CHAPTER 23

Valuing Young or Start-Up Firms

Many of the firms that we have valued in this book are publicly traded firms with established operations. But what about young firms that have just ~~started operations~~? There are many analysts who argue that these firms cannot be valued because they have no history and in some cases no products or services to sell. This chapter will present a dissenting point of view. While conceding that valuing young firms is more difficult to do than valuing established firms, we will argue that the fundamentals of valuation do not change. The value of a young start-up firm is the present value of the expected cash flows from its operations, though estimates of these expected cash flows may require us to go outside our normal sources of information~~, which include historical financial statements and the valuation of comparable firms~~.

INFORMATION CONSTRAINTS

When valuing a firm, you draw on information from three sources. The first is the current financial statements for the firm. You use these to determine how profitable a firm's investments are or have been, how much it reinvests back to generate future growth and for all of the inputs that are required in any valuation. The second is the past history of the firm, in terms of both earnings and market prices. A firm's earnings and revenue history over time let you make judgments on how cyclical a firm's business has been and how much growth it has shown, while a firm's price history can help you measure its risk. Finally, you can look at the firm's competitors or peer group to get a measure of how much better or worse a firm is than its competition, and also to estimate key inputs on risk, growth, and cash flows.

While you would optimally like to have substantial information from all three sources, you may often have to substitute more of one type of information for less of the other if you have no choice. Thus the fact that there exists 75 years or more of history on each of the large automakers in the United States compensates for the fact that there are only ~~three of~~ them. In contrast, there may be only a few years of information on Abercombie and Fitch, but the firm is in a sector (specialty retailing) where there are more than 200 comparable firms. The ease with which you can obtain industry averages and the precision of these averages compensate for the lack of history at the firm.

There are some firms, especially in new sectors of the economy, where you might run into information problems. First, these firms usually have not been in existence for more than a year or two, leading to a very limited history. Second, their current financial statements reveal very little about the component of their

assets—expected growth—that contributes the most to their value. Third, these firms often represent the first of their kind of business. In many cases, there are no competitors or a peer group against which they can be measured. When valuing these firms, therefore, you may find yourself constrained on all three counts when it comes to information. How have investors responded to this absence of information? Some have decided that these stocks cannot be valued and should not therefore be held in a portfolio. Others have argued that while these stocks cannot be valued with traditional models, the fault lies in the models. They have come up with new and inventive ways, based on the limited information available, of justifying the prices paid for them. We will argue in this chapter that discounted cash flow models can be used to value these firms.

NEW PARADIGMS OR OLD PRINCIPLES: A LIFE CYCLE PERSPECTIVE

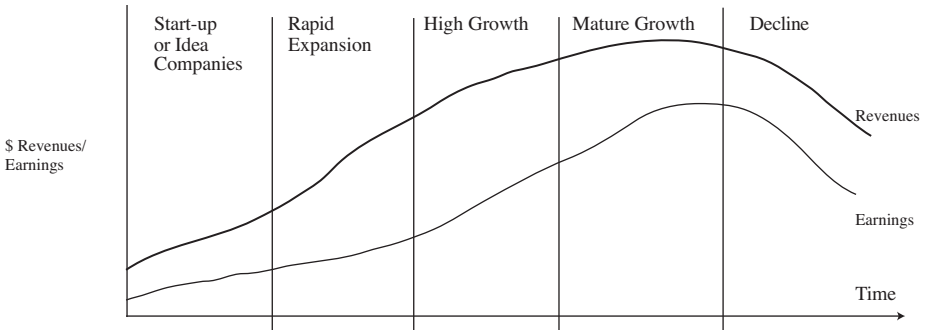
The value of a firm is based on its capacity to generate cash flows and the uncertainty associated with these cash flows. Generally speaking, more profitable firms have been valued more highly than less profitable ones. However, young start-up firms often lose money but still sometimes have high values attached to them. This seems to contradict the proposition about value and profitability going hand in hand. There seems to be, at least from the outside, one more key difference between young start-up firms and other firms in the market. A young firm does not have significant investments in land, buildings, or other fixed assets, and seems to derive the bulk of its value from intangible assets.

The negative earnings and the presence of intangible assets are used by analysts as a rationale for abandoning traditional valuation models and developing new ways that can be used to justify investing in young firms. For instance, as noted in Chapter 20, Internet companies in their infancy ~~have been~~ compared based on their value per site visitor, computed by dividing the market value of a firm by the number of visitors to the web site. Implicit in these comparisons ~~are~~ the assumptions that more visitors to your site translate into higher revenues, which, in turn, ~~will~~ lead to greater profits in the future. All too often, though, these assumptions ~~are~~ neither made explicit nor tested, leading to unrealistic valuations.

This search for new paradigms is misguided. The problem with young firms is not that they lose money, have no history, or do not have substantial tangible assets. It is that they are far earlier in their life cycles than established firms, and often have to be valued before they have an established market for their products. In fact, in some cases, the firms being valued have an interesting idea that could be a commercial success but has not been tested yet. The problem, however, is not a conceptual problem but one of estimation. The value of a firm is still the present value of the expected cash flows from its assets, but those cash flows are likely to be much more difficult to estimate.

Figure 23.1 offers a view of the life cycle of the firm and how the availability of information and the source of value changes over that life cycle:

- *Start-up*. This represents the initial stage after a business has been formed. The product is generally still untested and does not have an established market. The firm has little in terms of current operations, no operating history, and no



	Start-up or Idea Companies	Rapid Expansion	High Growth	Mature Growth	Decline
Revenues/Current Operations	Nonexistent or low revenues; negative operating income	Revenues increasing; income still low or negative	Revenues in high growth; operating income also growing	Revenue growth slows; operating income still growing	Revenue and operating income growth drops off
Operating History	None	Very limited	Some operating history	Operating history can be used in valuation	Substantial operating history
Comparable Firms	None	Some, but in same stage of growth	More comparables, at different stages	Large number of comparables, at different stages	Declining number of comparables, mostly mature
Source of Value	Entirely future growth	Mostly future growth	Portion from existing assets; growth still dominates	More from existing assets than growth	Entirely from existing assets

FIGURE 23.1 Valuation Issues across the Life Cycle

comparable firms. The value of this firm rests entirely on its future growth potential. Valuation poses the most challenges at this firm, since there is little useful information to go on. The inputs have to be estimated and are likely to have considerable error associated with them. The estimates of future growth are often based on assessments of the competence of existing managers and their capacity to convert a promising idea into commercial success. This is often the reason why firms in this phase try to hire managers with a successful track record in converting ideas into dollars, because it gives them credibility in the eyes of ~~financial backers~~.

- *Expansion.* Once a firm succeeds in attracting customers and establishing a presence in the market, its revenues increase rapidly, though it still might be reporting losses. The current operations of the firm provide useful clues on pricing, margins, and expected growth, but current margins cannot be projected into the future. The operating history of the firm is still limited, and shows large changes from period to period. Other firms generally are in operation, but usually are at the same stage of growth as the firm being valued. Most of the value for this firm also comes from its expected growth. Valuation becomes a little simpler at this stage, but the information is still limited and unreliable, and the inputs to the valuation model are likely to be shifting substantially over time.

- *High growth*. While the firm's revenues are growing rapidly at this stage, earnings are likely to lag behind revenues. At this stage, both the current operations and operating history of the firm contain information that can be used in valuing the firm. The number of comparable firms is generally highest at this stage, and these firms are more diverse in where they are in the life cycle, ranging from small, high-growth competitors to larger, lower-growth competitors. The existing assets of this firm have significant value, but the larger proportion of value still comes from future growth. There is more information available at this stage, and the estimation of inputs becomes more straightforward.
- *Mature growth*. As revenue growth starts leveling off, firms generally find two phenomena occurring. The earnings and cash flows continue to increase rapidly, reflecting past investments, and the need to invest in new projects declines. At this stage in the process, the firm has current operations that are reflective of the future, an operating history that provides substantial information about the firm's markets, and a large number of comparable firms at the same stage in the life cycle. Existing assets contribute as much or more to firm value than expected growth, and the inputs to the valuation are likely to be stable.
- *Decline*. The last stage in this life cycle is decline. Firms in this stage find both revenues and earnings starting to decline, as their businesses mature and new competitors overtake them. Existing investments are likely to continue to produce cash flows, albeit at a declining pace, and the firm has little need for new investments. Thus, the value of the firm depends entirely on existing assets. While the number of comparable firms tends to become smaller at this stage, they are all likely to be either in mature growth or in decline as well. ~~Valuation is easiest at this stage.~~

~~Are the principles that drive valuation different at each stage? No.~~ Valuation is clearly more of a challenge in the earlier stages in a life cycle, and estimates of value are much more likely to contain errors for start-up or high-growth firms. But the payoff to valuation is also likely to be highest with these firms for two reasons. The first is that the absence of information scares many analysts away, and analysts who persist and end up with a valuation, no matter how imprecise, are likely to be rewarded. The second is that these are the firms that are most likely to be coming to the market in the form of initial public offerings and new issues, and need estimates of value.

VENTURE CAPITAL VALUATION

Until very recently, young start-up firms raised additional equity primarily from venture capitalists. It is useful to begin by looking at how venture capitalists assess the value of these firms. While venture capitalists sometimes use discounted cash flow models to value firms, they are much more likely to value private businesses using what is called the venture capital method. Here, the earnings of the private firm are forecast in a future year, when the company can be expected to go public. These earnings, in conjunction with an earnings multiple that is estimated by looking at publicly traded firms in the same business, are used to assess

the value of the firm at the time of the initial public offering; this is called the exit or terminal value.

For instance, assume that you are valuing InfoSoft, a small software firm, that is expected to have an initial public offering in three years, and that the net income in ~~three years~~ for the firm is expected to be $4 million. If the price-earnings ratio of publicly traded software firms is 25, this would yield an estimated exit value of $100 million. This value is discounted back to the present at what venture capitalists call a target rate of return, which measures what venture capitalists believe is a justifiable return, given the risk that they are exposed to. This target rate of return is usually set at a much higher level than the ~~traditional~~ cost of equity for the firm.[1]

$$\text{Discounted terminal value} = \text{Estimated exit value}/(1 + \text{Target return})^n$$

Using the InfoSoft example again, if the venture capitalist requires a target return of 30 percent on his or her investment, the discounted terminal value for InfoSoft would be:

$$\text{Discounted terminal value for InfoSoft} = \$100 \text{ million}/1.30^3 = \$45.52 \text{ million}$$

So, how do venture capitalists come up with target rates of return and why are they so high? It is possible that there are some venture capitalists who have developed sophisticated risk-return models that yield target returns, but for the most part, the target returns represent a mix of judgment, historical experience, and guesswork. As for why they are so high, it is a combination of three factors:

1. Young and start-up firms are more exposed to macroeconomic risk than the rest of the market. In CAPM terms, they should command high betas.
2. Venture capitalists are often sector-focused and not diversified. Consequently, they demand a premium for firm-specific risk that can be diversified away.
3. Many young, start-up companies don't make it, and the target rate of return incorporates the risk of failure.

~~Investors valuing young, start-up firms have to be wary of using these target returns in their valuations of publicly traded companies. They cannot demand premiums for nondiversification, since they can easily diversify and the risk of failure may drop off, once a company goes public.~~

The venture capital approach is also exposed to another problem. To the extent that exit multiples are based on how comparable firms are priced today, they can result in serious misevaluations if the market is wrong. For instance, venture capitalists who valued Internet firms in 2000 on the assumption that they would be able to sell these firms at 80 times revenues (which was what the market was pricing small, publicly traded Internet firms at that time) would have overestimated the value of these firms.

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[1]In ~~1999~~, for instance, the target rate of return for ~~private equity investors was in excess of 30 percent~~.

VENTURE CAPITAL, PRIVATE EQUITY, AND DIVERSIFICATION

Venture capitalists historically have been sector focused—they tend to concentrate their investments in one or two industries. Part of the reason for this is that the demand for venture capital tends to be concentrated in a few sectors at any point in time—new technology stocks in the late 1990s, biotechnology stocks in the late 1980s—and part of the reason is that venture capitalists draw on their knowledge of the industry both to value firms that ask for equity capital and to help in the management of these firms.

There is a cost to not being diversified, however, and it affects how these companies get valued in the first place. The cost of equity in a firm to a diversified investor will be lower than the cost of equity in the same firm to an undiversified investor, and this will result in a lower value being assigned to the firm by the latter.

In recent years, private equity investors have emerged as competition for traditional venture capitalists. Since these investors tend to be more diversified, they can settle for lower costs of equity and thus will attach a much higher value for the same private firm. In the long term, will private equity funds drive out venture capitalists? As long as localized knowledge about an industry matters in valuing firms in that industry, we do not believe so.

GENERAL FRAMEWORK FOR ANALYSIS

To value firms with negative earnings, little or no historical data, and few comparables, the steps involved are essentially the same as in any valuation. This section will look at some of the issues that are likely to come up at each step when valuing young companies.

Step 1: Assess the Firm's Current Standing: The Importance of Updated Information

It is conventional, when valuing firms, to use data from the most recent financial year to obtain the current year's inputs. For firms with negative earnings and high growth in revenues, the numbers tend to change dramatically from period to period. Consequently, it makes more sense to look at the most recent information that one can obtain, at least on revenues and earnings. Using the revenues and earnings from the trailing 12 months, for instance, will provide a much better estimate of value than using earnings from the last financial year. It is true that some items, such as operating leases and options outstanding, may not be updated as frequently. Even so, we would argue for using estimates for these inputs[2] and valuing firms with more recent data.

[2]One simple approach is to scale all of the inputs to reflect the growth in revenues that has occurred between the last financial year and the trailing 12 months.

Step 2: Estimate Revenue Growth

Young firms tend to have fairly small amounts of revenues, but the expectation is that these revenues will grow at a substantial rate in the future. Not surprisingly, this is a key input in these valuations, and we would suggest drawing on a number of sources.

- *Past growth rate in revenues at the firm itself*. Since the firm increases in scale as it grows, it will become more and more difficult to maintain very high growth rates. Thus, a firm that grew 300 percent two years ago and 200 percent last year is likely to grow at a lower rate this year.
- *Growth rate in the overall market that the firm serves*. It is far easier for firms to maintain high growth rates in markets that are themselves growing at high rates than it is for them to do so in stable markets.
- *Barriers to entry and competitive advantage possessed by the firm*. For a firm to be able to sustain high growth rates, it has to have some sustainable competitive advantage. This may come from legal protection (as is the case with a patent), a superior product or service, or a brand name, or from being the first mover into a market. If the competitive advantage looks sustainable, high growth is much more likely to last for a long period. If it is not, it will taper off much faster.

We looked at the process of estimating revenue growth in more detail in Chapter 11.

ILLUSTRATION 23.1: Revenue Growth Rates—Tesla Motors

Tesla Motors had only $117 million in revenues in 2010, but that was a jump from $15 million in revenues in 2008. The firm is still working on creating commercially viable electric cars, but the potential market is ~~very~~ large, and we foresee strong growth going into the future. The following table summarizes the expected revenue growth rates and revenues each year for the next 10 years and for a terminal year (year 11):

	Revenue Growth Rate	*$ Revenues*
Current		$ 117
1	150.00%	$ 292
2	100.00%	$ 584
3	80.00%	$1,051
4	60.00%	$1,681
5	40.00%	$2,354
6	30.00%	$3,060
7	20.00%	$3,672
8	15.00%	$4,222
9	10.00%	$4,645
10	5.00%	$4,877
Terminal year (11)	3.50%	$5,047

Note that even with the high growth rate, the projected revenues of $5.05 billion in year 11 will still make Tesla only a small automobile firm; in contrast, Ford had revenues of $129 billion, and Volvo had revenues of $38 billion in 2010.

In estimating revenue growth rates by year, we started with what we visualize as revenues for a successful Tesla Motors ($5 billion in 11 years) and work backwards to estimate revenue growth rates in the earlier years, following two simple principles. The first is that revenue growth in the earlier years can be tied to revenue growth rates in the recent past; Tesla's revenues grew 179% a year from 2008 to 2010. The second is that the revenue growth rate should decrease over time as revenues become larger. Thus, the key numbers to focus on are the starting and ending revenues (in year 11) rather than the year-by-year growth rates. The valuation is very sensitive to the former and is less affected by the latter.

Step 3: Estimate a Sustainable Operating Margin in Stable Growth

For a firm losing money, high revenue growth alone will accomplish little more than make the losses become larger over time. A key component for a young firm to be valuable is the expectation that the operating margin, while negative now, will become positive in the future. In many ways the true test in valuation is being able to visualize what a young, high-growth firm will look like when growth stabilizes. In the absence of comparables, the difficulty of this task is magnified. Again, a few guidelines help:

- *Looking at the underlying business that this firm is in, consider its true competitors.* For instance, while Commerce One is considered to be a B2B or e-commerce firm, it is ultimately a provider of business services and software. At least from the perspective of margins, is seems reasonable to argue that Commerce One's margins will approach those of other business service providers.
- *Deconstruct the firm's current income statement to get a truer measure of its operating margin.* Many young start-up firms that report negative earnings do so not because their operating expenses from generating current revenues are large, but because accounting convention requires them to report capital expenses as operating expenses. Since many of these capital expenses are treated as selling, general, and administrative (SG&A) expenses in income statements, estimating margins and profitability prior to these expenses is a useful exercise in figuring out how profitable a company's products truly are.

ILLUSTRATION 23.2: Estimating Sustainable Margin and Path to Margin: Tesla Motors

Tesla Motors reported an operating loss of $81 million in 2010 on revenues of $117 million, resulting in an operating margin of –69.28%. That is not surprising, though, given that it is making substantial investments in both R&D and infrastructure right now, with expectations of a payoff in the future. To estimate the expected operating margin, once the firm is in steady state, we looked at the average pre-tax operating margin for automotive firms globally in 2010; the average pretax operating margin across these firms was approximately 10% and we will use that value as the target margin.

We will assume that Tesla's operating margin will improve slowly, as revenues pick up, with the table following summarizing our estimates for margins and operating income:

	Revenues	*Operating Margin*	*EBIT*
Current	$ 117	–69.28%	–$ 81
1	$ 292	–42.86%	–$125
2	$ 584	–25.24%	–$147
3	$1,051	–13.49%	–$142
4	$1,681	–5.66%	–$ 95
5	$2,354	–0.44%	$ 10
6	$3,060	3.04%	$ 93
7	$3,672	5.36%	$197
8	$4,222	6.91%	$292
9	$4,645	7.94%	$369
10	$4,877	8.63%	$421
Terminal year	$5,047	10.00%	$505

Tesla's losses are expected to widen over the next few years, and the expected operating income turns positive only in year 6.

To estimate the after-tax operating income, we introduce two inputs. The first is that the marginal tax rate for the firm is assumed to be 40%, the composite tax rate for U.S. companies (including state and local taxes). The second is that Tesla has $141 million in net operating losses (NOLs) accumulated from its years of operations. The losses that the firm is expected to make in the first five years will add to the NOL and reduce the taxable income and taxes in the first few years of profitability. The table following summarizes the expected taxes and after-tax operating income each period:

Year	*Operating Income or Loss*	*NOL at End of Year*	*Taxable Income*	*Taxes*	*Tax Rate*	*EBIT (1–t)*
Current	–$ 81	$141	$ 0	0	0.00%	–$ 81
1	–$125	$266	$ 0	$ 0	0.00%	–$125
2	–$147	$413	$ 0	$ 0	0.00%	–$147
3	–$142	$555	$ 0	$ 0	0.00%	–$142
4	–$ 95	$650	$ 0	$ 0	0.00%	–$ 95
5	–$ 10	$661	$ 0	$ 0	0.00%	–$ 10
6	$ 93	$568	$ 0	$ 0	0.00%	$ 93
7	$197	$371	$ 0	$ 0	0.00%	$197
8	$292	$ 79	$ 0	$ 0	0.00%	$292
9	$369	—	$289	$116	31.40%	$253
10	$421	—	$421	$168	40.00%	$252
Terminal year	~~$504.74~~	0	$505	$202	40.00%	$303

Tesla is not expected to pay its full marginal tax rate until year 10.

Step 4: Estimate Reinvestment to Generate Growth

To grow, firms have to reinvest, and this principle cannot be set aside when you are looking at a young firm. Unlike a mature firm, though, there is likely to be little in the firm's history that will help in determining how much the firm will need to reinvest. As the firm grows, the nature of its reinvestment and the amount reinvested will probably change, and the challenge is to estimate this amount.

Chapter 11 ~~stated that~~ growth in operating income ~~ultimately is a function of~~ how much a firm reinvests and how well it reinvests (measured by the return on capital).

$$\text{Expected growth} = \text{Reinvestment rate} \times \text{Return on capital}$$

In fact, this equation has been used to estimate growth in most of the valuations done so far in this book. However, ~~we also noted~~ that this equation becomes inoperable when operating earnings are negative, which is the position we are in when valuing young firms. In those cases, the growth in revenues must be estimated first, and the reinvestment must be based on the revenue growth. To make this link, we used a sales-capital ratio, that is, a ratio that specifies how many additional dollars of revenue will be generated by each additional dollar of capital:

$$\text{Expected reinvestment} = \text{Expected change in revenue}/(\text{Sales/Capital ratio})$$

For instance, to grow revenues by $1 billion, with a sales-to-capital ratio of 4, would require a reinvestment of $250 million. The key input required for this formulation is the sales-to-capital ratio, and it can be estimated by looking at the firm's history, limited though it might be, and at industry averages, with the industry defined broadly to reflect the business the firm is in.

In steady state, however, the reinvestment needs can be computed using the expected growth rate and the expected return on capital:

$$\text{Expected reinvestment rate}_{\text{stable}} = \text{Expected growth}_{\text{stable}}/\text{ROC}_{\text{stable}}$$

An alternative approach is to use the industry-average reinvestment rates (broken up into capital expenditures and working capital needs) to estimate cash flows.

ILLUSTRATION 23.3: Estimating Reinvestment Needs—Tesla Motors

Tesla Motors will have substantial investments that it has to make not only in infrastructure and research, but also in working capital, as it grows. In 2010, the firm had capital expenditures (including capitalized R&D) of $105.41 million, depreciation of $10.62 million and its noncash working capital increased from $11.62 million to $22.94 million. In summary, the firm reinvested $106.11 million in 2010:

$$\begin{aligned}\text{Reinvestment in 2010} &= \text{Capital expenditures} - \text{Depreciation} + \Delta\text{Noncash WC}\\ &= \$105.41 - \$10.62 + (\$22.94 - \$11.62) = \$106.11 \text{ million}\end{aligned}$$

We are loath to use these numbers in our estimates for the future, since they represent one year's values for a young and evolving company.

To estimate reinvestment, we looked at revenues generated for every dollar of capital invested in the business. For automobile companies, the average sales-to-capital ratio in 2010 was 1.69, and for technology companies, the average was 2.20. To the extent that Tesla straddles the two businesses, with its innovative electric car technology, we decided to use a sales-to-capital ratio of 2.00; in effect, we will assume that Tesla will have to invest $1 in additional capital (reinvestment) for every $2 in additional revenues it is expected to generate. The following table summarizes the reinvestment each year for the firm:

Year	*Revenues*	*Increase in Revenues*	*Reinvestment*
Current	$ 117		
1	$ 292	$175	$ 88
2	$ 584	$292	$146
3	$1,051	$467	$233
4	$1,681	$630	$315
5	$2,354	$672	$336
6	$3,060	$706	$353
7	$3,672	$612	$306
8	$4,222	$551	$275
9	$4,645	$422	$211
10	$4,877	$232	$116

We make no attempt to break reinvestment down into its constituent parts—capital expenditures, R&D, acquisitions and working capital—because we know too little about how the firm will evolve over time.

One of the dangers of estimating reinvestment independently from operating income (which is what we have done) is that our estimates may become internally inconsistent over time. To make sure that the expected return on capital as the firm matures is a number that we can live with, we estimated the imputed return on capital each year:

Year	*Capital Invested at Start of Year*	*EBIT (1–t)*	*Return on Capital*
1	$ 311	–$126	–40.64%
2	$ 398	–$149	–37.38%
3	$ 544	–$144	–26.39%
4	$ 778	–$ 97	–12.49%
5	$1,093	–$ 12	–1.12%
6	$1,429	$ 91	6.40%
7	$1,782	$196	10.97%
8	$2,088	$291	13.92%
9	$2,363	$257	10.89%
10	$2,574	$252	9.79%

The capital invested at the start of year 1 is the capital invested in the 2010 balance sheet, computed as follows:

$$\text{Capital invested}_{2010} = \text{BV of equity}_{2010} + \text{Capitalized R\&D}_{2010} + \text{BV of debt}_{2010} - \text{Cash}_{2010}$$
$$= \$207.05 + \$167.04 + \$109.65 - \$173.16 = \$310.58$$

The capital invested in subsequent years is estimated by adding the reinvestment for the year to the capital invested at the start:

$$\text{Capital invested in year 2} = \$310.58 + \$87.56 = \$398.14 \text{ million}$$

The expected return on capital improves over time, as margins improve. In fact, the return on capital peaks in year 8, partly because NOLs shelter the firm from taxes. In year 10, the return on capital is 9.79%, very close to the 10% return on capital that we will assume in perpetuity for Tesla Motors after year 10.

Finally, bringing together the after-tax operating income and the reinvestment, we estimate the free cash flow to the firm each year for the next 10 years:

Year	*EBIT (1–t)*	*Reinvestment*	*FCFF*
1	–$126	$ 88	–$214
2	–$149	$146	–$295
3	–$144	$233	–$377
4	–$ 97	$315	–$412
5	–$ 12	$336	–$348
6	$ 91	$353	–$262
7	$196	$306	–$110
8	$291	$275	$ 15
9	$257	$211	$ 46
10	$252	$116	$136

The free cash flows to the firm are negative for the next seven years, partly because of operating losses (through year 5) and partly because of reinvestment needs. Based on our estimates, Tesla will need to raise about $2 billion in new capital (from debt and equity) over the next seven years.

REINVESTMENT AND GROWTH: LAGGED EFFECTS

In our valuation of ~~Commerce One~~, we have assumed that reinvestment and growth occur contemporaneously. In other words, the increase in revenues and the reinvestment that creates that increase occur simultaneously. This may seem like a radical assumption, but it is realistic in service businesses or when growth occurs through acquisitions.

If, in fact, there is a lag between reinvestment and growth, it is relatively simple to build this lag into the analysis. In the ~~Commerce One~~ valuation, assuming a one-year lag, you could estimate the reinvestment in year 1 from expected revenue growth in year 2. The length of the lag will depend on both the firm being valued—it will be longer for firms that have to make capital-intensive and infrastructure investments—and the form of the reinvestment—whether it is internal or external (acquisitions).

Step 5: Estimate Risk Parameters and Discount Rates

In the standard approaches for estimating beta, we regress stock returns against market returns. Young start-up firms, even when publicly traded, have little historical data, and we cannot use the conventional approach to estimate risk parameters.[3] In Chapter 7, though, we suggested alternative approaches for estimating betas that are useful to bridge this gap. One is the bottom-up approach. If there are comparable firms that have been listed for two or more years, the current risk parameters for the firm can be estimated by looking at the averages for these firms. If such firms do not exist, risk parameters can be estimated using the financial characteristics of the firm—the volatility in earnings, their size, cash flow characteristics, and financial leverage.[4]

If a young firm has debt, we run into a different problem when estimating the cost of debt. The firm will generally not be rated, thus denying us a chance to estimate a cost of debt based on the rating. We could try estimating a synthetic rating, but the negative operating income will yield a negative interest coverage ratio and a default rating for the firm. One solution is to estimate an expected interest coverage ratio for the firm based on expected operating income in future periods (note that these forecasts were already made in steps 2 and 3) and to use this expected interest coverage ratio to estimate a synthetic rating.

Whatever approach we use to estimate costs of equity and debt, they should not be left unchanged over the estimation period. As the firm matures and moves toward its sustainable margin and stable growth, the risk parameters should also approach those of an average firm—the betas should move toward 1 and the cost of debt should adjust toward a mature firm's cost of debt.

In addition to estimating the cost of equity for these firms, we have to estimate how leverage will change over time. Again, targeting an industry average or an optimal debt ratio for this firm (as it will look in steady state) should yield reasonable estimates for the cost of capital over time.

OPERATING LEVERAGE AND RISK

One argument that ~~can be~~ made for why young firms should have much higher betas than larger, more mature firms in their business is that they have much higher operating leverage. The costs for young firms are for the most part fixed and do not vary with revenues. If you are estimating a bottom-up beta for a young firm by looking at comparable firms, you have two choices:

1. You can use only small, publicly traded firms as your comparable firms. This will work only if there are significant numbers of publicly traded firms in the business.
2. The other and more promising approach is to adjust the bottom-up beta for differences in operating leverage. Chapter 7 noted how betas can be adjusted for differences in fixed cost structures:

$$\text{Unlevered beta} = \text{Business beta}[1 + (\text{Fixed costs}/\text{Variable costs})]$$

[3]The conventional approach is to regress returns on a stock against returns on a market index over a past period, say two to five years.

[4]For a description of this approach, refer back to Chapter 7.

ILLUSTRATION 23.4: Estimating Risk Parameters and Cost of Capital—Tesla Motors

Tesla is currently a risky, money-losing company, but it is an automobile company with a technology overlay. Rather than trust a regression beta for Tesla, we estimated a bottom-up beta of 1.50 for the next five years, half way between the bottom-up beta of 0.90 for automobiles and 2.10 for technology firms. Using a U.S. dollar risk-free rate of 3.5% and an equity risk premium of 5%, we obtain a cost of equity for the next five years:

$$\text{Cost of equity} = 3.5\% + 1.5(5\%) = 11.00\%$$

The cost of debt is more difficult to estimate because Tesla had no bond rating from S&P or Moody's in 2011 and was also reporting operating losses, thus making the interest coverage ratio negative (and short-circuiting the synthetic ratings process). The firm is expected to report operating losses for the next five years, making the average operating income over that period a negative number. Finally, we chose to use a CCC rating to reflect the fact that Tesla was ~~an ongoing~~ concern, with the capacity to use its cash balance to cover its debt obligations, if necessary. The resulting pretax cost of debt is 8%; since the firm has an NOL and operating losses, the after-tax cost of debt is also 8%.

Based on the debt outstanding of $109.65 million ($71.83 million in conventional debt and $37.82 million in present value of lease commitments) and the market capitalization of $2,773 million (based on a stock price of $29 and 95.63 million shares outstanding), we get a debt to capital ratio of 3.80%:

$$\text{Debt to capital} = 109.65/(109.65 + 2{,}773) = 3.80\%$$

The resulting cost of capital (assumed to remain unchanged for the first five years) is:

$$\text{Cost of capital} = 11\%(1 - .0380) + 8\%(1 - 0.00)(.0380) = 10.89\%$$

As the firm matures, though, we expect it to look more like the automobile firms and less like technology firms. As a consequence, starting in year 6, we start reducing the beta in linear increments to reach 0.90 in stable growth, and increasing the debt ratio in linear increments to 35% in year 10. The table following summarizes the cost of capital by year for Tesla Motors:

Year	*Beta*	*Cost of Equity*	*Pretax Cost of Debt*	*Tax Rate*	*After-Tax Cost of Debt*	*Debt Ratio*	*Cost of Capital*
1	1.50	11.00%	8.00%	0.00%	8.00%	3.80%	10.89%
2	1.50	11.00%	8.00%	0.00%	8.00%	3.80%	10.89%
3	1.50	11.00%	8.00%	0.00%	8.00%	3.80%	10.89%
4	1.50	11.00%	8.00%	0.00%	8.00%	3.80%	10.89%
5	1.50	11.00%	8.00%	0.00%	8.00%	3.80%	10.89%
6	1.38	10.40%	7.40%	0.00%	7.40%	10.04%	10.10%
7	1.26	9.80%	7.25%	0.00%	7.25%	11.60%	9.50%
8	1.14	9.20%	7.00%	0.00%	7.00%	14.20%	8.89%
9	1.02	8.60%	6.50%	30.06%	4.55%	19.40%	7.81%
10	0.90	8.00%	5.00%	40.00%	3.00%	35.00%	6.25%

The cost of capital decreases from years 6 through 10 to reach a steady state (and perpetual) cost of capital of 6.25%.

Step 6: Estimate the Value of the Firm

With the inputs on earnings, reinvestment rates, and risk parameters over time, this valuation ~~becomes much more conventional~~. In many cases, the cash flows in the early years will be negative, ~~in keeping with the negative earnings~~, but turn positive in later years as margins improve. The bulk of the value will generally be in the

terminal value. ~~Consequently, our assumptions about what the firm will look like in stable growth are significant.~~

Having valued the operating assets of the firm, you need to consider two other factors—the possibility that the firm will not survive to become a going concern and the value of nonoperating assets—to value the firm.

Survival When we value firms using discounted cash flow valuation, we tend to assume that the firm will be a going concern and continue to generate cash flows in perpetuity. This assumption might be suspect when valuing young companies, since many of them will not survive the tests that they will be put to over the next few years. If we ignore this possibility and consider only the best-case scenario of expansion and profitability, we will over estimate the value of these firms. We have two choices when it comes to dealing with this possibility.

1. The first is to build into the expected growth rates and earnings the likelihood of unfavorable outcomes. Thus, the growth rate used in revenues will be the expected growth rate over all scenarios, both optimistic and pessimistic. For young firms, this will become progressively more difficult to do as you get further and further into the future.
2. The second is to estimate a discounted cash flow value across only the scenarios where the firm is a going concern, and then apply a probability that the firm will be a going concern to this value. Once we have estimated the probability of surviving as a going concern, the value of a firm can then be estimated as follows:

$$\begin{aligned}\text{Value of firm} = {} & \text{Probability of surviving as a going concern} \\ & \times \text{Discounted cash flow value of firm} \\ & + (1 - \text{Probability of surviving as a going concern}) \\ & \times \text{Distress or liquidation sale value}\end{aligned}$$

One approach to estimating the probability of survival is to look at the empirical data. 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.[5] 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 four years and only 31% made it through all seven years. In addition, they categorized firms into 10 sectors and estimated survival rates for each one. Table 23.1 presents their findings on the proportion of firms that made it through each year for each sector and for the entire sample:

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

TABLE 23.1 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 seven years, whereas almost 44% of health service businesses make it through that period.

Value of Nonoperating Assets As with the valuation of any firm, you have to consider cash, marketable securities, and holdings in other companies when you value a firm. The only note of caution that we would add is that young firms can burn through significant cash balances in short periods because their operations drain cash rather than generate it. Thus, the cash balance from the last financial statements, especially if those statements are more than a few months old, can be very different from the current cash balances.

To the extent that young firms often have holdings in other young firms, there is also the danger that investments in other firms may be shown on the books at values that are not reflective of their true value. If there are only one or two large holdings, you should value those holdings using cash flow–based approaches as well.

ILLUSTRATION 23.5: Estimating Firm Value—Tesla Motors

To estimate firm value, we begin by discounting the free cash flows to the firm estimated in Illustration 23.3 at the cost of capital estimated in Illustration 23.4 in the table following:

Year	*FCFF*	*Cost of Capital*	*Cumulated Cost of Capital*	*PV*
1	–$214	10.89%	1.1089	–$ 193
2	–$295	10.89%	1.2296	–$ 240
3	$377	10.89%	1.3634	–$ 277
4	$412	10.89%	1.5118	–$ 273
5	–$348	10.89%	1.6764	–$ 208
6	–$262	10.10%	1.8457	–$ 142
7	–$110	9.50%	2.0211	–$ 55
8	$ 15	8.89%	2.2008	$ 7
9	$ 46	7.81%	2.3727	$ 19
10	$136	6.25%	2.5210	$ 54
Sum				–$1,306

Note that the changing costs of capital over time require us to compute a cumulated cost of capital. The present value of the free cash flows during the high growth period amounts to –$1,306 million.

At the end of year 10, we assume that Tesla Motors is in stable growth, growing at 3.5% a year, while maintaining a return on capital of 10%. The stable period reinvestment rate is computed to be 35%:

$$\text{Stable reinvestment rate} = \text{Stable growth rate/Stable ROC} = 3.5\%/10\% = 35\%$$

The terminal value (at the end of year 10) can then be computed using the operating income in year 11 (see Illustration 23.2):

$$\text{Terminal value}_{10} = \frac{\text{EBIT}(1 - \text{Tax rate})_{11}\,(1 - \text{Reinvestment rate})}{(\text{Cost of capital} - g)}$$

$$= \frac{\$505(1 - .40)(1 - .35)}{(.0625 - .035)} = \$7{,}158 \text{ million}$$

Discounting the terminal value back at the cumulated cost of capital in year 10 and adding to the present value of FCFF over the next 10 years, we get:

$$\text{Value for operating assets} = -\$1{,}306 + \$7{,}158/2.5210 = \$1{,}534 \text{ million}$$

Adding the current cash balance of $196 million to this estimate, we get the value of the firm:

$$\text{Value of the firm} = \$1{,}534 + \$196 = \$1{,}730 \text{ million}$$

Step 7: Estimate the Value of Equity and Per-Share Value

To get from firm value to equity value, we generally subtract out all nonequity claims on the firm. For mature firms, the nonequity claims take the form of bank debt and bonds outstanding. For young firms, there can also be preferred equity claims that have to be valued and subtracted to get to the value of the common equity.

To get from equity value to value per share, you have to consider equity options outstanding on the firm. In Chapter 16, we argued that this is something that needs to be done for all firms, but it becomes particularly important with young start-up firms, because the value of the options outstanding can be a much larger share of the overall equity value. Given the importance of these claims, we would suggest that the options—vested as well as nonvested—be valued using an option pricing model, and that the value of the options be subtracted from the value of the equity to arrive at the value of equity in common stock. This value should then be divided by the actual number of shares outstanding to arrive at the equity value per share.

ILLUSTRATION 23.6: Valuing Equity per Share—Tesla Motors

In Illustration 23.5, we estimated the value of Tesla Motors as a firm to be $1,730 million. To get from firm value to equity value per share, we first subtract out the estimated value of debt claims. Tesla Motors has $110 million in debt outstanding (in conventional debt and present value of lease commitments).

$$\text{Value of equity} = \text{Value of firm} - \text{Debt} = \$1{,}730 - \$110 = \$1{,}620 \text{ million}$$

There are 95.63 million shares outstanding, but Tesla (reflecting its technology roots) also has 13.805 million options outstanding, with an average exercise price of $8.59 and 6.06 years left to expiration. Drawing on Chapter 16, there are three ways we can adjust for these options:

1. Fully diluted approach: We divide the value of equity by the fully diluted number of shares:

$$\text{Value per share} = \$1{,}620/(95.63 + 13.805) = \$14.80/\text{share}$$

2. Treasury stock approach: We add the exercise proceeds from the options to the equity value before dividing by the fully diluted number of shares:

$$\text{Value per share} = (\$1{,}620+13.805 \times \$8.59)/(95.63+13.805) = \$15.89$$

3. Option valuation approach: The standard deviation in Tesla Motor's stock in 2010 was 71%. Using this standard deviation in the dilution-adjusted Black-Scholes model, in conjunction with the market price of $29 yields a value of $328 million for the options and a value per share of $15.35.

$$\text{Value per share} = (\$1{,}620 - \$328)/95.63 = \$15.35$$

The estimated value per share of $15.35 is much lower than the prevailing stock price of $29, suggesting that the stock is significantly over valued.

VALUE DRIVERS

What are the key inputs that determine the value of a young high-growth firm with negative earnings? In general, the inputs that have the greatest impact on value are the estimates of sustainable margins and revenue growth. To a lesser extent,

SHOULD THERE BE A DISCOUNT FOR FLOAT?

Some publicly traded stocks are lightly traded, and the number of shares available for trade (often referred to as the float) is small relative to the total number of shares outstanding.[6] Investors who want to sell their stock quickly in these companies often have a price impact when they sell, and the impact will increase with the size of the holding.

Investors with longer time horizons and a lesser need to convert their holdings into cash quickly have a smaller problem associated with illiquidity than investors with shorter time horizons and a greater need for cash. Investors should consider the possibility that they will need to convert their holdings quickly into cash when they look at lightly traded stocks as potential investments and require much larger discounts on value before they take large positions. Assume, for instance, that an investor is looking at a young firm that she has valued at $19.05 per share. The stock would be underpriced if it were trading at $17, but it might not be underpriced enough for a short-term investor to take a large position in it. In contrast, a long-term investor may find the stock an attractive buy at that price.

[6]The float is estimated by subtracting from the shares outstanding the shares that are owned by insiders and 5 percent owners and the rule 144 shares. (Rule 144 refers to restricted stock that cannot be traded.)

assumptions about how long it will take the firm to reach a sustainable margin and reinvestment needs in stable growth also have an impact on value.

In practical terms, the bulk of the value of these firms is derived from the terminal value. While this will trouble some, it mirrors how an investor makes returns in these firms. The payoff to these investors takes the form of price appreciation rather than dividends or stock buybacks. Another way of explaining the dependence on terminal value and the importance of the sustainable growth assumption is in terms of assets in place and future growth. The value of any firm can be written as the sum of the two:

$$\text{Value of firm} = \text{Value of assets in place} + \text{Value of growth potential}$$

For start-up firms with negative earnings, almost all of the value can be attributed to the second component. Not surprisingly, the firm value is determined by assumptions about the latter.

ILLUSTRATION 23.7: Value Drivers—Tesla Motors

While there are literally dozens of assumptions that underlie the value per share of $15.35 that we obtained for Tesla Motors, there are two key ones that drive the value per share. One is the compounded growth rate in revenues over the next 10 years: with our estimated revenues growth rates, the compounded annual average growth rate is 45.24%. The other is the target pretax operating margin; we assumed that it would be 10%, higher than the automobile sector average but lower than the average for technology firms.

In Figure 23.2, we estimate the value per share as a function of the compounded annual revenue growth rate over the next 10 years. Not surprisingly, the value per share increases as the compounded growth rate increases.

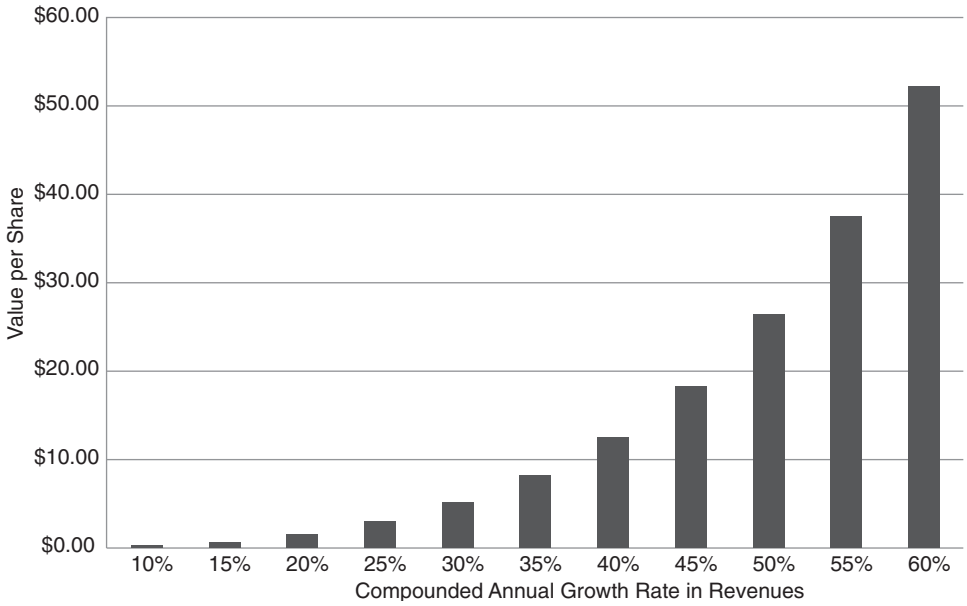

FIGURE 23.2 Value per Share versus Compounded Revenue Growth—Tesla Motors

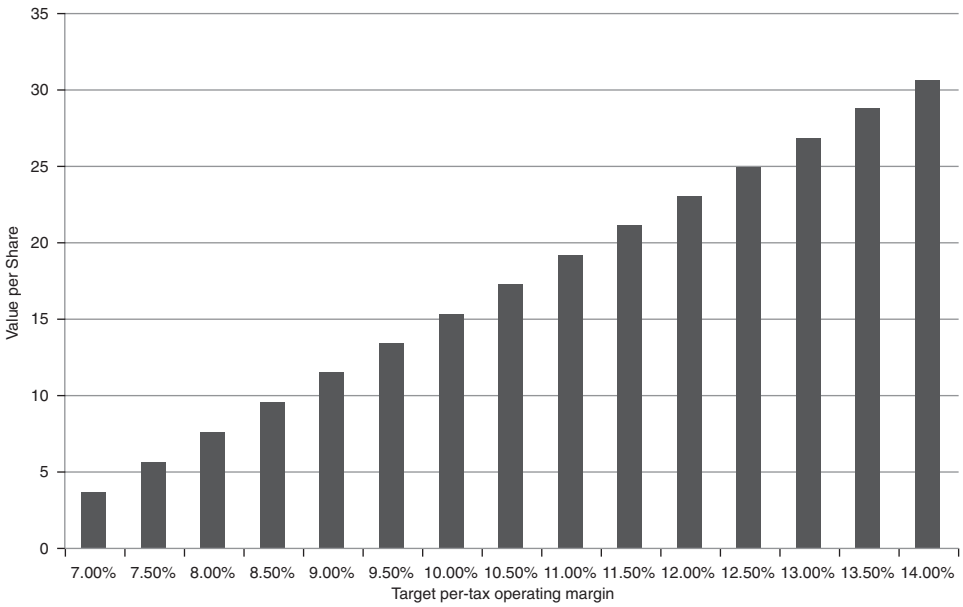

FIGURE 23.3 Value per Share and Pretax Margin— Tesla Motors

To justify the current price of $29, you would need ~~to compound a~~ revenue growth rate of between 50 and 55 percent, holding all else constant.

In Figure 23.3, we estimate the value per share as a function of the target pretax operating margin. Here again, the value per share increases as the margin increases but to a much smaller degree than with revenue growth.

The ~~pretax operating margin~~ by approximately $4/share for every 1% improvement in pretax margins. To justify a price of $29 per share, the pretax operating mrgin will have to be about 14%.

ESTIMATION NOISE

The framework for valuation provided in this section should not be considered a recipe for precision. *The valuation of a firm with negative earnings, high growth, and limited information will always ~~be noisy~~.* One way to present this ~~noise~~ is in terms of a valuation range, and the range on the value ~~of~~ these firms will be large. This is often used as an excuse by analysts who do not want to go through the process of valuing such firms. It also provides critics with a simplistic argument against trusting the numbers that emerge from these models.

We have a different view. The ~~noise~~ in the valuation is not a reflection of the quality of the valuation model, or the analyst using it, but of the underlying real uncertainty about the future prospects of the firm. This uncertainty is a fact of life when it comes to investing in these firms. In a valuation, we attempt to grapple with this uncertainty and make our best estimates about the future. Note that those who disdain valuation models for their potential errors end up using far cruder approaches, such as comparing price-sales ratios across firms. The difference, as we

see it, is that they choose to sweep the uncertainties under the rug and act as if they do not exist.

There are two other points to make about the precision in these valuations. First, *even if a valuation is imprecise, it provides a powerful tool to answer the question of what has to occur for the current market price of a firm to be justified*. Investors can then decide whether they are comfortable with these assumptions, and make their decisions on buying and selling stock. Second, *even if individual valuations are noisy, portfolios constructed based on these valuations will be more precisely valued*. Thus, an investor who buys 40 stocks that he or she has found to be undervalued using traditional valuation models, albeit with significant ~~noise~~, should find ~~noise~~ averaging out across the portfolio. The ultimate performance of the portfolio then should reflect the valuation skills, or the absence of them, of the analyst.

IMPLICATIONS FOR INVESTORS

From a valuation perspective, there are a number of useful lessons that emerge for investors in young firms with negative earnings and limited information.

- *Focus on sustainable margins and survival*, rather than quarter-to-quarter or even year-to-year swings in profitability. Understanding what a firm's operating margins will look like when it reaches financial health might be the single most important determinant of whether one is successful investing, in the long term, in such firms. Separating those firms that have a greater chance of surviving and reaching financial health from those that will not survive is a closely connected second determinant. After all, most start-up firms never survive to enjoy their vaunted growth prospects.
- *Earnings reports can be misleading*, especially when reinvestment costs are expensed (as is the case with research, development, and long-term marketing expenses). Thus, when a firm with high-growth potential and poor earnings reports a significant improvement in earnings, investors should examine the report for the reasons. If the earnings are improving because the costs of generating current revenues are coming down (due to economies of scale or pricing power), this is clearly good news. If, however, the earnings are increasing because the firm has reduced or eliminated discretionary reinvestment expenditures (such as development costs), the net effect on value can be very negative, since future growth is being put at risk.
- *Diversify.* This age-old rule of investing becomes even more critical when investing in stocks that derive the bulk of their value from uncertain future growth. The antidote to estimation ~~noise~~ is often a more diversified portfolio both across firms and across sectors.[7]

[7]The simple rules of diversification that suggest 20 stocks are enough may not apply here. Since these investments tend to come from the same sector and have higher correlations with each other, and since there is so much noise in estimation, more stocks will be needed to accomplish the same degree of diversification that one would have got by buying 20 large-capitalization, mature companies.

- *Keep track of barriers of entry* and competitive advantages; they will, in large part, determine whether the firm will continue to maintain high growth.
- *Be ready to be wrong.* The noise in these valuations is such that no matter how much information is brought into the process and how carefully a valuation is done, the value obtained is an estimate. Thus, investors in these stocks will be spectacularly wrong sometimes, and it is unfair to judge them on individual valuations. They will also be spectacularly right in other cases, and all that we can hope for is that with time as an ally, the successes outweigh the failures.

IMPLICATIONS FOR MANAGERS

If the future growth potential for a firm is uncertain, what are the implications for managers? The first is that the uncertainty about future growth will almost certainly translate into more uncertainty in traditional investment analysis. It is far more difficult to estimate cash flows and discount rates for individual projects in young start-up firms than in more stable sectors. While the reaction of some managers at these firms is to give up and fall back on more intuitive approaches, the managers who persevere and attempt to estimate cash flows will have a much better sense of what they need to do to make new investments pay off.

THE EXPECTATIONS GAME

As the proportion of value determined by future growth increases, expectations become a more critical determinant of how markets react to new information. In fact, the expectations game largely explains why stock prices change in ways that do not seem consistent with the news being announced (good earnings news leading to stock price drops; bad earnings news resulting in stock price increases) and the volatility of young start-up firms in general.

Expectations, Information, and Value

The value of a firm is the present value of the expected cash flows on the firm, and implicit in these expected cash flows and the discount rates used to discount the cash flows are investors' views about the firm, its management, and the potential for excess returns. While this is true for all firms, the larger proportion of value that comes from future growth potential at young start-up firms makes them particularly vulnerable to shifts in expectations about the future.

How are these expectations formed? While the past history of these firms and industry averages are sometimes used as the basis for estimates, the firms and the industries themselves both evolve and change over time. The fact that information is both noisy and limited suggests that expectations can change relatively quickly and in response to small shifts in information. An earnings announcement, for instance, that suggests that a firm's strategy is not working as well as anticipated may lead to a reassessment of expectations and a sharp drop in value.

Lessons for Investors

The power of expectations in determining the value of a stock has to be considered when investors choose stocks for their portfolios and when they assess new information about the firm. There are several important implications:

- *Risk is always relative to expectations.* The risk in a firm does not come from whether it performs well or badly but from how it does relative to expectations. Thus, a firm that reports earnings growth of 35 percent a year when it was expected to grow 50 percent a year is delivering bad news and will probably see its stock price drop. In contrast, a firm that reports a 20 percent drop in earnings when it was expected to report a 40 percent drop will generally see its stock price increase.
- *Good companies do not always make good investments.* It is not how well or badly a company is managed that determines stock returns; it is how well or badly managed it is relative to expectations. A company that meets every financial criterion for excellence may be a poor investment if markets are expecting too much of it. Conversely, a firm that is universally viewed as a poorly managed, poorly run company may be a good investment if expectations have been set too low.[8]
- *Small news leads to big price jumps.* As noted in the preceding section, you should expect to see what seem like disproportionate stock price responses to relatively small pieces of information. A report from a high-growth firm that earnings in the most recent quarter were a few cents less than expected may lead to a significant drop in the stock price.
- *Focus on information about value drivers.* On a positive note, investors can assess what it is that drives value the most at a firm, and get a sense of what they should focus on when looking at new information. Looking past the aggregate earnings numbers for information on these value drivers may provide clues of both upcoming trouble and potential promise.

Lessons for Managers

If the expectation game affects investors, it is even more critical to managers at young firms. One of the ironies that emerges from this game is that it is far easier to manage a firm that is perceived to be a poor performer than it is to manage one that is perceived to be a star.[9]

- *Find out what is expected of you.* If you are going to be judged against expectations, it is critical that you gauge what these expectations are. While this translates, for many firms, into keeping track of what analysts are estimating earnings per share or revenue growth to be in the next quarter, there is more to

[8]The empirical evidence backs up this proposition. Studies of investments seem to indicate that companies that are viewed as well managed underperform companies that are less well regarded as investments.

[9]Steve Jobs' job at Apple Computer was far easier when he took over in 1998 (when the stock price had hit a 10-year low) than it was two years later, when he had succeeded in changing investor perceptions of the company (and pushed the stock price up tenfold in the process).

it than this. Understanding why investors value your firm the way they do and what they think are your competitive advantages are much more important in the long term.

- *Learn to manage expectations.* When firms ~~first go public~~, managers and insiders sell the idea that their firm has great potential and should be valued highly. While this is perfectly understandable, managers have to ~~change roles after they go public and~~ learn to manage expectations. Specifically, they have to talk down expectations when they feel that their firm is being set up to do things that it cannot accomplish. Again, though, some firms damage their credibility when they talk down expectations incessantly, even when they know the expectations are reasonable.[10]
- *Do not delay the inevitable.* No matter how well a firm manages expectations, there are times when managers realize that they cannot meet expectations anymore because of changes in the sector or the overall economy. While ~~the temptation is strong~~ a to delay revealing this to financial markets, often by shifting earnings from future periods into the current one or using accounting ploys, it is far better to deal with the consequences immediately. This may mean reporting lower earnings than expected and a lower stock price, but firms that delay their day of reckoning tend to be punished much more.

CONCLUSION

Valuation, fundamentally, remains the same no matter what type of firm one is analyzing. There are three groups of firms where the exercise of valuation becomes more difficult and estimates of value more noisy. The first group includes firms that have negative earnings. Given the dependence of most models on earnings growth to make projections for the future, analysts have to consider approaches that allow earnings to become positive, at least over time. They can do so by normalizing earnings in the current period, by adjusting margins from current levels to sustainable levels over time, or by reducing leverage. The approach used will depend on why the firm has negative earnings in the first place. The second group of firms where estimates are difficult to make are young firms with little or no financial history. Here, information on comparable firms can substitute for historical data and allow analysts to estimate the inputs needed for valuation. The third group of firms where valuation can be difficult includes unique firms with few or no comparable companies.

If all three problems come together for the same firm—negative earnings, limited history, and few comparables—the difficulty is compounded. This chapter has laid out a broad framework that can be used to value such firms. It should be noted again that the question is not whether these firms can be valued—they certainly can—but whether we are willing to live with noisy estimates of value. To those who argue that these valuations are too noisy to be useful, our counter would be that much of this noise stems from real uncertainty about the future. As we see it, investors who attempt to measure and confront this uncertainty are better prepared for the volatility that comes with investing in these stocks.

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[10]Microsoft ~~has~~ developed a reputation for talking down expectations and then beating them on a consistent basis.

QUESTIONS AND SHORT PROBLEMS

In the problems following, use an equity risk premium of 5.5 percent if none is specified.

1. Intellitech is a technology firm that has been in operating for two years. In the most recent year, the firm reported revenues of $500 million, five times revenues in the previous year. The firm also reported an operating loss of $400 million. You expect revenues to grow 100% next year, 80% the year after, and 40% a year for the following three years, and the pretax operating margin to improve—in linear increments—to 10% by the fifth year. Estimate the revenues and operating income each year for the next five years.
2. You are trying to estimate the trailing 12-month earnings for Fiber Networks. The firm has just reported an operating loss for the first quarter of 2001 of $180 million on revenues of $600 million, a jump from the operating loss of $30 million on revenues of $120 million in the first quarter of 2000. In its annual report for 2000, Fiber Networks reported an operating loss of $330 million on revenues of $1.1 billion. Estimate the operating loss and revenues for the past four quarters.
3. Verispace Software sells inventory management software and reported revenues of $25 million in the most recent financial year. You estimate that the total market for inventory management software to be $25 billion, growing at 5% a year for the foreseeable future. If you expect Verispace to have 10% market share of this market in 10 years, estimate the compounded revenue growth rate over that period.
4. Lumin Telecomm produces specialized telecommunication equipment and has made losses each year over the three years it has been in existence—it has an accumulated net operating loss of $180 million. In the most recent year, the firm reported an operating loss of $90 million on revenues of $1 billion. If you expect the growth rate in revenues to be 20% a year for the next five years, and the pretax operating margin to be –6% next year, –3% two years from now, 0% the year after, 6% in four years, and 10% in five years (tax rate = 40%), estimate:
   a. The revenues and pretax operating income each year for the next five years.
   b. The taxes you would have to pay and your after-tax operating income each year for the next five years.
5. In problem 4, assume that Lumin Telecomm has a beta of 2.0 currently and that you expect it to drop in linear increments to 1.2 by year 5. If the current cost of borrowing is 9% and you expect this to remain unchanged over the next five years, estimate the cost of capital for the firm each year for the next five years. (The risk-free rate is 5.6%, and the risk premium is 4%.) The debt ratio is expected to decline from 70% in the current year to 50% in year 5 in linear increments.
6. You have estimated the value of Vitale Systems, an Internet software firm, to be $700 million as a going concern, seven times its book value. However, you are concerned that Vitale might not survive the next five years and estimate the probability of failure at 40%. If the firm fails, you expect its assets to sell for 1.5 times book value. If there are 30 million shares outstanding, estimate the value per share. (The firm has no debt or options outstanding.)