

## CHAPTER 22

## 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 and examine how best to value them. 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 For firms with long-term strategic ~~problems~~ or operating problems (outdated plants, a poorly trained workforce, or poor investments in the past) the process of valuation becomes more complicated because we have to make assumptions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 in recent years has been the number of such firms that have chosen to bypass or shorten the venture capital route and go to the markets directly.

## **VALUING NEGATIVE EARNINGS FIRMS**

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 Company Using a Higher Growth Rate—Dana Corporation in May 2011**

Dana manufactures automotive components and systems and was badly hurt by the global recession in 2008 and 2009; the company reported operating losses of \$123 million in 2008 and \$141 million in 2009. While the company reported an operating profit of \$196 million in 2010, the operating margin for the year amounted to only 3.21%. While the company is mature, it is anticipated that as the economy continues to improve, operating profits will grow 15% a year for the 2011–2015 time period, as margins improve. After 2015, the firm is expected to revert to stable growth, with revenues and operating income growing at 3% a year forever, with the firm earning a return on capital equal to its cost of capital in perpetuity.

The firm is expected to have a beta of 1.20 in perpetuity and maintain its existing debt-to-capital ratio of 26.32%. However, while the pretax cost of debt for the 2011–2015 time period will remain at the existing level of 6.85% (based on its bond rating), we assume that it will drop to 5% after 2015. Using a marginal tax rate of 40%, a risk-free rate of 3.5% and an equity risk premium of 5%, we estimate the cost of capital for Dana in both high and stable growth:

$$\begin{aligned}\text{Cost of capital}_{\text{High growth}} &= \text{Cost of equity}[E/(D + E)] + \text{Cost of debt}(1 - t)(D/(D + E)) \\ &= [3.5\% + 1.2(5\%)](1 - .2632) + 6.85\%(1 - .4)(.2632) = 8.08\%\end{aligned}$$

$$\text{Cost of capital}_{\text{Stable growth}} = [3.5\% + 1.2(5\%)](1 - .2632) + 5\%(1 - .4)(.2632) = 7.79\%$$

In the table following, we estimate the free cash flows to the firm for the 2011–2015 time period and discount them back at the cost of capital of 8.08%:

	<i>Current</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
Expected growth rate		15.00%	15.00%	15.00%	15.00%	15.00%
EBIT × (1 – Tax rate)	\$117.60	\$135.24	\$155.53	\$178.85	\$205.68	\$236.54
–(CapEx–Depreciation)	\$ 11.00	\$ 12.72	\$ 14.63	\$ 16.83	\$ 19.35	\$ 22.25
–Change in working capital	\$ 16.00	\$ 18.33	\$ 21.08	\$ 24.24	\$ 27.87	\$ 32.05
Free cashflow to firm	\$ 90.60	\$104.19	\$119.82	\$137.79	\$158.46	\$182.23
Cost of capital	8.08%	8.08%	8.08%	8.08%	8.08%	8.08%
Present value @8.08%	\$ 96.40	\$102.57	\$109.14	\$116.12	\$123.55	

The sum of the present value amounts to \$547.78 million. Note that we have assumed that the net cap ex and change in working capital will grow at the same rate as operating income.

To estimate the value at the end of the high growth period, we estimate the reinvestment rate based on the stable growth rate and return on capital:

$$\text{Stable growth rate} = 3\%$$

$$\text{Stable return on capital} = 7.79\% \text{ (equal to cost of capital in stable growth)}$$

$$\text{Stable reinvestment rate} = g/\text{ROC} = 3\%/7.79\% = 38.51\%$$

$$\begin{aligned}\text{Terminal value} &= \frac{\text{EBIT}(1 - t)^5(1 + g_{\text{stable}})(1 - \text{Reinvestment rate})}{(\text{Cost of capital} - g_{\text{stable}})} \\ &= \frac{236.54(1.03)(1 - .3851)}{(.0779 - .03)} = \$3,127.69\end{aligned}$$

Discounting the terminal value back at 8.08% for five years and adding to the present value of the cash flows over the five years yields a value for the operating assets of \$2668 million:

$$\text{Value of operating assets} = \$547.78 + \$3127.69/1.0808^5 = \$2,668 \text{ million}$$

Adding the cash balance of \$1,134 million, subtracting out debt outstanding of \$947 million and dividing by the number of shares outstanding (146.26 million) yields a value per share of \$19.52, about 8% higher than the stock price of \$18.13 at the end of May 2011.



**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: Valuing a Cyclical Company Using Normalized Earnings: Toyota Motors in March 2009**

In the years leading up to 2008, Toyota Motors acquired a reputation for efficiency and innovation. The banking crisis of 2008 and the slowing down of the global economy, however, led to Toyota reporting a loss in the last quarter of 2008, a precursor to much lower earnings in its 2008–2009 fiscal year (stretching from April 2008 to March 2009). To normalize Toyota’s operating income, we looked at its operating performance from 1998 to 2008 in the table below:

*Toyota's Operating Performance—1998–2008 (in millions of Yen)*

<i>Year</i>	<i>Revenues</i>	<i>Operating Income</i>	<i>EBITDA</i>	<i>Operating Margin</i>	<i>EBITDA/Revenues</i>
FY1 1998	¥11,678,400	¥ 779,800	¥1,382,950	6.68%	11.84%
FY1 1999	¥12,749,010	¥ 774,947	¥1,415,997	6.08%	11.11%
FY1 2000	¥12,879,560	¥ 775,982	¥1,430,982	6.02%	11.11%
FY1 2001	¥13,424,420	¥ 870,131	¥1,542,631	6.48%	11.49%
FY1 2002	¥15,106,300	¥1,123,475	¥1,822,975	7.44%	12.07%
FY1 2003	¥16,054,290	¥1,363,680	¥2,101,780	8.49%	13.09%
FY1 2004	¥17,294,760	¥1,666,894	¥2,454,994	9.64%	14.20%
FY1 2005	¥18,551,530	¥1,672,187	¥2,447,987	9.01%	13.20%
FY1 2006	¥21,036,910	¥1,878,342	¥2,769,742	8.93%	13.17%
FY1 2007	¥23,948,090	¥2,238,683	¥3,185,683	9.35%	13.30%
FY1 2008	¥26,289,240	¥2,270,375	¥3,312,775	8.64%	12.60%
FY 2009 (Est)	¥22,661,325	¥ 267,904	¥1,310,304	1.18%	5.78%
Average		¥1,306,867		7.33%	

We considered three different normalization techniques:

1. *Average income:* Averaging the operating income from 1998 to 2008 yields an value of ~~1,332.9~~ billion yen. Since the revenues over the period more than doubled, this will understate the normalized operating income for the firm.
2. *Industry average margin:* The average pretax operating margin of automobile firms (global) over the same time period (1998–2008) is about 6%. In 2009, however, many of these firms were in far worse shape than Toyota, and many are likely to report large losses. While we could apply the industry average margin to Toyota's 2009 revenues to estimate a normalized operating income (6% of 22,661 billion yen = 1,360 billion yen), this would understate the normalized operating income, since it will not reflect the fact that Toyota has been among the most profitable firms in the sector.
3. *Historical margin:* Averaging the pretax operating margin from 1998 to 2008 yields an average operating margin of 7.33%. Applying this margin to the revenues in 2009 yields a normalized operating income of 1,660.7 billion yen (7.33% of 22,661 billion yen), an estimate that captures both the larger scale of the firm today and its success in this business. We will use this value as our normalized operating income.

To value the firm, we made the following assumptions.

- To estimate Toyota's cost of equity, we used a bottom-up beta (estimated from the automobile sector) of 1.10. Using the 10-year Japanese yen government bond rate of 1.50% as the risk-free rate and an equity risk premium of 6.5% (reflecting a mature market premium of 6% in early 2009 and an additional 0.50% for exposure to emerging market risk), we computed a cost of equity of 8.65%.

$$\begin{aligned}\text{Cost of equity} &= \text{Risk-free rate} + \text{Beta} \times \text{Equity risk premium} \\ &= 1.50\% + 1.10 (6.5\%) = 8.65\%\end{aligned}$$

- In early 2009, Toyota had 11,862 billion yen in debt outstanding, and the market value of equity for the firm was 10,551 billion (3.448 billion shares outstanding at 3060 yen/share). Using a rating of AA and an associated default spread of 1.75% over the risk-free rate, we estimated a pretax cost of debt of 3.25%. Assuming that the current debt ratio is a sustainable one, we estimated a cost of capital of 5.09%; the marginal tax rate for Japan in 2009 was 40.7%.

$$\begin{aligned}\text{Debt Ratio} &= 11,862 / (11,862 + 10,551) = 52.9\% \\ \text{Cost of capital} &= 8.65\%(.471) + 3.25\%(1 - .407)(.529) = 5.09\%\end{aligned}$$

We did examine the cost of capital for Toyota over time, and since neither the debt ratio nor the cost of capital has moved substantially over time, we will use this as the normalized cost of capital.

- Since Toyota was already the largest automobile firm in the world, in terms of market share, we assumed that the firm was in stable growth, growing at 1.50% (capped at the risk-free rate) in perpetuity. We also assumed that the firm will be able to generate a return on capital equal to its cost of capital on its investments. The reinvestment rate that emerges from these two assumptions is 29.46%:

$$\text{Stable period reinvestment rate} = \frac{g}{\text{ROC}} = \frac{.015}{.0509} = .2946$$

Bringing together the normalized operating income (1,660.7 billion yen), the marginal tax rate for Japan (40.7%), the reinvestment rate (29.46%), the stable growth rate of 1.5% and the cost of capital of 5.09%, we estimated the value of the operating assets at Toyota:

$$\begin{aligned} \text{Value}_{\text{Operating assets}} &= \frac{\text{Operating income} (1 + g)(1 - \text{tax rate}) (1 - \text{Reinvestment rate})}{(\text{Cost of capital} - g)} \\ &= \frac{1660.7 (1.015)(1 - .407)(1 - .2946)}{(.0509 - .015)} = 19,640 \text{ billion yen} \end{aligned}$$

Adding in cash (2,288 billion yen) and nonoperating assets (6,845 billion yen), subtracting out debt (11,862 billion yen) and minority interests in consolidated subsidiaries (583 billion yen), and dividing by the number of shares (3.448 billion) yielded a value per share of 4735 yen/share.

$$\begin{aligned} \text{Value per share} &= \frac{\text{Operating assets} + \text{Cash} + \text{Nonoperating assets} - \text{Debt} - \text{Minority interest}}{\text{Number of shares}} \\ &= \frac{19640 + 2288 + 6845 - 11862 - 583}{3.448} = 4735 \text{ yen/share} \end{aligned}$$

Based on the normalized income, Toyota looked significantly undervalued at its stock price of 3060 yen per share in early 2009.



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

**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.

~~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

### 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.

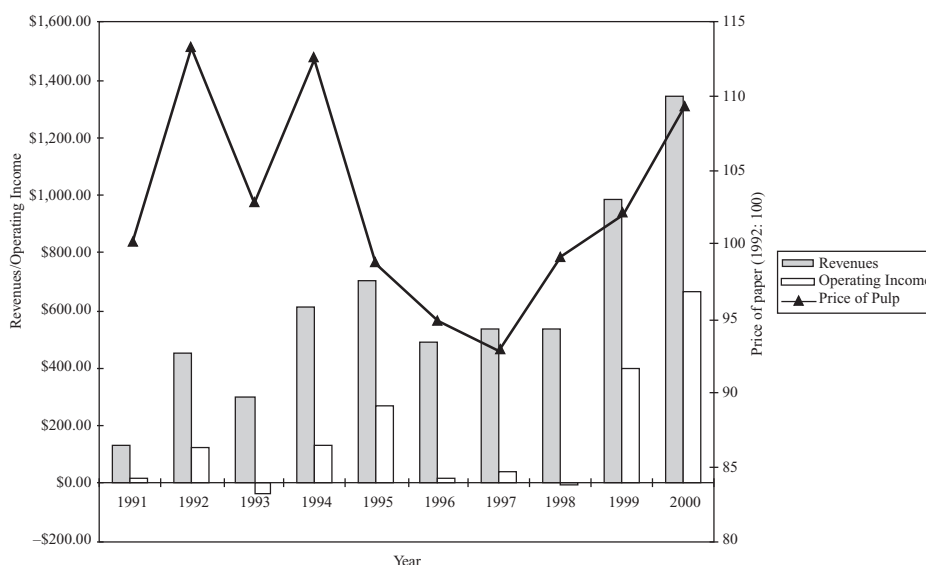
group would include not just mining firms but also forest product firms (such as timber) and plantations—you have three choices:

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.
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 at the Bottom of the Cycle: Aracruz Celulose in 2001

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 22.1 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.

Valuing Negative Earnings Firms



**FIGURE 22.1** Aracruz Celulose: Revenues, Profits, and the Price of Pulp  
 Source: Aracruz Annual Report.

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:

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

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 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:

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

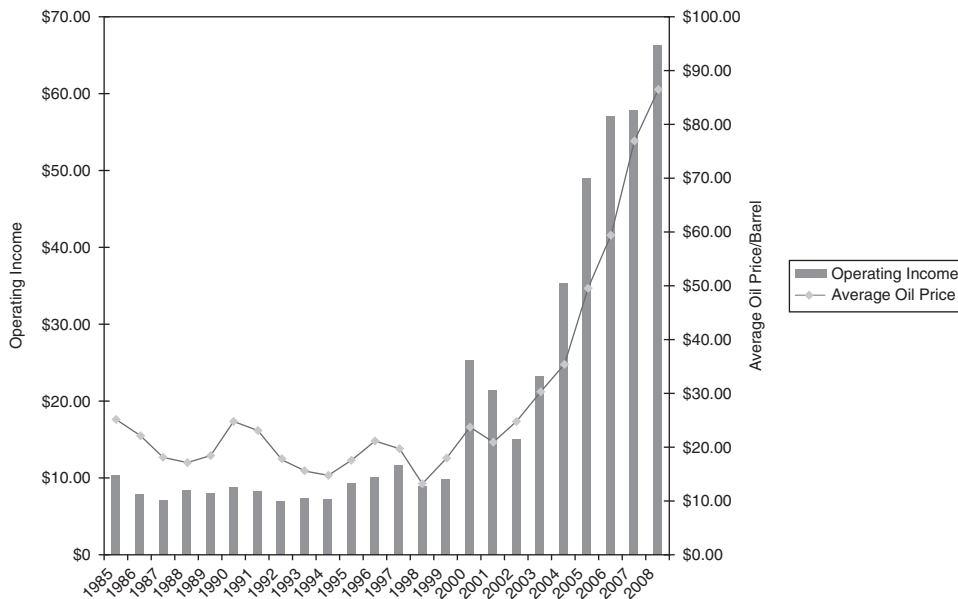
We added back the value of cash and marketable securities (849 million BR) and subtracted outstanding debt (1,395 million BR) to estimate a value of equity:

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

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

**ILLUSTRATION 22.5: Valuing a Commodity Company at the Peak of a Cycle: Exxon Mobil in March 2009**

Exxon Mobil may be the largest of the oil companies, but it is as dependent upon oil prices as the rest of the companies in its sector. In the figure below, we graph Exxon's operating income as a function of the average oil price each year from 1985 to 2008.



**FIGURE 22.2** Operating Income versus Oil Prices for Exxon Mobil: 1985–2008

The operating income clearly increases (decreases) as the oil price increases (decreases). We regressed the operating income against the oil price per barrel over the period and obtained the following:

$$\text{Operating Income} = -6,395 + 911.32 (\text{Average oil price}) \quad R^2 = 90.2\%$$

$$[2.95] \quad [14.59]$$

Put another way, Exxon Mobil's operating income increases about \$9.11 billion for every \$10 increase in the price per barrel of oil and 90% of the variation in Exxon's earnings over time comes from movements in oil prices.

To get from operating income to equity value at Exxon, we made the following assumptions:

- We estimated a bottom-up beta of 0.90 for Exxon Mobil, and then used the Treasury bond rate of 2.5% and an equity risk premium of 6.5% to estimate a cost of equity.

$$\text{Cost of equity} = 2.5\% + 0.90 (6.5\%) = 8.35\%$$

Exxon has \$9.4 billion of debt outstanding and a market capitalization of \$320.4 billion (4941.63 million shares, trading at \$64.83/share), resulting in a debt ratio of 2.85 percent. As a AAA-rated company, its cost of debt is expected to be 3.75%, reflecting a default spread of 1.25% over the risk-free rate. Using a marginal tax rate of 38% (rather than the effective tax rate), we estimate a cost of capital of 8.18% for the firm.

$$\text{Cost of capital} = 8.35\% (.9715) + 3.75\% (1 - .38) (.0285) = 8.18\%$$



- Exxon Mobil is in stable growth with the operating income growing at 2% a year in perpetuity. New investments are expected to generate a return on capital that reflects the normalized operating income and current capital invested; this return on capital is used to compute a reinvestment rate.

Exxon reported pretax operating income in excess of \$60 billion in 2008, but that reflects the fact that the average oil price during the year was \$86.55. By March 2009, the price per barrel of oil had dropped to \$45, and the operating income for the coming year will be much lower. Using the regression results, the expected operating income at this oil price is \$34,614 billion:

$$\text{Normalized operating income} = -6,395 + 911.32 (\$45) = \$34,614$$

This operating income translates into a return on capital of approximately 21% and a reinvestment rate of 9.52%, based upon a 2% growth rate.<sup>3</sup>

$$\text{Reinvestment Rate} = g / \text{ROC} = 2/21\% = 9.52\%$$

$$\begin{aligned} \text{Value of operating assets} &= \frac{\text{Operating income} (1 + g) (1 - \text{tax rate}) (1 - \frac{g}{\text{ROC}})}{\text{Cost of capital} - g} \\ &= \frac{34614(1.02)(1 - .38)(1 - \frac{2\%}{21\%})}{.0818 - .02} = \$320,472 \text{ million} \end{aligned}$$

Adding the current cash balance (\$32,007 million), subtracting out debt (\$9,400 million) and dividing by the number of shares (4,941.63 million) yields the value per share.

$$\begin{aligned} \text{Value per share} &= \frac{\text{Operating assets} + \text{Cash} - \text{Debt}}{\text{Number of shares}} \\ &= \frac{320472 + 32007 - 9400}{4941.63} = \$69.43/\text{share} \end{aligned}$$

At its current stock price of \$64.83, the stock looks slightly undervalued.

### 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.

<sup>3</sup>To compute the return on capital, we aggregated the book value of equity (\$126,044 million), the book value of debt (\$9,566 million) and netted out cash (\$33,981 million) from the end of 2007, to arrive at an invested capital value of \$101,629 million. The return on capital is computed as follows:

$$\text{Return on capital} = \text{Operating income} (1 - \text{Tax rate}) / \text{Invested capital} = 34614 (1 - .38) / 101629 = 21.1\%$$

### 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>4</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>4</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.

### 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.

**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.

### ILLUSTRATION 22.6: Valuing a Privatization: Compahnia Vale Dio Roce (CVRD) in 1995

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:

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

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

AU: See query on page 629. Did you insert a replacement Illustration 22.6 and renumber this one? (Replacement not found.)

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>5</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 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%

<sup>5</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.

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>6</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.

<sup>6</sup>You could discount the expected cash flows on the debt at a pretax cost of debt that reflects the firm's current standing.



**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.

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

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).

**Distress-Adjusted DCF** Discounted cash flow valuation will yield too high a value for a firm where there is a significant likelihood of distress or default, because we assume that the firm will survive as a going concern. One way of counteracting this bias is to first value the firm using a DCF approach, assuming that it makes it back to financial health and profitability. We then follow this up by estimating two inputs:

- The probability that the firm will not make it as a going concern (i.e., the probability of default). This can be estimated in one of three ways.
  1. If the company has traded bonds outstanding, it can be backed out of the price of the bonds.

$$\text{Bond Price} = \sum_{t=1}^{t=N} \frac{\text{Coupon} (1 - \pi_{\text{Distress}})^t}{(1 + \text{Risk-free rate})^t} + \frac{\text{Face value of bond} (1 - \pi_{\text{Distress}})^N}{(1 + \text{Risk-free rate})^N}$$

We are solving for an annualized probability of default over the life of the bond, and ignoring the ~~reality~~ that the annualized probability of default will be higher in the earlier years and decline in the later years.

2. If the company has a bond rating, we can use historical data to evaluate the likelihood of default. Table 22.1 summarizes the probability of default over 5- and 10-year periods, for bonds in different ratings classes:

**TABLE 22.1** Probability of Default by Bond Ratings Class

Bond Rating	Cumulative Probability of default	
	5 years	10 years
AAA	0.03%	0.06%
AA	0.39%	0.47%
A	0.61%	1.19%
BBB	6.41%	7.72%
BB	11.63%	19.48%
B	29.38%	38.68%
CCC	48.53%	61.67%

Source: Altman (2010).

Based on this table, a CCC rated company has a 61.67% probability of default over 10 years.

- If neither bonds nor ratings exist, we can use statistical techniques (such as probits) to estimate the probability of bankruptcy.
- The value that the firm will be able to get for its assets in the event of default. ~~This can be estimated either as a percentage of the book value of the assets or the discounted cash flow value, but the value will depend upon the marketability of assets (more marketable assets will retain a higher percent of fair value) and the number of potential buyers.~~

Once these numbers have been estimated, the value for the equity in the firm today can be written as a probability weighted average of the going concern value and the distress value:

$$\text{Value of equity today} = \text{Value of equity in DCF} (1 - \text{Probability of default}) + \text{Value of equity in default} (\text{Probability of default})$$

#### **ILLUSTRATION 22.8: Valuing a Company with Depressed Operating Income and Substantial Debt — MGM in May 2011**

MGM Resorts is one of the leading gaming companies in the world, with casinos in the United States and Macau. Like other companies in the sector, the firm borrowed large amounts to fund its expansion between 2002 and 2008. As the economy slowed, the operating income for the firm dropped from \$1,425 million in 2007 to \$371 million in 2010 and net income decreased even more precipitously from \$1,584 million in 2007 to -\$1,437 million in 2010. In May 2011, the company was rated CCC and the potential for default loomed.

For MGM to survive as a going concern, it needs to fix two problems. First, it has to mend its operating margins and return to positive revenue growth; its revenues declined from \$7,962 million in 2007 to \$6,019 million in 2010. Second, it has to reduce its debt burden; its market debt to capital ratio of 59.70% in May 2011 was significantly higher than the industry average of 46.21%. To value MGM as a going concern, we made the following assumptions:

- Revenue growth: We see revenue growth returning in 2011, with a 6% growth rate, followed by 15% growth for the following four years and then declining growth to a stable growth rate of 3% beyond year 10.

- Operating margin: The current pretax operating margin of 6.23% is expected to increase to the industry average of 19.84% over the next 10 years, with more substantial improvements in the earlier years.
- Debt ratio and cost of capital: While we leave the debt ratio at 59.7% for the next five years, we assume that the debt ratio will decrease in linear increments after year 5 to the industry average of 46.21% by year 10. As the debt ratio decreases, we expect the beta (currently 2.63, because of the high debt ratio) to decrease to 1.20 in stable growth. The pretax cost of debt (set at 11.5% to reflect the current CCC rating) remains unchanged for the first five years and then decreases in linear increments to a pretax cost of debt of 6% in perpetuity.
- Reinvestment: Since the bulk of the growth will come from utilizing existing assets more efficiently, MGM will be able to deliver the growth with relatively little reinvestment in the first five years, but the reinvestment rate will climb over the following five years to reach a stable growth level of 30%. That level is estimated using the stable growth rate of 3% and assuming a return on capital in perpetuity of 10%.

Pulling all these assumptions together, we estimated revenues, operating income and free cash flow to the firm in the table following:

Year	Revenues	Revenue Growth Rate	Pretax Margin	EBIT	EBIT (1 - t)	Reinvestment Rate	Reinvestment	FCFF
Base	\$ 6,019		6.23%	\$ 375	\$ 233	19.78%	\$ 46	\$ 187
1	\$ 6,380	6.00%	10.77%	\$ 687	\$ 426	-5.91%	-\$ 25	\$ 451
2	\$ 7,656	20.00%	13.79%	\$1,056	\$ 655	0.95%	\$ 6	\$ 649
3	\$ 8,805	15.00%	15.81%	\$1,392	\$ 863	3.74%	\$ 32	\$ 831
4	\$10,125	15.00%	17.15%	\$1,737	\$1,077	7.80%	\$ 84	\$ 993
5	\$11,644	15.00%	18.05%	\$2,102	\$1,303	12.95%	\$169	\$1,134
6	\$13,041	12.00%	18.65%	\$2,432	\$1,508	16.97%	\$256	\$1,252
7	\$14,345	10.00%	19.04%	\$2,732	\$1,694	20.80%	\$352	\$1,342
8	\$15,493	8.00%	19.31%	\$2,992	\$1,855	23.82%	\$442	\$1,413
9	\$16,423	6.00%	19.49%	\$3,200	\$1,984	25.52%	\$506	\$1,478
10	\$17,080	4.00%	19.60%	\$3,348	\$2,076	25.99%	\$540	\$1,536
Terminal year	\$17,592	3.00%	19.84%	\$3,490	\$2,164	30.00%	\$649	\$1,515

Note that these cash flows get discounted back at costs of capital that will also change over time, as debt ratios and risk parameters change (see table following):

Year	Debt Ratio	Beta	Pretax Cost of Equity	After-tax Cost of Debt	Cost of Debt	Cost of Capital	Cumulated Cost of Capital
Current	59.70%	2.63	16.63%	11.50%	7.13%	10.96%	
1	59.70%	2.63	16.63%	11.50%	7.13%	10.96%	1.1096
2	59.70%	2.63	16.63%	11.50%	7.13%	10.96%	1.2311
3	59.70%	2.63	16.63%	11.50%	7.13%	10.96%	1.3660
4	59.70%	2.63	16.63%	11.50%	7.13%	10.96%	1.5157
5	59.70%	2.63	16.63%	11.50%	7.13%	10.96%	1.6818
6	57.00%	2.34	15.20%	10.40%	6.45%	10.21%	1.8535
7	56.33%	2.06	13.78%	10.13%	6.28%	9.55%	2.0306
8	55.20%	1.77	12.35%	9.67%	5.99%	8.84%	2.2101
9	52.96%	1.49	10.93%	8.75%	5.43%	8.01%	2.3872
10	46.21%	1.20	9.50%	6.00%	3.72%	6.83%	2.5502

The terminal value for MGM's operating assets can be estimated using the FCFF in the terminal year, the cost of capital, and the stable growth rate:

$$\text{Reinvestment rate in stable growth} = g / \text{ROC} = 3\% / 10\% = 30\%$$

$$\begin{aligned} \text{Terminal value} &= \frac{\text{EBIT}_{10} (1 + g)(1 - \text{Tax rate})(1 - \text{Reinvestment rate})}{(\text{Cost of capital} - g)} \\ &= \frac{\$17,080(1.03)(1 - .38)(1 - .30)}{(.0683 - .03)} = \$39,560 \end{aligned}$$

The value of the operating assets can be obtained by discounting the cash flows back at the cumulated cost of capital in the table following:

Year	FCFF	Cumulated Cost Terminal Value	Present of Capital	Value
1	\$ 451		1.1096	\$406.60
2	\$ 649		1.2311	\$526.76
3	\$ 831		1.3660	\$608.13
4	\$ 993		1.5157	\$655.02
5	\$1,134		1.6818	\$674.42
6	\$1,252		1.8535	\$675.36
7	\$1,342		2.0306	\$660.67
8	\$1,413		2.2101	\$639.33
9	\$1,478		2.3872	\$619.07
10	\$1,536	\$39,560	2.5502	\$16,115
Value of operating assets				\$21,580
+ Cash				\$ 499
– Debt				\$10,952
Value of equity				\$11,127
/ Number of shares				488.59
Value per share				\$ 22.77

If MGM can improve its operating performance and reduce its debt load, its value per share in May 2011 is \$22.77.

This going-concern value was much higher than the stock price of \$15.13 that MGM was trading at in May 2011, but MGM's high debt burden and low bond rating (CCC) both raise red flags about potential default. To bring in the potential for default, we estimated the probability of and proceeds from default.

*Probability of default:* Using table 22.1, we can assess a probability of default based on the CCC bond rating to be 61.67%. Since MGM has publicly traded bonds, we chose one of the most liquid—a bond with seven years to maturity and a 7.625% coupon rate that was trading at 97.4% of par and estimated the probability of distress ( $\pi_{\text{Distress}}$ ) from the bond price:

$$\text{Bond price} = 974 = \sum_{t=1}^{t=7} \frac{76.25 (1 - \pi_{\text{Distress}})^t}{(1.035)^t} + \frac{1000(1 - \pi_{\text{Distress}})^7}{(1.035)^7}$$

Solving for the probability of distress, we get an annual probability of 4.28 percent and a cumulative probability of 35.42% over 10 years  $1 - (1 - .0342)^{10} = .3542$ .

*Default proceeds:* In the event of default, we assumed that MGM could sell its assets (primarily real estate) for 80% of book value and that liquidation costs would be 5% of the proceeds.

$$\begin{aligned} \text{Distress proceeds} &= \text{Book value of assets (Distress proceeds as \% of book value)} \\ &\quad (1 - \text{Liquidation cost \%}) \\ &= \$14,548 (.80)(1 - .05) = \$11,531 \text{ million} \end{aligned}$$

Since the book value of debt is \$12,048 million, the equity will be worth nothing in the event of default.

The distress adjusted value of equity can then be written as a function of the DCF value and the distress adjusted value:

	<i>Going Concern</i>	<i>Distress/Default</i>
Probability	64.58%	35.42%
Value of firm	\$22,079	\$11,531
Debt outstanding =	\$10,952	\$12,048
Value of equity	\$11,127	\$0
Value per share	\$ 22.77	\$0.00

$$\text{Value of equity} = \$22.77(.6458) + \$0.00(.3542) = \$14.71$$

Since the stock price was \$15.13 in May 2011, the stock looks fairly valued.



**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.

**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.

**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

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

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

1. Internet 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.

- a. Assuming that the bond rating reflects normalized earnings, estimate the normalized earnings for Toro Corporation.
  - b. 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%.)

- a. Assuming that the average earnings from 1987 to 1992 represents the normalized earnings, estimate the normalized earnings and free cash flow to equity.
  - b. 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%.)
- a. Estimate the cost of capital for OHM.
  - b. Estimate the value of the firm.
  - c. 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 noncash 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?