Valuing Young and Growth Companies: Estimation Issues and Valuation Challenges

Young companies are difficult to value for a number of reasons. Some are start-up and idea businesses, with little or no revenues and operating losses. Even those young companies that are profitable have short histories and most young firms are dependent upon private capital, initially owner savings and venture capital and private equity later on. As a result, many of the standard techniques we use to estimate cash flows, growth rates and discount rates either do not work or yield unrealistic numbers. In addition, the fact that most young companies do not survive has to be considered somewhere in the valuation. In this paper, we examine how best to value young companies. We use a combination of data on more mature companies in the business and the company's own characteristics to forecast revenues, earnings and cash flows. We also establish processes for estimating discount rates for private capital and for adjusting the value today for the possibility of failure. In the process, we argue that the venture capital approach to valuation that is widely used now is flawed and should be replaced.

Valuing companies early in the life cycle is difficult, partly because of the absence of operating history and partly because most young firms do not make it through these early stages to success. In this paper, we will look at the challenges we face when valuing young companies and the short cuts employed by many who have to estimate the value of these businesses to arrive at value. While some of the rules for valuing young businesses make intuitive sense, there are other rules that inevitably lead to erroneous and biased estimates of value.

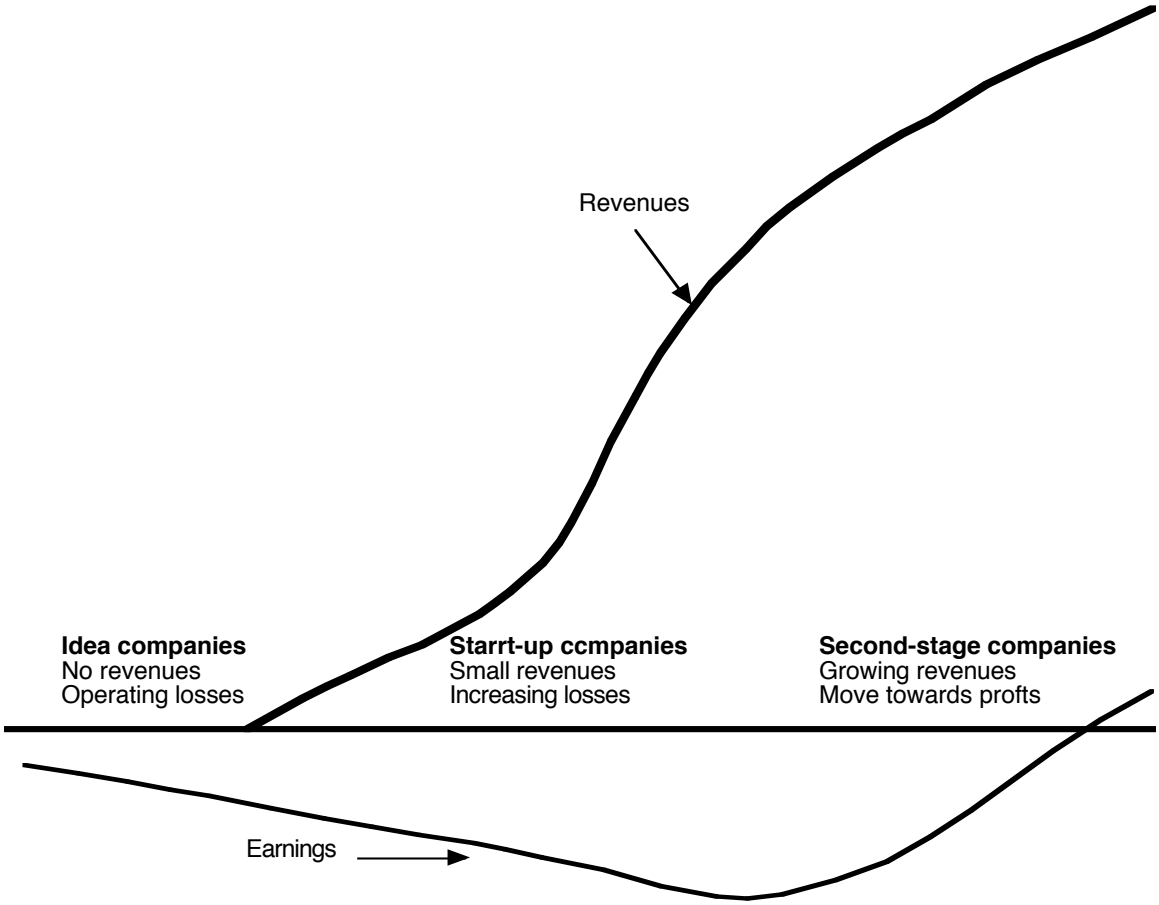
Young companies in the economy

It may be a cliché that the entrepreneurs provide the energy for economic growth, but it is also true that vibrant economies have a large number of young, idea businesses, striving to get a foothold in markets. In this section, we will begin by taking a look at where young companies fall in the business life cycle and the role they play in the overall economy. We will follow up by looking at some characteristics that young companies tend to share.

A Life cycle view of young companies

If every business starts with an idea, young companies can range the spectrum. Some are unformed, at least in a commercial sense, where the owner of the business has an idea that he or she thinks can fill an unfilled need among consumers. Others have inched a little further up the scale and have converted the idea into a commercial product, albeit with little to show in terms of revenues or earnings. Still others have moved even further down the road to commercial success, and have a market for their product or service, with revenues and the potential, at least, for some profits.

Figure 9.1: The Early Stages of the Life Cycle



Since young companies tend to be small, they represent only a small part of the overall economy. However, they tend to have a disproportionately large impact on the economy for several reasons.

1. Employment: While there are few studies that focus just on start-ups, there is evidence that small businesses account for a disproportionate share of new jobs created in the economy. The National Federation of Independent Businesses estimates that about two-thirds of the new jobs created in the recent years have been created by small businesses, and that start-ups account for a large share of these new jobs.[1]
2. Innovation: In the early 1990s, Clayton Christensen, a strategy guru from the Harvard Business School, argued that radical innovation, i.e., innovation that disrupted traditional economic mechanisms, was unlikely to come from established firms, since

[1] NFIB Small Business Policy Guide, Small Business Contributions in Small Business Policy Guide.

they have too much to lose from the innovation, but more likely to come from start-up companies that have little to lose. Thus, online retailing was pioneered by a young upstart, Amazon.com, rather than by traditional retailers.

3. Economic growth: The economies that have grown the fastest in the last few decades have been those that have a high rate of new business formation. Thus, the US was able to generate much more rapid economic growth than Western Europe during the 1990s, primarily as a consequence of the growth of small, new technology companies. Similarly, much of the growth in India has come from smaller, technology companies than it has from established companies.

Characteristics of young companies

As we noted in the last section, young companies are diverse, but they share some common characteristics. In this section, we will consider these shared attributes, with an eye on the valuation problems/issues that they create.

1. No history: At the risk of stating the obvious, young companies have very limited histories. Many of them have only one or two years of data available on operations and financing and some have financials for only a portion of a year, for instance.
2. Small or no revenues, operating losses: The limited history that is available for young companies is rendered even less useful by the fact that there is little operating detail in them. Revenues are small or non-existent for idea companies and the expenses often are associated with getting the business established, rather than generating revenues. In combination, they result in significant operating losses.
3. Dependent on private equity: While there are a few exceptions, young businesses are dependent upon equity from private sources, rather than public markets. At the earlier stages, the equity is provided almost entirely by the founder (and friends and family). As the promise of future success increases, and with it the need for more capital, venture capitalists become a source of equity capital, in return for a share of the ownership in the firm.
4. Many don't survive: Most young companies don't survive the test of commercial success and fail. There are several studies that back up this statement, though they vary in the failure rates that they find. A study of 5196 start-ups in Australia found

that the annual failure rate was in excess of 9% and that 64% of the businesses failed in a 10-year period.[2] Knaup and Piazza (2005,2008) used data from the Bureau of Labor Statistics Quarterly Census of Employment and Wages (QCEW) to compute survival statistics across firms.[3] This census contains information on more than 8.9 million U.S. businesses in both the public and private sector. Using a seven-year database from 1998 to 2005, the authors concluded that only 44% of all businesses that were founded in 1998 survived at least 4 years and only 31% made it through all seven years. In addition, they categorized firms into ten sectors and estimated survival rates for each one. Table 9.1 presents their findings on the proportion of firms that made it through each year for each sector and for the entire sample:

Table 9.1: Survival of new establishments founded in 1998

	Proportion of firms that were started in 1998 that survived through						
	Year 1	*Year 2*	*Year 3*	*Year 4*	*Year 5*	*Year 6*	*Year 7*
Natural resources	82.33%	69.54%	59.41%	49.56%	43.43%	39.96%	36.68%
Construction	80.69%	65.73%	53.56%	42.59%	36.96%	33.36%	29.96%
Manufacturing	84.19%	68.67%	56.98%	47.41%	40.88%	37.03%	33.91%
Transportation	82.58%	66.82%	54.70%	44.68%	38.21%	34.12%	31.02%
Information	80.75%	62.85%	49.49%	37.70%	31.24%	28.29%	24.78%
Financial activities	84.09%	69.57%	58.56%	49.24%	43.93%	40.34%	36.90%
Business services	82.32%	66.82%	55.13%	44.28%	38.11%	34.46%	31.08%
Health services	85.59%	72.83%	63.73%	55.37%	50.09%	46.47%	43.71%
Leisure	81.15%	64.99%	53.61%	43.76%	38.11%	34.54%	31.40%
Other services	80.72%	64.81%	53.32%	43.88%	37.05%	32.33%	28.77%
All firms	81.24%	65.77%	54.29%	44.36%	38.29%	34.44%	31.18%

Note that survival rates vary across sectors, with only 25% of firms in the information sector (which includes technology) surviving 7 years, whereas almost 44% of health service businesses make it through that period.

5. Multiple claims on equity: The repeated forays made by young companies to raise equity does expose equity investors, who invested earlier in the process, to the possibility that their value can be reduced by deals offered to subsequent equity investors. To protect their interests, equity investors in young companies often

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[2] John Watson and Jim Everett, 1996, "Do Small Businesses Have High Failure Rates?" *Journal of Small Business Management, v*34, pg 45-63.

[3] Knaup, Amy E., May 2005,, "Survival and longevity in the Business Employment Dynamics data," *Monthly Labor Review*, pp. 50–56; Knaup, Amy E. and MC. Piazza, September 2007, Business Employment Dynamics Data: Survival and Longevity, Monthly Labor Review, pp 3-10.

demand and get protection against this eventuality in the form of first claims on cash flows from operations and in liquidation and with control or veto rights, allowing them to have a say in the firm's actions. As a result, different equity claims in a young company can vary on many dimensions that can affect their value.

6. Investments are illiquid: Since equity investments in young firms tend to be privately held and in non-standardized units, they are also much more illiquid than investments in their publicly traded counterparts.

Valuation Issues

The fact that young companies have limited histories, are dependent upon equity from private sources and are particularly susceptible to failure all contribute to making them more difficult to value. In this section, we will begin by considering the estimation issues that we run into in discounted cash flow valuations and we will follow up by evaluating why these same issues crop up when we do relative valuation.

Intrinsic (DCF) Valuation

There are four pieces that make up the intrinsic valuation puzzle – the cash flows form existing assets, the expected growth from both new investments and improved efficiency on existing assets, the discount rates that emerge from our assessments of risk in both the business and its equity, and the assessment of when the firm will become a stable growth firm (allowing us to estimate terminal value). On each of these measures, young firms pose estimation challenges that can be traced back to their common characteristics.

Existing Assets

The standard approach to valuing existing assets is to use the current financial statements of the firm and its history to estimate the cash flows from these assets and to attach a value to them. With some young firms, existing assets represent such a small proportion of the overall value of the firm that it makes little sense to expend resources estimating their value. With other young firm, where existing assets may have some value, the problem is that the financial statements made available by the firm provide little relevant information is assessing that value, for the following reasons:

- The absence of historical data makes it difficult to assess how well the revenues from existing assets will hold up if macro economic conditions become less favorable. In other words, if all you have is one year of financial data, it is more difficult to make a judgment on whether the revenues represent a flash in the pan or are sustainable. The lack of data from prior years also makes it more difficult to analyze how revenues would change, if the company changes its pricing policy of faces new competition.
- The expenses that young companies incur to generate future growth are often mixed in with the expenses associated with generating current revenues. For instance, it is not unusual to see the Selling, General and Administrative (S,G&A) expenses at some young companies be three or four times larger than revenues, largely because they include the expenses associated with lining up future customers. To value existing assets, we have to be able to separate these expenses from genuine operating expenses and that is not easy to do.

Growth Assets

The bulk of a young company's value comes from growth assets. Consequently, the difficulties that we have in assessing the value of growth assets are at the heart of whether we can value these companies in the first place. There are several problems that we run into, when valuing young companies:

- The absence of revenues in some cases, and the lack of history on revenues in others, means that we cannot use past revenue growth as an input into the estimation of future revenues. As a result, we are often dependent upon the firm's own estimates of future revenues, with all the biases associated with these numbers.
- Even if we were able to estimate revenues in future years, we have to also estimate how earnings will evolve in future years, as revenues change. Here again, the fact that young companies tend to report losses and have no history on operating income makes it more difficult to assess what future profit margins will be.
- It is not revenue or even earnings growth per se that determines value, but the quality of that growth. To assess the quality of growth, we looked at how much the firm reinvested to generate its expected growth, noting that value creating growth arises

only when a firm generates a return on capital greater than its cost of capital on its growth investments. This intuitive concept is put to the test with young companies, because there is little to base the expected return on capital on new investments. Past data provides little guidance, because the company has made so few investments in the past and these investments have been in existence for short periods. The current return on capital, which is often used as a starting point for estimating future returns, is generally a negative number for young companies.

In summary, we have a tough time estimating future growth in revenues and operating margins for young companies, and the estimation problems are accentuated by the difficulties we face in coming up with reinvestment assumptions that are consistent with our growth estimates.

Discount Rates

The standard approaches for assessing the risk in a company and coming up with discount rates are dependent upon the availability of market prices for the securities issued by the firm. Thus, we estimate the beta for equity by regressing returns on a stock against returns on a market index, and the cost of debt by looking at the current market prices of publicly traded bonds. In addition, the traditional risk and return models that we use to estimate the cost of equity focus only on market risk, i.e., the risk that cannot be diversified away, based on the implicit assumption that the marginal investors in a company are diversified.

With young companies, these assumptions are open to challenge. First, most young companies are not publicly traded and have no publicly traded bonds outstanding. Consequently, there is no way in which we can run a regression of past returns, to get an equity beta, or use a market interest rate on debt. To add to the problem, the equity in a young company is often held by investors who are either completely invested in the company (founders) or only partially diversified (venture capitalists). As a result, these investors are unlikely to accept the notion that the only risk that matters is the risk that cannot be diversified away and instead will demand compensation for at least some of the firm specific risk.

Finally, we noted that equity in young companies can come from multiple sources at different times and with very different terms attached to it. It is conceivable that the differences across equity claims can lead to different costs of equity for each one. Thus, the cost of equity for an equity claim that a has first claim on the cash flows may be lower than the cost of equity for an equity claim that has a residual cash flow claim.

Terminal Value

If the terminal value accounts for a large proportion of the overall value of a typical firm, it is an even bigger component of the value of a young company. In fact, it is not unusual for the terminal value to account for 90%, 100% or even more than 100% of the current value of a young company. Consequently, assumptions about when a firm will reach stable growth, a pre-requisite for estimating terminal value, and its characteristics in stable growth can have a substantial impact on the value that we attach to a young company. Our task, though, is complicated by our inability to answer three questions:

a. Will the firm make it to stable growth? In an earlier section, we noted the high failure rate among young firms. In effect, these firms will never make it to stable growth and the terminal value will not provide the large windfall to value that is does for a going concern. Estimating the probability of survival for a firm, early in the life cycle, is therefore a critical component of value, but not necessarily an easy input to estimate.
b. When will the firm become a stable growth firm? Even if we assume that a firm will make it to stable growth in the future, estimating when that will occur is a difficult exercise. After all, some firms reach steady state in a couple of years, whereas others have a much longer stretch of high growth, before settling into mature growth. The judgment of when a firm will become stable is complicated by the fact that the actions of competitors can play an important role in how growth evolves over time.
c. What will the firm look like in stable growth? It is not just the growth rate in the stable growth rate that determines the magnitude of terminal value but the concurrent assumptions we make about risk and excess returns during the stable phase. In effect, assuming that a firm will continue to generate excess returns

forever will lead to a higher terminal value than assuming that excess returns will converge on zero or be negative. While this is a judgment that we have to make for any firm, the absence of any historical data on excess returns at young firms does complicate estimation.

Value of Equity Claims

Once the cash flows have been estimated, a discount rate computed and the present value computed, we have estimated the value of the aggregate equity in the firm. If all equity claims in the firm are equivalent, as is the case with a publicly traded firm with one class of shares, we divide the value of equity proportionately among the claims to get the value per claim. With young firms, there are potential problems that we face in making this allocation judgment, arising from how equity is generally raised at these firms. First, the fact that equity is raised sequentially from private investors, as opposed to issuing shares in a public market, can result in non-standardized equity claims. In other words, the agreements with equity investors at a new round of financing can be very different from prior equity agreements. Second, there can be large differences across equity claims on cash flows and control rights, with some claimholders getting preferential rights over others. Finally, equity investors in each round of financing often demand and receive rights protecting their interests in subsequent financing and investment decisions taken by the firm. The net effect of these diverse equity claims is that allocating the value of equity across different claims requires us to value both the preferential cash flow and control claims and the protective rights built into some equity claims and not into others.

As a final point, the lack of liquidity in equity investments in private business have an effect on how much value we attach to them. In general, we should expect more illiquid investments to have less value than more liquid investments, but measuring and pricing the illiquidity in the equity of private businesses is far more difficult to do than in their publicly traded counterparts.

Relative Valuation

The difficulties that we have outlined in valuing young companies in a discounted cash flow model lead some analysts to consider using relative valuation approaches to

value these companies. In effect, they try to value young companies using multiples and comparables. However, this task is also made more difficult by the following factors:

1. What do you scale value to? All valuation multiples have to be scaled to some common measure, and conventional scaling measures include earnings, book value and revenues. With young companies, each of these measures can pose problems. Since most of them report losses early in the life cycle, multiples such as price earnings ratios and EBITDA multiples cannot be computed. Since the firm has been in operation only a short period, the book value is likely to be a very small number and not reflect the true capital invested in the company. Even revenues can be problematic, since they can be non-existent for idea companies and miniscule for companies that have just transitioned into commercial production.
2. What are your comparable companies? When relative valuation is used to value a publicly traded company, the comparable firms are usually publicly traded counterparts in the same sector. With young companies, the comparison would logically be to other young companies in the same business but these companies are usually not publicly traded and have no market prices (or multiples that can be computed). We could look at the multiples at which publicly traded firms in the same sector trade at, but these firms are likely to have very different risk, cash flow and growth characteristics than the young firm being valued.
3. What is the best proxy for risk? Many of the proxies used for risk, in relative valuation, are market based. Thus, beta or standard deviation of equity returns are often used as measures of equity risk, but these measures cannot be computed for young companies that are privately held. In some cases, the standard deviation in accounting numbers (earnings and revenues) is used as a measure of risk, but this too cannot be computed for a firm that has been in existence for a short period.
4. How do you control for survival? In the context of discounted cash flow valuation, we looked at the problems created by the high failure rate of young companies. This is also an issue with using relative valuation. Intuitively, we would expect the relative value of a young company (the multiple of revenues or earnings that we assign it) to increase with its likelihood of survival. However, putting this intuitive principle into practice is not easy to do.

5. How do you adjust for differences in equity claims and illiquidity? With intrinsic valuation, we noted the effect that differences in cash flows and control claims can have on the value of equity claims and the need to adjust this value for illiquidity. When doing relative valuation, we will have to confront the same issues.

In conclusion, the use of relative valuation may seem like an easy solution, when faced with the estimation challenges posed in intrinsic valuation, but all of the problems that we face in the latter remain problems when we do the former.

The Dark Side of Valuation

With the estimation challenges that analysts face in valuing young companies, it should come as no surprise that they look for solutions that seem to, at least on the surface, offer them a way out. Many of these solutions, though, are the source of the valuation errors we see in young company valuations. In this section, we will look at the most common manifestations of what we view as the dark side in young company valuations, and how they play out in "venture capital" valuations.

a. Top line and bottom line, no detail: It is difficult to estimate the details on cash flow and reinvestment for young companies. Consequently, many valuations of young companies focus on the top line (revenues) and the bottom line (earnings, and usually equity earnings), with little or no attention paid to either the intermediate items (that separate earnings from revenues) or the reinvestment requirements (that separate earnings from cash flows)

b. Focus on the short term, rather than the long term: The uncertainty we feel about the estimates that we make for young companies become greater as we go further out in time. Many analysts use this as a rationale for cutting short the estimation period, using only three to five years of forecasts in the valuation. "It is too difficult to forecast out beyond that point in time" is the justification that they offer for this short time horizon.

c. Mixing relative with intrinsic valuation: To deal with the inability to estimate cash flows beyond short time periods, analysts who value young companies use relative valuation as a crutch. Thus, the value at then end of the forecast period (three to five years) is often estimated by applying an exit multiple to the expected revenues or

earnings in that year and the value of that multiple is itself estimated by looking at what publicly traded companies in the business trade at right now.

d. Discount rate as the vehicle for all uncertainty: The risks associated with investing in a young company include not only the traditional factors – earnings volatility and sensitivity to macroeconomic conditions, for example – but also the likelihood that the firm will not survive to make a run at commercial success. When valuing private businesses, analysts often hike up discount rates to reflect all of the concerns that they have about the firm, including the likelihood that the firm will not make it.

e. Ad hoc and arbitrary adjustments for differences in equity claims: As we noted in the last section, equity claims in young businesses can have different rights when it comes to cash flow and control and have varying degrees of illiquidity. When asked to make judgments on the value of prior claims on cash flows, superior control rights or lack of liquidity, many analysts use rules of thumb that are either arbitrary or based upon dubious statistical samples.

All five of these practices come into play in the most common approach used to value young firms, which is the venture capital approach. This approach has four steps to it:

Step 1: We begin by estimating the expected earnings or revenues in a future year, but not too far into the future: two to five years is the typical range. In most cases, the forecast period is set to match the point in time at which the venture capitalist plans to sell the business or take it public.

Step 2: The value at the end of the forecast period is assessed by multiplying the expected earnings in the future year by the multiple of earnings (PE ratio) that publicly traded firms in the sector trade at. In some cases, the multiple is based on other companies in the sector that have been sold or gone public recently.

Equity Value at end of forecast horizon = Expected Earnings $_{\text{year n}}$ * Forecasted PE

Alternatively, the revenues at the end of the forecast period can be multiplied by the revenue multiple at which publicly traded firms trade at to arrive at an estimate of the value of the entire business (as opposed to just equity).

Enterprise value end of forecast period = Expected Revenues$_{\text{year n}}$* Forecasted EV/Sales

This approach is used for companies that may not become profitable until later in the life cycle.

Step 3: The estimated value at the end of the forecast period is discounted back at a target rate of return, generally set high enough to capture both the perceived risk in the business and the likelihood that the firm will not survive. Since the latter is a high, venture capital required rates of return tend to be much higher than the discount rates that we see used with publicly traded companies.

$$\text{Equity Value today} = \frac{\text{Equity Value at end of forecast horizon(n)}}{(1 + \text{ Target rate of return})^n}$$

Table 9.2 summarizes the target rates of return demanded by venture capitalists, categorized by how far along a firm is in the life cycle:

Table 9.2: Venture Capital Target Rates of Return – Stage in Life Cycle

Stage of development	*Typical target rates of return*
Start up	50-70%
First stage	40-60%
Second stage	35-50%
Bridge / IPO	25-35%

How do we know that these rates of return have survival risks built into them? In addition to the intuitive rationale that they decrease as firms move through the life cycle and the chance of failure drops off, the actual returns earned by venture capitalists at every stage of the process are much more modest. Table 9.3 summarizes the actual returns earned by venture capitalists in the aggregate for investments across the life cycle.

Table 9.3: Returns earned by Venture Capitalists – 2007

	3 year	*5 year*	*10 year*	*20 year*
Early/Seed VC	4.90%	5.00%	32.90%	21.40%
Balanced VC	10.80%	11.90%	14.40%	14.70%
Later Stage VC	12.40%	11.10%	8.50%	14.50%
All VC	8.50%	8.80%	16.60%	16.90%
NASDAQ	3.60%	7.00%	1.90%	9.20%
S&P	2.40%	5.50%	1.20%	8.00%

Note that the returns earned by venture capitalists, especially on early stage investments, are significantly higher than the returns earned by investors in equity in public markets over the same period, but are no where near the target returns listed in table 9.2. For instance, early stage VC investors earned an annual return of 21.4% over the last 20 years, well below the 50-70% target returns. In effect, the high target rates of return that are used in analysis are not delivered by most investments (usually the ones that fail to make it to the exit valuation).

Step 4: Venture capitalists receive a proportion of the business in return for the capital they bring to the firm. To make a judgment on what proportion of the firm they are entitled to, the new capital brought in is added to the estimated value from step 3 (called the pre-money value) to arrive at the post money valuation of the firm.

Post money valuation = Pre Money valuation from step 3 + New capital infusion

The proportion of equity that the venture capitalist is entitled to is then computed by dividing the capital infusion by the post-money valuation.

$$\text{Proportion of equity to new capital provider} = \frac{\text{New Capital Provided}}{\text{Post Money Valuation}}$$

As we see it, there are several problems with the venture capital approach and many of them are rooted in the practices we listed before:

1. By focusing on revenues and earnings, and ignoring both the intermediate items and those that come after, venture capital valuations encourage game playing. Since value increases as the projected earnings (revenues) increase, the existing owners of the business try to push up these values, without having to flesh out the consequences in terms of future capital investment. On the other side of the bargaining table, venture capitalists will argue for using lower numbers for earnings and revenues, since this pushes down the estimated value (and gives them a greater share of equity for the same capital investment). Consequently, the projected value becomes a bargaining point between the two sides rather than the subject of serious estimation.
2. Venture capital valuations try to avoid the serious challenges of estimating operating details for the long term by cutting off the estimates prematurely (with a short forecast period) and using a multiple that is usually based on what

comparable companies are trading at currently. However, the multiple of earnings or revenues that a business will trade at 3 years from now will be a function of the cash flows after that point. Not estimating those cash flows or dealing with the uncertainty in the cash flows does not mean that the uncertainty has gone away.

3. There is a degree of sloppiness associated with the use of a target rate to discount the future value of the firm. This target rate is the rate demanded by venture capitalists, who are equity investors in the firm, and this rate incorporates the likelihood that the business will fail. There are two problems with using this number as the discount rate on the future value of the business. The first is that the future value discounted has to be an equity value; this is of course the case when we use expected equity earnings and a PE ratio, but will not be so if we use revenues and enterprise value multiples. In the latter case, we should be considering the cost of capital as the discount rate and not the rate demanded by just equity investors. The second is that building in a probability that the business will not survive into the discount rate also implies that this rate will not change over time, as a firm moves through the life cycle.
4. While the rationale for adding the new capital infusion to the pre-money value is simple, it works only if the new capital raised stays in the firm to be used to fund future investments. If some or all of the new capital is used by existing equity investors to cash out of their ownership in the firm, the portion that is removed from the firm should not be added back to get to the post-money value.

Illustration 9.1: Valuing Secure Mail – Venture Capital Approach

Secure Mail is a small software company that has developed a new computer virus screening program that it believes will be more effective than existing anti-virus programs. The company is fully owned by its founder and has no debt outstanding. The firm has been in existence only a year, has offered a beta version of the software for free to online users but has never sold the product (revenues are zero). During its year of existence, the firm incurred $ 15 million in expenses, thus recording an operating loss for the year of the same amount. As a venture capitalist, you have been approached about providing $ 30 million in additional capital to the firm, primarily to cover the commercial

introduction of the software and expanding the market for the next two years. To value the firm, you decide to employ the venture capital approach.

1. The founder believes that the virus program will quickly find a market and that revenues will be $ 300 million by the third year.
2. Looking at publicly traded companies that produce anti-virus software, you come up with two companies that you feel are relevant comparables.

Company	*Market Cap*	*Debt outstanding*	*Cash*	*Enterprise Value*	*Revenues*	*EV/Sales*
Symantec	$9,388	$2,300	$1,890	$9,798	$5,874	1.67
McAfee	$4,167	$0	$394	$3,773	$1,308	2.88

   You decide to use the average across the two companies, which yields an enterprise value of 2.275 times revenues.[4]

   Estimated value in 3 years = $\text{Revenues}_{\text{Year 3}}$ * EV/Sales

   = 300 * 2.275 = $682.89 million

3. Since this business has a product, ready for the market, but has no history of commercial success, you decide to use a target rate of return of 50%. Since the firm has no debt outstanding, the estimated value is entirely equity and the value today can be estimated as follows:

   $$\text{Value today} = \frac{\text{Estimated value in year 3}}{(1+\text{Target return})^3} = \frac{682.89}{1.50^3} = \$202.34 \text{ million}$$

4. To estimate the post-money valuation, you add the cash proceeds that you will be bringing into the firm to the pre-money value of $202.34 million.

   Post money value = Pre-money value + Capital infusion

   = $202.34 million + $ 30 million = $232.34 million

   The proportion of the equity in the firm that you will receive for your capital infusion can then be computed as follows:

   $$\text{Proportional share of equity} = \frac{\text{Capital infusion}}{\text{Post - money value}} = \frac{30}{232.34} = 12.91\%$$

Note that these numbers are subject to negotiation and that this is the minimum share that the venture capitalist would accept. The venture capitalist will push for lower future

[4] As the venture capitalist, you would probably argue for an even lower number (Symantec's multiple). To counter, the founder of Secure Mail will probably argue that his company will be priced more like McAfee.

revenues, a more conservative multiple of those revenues in the final year and a higher target rate of return, all of which lower the value of the firm and will give him a higher share of the equity (for the same capital investment). The existing owner of the firm will push for higher future revenues, a higher multiple of these revenues in the final year and a lower target rate of return, all in the interests of pushing up value, and giving up less equity ownership for the capital invested.

The Light Side of Valuation

While it is understandable that analysts, when confronted with the myriad uncertainties associated with valuing young companies, look for short cuts, there is no reason why young companies cannot be valued systematically. In this section, we will begin by laying out the foundations for estimating the intrinsic value of a young company, move on to consider how best to adapt relative valuation for the special characteristics of young companies and close with a discussion of how real options may be useful, at least for some small businesses.

Discounted Cash Flow Valuation

To applying discounted cash flow models to valuing young companies, we will move systematically through the process of estimation, considering at each stage, how best to deal with the characteristics of young companies.

1. Estimation of future cash flows

In the last section, we noted that many analysts who value young companies forecast just the top and bottom lines (revenues and earnings) for short periods, and offer the defense that it there are far too many uncertainties in the long term to do estimation in detail. We believe that it is important, the uncertainties notwithstanding, to take a look at operating expenses in the aggregate and to go beyond earnings to estimate cash flows. There are two ways in which we can approach the estimation process. In the first, which we term the "top down" approach, we begin with the total market for the product or service that a company sells and work down to the revenues and earnings of the firm. In the "bottom up" approach, we work within the capacity constraints of the firm, estimate

the number of units that will be sold and derive revenues, earnings and cash flows from those units.

Top Down Approach

In the top-down approach, we start by estimating the total market for a product or service and derive the rest of the numbers from that top line. In effect, we estimate the revenues first and then consider how much we need as capacity (and capital to create this capacity) to sustain these revenues. The steps involved in the process are the following:

1. Potential market for the product/service: The first step in deriving the revenues for the firm is estimating the total potential market for its products and services. There are two challenges we face at this juncture.
    a. Defining the product/service offered by the firm: If the product or service offered by the firm is defined narrowly, the potential market will be circumscribed by that definition and will be smaller. If we use a broader definition, the market will expand to fit that definition. For example, defining Amazon.com as a book retailer, which is what it was in 1998, would have yielded a total market of less than $ 10 billion in that year, representing total book retailing sales in 1998. Categorizing Amazon.com as a general retailer would have yielded a much larger potential market. While that might have been difficult to defend in 1998, it did become more plausible as Amazon expanded its offerings in 1999 and 2000.
    b. Estimating the market size: Having defined the market, we face the challenge of estimating the size of that market. For a product or service that is entering an established market, the best sources of data tend to be trade publications and professional forecasting services. Almost every business has a trade group that tracks the operating details of that business; there are almost 7600 trade groups just in the United States, tracking everything from aerospace to telecom.[5] In many businesses, there are firms that specialize in collecting information about the businesses for commercial and consulting purposes. For

[5] Wikipedia has an excellent listing of industry trade groups, with links to each one. (http://en.wikipedia.org/wiki/List_of_industry_trade_groups_in_the_United_States)

instance, the Gartner Group collects and provides data on different types of information technology business, including software.

c. Evolution in total market over time: Since we have to forecast revenues into the future, it would be useful to get a sense of how the total market is expected to change or grow over time. This information is usually also usually available from the same sources that provide the numbers for the current market size.

2. Market Share: Once we have a sense of the overall market size and how it will changeover time, we have to estimate the share of that market that will be captured by the firm being analyzed, both in the long term and in the time periods leading up to steady state. Clearly, these estimates will depend both on the quality of the product or service that is being offered and how well it measures up against the competition. A useful exercise in estimation is to list the largest players in the targeted market currently and to visualize where the firm being valued will end up, once it has an established market. However, there are two other variables that have to be concurrently considered. One is the capacity of the management of the young company to deliver on its promises; many entrepreneurs have brilliant ideas but do not have the management and business skills to take it to commercial fruition. That is part of the reason that venture capitalists look for entrepreneurs who have had a track record of success in the past. The other is the resources that the young company can draw on to get its product/service to the desired market share. Optimistic forecasts for market share have to be coupled with large investments in both capacity and marketing; products usually don't produce and sell themselves.

3. Operating expenses/ margins: Revenues may be the top line but as investors, but a firm can have value only if it ultimately delivers earnings. Consequently, the next step is estimating the operating expenses associated with the estimated revenues. We are stymied in this process, with young companies, both by the absence of history and the fact that these firms usually have very large operating losses at the time of the estimate. Again, we would separate the estimation process into two parts. In the first part, we would focus on estimating the operating margin in steady state, primarily by looking at more established companies in the business. Once we have the target margin, we can then look at how we expect the margin to evolve over time; this “pathway to profitability” can

be rockier for some firms than others, with fixed costs and competition playing significant roles in the estimation. One final issue that has to be confronted at this stage is the level of detail that we want to build into our forecasts. In other words, should we just estimate the operating margin and profit or should we try to forecast individual operating expense items such as labor, materials, selling and advertising expenses? As a general rule, the level of detail should decrease as we become more uncertain about a firm's future. While this may seem counter intuitive, detail in forecasts leads to better estimates of value, if an only if we bring some information into that detail that otherwise would be missed. An analyst who has a tough time forecasting revenues in year 1 really is in no position to estimate labor or advertising costs in year 5 and should not even try. In valuing young companies, less (detail) is often more (precision).

4. Investments for growth: When owners are asked for forecasts of revenues and earnings (step 2 and 3), it is natural that they go for optimistic values: revenues increase at exponential rates and margins quickly move towards target values. In any competitive business, though, neither revenue growth nor margin improvement is delivered for free. Consequently, it is critical that we estimate how much the firm is reinvesting to generate the forecasted growth. With a manufacturing firm, this will take the firm of investments in additional production capacity and with a technology firm, it will include not only investments in R&D and new patents, but also in human capital (hiring software programmers and researchers). There are two reasons to pay attention to this step in the process. The first is that these investments will require cash outflows and thus affect the final bottom line, which is the cash flow that can be delivered to investors. The second, and this is especially so with young firms, this reinvestment will often result in negative cash flows, which will then have to be covered with new capital infusions. Thus, existing equity investors will see their share of the ownership either reduced (when new equity investors come in) or be called upon to make fresh investments to keep the business going.

5. Compute tax effect: With healthy firms, computing the tax effect is usually a simple exercise of multiplying the expected pre-tax operating income by the tax rate; the only real estimation question we face is what tax rate (marginal or effective) to use. With young firms that are losing money, there are two estimation challenges. The first is that

these firms have generally never paid taxes in the past (since they have never generated earnings) and thus have no effective tax rates. The second is that the losses that have been made in the past and that you often expect them to make in the near future will create net operating losses that can be carried forward and used to shelter positive earnings in future years. The most direct way of dealing with these losses is to cumulate them as they are expected to occur over time, and keep track of the net operating loss carry forward (NOL). In the first few years of positive earnings, we can draw on this NOL and essentially not pay taxes. When the NOL is exhausted, we should move to a marginal tax rate, based on the statutory tax codes; this is a conservative solution, and the alternative is to use the average effective tax rate paid by healthy firms in the sector.

6. Check for internal consistency: One of the perils of the top down approach is that operating income and reinvestment are estimated separately, and there is the possibility that these numbers are not internally consistent. In other words, we may be reinvesting too little, given our forecasts of expected revenue growth, or too much. One simple test that can be used to check for consistency is to compute an imputed return on capital, based upon the earnings and reinvestment forecasts.

$$\text{Imputed Return on capital} = \frac{\text{Expected Operating Income after tax}_t}{\text{Capital Invested in firm}_{t-1}}$$

The numerator is the forecasted operating income and the denominator is computed as the cumulated total of all reinvestment (net capital expenditures and change in non-cash working capital) over time, through period t-1, added on to the initial capital invested (at the time of the valuation).

$$\text{Capital invested}_{t-1} = \text{Capital Invested}_0 + \sum_{n=1}^{n=t-1} \text{Reinvestment}_n$$

The imputed return on capital, as you approach steady state, can then be compared to both the industry average return on capital (to ensure that you are not making your company an outlier) and to the company's own steady state cost of capital. An imputed return on capital well above the industry average and the cost of capital is an indication that the reinvestment forecasted for the firm over the forecast period is insufficient, given the expected earnings. Conversely, an imputed return on capital below the cost of capital

would indicate that the reinvestment numbers are too high, given the revenue and earnings forecasts.

Illustration 9.2: Estimating cash flows for a young business- Secure Mail Software

We will illustrate the top-down approach with Secure Mail Software, the company that we used earlier to illustrate the venture capital approach.

1. Total Market: Secure Mail is planning to sell anti-virus software. We used the estimates of total size of the security software market (which includes the anti-virus software) globally, from Gartner in 2008: Table 9.4 summarizes their estimate of the market size in 2008 and their forecasts from 2009 to 2012:

Table 9.4: Forecasted Global Market for Security Software (in million US $)

Year	Current (2008)	2009	2010	2011	2012	2013
Market growth rate	NA	5.50%	5.50%	5.50%	5.50%	5.50%
Overall market	$10,500	$11,078	$11,687	$12,330	$13,008	$13,723

Beyond 2012, we estimate a growth rate, in the overall market, of 5% from 2013-2018 and 3% afterwards.

2. Market Share: To estimate the market share, we looked at the largest anti-virus software firms in the market in 2008, in terms of market share. Table 9.5, also from Gartner, lists the five largest firms, with their market share:

Table 9.5: Largest Anti-virus Software companies – 2007

Company	*2007 Revenues*	*Market Share*
Symantec	$2,789 million	26.6%
McAfee	$1,226 million	11.8%
Trend Micro	$810 million	7.8%
IBM	$608 million	5.8%
CA	$419 million	4.0%
EMC	$415 million	4.0%
Others	$4,171 million	40.0%

Secure Mail's software offering measures up well against the competitions, both in terms of features and price. In addition, the management of the company includes the founder who has had experience in other successful software start-ups. Consequently,

we estimate that Secure Mail will be able to capture a 10% market share in steady state (expected in ten years).

3. Operating income/margins: To estimate the expected operating margin in ten years, we examined the pre-tax operating margins and after-tax returns on invested capital of the largest publicly traded competitors that operated primarily in the anti-virus business in 2007 in table 9.6:

Table 9.6: Pre-tax Profitability Measures – Anti-virus Software Business

Company	*Operating margin (Pre-tax)*	*Return on invested capital (After-tax)*
Symantec	13.05%	17.07%*
McAfee	12.91%	22.80%
Trend Micro	14.50%	17.89%

* Symantec had $ 11 billion in goodwill on the balance. We netted out a portion of this goodwill, in computing return on capital.

We assumed that Secure Mail's pre-tax operating margin would converge to 13%, close to the margins reported by Symantec and McAfee, by 2018. However, the pathway to profitability is likely to be rocky, with margins staying negative for at least 3 years. Table 9.7 lists the estimated revenues and operating margins for Secure Mail for the next 10 years.

Table 9.7: Expected Revenues, Operating Margins & Earnings – Secure Mail

Year	*Total Market*	*Market Share*	*Revenues*	*Pre-tax Operating Margin*	*Pre-tax Operating Income*
2009	$11,078	0.50%	$55	-10.00%	-$5.54
2010	$11,687	1.50%	$175	-5.00%	-$8.77
2011	$12,330	2.50%	$308	-1.00%	-$3.08
2012	$13,008	4.00%	$520	5.00%	$26.02
2013	$13,723	5.00%	$686	10.00%	$68.62
2014	$14,409	6.00%	$865	10.60%	$91.64
2015	$15,130	7.00%	$1,059	11.20%	$118.62
2016	$15,886	8.00%	$1,271	11.80%	$149.97
2017	$16,680	9.00%	$1,501	12.40%	$186.15
2018	$17,515	10.00%	$1,751	13.00%	$227.69

4. Taxes: In computing taxes for Secure Mail, we started with the fact that the firm had accumulated net operating losses of $15 million over its lifetime. In the first three years, where we are anticipating operating losses, we added the losses to the NOL,

and then used this NOL to shelter income in year 4 and partially in year 5. We will use the marginal tax rate for the US of 40% as the tax rate on income thereafter. Table 9.8 lists the NOL and taxes paid each year, based upon the 40% tax rate, each year:

Table 9.8: NOLs, Taxes and After-tax Operating Income

Year	*Pre-tax Operating Income*	*NOL at start of year*	*NOL at end of year*	*Taxable Operating Income*	*Taxes*	*After-tax Operating Income*
2009	-$5.54	$15.00	$20.54	$0.00	$0.00	-$5.54
2010	-$8.77	$20.54	$29.30	$0.00	$0.00	-$8.77
2011	-$3.08	$29.30	$32.39	$0.00	$0.00	-$3.08
2012	$26.02	$32.39	$6.37	$0.00	$0.00	$26.02
2013	$68.62	$6.37	$0.00	$62.24	$24.90	$62.24
2014	$91.64	$0.00	$0.00	$91.64	$36.66	$91.64
2015	$118.62	$0.00	$0.00	$118.62	$47.45	$118.62
2016	$149.97	$0.00	$0.00	$149.97	$59.99	$149.97
2017	$186.15	$0.00	$0.00	$186.15	$74.46	$186.15
2018	$227.69	$0.00	$0.00	$227.69	$91.08	$227.69

5. Reinvestment: We are assuming that revenues will increase to $1.35 billion in ten years, as Secure Mail expands its market share of this growing market. To estimate how much Secure Mail will need to reinvest to generate this additional revenue, we use the ratio of revenues to capital invested in this sector of 1.95 (based upon revenues and book capital at publicly traded firms in the business) and a one-year lag between reinvestment and growth to estimate the reinvestment in each year. Table 9.9 summarizes our estimates:

Table 9.9: Estimated Reinvestment by year

Year	*Revenues*	*Change in revenues in next year*	*Sales/Capital*	*Reinvestment*
2009	$55	$120	1.95	$61.49
2010	$175	$133	1.95	$68.17
2011	$308	$212	1.95	$108.75
2012	$520	$166	1.95	$85.05
2013	$686	$178	1.95	$91.49
2014	$865	$195	1.95	$99.76
2015	$1,059	$212	1.95	$108.62
2016	$1,271	$230	1.95	$118.13
2017	$1,501	$250	1.95	$128.31

2018	$1,751	$53	1.95	$26.95*

* Revenues in 2019 at $1,804 million are 3% higher than revenues in 2018.

Note that the reinvestment in year 1 is computed based upon the change in revenues from year 1 to year 2, and using the sales to capital ratio of 1.95:

$$\text{Reinvestment in year 1} = \frac{(\text{Revenues}_2 - \text{Revenues}_1)}{\text{Sales to Capital Ratio}} = \frac{(175 - 55)}{1.95} = \$61.49 \text{ mil}$$

The process is repeated for the ensuing periods.

6. Internal consistency check: As a final check on our estimates, we compute the capital invested each year, starting with the initial capital investment of $ 5 million and adding to this amount the reinvestment each year to get to cumulated capital invested at the end of each period. Dividing by the after-tax operating income each year yields the after-tax return on capital in table 9.10:

Table 9.10: Estimated Capital Invested and ROIC

Year	*After-tax Operating Income*	*Reinvestment*	*Capital invested at start of year*	*Capital invested at end of year*	*Return on capital*
2009	-$5.54	$61.49	$5.00	$66.49	-110.78%
2010	-$8.77	$68.17	$66.49	$134.67	-13.18%
2011	-$3.08	$108.75	$134.67	$243.42	-2.29%
2012	$26.02	$85.05	$243.42	$328.47	10.69%
2013	$43.72	$91.49	$328.47	$419.96	13.31%
2014	$54.99	$99.76	$419.96	$519.71	13.09%
2015	$71.17	$108.62	$519.71	$628.34	13.69%
2016	$89.98	$118.13	$628.34	$746.46	14.32%
2017	$111.69	$128.31	$746.46	$874.78	14.96%
2018	$136.61	$26.95	$874.78	$901.72	15.62%

We computed the return on capital each year, based upon the capital invested at the start of the year.[6] The return on capital in 2018 is 15.62%, below the industry average return on capital reported in table 9.6, but close to what we will assume Secure Mail's return on capital will be in stable growth of 15%. The end result of these assumptions is table 9.11, which summarizes the expected cash flows, after taxes and reinvestment needs, to Secure Mail as a business for the next 10 years.

[6] The alternative is to use the average capital invested over the period. In keeping with the fact that we are using end-of-the year cash flows (rather than mid-year cashflows), we chose the capital invested at the start of each year.

Table 9.11: Expected Free Cashflow to the Firm – Secure Mail Software

Year	*After-tax Operating Income*	*Reinvestment*	*FCFF*
2009	-$5.54	$61.49	-$67.03
2010	-$8.77	$68.17	-$76.94
2011	-$3.08	$108.75	-$111.84
2012	$26.02	$85.05	-$59.03
2013	$43.72	$91.49	-$47.77
2014	$54.99	$99.76	-$44.77
2015	$71.17	$108.62	-$37.45
2016	$89.98	$118.13	-$28.15
2017	$111.69	$128.31	-$16.62
2018	$136.61	$26.95	$109.67

Note that earnings become positive well before cash flows do; the latter are weighed down by the reinvestment needs to sustain future growth.

Bottom-up Approach

The bottom up approach is a more contained way of estimating the expected cash flows on a business. Instead of starting with the total market and building down to estimates of revenues and cash flows for the firm, we begin with an estimate of investment in capacity and then build up to estimates of revenues and cash flows, based on this capacity constraint. In general, we can break down the approach into the following steps:

1. Capacity size/investment: The process begins with an estimate of what we will need to invest to get the business off the ground, which also determines the production capacity. There is a trade off inherent in this step. Investing in more capacity will allow us to produce and sell more in the future, but the capital (both financial and human) needed to sustain this capacity will also greater. To the degree that either human or financial capital is limited, we may have to settle for less capacity over more.

2. Unit sales/ revenues: Once we have chosen a capacity constraint, we have to estimate how many units we can sell each period, for the forecast period, and the price that will be charged per unit. At this stage, we will have to consider not only the potential market for the product or service we offer but also the competition (both current and potential) in this market. The choices we make on pricing can determine the number of units sold, with lower prices generally translating into more sales, but not necessarily higher profits.

3. Operating costs: With the number of units sold each period as an input, we can estimate the costs of production in each period. These estimates should include not only the costs of inputs that go into the product, but also selling, administrative and other costs; the latter have to be consistent with the unit sales assumptions in the second step.

4. Taxes: The revenue and expense estimates are used to estimate the taxable income that the firm will generate each period and the resulting taxes. At this stage, we will also have to separate capital from operating expenses, and estimate depreciation and amortization on the former, and operating from financial expenses (interest expenses) to determine cash flows to the firm and cash flows to equity; the former is before financial expenses whereas the latter is after.

5. Additional reinvestment: While we estimated the initial investment in step 1, there may be additional investments that have to be made over time to augment or preserve the earning capacity of the business. We need to determine what the business will have to reinvest to preserve its income generating capacity. If the business requires working capital, growth in revenues may also lead to investments in working capital (inventory and accounts receivable) that have to be considered as reinvestment.

As a general rule, bottom up approaches of cash flows will yield lower expected cash flows and earnings, because we work with capacity constraints. Consequently, it is more suited for businesses that either face significant restrictions on raising additional capital (too small and/or in the wrong type of business) or are dependent upon a key person or key people for their success. As a general rule, personal service businesses (medical practices, a plumbing business, restaurants etc.) are better valued using this approach than top down approaches, unless the service can be franchised or replicated easily.

Illustration 9.3: Estimating cash flows for Healthy Meals - An Organic Restaurant

Charles Black, a chef at a five-star restaurant in New York City, has decided to leave his job and start a new business, making and delivering healthy family meals, based on organic produce, in a suburban town in New Jersey.[7] To estimate the cash flows, we will go through the steps in the bottom up approach:

[7] Mr. Black has lived in the town for an extended period and is a local celebrity.

1. Capacity investment: The business, Healthy Meals, will be run out of a storefront on Main Street, that will be converted into a state-of-the-art kitchen with an investment of $80,000. Licensing, legal and other set-up costs are expected to amount to $20,000, with the entire initial cost ($100,000) being tax deductible immediately.[8] Half of the initial cost ($50,000) will be covered by a bank loan, with an interest rate of 7%. The kitchen (with Mr. Black as chef) is capable of producing up to 60 family meals a day comfortably.
2. Unit Sales/ Revenues: The family meals, which will come pre-packaged and ready to serve up to 6 people, will be priced at $ 60 for a meal next year, with the price expected to rise with the inflation rate in subsequent years (with inflation assumed to be 2% a year). The expectation is that the restaurant will sell about 20 meals a day, on average, next year, but that sales will increase each year after that to hit a peak of 50 meals a day, in five years;[9] the restaurant plans to stay open approximately 300 days a year. Table 9.12 summarizes the expected revenues at the restaurant for the next 5 years:

Table 9.12: Expected Revenues – Healthy Meals

	1	2	3	4	5
# Meals/day	20	30	40	45	50
# Days/ year	250	250	300	300	300
Price/Meal	$60.00	$61.20	$63.67	$67.57	$73.14
Revenues	$300,000	$459,000	$764,070	$912,192	$1,097,095

3. Operating Costs: There are several fixed operating costs involved in running the restaurant – a rental expense of $25,000 for next year for the storefront and selling, general and administrative expenses that are expected to amount to $100,000 next year; these expenses will increase at the inflation rate after next year. The cost of the ingredients for the meals will amount to 30% of the revenues whereas labor costs (kitchen help, delivery people) are anticipated to be 20% of revenues. The latter does not include a salary for Mr. Black, but he would have earned a salary of $80,000 next year, if he had stayed on as a restaurant chef in

[8] Charles has enough taxable income this year to claim the tax deduction immediately.
[9] Though the kitchen has the capacity to produce 60 meals a day, it is unrealistic to expect it to produce and sell this many meals every day of the year.

Manhattan; this salary would have grown with inflation over time. Table 9.13 provides estimates of the operating costs and profits for Healthy Meals for the next 5 years:

Table 9.13: Expected Operating Income for Healthy Meals

	1	2	3	4	5
Revenues	$300,000	$459,000	$764,070	$912,192	$1,097,095
- Rental expense	$25,000	$25,500	$26,010	$26,530	$27,061
- Cost of ingredients	$90,000	$137,700	$229,221	$273,657	$329,128
- Labor costs	$60,000	$91,800	$152,814	$182,438	$219,419
- Imputed chef salary (owner)	$80,000	$81,600	$83,232	$84,897	$86,595
- S,G and A expenses	$100,000	$102,000	$104,040	$106,121	$108,243
Operating income	-$55,000	$20,400	$168,753	$238,548	$326,649

4. Taxes: To compute the taxes, we use a marginal tax rate of 40% to cover federal, state and local taxes. Since all of the initial investment was tax deductible, we have no depreciation charges to consider. Table 9.14 summarizes expected taxes paid and after-tax operating income for the restaurant:

Table 9.14: Expected Taxes and After-tax Operating Income

	1	2	3	4	5
Operating income	-$55,000	$20,400	$168,753	$238,548	$326,649
- Taxes	-$22,000	$8,160	$67,501	$95,419	$130,660
Operating income after taxes	-$33,000	$12,240	$101,252	$143,129	$195,989

We are assuming that Mr. Black will be able to claim the loss on the restaurant as a tax deduction in year 1 against his imputed salary.

5. Additional reinvestment: Since Mr. Black intends to keep the business going after year 5, he will have to invest in updating the kitchen appliances and renovating the storefront. While the precise timing of the investment is unclear, we will assume that he will need to set aside 10% of his after-tax operating income each year to cover these costs. Table 9.15 summarizes the expected after-tax cashflows, prior to debt payments, from the restaurant:

Table 9.15: Expected After-tax Cashflow to the Firm- Healthy Meals

Year	0	1	2	3	4	5
EBIT (1-t)		-$33,000	$12,240	$101,252	$143,129	$195,989
- Reinvestment	$60,000	-$3,300	$1,224	$10,125	$14,313	$19,599
FCFF	-$60,000	-$29,700	$11,016	$91,127	$128,816	$176,390

Note that the initial investment is the after-tax initial investment cost; the initial investment of $100,000 is tax deductible and delivers a tax benefit of 40%.

2. Estimating Discount Rates

There are two key risk parameters for a firm that we need to estimate its cost of equity and debt. We estimate the cost of equity by looking at the beta (or betas) of the company in question, the cost of debt from a measure of default risk (an actual or synthetic rating) and apply the market value weights for debt and equity to come up with the cost of capital. There are both conceptual and estimation issues that make each of these ingredients difficult to deal with, when it comes to young companies.

- Beta and cost of equity: Young companies are often held by either undiversified owners or by partially diversified venture capitalists. Consequently, it does not make sense to assume that the only risk that should be priced in is the market risk; the cost of equity has to incorporate some (in the case of venture capitalists) or maybe even all (for completely undiversified owners) of the firm specific risk. The standard practice of estimating betas from stock prices will not work, since young firms are generally not publicly traded.
- Cost of debt: Young firms almost never have bonds outstanding and are instead dependent on bank loans for debt. Consequently, there will be no bond rating, measuring default risk. Even though we may be able to estimate a synthetic rating, based upon the interest coverage and other ratios, the resulting cost of debt may not appropriately capture the interest rates actually paid by these small and risky businesses, since banks may charge them a premium.
- Debt ratio: Since the equity and debt in young companies is not traded, there are no market values that can be used to weight the debt and equity to arrive at the cost of capital.

It is the confluence of these problems that is used as the justification for the use of arbitrary "target rates" by venture capitalists. We would suggest an alternate process, built around the following steps:

1. Sector averages: While the company being valued may not be traded, there are generally other companies in the same business that have made it through the early stage

in the life cycle and are publicly traded. We would use the betas of these firms to arrive at an estimate of the market risk associated with being in this business. Generally, this will require taking an average of the regression betas across the publicly traded firms, and unlevering the beta to arrive at the beta of the business.

$$\text{Unlevered Beta for sector} = \frac{\text{Average Regression Beta for publicly traded firms}}{(1 + (1 - \text{Tax Rate}) \text{ Average Market D/E Ratio for sector})}$$

2. Adjust for diversification or its absence: As noted earlier, the owners of young businesses tend not to be diversified. In fact, the entire firm may be held by the founder, who, in turn, has all of his or her wealth tied up in that investment. To account for this absence of diversification, we will again draw on the publicly traded firm sample. The same regressions that yielded the market betas for these firms also provides an estimate of how much of the risk in these firms comes from the market (through the R-squared and correlation coefficients in the regressions). Dividing the market beta by the correlation of the publicly traded firms with the market gives us a scaled up version of beta (that we will term total beta) that captures all of the risk of being in a specific business, rather than just the market risk:

$$\text{Total Beta} = \frac{\text{Market Beta}_{\text{Publicly traded firms in business}}}{\text{Correlation with market}_{\text{Publicly traded firms in business}}}$$

This total beta will be much higher than the market beta and the resulting cost of equity will reflect the cost of equity to an investor who is completely invested only in this business. As the firm expands and taps into venture capitalists, it is attracting investors who have some diversification; venture capitalists tend to hold investments in multiple companies but often in the same sector or a few sectors. The portfolio of investments held by a venture capitalist will be more highly correlated with the market than an individual company is, and the resulting total beta to a venture capitalist will be lower:

$$\text{Total Beta}_{VC} = \frac{\text{Market Beta}_{\text{Publicly traded firms in business}}}{\text{Correlation with market}_{\text{VC Portfolio}}}$$

Thus, as firms move through the life cycle and attract larger and more diversified venture capitalists into the fold, they should see lower costs of equity. Ultimately, the cost of equity will converge on the market beta measure, if the firm goes public or is sold to a publicly traded entity.

3. Consider the use of debt and its cost: The absence of a rating should not be used as an excuse for using book interest rates or arbitrary costs of debt. Synthetic bond ratings can be estimated for any firm based upon financial ratios that are available even for private businesses. Thus, an interest coverage ratio can be computed for a small business and used to come up with a synthetic rating and a pre-tax cost of debt (by adding the default spread based upon the rating to the riskfree rate). The one additional adjustment we would consider making to this cost of debt is to add a spread to capture the small size of these businesses; it is likely that a bank would charge more for a BBB rated firm, with revenues of $ 1 million, than for a BBB rated firm, with revenue of a billion.

4. Look at management proclivities and industry averages: There are some young businesses, where the owners come in with strong views on using (or more commonly, never using) debt. In these cases, and they are unusual, we can use the target debt ratio specified by management to compute the cost of capital. In the more common scenario, where the owners are unclear about how much they will use debt, especially as they grow, it is best to revert back to the publicly traded firms in the business and use the average market debt ratio of these firms as the debt ratio for the firm being analyzed.

5. Build in expected changes in all of these inputs over time: As firms move through the life cycle, we should expect their risk and cash flow characteristics to change; in fact, we build in these expected changes in the earnings and cash flows that we forecast. To preserve consistency, we should allow the cost of equity, debt and capital to change over time. Thus, a firm that is all equity funded and owned entirely by its founder, with a cost of equity of 30%, as a start-up, should not only see its cost of equity decline over time, as it attracts more diversified investors into the mix, but to also be more open to the use of debt, as earnings become larger and more stable.

Illustration 9.4: Estimating discount rates for Secure Mail Software

To estimate the cost of equity and capital for Secure Mail, we begin with the unlevered beta of the virus software business. We estimated this number by first

averaging the regression betas of publicly traded security software firms, and then adjusting this beta for the typical financial leverage at these firms:[10]

Average beta across public security software firms = 1.24

Average Debt to Equity ratio for security software firms = 6%

Unlevered Beta for security software firms = 1.24/ (1+ (1-0.4) (.06)) = 1.20

While we leave this unlevered beta untouched for the entire ten-year time horizon, we assumed that the only equity investor in the business in the first two years is the founder who is completely undiversified (and fully invested in the firm). We compute the average R-squared across the security software company regressions, and use this number to estimate a total beta for Secure Mail.

Average R-squared of security software firms with market = 0.16

Average correlation of security software firms with market = 0.40

Total beta: Years 1 & 2 = Market Beta/ Average correlation = 1.20/ 0.40= 3.00

At the start of year 3, we expect the firm to approach a venture capitalist, who while not fully diversified, has a portfolio of several sotware companies. The correlation between this portfolio and the market is expected to be 0.50, which results in a lower total beta after year 3.

Total beta: Years 3 & 4 = Market beta/ Correlation of VC portfolio = 1.20/0.50 = 2.40

At the end of year 4, we expect larger venture capitalists to invest in the firm and their portfolios, which include growth companies from multiple sectors, have a correlation of 0.75 with the market.

Total beta: Years 5-10 = Market beta/ Correlation of larger VC portfolio = 1.20/0.75 = 1.60

Finally, we expect the firm to go public at the end of year 10, at which point the market beta will apply.

Since the owners of the firm are deadest against the use of debt and the sector itself is lightly levered (D/E ratio =6%), we will assume that the firm will be all equity

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[10] We used a sample of 12 companies involved in the security software business, rather than stick with the stricter sample of firms that just produce anti-virus software. We assumed a marginal tax rate of 40% applied to all of these firms.

funded over time. Using a riskfree rate of 4% and a market risk premium of 5% yields the costs of equity by year for Secure Mail:

Table 9.16: Costs of equity and capital – Secure Mail

Year	Market Beta	Correlation with market	Total Beta	Cost of Equity	Debt Ratio	Cost of capital
2009	1.2	0.40	3.0000	19.00%	0.00%	19.00%
2010	1.2	0.40	3.0000	19.00%	0.00%	19.00%
2011	1.2	0.50	2.4000	16.00%	0.00%	16.00%
2012	1.2	0.50	2.4000	16.00%	0.00%	16.00%
2013	1.2	0.75	1.6000	12.00%	0.00%	12.00%
2014	1.2	0.75	1.6000	12.00%	0.00%	12.00%
2015	1.2	0.75	1.6000	12.00%	0.00%	12.00%
2016	1.2	0.75	1.6000	12.00%	0.00%	12.00%
2017	1.2	0.75	1.6000	12.00%	0.00%	12.00%
2018	1.2	0.75	1.6000	12.00%	0.00%	12.00%
After 2018	1.2	1.00	1.2000	10.00%	0.00%	10.00%

Note that in the absence of debt, the cost of equity will also be the cost of capital for the firm.

Illustration 9.5: Estimating discount rates for Healthy Meals

To estimate the cost of equity for Healthy Meals, we begin with the betas of publicly traded firms in the restaurant business and cleanse them of the financial leverage effect:[11]

Average regression beta across public restaurants = 0.902

Average Debt to equity ratio for public restaurants= 25%

Unlevered Beta for restaurants = 0.902/ (1+(1-.4) (.25)) = 0.78

As with the beta for Secure Mail, we adjust this beta for the lack of diversification of the owner/chef by estimating the average correlation of publicly traded restaurants with the market:

Average correlation of restaurant firms with the market = 0.333

Total unlevered beta for restaurants = 0.78/ 0.333 = 2.34

[11] There were 22 publicly traded restaurants in the sample and we assumed a marginal tax rate of 40% applied to them.

Unlike Secure Mail, where we assumed that the firm would depend entirely on equity, the owner of Healthy Meals plans to borrow $ 50,000 (from a bank with an interest rate of 7%) and will continue to borrow as he expands the business. Rather than trust a book debt ratio, we will assume that Healthy Meals will adopt a debt ratio similar to publicly traded restaurants (25% debt to equity and a 20% debt to capital ratio). The resulting levered beta is computed below:

Levered beta for Healthy Meals = 2.34 (1+ (1-.4) (.25)) = 2.70

Sticking with the riskfree rate of 4% and an equity risk premium of 5%, we can estimate the cost of equity from this beta. We will use the interest rate on the bank loan as the pre-tax cost of debt.[12] Table 9.17 summarizes costs of equity and capital for Healthy Meals:

Table 9.17: Costs of equity and capital – Healthy Meals

Year	1	2	3	4	5
Total Beta	2.70	2.70	2.70	2.70	2.70
Cost of equity	17.50%	17.50%	17.50%	17.50%	17.50%
Cost of debt (after-tax)	4.20%	4.20%	4.20%	4.20%	4.20%
Debt to Capital ratio	20.00%	20.00%	20.00%	20.00%	20.00%
Cost of capital =	14.84%	14.84%	14.84%	14.84%	14.84%

Since there are no other equity investors in the picture, we will leave the cost of equity and capital unchanged over time at 14.84%.

3. Estimating Value today and adjusting for survival

The expected cash flows and discount rates, estimated in the last two steps, are key building blocks towards estimating the value of the business and equity today. However, there are three more components that we have to deal with at this stage in getting to the value of the firm. The first is determining what happens at the end of our forecast period, i.e., the assumptions that lead to the value we assign the business at the end of the period. The second is adjusting for the likelihood that the business will not survive, an issue that has added relevance with young firms, because so many fail early in the process. The third factor that we have to deal with, at least in businesses that are dependent upon a person or a few key people for their success, is how best to incorporate into the value the effects of their loss.

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[12] Since this is a fresh bank loan, we are assuming that the bank is charging a fair interest rate, given perceived default risk.

Terminal Value

In an earlier section, we considered how best to estimate earnings and cash flows for a forecast period for a young firm. At some point in time in the future, we have to stop estimating cash flows, partly because of increasing uncertainty and partly for practical reasons. Whatever the reason for stopping, we have to then estimate what we expect the value of the business to be at that point in time. This "terminal value" estimate represents a big chunk of the value of any business, but is an even bigger component of value for a young firm that has small or negative cash flows in the near years. There are three ways in which we can estimate the terminal value for young firms:

- We can value the firm as a going concern, making reasonable assumptions about cash flows growing in perpetuity. The terminal value could then be written as a function of the perpetual growth rate and the excess returns accompanying the growth rate (with excess returns defined as the difference between returns on invested capital and the cost of capital).
- If the assumption of cash flows continuing in perpetuity is too radical for the firm being valued, either because the firm is dependent upon a key person or persons for survival or because it is a small business, we can estimate the terminal value by making an assumption about how long we expect cash flows to continue beyond the forecast horizon and estimating the present value of these cash flows.
- The most conservative assumption that we can make about terminal value is that the firm will be liquidated at the end of the forecast period and that the salvage value of any assets that the firm may have accumulated over its life is the terminal value.

Note that using relative valuation (multiples) to estimate terminal value, as is often the practice, is inconsistent with the notion of intrinsic value. Of the three approaches described, the right approach for estimating terminal value will depend upon the characteristics of the firm being valued. When valuing firms, where success will translate into an initial public offering or sale to a publicly traded firm, the perpetual growth model makes the most sense. For smaller, less ambitious firms, where success will be defined as surviving the forecast period and delivering cash flows beyond, assuming a finite life for the cash flows will yield the most reasonable value. Finally, liquidation value is best

suited for businesses that come with time limits on their operating lives – for instance, an operating license that will end in 5 years.

Illustration 9.6: Estimating terminal value and value today for Secure Mail

We estimate the terminal value for Secure Mail at the end of year 10, for three reasons:

(1) It is the first year with a growth rate (3%) that is consistent with stable growth, i.e,, it is less than the riskfree rate and the nominal growth rate in the economy.

(2) Operating margins do not reach the target level (13%) until year 10.

(3) The firm is assumed to be ready for an initial public offering, allowing us to settle on betas and costs of equity and capital in perpetuity.

Reviewing the year 10 numbers, Secure Mail is expected to generate $136.61 million in after-tax operating income on revenues of $1.751 billion. We first estimate revenues and after-tax operating income in year 11:

$\text{Revenues}_{11} = \text{Revenues}_{10}(1 + \text{Stable growth rate})$

$= \$1{,}751\ (1.03) = \$1{,}804 \text{ million}$

$\text{After-tax Operating income}_{11} = \text{Revenues}_{11}\ (\text{Stable Operating Margin}) = \$\ 1{,}804\ (0.13) = \$140.71 \text{ million}$

To estimate how much the firm will need to reinvest to sustain a 3% growth rate forever, we assume that the return on capital at Secure Mail in stable growth is 15%. (Note that we made reinvestment assumptions during the high growth phase with the intent of pushing towards this return, which is lower than the industry average, but higher than the cost of capital of 10% in stable growth).

$$\text{Reinvestment in stable growth} = \frac{\text{Stable growth rate}}{\text{Stable ROC}} = \frac{3\%}{15\%} = 20\%$$

$\text{Free Cash flow to the firm}_{11} = \text{After-tax Operating income}_{11} * (1\text{-Reinvestment Rate})$

$= \$140.71\ (1 - .20) = \$112.57$

Finally, using the stable period cost of capital of 10% (see table 9.16), we estimate the terminal value:

$$\text{Terminal Value}_{10} = \frac{\text{FCFF}_{11}}{(\text{Cost of capital}_{\text{Stable}} - \text{Stable growth rate})} = \frac{112.57}{(.10 - .03)} = \$1608.13$$

Incorporating this value into the expected free cashflows to the firm (estimated in table 9.11) and discounting back at the year-specific costs of capital (from table 9.16), we can arrive at the value of the operating assets today in table 9.18:

Table 9.18: Expected Cashflows and Value today: Secure Mail

Year	FCFF	Terminal Value	Cost of capital	Cumulated Cost of capital	Present Value
2009	-$67.03		19.00%	1.19000	-$56.33
2010	-$76.94		19.00%	1.41610	-$54.33
2011	-$111.84		16.00%	1.64268	-$68.08
2012	-$59.03		16.00%	1.90550	-$30.98
2013	-$47.77		12.00%	2.13416	-$22.38
2014	-$44.77		12.00%	2.39026	-$18.73
2015	-$37.45		12.00%	2.67710	-$13.99
2016	-$28.15		12.00%	2.99835	-$9.39
2017	-$16.62		12.00%	3.35815	-$4.95
2018	$109.67	$1,608.13	12.00%	3.76113	$456.72
					$177.56

Note that the cost of capital is cumulated to reflect the changes in the cost over time. Thus, the cost of capital in year 5 is computed as follows:

Cost of capital in year 5 = $(1.19)^2 (1.16)^2 (1.12) = 2.13416$

Based on the expected cash flows and discount rates, the value of the operating assets today is $177.56 million.

Illustration 9.7: Estimating terminal value and value today for Healthy Meals

We use a much shorter period for Healthy Meals, since it runs into its capacity constraint (both physical and financial) by the end of year 5. As a privately owned restaurant, we are unwilling to assume that the business will generate cash flows forever or that there is the possibility of public investors in the company. Consequently, we make the following assumptions:

a. The after-tax operating income ($195,989) and free cash flow to the firm ($176,390) in year 5 (see table 9.15) will continue to grow at the inflation rate for ten more years. At the end of year 15, we will assume that the business is shut down and that there are no assets to salvage.

b. The owner will continue to be the only equity investor in the business and the debt ratio we assumed for the first five years will hold for the next 10 years. The cost of capital will therefore remain at 14.84% (see table 9.17) for the entire period.

With these assumptions, we can estimate the terminal value at the end of year 5 using an equation for a growing annuity.[13]

$$\text{Terminal Value} = \frac{FCFF_5(1+g)(1-\frac{(1+g)^n}{(1+r)^n}}{(r-g)} = \frac{176{,}390(1.02)(1-\frac{(1.02)^{10}}{(1.1484)^{10}}}{(.1484-.02)} = \$973{,}098$$

Including this estimate with the cash flows for each year estimated in table 9.15, and discounting back at the cost of capital of 14.84% yields the estimate of value for the operating assets of the firm in table 9.19:

Table 9.19: Cash flows and Value today: Healthy Meals

Year	0	1	2	3	4	5
EBIT (1-t)		-$33,000	$12,240	$101,252	$143,129	$195,989
- Reinvestment	$60,000	-$3,300	$1,224	$10,125	$14,313	$19,599
FCFF	-$60,000	-$29,700	$11,016	$91,127	$128,816	$176,390
Terminal value						$973,098
Cost of capital		14.84%	14.84%	14.84%	14.84%	14.84%
Present value	-$60,000	-$25,862.07	$8,352.91	$60,167.98	$74,062.28	$575,491.14
Value of operating assets today =	$632,212					

Survival

Many young firms succumb to the competitive pressures of the market place and don't make it. Rather than try to adjust the discount rate for this likelihood, a difficult exercise, we would suggest a two-step approach. In the first step, we would value the firm on the assumption that it survives and makes it to financial heath. This, in effect, is what we are assuming when we a terminal value and discount cash flows back to today at a risk-adjusted discount rate. In the second step, we would bring in the likelihood that the firm will not survive. The probability of failure can be assessed in one of three ways.

[13] The equation is a short cut. The same answer can be obtained by estimating the cash flows each year for 10 years and discounting back at the cost of capital.

i. Sector averages: Earlier in the paper we noted a study by Knaup and Piazza (2007) that used data from the Bureau of Labor Statistics to estimate the probability of survival for firms in different sectors from 1998 to 2005. We could use the sector averages from this study as the probability of survival for individual firms in the sector. For a software firm that has been in existence for one year, for instance, the likelihood of failure (from table 9.1) over a five-year period would be assessed at 38% (the difference between the probability of surviving 2 years – 64.85% - and the probability of surviving 7 years – 24.78%). We are painting with a broad brush, in this case, and generalizing findings from a very specific time period (1998-2005) to all firms.

ii. Probits: A more sophisticated way to estimate the probability of failure is to look at firms that have succeeded and failed over a time period (say, the last 10 years) and to then try to build a model that can predict the probability of a firm failing as a function of firm specific characteristics – the cash holdings of the firm, the age and history of its founders, the business it is in and the debt that it owes.

iii. Simulations: Simulations can be put to good use, when confronted with uncertainty. If we can specify probability distributions (rather than just expected values) for revenues, margins and costs, we may be able to specify the conditions under which the firm will face failure (costs exceed revenues by more than 30% and debt payments coming due, for example) and estimate the probability of failure.

Once the probability of failure has been assessed, the value of the firm can be written as an expected value of the two scenarios – the intrinsic value (from the discounted cash flows) under the going concern scenario and the distress value under the failure scenario.

Expected Value = Value of going concern (1 – Probability of failure) + Distress Sale value (Probability of failure)

Illustration 9.8: Adjusting valuation of Secure Mail Software for survival

In illustration 9.6, we estimated the value of Secure Mail, assuming that it survives to become a going concern and becomes a publicly traded firm. Since the firm has no revenues today, this is an inherently optimistic assumption and there is the strong

possibility that the firm will not survive. To estimate the probability of survival, we begin by looking at the Knaup/ Piazza data that suggests that only 25% of software firms survive past year 5, but adjust this probably upwards to 60% to reflect the fact that the Secure Mail has a solid anti-virus product (albeit in beta form) and that it's founder has been involved with other start-ups that have succeeded in the past. In the event of failure, we assume that distress sale proceeds will be close to zero, since there are few tangible assets to sell and salvage. The expected value of the operating assets can then be written as:

Expected Value of Operating Assets = Value of going concern (1 – Probability of failure) + Distress Sale value (Probability of failure) = $177.56 (1-.4) + 0 (.4) = $106.54 million

This is clearly much lower than the value we assessed, using the venture capital approach of $202.34 million. In this case, at least, the lower intrinsic value can be traced to three factors: (a) the high costs of equity in the early years, resulting from the lack of diversification of the early equity investors, (b) the negative cash flows that the firm is expected to experience for much of the high growth phase and (c) the high chance of failure. The value of this firm will change significantly, with each year of survival, since the probability of failure will drop off over time, the costs of equity decrease and the positive cash flows get closer. We estimate the value of Secure Mail each year until its expected initial public offering in year 10 in table 9.20:

End of year	PV of future Cash flows	Probability of failure	Value
Current	$177.56	40%	$106.54
1	$278.33	35%	$180.91
2	$408.15	30%	$285.71
3	$585.29	25%	$438.97
4	$737.97	15%	$627.28
5	$874.30	10%	$786.87
6	$1,023.98	5%	$972.78
7	$1,184.32	0%	$1,184.32
8	$1,354.58	0%	$1,354.58
9	$1,533.75	0%	$1,533.75
10	$1,608.13	0%	$1,608.13

Note that the value of the end of each period is estimated by discounting subsequent cash flows at the cumulated cost of capital from that point. The probability of failure remains high for the first 3 years (when the firm is reporting losses) but decreases after that.

Key Person Discounts

Young companies, especially in service businesses, are often dependent upon the owner or a few key people for their success. Consequently, the value we estimate for these businesses can change significantly if one or more of these key people will no longer be associated with the firm. To assess a key person discount in valuations, we would suggest that the firm be first valued, with the status quo (with key people involved in the business) and be valued again, with the loss of these individuals built into revenues, earnings and expected cash flows. To the extent that earnings and cash flows suffer when key people leave, the value of the business will be lower with the loss of these individuals and the key person discount can then be estimated as follows:

$$\text{Key person discount} = \frac{(\text{Value of firm}_{\text{Status Quo}} - \text{Value of firm}_{\text{Key person lost}})}{\text{Value of firm}_{\text{Status Quo}}}$$

There is no simple formula that will help in determining how much cash flows will be lost as a result of the loss of key personnel, since it will vary not only across businesses but across the personnel involved. One way to assess it is to survey existing customers to see how they will respond if the key personnel leave and to then build in this impact into operating forecasts.

Illustration 9.7: Adjusting valuation of Healthy Meals for key person discount

In illustration 9.5, we estimated the value of Healthy Meals, an organic restaurant, using expected cash flows to be $632,212. A key factor in its expected success are the networking connections that Charles Black, the founder/chef has in the suburban town that Healthy Meals will be located. The value of the restaurant is therefore very dependent upon Mr. Black's health and continued involvement with the restaurant. To estimate how much of an impact his absence would have on the value, we estimated the impact on both cash flows and value by assuming that while a replacement chef for Mr. Black can be found (for an equivalent salary to the $80,000 that we estimated for him), the revenues will drop by 20%, every year, as a result of his absence. Table 9.21 summarizes the cash flows and value with the lower revenues:

Table 9.21: Value of Healthy Meals: Without Key Person

	Initial	1	2	3	4	5
Revenues		$240,000	$367,200	$611,256	$729,753	$877,676

- Rental expense		$25,000	$25,500	$26,010	$26,530	$27,061
- Cost of ingredients		$72,000	$110,160	$183,377	$218,926	$263,303
- Labor costs		$48,000	$73,440	$122,251	$145,951	$175,535
- Imputed chef salary (owner)		$80,000	$81,600	$83,232	$84,897	$86,595
- S,G and A expenses		$100,000	$102,000	$104,040	$106,121	$108,243
Operating income		-$85,000	-$25,500	$92,346	$147,329	$216,939
- Taxes		-$34,000	-$10,200	$36,938	$58,932	$86,776
Operating incone after taxes		-$51,000	-$15,300	$55,408	$88,397	$130,164
- Reinvestment	-$60,000.00	-$5,100	-$1,530	$5,541	$8,840	$13,016
Free Cashflow to Firm	$60,000.00	-$45,900	-$13,770	$49,867	$79,558	$117,147
Terminal value						646269.6797
Cost of capital		14.84%	14.84%	14.84%	14.84%	14.84%
Present value	$60,000	-$39,968.65	-$10,441.13	$32,925.46	$45,741.38	$382,204.58
Value today =	$470,462					

We valued the firm using the lower revenues and earnings, arising out of these estimates at $470,462. The key person discount, in this case, can then be estimated to be 27.78%.

$$\text{Key person discount} = \frac{(\text{Value of firm}_{\text{Status Quo}} - \text{Value of firm}_{\text{Key person lost}})}{\text{Value of firm}_{\text{Status Quo}}}$$

$$= \frac{(632{,}212 - 470.462)}{632{,}212} = 25.58\%$$

Clearly, this will come into play, if Mr. Black ever decided to sell the restaurant to someone else. To the extent that the buyer will have to build in the discount, he would be willing to pay about 25.58% less than the estimated value. Mr. Black can ease the effect by agreeing to stay on for a transition period as the chef and provide an easier transition for the new owner.[14]

4. Valuing Equity Claims in the business

The path from firm value to equity value in publicly traded firms is simple. We add back cash and marketable securities, subtract out debt and divide by the number of

[14] Needless to say, the buyer will want Mr. Black to sign an agreement that he will not compete with the existing owner for the customer base.

shares outstanding to estimate value of equity per share. With young private businesses, there are complications in each of these phases.

From operating asset to firm value: Cash and capital infusions

Unlike mature companies, where the cash balance represents what the firm has accumulated from operations and is generally static, cash balances at young companies are dynamic for two reasons. The first is that these firms use the accumulated cash, rather than earnings from ongoing operations, to fund new investments; the resulting "cash burn" can quickly eat through the cash balances. The second is that young firms raise new capital at regular intervals, and these capital infusions can augment not only the cash balance but also represent a significant proportion of overall firm value.

To deal with the former, we would suggest caution. Rather than add the cash balance from the most recent financial statements to operating asset value, we would recommend obtaining an updated value (reflecting the cash balance today). To deal with capital infusions, we would revert back to the concept of pre-money and post-money valuations that we introduced in the section on venture capital valuation. When we discount free cash flows to the firm, where reinvestment needs are treated as cash outflows, we are in effect computing a value of the operating assets, with no consideration for the cash that we may have on hand to take these investments. Adding the company's prevailing cash balance yields a pre-money valuation of the firm:

$$\text{Pre-money firm value} = \sum_{t=1}^{t=\infty} \frac{E(FCFF_t)}{(1+\text{Cost of capital})^t} + \text{Cash \& Marketable Securities}$$

$$\text{Pre-money equity value} = \text{Pre-money firm value} - \text{Debt}_{\text{Existing}}$$

If the firm raises additional capital in the form of either debt or equity, the portion of that capital infusion that stays in the firm (as opposed to being used by owners who want to cash out their ownership) will augment value to yield a post-money valuation:

$$\text{Post-money firm value} = \text{Pre-money firm value} + (\text{Equity}_{\text{New}} + \text{Debt}_{\text{New}} - \text{Owner cash out})$$

$$\text{Post-money equity value} = \text{Post-money firm value} - \text{Debt}_{\text{Existing}} - \text{Debt}_{\text{New}}$$

From firm value to equity value: Dealing with debt

Many young firms do not borrow money and those that do often have to add special features to them to make them acceptable to lenders. Convertible debt is far more

common, for instance, at young firms than at mature firms. Since convertible debt is a hybrid – the conversion option is equity and the rest is debt – it does make the process of getting from firm value to equity value a little trickier. Strictly speaking, we should be subtracting out only the debt portion of the convertible debt from firm value to arrive at equity value.

Equity Value = Value of the firm – Debt portion of convertible debt

Once we estimate the equity value, we can then apportion the value between the option holders (in the convertible debt or elsewhere) and standard equity investors.

Differences in equity claims

Once we have the aggregate equity value in a young firm, we have to allocate the value of the equity across various claim holders. This part of the process is complicated by the fact that equity claims in a young firm are seldom homogeneous, as is the case with publicly traded firms, with one class of shares. Instead, some equity claim holders have first claim on the cash flows of the business and other claim holders get control claims which given them more power over how the firm is operated. To apportion the value of equity across different claim holders, we have to value these cash flow and control rights.[15]

1, Cash Flow Claims

There are two types of preferential cash flow rights that can be embedded in equity claims. The first allows some equity investors to claim a share of the operating cash flows, usually in the form of preferential dividends, before other claimholders get paid. The second gives priority to some equity investors, if the firm is liquidated and the cash flows are distributed to investors.

To value first claim on the cash flows from operations, i.e., preferred dividends, the simplest mechanism to use is to discount these dividends back at a lower rate than other cash flows to equity, which should lead to a premium for those owning these claims. The practical issue is coming up with an appropriate discount rate. If we accept

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[15] While we will present a compressed version of how best to value cash flow and control claims in this chapter, there is a more comprehensive paper on this topic. Damodaran, A., 2008, Claims on Equity: Voting and liquidity differences, cash flow preferences and financing rights.

the premise that preferred equity is similar to a debt issue, we can approach this question in much the same way that we estimate the pre-tax cost of debt. In effect, the risk-adjusted rate for fixed preferred dividend-paying equity would be:

Risk-adjusted Discount Rate = Riskfree rate + Spread capturing default risk (of defaulting on dividend payment)

The default spread can be estimated using an approach that is often used to estimate the cost of debt for non-rated companies, where we estimate a synthetic rating for a company based upon its financial ratios and use that rating to come up with a default spread. In fact, one ratio that is widely used for synthetic bond ratings is the interest coverage ratio:

Interest coverage ratio = Operating income/ Interest expenses

This ratio can be adapted to incorporate preferred dividends in the denominator (treated like interest expenses).

Preferred coverage ratio = Operating income/ (Interest expenses + Preferred dividends)

The resulting number should yield a synthetic rating for preferred stock, which, in turn, can be used to estimate the default spread and the risk-adjusted cost of preferred stock. The resulting number should be higher than the pre-tax cost of debt, because preferred dividends are paid after interest expenses, but lower than the cost of equity, because preferred stockholders get their dividends before common stockholders.

Pre-tax cost of debt < $r_{\text{Preferred dividends}}$ < Cost of equity

The question of whether the dividend is cumulative or non-cumulative can be examined in this context as well, with the rate on cumulative preferred stock being lower than the rate on non- cumulative preferred stock.

In some cases, preferred stockholders also get first claim on the cash flows of the firm on liquidation. Unlike dividends, which represent an on-going claim, liquidation is a one-time event and the valuation approaches that we use reflect the difference. One approach to bring in liquidation cash preferences is try to incorporate the likelihood of and the expected cash flows from liquidation into a discounted cash flow model and arrive at a value today. The simplest way to do this is to create two scenarios. In the first, you value the equity claims assuming the firm is a going concern; in effect, you assume that the cash flows (dividends or free cashflows) continue forever and compute the

present value. In the second, you assume that the firm will be liquidated at a specific point in time (say 5 years from now) and compute the value of the equity claims on the firm based upon the cashflows each period during the time period and the cash flows in liquidation. Once the claims have been valued under both scenarios, you estimate the probability of each scenario (going concern and liquidation) and compute an expected value. The approach is predicated on the assumption that liquidation will occur only at the specified point in time and that the probability of it occurring can be estimated with reasonable ease.

2, Control Claims

There are two ways in which control claims can vary across equity investors in young businesses. In the first, one class of equity may have the power to operate the firm and make the day-to-day decisions that determine value, whereas the other class represents passive equity investors. This is the case, for instance, in partnerships with limited partners, who supply capital but do not have a role in running the firm, and general partners, who control the operations. In the second, some classes of equity may be given powers, but only if a specified event (acquisition, public offering etc.) occurs. These powers can be classified loosely into two groups – veto powers, where the equity class has the right to prevent the event from occurring, if it feels that its interests are not being served, and protective powers, where the equity class obtains special protection against its value or ownership claim being diluted.

Veto power, i.e. the power to say no to an event occurring, does protect the rights of the equity claim endowed with the power, but it does so at the expense of overall firm value. By reducing the probability of a specific event (acquisition, initial public offering) that may increase overall firm value at the expense of a specific claim on equity, it will reduce the expected value of the business and thus the value of all claims on the business. For instance, assume that the value of a firm, run by existing managers, is $ 10 million, the value to an acquirer is $ 15 million and that the probability of an acquisition is 40%. If the firm has only class of shares outstanding and there are ten million shares, the value per share can be estimated as follows:

$$\text{Value per share} = \frac{\text{Status Quo Value } (1 - \text{Prob}_{\text{Acq}}) + \text{Acquisition Value } (\text{Prob}_{\text{Acq}})}{\text{Number of shares}}$$

$$= \frac{10\ (1 - \ .4) + 15\ (.4)}{10} = \$1.20/\text{share}$$

Assume now that there are two classes of equity, 5 million class A shares with no special rights and 5 million class B shares with veto rights over acquisitions. As a consequence, the probability of an acquisition drops to 20%. The estimated value of equity per share will reflect this change:

$$\text{Value per generic share} = \frac{10\ (1 - \ .2) + 15\ (.2)}{10} = \$1.10/\text{share}$$

Note that the class B shareholders are costing the firm a million dollars in value. It is possible that they could negotiate to give up their veto rights for approximately that amount. Consequently, the value per class B share can be computed as follows:

$$\text{Value per Class B share} = \text{Value per share} + \frac{\text{Value Loss}}{\#\ \text{Class B shares}} = \$1.10 + \frac{(\$12\ -\ \$11)}{5}$$

$$= \$1.30 \text{ per share}$$

The veto power that the class B shareholders have will allow them to have a higher value than the class A shareholders, but they can monetize this value only if they are willing to give up their veto power.

Protective rights can be more complicated to value, because the right extends beyond the power to say no. In effect, the equity claimholders who have the right receive cash flows to compensate for the loss of value from the event. It is more akin to an option, providing protection against negative consequences, and can be valued as such.

Illustration 9.8: Valuing Equity Claims in Secure Mail Software

To get from the value of the operating assets to the value of equity in Secure Mail, we will first consider the cash balance and debt in the firm; the former is $ 5 million and there is no debt outstanding. The pre-money valuation can then be computed as follows:

Expected value of operating assets (adjusted for survival)	=	$106.54 million
+ Existing cash balance	=	$ 5.00 million
Pre-Money Value of the firm	=	$ 111.54 million
- Existing Debt	=	$ 0.00 million
Pre-Money Value of Equity	=	$ 111.54 million

If a venture capitalist is planning to bring $ 30 million in additional capital into the firm, and all of the capital is assumed to stay in the firm, the post-money value of both the firm and equity will be altered:

Pre-Money Value of the firm	=	$ 111.54 million
+ Capital Infusion	=	$ 30.00 million
- Cash Withdrawn by owner	=	$ 0.00 million
Post-Money Value of firm	=	$ 141.54 million

One possible modification may be to the probability of failure. The addition of $ 30 million to the cash balance may reduce the possibility of failure in the firm. If we assume, for instance, that the probability of failure will decrease from 40% to 30%, as a result of the capital infusion, the post-money value of the firm will be $154.29 million.[16]

5. The Effect of Illiquidity

Investments that are less liquid should be valued less than otherwise similar investments that be sold easily. This intuitive proposition is put to the test, though, when we value equity in young businesses, where it is difficult to measure the illiquidity in an investment and to convert that measure into a "value discount". Analysts have generally adopted one of three practices for dealing with illiquidity. The first is to use a fixed discount that does not vary across private businesses. The second is to estimate an illiquidity discount that is a function of the private business being valued, leading to larger discounts for some firms and smaller discounts for others. The third is to adjust the discount rate used in discounted cash flow valuation for illiquidity.

Fixed Discount

The standard practice in many private company valuations is to either use a fixed illiquidity discount for all firms or, at best, to have a range for the discount, with the analyst's subjective judgment determining where in the range a particular company's discount should fall. The genesis for these fixed discounts comes from studies of restricted stock, which are shares issued by publicly traded companies with restriction on trading for a year after issue, are generally placed at discounts on the market price.

[16] It is unlikely that the venture capitalist will accept the higher valuation, unless he gets full credit for the increase in value, since it is his capital infusion that creates the increase.

Studies that have looked at restricted stock conclude that the discount ranges from 25-35%, relative to their unrestricted counterparts, and private company appraisers have used discounts of the same magnitude in their valuations.[17] In more recent periods, these studies have been augmented with looking at prices paid on private transactions just prior to initial public offerings and computing the discount, relative to the offering price on the IPO. These studies also have found substantial discounts, ranging from 40-50%. Some researchers have argued that these discounts are too large because the firms where you see restricted stock issues and pre-IPO trading tend to be troubled and riskier firms, and that results are therefore tainted with sampling bias. In a 2003 court case[18], the Internal Revenue Service, often at the short end of the illiquidity discount argument, was able to convince the judge that the conventional restricted stock discount was too large and to accept a smaller discount.

Firm-specific Discount

With equity in a private company, you would expect the illiquidity discount to be a function of the size and the type of assets that the company owns, as well as its financial health. For instance, we would expect smaller discounts for larger firms with more liquid assets and positive earnings than for smaller firms in distress. To put this proposition into practice, we need to be able to adjust illiquidity discounts for individual firms and there are three ways in which this can be done:

a. Some of the studies of restricted stock issues and private placements that have been used to justify the fixed discount have also looked at variables that explain the differences in discounts across firms. Silber (1991), in a study of restricted stock discounts, noted that the discount was about 9% higher for money losing than money making firms and that the discount was smaller for firms with more revenues than less (the discount was about 2% smaller for a firm with $ 10 million in revenues, relative to a firm with $ 1 million in revenues). We could

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[17] In recent years, some appraisers have shifted to using the discounts on stocks in IPOs in the years prior to the offering. The discount is similar in magnitude to the restricted stock discount.

[18] The court case was McCord versus Commissioner. In the case, the taxpayer's expert argued for a discount of 35% based upon the restricted stock studies. The IRS argued for a discount of 7%, on the basis that a big portion of the observed discount in restricted stock and IPO studies reflects factors other than liquidity. The court ultimately decided on an illiquidity discount of 20%.

begin with a fixed discount and adjust it therefore for the specific characteristics of the firm being valued, using these parameters.

b. Rather than view publicly traded companies as liquid and private businesses as illiquid, we could argue that all investments are illiquid and that the illiquidity in a publicly traded company takes the form of a bid-ask spread. Damodaran (2005) related bid-ask spreads at publicly traded companies to firm-specific variables (including revenues, profitability and trading volume) in a regression, and then extended this regression to estimate a "synthetic" bid-ask spread at private businesses; that spread can be used as an illiquidity discount.

c. An interesting twist on liquidity is to the holders of liquid assets have the option to sell at the prevailing market price and the lack of liquidity represents the loss of that option.

Adjusting Discount Rates

The third approach for incorporating illiquidity into value is to use a higher discount rate for illiquid assets than for otherwise similar liquid assets. The practical question, of course, is how much higher? There are three possible ways to answer this question:

a. Look at publicly traded assets that are relatively illiquid, and back out the illiquidity effect from what people are willing to pay for them. To provide a very simple illustration, assume that you have two publicly traded assets with expected cash flows of $ 10 million a year in perpetuity. Assume further that the first asset is very liquid and trades at a price of $ 100 and that the second asset is relatively illiquid and trades at a price of $ 90. The implied return on the first asset is 10% and on the second is 11.11%, and the difference of 1.11% is the additional premium for illiquidity.

b. Take the difference in past returns on liquid asset classes (such as large market cap stocks) and illiquid asset classes (such as private equity investments in large companies) and use that difference as an illiquidity premium. We are assuming that everything else is constant across the two asset classes, and to the extent that this is not true, we may be capturing other factors when we compute the difference.

If we decide to adjust discount rates for illiquidity, we should not be discounting the end-value, since that would be double counting.

Illustration 9.9: Estimating the effect of illiquidity on equity value – Healthy Meals

The equity investment in Healthy Meals, as a privately owned restaurant, with no aspirations to go public, is clearly illiquid. To consider the effect on illiquidity on equity value, we draw on the discounted cash flow valuation of $632,212 that we estimated for the restaurant in illustration 9.5. Subtracting out the bank debt of $ 50,000 yields a value for the equity, prior to adjusting for illiquidity, of $582,212. Table 9.22 summarizes the effect on value of using the various approaches listed in the last section:

Table 9.22: Valuing Equity in Healthy Meals – Illiquidity Effect

Approach	*Estimated Discount*	*Liquidity Adjusted Value*
Fixed Discount- Restricted Stock Studies	25.00%	$436,659
25% Base Discount for $ 10 million company + 2% added on since revenues are only $ 1 million.	27.00%	$425,015
Synthetic Spread (using bid-ask spread regression)	22.55%	$450,923
Cost of capital increased by 2% (from 14.84% to 16.84%) to reflect illiquidity		$493,544

While we should also consider the effect of illiquidity on the equity value in Secure Mail, it should be far smaller for two reasons. The first is that the expected revenues for the firm become large (in the hundreds of millions) soon, which should lead to a lower discount. The second is that the potential for a public offering (planned in year 10) provides for a easier exit for investors.

Relative Valuation

The essence of relative valuation is that you value a firm, based upon how much the market is paying for similar firms. This premise is clearly more challenging with young firms that often have little to show in terms of operations and are private businesses. Notwithstanding these problems, analysts have tried to extend the relative valuation practices that have been developed for public companies into the private business space. In general, the biggest area of difference across analysts who value private businesses lies in where they go to get the comparable firms. Some analysts focus

on transaction prices paid for other private businesses, arguing that these businesses are likely to have more in common with the young business being valued. Other analysts, distrustful of private transaction prices, draw on the market prices of publicly traded companies in the same business, and try to adjust for differences in fundamentals.

Private transaction multiples

Since we are valuing a young, private business, it seems logical that we should look at what others have paid for similar businesses in the recent past. That is effectively the foundation on which private transaction multiples are based. In theory, at least, we pull together a dataset of other young, private businesses, similar to the one that we are valuing (same business, similar size and at the same stage in the life cycle), that have been bought/sold and the transaction values. We then scale these values to a common variable (revenues, earnings or something even sector specific) and compute a typical multiple that acquirers have been willing to pay. Applying this multiple to the same variable for the company being valued should yield an estimated value for the company.

Potential problems

While the biggest problem used to be the absence of organized databases of private business transactions, that is no longer the case. Many private services offer databases (for a price) that contain this data, but other problems remain:[19]

a. Arms length transactions: One of the perils of using prices from private transactions is that some of them are not arms length transactions, where a the price reflects just the business being sold. In effect, the price includes other services and side factors that may be specific to the transaction. Thus, a doctor selling a medical practice may get a higher price because he agrees to stay on for a period of time after the transaction to ease the transition.
b. Timing differences: Private business transactions are infrequent and reflect the fact that the same private business will not be bought and sold dozens of time during a particular period. Unlike public firms, where the current price can be used to compute the multiples for all firms at the same point in time, private

[19] BIZCOMPS, IBA Market Data and Pratt Stats all provide transaction data for private businesses.

transactions are often staggered across time. A database of private transactions can therefore include transactions from June 2008 and December 2008, a period when the public markets lost almost 45% of their value.

c. Scaling variable: To compare firms of different scale, we generally divide the market price by a standardizing variable. With publicly traded firms, this can take the form of revenues (Price/Sales, EV/Sales, earnings (PE, EV/EBITDA) or book value. While we could technically do the same with private transactions, there are two potential roadblocks. The first is that young firms have little to show in terms of current revenues and earnings, and what they do show may not be a good indication of their ultimate potential. The second is that there are broad differences in accounting standards across private businesses and these differences can result in bottom lines that are not quite equivalent.

d. Non-standardized equity: As we noted in the last section, equity claims in young, private businesses can vary widely in terms of cash flow, control claims and illiquidity. The transaction price for equity in a private business will reflect the claims that are embedded in the equity in that business and may not easily generalize to equity in another firm with different characteristics.

e. Non-US firms: Most of the transaction databases that are available and accessible today are databases of transactions of private businesses in the United States. As we are called upon increasingly to value young businesses in other markets, some of which are riskier, emerging markets, it is not clear how or even whether this data can be used in that context.

Usefulness and best practices

So, when is it appropriate to use private transaction data to value a young, private business? As a general rule, this approach works best for small businesses that plan to stay small and private, rather than expand their reach and perhaps go public. It also helps if the firm being valued is in a business, where there are not only a large number of other private businesses but also where transactions are common. For instance, this approach should work well for valuing a medical/dental practice or a small, retail business. It will get more difficult to apply for firms that are in unique or unusual businesses.

If we decide to employ private company transactions to value a young business, there are some general practices that can help to deliver more dependable valuations:

a. Scale to variables that are less affected by discretionary choices: As a counter to the problem of wide differences in accounting and operating standards across private companies, we can focus on variables where discretionary choice matters less. For instance, multiples of revenues (which are more difficult to fudge or manipulate) should be preferred to multiples of earnings. We could even scale value to units specific to the business being valued – number of patients for a general medical practice or the number of customers for a plumbing business.
b. Value businesses, not equity: We classify multiples into equity multiples (where equity value is scaled to equity earnings or book value) and enterprise value multiples (where the value of the business is scaled to operating earnings, cash flows or the book value of capital). Given the wide differences in equity claims and the use of debt across private businesses, it is better to focus on enterprise value multiples rather than equity multiples. In other words, it is better to value the entire business and then work out the value of equity than it is to value equity directly.
c. Start with a large dataset: Since transactions with private businesses are infrequent, it is best to start with a large dataset of companies and collect all transaction data. This will then allow us to screen the data for transactions that look suspicious (and are thus likely to fail the arms length test).
d. Adjust for timing differences: Even with large datasets of private transactions, there will timing differences across transactions. While this is not an issue in a period where markets are stable, we should make adjustments to the value (even if they are crude) to account for the timing differences. For instance, using June 2008 and December 2008 as the transaction dates, we would reduce the transaction prices from June 2008 by the drop in the public market (a small cap index like the Russell 5000 dropped by about 40% over that period) to make the prices comparable.
e. Focus on differences in fundamentals: The notion that the value of a business depends on its fundamentals – growth, cash flows and risk – cannot be abandoned

just because we are doing relative valuation. The estimated value is likely to be more reliable if we can collect other measures of the transacted private businesses that reflect these fundamentals. For instance, it would be useful to obtain not only the transaction prices of private businesses but also the growth in revenues recorded in these businesses in the period prior to the transactions and the age of the business (to reflect maturity and risk). We can explore the data to see if there is a relationship between transaction value and these variables, and if there is one, to build it into the valuation.

Illustration 9.9: Valuing Healthy Meals with Private transaction Multiples

As a small restaurant, with no aspirations to go public or become larger, Healthy Meals is a good candidate for the use of private transaction multiples, especially because there are a large number of privately owned restaurants that are bought and sold each year. Using data from BIZCOMPS, a widely used database of private company transactions, we did the following:

a. Extracted valuation information on all transactions involving privately owned restaurants in the United States in 2008, in conjunction with key operating data (revenues and operating income).
b. Made approximate adjustments to the valuations prior to September 2008 to bring them in line with the market crisis; the transaction values from prior to September 2008 were reduced to reflect the drop in the Russell 5000 since.
c. Computed the value as a multiple of revenues and operating cash flow and income (EBITDA and operating income) on each transaction.
d. Generated distributions of the three multiples – EV to revenues, EV to EBITDA and EV to Operating income – across all restaurant transactions. The top and bottom 10% of the distribution were discarded because they were most likely to contain non arms-length transactions.
e. With the remaining data, we computed the median, mean and standard deviation in each multiple. Since the revenue multiple had the least volatility, we decided to stick with that in assessing the value of Healthy Meals.

Multiple	*Average*	*Standard Deviation*	*Median*
EV/ EBIT	5.15	1.56	4.75

EV/ EBITDA	3.91	1.35	3.65
EV/ Revenues	0.52	0.22	0.45

f. The transaction revenue multiple was regressed against restaurant size (measured in revenues) and profitability (measured with an operating margin) to arrive at the following equation:

   EV/ Sales = 0.25 -0.10 (Annual revenues, in thousands) + 0.20 (Operating Margin)

Plugging in values for Healthy Meals into the regression, we obtain the following estimates of value for the restaurant in year 1 and year 5:

In year	EV/Sales Ratio	Estimated value for restaurant
1		
5		

Note that the value of the restaurant will be dramatically higher in year 5, once it has become established, than in year 1, when it still struggling to get a foothold.

Public multiples

It is far easier to obtain timely data on pricing and multiples for publicly traded firms. In fact, for those analysts who do not have access to private transaction data, this is the only option when it comes to relative valuation. The peril, though, is that we are extending the pricing lessons that we learn from looking at more mature, publicly traded firms to a young, private business.

Problems

The issues we face in applying public market multiples to private businesses, especially early in the life cycle, are fairly obvious:

a. Life cycle affects fundamentals: If we accept the premise that only those young firms that make it through the early phase of the life cycle and succeed are likely to go public, we also have to accept the reality that public firms will have different fundamentals than private firms. Generally, public firms will be larger, have less potential for growth and have more established markets than private businesses, and these differences will manifest themselves in the multiples investors pay for public companies.

b. Survival: A related point is that there is a high probability of failure in young firms. However, this probability of failure should decrease as firms establish their product offerings and those firms that go public should have a greater chance of surviving than younger private firms. The former should therefore trade at higher market values, for any given variable such as revenues, earnings or book value, holding all else (growth and risk) constant.
c. Diversified versus undiversified investors: When we discussed estimating risk and discount rates for young, private businesses, we noted the different perspectives on risk that diversified investors in public companies have, relative to equity investors in private businesses, and how that difference can manifest itself as higher costs of equity for the latter. When we use multiples of earnings or revenues, obtained from a sample of publicly traded firms with diversified investors, to value a private business with undiversified investors, we will over value the latter.
d. Scaling variable: Assuming that we are able to obtain a reasonable multiple of revenues or earnings from our public company dataset, we face one final problem. Young firms often have very little revenues to show in the current year and many will be losing money; the book value is usually meaningless. Applying a multiple to any one of these measures will result in strange valuations.
e. Liquidity: Since equity in publicly traded companies is more liquid than equity in private businesses, the value obtained by using public multiples will be too high if used for a private business. Just as we had to adjust for illiquidity in intrinsic valuation, we have to adjust for illiquidity with relative valuation.

Usefulness and Best practices

What types of private businesses are best valued using public company multiples? Generally, young companies that aspire to not only reach a larger market and either go public or be acquired by a public company are much better candidates for this practice. In effect, we are valuing the company for what it wants to be, rather than what it is today.

There are simple practices that can not only prevent egregious valuation errors but also lead to better valuations:

a. Use forward revenues/ earnings: One of the problems we noted with using multiples on young companies is that the current operations of the company do not provide much in terms of tangible results: revenues are very small and earnings are negative. One solution is to forecast the operating results of the firm further down the life cycle and use these forward revenues and earnings as the basis for valuation. In effect, we will estimate the value of the business in five years, using revenues or earnings from that point in time.
b. Adjust the multiple for your firm's characteristics at time of valuation: If we are valuing the firm five years down the road, we have to estimate a multiple that is appropriate for the firm at that point in time, rather than today. Consider a simple illustration. Assume that you have a company that is expected to generate a compounded revenue growth of 50% a year for the next five years, as it scales from being a very small firm to a more established enterprise. Assume that revenue growth after year 5 will drop to a more moderate compounded annual rate of 10%. The multiple that we apply to revenues or earnings in year 5 should reflect an expected growth rate of 10% (and not 50%).
c. Adjust for survival: When we estimated the intrinsic value for young firms, we allowed for the possibility of failure by adjusting the value for the probability that the firm would not make it. We should stick with that principle, since the value based upon future revenues/ earnings is implicitly based upon the assumption that the firm survives and succeeds.
d. Adjust for non-diversification: The value estimated for the firm or equity, based upon future earnings and revenues, has to be discounted back to the present to arrive at the value today. By using the techniques that we developed for adjusting the beta and cost of equity for private businesses in the intrinsic value section, we can discount for the forecasted future value of the business by a high enough rate, to reflect the non-diversification of equity investors today. In effect, we are assuming that he firm will go public in the future year (where the multiple is applied) and that the non-diversification issue will dissipate.
e. Adjust for illiquidity: In the last section on intrinsic valuation, we presented different ways of estimating illiquidity discounts for equity in private businesses.

We could adopt the same techniques to adjust the public multiple value for illiquidity.

Illustration 9.10: Valuing Secure Mail – Relative Valuation

We will use publicly traded firms as comparable firms in the relative valuation of Secure Mail because:

(a) It aspires to become a much larger firm and eventually go public

(b) There are very few transactions involving young, private software companies

In coming up with a sample of comparable firms, we initially looked at only the three anti-virus firms that we used in the venture capital approach – Symantec, McAfee and Trend Micro – but decided that we could not base a valuation on a sample this small. Consequently, we expanded our sample to include publicly traded software companies with a market capitalization less than $ 100 million and regressed the ratio of enterprise value to sales at these companies against three variables - the beta (as a measure of risk), the expected growth in revenues over the next 5 years (to capture growth differences) and the return on capital (as a measure of the quality of growth).

EV/Sales = 0.33 – 0.6 (Beta) + 7.6 (Revenue Growth) + 5.3 (Return on capital)

We then applied this regression to get a predicted EV/Sales ratio for Secure Mail in year 5, using the following inputs as independent variables – the total beta in year 5 for the firm (1.60), the expected growth rate in revenues from years 6-10 (which is 21.2%, from the forecasts in table 9.7) and the return on capital in year 5 (estimated to be 13.31% in year 5, from table 9.10).

$$\text{Predicted EV/Sales}_{\text{Secure Mail, Year 5}} = 0.33 - 0.6\,(1.6) + 7.6\,(0.212) + 5.3\,(0.1331) = 1.7466$$

Applying this multiple to revenues of $686 million in year 5, we obtain a value for the firm of $ 1,198 million in year 5. We make three adjustments to get to value of equity today:

a. We adjust for the probability that the firm will fail before the fifth year (40%) and arrive at an expected value.

   Expected Value = Estimated Value in year 5 (1- Probability of failure)

   = 1,198 (1-.40) = $561.56 million

b. We discount the estimated value in year 5 back to today, using the higher costs of equity that we estimated in the intrinsic valuation for years 1-5.

$$\text{Value today} = \frac{561.56}{(1.19)^2\ (1.16)^2\ 1.12} = \$338.93 \text{ million}$$

Adding today's cash balance of $ 5 million to this number will yield an equity value of $ 343.93 million. It is higher than the intrinsic value estimate of $111.54 that we obtained earlier (see illustration 9.8), partly because we are ignoring the possibility of negative cash flows from years 1 through 5.

c. Both the intrinsic value and the relative value may need to be adjusted for the illiquidity faced by equity investors for the next 10 years. As we argued in the last section, the illiquidity discount should be much smaller for Secure Mail. Using an illiquidity discount of 10%, we arrive at liquidity-adjusted values of $305 million with the relative valuation and $ 100 million with the intrinsic valuation.

Real Options

The option to expand into new businesses can sometimes result in a premium being attached to intrinsic value. With young companies, this real options argument will sometimes have resonance and we will explore its applicability in this section.

The option to expand in young companies

In both discounted cash flow and relative valuation, we build in our expectations of what success for a young firm will look like in terms of revenues and earnings. Thus, it can be argued that the potential upside is already reflected in the value. The counter to this argument is that success in one business or market can sometimes be a stepping-stone to success in other businesses/markets:

a. <u>New products</u>: Success with an existing product or service can sometimes provide an opening for a firm to introduce a new product. A classic example would be Microsoft building off the operating system (MSDOS and Windows) it developed for the PC to produce Microsoft Office, an immensely profitable addition to its product line. Apple's introduction of the iPhone to take advantage of the customer base that it had developed with the iPod would be another example. While neither new product (MS Office and the iPhone) could have been predicted at the time of

the original product's introduction, the success of the initial product was clearly the launching pad for these offerings.

b. New markets: In some cases, companies that succeed with a product in one market may be able to expand into other markets, with similar success. The most obvious example of this is expanding into foreign markets to build on domestic market success, a pathway adopted by companies like Coca Cola, McDonalds and many retail companies. The more subtle examples are products that are directed at one market that serendipitously find new markets: an ulcer drug that reduces cholesterol would be a good example.

Why cannot we build expectations about new products and new markets into our cash flows and value? We can try, but there are two problems. The first is that our forecasts about these potential product and market extensions will be very hazy at the time of the initial valuation and the cash flows will reflect this uncertainty. In other words, neither Microsoft nor Apple would have been able to visualize the potential markets for Microsoft Office or the iPhone at the time that they were introducing MSDOS or the iPod. The second is that it is the information gleaned and the lessons learned during the initial product launch and subsequent development that allows firms to take full advantage of the follow-up offerings. It is this learning and adaptive behavior that gives rise to the option value.

Valuing the option to expand in young companies

Given that we are valuing the option to expand today, when the uncertainties are greatest, how can we about go about estimating a value? There are four steps involved in putting a number (and a premium) to real options.

1. Estimate the expected value and the cost of going ahead with the expansion option today: The process of valuing real options begins with a fairly counter intuitive first step, which is to determine what the present value of the expected cash flows would be, if we expanded into the new product today, and the cost of that expansion. In other words, this would have required Apple to consider the possibility and the potential cash flows from introducing the iPhone at the time that they were introducing the iPod. Many analysts will resist making these

estimates, arguing that they know too little about the potential product and market, but that is precisely where the option value is derived.

2. Assess the uncertainty in the estimated value of the expansion option: In the second step in the process, we not only confront the inherent uncertainty in the process but also try to measure this uncertainty, in the form of a standard deviation in the value of the cash flows. There are two ways in which we can do this. The first is to fall back on a market based measure: the standard deviation of publicly traded firms in the business could be used as a proxy. The other is to run simulations on the expansion investment and derive a standard deviation in the value of the expected cash flow, across simulations.
3. Determine the point in time, where the firm will have to make the expansion choice: The option to expand into new markets and products cannot be open ended. Practically speaking, there has to be a time period, by which the firm either has to decide to expand or abandon that option. In some cases, this time period may be a function of specified factors – a patent expiring or a license renewal – and in others it may be self-imposed.
4. Value the option to expand: The inputs to value the option are now in place, with the following pieces going into value. The present value of the expected cash flows from expansion, assuming we expand now, becomes the value of the underlying asset and the cost of expansion today becomes the strike price. The standard deviation in value is the volatility in the underlying assets and the life of the option is the point in time by which the expansion decision has to be made. In theory, binomial option pricing models should work better at pricing real options, because they allow for early exercise, but the traditional Black Scholes model provides reasonable approximations for most real options.

Limits

The argument that we use to justify a real option premium, i.e., that what we learn from existing products and markets can be used to add value down the road by expanding into new products and markets can be made for any young firm. There is, however, a key test that has to be met before we assess a value for the option to expand and augment our

traditional estimates of value, and that is the test of exclusivity. In other words, the learning and adaptive behavior has to restricted to the firm in question and not be open to the rest of the market.

Consider, for instance, the two examples that we used to illustrate the real options argument in the first part of this section. Microsoft's exclusivity in developing Office arose from its control of the operating system; thus, it had a significant advantage over the competition (Lotus, WordPerfect etc.) when developing its software. Apple's exclusivity came from a brand name that it developed for innovation and coolness with the iPod and both were critical components in the adoption of the iPhone.

The allure of the real options argument is the premium that you can add on to traditional discounted cash flow valuation and there are clearly who push this the use of this argument to itslogical limit and beyond. Thus, we see some analysts arguing that discounted cash flow valuations under value all young companies and that we should be adding option premiums to all of them. Other analysts mistake opportunities for options, using the real options argument to add premiums on to any company that has high growth potential, from technology companies in growing markets (software and alternative energy, for example) to small companies in large, emerging markets (Indian and Chinese companies). In the process, they often double count the value of growth, once through the expected cash flows in discounted cash flow valuation, and again when they add the premium. While real options are a powerful and effective tool for assessing value, they have to be used selectively only in those cases where the expected expansion opportunities cannot be adequately captured in the expected cash flows and where the company in question has significant competitive advantages over the competition.

Illustration 9.10: Valuing the option to expand into database systems– Secure Mail

While we have valued Secure Mail, based on the potential cash flows from its anti-virus software program, there is the possibility that the company could use the customer base that it develops for the anti-virus software and the technology on which the software is based to create a database software program sometime in the next 5 years.

- It will cost Secure Mail about $500 million to develop a new database program, if they decided to do it today.

- Based upon the information that Secure Mail has right now on the market for a database program, the company can expect to generate about $ 40 million a year in after-tax cashflows for ten years. The cost of capital for private companies that provide database software is 12%.
- The annualized standard deviation in firm value at publicly traded database companies is 50%.
- The five-year treasury bond rate is 3%.

To value the expansion option, we used the information to derive the option inputs:

S = Value of the underlying asset

= PV of expected cash flows from entering the database software market today

$$= \frac{40\ (1 - \frac{1}{(1.12)^{10}})}{0.12} = \$226 \text{ million}$$

K = Exercise price = Cost of entering the database software market = $ 500 million

t = Life of the option = Period over which expansion opportunity exists = 5 years

s = Standard deviation of underlying asset = 50%

r = Riskless rate = 3%

Inputting these numbers into the Black-Scholes model, we obtain the following:[20]

Value of call $= S\ N(d1) - K\ e^{-rt}\ N(d2)$

$= 226\ (0.4932) - 500\ e^{-(.03)\ (5)}(0.1282) = \$56.30$ million

Note that the numbers would not justify developing the database program today – the present value of the expected cash flows ($226 million) is well below the cost. However, Secure Mail has two factors in its favor. The first is that it can refine its assessments of the market, based upon how its anti-virus program performs. The second is that it can adapt the database program, based upon the information it collects, to increase the potential market and cash flows.

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[20] The values that we derive for d1 and d2 are as follows:

$$d_1 = \frac{\ln\left(\frac{226}{500}\right) + \left(0.03 + \frac{(0.50)^2}{2}\right)(5)}{0.50\ \sqrt{5}} = 0.0171$$

$$d_2 = 0\ .0171 - \ 0.50\sqrt{5} = -1.1351$$

If we accept this value for the expansion option, we should add it to the value that we derived for Secure Mail earlier in the intrinsic valuation of $111.54 million. We would justify the use of the option pricing model in this case by arguing that Secure Mail derives its exclusivity from its proprietary technology and access to customer lists (from its anti-virus program).

Conclusion

There can be no denying the fact that young companies pose the most difficult estimation challenges in valuation. A combination of factors – short and not very informative histories, operating losses and the possibility that high probability of failure – all feed into valuation practices that try to avoid dealing with the uncertainty by using a combination of forward multiples and arbitrarily high discount rates.

In this paper, we have laid out processes that can be used to apply conventional valuation models to young companies. While these approaches require us to estimate inputs that are often difficult to nail down, they are still useful insofar as they force us to confront the sources of uncertainty, learn more about them and make our best estimates. While we may be tempted to add premiums to these values for potential opportunities that we see in the future, the use of real option premiums should be limited to those companies that have some degree of exclusivity in exploiting these opportunities.