

## Valuing Firms with Negative Earnings

In most of the valuations thus far in this book, we have looked at firms that have positive earnings. In this chapter, we consider a subset of firms with negative earnings or abnormally low earnings that we categorize as troubled firms. We begin by looking at why firms have negative earnings in the first place and look at the ways that valuation has to be adapted to reflect these underlying reasons.

For firms with temporary problems—a strike or a product recall, for instance—we argue that the adjustment process is a simple one, where we back out of current earnings the portion of the expenses associated with the temporary problems. For cyclical firms, where the negative earnings are due to a deterioration of the overall economy, and for commodity firms, where cyclical movements in commodity prices can affect earnings, we argue for the use of normalized earnings in valuation. For firms with long-term strategic problems or operating problems (outdated plants, a poorly trained workforce, or poor investments in the past) the process of valuation becomes more complicated because we have to make assumptions about whether the firm will be able to outlive its problems and restructure itself. Finally, we look at firms that have negative earnings because they have borrowed too much, and consider how best to deal with the potential for default.

### **NEGATIVE EARNINGS: CONSEQUENCES AND CAUSES**

A firm with negative earnings or abnormally low earnings is more difficult to value than a firm with positive earnings. This section looks at why such firms create problems for analysts in the first place, and then follows up by examining the reasons for negative earnings.

#### **Consequences of Negative or Abnormally Low Earnings**

Firms that are losing money currently create several problems for the analysts who are attempting to value them. While none of these problems are conceptual, they are significant from a measurement standpoint:

1. *Earnings growth rates cannot be estimated or used in valuation.* The first and most obvious problem is that we can no longer estimate an expected growth rate to earnings and apply it to current earnings to estimate future earnings. When current earnings are negative, applying a growth rate will just make it more negative. In fact, even estimating an earnings growth rate becomes problematic, whether one uses historical growth, analyst projections, or fundamentals.

- Estimating historical growth when current earnings are negative is difficult, and the numbers, even if estimated, often are meaningless. To see why, assume that a firm's operating earnings have gone from −\$200 million last year to −\$100 million in the current year. The traditional historical growth equation yields the following:

$$\begin{aligned}\text{Earnings growth rate} &= \text{Earnings}_{\text{today}} / \text{Earnings}_{\text{last year}} - 1 \\ &= (-100 / -200) - 1 = -50\%\end{aligned}$$

This clearly does not make sense since this firm has improved its earnings over the period. In fact, we looked at this problem in Chapter 11.

- An alternative approach to estimating earnings growth is to use analyst estimates of projected growth in earnings, especially over the next five years. The consensus estimate of this growth rate across all analysts following a stock is generally available as public information for many U.S. companies and is often used as the expected growth rate in valuation. For firms with negative earnings in the current period, this estimate of a growth rate will not be available or meaningful.
- A third approach to estimating earnings growth is to use fundamentals. This approach is also difficult to apply for firms that have negative earnings, since the two fundamental inputs—the return made on investments (return on equity or capital) and the reinvestment rate (or retention ratio)—are usually computed using current earnings. When current earnings are negative, both these inputs become meaningless from the perspective of estimating expected growth.

2. *Tax computation becomes more complicated.* The standard approach to estimating taxes is to apply the marginal tax rate on the pretax operating income to arrive at the after-tax operating income:

$$\text{After-tax operating income} = \text{Pretax operating income}(1 - \text{Tax rate})$$

This computation assumes that earnings create tax liabilities in the current period. While this is generally true, firms that are losing money can carry these losses forward in time and apply them to earnings in future periods. Thus analysts valuing firms with negative earnings have to keep track of the net operating losses of these firms and remember to use them to shield income in future periods from taxes.

3. *The going concern assumption may not apply.* The final problem associated with valuing companies that have negative earnings is the very real possibility that these firms will go bankrupt if earnings stay negative, and that the assumption of infinite lives that underlies the estimation of terminal value may not apply in these cases.

The problems are less visible but exist nevertheless for firms that have abnormally low earnings; that is, the current earnings of the firm are much lower than what the firm has earned historically. Though you can compute historical growth and fundamental growth for these firms, they are likely to be meaningless because current earnings are depressed. The historical growth rate in earnings will be negative, and the fundamentals will yield very low estimates for expected growth.

## Causes of Negative Earnings

There are several reasons why firms have negative or abnormally low earnings, some of which can be viewed as temporary, some of which are long-term, and some of which relate to where a firm stands in the life cycle.

**Temporary Problems** For some firms, negative earnings are the result of temporary problems, sometimes affecting the firm alone, sometimes affecting an entire industry, and sometimes the result of a downturn in the economy.

- Firm-specific reasons for negative earnings can include a strike by the firm's employees, an expensive product recall, or a large judgment against the firm in a lawsuit. While these will undoubtedly lower earnings, the effect is likely to be one-time and not affect future earnings.
- Sectorwide reasons for negative earnings can include a downturn in the price of a commodity for a firm that produces that commodity. It is common, for instance, for paper and pulp firms to go through cycles of high paper prices (and profits) followed by low paper prices (and losses). In some cases, the negative earnings may arise from the interruption of a common source of supply for a necessary raw material or a spike in its price. For instance, an increase in oil prices will negatively affect the profits of all airlines.
- For cyclical firms, a recession will affect revenues and earnings. It is not surprising, therefore, that automobile companies report low or negative earnings during bad economic times.

The common thread for all of these firms is that we expect earnings to recover sooner rather than later as the problem dissipates. Thus we would expect a cyclical firm's earnings to bounce back once the economy revives and an airline's profits to improve once oil prices level off.

**Long-Term Problems** Negative earnings are sometimes reflections of deeper and much more long-term problems in a firm. Some of these are the results of poor strategic choices made in the past, some reflect operational inefficiencies, and some are purely financial, the result of a firm borrowing much more than it can support with its existing cash flows.

- A firm's earnings may be negative because its strategic choices in terms of product mix or marketing policy might have backfired. For such a firm, financial health is generally not around the corner and will require a substantial makeover and, often, new management.
- A firm can have negative earnings because of inefficient operations. For instance, the firm's plant and equipment may be obsolete or its workforce may be poorly trained. The negative earnings may also reflect poor decisions made in the past by management and the continuing costs associated with such decisions. For instance, firms that have gone on acquisition binges and overpaid on a series of acquisitions may face several years of poor earnings as a consequence.
- In some cases, a firm that is in good health operationally can end up with negative equity earnings because it has chosen to use too much debt to fund its operations. For instance, many of the firms that were involved in leveraged buyouts in the 1980s reported losses in the first few years after the buyouts.

**Life Cycle** In some cases, a firm's negative earnings may not be the result of problems in the way it is run but because of where the firm is in its life cycle. Here are three examples:

1. Firms in businesses that require huge infrastructure investments up front will often lose money until these investments are in place. Once they are made and the firm is able to generate revenues, the earnings will turn positive. You can argue that this was the case with the phone companies in the early part of the twentieth century in the United States, the cable companies in the 1980s, and the cellular companies in the early 1990s.
2. Small biotechnology or pharmaceutical firms often spend millions of dollars on research, come up with promising products that they patent, but then have to wait years for Food and Drug Administration (FDA) approval to sell the drugs. In the meantime, they continue to have research and development expenses and report large losses.

#### **MAKING THE CALL: SHORT-TERM VERSUS LONG-TERM PROBLEMS**

In practice, it is often difficult to disentangle temporary or short-term problems from long-term ones. There is no simple rule of thumb that works, and accounting statements are not always forthcoming about the nature of the problems. Most firms, when reporting negative earnings, will claim that their problems are transitory and that recovery is around the corner. Analysts have to make their own judgments on whether this is the case, and they should consider the following:

- *The credibility of the management making the claim.* The managers of some firms are much more forthcoming than others in revealing problems and admitting their mistakes, and their claims should be given much more credence.
- *The amount and timeliness of information provided with the claim.* A firm that provides detailed information backing up its claim that the problem is temporary is more credible than a firm that does not provide such information. In addition, a firm that reveals its problems promptly is more believable than one that delays reporting problems until its hand is forced.
- *Confirming reports from other companies in industry.* A cyclical company that claims that its earnings are down because of an economic slowdown will be more believable if other companies in the sector also report similar slowdowns.
- *The persistence of the problem.* If poor earnings persist over multiple periods, it is much more likely that the firm is facing a long-term problem. Thus, a series of restructuring charges should be viewed with suspicion.

3. The third group includes young start-up companies. Often these companies have interesting and potentially profitable ideas, but they lose money until they convert these ideas into commercial products. Until the late 1990s, these companies seldom went public but relied instead on venture capital financing for their equity needs. One of the striking features of the boom in new technology companies from 1997 to 2000 was the number of such firms that chose to bypass the venture capital route and go to the markets directly.

## VALUING NEGATIVE EARNINGS FIRMS

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The way we deal with negative earnings will depend on why the firm has negative earnings in the first place. This section explores the alternatives that are available for working with negative earnings firms.

### Firms with Temporary Problems

When earnings are negative because of temporary or short-term problems, the expectation is that earnings will recover in the near term. Thus, the solutions we devise will be fairly simple ones, which for the most part will replace the current earnings (which are negative) with normalized earnings (which will be positive). How we normalize earnings will vary depending on the nature of the problem.

**Firm-Specific Problems** A firm can have a bad year in terms of earnings, but the problems may be isolated to that firm, and be short-term in nature. If the loss can be attributed to a specific event—a strike or a lawsuit judgment, for instance—and the accounting statements report the cost associated with the event, the solution is fairly simple. You should estimate the earnings prior to these costs and use these earnings not only for estimating cash flows but also for computing fundamentals such as return on capital. In making these estimates, though, note that you should remove not just the expense but all of the tax benefits created by the expense as well, assuming that it is tax deductible.

If the cause of the loss is more diffuse or if the cost of the event causing the loss is not separated out from other expenses, you face a tougher task. First, you have to ensure that the loss is in fact temporary and not the symptom of long-term problems at the firm. Next, you have to estimate the normal earnings of the firm. The simplest and most direct way of doing this is to compare each expense item for the firm for the current year with the same item in previous years, scaled to revenues. Any item that looks abnormally high, relative to prior years, should be normalized (by using an average from previous years). Alternatively, you could apply the operating margin that the firm earned in prior years to the current year's revenues and estimate an operating income to use in the valuation.

In general, you will have to consider making adjustments to the earnings of firms after years in which they have made major acquisitions, since the accounting statements in these years will be skewed by large items that are generally nonrecurring and related to the acquisition.

**ILLUSTRATION 22.1: Normalizing Earnings for a Firm after a Poor Year: Daimler-Benz in 1995**

In 1995, Daimler-Benz reported an operating loss of DM 2,016 million and a net loss of DM 5,674 million. Much of the loss could be attributed to firm-specific problems including a large write-off of a failed investment in Fokker Aerospace, an aircraft manufacturer. To estimate normalized earnings at Daimler-Benz, we eliminated all charges related to these items and estimated a pretax operating income of DM 5,693 million. To complete the valuation, we made the following additional assumptions:

- Revenues at Daimler had been growing 3% to 5% a year prior to 1995, and we anticipated that the long-term growth rate would be 5% in both revenues and operating income.
- The firm had a book value of capital invested of DM 43,558 million at the beginning of 1995, and was expected to maintain its return on capital (based on the adjusted operating income of DM 5,693 million).
- The firm's tax rate is 44%.<sup>1</sup>

To value Daimler, we first estimated the return on capital at the firm, using the adjusted operating income:

$$\begin{aligned}\text{Return on capital} &= \text{EBIT}(1 - t)/\text{Book value of capital invested} \\ &= 5,693(1 - .44)/43,558 = 7.32\%\end{aligned}$$

Based on the expected growth rate of 5%, this would require a reinvestment rate of 68.31%:

$$\text{Reinvestment rate} = g/\text{ROC} = 5\%/7.32\% = 68.31\%$$

With these assumptions, we were able to compute Daimler's expected free cash flows in 1996:

EBIT(1 - t) = 5,693(1.05)(1 - .44)	DM 3,347 million
– Reinvestment = 5,693(1.05)(.6831)	DM 2,287 million
Free cash flow to firm	DM 1,061 million

To compute the cost of capital, we used a bottom-up beta of 0.95, estimated using automobile firms listed globally. The long-term bond rate (on a German government bond denominated in DM) was 6%, and Daimler-Benz could borrow long-term at 6.1%. We assumed a market risk premium of 4%. The market value of equity was DM 50,000 million, and there was DM 26,281 million in debt outstanding at the end of 1995.

$$\begin{aligned}\text{Cost of equity} &= 6\% + 0.95(4\%) = 9.8\% \\ \text{Cost of debt} &= 6.1\%(1 - .44) = 3.42\% \\ \text{Debt ratio} &= 26,281/(50,000 + 26,281) = 34.45\% \\ \text{Cost of capital} &= 9.8\%(.6555) + 3.42\%(.3445) = 7.60\%\end{aligned}$$

Note that all of the costs are computed in DM terms, to be consistent with our cash flows. The firm value can now be computed, if we assume that earnings and cash flows will grow at 5% a year in perpetuity:

<sup>1</sup>Germany has a particularly complicated tax structure since it has different tax rates for retained earnings and dividends, which makes the tax rate a function of a firm's dividend policy.

$$\begin{aligned}\text{Value of operating assets at end of 1995} &= \text{Expected FCFF in 1996} \\ &\quad / (\text{Cost of capital} - \text{Expected growth rate}) \\ &= 1,061 / (.076 - .05) = \text{DM } 40,787 \text{ million}\end{aligned}$$

Adding to this the value of the cash and marketable securities (DM 13,500 million) held by Daimler at the time of this valuation, and netting out the market value of debt (\$26,281) yields an estimated value of DM 28,006 million for equity, significantly lower than the market value of DM 50,000 million.

$$\begin{aligned}\text{Value of equity} &= \text{Value of operating assets} + \text{Cash and marketable securities} - \text{Debt} \\ &= 40,787 + 13,500 - 26,281 = \text{DM } 28,006 \text{ million}\end{aligned}$$

As in all firm valuations, there is an element of circular reasoning involved in this valuation.<sup>2</sup>

**Sectorwide or Market-Driven Problems** The earnings of cyclical firms are, by definition, volatile and depend on the state of the economy. In economic booms the earnings of these firms are likely to increase, while in recessions the earnings will be depressed. The same can be said of commodity firms that go through price cycles, where periods of high prices for the commodity are often followed by low prices. In both cases, you can get misleading estimates of value if you use the current year's earnings as your base year earnings.

**Valuing Cyclical Firms** Cyclical firm valuations can be significantly affected by the level of base year earnings. There are two potential solutions: One is to adjust the expected growth rate in the near periods to reflect cyclical changes, and the other is to value the firm based on normalized rather than current earnings.

**Adjust Expected Growth** Cyclical firms often report low earnings at the bottom of an economic cycle, but the earnings recover quickly when the economy recovers. One solution, if earnings are not negative, is to adjust the expected growth rate in earnings, especially in the near term, to reflect expected changes in the economic cycle. This would imply using a higher growth rate in the next year or two, if both the firm's earnings and the economy are depressed currently but are expected to recover quickly. The strategy would be reversed if the current earnings are inflated (because of an economic boom), and if the economy is expected to slow down. The disadvantage of this approach is that it ties the accuracy of the estimate of value for a cyclical firm to the precision of the macroeconomic predictions of the analyst doing the valuation. The criticism, though, may not be avoidable since it is difficult to value a cyclical firm without making assumptions about future economic growth. The actual growth rate in earnings in turning-point years (years when the economy goes into or comes out of a recession) can be estimated by looking at the experience of this firm (or similar firms) in prior recessions.

<sup>2</sup>The circular reasoning comes in because we use the current market value of equity and debt to compute the cost of capital. We then use the cost of capital to estimate the value of equity and debt. If this is unacceptable, the process can be iterated, with the cost of capital being recomputed using the estimated values of debt and equity, and continued until there is convergence.

**ILLUSTRATION 22.2: Valuing a Cyclical Firm during a Recession—Adjusting the Growth Rate: Chesapeake Corporation in Early 1993**

Chesapeake Corporation, a cyclical firm in the paper products industry that makes recycled commercial and industrial tissue, had earnings per share in 1992 of \$0.63, down from \$2.51 in 1988. If the 1992 earnings per share had been used as the base year's earnings, Chesapeake Corporation would be valued based on the following inputs:

Current earnings per share = \$0.63  
 Current depreciation per share = \$2.93  
 Current capital spending per share = \$3.63  
 Debt ratio for financing capital spending = 45%

Chesapeake had a beta of 1.00 and no significant working capital requirements. The Treasury bond rate was 8.5% at the time of this analysis, and the risk premium of 4% for stocks over bonds is used.

$$\text{Cost of equity} = 8.5\% + 1(4\%) = 12.5\%$$

If we valued Chesapeake based on current earnings and assume a long-term growth rate of 6%, we would have estimated a value per share of \$4.

$$\text{Free cash flow to equity in 1992} = \$0.63 - (1 - 0.45)(\$3.63 - \$2.93) = \$0.245$$

$$\text{Value per share} = \$0.245 \times 1.06 / (.125 - .06) = \$4.00$$

Chesapeake Corp. was trading at \$20 per share in May 1993.

Assume that the economy was expected to recover slowly in 1993 and much faster in 1994. As a consequence, the growth rates in earnings projected for Chesapeake Corporation were as follows:

<i>Year</i>	<i>Expected Growth Rate</i>	<i>Earnings per Share</i>
1993	5%	\$0.66
1994	100%	\$1.32
1995	50%	\$1.98
After 1996	6%	

The capital spending and depreciation were expected to grow at 6%. The free cash flow to equity could be estimated as follows:

	<i>1993</i>	<i>1994</i>	<i>1995</i>	<i>1996</i>
EPS	\$0.66	\$1.32	\$1.98	\$2.10
– (Cap ex – Depreciation)(1 – Debt ratio)	\$0.41	\$0.43	\$0.46	\$0.49
= FCFE	\$0.25	\$0.89	\$1.53	\$1.62

$$\text{Terminal price (at end of 1995)} = \frac{\$1.62}{(.125 - .06)} = \$24.88$$

$$\text{Present value per share} = \$0.25/1.125 + \$0.89/1.125^2 + (\$1.53 + \$24.88)/1.125^3 = \$19.47$$

This value was much closer to the market price of \$20.

**Normalize Earnings** For cyclical firms, the easiest solution to the problem of volatile earnings over time, and negative earnings in the base period, is to normalize earnings. When normalizing earnings for a firm with negative earnings, we are simply trying to answer the question: “What would this firm earn in a normal



year?” Implicit in this statement is the assumption that the current year is not a normal year and earnings will recover quickly to normal levels. This approach, therefore, is most appropriate for cyclical firms in mature businesses. There are a number of ways in which earnings can be normalized:

- *Average the firm's dollar earnings over prior periods.* The simplest way to normalize earnings is to use the average earnings over prior periods. How many periods should you go back in time? For cyclical firms, you should go back long enough to cover an entire economic cycle—between 5 and 10 years. While this approach is simple, it is best suited for firms that have not changed in scale (or size) over the period. If it is applied to a firm that has become larger or smaller (in terms of the number of units it sells or total revenues) over time, it will result in a normalized estimate that is incorrect.
- *Average the firm's return on investment or profit margins over prior periods.* This approach is similar to the first one, but the averaging is done on scaled earnings instead of dollar earnings. The advantage of the approach is that it allows the normalized earnings estimate to reflect the current size of the firm. Thus a firm with an average return on capital of 12 percent over prior periods and a current capital invested of \$1,000 million would have normalized operating income of \$120 million. Using average return on equity and book value of equity yields normalized net income. A close variant of this approach is to estimate the average operating or net margin in prior periods and apply this margin to current revenues to arrive at normalized operating or net income. The advantage of working with revenues is that they are less susceptible to manipulation by accountants.

There is one final question that we have to deal with when normalizing earnings, and it relates to when earnings will be normalized. Replacing current earnings with normalized earnings essentially is equivalent to assuming that normalization will occur instantaneously (i.e., in the very first time period of the valuation). If earnings will not return to normalized levels for several periods, the value obtained by normalizing current earnings will be too high. A simple correction that can be applied is to discount the value back by the number of periods it will take to normalize earnings.

#### **ILLUSTRATION 22.3: Normalizing Earnings for a Cyclical Firm in a Recession: Historical Margin**

In 1992, toward the end of a recession in Europe and the United States, Volvo reported an operating loss of 2,249 million Swedish kroner (Sk) on revenues of 83,002 million Sk. To value the firm, we first had to normalize earnings. We used Volvo's *average* pretax operating margin from 1988 to 1992 of 4.1% as a measure of the normal margin, and applied it to revenues in 1992 to estimate normalized operating income:

$$\begin{aligned}\text{Normalized operating income in 1992} &= \text{Revenues}_{1992} \times \text{Normalized margin} \\ &= 83,002 \text{ million} \times .041 = 3,403 \text{ million Sk}\end{aligned}$$

To value the operating assets of the firm, we assumed that Volvo was in stable growth, a reasonable assumption given its size and the competitive nature of the automobile industry, and that the ex-

pected growth rate in perpetuity would be 4%. To estimate the firm's reinvestment needs, we assumed that Volvo's return on capital in the future would be equal to the average return on capital that the firm earned between 1988 and 1992, which was 12.2%. This allowed use to estimate a reinvestment rate for the firm of 32.78%.

$$\text{Reinvestment rate in stable growth} = g/\text{ROC} = 4\%/12.2\% = 32.78\%$$

The expected free cash flow to the firm in 1993, based on the normalized pretax operating income of 3,403 million Sk, an estimated tax rate of 35%, the expected growth rate of 4%, and the reinvestment rate of 32.78%, can be estimated as follows:

$$\begin{aligned}\text{Expected free cash flow to the firm in 1993} &= \text{EBIT}_{1992}(1 + g)(1 - \text{Tax rate})(1 - \text{Reinvestment rate}) \\ &= 3,403(1.04)(1 - .35)(1 - .3278) = 1,546 \text{ million Sk}\end{aligned}$$

To estimate the cost of capital for Volvo, we computed weights on the market value of equity of 22,847 million Sk at the end of 1992 and the debt outstanding of 42,641 million Sk. We used a bottom-up beta of 1.20 for Volvo and a pretax cost of debt of 8.00%, reflecting its high leverage at the time of the analysis. The risk-free rate in Swedish kroner was 6.6% and the risk premium used was 4%:

$$\text{Cost of equity} = 6.6\% + 1.2(4\%) = 11.40\%$$

$$\begin{aligned}\text{Cost of capital} &= 11.40\%[.22847/(22,847 + 42,641)] + 8\%(1 - .35)[42,641/(22,847 + 42,641)] \\ &= 7.36\%\end{aligned}$$

The value of the operating assets of Volvo can now be estimated:

$$\begin{aligned}\text{Value of operating assets} &= \text{Expected FCFF in 1993}/(\text{Cost of capital} - \text{Expected growth}) \\ &= 1,546/ (.0736 - .04) = 45,977 \text{ million Sk}\end{aligned}$$

Adding to this the value of cash and marketable securities (20,760 million Sk) held by the firm at the end of 1992 and subtracting out debt (\$42,641) yields an estimated value for equity:

$$\begin{aligned}\text{Value of equity} &= \text{Value of operating assets} + \text{Cash and marketable securities} - \text{Debt} \\ &= 45,977 + 20,760 - 42,641 = 24,096 \text{ million Sk}\end{aligned}$$

Based on this estimate, Volvo was slightly undervalued at the end of 1992, since the market value of equity was \$22,847 million.

Implicitly, we are assuming that Volvo's earnings will rebound quickly to normalized levels and that the recession will end in the very near future. If we assume that the recovery will take time, we can incorporate the effect into value by discounting the value estimated in the analysis back by the number of years that it will take Volvo to return to normal earnings. For instance, if we assume that adjustment will take two years, we could discount the value of the firm back two years at the cost of capital and then add cash and subtract the debt outstanding:

Value of the operating assets assuming two-year recovery = $45,977/1.0736^2$	39,889
+ Cash and marketable securities	+ 20,760
- Value of debt outstanding	- 42,641
= Value of equity	18,008

If we assume that the recovery will take two years or more, Volvo's equity is overvalued.



**normearn.xls:** This spreadsheet allows you to normalize the earnings for a firm, using a variety of approaches.

**MACROECONOMIC VIEWS AND VALUATION**

The earnings of cyclical firms tend to be volatile, with the volatility linked to how well or badly the economy is performing. One way to incorporate these effects into value is to build in expectations of when future recessions and recoveries will occur into the cash flows. This exercise is fraught with danger, since the error in such predictions is likely to be very large. Economists seldom agree on when a recovery is imminent, and most categorizations of recessions occur after the fact. Furthermore, a valuation that is based on specific macroeconomic forecasts makes it difficult for users to separate how much of the final recommendation (i.e., that the firm is under- or overvalued) comes from the firm being mispriced and how much reflects the analyst's optimism or the pessimism about the overall economy.

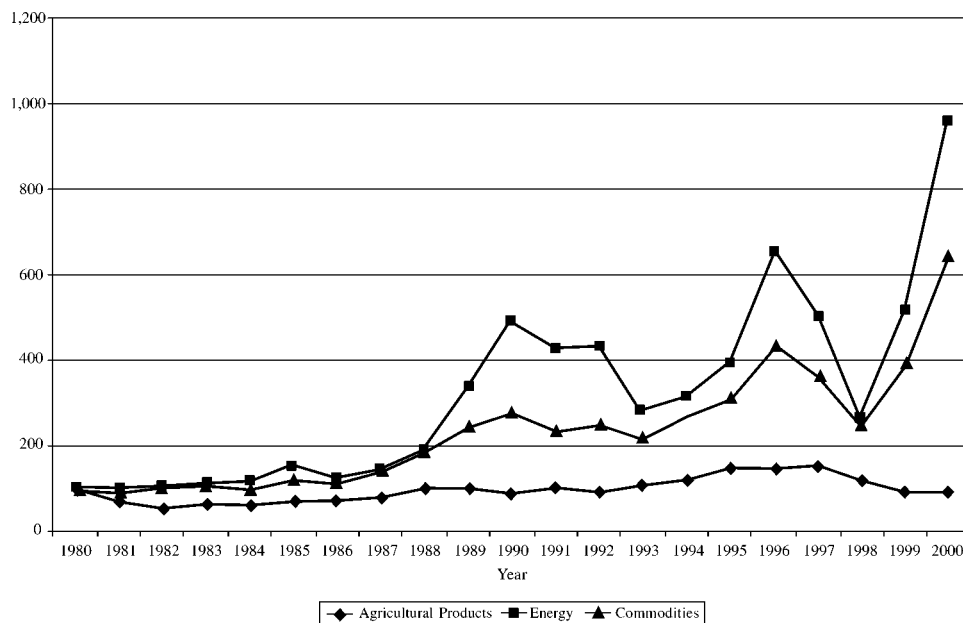
The other way to incorporate earnings variability into the valuation is through the discount rate—cyclical firms tend to be more risky and require higher discount rates. This is what we do when we use higher unlevered betas and/or costs of debt for cyclical firms.

**Valuing Commodity and Natural Resource Firms** Commodity prices are not only volatile but go through cycles—periods of high prices followed by periods with lower prices. Figure 22.1 summarizes the levels of three indexes—an agricultural products index, an energy index, and an overall commodities index each year from 1980 to 2000.

There are two facts that come through from this analysis. The first is that commodity prices are volatile, with long periods of price increases followed by long periods of depressed prices. The other is that there is some correlation across different commodities when it comes to prices, with energy being much more volatile than agricultural products.

Some natural resource companies smooth out their earnings using futures and options contracts, but many let the price changes flow through into their bottom lines. As a consequence, the earnings of commodity companies tend to move up and down with commodity prices. To value natural resource companies—and that group would include not just mining firms but also forest product firms (such as timber) and plantations—you have three choices:

1. One is to try to forecast future commodity prices—the commodity price cycle—and build these forecasts into expected revenues in future years. This may be difficult to do since the cycles are unpredictable. However, you could use prices from the futures market as your forecasted prices.
2. You could value the firms using a normalized commodity price, estimated by looking at the average price of the commodity over a cycle. Thus, the average price of coffee over the past decade can be used to estimate the value of a coffee plantation. The danger, of course, is that the price of coffee may stay well above or below this average price for an extended period, throwing off estimates of value.



**FIGURE 22.1** Commodity Prices

Source: Bloomberg.

3. You could value the firm's current production using the current price for the commodity, low though it might be, and add to it the value of the option that the company possesses, which is to produce more if prices go up and less if they go down. We will look at this approach in more detail in Chapter 28.

#### ILLUSTRATION 22.4: Valuing a Commodity Company: Aracruz Celulose

Aracruz Celulose is a Brazilian paper and pulp manufacturer and, like all firms in this sector, it is susceptible to the ups and downs of the price of paper and pulp. Figure 22.2 reports on the revenues and operating income at Aracruz over the past decade, and the same graph provides an index of the price of pulp each year. Note the correlation between Aracruz's fortunes and the price of paper and pulp. The years with low or negative earnings for Aracruz generally are also the years when paper prices decline.

In May 2001, when we valued Aracruz, the firm had just emerged from a year of high paper prices and profitability to report 666 million BR of operating income on revenues of 1,342 million BR in 2000; the firm faced a tax rate of 33%. If we use this operating income to value Aracruz, we are assuming that paper prices will continue to remain high. To prevent this from biasing the valuation, we reestimated revenues and operating income in 2000, using the average price of paper over the past decade:

$$\begin{aligned}\text{Restated revenues} &= \text{Revenues}_{2000} \times (\text{Average paper price}_{91-00} / \text{Paper price}_{2000}) \\ &= 1,342 \times (102.58/109.39) = 1,258 \text{ million BR}\end{aligned}$$

$$\begin{aligned}\text{Restated operating income} &= \text{Restated revenues} - \text{Operating expenses} \\ &= 1,258 - (1,342 - 666) = 582 \text{ million BR}\end{aligned}$$

This operating income was used to compute a normalized return on capital for the firm of 10.55%, based on the book values of debt (\$1,549 million) and equity (\$2,149 million) invested at the end of the previous year:

$$\begin{aligned}\text{Normalized return on capital} &= \text{Operating income}_{2000} (1 - t) \\ &\quad / (\text{Book value of debt}_{1999} + \text{Book value of equity}_{1999}) \\ &= 582 \times (1 - .33) / (1,549 + 2,149) = 10.55\%\end{aligned}$$

We assumed that the firm would maintain this return on capital and grow 10% a year, in real terms, for the next five years and 3% a year in real terms in perpetuity after that. The following table summarizes projections of free cash flows to the firm for Aracruz for the next five years and for the first year of stable growth (six years from now):

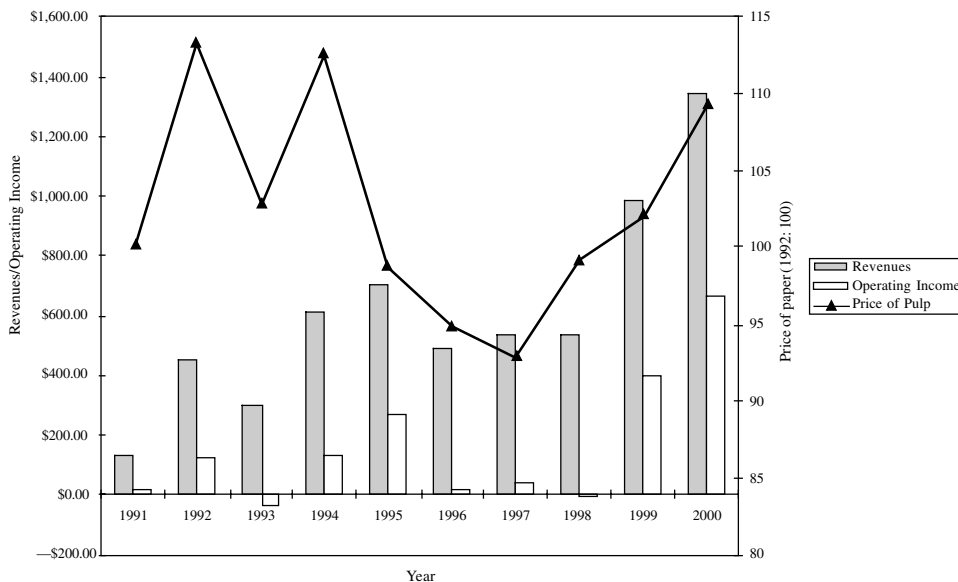
	1	2	3	4	5	Terminal Year
Expected growth	10%	10%	10%	10%	10%	3%
Reinvestment rate	94.79%	94.79%	94.79%	94.79%	94.79%	28.44%
EBIT	\$644	\$712	\$787	\$870	\$961	\$1,063
EBIT(1 - t)	\$431	\$477	\$527	\$583	\$644	\$712
- Reinvestment	\$409	\$452	\$500	\$552	\$611	\$203
= FCFF	\$22	\$25	\$27	\$30	\$34	\$510

Note that the reinvestment rate each year is computed based on the expected growth rate and return on capital:

$$\text{Reinvestment rate} = g / \text{Normalized return on capital}$$

As expected growth declines in year 6 (the terminal year), the reinvestment rate also declines.

The cost of capital was estimated in real terms, using a bottom-up beta of 0.70 estimated by looking at paper and pulp firms and an additional risk premium for exposure to Brazilian country



**FIGURE 22.2** Aracruz Celulose: Revenues, Profits, and the Price of Pulp

Source: Aracruz Annual Report.

risk—10.24% for the next five years and 5% after five years. This is in addition to the mature market premium of 4%. We use a real risk-free rate of 4%. To estimate the real cost of debt, we assume a pretax real cost of borrowing of 7.5% for Aracruz for both the high-growth and stable-growth periods:

$$\text{Real after-tax cost of debt} = 7.5\%(1 - .33) = 5.03\%$$

The current market values of equity (3,749 million BR) and debt (1,395 million BR) were used to compute a market debt to capital ratio of 27.11%, and the costs of capital for both periods are shown in the following table:

	<i>High Growth</i>	<i>Stable Growth</i>
Beta	0.7	0.7
Risk-free rate	4%	4%
Mature market premium	4%	4%
Country premium	10.24%	5%
Cost of equity	$4\% + 0.7(4\% + 10.24\%) = 13.97\%$	$4\% + 0.7(4\% + 5\%) = 10.30\%$
Cost of debt	5.03%	5.03%
Debt ratio	27.11%	27.11%
Cost of capital	11.54%	8.87%

The terminal value is first estimated using the terminal year's cash flows estimated in the table and the perpetual growth rate of 3%:

$$\begin{aligned} \text{Terminal value} &= \text{FCFF}_{\text{terminal year}} / (\text{Cost of capital}_{\text{stable}} - g) \\ &= 510 / (.0887 - .03) = 8,682 \text{ million BR} \end{aligned}$$

The value of the operating assets of the firm can be computed today as the present value of the cash flows for the next five years and the present value of the terminal value, using the high-growth period cost of capital as the discount rate:

$$\begin{aligned} \text{Value of operating assets} &= 22/1.1154 + 25/1.1154^2 + 27/1.1154^3 + 30/1.1154^4 \\ &\quad + 34/1.1154^5 + 8,682/1.1154^5 = 5,127 \text{ million BR} \end{aligned}$$

We added back the value of cash and marketable securities (849 million BR) and subtracted outstanding debt (1,395 million BR) to estimate a value of equity:

$$\text{Value of equity} = 5,127 + 849 - 1,395 = 4,581 \text{ million BR}$$

This would suggest that the firm is undervalued at its current value of 2,149 million BR.

## Firms with Long-Term Problems

In all of the valuations presented in the last section, earnings were adjusted either instantaneously to reflect normal levels or very quickly, reflecting our belief that the negative earnings will soon pass. In some cases, though, the negative earnings are a manifestation of more long-term problems at the firm. In such cases, we will be forced to make judgments on whether the problem will be overcome, and if so, when this will occur. This section presents a range of solutions for companies in this position.

**MULTIPLES AND NORMALIZED EARNINGS**

Would you have to make these adjustments to earnings if you were doing relative valuation rather than discounted cash flow valuation? The answer is generally yes, and when adjustments are not made, you are implicitly assuming normalization of earnings.

To see why, assume that you are comparing steel companies using price-earnings ratios and that one of the firms in your group has just reported very low earnings because of a strike during the past year. If you do not normalize the earnings, this firm will look overvalued relative to the sector, because the market price will probably be based on the expectation that the labor troubles, though costly, are in the past. If you use a multiple such as price-to-sales to make your relative valuation judgments and you compare this firm's price-to-sales ratio to the industry average, you are assuming that the firm's margins will converge on industry averages sooner rather than later.

What if an entire sector's earnings are affected by an event? Would you still need to normalize? We believe so. Though the earnings of all automobile stocks may be affected by a recession, the degree to which they are affected can vary widely depending on differences in operating and financial leverage. Furthermore, you will find yourself unable to compute multiples such as price-earnings ratios for many of the firms in the group that lose money during recessions. Using normalized earnings will yield multiples that are more reliable measures of true value.

**Strategic Problems** Firms can sometimes make mistakes in terms of the product mix they offer, the marketing strategies they adopt, or even the markets that they choose to target. They often end up paying a substantial cost in terms of negative or lower earnings and perhaps a permanent loss of market share. Consider the following examples:

- IBM found its dominant position in the mainframe computer business and the extraordinary profitability of that business challenged by the explosion of the personal computer market in the 1980s. While IBM could have developed the operating system for personal computers early in the process, it ceded that business to an upstart called Microsoft. By 1989, IBM had lost more than half its market value and its return on equity had dropped into the single digits.<sup>3</sup>
- For decades, Xerox dominated the copier business to the extent that its name became synonymous with the product. In the 1970s and 1980s it was challenged for the market by Asian firms with lower cost structures, like Ricoh and Canon. After initial losses Xerox was able to recoup some of its market share. However, the last part of the 1990s saw a steady decline in Xerox's fortunes as

<sup>3</sup>It is worth noting that IBM made a fulsome recovery in the following decades by going back to basics, cutting costs, and refocusing its efforts on business services.

technology (in the form of e-mails, faxes, and low-cost printers) took its toll. By the end of 2000, there were questions about whether Xerox had a future.

- Under the leadership of Michael Armstrong, AT&T tried to shed its image as a stodgy phone company and become a technology firm. After some initial successes, a series of miscues and poor acquisitions saw the firm enter the new millennium with a vastly reduced market capitalization and no clear vision on where to go next.

When firms have low or negative earnings that can be traced to strategic missteps, you have to determine whether the shift is a permanent one. If it is, you will have to value the firm on the assumption that it will never recover lost ground, and scale down your expectations of revenue growth and expected margins. If, on the other hand, you are more optimistic about the firm's recovery or its entry into new markets, you can assume that the firm will be able to revert to its traditional margins and high growth.

**Operating Problems** Firms that are less efficient in the delivery of goods and services than their competitors will also be less profitable and less valuable. But how and why do firms become less efficient? In some cases, the reasons can be traced to a failure to keep up with the times and replenish existing assets and keep up with the latest technology. A steel company whose factories are decades old and whose equipment is outdated will generally bear higher costs for every ton of steel that it produces than its newer competitors. In other cases, the problem may be labor costs. A steel company with plants in the United States faces much higher labor costs than a similar company in Asia.

The variable that best measures operating efficiency is the operating margin, with firms that have operating problems tending to have much lower margins than their competitors. One way to build in the effect of operating improvements over time is to increase the margin toward the industry average, but the speed with which the margins will converge will depend on several factors:

- *Size of the firm.* Generally, the larger the firm, the longer it will take to eliminate inefficiencies. Not only is inertia a much stronger force in large firms, but the absolute magnitude of the changes that have to be made are much larger. A firm with \$10 billion in revenues will have to cut costs by \$300 million to achieve a 3% improvement in pretax operating margin, whereas a firm with \$100 million in revenues will have to cut costs by \$3 million to accomplish the same objective.
- *Nature of the inefficiency.* Some inefficiencies can be fixed far more quickly than others. For instance, a firm can replace outdated equipment or a poor inventory system quickly, but retraining a labor force will take much more time.
- *External constraints.* Firms are often restricted in terms of how much and how quickly they can move to fix inefficiencies by contractual obligations and social pressure. For instance, laying off a large portion of the workforce may seem an obvious solution for a firm that is overstaffed, but union contracts and the potential for negative publicity may make firms reluctant to do so.
- *Management quality.* A management that is committed to change is a critical component of a successful turnaround. In some cases, a replacement of top management may be necessary for a firm to be able to resolve its operating problems.



**ILLUSTRATION 22.5: Valuing a Firm with Operating Problems: Marks and Spencer**

Marks and Spencer, a multinational retailer headquartered in the United Kingdom, saw its operating income halved from 1996 to 2000, partly because of a high cost structure and partly because of ill-conceived expansion. In 2000, the firm reported £552 million in operating income on revenues of £8,196 million—a pretax operating margin of 6.73%. In contrast, the average pretax operating margin for department stores in the United Kingdom and United States is 12%, and Marks and Spencer's own historical margin (over the previous decade) is 11%. To value Marks and Spencer, we will assume the following:

- Revenues will grow 5% a year in perpetuity. The firm is a large firm in a mature market and it does seem unrealistic to assume much higher growth in revenues.
- The firm reported capital expenditures of £448 million and depreciation of £262 million for the 2000 financial year. In addition, the noncash working capital at the end of the year was £1,948 million. We will assume that net capital expenditures and noncash working capital will continue to grow at the same rate as revenues (i.e., 5% a year forever).
- We will assume that the pretax operating margin of the firm will improve over the next 10 years from 6.73% to 11.50%, with more significant improvements occurring in the next two years, and smaller improvements thereafter.
- We will use a tax rate of 33% to estimate after-tax cash flows. The cost of capital for the firm is estimated using its current market debt to capital ratio of 20%, a cost of equity of 9.52%, and a pretax cost of debt of 6%.

$$\text{Cost of capital} = 9.52(.80) + 6\%(1 - .33)(.2) = 8.42\%$$

The following table summarizes the forecasts of revenues, operating income, and free cash flows to the firm every year for the next six years.

Year	Revenues	Operating Margin	EBIT	EBIT (1 - t)	Net Cap Ex	Change in Working Capital	FCFF
Current	£ 8,196	6.73%	£ 552	£ 370	£186		
1	£ 8,606	8.32%	£ 716	£ 480	£195	£ 97	£187
2	£ 9,036	9.38%	£ 848	£ 568	£205	£102	£261
3	£ 9,488	10.09%	£ 957	£ 641	£215	£107	£319
4	£ 9,962	10.56%	£1,052	£ 705	£226	£113	£366
5	£10,460	10.87%	£1,137	£ 762	£237	£118	£406
6	£10,983	11.08%	£1,217	£ 815	£249	£124	£442
7	£11,533	11.22%	£1,294	£ 867	£262	£131	£475
8	£12,109	11.31%	£1,370	£ 918	£275	£137	£506
9	£12,715	11.38%	£1,446	£ 969	£289	£144	£537
10	£13,350	11.42%	£1,524	£1,021	£303	£151	£567
Terminal year	\$14,018	11.50%	£1,612	£1,080			

After year 10, we assume that revenues and operating income will continue to grow 5% a year forever, and that Marks and Spencer will earn an industry-average return on capital of 15%. This allows us to estimate a stable period reinvestment rate and terminal value:

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

$$\begin{aligned} \text{Terminal value} &= \text{EBIT}_{11}(1 - t)(1 - \text{Reinvestment rate})/(\text{Cost of capital} - g) \\ &= £1,080(1 - .3333)/(.0842 - .05) = £21,054 \text{ million} \end{aligned}$$

Adding the present value of the cash flows in the table to the present value of the terminal value, using the cost of capital of 8.42% as the discount rate, yields a value for the operating assets of £11,879

million. Adding the value of cash and marketable securities at the end of 2000 to this amount, and subtracting the debt yields a value of equity of £10,612 million.

Value of operating assets	£11,879 million
+ Cash & Securities	£687 million
– Debt	£1,954 million
Value of equity	£10,612 million

Dividing by the 2,875 million shares outstanding yields a value per share of £3.69, higher than the stock price of £2.72 prevailing at the time of this analysis in May 2001.

**The Special Case of Privatizations** In many privatizations, we are called on to value firms with long financial histories but not very profitable ones. The lack of profitability is not surprising, however, since many of these firms have been run with objectives other than maximizing value or profitability. In some cases, employment in these firms has been viewed as a source of political patronage. Consequently, they end up overstaffed and inefficient.

Will this all change as soon as they are privatized? Not necessarily, and certainly not immediately. The power of unions to preserve existing jobs, the power that governments continue to have on how they are run, and the sheer size of these firms makes change both daunting and slow. While it is reasonable to assume that these firms will, in fact, become more efficient once they are privatized, the speed of the improvement will vary from firm to firm. In general, you would expect the adjustment to be much quicker if the government relinquishes its power to control the management of the firm and if there are strong competitive pressures to become more efficient. It will be slower if the firm is a monopoly and the government continues to handpick the top management of the firm.

#### **GOLDEN SHARES AND THE VALUE OF PRIVATIZED FIRMS**

While governments are always eager to receive the cash proceeds from privatizing the firms that they own, they are generally not as eager to give up control of these firms. One way they attempt to preserve power is by maintaining what is called a golden share in the firm that gives them veto power and control over some or many aspects of the firm's management.

For instance, the Brazilian government maintains a golden share in CVRD, allowing it the final decision on whether mines can be closed and other major financial decisions. While governments often view these golden shares as a costless way to privatize and preserve control at the same time, there is a cost that they will bear. Investors valuing firms with golden shares will generally be much less willing to assume radical changes in management and improvements in efficiency. Consequently, the values attached to these firms by the market will be much lower. The more inefficient the firm being privatized and the more restrictive the golden share, the greater will be the loss in value to the government.

**ILLUSTRATION 22.6: Valuing a Privatization: Compahnia Vale Dio Roce (CVRD)**

In 1995, the Brazilian government privatized Compahnia Vale Dio Roce (CVRD), Latin America's biggest mining company. In the year the firm was privatized, it reported after-tax operating income of 717 million BR on revenues of 4,714 million BR. Based on the capital invested in the firm at the beginning of the year of 14,722 million BR, the after-tax return on capital earned by the firm was 5.33%.

If we assumed a stable real growth rate of 3% and a real cost of capital of 10%, and valued CVRD on the basis of these inputs, we would have estimated the following value for the firm:

$$\text{Reinvestment rate} = g/\text{ROC} = 3\%/5.33\% = 56.29\%$$

$$\begin{aligned}\text{Value of the firm} &= \text{EBIT}(1 - t)(1 + g)(1 - \text{Reinvestment rate})/(\text{Cost of capital} - g) \\ &= 717(1.03)(1 - .5629)/(.10 - .03) \\ &= 4,611 \text{ million BR}\end{aligned}$$

Note, though, that this assumes that CVRD's return on capital will remain at existing levels in perpetuity. If privatization leads to operating efficiencies at the firm, its margins and return on capital can be expected to improve. For instance, if we valued CVRD using the real return on capital of 7% earned by mining companies in the United States, we would have estimated the following:

$$\text{Reinvestment rate} = g/\text{ROC} = 3\%/7\% = 42.86\%$$

$$\begin{aligned}\text{Value of the firm} &= \text{EBIT}(1 - t)(1 + g)(1 - \text{Reinvestment rate})/(\text{Cost of capital} - g) \\ &= 717(1.03)(1 - .4286)/(.10 - .03) \\ &= 6,029 \text{ million BR}\end{aligned}$$

Is it reasonable to assume this improvement in margins? It depends on which side of the transaction you are on. If you were an investor interested in buying the stock, you might argue that the firm is too entrenched in its ways to make the changes needed for higher profitability, and you would then use the value estimated with current margins. If you are the government and want to obtain the highest value you can, you would argue for the latter.

**Financial Leverage** In some cases firms get into trouble because they borrow too much and not because of operating or strategic problems. In these cases, it will be the equity earnings that will be negative while operating earnings will be positive. The solution to the problem depends, in large part, on how distressed the firm really is. If the distress is not expected to push the firm into bankruptcy, there are a variety of potential solutions. If, however, the distress is likely to be terminal, finding a solution is much more difficult.

**Overlevered with No Immediate Threat of Bankruptcy** Firms that borrow too much are not always on the verge of bankruptcy. In fact, firms with valuable operating assets and substantial operating cash flows can service much more debt than is optimal for them, even though they might not do so comfortably. So, what are the costs of being overlevered? First, the firm might end up with a large enough exposure to default risk that it affects its operations—customers might not buy its products, suppliers might demand speedier payment, and it might have trouble retaining valued employees. Second, the higher beta and cost of debt that go with the higher leverage may increase the firm's cost of capital and reduce its value. It is therefore in the best interests of the firm to reduce its debt ratio, if not immediately, at least over time.

There are two choices when it comes to valuing levered firms as going concerns:

1. You can estimate free cash flows to the firm and value the firm. If the firm is operationally healthy (the operating margins are both positive and similar to those of comparable firms), the only modification you have to make is to reduce the debt ratio over time—in practical terms, a disproportionate share of the reinvestment each year has to come from equity—and compute costs of capital that change with the debt ratio. If the firm's operating margins have suffered because it borrowed too much, you might need to adjust the operating margins over time toward industry averages as well.
2. You can use the adjusted present value approach and value the firm as an unlevered firm, and add to this unlevered firm value the costs (expected bankruptcy costs) and benefits (tax benefits) of debt. As noted in Chapter 15, though, estimating the expected bankruptcy cost can be difficult to do.

#### ILLUSTRATION 22.7: Adjust Debt Ratio over Time: Hyundai

Hyundai Corporation is a Korean company that is part of the Hyundai group and handles the trading operations for the firm. Like many other Korean companies, Hyundai borrowed large amounts to fund expansion until the late 1990s. By the end of 2000, Hyundai had debt outstanding of 848 billion Korean won (krw) and had a market value of equity of 163 billion krw, resulting a debt to capital ratio of 83.85%. The high leverage has three consequences:

1. The bottom-up beta for the firm is 2.60, reflecting the firm's high debt-to-equity ratio. With a risk-free rate of 9% in Korean won and the risk premium of 7% (4% as the mature market premium and 3% for Korean country risk) we estimate a cost of equity in Korean won for the firm of 27.20%.

$$\text{Cost of equity} = 9\% + 2.6(7\%) = 27.20\%$$

2. The firm has high default risk, leading to a pretax cost of borrowing in Korean won terms of 12.5%; the tax rate for the firm is 30%.
3. The firm reported pretax operating income of 89.42 billion krw, but the interest expenses of the firm amounted to 99 billion krw, resulting in a loss for the firm. Note, though, that the firm is still obtaining the tax benefits of almost all of its interest payments.<sup>4</sup>

We will assume that the operating income will grow 10% a year for the next six years and 8% a year beyond that point in time. Over that period, we will assume that the firm's capital expenditures (which are currently 12 billion won), depreciation (which is currently 4 billion won), and noncash

<sup>4</sup>Without interest expenses, Hyundai would have paid taxes on its operating income of 93 billion won. Because of its interest payments, Hyundai was able to not pay taxes. Of the 99 billion won in interest payments, Hyundai is receiving tax benefits on 93 billion won.

working capital (which is currently 341 billion won) will grow at the same rate as operating income, yielding the following estimates for the cash flows:

	1	2	3	4	5	6
EBIT(1 - t)	\$68.86	\$75.74	\$83.32	\$91.65	\$100.81	\$110.89
+ Depreciation	\$ 4.40	\$ 4.84	\$ 5.32	\$ 5.86	\$ 6.44	\$ 7.09
- Capital spending	\$13.20	\$14.52	\$15.97	\$17.57	\$ 19.33	\$ 21.26
- Chg. working capital	\$34.11	\$37.52	\$41.27	\$45.40	\$ 49.94	\$ 54.93
Free CF to firm	\$25.95	\$28.54	\$31.40	\$34.54	\$ 37.99	\$ 41.79

Over the next six years, we will assume that the firm will reduce its debt ratio from 83.85% to 50%, which will result in the beta decreasing from 2.60 to 1.00 and the pretax cost of debt from 12.5% to 10.5% (we assume that the changes occur linearly over the period). The costs of capital for Hyundai are estimated each year for the next six years:

	1	2	3	4	5	6
Beta	2.60	2.28	1.96	1.64	1.32	1.00
Cost of equity	27.20%	24.96%	22.72%	20.48%	18.24%	16.00%
Cost of debt (after-tax)	8.75%	8.47%	8.19%	7.91%	7.63%	7.35%
Debt ratio	83.85%	77.08%	70.31%	63.54%	56.77%	50.00%
Cost of capital	11.73%	12.25%	12.50%	12.49%	12.22%	11.68%

To estimate the terminal value, we assume a growth rate of 8% in perpetuity, after year 6, and a return on capital of 16%. This allows us to estimate a reinvestment rate and terminal value for the firm at the end of year 6:

$$\text{Reinvestment rate} = 8\%/16\% = 50\%$$

$$\text{Terminal value} = 110.89(1.08)(1 - .50)/(.1168 - .08) = 1,626 \text{ billion krw}$$

Discounting the cash flows over the next six years and the terminal value using the cumulated cost of capital yields the following:

Present value of FCFF in high-growth phase	132.34 billion krw
Present value of terminal value	819.19 billion krw
Value of the operating assets =	951.52 billion krw
+ Cash and marketable securities	80.46 billion krw
- Market value of debt	847.73 billion krw
Market value of equity	184.25 billion krw

Dividing by the number of shares results in an estimated value of equity for the firm of 2,504 won per share, a little higher than the actual trading price of 2,220 won per share.

**CAN EQUITY VALUE BE NEGATIVE?**

We generally subtract the value of outstanding debt from firm value to get to the value of equity. But can the value of the outstanding debt exceed the value of the firm? If you are using market values for both the firm (obtained by adding the market values of debt and equity) and debt, this will never occur. This is because the market value of equity can never be less than zero. However, if you are using your estimated value for the firm, obtained by discounting cash flows to the firm at the cost of capital, the estimated firm value can be less than the market value of the outstanding debt. When this occurs, there are three possible interpretations:

1. The first and most obvious reading is that you have made a mistake in estimating firm value and that your estimate is too low. In this case, the obvious solution is to redo the firm valuation.
2. The second possibility is that the market value of debt is overstated. This can happen if you are using the book value of debt as a proxy for market value for troubled firms, or if the bond market is making a mistake pricing the debt. Estimating the correct market value of debt will eliminate the problem.<sup>5</sup>
3. The third and most intriguing possibility is that your estimate of firm value and the market value of debt are both correct, in which case the equity value is, in fact, negative. Since the market price of equity cannot be less than zero, the implication is that the equity in this firm is worth nothing. However, as you will see later, equity may still continue to command value, even under these circumstances, if it is viewed as a call option on the firm's assets.

**Overlevered with High Probability of Bankruptcy** Discounted cash flow valuation is conditioned on a firm being a going concern, with cash flows continuing into the future. When a firm's financial problems are severe enough to suggest a strong likelihood of bankruptcy, other approaches may need to be used to value a firm and the equity claim in it. There are two possible approaches: One is to estimate a liquidation value for the assets today, and the other is to continue to treat the firm as a going concern and value the equity in it as an option.

**Liquidation Value** The liquidation value of a firm is the aggregate of the value that the assets of the firm would command on the market, net of transactions and legal costs. The value of equity can be obtained by subtracting the value of the outstanding debt from the asset value.

$$\text{Value of equity} = \text{Liquidation value of assets} - \text{Outstanding debt}$$

<sup>5</sup>You could discount the expected cash flows on the debt at a pretax cost of debt that reflects the firm's current standing.

Estimating liquidation value is complicated when the assets of the firm are not easily separated and thus cannot be valued individually. Furthermore, the likelihood that assets will fetch their fair market value will decrease as the urgency of the liquidation increases. A firm in a hurry to liquidate its assets may have to accept a discount on fair market value as a price for speedy execution.

As a note of caution, it is almost never appropriate to treat the book value of the assets as the liquidation value. Most distressed firms earn subpar returns on their assets, and the liquidation value will reflect the earning capacity of the assets rather than the price paid for the assets (which is what the book value measures, net of depreciation).

**Option Pricing Models** The liquidation value approach presumes that the market value of the assets currently exceeds the face value of outstanding debt. When this assumption is violated, the only approach left to value the equity in a distressed firm may be to use option pricing models. Equity in a heavily levered firm, where the value of the assets is lower than the face value of the debt, can be viewed as an out-of-the-money call option on the underlying firm and can be valued as such. We will return to examine this concept in more detail in Chapter 30.



**dbtfund.xls:** This dataset on the Web summarizes book and market value debt ratios by industry group in the United States for the most recent year.

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**Life Cycle Earnings** As noted earlier in the chapter, it is normal for firms to lose money at certain stages in their life cycles. When valuing such firms, you cannot normalize earnings, as we did with cyclical firms or firms with temporary problems. Instead, you have to estimate the cash flows of the firm over its life cycle, and let them turn positive at the right stage of the cycle. This section will consider in detail one group of firms—those with large infrastructure investments. The other two—pharmaceutical firms that derive the bulk of their value from a patent or patents and young start-up companies—will be considered in more detail in the coming chapters.

**Infrastructure Firms** If the business that a firm is in requires large infrastructure investments early in the life cycle and the firm has to wait for a long period before it can generate earnings, it is entirely possible that the firm will report large losses in the initial periods when the investments are made. In fact, as an added complication, many of these firms have to borrow large amounts to fund their infrastructure investments, creating a fairly toxic combination—negative earnings and high leverage.

Given this combination, how can an infrastructure firm—a telecom firm or cable company—ever be valuable? Consider one possible path to success. A firm borrows money and makes large investments in infrastructure. Having made these investments, though, it has a secure market where entry is prohibitively expensive. In some cases, the firm may have a legally sanctioned monopoly to provide the service. No further investments are needed in infrastructure but depreciation on the existing investments continues to generate large tax benefits. The net effect is that the firm will be sitting on a cash machine that allows it to not only pay off its debt

but ready itself for the next generation of investments. In a sense, phone companies and power companies, as well as some cable and cellular firms, have followed this path to success.

In the 1990s, we saw an explosion both in the number of telecom firms and the capital raised by telecom firms in a variety of ventures. While they followed the timeworn path of high debt and large up-front infrastructure investments laid by their predecessors, we believe that there are two critical ingredients that are missing with this generation of firms. The first is that technology has become a wild card and large investments in infrastructure do not guarantee future profitability or even that a market will exist. The second is that the protection from competition that allowed the old-time technology firms to generate large and predictable profits is unlikely to be there for this new generation of telecom firms. As a consequence, we would predict that far more of these firms will go bankrupt and that they might be well advised to rethink their policies on financial leverage as a consequence.

#### ILLUSTRATION 22.8: Valuing an Infrastructure Firm: Global Crossing

Global Crossing provides managed data and voice products over a fiber-optic network. Over its three-year history, the firm has increased revenues from \$420 million in 1998 to \$3,789 million in 2000, but it has gone from an operating income of \$120 million in 1998 to an operating loss of \$1,396 million in 2000. In addition, the firm is capital intensive and reported substantial capital expenditures (\$4,289 million) and depreciation (\$1,381 million) in 2000.

In making the valuation, we assume that there will be no revenue growth in the first year (to reflect a slowing economy) and that revenue growth will be brisk for the next four years and then taper off to a stable growth rate of 5% in the terminal phase, that EBITDA as a percent of sales will move from the current level (of close to 0%) to an industry average of 33% by the end of the tenth year, and that capital expenditures will be ratcheted down over the next two years to maintenance levels. The following table summarizes our assumptions on revenue growth, EBITDA/sales, and reinvestment needs over the next 10 years.

<i>Year</i>	<i>Growth Rate in Revenue</i>	<i>EBITDA/ Revenue</i>	<i>Growth Rate in Capital Spending</i>	<i>Growth Rate in Depreciation</i>	<i>Working Capital as Percent of Revenue</i>
1	0.00%	0.00%	-20%	10%	3.00%
2	30.00%	7.50%	-50%	10%	3.00%
3	25.00%	15.00%	-50%	10%	3.00%
4	20.00%	22.50%	-50%	10%	3.00%
5	10.00%	30.00%	5%	-50%	3.00%
6	10.00%	30.60%	5%	-50%	3.00%
7	10.00%	31.20%	5%	5%	3.00%
8	8.00%	31.80%	5%	5%	3.00%
9	6.00%	32.40%	5%	5%	3.00%
10	5.00%	33.00%	5%	5%	3.00%

For both revenue growth and improvement in EBITDA margins, we assume that the larger changes occur in the earlier years. Note that the changes in depreciation lag the changes in capital spending—the capital spending is cut first and depreciation drops later. Finally, we assume that the firm will need to set aside 3% of the revenue change each year into working capital based on the industry averages.



With these forecasts, we estimated revenues, operating income, and after-tax operating income each year for the high growth period in the following table. To estimate taxes, we consider the net operating losses carried forward into 2001 of \$2,075 million and add on the additional losses that we expect in the first few years of the projection.

<i>Year</i>	<i>Revenues</i>	<i>EBITDA</i>	<i>Depreciation</i>	<i>EBIT</i>	<i>NOL at Beginning of Year</i>	<i>Taxes</i>	<i>EBIT (1 - t)</i>
1	\$ 3,789	\$ 0	\$1,519	-\$1,519	\$2,075	\$ 0	-\$1,519
2	\$ 4,926	\$ 369	\$1,671	-\$1,302	\$3,594	\$ 0	-\$1,302
3	\$ 6,157	\$ 924	\$1,838	-\$ 915	\$4,896	\$ 0	-\$ 915
4	\$ 7,389	\$1,662	\$2,022	-\$ 359	\$5,810	\$ 0	-\$ 359
5	\$ 8,127	\$2,438	\$1,011	\$1,427	\$6,170	\$ 0	\$1,427
6	\$ 8,940	\$2,736	\$ 505	\$2,230	\$4,742	\$ 0	\$2,230
7	\$ 9,834	\$3,068	\$ 531	\$2,538	\$2,512	\$ 9	\$2,529
8	\$10,621	\$3,314	\$ 557	\$2,756	\$ 0	\$ 965	\$1,792
9	\$11,258	\$3,580	\$ 585	\$2,995	\$ 0	\$1,048	\$1,947
10	\$11,821	\$3,830	\$ 614	\$3,216	\$ 0	\$1,125	\$2,090
Terminal year	\$12,412	\$4,096	\$ 645	\$3,451	\$ 0	\$1,208	\$2,243

The accumulated losses over the first few years shield the firm from paying taxes until the seventh year. After that point, we assume a marginal tax rate of 35%.

Finally, we estimated free cash flows to the firm with our assumptions about capital expenditures and working capital.

<i>Year</i>	<i>EBIT (1 - t)</i>	<i>Capital Expenditures</i>	<i>Depreciation</i>	<i>Change in Working Capital</i>	<i>FCFF</i>
1	-\$1,519	\$3,431	\$1,519	\$ 0	-\$3,431
2	-\$1,302	\$1,716	\$1,671	\$34	-\$1,380
3	-\$ 915	\$ 858	\$1,838	\$37	\$ 29
4	-\$ 359	\$ 429	\$2,022	\$37	\$1,197
5	\$1,427	\$ 450	\$1,011	\$22	\$1,966
6	\$2,230	\$ 473	\$ 505	\$24	\$2,238
7	\$2,259	\$ 497	\$ 531	\$27	\$2,536
8	\$1,792	\$ 521	\$ 557	\$24	\$1,804
9	\$1,947	\$ 547	\$ 585	\$19	\$1,965
10	\$2,090	\$ 575	\$ 614	\$17	\$2,113
Terminal year	\$2,243	\$1,562	\$ 645	\$18	\$1,308

The firm uses debt liberally to fund these investments and had debt outstanding of \$7,271 million at the end of 2000. Based on its market capitalization of \$11,142 million at the time of this valuation, we estimated a market debt to capital ratio for the firm.

$$\text{Debt to capital} = \frac{7,271}{7,271 + 11,142} = 39.49\%$$

$$\text{Equity to capital} = \frac{11,142}{7,271 + 11,142} = 60.51\%$$

Using a bottom-up beta of 2.00 for the equity and a cost of debt of 8.9% based on the current rating for the firm, we can estimate a cost of capital for the next five years. (The risk-free rate is 5.4% and the risk premium is 4%.)

$$\text{Cost of equity} = 5.4\% + 2(4\%) = 13.40\%$$

$$\text{After-tax cost of debt} = 8.9\%(1 - 0) = 8.9\% \text{ (The firm does not pay taxes)}$$

$$\text{Cost of capital} = 13.40\%(0.6051) + 8.9\%(0.3949) = 11.62\%$$

In stable growth, after year 10, we assume that the beta will decrease to 1.00 and that the pretax cost of debt will decrease to 8%. The adjustment occurs in linear increments from years 6 through 10 as shown in the following table.

	1-5	6	7	8	9	10
Tax rate			0.35%	35%	35%	35%
Beta	2.00	1.80	1.60	1.40	1.20	1.00
Cost of equity	13.40%	12.60%	11.80%	11.00%	10.20%	9.40%
Pretax cost of debt	8.90%	8.72%	8.54%	8.36%	8.18%	8.00%
After-tax cost of debt	8.90%	8.72%	8.51%	5.43%	5.32%	5.20%
Debt ratio	39.49%	39.49%	39.49%	39.49%	39.46%	39.46%
Cost of capital	11.62%	11.07%	10.50%	8.80%	8.27%	7.74%

To estimate the reinvestment rate in the terminal year, we assume that Global Crossing would earn a 9% return on capital in perpetuity after year 10, and that the expected growth rate would be 5%. This yields a reinvestment rate of 55.56%.

$$\text{Reinvestment rate in stable growth} = \frac{5\%}{12\%} = 41.67\%$$

$$\begin{aligned} \text{Expected FCFF in terminal year} &= \text{EBIT}_{10}(1+g)(1-t)(1-\text{Reinvestment rate}) \\ &= 3,216(1.05)(1-0.35)(1-0.5556) \\ &= \$997 \text{ million} \end{aligned}$$

$$\text{Terminal value} = \frac{\text{FCFF}_{11}}{\text{Cost of capital} - g} = \frac{997}{0.0774 - 0.05} = \$36,363 \text{ million}$$

Adding the present value of the cash flows over the high-growth period to the present value of the terminal value, we obtain the value of the operating assets.

Value of operating assets	\$15,917 million
+ Cash and marketable securities	\$ 1,477 million
– Debt	\$ 7,271 million
Value of equity	\$10,123 million

In May 2001, Global Crossing's market value of equity of \$11,143 million suggests that the stock is overvalued.

**Firms with Patents** The value of a firm generally comes from two sources—assets in place and expected future growth opportunities. The value of the former is generally captured in current cash flows, while the value of the latter is reflected in the expected growth rate. In the special case of a firm that derives a large portion of its value from a product patent or patents, expected growth will be from developing the patents. Ignoring them in a discounted cash flow valuation will understate the value of the firm.

There are three possible solutions to the problems associated with valuing firms with product options:

1. Value the product options on the open market and add them to the value from discounted cash flow (DCF) valuation. If there is an active market trading in product options, this offers a viable and simple way of valuing these options. In the absence of such a market, or when the product options are not separable and tradable, this approach becomes difficult to apply.
2. Use a higher growth rate than the one justified by existing projects and assets, to capture the additional value from product options. While this keeps the analysis within the traditional discounted cash flow valuation framework, the increase in the growth rate is essentially subjective and it converts contingent cash flows (where the product option will be exercised if and only if it makes economic sense) to expected cash flows.
3. Use an option pricing model to value product options and add the value to that obtained from DCF valuation of assets in place. The advantage of this approach is that it mirrors the cash flow profile of a product option much more precisely.

The primary problem in valuing firms with product options is not that these options are ignored, but that they are often double counted. Analysts all too frequently use a higher growth rate to reflect the product options that a firm owns, but then add on a premium to the DCF value for the same product options. We will return to examine the valuation of these firms in Chapter 28.

**Young, Start-Up Firms** Many firms begin as ideas in the minds of entrepreneurs and develop into commercial ventures over time. During this transition from idea companies to commercial ventures, it is not unusual for these firms to lose money. This does not make them worthless. In fact, the boom in the market value of new economy companies in the late 1990s brought home the fact that good ideas can have substantial values, though the correction in 2000 also illustrated how volatile these values can be.

Valuing young start-up firms is perhaps the most difficult exercise in valuation and one that was, until very recently, the domain of venture capitalists and private equity investors, who often compensated for uncertainty by demanding extremely high returns on these investments. The challenge becomes much more daunting if a young start-up firm is publicly traded. The next chapter will examine the estimation issues that we face in valuing such a firm.

## CONCLUSION

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There are many cases where traditional discounted cash flow valuation has to be modified or adapted to provide reasonable estimates of value. Some of these cases are presented in this chapter. Cyclical firms can be difficult to value because their earnings track the economy. The same can be said about commodity firms in relation to the commodity price cycle. A failure to adjust the earnings for these cyclical ups and downs can lead to significant undervaluation of these firms at the depth of a recession and a significant overvaluation at the peak of a boom.

When a firm's earnings are negative because of long-term strategic, operating, or financial problems, the process of valuing these firms becomes more complicated. You have to make a judgment of whether the firm's problems will be solved and, if so, when. For those firms where there is a significant chance of bankruptcy,

you might have to consider the liquidation value of the assets. Valuing firms early in their life cycles poses similar problems, but they are accentuated when earnings, cash flow, and book value all turn negative. In most these cases, discounted cash flow valuation is flexible enough to be used to estimate value.

## QUESTIONS AND SHORT PROBLEMS

1. Intermet Corporation, the largest independent iron foundry organization in the country, reported a deficit per share of \$0.15 in 1993. The earnings per share from 1984 to 1992 were as follows:

<i>Year</i>	<i>EPS</i>
1984	\$0.69
1985	\$0.71
1986	\$0.90
1987	\$1.00
1988	\$0.76
1989	\$0.68
1990	\$0.09
1991	\$0.16
1992	<\$0.07>

The firm had capital expenditures of \$1.60 per share and depreciation per share of \$1.20 in 1993. Working capital was expected to increase \$0.10 per share in 1994. The stock has a beta of 1.2, which is expected to remain unchanged; the company finances its capital expenditure and working capital requirements with 40% debt  $[D/(D + E)]$ . The firm was expected, in the long term, to grow at the same rate as the economy (6%).

- a. Estimate the normalized earnings per share in 1994, using the average earnings approach.
  - b. Estimate the normalized free cash flow to equity per share in 1994, using the average earnings approach.
2. General Motors Corporation reported a deficit per share in 1993 of \$4.85, following losses in the two earlier years. (The average earnings per share is negative.) The company had assets with a book value of \$25 billion, and spent almost \$7 billion on capital expenditures in 1993, which was partially offset by a depreciation charge of \$6 billion. The firm had \$19 billion in debt outstanding, on which it paid interest expenses of \$1.4 billion. It intended to maintain a debt ratio  $[D/(D + E)]$  of 50%. The working capital requirements of the firm were negligible, and the stock has a beta of 1.10. In the last normal period of operations for the firm between 1986 and 1989, the firm earned an average return on capital of 12%. The Treasury bond rate was 7%, and the market risk premium is 5.5%.

Once earnings are normalized, GM expected them to grow 5% a year forever, and capital expenditures and depreciation to grow at the same rate.

- a. Estimate the value per share for GM, assuming earnings are normalized instantaneously.
- b. How would your valuation be affected if GM is not going to reach its normalized earnings until 1995 (in two years)?

3. Toro Corporation, which manufactures lawn mowers and tractors, had revenues of \$635 million in 1992, on which it reported a loss of \$7 million (largely as a consequence of the recession). It had interest expenses of \$17 million in 1992, and its bonds were rated BBB; a typical BBB-rated company had an interest coverage ratio (EBIT/Interest expenses) of 3.10. The company faced a 40% tax rate. The stock had a beta of 1.10. (The Treasury bond rate was 7%, and the risk premium is 5.5%.)

Toro spent \$25 million on capital expenditures in 1992, and had depreciation of \$20 million. Working capital amounted to 25% of sales. The company expected to maintain a debt ratio of 25%. In the long term, growth in revenues and profits was expected to be 4%, once earnings return to normal levels.

- Assuming that the bond rating reflects normalized earnings, estimate the normalized earnings for Toro Corporation.
  - Allowing for the long-term growth rate on normalized earnings, estimate the value of equity for Toro Corporation.
4. Kollmorgen Corporation, a diversified technology company, reported sales of \$194.9 million in 1992, and had a net loss of \$1.9 million in that year. Its net income had traced a fairly volatile course over the previous five years:

<i>Year</i>	<i>Net Income</i>
1987	\$ 0.3 million
1988	\$11.5 million
1989	-\$ 2.4 million
1990	\$ 7.2 million
1991	-\$ 4.6 million

The stock had a beta of 1.20, and the normalized net income was expected to increase 6% a year until 1996, after which the growth rate was expected to stabilize at 5% a year (the beta will drop to 1.00). The depreciation amounted to \$8 million in 1992, and capital spending amounted to \$10 million in that year. Both items were expected to grow 5% a year in the long term. The firm expected to maintain a debt ratio of 35%. (The Treasury bond rate was 7%, and the risk premium is 5.5%.)

- Assuming that the average earnings from 1987 to 1992 represents the normalized earnings, estimate the normalized earnings and free cash flow to equity.
  - Estimate the value per share.
5. OHM Corporation, an environmental service provider, had revenues of \$209 million in 1992 and reported losses of \$3.1 million. It had earnings before interest and taxes of \$12.5 million in 1992, and had debt outstanding of \$104 million (in market value terms). There were 15.9 million shares outstanding, trading at \$11 per share. The pretax interest rate on debt owed by the firm was 8.5%, and the stock had a beta of 1.15. The firm's EBIT was expected to increase 10% a year from 1993 to 1996, after which the growth rate is expected to drop to 4% in the long term. The return on capital in stable growth is 10%. (The corporate tax rate was 40%, the Treasury bond rate was 7%, and the market risk premium is 5.5%.)
- Estimate the cost of capital for OHM.
  - Estimate the value of the firm.
  - Estimate the value of equity (both total and on a per share basis).

6. You have been provided the following information on CEL Inc., a manufacturer of high-end stereo systems.
- In the most recent year, which was a bad one, the company made only \$40 million in net income. It expects next year to be more normal. The book value of equity at the company is \$1 billion, and the average return on equity over the previous 10 years (assumed to be a normal period) was 10%.
  - The company expects to make \$80 million in new capital expenditures next year. It expects depreciation, which was \$60 million this year, to grow 5% next year.
  - The company had revenues of \$1.5 billion this year, and it maintained a non-cash working capital investment of 10% of revenues. It expects revenues to increase 5% next year and working capital to decline to 9.5% of revenues.
  - The firm expects to maintain its existing debt policy (in market value terms). The market value of equity is \$1.5 billion, and the book value of equity is \$500 million. The debt outstanding (in both book and market terms) is \$500 million.
  - The cost of equity for the firm is 9%.
- a. Estimate the FCFE next year.
  - b. Estimate the value of the equity assuming that the firm can grow 5% a year in perpetuity.
7. Tenet Telecommunications is in serious financial trouble and has just reported an operating loss of \$500 million on revenues of \$5 billion. The firm also had capital expenditures of \$1.8 billion and depreciation of \$800 million in the most recent financial year, and no significant noncash working capital requirements. You assume that:
- Revenues will continue to grow 10% a year for the next five years and 5% in perpetuity after that.
  - EBITDA as a percent of sales will increase in linear increments from existing levels to 20% of revenues in year 5.
  - Capital expenditures can be cut to \$600 million each year for the next five years, while depreciation will remain at \$800 million each year.
  - The net operating loss carried forward is \$700 million.
  - Return on capital in perpetuity after year 5 will be 10%.
  - Cost of capital for the firm is 9% in perpetuity.
- a. Estimate the EBITDA, EBIT, and after-tax EBIT for the firm each year for the next five years, assuming a corporate tax rate of 40%.
  - b. Estimate the FCFF each year for the next five years.
  - c. Estimate the terminal value of the firm.
  - d. Estimate the value of the firm today.
  - e. How would your valuation change if you were told that there is a 20% chance that the firm will go bankrupt and that assets will have a distress sale value amounting to 60% of the current book value of \$1.25 billion?

## Valuing Young or Start-Up Firms

**M**any 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

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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.<sup>1</sup> In contrast, there may be only a few 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 compensate for the lack of history at the firm.

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<sup>1</sup>The big three automakers are GM, Chrysler, and Ford. In fact, with Daimler's acquisition of Chrysler, only two are left.

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**

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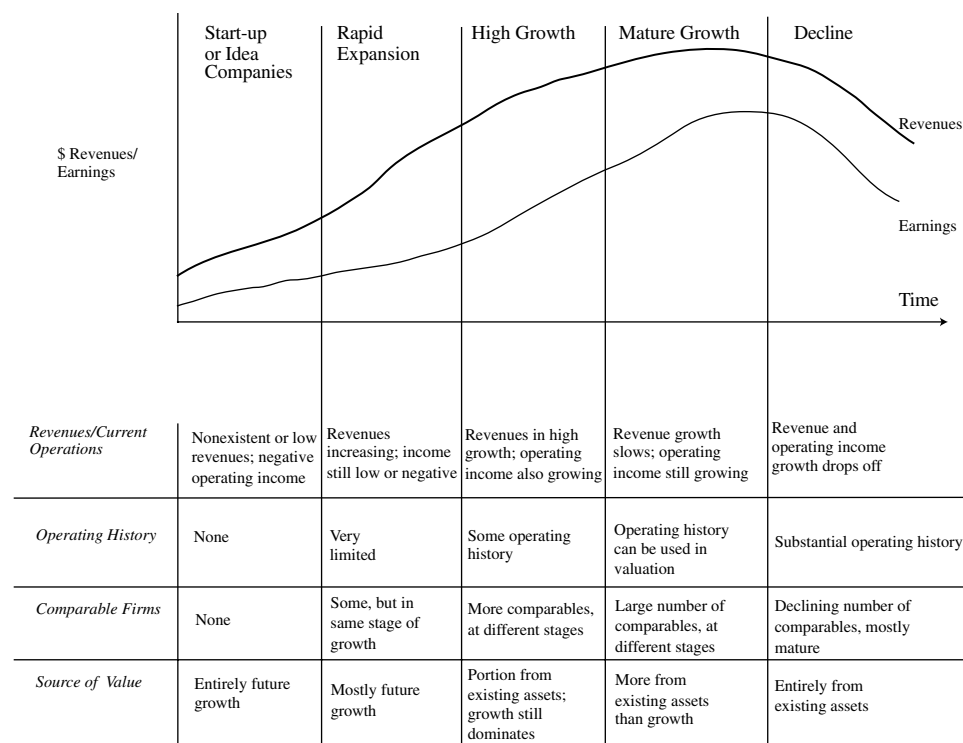
The value of a firm is based on its capacity to generate cash flows and the uncertainty associated with these cash flows. Generally speaking, more profitable firms have been valued more highly than less profitable ones. However, young start-up firms often lose money but still sometimes have high values 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:





**FIGURE 23.1** Valuation Issues across the 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 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

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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.<sup>2</sup>

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

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:

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

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 30 percent or 40 percent, 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 on how comparable firms are priced today, they can result in serious miscalculations 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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<sup>2</sup>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<sup>3</sup> and valuing firms with more recent data.

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<sup>3</sup>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.

**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 (10-K) 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 the following table (in thousands):

	<i>First Quarter 2001</i>	<i>First Quarter 2000</i>	<i>Last 10-K</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	223,820	151,420	168,065	228,320

While only three months have elapsed since the last report, the trailing 12-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. 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 23.2: Commerce One: Estimating Revenue Growth**

Commerce One has grown at an extraordinary rate since it began operations 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 has been 1,166% a year, and the growth rate just in the last year was 1,093%.

The market that Commerce One serves—business software and services—is a very large market, potentially allowing much more room 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. The following table summarizes our forecasts of revenue growth and dollar revenues at Commerce One for the next 10 years (in millions):

<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
Terminal year (11)	5.00%	\$16,592

Note first that all projections are based on 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 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 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 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 23.3: Estimating Sustainable Margin and Path to Margin: Commerce One

In the most recent 12 months, Commerce One reported an operating loss of \$529 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 can be expected to improve, but to what level? The average pretax 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 toward 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 five years from now. The following table summarizes the forecasted operating margins and earnings before interest and taxes for the next 10 years and for the terminal year (year 11):

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 or slower than we forecast, our estimates of value will need to be adjusted upward or downward, respectively.

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 four years. The other is that the losses accumulate and will 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 past three years amounting to \$676 million. The following table summarizes the net operating losses, taxable income, and effective tax rates for the forecast period:

<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.<sup>4</sup>

#### 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.

<sup>4</sup>The tax rate is computed by dividing the taxes by the earnings before interest and taxes.



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 23.4: 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:

1. 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 on this, we can estimate a marginal sales/marginal capital ratio for the year:

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

2. 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 Illustration 23.2, we were able to estimate the total reinvestment needed each year:

Year	Revenues	Change in Revenues	Reinvestment	Total Capital	EBIT(1 - t)	ROC
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%.<sup>5</sup> 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:

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

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

<sup>5</sup>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.

**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.<sup>6</sup> 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.<sup>7</sup>

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.

<sup>6</sup>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.

<sup>7</sup>For a description of this approach, refer back to Chapter 7.

**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:

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

**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 on the prevailing market price of \$8.28, a market value of equity of \$1.89 billion and a debt-to-equity ratio of 8.26% were estimated.

$$\text{Debt-to-equity ratio} = (25.1 + 131.12)/1,890 = 8.26\%$$

$$\text{Levered beta} = \text{Unlevered beta}[1 + (1 - t)(D/E)] = 2.00[1 + (1 - 0.00)(.0826)] = 2.17$$

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 risk-free 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 seven years using the projections in Illustration 23.3 (obtaining a value of \$54 million) and divided this by the current interest expenses (including the operating lease expenses from the current year):

$$\begin{aligned} \text{Predicted interest coverage ratio} &= \text{Average EBIT}/(\text{Interest expense} + \text{Current year's lease expense}) \\ &= 54/(2.5 + 14.41) = 3.17 \end{aligned}$$

This yields a rating of BB and a default spread of 3.50%, as well as a pretax cost of debt of 8.90% for the next five years. Since the firm pays no taxes over this period, its after-tax cost of debt is equal to the pretax 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, which will still make it riskier than the typical firm in the sector. The pretax cost of debt will also decline toward an industry average of 7%, while the debt ratio will increase toward the average for the industry of 12%. The following table summarizes resulting estimates of cost of equity, debt, and capital for Commerce One:

<i>Year</i>	<i>Beta</i>	<i>Cost of Equity</i>	<i>Pretax 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 that the beta declines linearly from the current level of 2.17 in year 5 to 1.20 in year 10 and the pretax cost of debt declines 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 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. Chapter 12 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 as follows:

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

**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 23.6: Estimating Firm Value: Commerce One

Having estimated the cash flows and the discount rates, we are now in a position to estimate the 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. The following table 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.

Year	EBIT (1 - t)	Reinvestment	FCFF	Cost of Capital	Cumulated Cost of Capital	Present Value
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:

$$\begin{aligned}\text{Free cash flow to the firm} &= \text{EBIT}_{11}(1 - t)(1 - \text{Reinvestment rate}_{\text{stable}}) \\ &= \$2,442(1 - .35)(1 - .33) = \$1,058 \text{ million}\end{aligned}$$

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;

$$\begin{aligned}\text{Terminal value} &= \text{FCFF}_{11} / (\text{Cost of capital}_{\text{stable}} - \text{Stable growth rate}) \\ &= 1,058 / (.0952 - .05) = \$23,404 \text{ million}\end{aligned}$$

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

$$\begin{aligned}\text{Value of operating assets} &= \text{PV of cash flows during high growth} + \text{PV of terminal value} \\ &= -\$2,435 + \$23,404 / 3.2307 = \$4,809 \text{ million}\end{aligned}$$

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

$$\begin{aligned}\text{Value of firm} &= \text{Value of operating assets} + \text{Cash and marketable securities} + \text{Other investments} \\ &= \$4,809 \text{ million} + \$249 \text{ million} + \$38 \text{ million} = \$5,097 \text{ million}\end{aligned}$$

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 only about six 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 five 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:

$$\begin{aligned}\text{Value of Commerce One} &= \text{Going concern value} \times \text{Probability of going concern} \\ &\quad + \text{Distress sale value} \times \text{Probability of failure} \\ &= \$5,097 \times .75 + (\$2,744 \times .5) \times .25 = \$4,166 \text{ million}\end{aligned}$$

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 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 23.7: 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:

$$\text{Value of Commerce One equity} = \text{Value of firm} - \text{Debt} = 5,097 - (25 + 131) = \$4,941 \text{ million}$$

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 when the options are exercised, the value of equity in common stock was computed then, as follows:

Value of equity	\$4,941 million
– Value of equity in options outstanding = $\$349(1 - .35)$	\$ 227 million
= Value of equity in common stock	\$4,714 million

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	228.32 million
= 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 (pretax) for the options and a value per share of \$19.26.

**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.<sup>8</sup> 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.

<sup>8</sup>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.)

## VALUE DRIVERS

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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 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 23.8: Value Drivers for Commerce One

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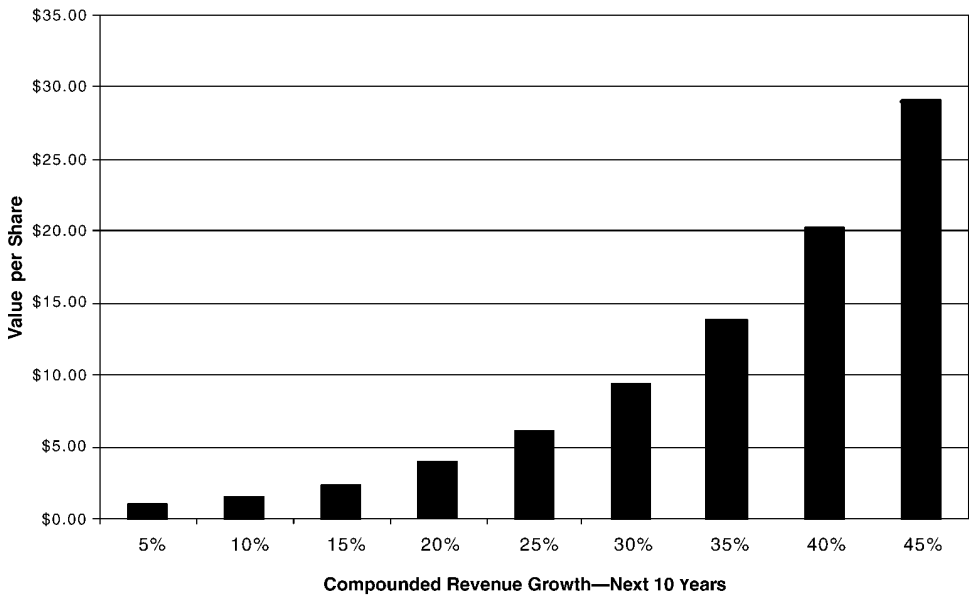
There are two key value drivers that affect the value of Commerce One as a firm. The first is the expected compounded growth rate in revenues. We have assumed it to be approximately 40% compounded over the next 10 years. If revenue growth were higher, the value per share would also be higher, as evidenced in Figure 23.2. 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. (See Figure 23.3.) If the pretax 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.

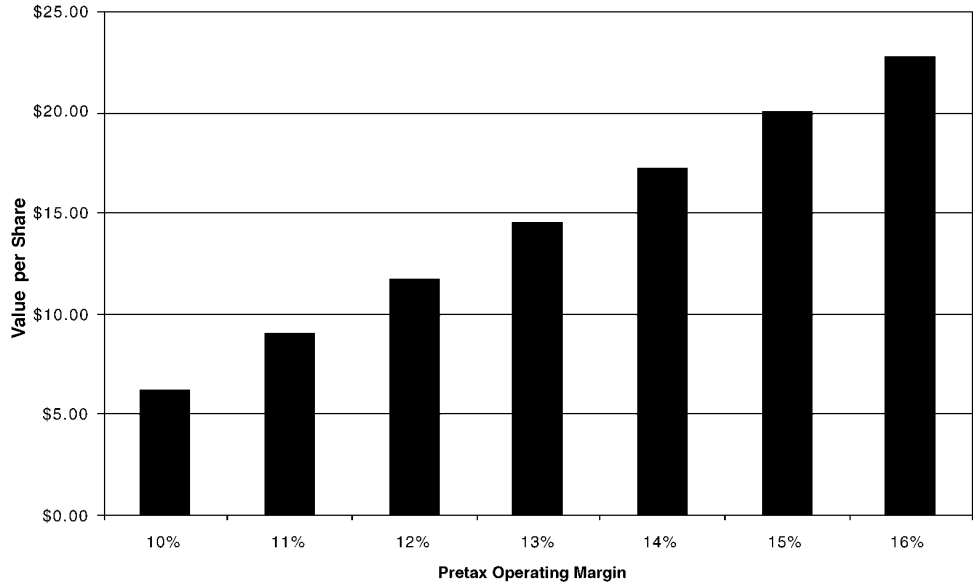
In conclusion, it is worth noting that we can justify Commerce One's price per share (of \$8.28 at the time of this analysis) under certain circumstances, just as we can justify the market price of any security. For instance, assuming a lower compounded growth rate in revenues for the next 10 years or a lower pretax 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 questions then become pragmatic ones: What are the odds of such an occurrence? Do you feel confident enough that this is too pessimistic a view of the world?

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**FIGURE 23.2** Revenue Growth and Value per Share: Commerce One



**FIGURE 23.3** Value per Share and Sustainable Margins: Commerce One

## ESTIMATION NOISE

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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

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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 generat-

ing 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.<sup>9</sup>
- *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

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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

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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.

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<sup>9</sup>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.

### 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.<sup>10</sup>
- *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.

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<sup>10</sup>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.

- *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.<sup>11</sup>

- *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 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.<sup>12</sup>
- *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 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.

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<sup>11</sup>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).

<sup>12</sup>Microsoft has developed a reputation for talking down expectations and then beating them on a consistent basis.

## CONCLUSION

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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.

## QUESTIONS AND SHORT PROBLEMS

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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.)