise value, the EV/Revenue ratio is used instead. For this method, two groups of peers are analysed to consider all potential factors that can assist in the prediction, these are – Data Analytics Peers and High Growth Software Peers. An illustration of the selected peers in each group and the respective EV/Revenue calculations for the chosen time period (2020A till 2022E) are presented in *Table A1.5* and *A1.6.*

For the first group of peers, the following calculations have been performed in order to obtain a prediction for the share price and enterprise value:

Table 4: Data Analytics Peers Relative Valuation

Valuation - Data Analytics Peers	2020A	2021E	2022E
Revenue	265	592	1,219
Peer's Average	24.4x	17.4x	14.8x
Implied Entrepise Value	**6,459**	**10,313**	**18,051**
Peer's Median	20.8x	15.4x	12.0x
Implied Enterprise Value	**5,511**	**9,126**	**14,593**
(-) Net Debt	-472	-5048	-5029
Equity Value	5,983	14,174	19,622
(÷) Shares outstanding - 2020	221.0	221.0	221.0
Share Price ($)	**27.07**	**64.13**	**88.79**

Note. Own elaboration and J.P. Morgan Equity Research

As seen in *Table 4*, when comparing Snowflake to its Data Analytics Peers, the enterprise value ranges from $6,459 Mn to $18,051 Mn. Nonetheless, the value obtained in 2020A and 2021E does not accurately reflect the true value of Snowflake, as its revenue was still very low during those periods. In terms of share price, the value ranges between $27.07 and $88.79, but in the same manner, only the latter value is representative.

For the High Growth Analytics Peers, the following valuation analysis has been conducted:

Table 5: High Growth Analytics Peers Relative Valuation

Valuation - High Growth Software Peers	2020A	2021E	2022E
Revenue	265	592	1,219
Peer's Average	33.5x	22.8x	19.3x
Implied Enterprise Value	**8,875**	**13,505**	**23,512**
Peer's Median	36.8x	24.0x	17.7x
Implied Enterprise Value	**9,753**	**14,185**	**21,624**
(-) Net Debt	-472	-5048	-5029
Equity Value	10,225	19,233	26,653
(÷) Shares outstanding - 2020	221.0	221.0	221.0
Share Price ($)	**46.27**	**87.03**	**120.60**

Note. Own elaboration and J.P. Morgan Equity Research

Similarly, when comparing Snowflake to its High Growth Software Peers, the valuation yields an enterprise value of $23,512 Mn and a corresponding share price of $120.60. On the other hand, it is worth noting that the obtained share price obtained perfectly matches Snowflake's IPO opening price, indicating that this peer group provides a more accurate representation of Snowflake's potential.

3. Real Options

For the Real Options framework, the valuation is conducted using the Black & Scholes method. In addition, the analysis considers two distinct time periods, allowing the determination of a range for both the share price and enterprise value outcomes. First, the debt maturity is assumed to be 10 years.

Table 6: Real Options Assumptions (t = 10)

Variable	Symbol	Value
Enterprise Value	S	34,300
Outstanding Debt	E	472
Debt Maturity	τ	10
Volatility	σ	0.6629
Risk-free Rate (Discrete)	r	0.87%
Risk-free Rate (Continuous)	r'	0.86%

Note. Own elaboration, J.P. Morgan Equity Research and Bloomberg database

Once all variables have been defined, the equity value and the corresponding share price can be determined using *Equations (13)* to *(16)*.

Table 7: Real Options Valuation (t = 10)

Valuation	
d1	3.13
d2	1.04
N(d1)	0.91
N(d2)	0.85
Equity Value	30,934
(÷) Shares Outstanding - 2020	221.00
Share Price ($)	**139.97**

Note. Own elaboration and J.P. Morgan Equity Research

Assuming a debt maturity of 10 years, the resulting share price is $139.97. Furthermore, by applying *Equation (8)* in reverse, the corresponding enterprise value for Snowflake can be computed. Considering a net debt of - $472 in 2020, Snowflake's enterprise value is equivalent to $30,642 Mn.

Finally, the debt maturity period has been adjusted to 5 years, while all other factors remain unchanged. As a result, the following valuation outcomes have been obtained:

Table 8: Real Options Valuation (t = 5)

Valuation	
d1	3.66
d2	2.18
N(d1)	0.99
N(d2)	0.99
Equity Value	33,422
(÷) Shares Outstanding - 2020	221.00
Share Price ($)	**151.23**

Note. Own elaboration and J.P. Morgan Equity Research

In a similar manner, the enterprise value can be computed by adding up net debt to the equity value. Consequently, with a debt maturity of 5 years, the share value and enterprise value obtained are $151.25 and $32,950 Mn respectively.

Among the various valuation methods discussed in this paper, the Real Options approach is considered one of the most relevant approaches when valuing startups due to its ability to incorporate uncertainty in the valuation. Given Snowflake's status as a relatively young venture and the additional uncertainty caused by the COVID-19 situation, this method appropriately considers these factors. Hence, the enterprise value obtained closely aligns with Snowflake's enterprise value on the day of its IPO. Nonetheless, it is worth noting that the share price obtained with the Black & Scholes formula is slightly above the IPO opening price. This observation suggests that the price paid for Snowflake's IPO was underestimated initially and should have been set at a higher value.

5.3 Alternative Valuation Methods

4. Venture Capital

In the VC approach, it is first needed to compute the terminal value or exit value that the company would have upon the investor's exit. This calculation relies on a few key assumptions. Firstly, the investment needed for the company represents the money raised in Snowflake's IPO. Secondly, the time horizon considered spans 5 years, from the IPO in late 2020 to the end of 2025. Lastly, according to BTIG Equity reports, the total number of outstanding shares at that time amounts to 357. As Snowflake relied solely on equity funding during this period, the Cost of Equity is equivalent to the WACC.

Table 9: Venture Capital Assumptions

Assumptions	
Invesment needed	3,360
Timing of Exit (Years)	5
Cost of Equity	9.1%
Total Shares Outsanding	357
Revenue - 2025	3,640

Note. Own elaboration, Bloomberg database and BTIG Equity Research

Considering the exit of the project is assumed to be in late 2025, the forecasted revenue for this year is used to compute the exit value. Likewise, the average EV/Revenue from the year 2022 is used as a suitable representation to compute the exit value, since the revenues in 2020 and 2021 do not reflect Snowflake's true value Similar to the relative valuation approach, the exit values obtained from the two peer groups – Data Analytics Peers and High Growth Software Peers; are averaged in order to calculate the average exit value of the project, as seen in *Table A1.7*. Next, the post-money valuation which equals the enterprise value, is computed as explained in the methodology presented in section *4.2.1 Venture Capital.* Finally, the average share price and enterprise value of the two peer groups are examined.

Table 10: Venture Capital Valuation

Valuation	
Return on Investment (ROI)	155%
PV of Exit Value (Post-Money)	40052
Pre-Money Value	36692
VC Ownership	8.4%
Share Issued	30
Share Price ($)	**112.24**

Note. Own elaboration, Bloomberg database and BTIG Equity Research

To determine a range of possible values for the share price and enterprise value using the VC approach, each peer group's exit value has been individually used, as illustrated in *Table A1.8* and *A1.9.*

5. First Chicago

The initial step of the First Chicago method is to define the terminal value for three different scenarios: best-case, mid-case and worst-case scenarios. Sahlman & Scherlis suggest that the probabilities associated with each scenario are 25%, 50% and 25% respectively. The terminal value is then computed the same way as in the VC approach. Lastly, for a more comprehensive valuation, the model incorporates Snowflake's peer groups and their respective projected median EV/Revenue ratios as of 2022. As a result, the terminal value for each scenario and peer subgroup are presented in *Table A1.10* to *A1.12*. Furthermore, the terminal value for the average scenario is computed for each subgroup.

Table 11: First Chicago Average Scenario Terminal Value Calculation

Terminal Value	Weight	Data Analytics Peers	High Growth Software Peers
Scenario 1: Best-Case (BTIG)	25%	32,470	48,114
Scenario 2: Mid-Case (Credit Suisse)	50%	20,846	30,890
Scenario 3: Worst-Case (Barclays)	25%	20,535	30,429
Average Scenario - Terminal Value		23,674	35,081

Note. Own elaboration and Sahlman & Scherlis scenario probabilities

With the average scenario terminal value calculated, and assuming the Cost of Equity as the expected annual return, the enterprise value can be determined with a three-year investment horizon. Applying the First Chicago methodology and incorporating the two peer groups in the model, the resulting enterprise value ranges from $30,762 Mn to $45,584 Mn, as indicated in the table below.

Table 12: First Chicago Valuation by Peer Group

Valuation	Data Analytics Peers	High Growth Software Peers
Annual Return Expected	9.1%	9.1%
Investment Horizon	3	3
Enterprise Value	**30,762**	**45,584**
(-) Net Debt	-472	-472
Equity Value	31,234	46,056
(÷) Shares outstanding	221.0	221.0
Share Price ($)	**141.33**	**208.40**

Note. Own elaboration, Bloomberg database and J.P. Morgan Equity Research

5.4 Valuation Methods Comparison: Football Field

After conducting an extensive assessment of Snowflake's market value and share price employing multiple startup valuation approaches – encompassing both traditional and alternative methods – numerous insightful findings have emerged. To enable a meaningful comparison of the results obtained from each valuation approach, a Football Field chat is constructed. This analytical tool serves the purpose of identifying any deviations in the valuation as well as weighing the relevance of specific techniques in predicting Snowflake's IPO valuation. Finally, a full picture of the different valuation methods predictions, regarding the Enterprise Value and Share Price, is presented.

- **Enterprise Value**

For the assessment of Snowflake's enterprise value, *Table A1.13* and *A1.14* provide a range of potential values obtained from different valuation methods. The analysis incorporates two weighted average valuation scenarios, wherein appropriate weights are assigned based on the relevance of each method to predict Snowflake enterprise value. The Football Field chart for the enterprise value is as follows:

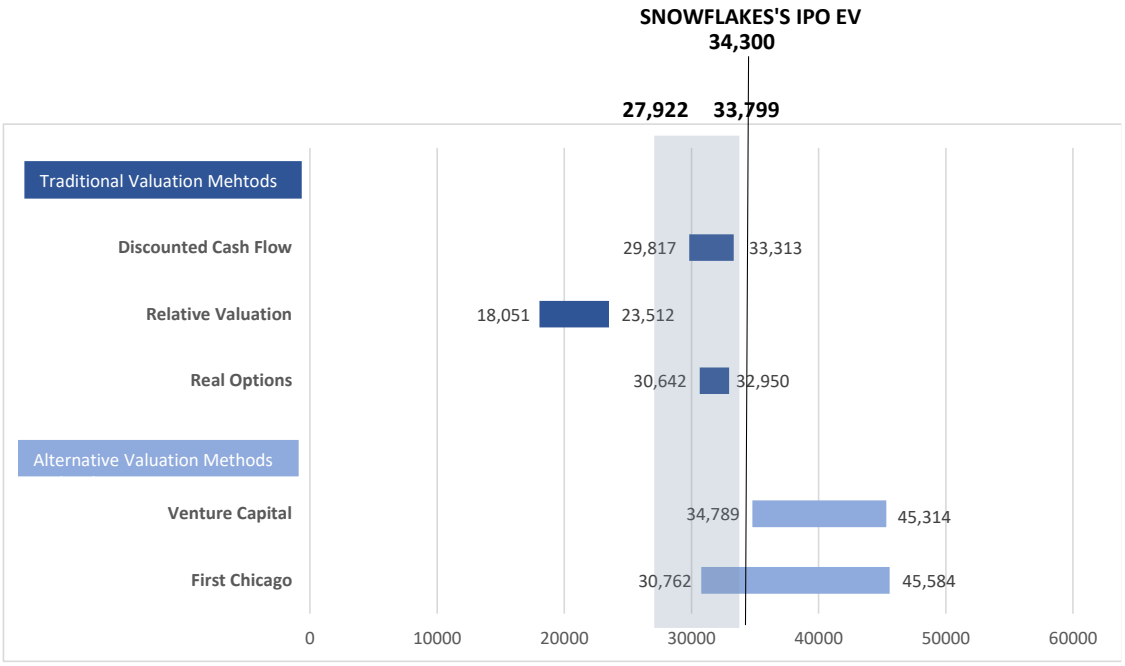

Figure 9: Football Field Valuation – Enterprise Value ($Mn)

Source: Own elaboration, J.P. Morgan Equity Research and Bloomberg database

Given that traditional methods are typically more suitable for mature and stable companies rather than startups, the findings of the study are very acceptable. Nonetheless, as depicted above, the Relative Valuation approach yields an enterprise value that significantly deviates from the true value. This can be explained by the fact that Snowflake's EBITDA was still negative during the initial years after its late 2020 IPO. Moreover, despite using the EV/Revenue multiple for this approach, the relatively low revenues in 2020 and 2021 undermine the reliability of the results. Additionally, the uncertainty caused by the COVID-19 pandemic also affected the results obtained in the Relative Valuation method, although the effect was relatively less severe compared to i.e., non-internet-based companies. On the other hand, the DCF analysis, extending the valuation until 2030, mitigates the pandemic's effects, leading to satisfactory results within the valuation range. Similarly, the Real Options model incorporates uncertainty into the valuation, thereby yielding reliable estimations for the enterprise value. Regarding the alternative valuation methods discussed in the study, the results obtained are more optimistic compared to traditional approaches. This can be attributed to the incorporation of certain assumptions, such as financial forecasts, which particularly enhance startup valuation. Consequently, the Venture Capital and First Chicago methods exhibit the highest reliability in predicting Snowflake's enterprise value.

- **Share Price**

In this case, the opening price on Snowflake's IPO day is compared to the prediction derived from different valuation methods. Similar to the enterprise value assessment, *Table A1.15* and *A1.16* present a weighted analysis of potential values and an accuracy analysis for the predicted average share price, using all the valuation methods discussed. The Football Field chart for the share price is as follows:

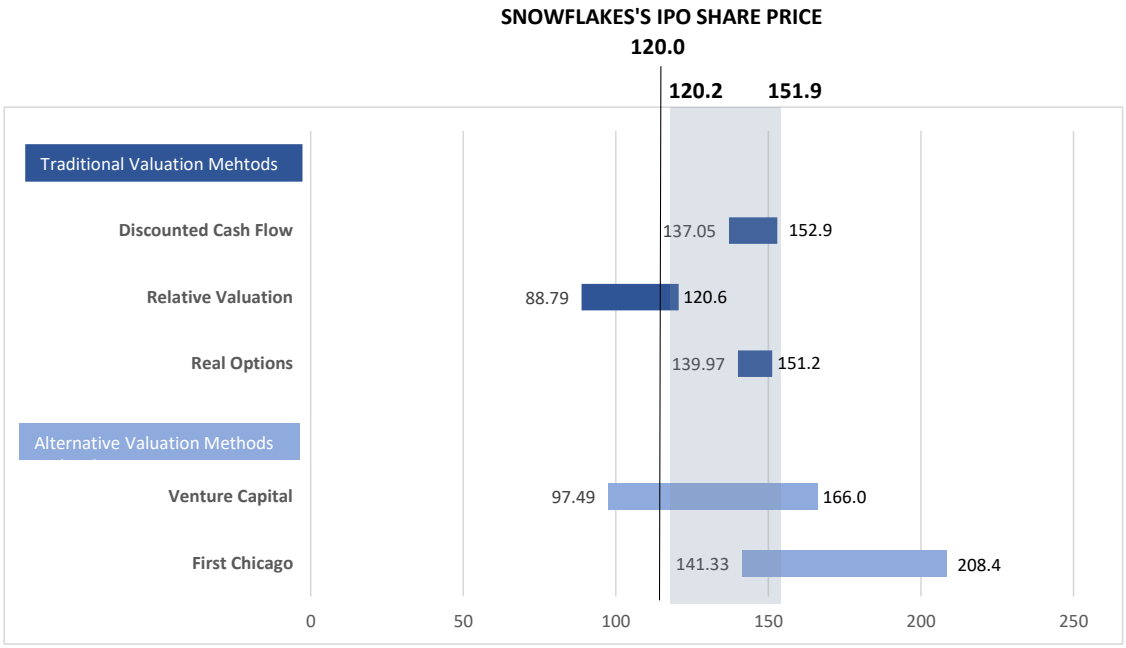

Figure 10: Football Field Valuation – Share Price ($)

Source: Own elaboration, J.P. Morgan Equity Research and Bloomberg database

Before analysing each outcome individually, it is crucial to note that as opposed to the predictions for the enterprise value, the valuation range depicted above clearly exceeds Snowflake's IPO share price. This suggests that the IPO opening price was underpriced by the company. For instance, this observation becomes evident when considering that on the first day of trading, the stock opened at $250, more than doubling the initial IPO price. Firstly, in a similar manner to the evaluation of the enterprise value, the valuation predictions from both the DCF and Real Options approaches yield satisfactory outcomes compared to the Relative Valuation method. Again, this discrepancy can be attributed to the fact that the multiples employed in the Comparable Companies model use revenue figures that do not accurately capture Snowflake's true growth potential. As a result, the EV/Revenue ratios are not suitable for the years 2020 and 2021. On the other hand, the Venture Capital and First Chicago approaches, solely rely on the ratio for 2022 in the calculation of the terminal value; and together with uncertainty incorporated in both models, these approaches yield a more accurate representation of Snowflake's share price. All in all, the valuation range or suggested bid price for Snowflake IPO in September 2020 ranges from $120.2 to $151.9. However, if the Relative Valuation results were to be omitted, the findings would reveal an even more pronounced underpricing than what is depicted in *Figure 10*.

CHAPTER 6 – Conclusion

After conducting an extensive analysis of startups and their corresponding valuation methods, including both traditional and alternative approaches, a comprehensive understanding can be attained. Thanks to this study, it becomes evident the significant role that the startup ecosystem plays in the economy and the great importance of assessing its value. Nonetheless, their unpredictable nature and the lack of publicly available financials, make this task very challenging for investors. In light of this, different valuation predictions have been undertaken in this study in order to assess the complexity of this matter. Likewise, this paper acknowledges the impact of high interest rates on startup valuation, as they can significantly decrease the company's valuation. Although these rates were historically low in late 2020, the study aims to analyse the financial context by considering their potential effects on the economy. In fact, low interest rates decrease a company's cost of capital, leading to high earnings and increasing share prices. As a result, valuations accounting for the effect of interest rates, such as the DCF, might have yielded more optimistic predictions compared to scenarios where interest rates were higher.

Despite its current status as a publicly traded company, since the valuation was made on its first trading day, Snowflake still had many attributes that defined it as a startup. Throughout the case study, this became evident as the results obtained from the uncertainty-based models, such as Real Options, Venture Capital, and First Chicago, consistently outperformed other methods by delivering more accurate and acceptable outcomes. However, the fact that Snowflake was still a startup when performing the valuation, as well as the presence of COVID-19, led to some discrepancies in the predictions. Especially, for the Relative Valuation approach, which relies on ratios based on revenue and EBITDA figures. These two financial measures were heavily impacted by the pandemic and hence yielded biased and unsuitable results. On the other hand, those methods that relied on longer time horizons, such as the DCF, Venture Capital and the First Chicago, were able to effectively mitigate the challenges posed by the pandemic and deliver satisfactory results. All in all, the methodologies that better predicted Snowflake’s enterprise and share value as of its IPO on September 2020 were the DCF, Real Options and First Chicago approach. Finally, the last part of the study incorporates an in-depth weighted average examination of the results provided by each valuation method. The weighted average analysis reveals an enterprise value of $30,861 Mn, which is lower than the actual enterprise value of $34,300 Mn. On the other hand, the average weighted share price is determined to be $136.1. This suggests that Snowflake's IPO share price was slightly undervalued by the company itself, as the share price at the time of the valuation was $120.

To conclude, valuing a startup is a complex and challenging process. Investors who aim to determine the worth of their investment often perceive the valuation process as an art rather than a science (Montani et al., 2020), particularly during uncertain times such as Snowflake’s IPO in 2020. Therefore, it is crucial to identify the most appropriate valuation methods for each firm, depending on its unique characteristics and prevailing market conditions, prior to conducting any valuation.

APPENDIX 1 - Relevant Calculations

Table A1. 1*: Unlevered Free Cash Flow Calculation*

	2020A	2021E	2022E	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E
Operating Cash Flow (OCF)	(176.56)	(63.18)	34.35	116.96	716.30	954.00	1196.00	1520.00	1949.70	3584.00	4775.40
(-) CapEX	(18.58)	(75.37)	(44.66)	(54.27)	(32.70)	(42.80)	(57.20)	(70.10)	(100.90)	(123.00)	(145.40)
(-) Capitalized internal-use s/w dev cost	(4.27)	(6.91)	(9.61)	(12.54)	(117.10)	424.30	541.20	0.00	0.00	0.00	0.00
Unlevered FCF (Snowflake Definition)	(199.40)	(145.45)	(19.92)	50.15	566.50	1335.50	1680.00	1449.90	1848.80	3461.00	4630.00

Note. Own elaboration and J.P. Morgan Equity Research

Table A1. 2:. *Discounted Unlevered Free Cash Flow Calculation*

	2020A	2021E	2022E	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E
Unlevered FCF	(176.56)	(63.18)	34.35	116.96	566.50	1335.50	1680.00	1449.90	1848.80	3461.00	4630.00
Terminal Value											71663.27
Discount factor - WACC	1.09	1.19	1.30	1.42	1.55	1.69	1.84	2.01	2.19	2.39	2.61
Discounted FCF	(161.80)	(53.06)	26.43	82.49	366.13	790.98	911.83	721.16	842.69	1445.66	27431.43

Note. Own elaboration and J.P. Morgan Equity Research

Table A1. 3: *DCF Sensitivity Analysis for Enterprise Value*

Sensitivity of EV: WACC vs Perpetuity Growth						
Perpetuity Growth \ WACC	*8.0%*	*8.5%*	*9.0%*	*9.5%*	*10.0%*	*10.5%*
1.0%	34065.52	30628.57	27671.35	25106.65	22866.78	20898.46
1.5%	36422.21	32578.84	29301.15	26480.38	24033.49	21896.07
2.0%	39171.68	34829.15	31163.78	28037.27	25346.04	23011.05
2.5%	42421.05	37454.51	33312.97	29816.58	26833.60	24265.40
3.0%	46320.30	40557.21	35820.36	31869.62	28533.66	25687.00
3.5%	51086.04	44280.45	38783.64	34264.84	30495.27	27311.68
4.0%	57043.23	48831.08	42339.57	37095.55	32783.82	29186.32

Table A1. 4: *DCF Sensitivity Analysis for Share Price*

Sensitivity of Share Price: WACC vs Perpetuity Growth						
Perpetuity Growth \ WACC	*8.0%*	*8.5%*	*9.0%*	*9.5%*	*10.0%*	*10.5%*
1.0%	156.28	140.73	127.35	115.74	105.61	96.70
1.5%	166.94	149.55	134.72	121.96	110.88	101.21
2.0%	179.38	159.73	143.15	129.00	116.82	106.26
2.5%	194.09	171.61	152.87	137.05	123.55	111.93
3.0%	211.73	185.65	164.22	146.34	131.25	118.37
3.5%	233.29	202.50	177.63	157.18	140.12	125.72
4.0%	260.25	223.09	193.72	169.99	150.48	134.20

Note. Own elaboration, Bloomberg database and Finbox.com

Table A1. 5: *Snowflake Data Analytics Peers and EV/Revenue Calculation*

Data Analytics Peers		Market Data			Revenue			EV/Revenue		
Company name	Country	Share Price	Market Cap	EV	2020	2021	2022	2020	2021	2022
Snowflake Inc.	**US**	**120**	**57,980**	**34,300**	**264.7**	**592.0**	**1219.3**	**129.58x**	**57.94x**	**28.13x**
Datadog Inc.	US	88.54	31,120	26,020	603.47	1,030	1,030	43.12x	25.26x	25.26x
Dynatrace Inc.	US	40.53	14,860	11,700	545.8	703.51	929.44	21.44x	16.63x	12.59x
Elastic NV	US	103.76	6,390	8,640	427.62	608.49	862.37	20.20x	14.20x	10.02x
Splunk Inc.	US	185.35	17,820	30,300	2,360	2,230	2,670	12.84x	13.59x	11.35x
Average								24.40x	17.42x	14.80x
Median								20.82x	15.41x	11.97x

Note. Own elaboration, BTIG Equity Research and Bloomberg database

Table A1. 6: *Snowflake High Growth Software Peers and EV/Revenue Calculation*

High Growth Software Peers		Market Data			Revenue			EV/Revenue		
Company name	Country	Share Price	Market Cap	EV	2020	2021	2022	2020	2021	2022
Snowflake Inc.	**US**	**120**	**57,980**	**34,300**	**264.7**	**592.0**	**1219.3**	**129.58x**	**57.94x**	**28.13x**
Cloudflare Inc.	US	36.17	22,410	10,400	431.06	656.43	656.43	24.13x	15.84x	15.84x
DocuSign Inc.	US	202.02	10,590	37,420	973.97	1,450	2,110	38.42x	25.81x	17.73x
Fastly Inc.	US	84.08	2,100	8,490	290.87	354.33	354.33	29.19x	23.96x	23.96x
Shopify Inc.	CA	93.04	81,960	107,960	2,930	4,610	4,610	36.85x	23.42x	23.42x
Zscaler Inc.	US	132.64	21,670	16,850	431.27	673.1	1,090	39.07x	25.03x	15.46x
Average								33.53x	22.81x	19.28x
Median								36.85x	23.96x	17.73x

Note. Own elaboration, BTIG Equity Research and Bloomberg database

Table A1. 7: *Snowflake Peers Average Exit Value Calculation*

Peers Group	Average EV/Revenue 2022E	Revenue - 2025E	Exit Value
Data Analytics Peers	14.80x	3639.80	53,888
High Growth Analytics Peers	19.28x	3639.80	70,191
Average			62,039

Note. Own elaboration and Bloomberg database

Table A1. 8: *Venture Capital Valuation using Exit Value of Data Analytics Peers*

Valuation	
Return on Investment (ROI)	155%
PV of Exit Value (Post-Money)	34789
Pre-Money Value	31429
VC Ownership	9.7%
Share Issued	34
Share Price ($)	**97.49**

Note. Own elaboration, Bloomberg database and BTIG Equity Research

Table A1. 9: *Venture Capital Valuation using Exit Value of High Growth Analytics Peers*

Valuation	
Return on Investment (ROI)	155%
PV of Exit Value (Post-Money)	45314
Pre-Money Value	41954
VC Ownership	7.4%
Share Issued	26
Share Price ($)	**166.01**

Note. Own elaboration, Bloomberg database and BTIG Equity Research

Table A1. 10: *First Chicago Scenario 1: Best-Case*

Scenario 1: Best-Case (BTIG)	Data Analytics Peers	High Growth Software Peers
Probability	25%	25%
Revenue (2023E)	2,713	2,713
Comps Multiple (EV/Revenue) - 2022E	11.97x	17.73x
Terminal Value	**32,470**	**48,114**

Note. Own elaboration, BTIG Equity Research, Capital IQ and Sahlman & Scherlis scenario probabilities

Table A1. 11: *First Chicago Scenario 2: Mid-Case*

Scenario 2: Mid-Case (Credit Suisse)	Data Analytics Peers	High Growth Software Peers
Probability	50%	50%
Revenue (2023E)	1,742	1,742
Comps Multiple (EV/Revenue) - 2022E	11.97x	17.73x
Terminal Value	**20,846**	**30,890**

Note. Own elaboration, BTIG Equity Research, Capital IQ and Sahlman & Scherlis scenario probabilities

Table A1. 12: *First Chicago Scenario 3: Worst-Case*

Scenario 3: Worst-Case (Barclays)	Data Analytics Peers	High Growth Software Peers
Probability	25%	25%
Revenue (2023E)	1,716	1,716
Comps Multiple (EV/Revenue) - 2022E	11.97x	17.73x
Terminal Value	**20,535**	**30,429**

Note. Own elaboration, BTIG Equity Research, Capital IQ and Sahlman & Scherlis scenario probabilities

Table A1. 13: *Enterprise Value Football Field Valuation*

Valuation Methods - Enterprise Value ($Mn)	Min	Max	Diff	Weight 1	Weight 2
Discounted Cash Flow	29,817	33,313	3,496	25%	25%
Relative Valuation	18,051	23,512	5,461	25%	25%
Real Options	30,642	32,950	2,308	25%	25%
Venture Capital	34,789	45,314	10,525	15%	25%
First Chicago	30,762	45,584	14,821	10%	0%
Valuation 1	**27,922**	**33,799**	**5,877**	**100%**	**100%**
Valuation 2	**28,325**	**33,772**	**5,448**	**100%**	**100%**

Note. Own elaboration

Table A1. 14: *Enterprise Value Football Field Valuation Accuracy*

Accuracy of the Method - Enterprise Value ($Mn)	Average	Error	Error (%)
Discounted Cash Flow	31,565	704	2.3%
Relative Valuation	20,782	-10,079	-32.7%
Real Options	31,796	935	3.0%
Venture Capital	40,052	9,191	29.8%
First Chicago	38,173	7,312	23.7%
Valuation 1	**30,861**	**0**	**0.0%**

Note. Own elaboration

Table A1. 15: *Share Price Football Field Valuation*

Valuation Methods - Share Price ($)	Min	Max	Diff	Weight 1	Weight 2
Discounted Cash Flow Alaysis	137.1	152.9	15.8	25%	25%
Relative Valuation	88.8	120.6	31.8	25%	25%
Real Options	140.0	151.2	11.3	25%	25%
Venture Capital	97.5	166.0	68.5	15%	25%
First Chicago	141.3	208.4	67.1	10%	0%
Valuation 1	**120.2**	**151.9**	**31.7**	**100%**	**100%**
Valuation 2	**115.8**	**147.7**	**31.9**	**100%**	**100%**

Note. Own elaboration

Table A1. 16: *Share Price Football Field Valuation Accuracy*

Accuracy of the Method - Share Price ($)	Average	Error	Error (%)
Discounted Cash Flow	145.0	8.9	6.5%
Relative Valuation	104.7	-31.4	-23.1%
Real Options	145.6	9.5	7.0%
Venture Capital	131.8	-4.3	-3.2%
First Chicago	174.9	38.8	28.5%
Valuation 1	**136.1**	**0.0**	**0.0%**

Note. Own elaboration

APPENDIX 2 - Financial Statements

Table A2.1

Snowflake Inc. Income Statement

Income Statement	2019A	2020A	2021E	2022E	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E
($mn)												
Revenue	96.67	264.75	562.92	1069.89	1717.87	2761.60	3639.80	4777.00	6480.80	8361.40	10919.60	13909.80
Growth (%)		*173.9%*	*112.6%*	*90.1%*	*60.6%*	*60.8%*	*31.8%*	*31.2%*	*35.7%*	*29.0%*	*30.6%*	*27.4%*
Adj. EBITDA	(121.43)	(230.02)	(205.55)	(164.80)	(18.72)	(970.10)	(904.40)	(1046.40)	(935.30)	(250.40)	492.00	949.20
D&A	10.21	48.22	69.80	127.81	260.43	72.30	73.10	69.50	81.80	91.40	107.50	126.70
Adj. EBIT	(131.64)	(278.24)	(275.35)	(292.60)	(279.15)	(1042.40)	(977.50)	(1115.90)	(1017.10)	(341.80)	384.50	822.50
Interest Expense	(8.26)	(10.65)	(7.10)	(7.78)	(10.07)	(101.00)	(114.40)	(157.40)	(150.50)	-	-	-
Adj. EBT	(123.38)	(267.59)	(268.25)	(284.82)	(269.08)	(941.40)	(863.10)	(958.50)	(866.60)	(492.20)	850.40	1709.80
Taxes	0.845	1.411	2.736	4.783	7.075	44.2	63.9	66.5	44	139.3	161.9	278.9
Net Income	**(124.23)**	**(269.00)**	**(270.98)**	**(289.61)**	**(276.16)**	**(985.60)**	**(927.00)**	**(1025.00)**	**(910.60)**	**(631.50)**	**688.50**	**1430.90**
EPS ($)	**-**	**-**	**1.07**	**1.02**	**0.92**							

Source: J.P. Morgan broker report and Bloomberg forecasts (from 2024E-2030E)

Table A2.2

Snowflake Inc. Balance Sheet

Balance Sheet	2019A	2020A	2021E	2022E	2023E
($mn)					
Cash and Cash Equivalents	123.0	142.0	3,544.0	3,316.0	3,363.0
Account Receivable	63.0	179.0	256.0	434.0	753.0
Other current assets	513.0	344.0	418.0	285.0	272.0
Total Current Assets	**699.0**	**665.0**	**4,218.0**	**4,035.0**	**4,388.0**
PP&E	7.0	27.0	108.0	132.0	124.0
LT investments	0.0	24.0	243.0	144.0	126.0
Other non current assets	58.0	297.0	307.0	260.0	177.0
Total Assets	**764.0**	**1,013.0**	**4,876.0**	**4,571.0**	**4,815.0**
Payables	8.0	8.0	14.0	22.0	34.0
Other short term liabilities	137.0	408.0	705.0	1,115.0	1,585.0
Total Current Liabilities	**145.0**	**416.0**	**719.0**	**1,137.0**	**1,619.0**
Other long term liabilities	21.0	205.0	193.0	183.0	173.0
Total Liabilities	**166.0**	**621.0**	**912.0**	**1,320.0**	**1,792.0**
Shareholders Equity	**598.0**	**392.0**	**3,964.0**	**3,251.0**	**3,023.0**
Total liabilities & Equity	**764.0**	**1,013.0**	**4,876.0**	**4,571.0**	**4,815.0**

Source: J.P. Morgan broker report

Table A2.3

Snowflake Inc. Cash Flow Statement

Cash Flow Statement	2019A	2020A	2021E	2022E	2023E
($mn)					
Net Income (loss)	(178.03)	(348.54)	(423.20)	(644.92)	(707.89)
D&A	10.2	48.2	69.8	127.8	260.4
Stock-based Compensation Expense	22.4	78.4	147.5	353.1	429.5
Net amortization of premium on investments	(5.01)	(5.46)	(0.10)	(0.20)	(0.22)
Other	0.22	1.48	4.05	-	-
Change in WC	6.2	49.3	138.8	198.6	135.2
Net Cash from Operations	**(143.98)**	**(176.56)**	**(63.18)**	**34.35**	**116.96**
Purchases of Property and Equipment (CapEx)	(2.06)	(18.58)	(75.37)	(44.66)	(54.27)
Capitalized internal-use	(1.96)	(4.27)	(6.91)	(9.61)	(12.54)
Purchase of Investments	(738.38)	(622.85)	(975.80)	(668.36)	(465.10)
Maturities and Redemptions of Invesmtents	379.76	776.42	411.99	420.39	421.38
Other	-	7.77	(8.71)	-	-
Net Cash from Investing	**(362.64)**	**138.50**	**(654.80)**	**(302.24)**	**(110.53)**
Net proceeds from issuance of common stock in IPO	-	-	4223.92	-	-
Proceeds from issuance of conv pfd shares	438.23	24.12	478.57	-	-
Proceeds from early exercised stock options	2.75	6.21	0.16	-	-
Proceeds from exercise of stock options	2.26	27.53	41.44	40.43	39.70
Other	(29.64)	(0.39)	(0.88)		
Net Cash from Financing	**413.6**	**57.5**	**4,743.2**	**40.4**	**39.7**
FCF (Snowflake Definition = OCF - CapEx - capitalized internal-use)	**(148.0)**	**(199.4)**	**(145.5)**	**(19.9)**	**50.2**

Source: J.P. Morgan broker report

REFERENCES

Akkaya, M. (2020). Startup valuation: Theories, models, and future. In *Valuation Challenges and Solutions in Contemporary Businesses* (pp. 137-156). IGI Global.

Baldridge, R. (2022). What Is a Startup? Forbes Advisor. Curry, B. (Ed.). Retrieved from https://www.forbes.com/advisor/business/what-is-a-startup/

Brealey, R., S. Myers, and F. Allen. 2007. Principles of corporate finance. New York: McGraw Hill Higher Education

Borsa Italiana. (2014). Valuation Guide. Listing Guides. London Stock Exchange Group

Corporate Finance Institute. (n.d.). Terminal Value. Corporate Finance Institute. Retrieved

February 6, 2022, from https://corporatefinanceinstitute.com/resources/financial-modeling/dcf-terminal-value-formula/

Dastkhan, H. (2022). A framework to assess the valuation techniques for new technology-based firms: a case in an emerging market. *Venture Capital*, *24*(3-4), 309-334

Damodaran, A. (2009). Valuing young, start-up and growth companies: estimation issues and valuation challenges. *Available at SSRN 1418687*.

Davila, A., Foster, G., & Gupta, M. (2003). Venture capital financing and the growth of startup firms. Journal of business venturing, 18(6), 689-708.

Dittmann, I., E. Maug, and J. Kemper. 2004. How fundamental are fundamental values? Valuation methods and their impact on the performance of German venture capitalists. European Financial Management 10: 609–38.

Engel, R. (2003, April). Seed-Finanzierung wachstumsorientierter Unternehmensgründungen.

Entrepreneurial and financial studies. Sternenfels: Verlag Wissenschaft & Praxis

Fundz.net. (2020). Series A, B, C Funding: Averages, Investors, Valuations. Fundz.Net

Ge, D., J. M. Mahoney, and J. T. Mahoney. 2005. "New Venture Valuation by Venture Capitalists: An Integrative Approach." University of Illinois at Urban Champaign Working Paper 124: 05–0124.

Gonzalez, G. (2017). What factors are causal to the survival of a startup? *Muma Business Review*, *1*(9), 97-114.

Gordon, M. (1959, May). Dividends, Earnings, and Stock Prices. The Review of Economics and Statistics. The MIT Press.

Grinblatt, M., & Hwang, C. Y. (1989). Signalling and the pricing of new issues. The Journal of Finance, 44(2), 393-420.

Herbst, A. F., Lin, J. B., & Yi, B. S. (2006). A Simple Application of Real-Options to the Valuation of Pre-IPO High-Growth Firms. *Journal of Financial Education*, 58-74.

Köhn, A. (2018). The determinants of startup valuation in the venture capital context: a systematic review and avenues for future research. Management Review Quarterly, 68(1), 3-36.

Laura Giurca Vasilescu. (2009). Business Angels: potential financial engines for start-ups

Manigart, S., K. De Waele*, M. Wright, K. Robbie, P. Desbrières, H. Sapienza, and A. Beekman. 2000. "Venture Capitalists, Investment Appraisal and Accounting Information: A Comparative Study of the USA, UK, France, Belgium and Holland." European Financial Management 6 (3): 389–403

Marino Sanjurjo, G. (2022). *Startup Valuation: A Share Price Assessment of Airbnb* (Master's thesis, Universitat Politècnica de Catalunya).

Mazur, C. (2022, November 3). Crowdfunding Statistics: Average Success Rate and More. Zippia. Retrieved from https://www.zippia.com/advice/crowdfunding-statistics/#:~:text=What's%20the%20average%20success%20rate,crowdfunding%20projects%20are%20fully%20funded.

Milanesi, G. S., Pesce, G., & El Alabi, E. (2013). Technology-based startup valuation using real options with Edgeworth expansion.

Miloud, T., Aspelund, A., & Cabrol, M. (2012). Startup valuation by venture capitalists: an empirical study. *Venture Capital*, *14*(2-3), 151-174.

Montani, D., Gervasio, D., & Pulcini, A. (2020). Startup company valuation: The state of the art and future trends. *International Business Research*, *13*(9), 31-45.

Nasser, S. (2016). Valuation for startups—9 methods explained. *ICT Strategic Consulting*, *61*(02), 1-9.

Puigderrajols Sanchez, R. (2022). *Valuation of a Startup: Zoom Case Study* (Master's thesis, Universitat Politècnica de Catalunya).

Sahlman, William A., and Daniel R. Scherlis. A method for valuing high-risk, long-term investments: The" venture capital method". 1989.

Smith, J. (2016, March 23). How Yahoo Is Trying To Drive Revenues For Tumblr. Forbes. Retrieved from https://www.forbes.com/sites/greatspeculations/2016/03/23/how-yahoo-is-trying-to-drive-revenues-for-tumblr/?sh=2e88f4757ff5

Spender, J. C., Corvello, V., Grimaldi, M., & Rippa, P. (2017). Startups and open innovation: a review of the literature. European Journal of Innovation Management, 20(1), 4-30.

Statista. (2021). Number of unicorn companies worldwide as of July 2021, by country. Statista. Retrieved from https://www.statista.com/statistics/1068995/unicorn-companies-worldwide/

Statista. (2022). Number of global unicorns by industry. Retrieved from https://www.statista.com/statistics/1093261/number-of-global-unicorns-by-industry/

Vesper, K. H. (1990). New Venture Strategies (2nd ed.). Englewood Cliffs, NJ: Prentice Hall.

Vicén Sampériz, C. (2020). *Startup Valuation* (Master's thesis, Universitat Politècnica de Catalunya).

Wright Robbie, M. K. 1998. “Venture Capital and Private Equity: A Review and Synthesis.” Journal of Business Finance & Accounting 25 (5–6): 521–570.