



VALUATION OF TECH COMPANIES

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Abstract

The goal of this paper is to analyze and discuss the valuation of technology companies. Valuating tech companies is a challenge given the lack of tangible assets like in traditional manufacturing companies and many uncertain factors about the future. This paper presents a methodology for the valuation of tech companies & early stage start-ups that we have proven in practice. The risk linked to a tech company is expressed through an individual beta coefficient as important component of the discounting factor within a discounted cash flow (DCF) valuation based on the historical data. Two valuation methodology has been applied to a single company to observe the variations, which provided an easy-to-handle and comprehensible comparison of different valuation for early stage investors. The results show the variations in the final value of the company based on the assumptions taken in the calculation & valuation is more of an art rather than science where the valuation is justified by the strength of the reasoning behind the assumptions.

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1.Introduction

1.1 Valuation

Investors like to invest into shares of the company which shows good growth. For several years now, technology companies have shown fast growth & high volatility. There was a rapid rise & sudden collapse at the end of the 20th century. This had raised a no. of questions regarding the sanity of the stock markets & how these companies are valued. The stock market appeared to assign higher value to tech companies the more their losses mounted.

In the search for precise valuations critical to investors, some well-established principles work just fine for high-growth tech companies. Discounted-cash-flow valuation, though it may sound old school, works where other methods fail, since the core principles of finance apply even in uncharted territories. Other alternative methods such as price-to-earning, or revenue multiples work well when the earnings are positive but fail when there aren't good benchmarks for sales multiples. These shorthand methods can't account for the unique characteristics of each company in a fast-changing environment, and they provide little insight into what drives valuation.

1.2 Characteristics of Technology companies

There are certain features which make technology companies different than regular established companies. Tech companies have a rapid-growth phase at the beginning of their lifecycle. It is very difficult to judge the duration of the growth phase or will it have multiple growth phase.

The technology companies have tough competition. When a company succeeds to make a entry into the market, it would like to make a mark in the market. The company tries to take monopoly but making it difficult for its competitors to enter the market. But it's a challenge to measure the effectivity of its barriers for its competitors & how long will the barriers will last.

Valuation of tech companies becomes difficult as the multiples which are normally used to value established companies in other sector like the manufacturing companies, are not so useful in valuating them. Valuation of tech companies may require industry specific multiples like no. of users or registered subscribers (for online tech companies like Yelp) & conversion rate (no. of people moving from free membership to value added premium membership). Deciding how to calculate multiples – measuring a company's financial wellbeing by dividing one metric by another – in valuations, and whether multiples should be used at all.

The entry into the market maybe a tough job but maintaining that first movers' advantage & converting into market power is difficult. Its tough to spot companies which can actually do this & valuing them correctly.

The latest trends of recent tech companies are having different governance rules that what have been followed for years by other companies. One of these issues is the absence of voting rights by major tech companies to their external shareholders. Its feels as if the company doesn't what to value the input coming from them. Taking thing like this when valuing companies have been seen to be difficult to do. (1)

1.3 Market Capitalization

In the past, it's been observed many times that market leaders in the most stable industries are unlikely to keep their leadership position over long periods of time. But in the tech world, sometimes companies are able to separate from the rest of the pack for significant amounts of time. But the companies which are at the top of the list in market capitalization flips the charts more often than ever. Company valuations are constantly changing. In September of 2018, Apple & Amazon topped the \$1 trillion milestone for a short period of time. The latest top 10 companies with respect to their market capitalization (US stock exchange-based list) are shown below. Interestingly it misses companies like Tencent listed on Hong Kong Stock exchange will be roughly \$450 billion (taking HKD/USD conversion rates). (2)

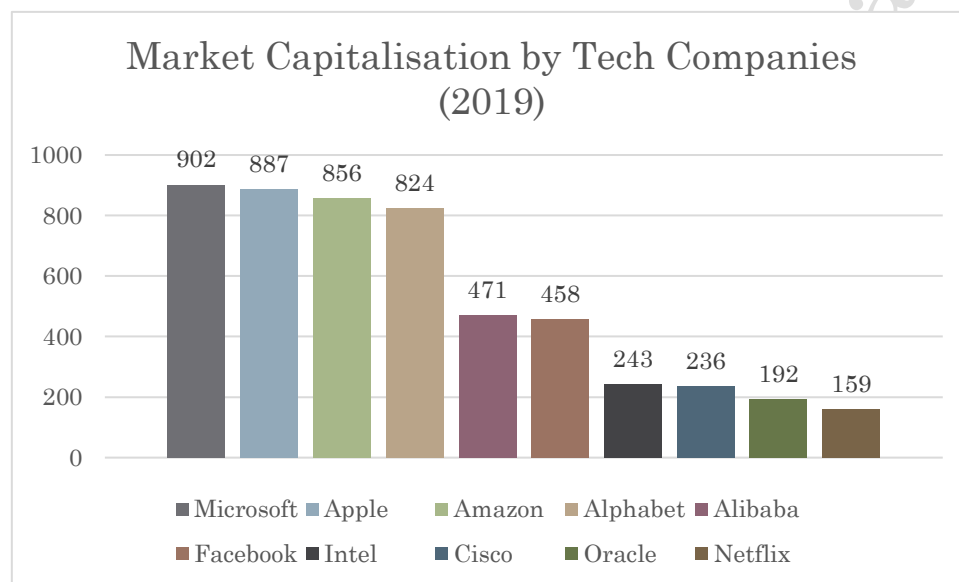


FIGURE 1: MARKET CAPITALISATION

2 Evolution

The first valuation was in the middle of 1800s in the Industrial Age, which saw the growth of immigration & larger companies began forming as technology advanced in communications, transportation and climate control, and made it easier for workers to perform more uniform tasks. As these companies were sold, accountants and actuaries were first called upon to study the financial documents of the day to determine their accuracy and the value of their projections.

Up until the 1990s, the work of calculating business value was strongly done by accountants and actuaries, but the development of the internet and the Information Age further narrowed this specialty until business appraisers were able to strike out under their own banner.

For any investor every company has its intrinsic value based on the fundamentals of its business. The evolution of global economies & accounting standards has changed perspectives on how to differentiate between what is cheap & what is expensive. With this changing environment, we

need to adapt as the valuation metrics used before are no longer relevant for the current environment.

3 Valuation Category

3.1 Cost Approach

The cost approach is based on the economic belief that informed buyers will not pay any more for a product than they would for the cost of producing a similar product that has the same level of utility. The cost approach to valuation is easy to use when the property is new and represents the highest and best use of the property. There should be a negligible amount of accumulated depreciation. Since the cost approach does not rely on comparables, it is also useful when valuing a special use property or a property with unique components.

$$\text{Property Value} = \text{Land Value} + (\text{Cost New} - \text{Accumulated Depreciation})$$

Cost new can be defined in two different ways. Replacement cost new is the current cost to construct a building with the same utility using the current construction materials while adhering to current standards, designs, and layouts. Reproduction cost new is the current cost to construct an exact duplicate of the property with the same materials and construction practices according to the design, layout, and standards in place at the time the property was initially constructed. (3)

3.2 Market Approach (relative value)

3.2.1 Company Comparables

Equity Value is the value only to the shareholders, however, Enterprise value is the value of the firm that accrues to both the shareholders and the debt holders (combined).

3.2.3 Enterprise Value (EV) multiples

Enterprise value multiple is the comparison of enterprise value and earnings before interest, taxes, depreciation and amortization. Enterprise value multiple is a better measure than the P/E ratio because it is not affected by the changes in the capital structure.

$$\text{Enterprise value multiple} = \text{Enterprise Value} / \text{EBITDA}$$

3.2.4 Equity Value multiples

Equity Value is the Value of a firm's equity i.e. the market Capitalization of the Firm. It can be calculated by multiplying the market value per share by the total number of shares outstanding. (3)

3.2.6 Amazon Inc case study

This section shows the analysis of the valuation of US NYSE listed Amazon Inc using the company comparables method. I have used multiples like EV/EBITDA & Price to earning ratio to calculate the value of the company. The stock price is evaluated to be \$1206.68 which is lower than the market price of \$ 1920 at the time of valuation. (8)

Multiples										
Company	Ticker	Stock price	Shares Outstanding (in bn)	Market Cap. (in bn)	Enterprise Value	EBITDA	Net Income	EPS	Price to Earnings Ratio	EV to EBITDA
Walmart Inc	WMT	110.62	2.85	315.71	388.79	32.62	8.38	2.94	37.68	11.92
Alibaba	BABA	175.05	2.60	455.66	441.17	NA	9.03	3.47	50.46	N.A.
Target	TGT	86.73	0.52	44.71	58.01	6.81	3.00	5.82	14.90	8.52
eBay	EBAY	39.94	0.87	34.81	40.30	3.06	2.64	3.03	13.19	13.17
Best Buy	BBY	71.82	0.27	19.18	20.89	2.80	1.52	5.69	12.62	7.46
							Min		12.62	7.46
							Median		14.90	10.22
							Max		50.46	13.17
							Mean		25.77	10.27
Target Company	Ticker	Stock Price	Shares Out.	Market Cap.	Enterprise Value	Cash & Equivalents	Total Debt	EPS	EBITDA	Net Income
Amazon	AMZN	1206.68	0.502	605.7539701	964.28	31.75	23.49	23.91	31.44	12.005
Amazon	AMZN	1920	0.50	963.84	964.28	31.44	12.01	23.91	80.29	30.67
									Min	Max
PE Implied Share Price									301.74	1206.68
EV/EBITDA Implied Share Price									483.71	841.28
								Avg	616.2623533	659.4674085

TABLE 1

This shows that the market price of Amazon Inc is overvalued.

3.2.7 Advantage & Disadvantage

It is based on real data as opposed to future assumptions. It is relatively easy to use.

It's easier to understand by investors.

There may not be true comparable companies. This method is less accurate for thinly traded stocks or volatile companies. (4)

3.2.8 Precedent Transaction Analysis

Precedent Transaction Analysis typically uses the same multiples as Comparable Companies' Analysis. In particular, Enterprise Value/Sales, Enterprise Value/EBITDA and Earnings/Earnings Per Share (EPS) are the most commonly used metrics. However, unlike in Comparable Company Analysis, the basis for value comparison is the price paid by the purchaser for a business, rather than the traded market values of the company's securities. These prices can be different because there is a control premium, the value ascribed to being able to control a business rather than simply own a percentage of the equity in it. Thus, Precedent Transaction Analysis will typically result in valuations that are higher than standard Comparable Company Analysis.

3.3 Discounted Cashflow (intrinsic value approach)

The weighted average cost of capital (WACC) is the average after tax cost of a company's capital & a measure of the interest return a company pays out for its financing. Lower WACC means lower cost of capital. The capital structure of a company includes common stocks, preferred stocks, short-term debt and also the long term debt. The capital is used to fund the company & growth initiatives. The WACC shows average interest the company pays for every dollar it finances. Generally, debt offerings have lower-interest return payouts than equity offerings. Companies use the WACC as a minimum rate for consideration when analyzing projects since it is the base rate of return needed for the firm. Analysts use the WACC for discounting future cash flows to arrive at a net present value when calculating a company's valuation. (6)

An internal rate of return can be expressed in a variety of financial scenarios. In practice, an internal rate of return is a valuation metric in which the net present value (NPV) of a stream of cash flows is equal to zero.

Commonly, the IRR is used by companies to analyze and decide on capital projects. For example, a company may evaluate an investment in a new plant versus expanding an existing plant based on the IRR of each project. The higher the IRR the better the expected performance of the project and the more return the project can bring to the company.

The WACC is used in consideration with IRR but is not necessarily an internal performance return metric, that is where the IRR comes in. Companies want the IRR of any internal analysis to be greater than the WACC in order to cover the financing. This section shows the formulae to calculate WACC for the valuation.

$$DCF = \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \dots + \frac{CF_n}{(1+r)^n}$$

$$FV = DCF \cdot (1 + r)^n$$

$$DPV = \frac{FV}{(1 + r)^n}$$

$$WACC = \frac{\text{Market Value of Equity}}{\text{Total Value of Financing}} \text{Cost of Equity} + \frac{\text{Market Value of Debt}}{\text{Total Value of Financing}} \text{Cost of Debt} \cdot (1 - \text{Tax Rate})$$

DPV /DCF= Discounted Present Value

FV = Future Value of Cash flow

R = Internal rate of return = WACC

N = time

The IRR is an investment analysis technique used by companies to determine the return they can expect comprehensively from future cash flows of a project or combination of projects. Overall, IRR gives an evaluator the return they are earning or expect to earn on the projects they are analyzing on an annual basis.

$$NPV = \sum_{t=1}^T \frac{C_t}{(1+r)^t} - C_0 = 0$$

where:

C_t =net cash inflow during the period t

C_0 =total initial investment costs

r =discount rate

t =number of time periods

When looking purely at performance metrics for analysis, a manager will typically use IRR and return on investment (ROI). The IRR provides a rate of return on an annual basis while the ROI gives an evaluator the comprehensive return on a project over the project's entire life.

The next section provides the valuation analysis of Amazon Inc using the DCF explained in the previous sections above. (10)

3.3.1 Valuation of Amazon.Inc (DCF method)

Here the growth period is calculated to next 5 years (2018 – 2022). The growth rate beyond the forecasting high growth period is assumed to be 6%. This value is assumed based on comparable companies which have exited the hyper growth phase & entered early maturity phase. Since a change in the tax rate in recent years from 32-35% to 21%, its assumed to be the latest value for the tax rate in the calculations. The risk free rate is assumed to be 2%. This value is an average of a yearly US treasury bond return over recent few years. Also, the risk premium to be paid by the stakeholder to own Amazon shares is assumed to be 6%.

TABLE 2: AMAZON WACC

Amazon.com Inc (NAS: AMZN)			Input	Calculation			
KEY DRIVERS			2018	2019	2020	2021	2022
Growth Rate			11.347%	11.347%	11.347%	11.347%	11.347%
Growth beyond forecast period		6%					
Tax Rate		21%					
Cost of Debt		6.06%					
Total Debt	23.322						
Interest expenses	1.415						
Income taxes	0						
Cost of Equity=Rf+(Rp*B)		11.52%					
Rf	2%						
Rp	6%						
B	1.73						
MVA							
Price per share	1920						
No. of shares	0.502						
Market Value	963.84						
BVPS	96.43						
Book Value	48.4						
MVA=Market Value - Book Value	915.44						
Total Debt + MVA	938.762						
Wd		2.48%					
We		97.51%					
WACC		11.347%					

The WACC is evaluated to be 11.34%. It is assumed that the company grows close to this rate over the next five years.

FCFF Calculation	2018	2019	2020	2021	2022	
Sales	232.88	275.2642	324.2612	372.9004	428.8354	
EBITA	27.76	43.028	54.64556	65.57467	80.65685	
Less: Depreciation	15.341	18.10238	21.17978	24.35675	28.01027	
EBIT	12.419	24.92562	33.46578	41.21792	52.64658	
Less: Taxes on EBIT	6.64	7.636	9.23956	11.17987	13.52764	
EBIT*(1-t)	5.779	17.28962	24.22622	30.03805	39.11894	
Plus: Depreciation	15.341	18.10238	21.17978	24.35675	28.01027	
Less: Capital Expenditures	13.42	14.30572	15.56462	16.42068	18.22695	
Less: Change in Working Capital	3.65	3.9639	4.304795	4.675008	5.077058	
Free Cash Flow to the Firm	11.35	25.05018	34.14617	42.64913	53.97931	
Present Value of FCF	10.194	20.20731	24.73936	27.75271	31.54796	114.4413

TABLE 3: FCFF

The free cash flow calculation assumes growth rate of 15-18% to Sales over period of 5 years. The summation of present value of FCF is \$114.44 mn. The calculation of terminal value is below.

Terminal Value Calculations	
Growth beyond forecast period	6%
FCFF(n+1)	57.21806
Terminal Value	1071.499
Present Value of Terminal Value	626.2327

TABLE 4: TERMINAL VALUE

The equity value is evaluated to be \$354.80 which is overvalued when compared to market value of \$1920. (8)

Equity Value	
PV of FCF	114.44
PV of Terminal Value	626.23
Total Entity Value	740.67
Less Debt (2018)	33.88
Net Asset (Equity) Value	706.79
Number of shares	0.502
Value per share	354.8086
Share price	1920

TABLE 5: EQUITY VALUE

3.3.2 Advantage & Disadvantage of DCF

DCF Valuation truly captures the underlying fundamental drivers of a business (cost of equity, weighted average cost of capital, growth rate, re-investment rate, etc.). Consequently, this comes closest to estimating intrinsic value of the asset/business.

Unlike other valuations, DCF relies on Free Cash Flows. Irrespective of whether a cash outlay is categorized as an operating expense in P&L, or capitalized into an asset on balance sheet, FCF is a true measure of the money left over for investors. (5)

4. Technology Vs. Business Valuation

Although the components of high-tech valuation are the same, their order and emphasis differ from the traditional process for established companies. The companies past performance is not so important rather examining the expected long-term development of the company' market & then working backwards. Focusing on the potential size of the market. The company's market share & the level of return on capital the company might be able to earn are considered. Since long-term projections are highly uncertain, valuing the company under different probability-weighted scenarios. These techniques can help bound and quantify uncertainty, but they will not make it disappear. This is how valuation of tech companies are different to other business valuation.

5. Startup Tech Valuation

Valuating start-ups, especially at early stages, is a challenge given the lack of historical data and many uncertain factors about the future. This article presents a methodology for the valuation of early stage start-ups that we have proven in practice. The risk linked to a start-up is expressed through an individual beta coefficient as important component of the discounting factor within a discounted cash flow (DCF) valuation based on the data in a business plan. Core of this methodology is the development of an evaluation framework for the individual adjustment of the beta coefficient that is applicable to early stage start-ups. This was shown by applying the methodology to 16 early stage start-ups in the fields of biotechnology, nanotechnology, medical technology and clean technology, which provided an easy-to-handle and comprehensible comparison of different investment options for early stage investors.

5.1 Berkus Method

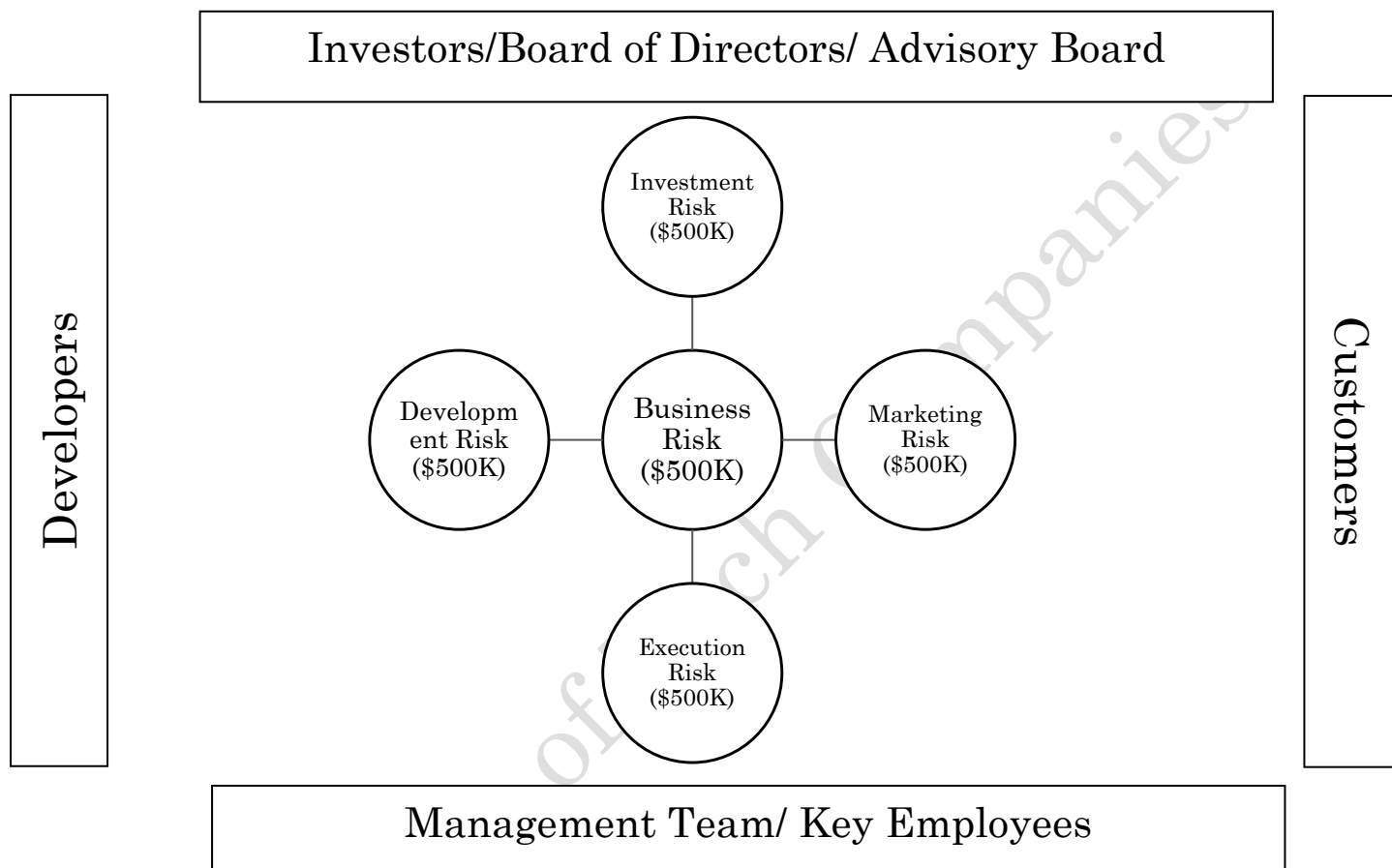


FIGURE 2: BERKUS METHOD

The Berkus Method is a simple and convenient rule of thumb to estimate the value of your company. It was designed by Dave Berkus, a renowned author and business angel investor. It is assumed the company can reach \$20M in revenue by the fifth year of business. The company can be assessed against 5 key criteria for building the company.

An example of Berkus Method is as follows. If a company expected (15)

5.2 VC Method

Even though having a great start-up is a good start, raising capital from a Venture Capitalist (VC) is a herculean task. VC require great valuations & attention to details.

So to create a great valuation, we have to think as a VC. The VC method is one of the methods the VC uses to value a firm. The magic of the VC method is that it works backwards. For example if a business plan shows a turnover of \$80 million after 3 years, the VC thinks that at

this time, he can sell the start-up for 10 times that amount to competitors like Google or Facebook etc. So the VC values the start-up at \$800 million in year 3. But the VC is ambitious & intends to double investment in each year. That means a 100% investment each year. So if the start-up is valued at \$800 million in year 3, discounting it at 100% each year, in the 2nd year the value will be \$400 million & \$200 million in year 1 & \$100 million today when the VC makes the investment. So if the start-up is asking for a \$25 million in funding from the VC, the funding will be out of the \$100 million value of today. That gives the VC 25% of the firm. So if the firm were to be sold to the competitor like Google or Facebook, the value they would pay in 3 years time is the exit value. The 10 factor which multiply with the turnover value to obtain the exit value is called the exit multiple. The 100% return rate expected by the VC is called the Internal Rate of Return (IRR). The IRR is not always 100%. It depends on many factors like maturity of the company, quality of the management, the competition etc. The valuation of today (like \$100 million in the example given) is called the post money valuation. So the investment amount is deducted from this amount is called the pre-money valuation. In the example, if the VC makes an investment of \$25 million, then the pre-money valuation is \$75 million. (17)

5.3 Risk Factor Summation Method

The Risk Factor Summation Method or RFS Method is a slightly more evolved version of the Berkus Method. Firstly, the initial value of the start-up is evaluated. Then the initial value is adjusted for 12 risk factors inherent to building of the firm.

Initial value is determined as the average value for a firm in the same sector, and risk factors are modelled as multiples of \$250k, ranging from \$500k for a very low risk, to -\$500k for a very high risk. The most difficult part here, and in most valuation methods, is actually finding data about similar firms. (16)

The Risk Factor Summation Method is meant for pre-revenue start-ups. An example of the RFS method is as follows:

The Risk Factor Summation Method				
Initial Value				\$1500000
Serial no.	Factors	Intensity	Amount	
1	Management Risk	Very low	+\$500000	\$2000000
2	Stage of Business	Normal		
3	Legislation/Political Risk	Normal		
4	Manufacturing Risk	Normal		
5	Sales Risk	Normal		
6	Funding & capital Raising Risk	Normal		
7	Competition Risk	Very high	-\$500000	\$1500000
8	Technology Risk	Low	+\$250000	\$1750000
9	Litigation Risk	Very low	+\$500000	\$2250000
10	International Risk	Normal		
11	Reputation Risk	Very low	+\$500000	\$2750000
12	Potential Lucrative Exit	Normal		
Firm Valuation				\$2750000

TABLE 6: RFS METHOD

5.4 Scorecard Valuation method

The Scorecard Valuation Method is a more elaborate approach to the firm valuation problem. It starts the same way as the RFS method i.e. determination of a base valuation for the firm, then you adjust the value for a certain set of criteria. Nothing new, except that those criteria are themselves weighed up based on their impact on the overall success of the project.

This method can also be found under the name of Bill Payne Method, considering 6 criteria: Management (30%), Size of opportunity (25%), Product or Service (10%), Sales channels (10%), Stage of business (10%) and Other factors (15%). (14)

The Scorecard Valuation Method is meant for pre-revenue start-ups. An example of this method is as follows:

Scorecard Valuation Method			
Serial no.	Item	Weight	Vs. Average Project
1	Team Capacity	40%	125%
2	Product/Technology Readiness	30%	100%
3	Market Size	20%	15%
4	Competition	10%	75%
Initial Value		\$1500000	
Multiplier		117.50%	
Firm Valuation		\$1760250	

TABLE 7: SCORECARD METHOD

5.5 Comaprable Transaction method

Depending on the type of firm being built, an indicator has to be ascertained which will be a good proxy for the value of your firm. This indicator can be specific to the industry the firm belongs like Monthly Recurring Revenue (Software as a Service), HR headcount (Interim), Number of outlets (Retail), Patent filed (MedTech/Biotech), Weekly Active Users or WAU (Messengers). Most of the time, item lines from the P&L : sales, gross margin, EBITDA, etc can be used for valuation. The Comparables Transactions Method is meant for pre- and post-revenue start-ups. (18)

5.6 Book Value Method

The book value refers to the net worth of the company i.e. the tangible assets of the firm i.e. PPE, Inventory etc.

The Book Value Method is particularly irrelevant for startups as it is focused on the “tangible” value of the company, while most startups focus on intangible assets : RD (for a biotech), user base and software development (for a Web startup), etc. (19)

5.7 Liquidation Value method

Things that counts for a liquidation value estimation are all the tangible assets: Real Estate, Equipment, Inventory. Everything you can find a buyer for in a short span of time. The mindset is how much can I make if the company is being sold in 2 months. All the intangibles on the other hand are considered worthless in a liquidation process (the underlying assumption is that if it was worth something, it would have already been sold at the time you enter in liquidation): patents, copyright, and any other intellectual property.

Practically, the liquidation value is the sum of the scrap value of all the tangible assets of the company.

For an investor, the liquidation value is useful as a parameter to evaluate the risk of the investment: a higher potential liquidation value means a lower risk. For example, all other things equal, it is preferable to invest in a company that owns its equipment compared to one that leases it. If everything goes wrong and you go out of business, at least you can get some money selling the equipment, whereas nothing if you lease it.

So, there is a difference between the book value & the liquidation value. If a start-up really had to sell its assets in the case of a bankruptcy, the value it would get from the sale would likely be below its book value, due to the adverse conditions of the sales.

So, liquidation value < book value. Although they both account for tangible assets, the context in which those assets are valued differs. As Ben Graham points out, the liquidation value measures what the stockholders could get out of the business, while the book value measures what they have put into the business.

5.8 DCF

If the firm works well, it brings in a certain amount of cash every year. Consequently, the current value of the firm is the sum of all the future cash flows over the next years. And that is exactly the reasoning behind the DCF method.

For example, if we are projecting cash flows over n years. After the forecast the final value is addressed by the Terminal Value (TV)

Option 1: It is considered the business will keep growing at a steady pace and keep generating indefinite cash flows after the n years period. Then the formula for Terminal Value can be applied: $TV = CF \cdot (n+1) / (r - g)$ with “ r ” being the discount rate and “ g ” being the expected growth rate.

Option 2: It is considered an exit after the n year period. First, estimating the future value of the acquisition, for example with the comparable method transaction in the other method mention above. Then, this future value is discounted to get its net present value. $TV = \text{exit value} / (1+r)^n$

Although technically, this method is used it for post-revenue start-ups, it is just not meant for start-up valuation. (20)

6. Unicorns

A unicorn is a term used in the venture capital industry to describe a start-up company with a value of over \$1 billion. Some of the more popular unicorns based in the U.S. include home

sharing giant Airbnb, video game company Epic Games, as well as fintech companies Robinhood and Sofi.

The value of unicorns is generally based on how investors and venture capitalists feel they will grow and develop, so it all comes down to longer term forecasting. This means their valuations have nothing to do with the way they perform financially. In fact, many of these companies rarely generate any profits when they first get running.

Investors and capitalists may come across some hurdles, though. If there are no other competitors in the industry—making the start-up a first of its kind—there may be no other business model with which to compare, making it a somewhat complicated process. (21)

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