

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. In this chapter, we 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 of 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*, both in terms of earnings and market prices. A firm's earnings and revenue history over time lets 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 these automakers.¹ In contrast, there may be only five years of information on Abercrombie 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 compensates for the lack of history at the firm.

There are some firms, especially in new sectors of the market, 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 upon 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 upon 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,

¹ The big three automakers are GM, Chrysler and Ford. In fact, with the acquisition of Chrysler by Daimler, only two are left.

buildings or other fixed assets and seem 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 we noted in Chapter 20, internet companies in their infancy were compared based upon their value per site visitor, computed by dividing the market value of a firm by the number of viewers to their web site. Implicit in these comparisons is the assumptions that more visitors to your site translate into higher revenues, which, in turn, it is assumed 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 product. In fact, in some cases, the firms being valued have an interesting idea that could be commercial 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 change 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 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 upon 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

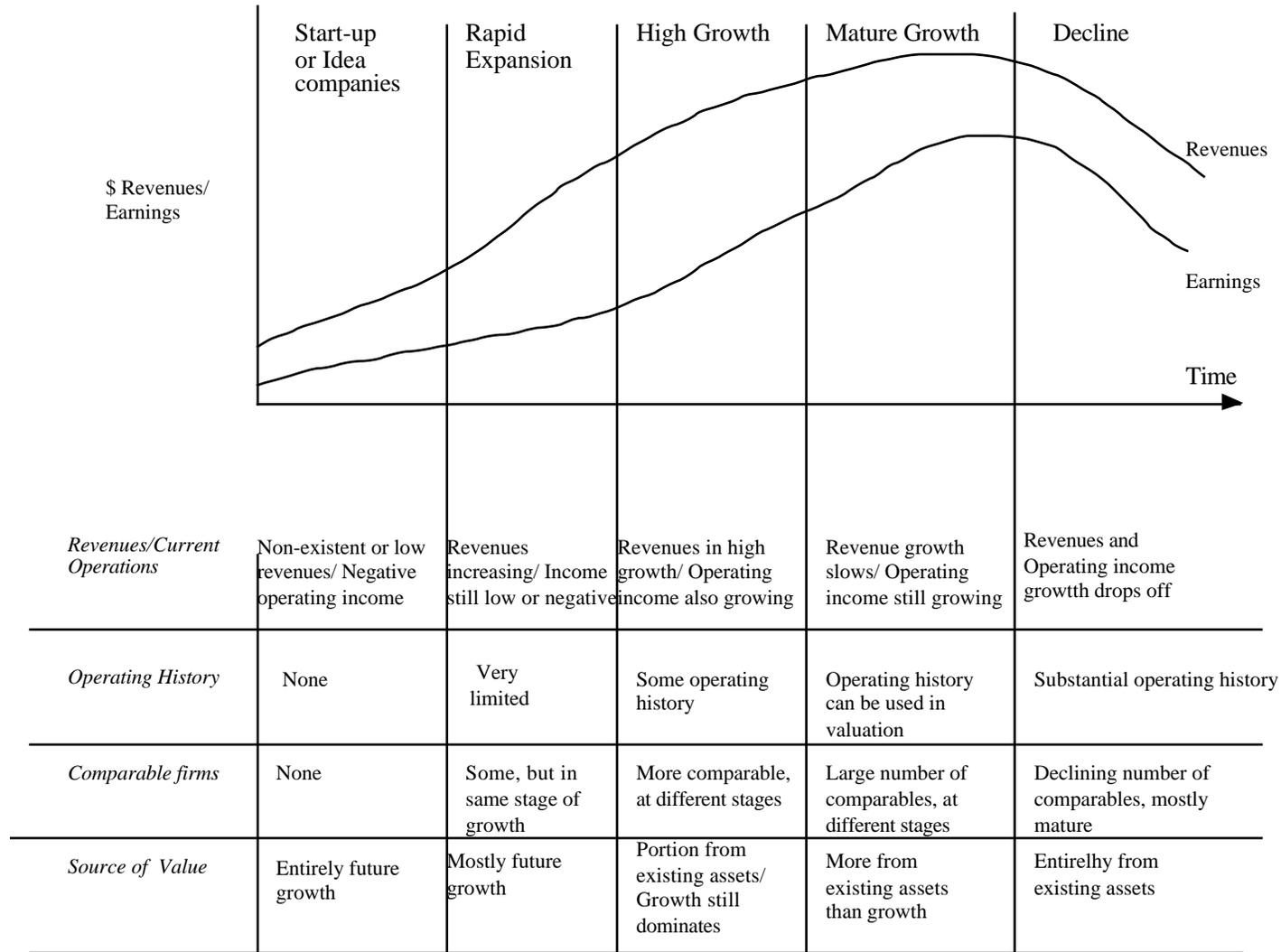
managers with a successful track record in converting ideas into dollars, because it gives them credibility in the eyes of financial backers.

- *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 operation history of the firm contain information that can be used in valuing the firm. The number of comparable firms is generally be 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 growth starts leveling off, firms generally find two phenomena occurring. The earnings and cash flows continues 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 decline as well. Valuation is easiest at this stage.

Is valuation easier in the last stage than in the first? Generally, yes. Are the principles that drive valuation different at each stage? Probably not. In fact, 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, 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.

Figure 23.1: Valuation Issues across the Life Cycle



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 a price-earnings multiple, estimated by looking at publicly traded firms in the same business, is used to assess the value of the firm at the time of the initial public offering; this is called the *exit or terminal value*. Alternatively, you could forecast revenues for the firm in a future year and apply a revenue multiple to estimate terminal value.

For instance, assume that you are valuing InfoSoft, a small, software firm that is expected to have an initial public offering in 3 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 level² than the traditional cost of equity for the firm.

$$\text{Discounted Terminal Value} = \frac{\text{Estimated exit value}}{(1 + \text{Target return})^n}$$

Using the software firm example again, if the venture capitalist requires a target return on 30% on his or her investment, the discounted terminal value for InfoSoft would be \$45.52 million.

$$\text{Discounted Terminal value for InfoSoft} = \frac{100 \text{ million}}{(1.30)^3} = \$45.52 \text{ million}$$

² By 1999, for instance, the target rate of return for private equity investors was in excess of 30%.

While this approach works for venture capitalist, it is unlikely to work for investors who are valuing young, start-up companies that are publicly traded, for two reasons. First, investors generally do not have the luxury of setting target returns of 35% or 40%, since they compete with other investors for the stock. Furthermore, there is an argument that can be made that a young-start up company should be less risky to an investor who holds a diversified portfolio than to a venture capitalist who might have fewer holdings. Second, venture capitalists have access to the firm's internal projections and usually can play a role in the management of the firm. In contrast, investors have to rely on information that the firm makes publicly available and generally have little or no say in the way the company is run.

The venture capital approach is also exposed to another problem. To the extent that exit multiples are based upon how comparable firms are priced today, they can result in serious misvaluations 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.

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.

A 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. In this section, we 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, for firms that are growing at very high rates. Using the revenues and earnings from the trailing twelve 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 capital expenditures and depreciation, may not be updated as frequently. Even so, we would argue for using estimates³ for these inputs and valuing firms with more recent data.

Illustration 23.1: Commerce One: Last Financial Year versus Trailing 12 Months

Commerce One provides services and software to businesses that are interested in setting up electronic marketplaces, a process that arguably reduces costs to these businesses. In May 2001, when we valued Commerce One, its last annual report was only three months old and represented information through December 2000. The firm has released one more quarterly report since, containing information for the first quarter of 2001. We constructed trailing 12-month values for each of the key inputs into the valuation. The results are summarized in Table 23.1.

Table 23.1: Trailing 12-month versus Last Annual Report: Commerce One (in '000s)

	<i>First Quarter 2001</i>	<i>First Quarter 2000</i>	<i>Last 10K</i>	<i>Trailing 12 months</i>
Revenues	\$170,273	\$35,009	\$401,796	\$537,060
Operating Income	-\$228,739	-\$45,186	-\$345,564	-\$529,117
Net Operating Loss Carryforward			-\$447,503	-\$676,037
Net Income	-\$228,534	-\$43,645	-\$344,947	-\$529,836
Capital Expenditures	\$23,386	\$9,718	\$79,158	\$92,826
Depreciation	\$10,695	\$1,536	\$13,815	\$22,974
Cash and Marketable Securities	\$249,373		\$341,440	\$249,373
Investments in Other Assets	\$38,213		\$46,414	\$38,213
Book Value of Equity	\$2,604,592		\$2,799,411	\$2,604,592
Book Value of Debt	\$23,510		\$6,195	\$23,510
Number of Shares outstanding	223820	151420	168065	228320

While only three months have elapsed since the last report, the trailing twelve-month numbers are very different from the last annual report. Not only are the income statement numbers – revenues and income – very different, but the number of shares has increased by almost a third since the last annual report. In valuing Commerce One, we will use the updated numbers.

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.

³ 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 twelve months.

Thus, a firm that grew 300% two years ago and 200% last year is likely to grow 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 Advantages 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, brand name and 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 far more detail in Chapter 11.

Illustration 23.2: Commerce One: Estimating Revenue Growth

Commerce One has grown at an extraordinary rate since it began operations just about three years ago. The revenues of the firm have increased from \$2.5 million in 1998 to \$33.6 million in 1999 to \$401 million in 2000. The compounded revenue growth rate over the two years has been 1166% a year and the growth rate just in the last year was 1093%.

The market that Commerce One serves – business software and services – is a very large market, potentially allowing us much more room to allow for growth in future years. The primary competition for Commerce One comes both from other B2B firms like Ariba and from larger and more established firms such as Electronic Data Systems (EDS).

As a final consideration, the economy was weak at the time of this valuation and business spending had slowed down. Consequently, we will be conservative about our estimate of revenue growth for the next year. Table 23.2 summarizes our forecasts of revenue growth and dollar revenues at Commerce One for the next 10 years.

Table 23.2: Revenue Growth and Revenues: Commerce One

<i>Year</i>	<i>Expected Growth Rate</i>	<i>Revenues</i>
Current		\$537

1	50.00%	\$806
2	100.00%	\$1,611
3	80.00%	\$2,900
4	60.00%	\$4,640
5	40.00%	\$6,496
6	35.00%	\$8,770
7	30.00%	\$11,401
8	20.00%	\$13,681
9	10.00%	\$15,049
10	5.00%	\$15,802

Note first that all projections are based upon the trailing 12-month revenues, rather than revenues last year. Note also that while the growth rate in revenues is expected to decline over time, the dollar increase in revenues each year is larger than the previous year until we get to year 9. By the end of the tenth year, Commerce One's revenues of \$15.8 billion would make it a very large player in the business services/software business. As comparison, note that the EDS, the largest firm in this business currently, reported revenues of \$19.6 billion in 2000.

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 will 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, it 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 S,G&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 23.3: Estimating Sustainable Margin and Path to Margin: Commerce One

In 2000, Commerce One reported an operating loss of \$518 million on revenues of \$537 million. When we capitalize research and development expenses, the operating loss narrows to \$427 million. As the firm matures, these margins will surely improve, but to what level? The average pre-tax operating margin of established business service providers in 2000 was 15.73%. Over the 1996-2000 period, the margin has averaged 14.72%. We assumed that Commerce One's margins would reach 14.72% by year 10. There are some who would argue that Commerce One as a B2B business will have higher margins, because it does not have the same cost structure as traditional service providers. We do not agree for two reasons. The first is that the high growth rates in revenues that we have assumed will require aggressive pricing from Commerce One and, therefore, lower margins. The second is that as long as anticipated margins for e-commerce firms are higher than they are for traditional competitors, there will be increased competition coming from the latter, pushing margins towards convergence.

To move from current margins to the sustainable margins, we assumed that the marginal improvement will be greater in the first few years, but we do not forecast operating profits until 5 years from now. Table 23.3 summarizes the forecasted operating margins and earnings before interest and taxes for the next ten years and for the terminal year (year 11).

Table 23.3: Operating Margins and Income – Commerce One

Year	Revenues	Operating Margin	EBIT
Current	\$537	-79.45%	-\$427

1	\$806	-48.06%	-\$387
2	\$1,611	-27.14%	-\$437
3	\$2,900	-13.18%	-\$382
4	\$4,640	-3.88%	-\$180
5	\$6,496	2.32%	\$151
6	\$8,770	6.45%	\$566
7	\$11,401	9.21%	\$1,050
8	\$13,681	11.05%	\$1,511
9	\$15,049	12.27%	\$1,847
10	\$15,802	13.09%	\$2,068
Terminal year	\$16,592	14.72%	\$2,442

Note that the growth rate in the terminal year is 5%. If the improvement in margins is much faster (slower) than we forecast, our estimates of value will need to be adjusted upwards (downwards).

To get from operating income to after-tax operating income, we generally apply the marginal tax rate, which we assume to be 35% for most U.S. firms. With Commerce One, though, there are two considerations. The first is that the firm is losing money currently and does not pay taxes, and in fact, will not be paying taxes for the next 4 years. The other is that the losses accumulate and may save the firm taxes even after it starts making money in year 5. At the time of this valuation, Commerce One had already accumulated losses from the last 3 years amounting to \$676 million. Table 23.4 summarizes the net operating losses, taxable income and effective tax rates for the forecast period.

Table 23.4: Net Operating Losses and Tax Rates

<i>Year</i>	<i>EBIT</i>	<i>NOL at beginning of year</i>	<i>Taxable Income</i>	<i>Taxes Paid</i>	<i>Tax Rate</i>
1	-\$387	\$676	\$0	0	0.00%
2	-\$437	\$1,063	\$0	0	0.00%

3	-\$382	\$1,500	\$0	0	0.00%
4	-\$180	\$1,883	\$0	0	0.00%
5	\$151	\$2,063	\$0	0	0.00%
6	\$566	\$1,912	\$0	0	0.00%
7	\$1,050	\$1,346	\$0	0	0.00%
8	\$1,511	\$297	\$1,215	\$425	28.13%
9	\$1,847	\$0	\$1,847	\$646	35.00%
10	\$2,068	\$0	\$2,068	\$724	35.00%
Terminal year	\$2,442	\$0	\$2,442	\$855	35.00%

Note that Commerce One starts making money in year 5 but does not start paying taxes until year 8, which is the year in which the net operating losses run out.⁴

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.

In Chapter 11, we 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).

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

In fact, we have used this equation to estimate growth in most of the valuations that we have 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, we argued that the growth in revenues be estimated first, and that the reinvestment be based upon the revenue growth. To make this link, we

⁴ The tax rate is computed by dividing the taxes by the earnings before interest and taxes.

used a sales/capital ratio, i.e, a ratio that specifies how many additional dollars of revenue will be generated by each additional dollar of capital.

$$\text{Expected Reinvestment} = \frac{\text{Expected change in Revenue}}{\text{Sales/Capital ratio}}$$

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.

$$\text{Expected Reinvestment Rate}_{\text{stable}} = \frac{\text{Expected Growth}_{\text{stable}}}{\text{ROC}_{\text{stable}}}$$

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 23.4: Estimating Reinvestment Needs: Commerce One

Even over its brief history, Commerce One has reinvested in a number of different ways – R&D, acquisitions and traditional capital expenditures – and has reinvested large amounts relative to its size. To estimate future reinvestment needs, we used two pieces of information.

- In 2000, Commerce One had net capital expenditures, including capitalized R&D, of \$160 million and an increase in working capital of \$73 million. The revenues for the firm increased from \$34 million to \$ 537 million. Based upon this, we can estimate a marginal sales/marginal capital ratio for the year.

$$\text{Sales / Capital} = \frac{\text{Change in Sales}_{2000}}{\text{Reinvestment}_{2000}} = \frac{537 - 34}{160 + 73} = 2.16$$

- The average sales to capital ratio for the industry – business services and software – is approximately 2.0. This includes more mature firms that are not e-commerce firms like EDS. For smaller firms in the business, the ratio is 2.21.

We assumed that the sales to capital ratio for Commerce One would be 2.20 for the forecast period. In conjunction with the revenues estimated in Table 23.2, we were able to estimate the total reinvestment needed each year in Table 23.5.

Table 23.5: Reinvestment Needs and Forecast Return on Capital: Commerce One

<i>Year</i>	<i>Revenues</i>	<i>Change in Revenues</i>	<i>Reinvestment</i>	<i>Total Capital</i>	<i>EBIT(1-t)</i>	<i>ROC</i>
Current	\$537			\$2,744	-\$427	
1	\$806	\$269	\$122	\$2,866	-\$387	-14.11%
2	\$1,611	\$806	\$366	\$3,232	-\$437	-15.26%
3	\$2,900	\$1,289	\$586	\$3,818	-\$382	-11.83%
4	\$4,640	\$1,740	\$791	\$4,609	-\$180	-4.72%
5	\$6,496	\$1,856	\$844	\$5,452	\$151	3.27%
6	\$8,770	\$2,274	\$1,033	\$6,486	\$566	10.38%
7	\$11,401	\$2,631	\$1,196	\$7,682	\$1,050	16.19%
8	\$13,681	\$2,280	\$1,036	\$8,718	\$1,086	14.14%
9	\$15,049	\$1,368	\$622	\$9,340	\$1,200	13.77%
10	\$15,802	\$752	\$342	\$9,682	\$1,344	14.39%

By adding the total reinvestment to the capital invested at the beginning of the period, we estimate the total capital invested in the firm. In the last column, we divide our projected after-tax operating income each year by the capital invested at the end of the previous year to compute the return on capital. By year 10, the return on capital at Commerce One is 14.39%, just a shade below the average return on capital for the industry of 15%.⁵ In year 11, which is the first year of stable growth, we assume that Commerce One's return on capital will move to the industry average return on capital. Assuming a stable growth rate of 5% allows us to estimate the reinvestment rate in stable growth.

$$\text{Reinvestment rate in stable growth} = \frac{g}{\text{ROC}} = \frac{5\%}{15\%} = 33.33\%$$

⁵ If the return on capital had become much larger than the industry average in year 10, we would have lowered the sales to capital ratio used in the valuation.

We will use this reinvestment rate to estimate the terminal value in a few pages.

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 one from expected revenue growth in year 2. The length of the lag will depend upon 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: Estimating 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 approaches⁶ to estimate risk parameters. 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 characteristics⁷ of the firm – the volatility in earnings, their size, cash flow characteristics and financial leverage.

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 upon the rating. We could try estimating a synthetic rating, but the negative

⁶ 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.

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

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 upon 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 towards its sustainable margin and stable growth, the risk parameters should also approach those of an average firm – the betas should move towards one and the cost of debt should adjust towards the industry average 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:

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

$$\text{Unlevered Beta} = \text{Business Beta} (1 + (\text{Fixed Costs} / \text{Variable Costs}))$$

Illustration 23.5: Estimating Risk Parameters and Costs of Capital: Commerce One

Commerce One does not have sufficient historical data for us to estimate risk parameters with any degree of accuracy. A regression of stock returns against a market

index since the stock's listing in June 1999 yields a beta of 3.06 but the standard error in the estimate is 2.23, rendering it useless.

To estimate the current beta for the firm, we had a choice between using the average unlevered beta of other B2B firms (which is approximately 2.00) and the average unlevered beta of business service providers (0.98). At the moment, Commerce One's fundamental characteristics seem to reflect the former more than the latter; its growth potential is tied to the success of e-commerce. We therefore chose to use an unlevered beta of 2.00 to estimate the current beta for the firm. At the time of this analysis, Commerce One had debt outstanding of \$25.1 million and the present value of operating leases at the firm amounted to \$131.12 million. Based upon the prevailing market price of \$8.28 and the number of shares (228.32 million) from Table 23.1, we estimated a market value of equity of \$1.89 billion and a debt to equity ratio of 8.26%.

$$\begin{aligned} \text{Debt to Equity ratio} &= \frac{25.1 + 131.12}{1890} = 8.26\% \\ &= (\text{Unlevered beta})(1 + (1 - t)(D/E)) \\ \text{Levered Beta} &= (2)(1 + (1 - 0.00)(0.0826)) \\ &= 2.17 \end{aligned}$$

This will be the beta that we use for the first five years and the tax rate is set to zero to reflect the fact that the firm will not be paying taxes. With a riskfree rate of 5.4% and a risk premium of 4%, we estimate a cost of equity for the first five years.

$$\text{Cost of equity} = 5.4\% + 2.17 (4\%) = 14.06\%$$

To estimate the cost of debt, we computed the average operating income over the next 7 years using the projections in Table 23.4 (obtaining a value of \$54 million) and divided this by the current interest expenses (including the operating lease expenses from the current year)

$$\begin{array}{r} \text{Predicted} \qquad \qquad \qquad \text{Interest} \qquad \qquad \qquad \text{coverage} \qquad \qquad \qquad \text{ratio} \\ = \frac{\text{Average EBIT}}{\text{Interest expense} + \text{Current years lease expense}} = \frac{54}{2.5 + 14.41} = 3.17 \end{array}$$

This yields a rating of BB and a default spread of 3.50% and a pre-tax cost of debt of 8.90% for the next 5 years. Since the firm pays no taxes over this period, its after tax cost of debt is equal to the pre-tax cost.

Beyond year 5, as the firm matures, we feel that Commerce One's risk will approach those of other business service providers and that its beta will decline to 1.2 in year 10, which will still make it riskier than the typical firm in the sector. The pre-tax cost of debt will also decline towards an industry average of 7%, while the debt ratio will increase towards the average for the industry of 12%. The following table summarizes the resulting estimates of cost of equity, debt and capital for Commerce One.

Table 23.6: Costs of Debt, Equity and Capital: Commerce One

<i>Year</i>	<i>Beta</i>	<i>Cost of Equity</i>	<i>Pre-tax cost of debt</i>	<i>Tax Rate</i>	<i>After-tax cost of debt</i>	<i>Debt Ratio</i>	<i>Cost of Capital</i>
1	2.17	14.06%	8.90%	0.00%	8.90%	7.63%	13.67%
2	2.17	14.06%	8.90%	0.00%	8.90%	7.63%	13.67%
3	2.17	14.06%	8.90%	0.00%	8.90%	7.63%	13.67%
4	2.17	14.06%	8.90%	0.00%	8.90%	7.63%	13.67%
5	2.17	14.06%	8.90%	0.00%	8.90%	7.63%	13.67%
6	1.97	13.29%	8.52%	0.00%	8.52%	8.51%	12.88%
7	1.78	12.52%	8.43%	0.00%	8.43%	8.72%	12.16%
8	1.59	11.74%	8.27%	27.93%	5.96%	9.09%	11.22%
9	1.39	10.97%	7.95%	35.00%	5.17%	9.82%	10.40%
10	1.20	10.20%	7.00%	35.00%	4.55%	12.00%	9.52%

[NOTE: The original pre-tax cost of debt does not decline linearly from year 6 to year 10. It had a very strange pattern.]

Note that the beta declines linearly from the current level of 2.17 in year 5 to 1.20 in year 10 and the pre-tax cost of debt declines linearly from 8.90% in year 5 to 7% in year 10. The cost of capital beyond year 10 will be 9.52%.

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 non-operating 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.

- 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.
- 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. In Chapter 12, we suggested a couple of approaches that can help in coming up with this probability including statistical probits and Monte Carlo simulations. Once we have estimated the probability of surviving as a going concern, the value of a firm can then be estimated.

Value of firm = Probability of surviving as a going concern * Discounted Cash flow value of firm + (1- Probability of surviving as a going concern) * Distress or Liquidation sale value

Value of non-operating 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 operation 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 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 23.6: Estimating Firm Value: Commerce One

Having estimated the cash flows and the discount rates, we are now in a position to estimate the firm value for Commerce One as a firm. While estimating cash flows, we consider the fact that the firm will have net operating losses to carry forward and that this will reduce their tax burden when they initially start making money. Table 23.7 summarizes the cash flows to the firm after reinvestment needs for each of the next 10 years and the discount rate applied to these cash flows.

Table 23.7: Expected Cashflows to the firm and Present Value

<i>Year</i>	<i>EBIT(1-t)</i>	<i>Reinvestment</i>	<i>FCFF</i>	<i>Cost of Capital</i>	<i>Cumulated cost of capital</i>	<i>Present Value</i>
1	-\$388	\$122	-\$510	13.67%	1.1367	-\$449
2	-\$438	\$366	-\$805	13.67%	1.2920	-\$623
3	-\$384	\$586	-\$970	13.67%	1.4686	-\$660
4	-\$182	\$791	-\$973	13.67%	1.6693	-\$583
5	\$149	\$844	-\$694	13.67%	1.8975	-\$366
6	\$565	\$1,033	-\$469	12.88%	2.1419	-\$219
7	\$1,049	\$1,196	-\$147	12.16%	2.4024	-\$61
8	\$1,089	\$1,036	\$52	11.22%	2.6719	\$19
9	\$1,200	\$622	\$578	10.40%	2.9498	\$196

10	\$1,344	\$342	\$1,002	9.52%	3.2307	\$310
Sum of the present value of the cash flows over high growth period =						-\$2,435

There is one very significant cash flow that is not reported on this table and that is the terminal value of the firm. To estimate the terminal value, at the end of year 10, we first estimated the free cash flow to the firm in year 11.

$$= \text{EBIT}_{11}(1-t)(1-\text{Reinvestment Rate}_{\text{Stable}})$$

$$\text{Free cash flow to the firm} = (\$2,442)(1-.35)(1-0.3333)$$

$$= \$1,058 \text{ million}$$

We use the stable growth rate of 5% and the reinvestment rate of 33.33% that we estimated earlier. The terminal value can now be estimated.

$$= \frac{\text{FCFF}_{11}}{\text{Cost of capital}_{\text{Stable}} - \text{Stable growth rate}}$$

$$\text{Terminal value} = \frac{1058}{0.0952 - 0.05}$$

$$= \$23,404 \text{ million}$$

The value of the operating assets of the firm can be estimated.

$$= \text{PV of cashflows during high growth} + \text{PV of terminal value}$$

$$\text{Value of operating assets} = -\$2,435 + \frac{\$23,404}{3.2279}$$

$$= \$4,809 \text{ million}$$

To this, we add the most recent estimate that we have of cash, marketable securities and other investments.

$$\text{Value of firm} = \text{Value of operating assets} + \text{Cash and marketable securities} + \text{Other investments}$$

$$= \$4,809 \text{ million} + \$249 \text{ million} + \$38 \text{ million} = \$5,097 \text{ million}$$

This would be the value that we would assign the firm as a going concern.

How much of a discount should be applied for the likelihood that Commerce One may not survive? The firm has a cash balance that will cover its operating cash needs for about 6 months, which increases the chances of failure, especially if the equity markets remain weak. In addition, we expect the firm to continue to lose money for the next 5 years, which will increase its need for external financing. On the positive side, the firm is not heavily levered and is not under immediate pressure to meet debt payments. Assume,

for instance, that these facts lead you to assign a 25% probability that the firm will not survive and that the distress sale value in the event of failure will be 50% of book value of \$2,744 billion. The value of Commerce One can then be estimated as follows.

Value of Commerce One = Going Concern value * probability of going concern + Distress sale value * probability of failure = $\$5,097 * .75 + \$2,744 * .5 * .25 = \$4,166$ million

Clearly, the probability estimate and the distress sale value in this example are arbitrary values, but they can be fine tuned when the probability of default is high.

Step 7: Estimate the value of equity and Per-Share value

To get from firm value to equity value, we generally subtract out all non-equity claims on the firm. For mature firms, the non-equity 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 out to get to the value of the common equity.

To get from equity value to value per share, you have to consider all 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 non-vested – be valued using an option pricing model and that the value of the options be subtracted out 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 23.7: Valuing Equity per Share: Commerce One

Having estimated the value of Commerce One to be \$5.097 million, we first estimate the value of equity by subtracting out the value of the debt claims on the firm. The debt claims that we consider include both the debt outstanding of \$25.1 million and the present value of operating lease commitments of \$131 million.

Value of Commerce One Equity = Value of firm – Debt = $5097 - (25 + 131) = \$4,941$ million

As of December 2000, the firm had options outstanding on 45.911 million shares, with a weighted average life of 8.92 years and a weighted exercise price of \$35.49. Using a Black-

Scholes option pricing model, allowing for dilution, the value of these options were computed using Commerce One's market price of \$8.28 per share as of May 2001. The total value of the options outstanding was estimated to be \$349 million. Assuming that Commerce One will be able to claim this expense as a tax deduction, the value of equity in common stock was computed.

$$\begin{aligned}
 \text{Value of Equity} &= && \$4,941 \text{ million} \\
 \text{Value of Equity in Options Outstanding} &= && - \$227 \text{ million} && : (\$349 (1-.35)) \\
 = \text{Value of Equity in Common Stock} &&& \$ 4,714 \text{ million}
 \end{aligned}$$

Commerce One had 228.32 million shares outstanding as of May 2001, leading to a per share value of

Value of Equity in Common Stock	\$4,714 million
/ Number of Shares outstanding	228.32million
= Value of Equity per Share	\$ 20.65

This value per share is at variance with the value used to price the options. If we iterated back, using this estimated value per share to value the options, we would obtain a value of \$835 million (pre-tax) for the options and a value per share of \$19.26. [NOTE: I am unable to confirm this since I do not have all the parameters for the option pricing.]

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 outstanding⁸. 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 transaction.

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 under priced if it were trading at \$17, but it might not be under priced 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.

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

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.

$$\text{Value of Firm} = \text{Value of Assets in Place} + \text{Value of Growth Potential}$$

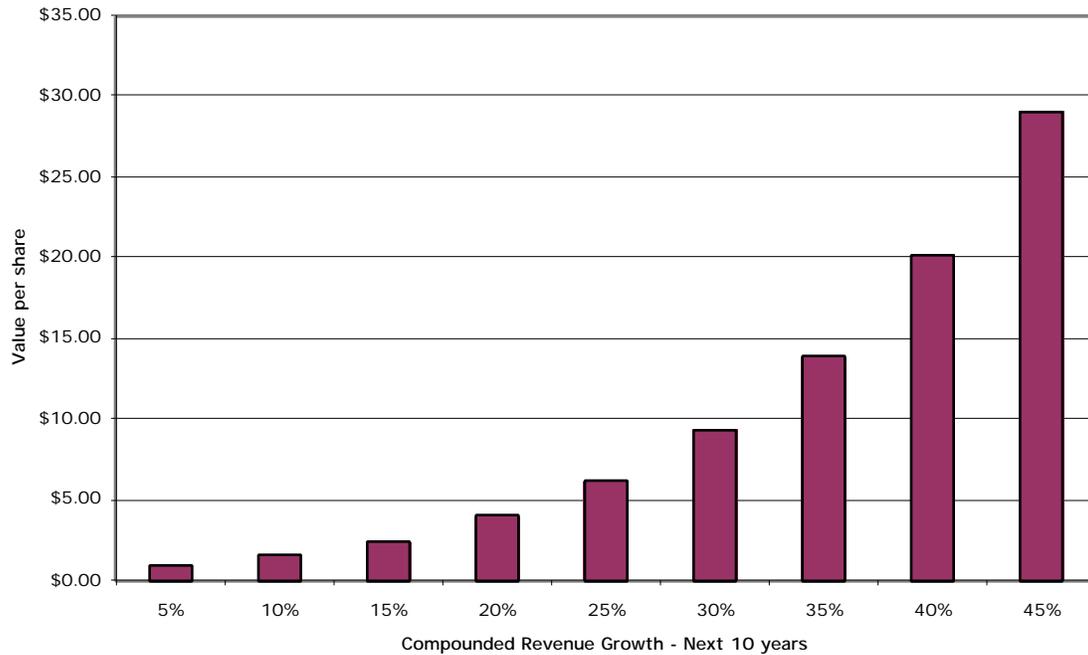
For start-up firms with negative earnings, almost all of the value can be attributed to the second component. Not surprisingly, the firm value is determined by assumptions about the latter.

Illustration 23.8: Value Drivers for Commerce One

There are two key value drivers that affect the value of Commerce One as a firm. The first is the expected compounded growth rate in revenues. We have assumed it to be approximately 40% compounded over the next 10 years. If revenue growth were higher, the value per share would also be higher, as evidenced in the figure below.

⁸ The float is estimated by subtracting out from the shares outstanding, shares that are owned by insiders, 5% owners and rule 144 shares. (Rule 144 refers to restricted stock which cannot be traded.)

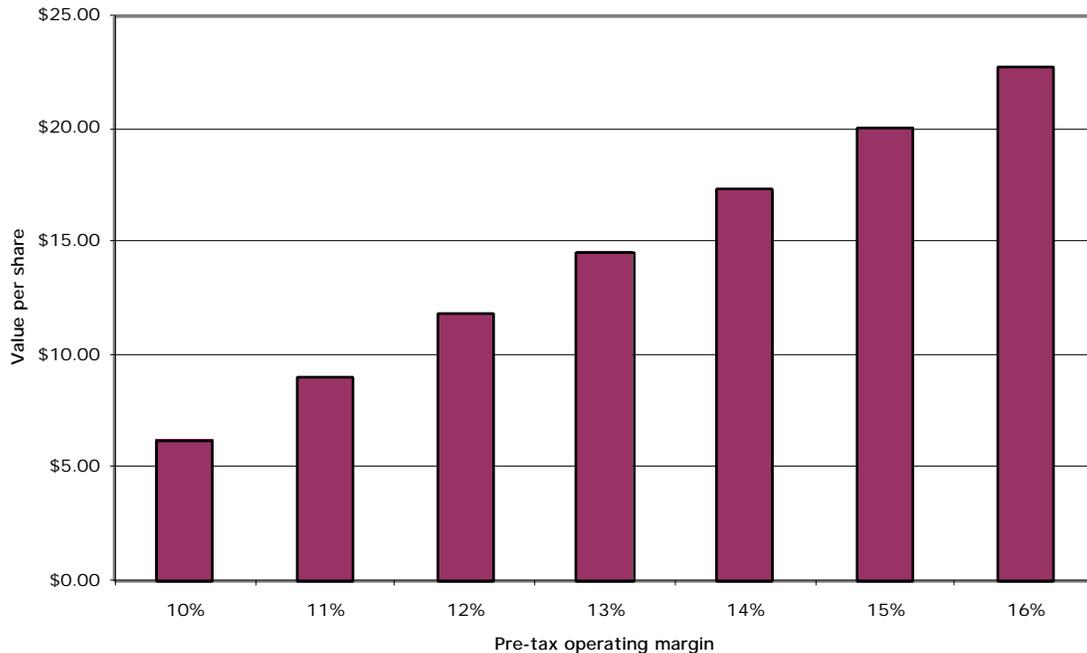
Figure 23.2: Revenue Growth and Value per share



Note, though, that we are talking about compounded growth. At a 50% compounded growth rate, the value per share would be in excess of \$40, but revenues in year 10 would have to be \$30 billion. This is in contrast to our base case assumption where revenues grow to \$15.8 billion in year 10.

The second is the sustainable operating margin. We assumed that it would converge on the industry average of 14.72%. The value per share is extremely sensitive to this assumption.

Figure 23.3: Value per share and Sustainable Margins



If the pre-tax operating margin were to be 16% instead of 14.72%, the value per share would increase to \$23. For this to happen, however, the competition would essentially have to collapse. If, on the other hand, this market turns out to have fewer barriers to entry than anticipated and competition drives margins to 10%, the value per share will drop to single digits.

In conclusion, it is worth noting that we can justify Commerce One's price per share (of \$8.28 at the time of this analysis) under certain circumstances, just as we can justify the market price of any security. For instance, assuming a lower compounded growth rate in revenues for the next 10 years or a lower pre-tax operating margin or some combination of the two would lead us to a value of \$8.28. For any investor or analyst, the follow-up question then becomes a pragmatic one: What are the odds of such an occurrence and do you feel confident enough that this is too pessimistic a view of the world to buy the stock today?

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 upon 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 portfolio⁹ both across firms and across sectors.
- *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

⁹ 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

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

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.

a firm's strategy is not working as well as anticipated may lead to a reassessment of expectations and a share 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% a year when it was expected to grow 50% a year is delivering bad news and will probably see its stock price drop. In contrast, a firm that reports a 20% drop in earnings when it was expected to report a 40% 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 relative to expectations. A company that meets every financial criteria 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 low¹⁰.
- *Small news leads to big price jumps.* As noted in the last 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

¹⁰ The empirical evidence backs up this proposition. Studies of investments seem to indicate that companies that are viewed as well managed under perform companies that are less well regarded as investments.

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 star¹¹.

- *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 to be in the next quarter, there is more to it than this. Understanding why investors value your firm the way they do and what they think are your competitive advantages is 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 reasonable¹².
- *Do not delay the inevitable:* No matter how well a firm manages expectations, there are times when managers realize that they cannot meet expectations any more, because of changes in the sector or the overall economy. While the temptation is strong 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

¹¹ Steve Job's job at Apple Computer was far easier when he took over in 1998 (when the stock price had hit a ten-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 ten-fold, in the process).

¹² Steve Ballmer at Microsoft has developed a reputation for talking down expectations and then beating them on a consistent basis.

and a lower stock price, but firms that delay their day of reckoning tend to be punished much more.

Summary

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 or by adjusting margins from current levels to sustainable levels over time or by reducing leverage. The approach used will depend upon 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 firms.

If all three problems come together for the same firm – negative earnings, limited history and few comparables – the difficulty is compounded. In this essay, we have 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. While some view multiples as a painless way of analyzing these firms, we have pointed out some of the inherent constraints with coming up with usable multiples and comparables for such firms, and the dangers of trusting the market to be right, on average.

Problems

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 pre-tax operating margin to improve – in linear increments – to 10% by the fifth year. Estimate the revenues and operating income each year for the next 5 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 last 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 Telecommunications 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 5 years, and the pre-tax 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, estimate
 - a. The revenues and pre-tax operating income each year for the next 5 years.

- b. The taxes you would have to pay and your after-tax operating income each year for the next 5 years..
5. In problem 4, assume that Lumin Telecommunications 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 5 years, estimate the cost of capital for the firm each year for the next 5 years. (The riskfree rate is 5.6% and the risk premium is 4%.)
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 5 years and you estimate the probability of failure at 40%. If the firm fails, you expect that its assets to sell for 1.5 times book value. If there are 30 million shares outstanding, estimate the value per share.