

## Valuing Private Firms

**S**o far this book has concentrated on the valuation of publicly traded firms. In this chapter, we turn our attention to the thousands of firms that are private businesses. These businesses range in size from small family businesses to some that rival large publicly traded firms. The principles of valuation remain the same, but there are estimation problems that are unique to private businesses. The information available for valuation tends to be much more limited in terms of both history and depth, since private firms are often not governed by the strict accounting and reporting standards of publicly traded firms. In addition, the standard techniques for estimating risk parameters such as beta and standard deviation require market prices for equity, an input that is lacking for private firms.

When valuing private firms, the motive for the valuation matters and can affect the value. In particular, the value that is attached to a publicly traded firm may be different when it is being valued for sale to an individual, for sale to a publicly traded firm, or for an initial public offering. In particular, whether there should be a discount on value for illiquidity and nondiversifiable risk or a premium for control will depend on the motive for the valuation. Each of these components will be considered over the course of this chapter.

### WHAT MAKES PRIVATE FIRMS DIFFERENT?

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There are a number of common characteristics shared by private firms with publicly traded firms, but there are four significant differences that can affect how we estimate inputs for valuation.

1. Publicly traded firms are governed by a set of accounting standards that allow us not only to identify what each item in a financial statement includes but also to compare earnings across firms. Private firms, especially if they are not incorporated, operate under far looser standards, and there can be wide differences between firms on how items are accounted for.
2. There is far less information about private firms in terms of both the number of years of data that is typically available and, more importantly, the amount of information available each year. For instance, publicly traded firms have to break down operations by business segments in their filings with the SEC and provide information on revenues and earnings by segment. Private firms do not have to provide this information, and usually do not.

3. A constantly updated price for equity and historical data on this price are very useful pieces of information that we can obtain easily for publicly traded firms but not for private firms. In addition, the absence of a ready market for private firm equity also means that liquidating an equity position in a private business can be far more difficult (and expensive) than liquidating a position in a publicly traded firm.
4. In publicly traded firms, the stockholders tend to hire managers to run the firms, and most stockholders hold equity in several firms in their portfolios. The owner of a private firm tends to be intimately involved with management, and often has all of his or her wealth invested in the firm. The absence of separation between the owner and management can result in an intermingling of personal expenses with business expenses, and a failure to differentiate between management salary and dividends (or their equivalent). The absence of diversification can affect our measurement of risk.

Each of the differences cited can change value by affecting discount rates, cash flows, and expected growth rates.

To examine the issues that arise in the context of valuing private firms, we will consider two firms. The first firm is the New York Yankees, the fabled baseball franchise, and the second is a private software firm called InfoSoft. We will value the Yankees for sale in a private transaction, whereas we will value InfoSoft for sale in an initial public offering (IPO).

## **ESTIMATING VALUATION INPUTS AT PRIVATE FIRMS**

The value of a private firm is the present value of expected cash flows discounted back at an appropriate discount rate. Since this construct is not different from the one we used to value publicly traded firms, the differences between private firms and publicly traded firms have to show up in how we estimate these inputs to the discounted cash flow model.

### **Discount Rates**

If we choose to value equity, we discount cash flows to equity at the cost of equity, whereas if we choose to value the firm, we discount cash flows at the cost of capital. While the fundamental definitions of these costs have not changed, the process of estimating them may have to be changed given the special circumstances surrounding private firms.

**Cost of Equity** In assessing the cost of equity for publicly traded firms, we looked at the risk of investments through the eyes of the marginal investors in these firms. With the added assumption that these investors were well diversified, we were able to define risk in terms of risk added on to a diversified portfolio or market risk. The beta in the capital asset pricing model (CAPM) and betas (in the multifactor models) that measure this risk are usually estimated using historical stock prices. The absence of historical price information for private firm equity and the failure on the part of many private firm owners to diversify can create serious problems with estimating and using betas for these firms.

**Approaches to Estimating Market Betas** The standard process of estimating the beta in the capital asset pricing model involves running a regression of stock returns against market returns. Multifactor models use other statistical techniques, but they also require historical price information. In the absence of such information, as is the case with private firms, there are three ways in which we can estimate betas: accounting betas, fundamental betas, and bottom-up betas.

**Accounting Betas** While price information is not available for private firms, accounting earnings information is. We could regress changes in a private firm's accounting earnings against changes in earnings for an equity index (such as the S&P 500) to estimate an accounting beta:

$$\Delta \text{Earnings}_{\text{private firm}} = a + b \Delta \text{Earnings}_{\text{S\&P 500}}$$

The slope of the regression (b) is the accounting beta for the firm. Using operating earnings would yield an unlevered beta, whereas using net income would yield a levered or equity beta.

There are two significant limitations with this approach. The first is that private firms usually measure earnings only once a year, leading to regressions with few observations and limited statistical power. The second is that earnings are often smoothed out and subject to accounting judgments, leading to mismeasurement of accounting betas.

#### ILLUSTRATION 24.1: Estimating Accounting Betas: InfoSoft

InfoSoft, even though it is a private business, has been in existence since 1992 and has accounting earnings going back to that year. The following table summarizes the quarterly accounting earnings changes at InfoSoft and for the S&P 500 for each quarter between 1992 and the middle of 1998.

<i>Period</i>	<i>InfoSoft</i>	<i>S&amp;P 500</i>	<i>Period</i>	<i>InfoSoft</i>	<i>S&amp;P 500</i>
1992: Q1	7.50%	-1.30%	1995: Q2	24.10%	8.50%
1992: Q2	8.30%	2.20%	1995: Q3	17.50%	6.00%
1992: Q3	8.80%	2.50%	1995: Q4	16.00%	5.00%
1992: Q4	7.90%	3.00%	1996: Q1	27.00%	8.10%
1993: Q1	14.30%	3.60%	1996: Q2	21.30%	7.00%
1993: Q2	16.50%	5.10%	1996: Q3	22.50%	7.20%
1993: Q3	17.10%	5.50%	1996: Q4	20.00%	6.00%
1993: Q4	13.50%	6.20%	1997: Q1	17.10%	5.80%
1994: Q1	11.50%	4.30%	1997: Q2	22.20%	8.00%
1994: Q2	12.30%	4.70%	1997: Q3	17.80%	6.10%
1994: Q3	13.00%	4.50%	1997: Q4	14.50%	4.50%
1994: Q4	11.10%	4.20%	1998: Q1	8.50%	1.30%
1995: Q1	18.60%	7.10%	1998: Q2	3.50%	-0.50%

*Note:* Earnings changes are over same quarter of previous year.

Regressing the changes in earnings at InfoSoft against changes in profits for the S&P 500 yields the following:

$$\text{InfoSoft earnings change} = 0.05 + 2.15(\text{S\&P 500 earnings change})$$

Based on this regression, the beta for InfoSoft is 2.15. In calculating this beta, we used net income to arrive at an equity beta. Using operating earnings for both the firm and the S&P 500 should yield the equivalent of an unlevered beta.

**Fundamental Betas** There have been attempts made by researchers to relate the betas of publicly traded firms to observable variables such as earnings growth, debt ratios, and variance in earnings. Beaver, Kettler, and Scholes (1970) examined the relationship between betas and seven variables—dividend payout, asset growth, leverage, liquidity, asset size, earnings variability, and the accounting beta. Rosenberg and Guy (1976) also attempted a similar analysis. The following is a regression that we ran relating the betas of NYSE and AMEX stocks in 1996 to four variables: coefficient of variation in operating income ( $CV_{OI}$ ), book debt/equity (D/E), historical growth in earnings (g), and the book value of total assets (TA).

$$\text{Beta} = 0.6507 + 0.25 CV_{OI} + 0.09 D/E + 0.54 g - 0.000009 TA \quad R^2 = 18\%$$

where  $CV_{OI}$  = Coefficient of variation in operating income = Standard deviation in operating income/Average operating income

We could measure each of these variables for a private firm and use these to estimate the beta for the firm. While this approach is simple, it is only as good as the underlying regression. The low R-squared suggests that the beta estimates that emerge from it are likely to have large standard errors.

#### ILLUSTRATION 24.2: Estimating a Fundamental Beta: InfoSoft

To use the cross-sectional regression reported earlier to estimate a beta for InfoSoft, we have to estimate the values for each of the independent variables for the firm:

<i>Variable</i>	<i>Value</i>
Coefficient of variation in operating income	0.40
Book debt-to-equity ratio	128.57%
Growth in earnings (previous five years)	30%
Book value of total assets	\$9 million

Inputting these values into the regression, we obtain a predicted value for the beta:

$$\text{Beta} = 0.6507 + 0.25(.40) + 0.09(1.2857) + 0.54(.3) - 0.000009(9) = 1.03$$

This would yield an estimate of 1.03 for InfoSoft's beta. The standard error on this estimate is 0.18, resulting in a range of 0.85 to 1.21 for the beta, with 67% probability.

**Bottom-Up Betas** When valuing publicly traded firms, we used the unlevered betas of the businesses that the firms operated in to estimate bottom-up betas—the costs of equity were based on these betas. We did so because of the low standard errors on these estimates (due to the averaging across large numbers of firms) and the forward-looking nature of the estimates (because the business mix used to weight betas can be changed). We can estimate bottom-up betas for private firms, and these betas have the same advantages that they do for publicly traded firms. Thus, the beta for a private steel firm can be estimated by looking at the average betas for publicly traded steel companies. Any differences in financial or even operating leverage can be adjusted for in the final estimate.

In making the adjustment of unlevered betas for financial leverage, we do run into a problem with private firms, since the debt-to-equity ratio that should be used is a market value ratio. While many analysts use the book value debt-to-equity ratio to substitute for the market ratio for private firms, we would suggest one of the following alternatives:

- Assume that the private firm's market leverage will resemble the average for the industry. If this is the case, the levered beta for the private firm can be written as:

$$\beta_{\text{private firm}} = \beta_{\text{unlevered}} [1 + (1 - \text{Tax rate})(\text{Industry average debt/Equity})]$$

- Use the private firm's target debt-to-equity ratio (if management is willing to specify such a target) or its optimal debt ratio (if one can be estimated) to estimate the beta:

$$\beta_{\text{private firm}} = \beta_{\text{unlevered}} [1 + (1 - \text{Tax rate})(\text{Optimal debt/Equity})]$$

The adjustment for operating leverage is simpler and is based on the proportion of the private firm's costs that are fixed. If this proportion is greater than is typical in the industry, the beta used for the private firm should be higher than the average for the industry.



***spearn.xls*: This dataset on the Web has earnings changes, by year, for the S&P 500 going back to 1960.**

#### ILLUSTRATION 24.3: Estimating Bottom-Up Betas: New York Yankees and InfoSoft

##### BOTTOM-UP BETA FOR YANKEES

To estimate a bottom-up beta for the Yankees, we first had to define what constituted a comparable firm. We considered three choices:

1. Firms that derive a significant portion of their revenues from baseball (traded baseball teams, baseball cards, and memorabilia).
2. Firms that derive a significant portion of their revenues from professional sports.
3. Firms that derive a significant portion of their revenues from entertainment.

The following table summarizes the number of firms that we obtained with each definition and the levered and unlevered betas for each group.

<i>Comparable Firms</i>	<i>Number of Firms</i>	<i>Levered Beta</i>	<i>Unlevered Beta</i>
Baseball firms	2	0.70	0.64
Sports firms	22	0.98	0.90
Entertainment firms	91	0.87	0.79

We abandoned the estimate obtained by looking at baseball firms because of the fact that there were only two firms that had betas available for them. In choosing between the unlevered beta estimated looking at sports firms and entertainment firms, we decided to go with the former largely because entertainment companies included conglomerates such as Disney and Time Warner with holdings in multiple businesses.

With an unlevered beta estimate of 0.90 for the Yankees from the preceding table, we used a target debt-to-equity ratio of 25%<sup>1</sup> and a private firm tax rate of 40% to arrive at a levered beta estimate of 1.04.

$$\text{Levered beta for Yankees} = 0.90[1 + (1 - .4)(.25)] = 1.04$$

#### BOTTOM-UP BETA FOR INFOSOFT

To estimate a beta for InfoSoft, we obtained the betas and market debt-equity ratios for publicly traded software firms. Since there are 264 software firms in the sample, with wide variations in market capitalization and growth prospects, the following table also looks at subclasses of these firms that might be more comparable to InfoSoft.

<i>Grouping</i>	<i>Number of Firms</i>	<i>Beta</i>	<i>D/E Ratio</i>	<i>Unlevered Beta</i>
All software firms	264	1.15	3.70%	1.13
Small-cap software firms	125	1.29	7.09%	1.23
Entertainment software firms	31	1.50	7.56%	1.43

Note that the debt/equity ratios are market value debt/equity ratios. Note also that the difference in the size of the firms should not affect the betas directly, but it might have an indirect effect, since smaller firms tend to have higher operating leverage. We will use an unlevered beta of 1.23 for InfoSoft, based on the average beta of small-cap software firms.

To estimate a levered beta, we have assumed that InfoSoft is close to the industry average for small-cap software firms (7.09%) in terms of financial leverage. We also use the corporate marginal tax rate of 35%, since InfoSoft is being priced to go public, to estimate a beta of 1.29 for InfoSoft.

$$\text{Bottom-up beta for InfoSoft} = 1.23[1 + (1 - .35)(.0709)] = 1.29$$

**Adjusting for Nondiversification** Betas measure the risk added by an investment to a diversified portfolio. Consequently, they are best suited for firms where the marginal investor is diversified. With private firms, the owner is often the only investor and thus can be viewed as the marginal investor. Furthermore, in most private firms, the owner tends to have much of his or her wealth invested in the private business and does not have an opportunity to diversify. Consequently, it can be argued that betas will understate the exposure to market risk in these firms.

At the limit, if the owner has all of his or her wealth invested in the private business and is completely undiversified, that owner is exposed to all risk in the firm and not just the market risk (which is what the beta measures). There is a fairly simple adjustment that can allow us to bring in this nondiversifiable risk into the beta computation. To arrive at this adjustment, assume that the standard

<sup>1</sup>If you are valuing a private firm, the target debt-to-equity ratio may be supplied to you by management. In this case, we assumed a target debt-to-equity ratio of 25 percent.

deviation in the private firm's equity value (which measures total risk) is  $\sigma_j$  and that the standard deviation in the market index is  $\sigma_m$ . If the correlation between the stock and the index is defined to be  $\rho_{jm}$ , the market beta can be written as:

$$\text{Market beta} = \rho_{jm} \sigma_j / \sigma_m$$

To measure exposure to total risk ( $\sigma_j$ ), we could divide the market beta by  $\rho_{jm}$ . This would yield the following:

$$\text{Market beta} / \rho_{jm} = \sigma_j / \sigma_m$$

This is a relative standard deviation measure, where the standard deviation of the private firm's equity value is scaled against the market index's standard deviation to yield what we will call a total beta.

$$\text{Total beta} = \text{Market beta} / \rho_{jm}$$

The total beta will be higher than the market beta, and will depend on the correlation between the firm and the market—the lower the correlation, the higher the total beta.

You might wonder how a total beta can be estimated for a private firm, where the absence of market prices seems to rule out the calculation of either a market beta or a correlation coefficient. Note, though, that we were able to estimate the market beta of the sector by looking at publicly traded firms in the business. We can obtain the correlation coefficient by looking at the same sample and use it to estimate a total beta for a private firm.

The question of whether the total beta adjustment should be made cannot be answered without examining why the valuation of the private firm is being done in the first place. If the private firm is being valued for sale, whether and how much the market beta should be adjusted will depend on the potential buyer or buyers. If the valuation is for an initial public offering, there should be no adjustment for nondiversification, since the potential buyers are stock market investors. If the valuation is for sale to another individual or private business, the extent of the adjustment will depend on the degree to which the buyer's portfolio is diversified; the more diversified the buyer, the higher the correlation with the market and the smaller the total beta adjustment.

#### ILLUSTRATION 24.4: Adjusting Bottom-Up Beta for Nondiversification

Consider the estimate of market beta obtained for the New York Yankees in the previous illustration. Using firms that derive the bulk of their revenues from sports as our comparable firms, we obtained an unlevered beta of 0.90 for the Yankees. The average correlation coefficient for these publicly traded firms with the markets is 0.50. (The R-squared is 25%.) The total unlevered beta for the Yankees can be estimated as follows:

$$\text{Total unlevered beta} = 0.90 / 0.5 = 1.80$$

Using the Yankee's tax rate of 40% and a debt to equity ratio of 25% yields a total levered beta of 2.07.

$$\text{Total levered beta} = 1.80[1 + (1 - .4)(.25)] = 2.07$$

This total beta estimate, in a sense, takes the limiting view that the potential buyer will own only the Yankees. To the extent that the buyer has some diversification, the correlation coefficient will be adjusted upward; if the buyer has a diversified portfolio, the correlation coefficient will approach 1 and the total beta will converge on the market beta.

**AN ALTERNATIVE ADJUSTMENT FOR PRIVATE FIRM RISK**

There is an alternative approach that is sometimes used to estimate the additional risk premium that should be charged a private firm. In this approach, you compare the historical returns earned by venture capital and private equity funds with the historical returns on publicly traded stocks. The difference between the two can be considered a premium for private company risk. For instance, private equity funds reported an average annual return of 24 percent from 1990 to 2000. In contrast, the average annual return on stocks from 1990 to 2000 was 15 percent. The difference of 9 percent can be viewed as the premium for private firm risk, and it should be added on to the cost of equity estimated with a market beta or betas.

There are three limitations with this approach. First, most venture capitalists and private equity investors do not publicly report their annual returns, and there is a selection bias among those who do; successful private equity funds are more likely to reveal their returns. Second, the standard errors in the annual returns are likely to be very large, and this noise will affect the risk premium estimate as well. Third, all private firms are treated equivalently in this approach, and no attempt is made to assess larger premiums for some firms and smaller premiums for others.

**From Cost of Equity to Cost of Capital** To get from the cost of equity to the cost of capital, we need two additional inputs—the cost of debt, which measures the rate at which firms can borrow, and the debt ratio that determines the weights in the cost of capital computation. This section considers how best to estimate each of these inputs for a private firm.

**Cost of Debt** The cost of debt represents the rate at which a firm can borrow money. To estimate it for publicly traded firms, we generally use either the yields on bonds issued by these firms or the ratings for these bonds to get default spreads. Private firms generally are not rated and do not have bonds outstanding. Consequently, we have to use one of the following alternative approaches:

- If the private firm has borrowed money recently (in the past few weeks or months), we can use the interest rate on the borrowing as a cost of debt. Since the cost of debt has to be current, the book interest rate<sup>2</sup> on debt issued in the past is generally not a good measure of the cost of debt.
- If the private firm is being valued for an initial public offering, we can assume that the cost of debt for the private firm will move toward the average cost of debt for the industry to which the firm belongs. We are essentially assuming that the private firm, once public, will structure its debt policy to resemble those of comparable firms.

<sup>2</sup>Book interest rate = Interest expenses/Book value of debt.



- When estimating the cost of debt for publicly traded firms in Chapter 8, we used the interest coverage ratios of these firms to estimate synthetic ratings, and then used the default spreads on these ratings to arrive at the costs of debt. To allow for the fact that private firms tend to be smaller and riskier than most publicly traded firms, we would use the relationship between interest coverage ratios and ratings for a subset of smaller, publicly traded firms, summarized in Table 24.1.

To estimate the cost of debt for a private firm with an interest coverage ratio of 5.1, for instance, we would use a synthetic rating of A– and the default spread associated with that rating. Thus, if firms that are rated A– typically pay 1.25 percent above the riskless rate to borrow, we would add that default spread to the riskless rate to estimate the cost of debt for the private firm.

This approach may underestimate the cost of debt if banks charge higher interest rates for private firms than for otherwise similar publicly traded firms. In that case, you would add an additional spread to reflect this difference, if you were valuing the firm for sale in a private transaction, but not if you were valuing it for sale to a publicly traded firm or an initial public offering.

**Debt Ratios** The debt ratio represents the proportion of the market value of a firm that comes from debt financing. For publicly traded firms, we use the market prices of publicly traded stocks and bonds to arrive at this ratio. Since neither input will be available for private firms, we have to consider one of the following options:

- In estimating levered betas, we suggested that the industry-average or target debt ratios could be used in the computation. Consistency demands that we use the same debt ratio for computing the cost of capital. Thus, if the industry-

**TABLE 24.1** Interest Coverage Ratios and Bond Ratings

Interest Coverage Ratio	Rating
> 12.50	AAA
9.50–12.50	AA
7.50–9.50	A+
6.00–7.50	A
4.50–6.00	A–
3.50–4.50	BBB
3.00–3.50	BB
2.50–3.00	B+
2.00–2.50	B
1.50–2.00	B–
1.25–1.50	CCC
0.80–1.25	CC
0.50–0.80	C
< 0.50	D

average debt-to-equity ratio is used to estimate the levered beta, the industry-average debt-to-capital ratio should be used to estimate the cost of capital. If the target debt-to-equity ratio is used for the levered beta computation, the target debt-to-capital ratio should be used in the cost of capital calculation.

- While market values of equity and debt are not available for private firms, we can use our estimated values of equity and debt from the valuation, though this creates circular reasoning in the analysis. You need the cost of capital (and the debt ratio) to estimate firm and equity value, and you need the equity value to estimate the cost of capital. You could overcome this problem by iterating toward a value—you could start with the book-debt ratio and cost of capital, estimate a firm and equity value, use these values to arrive at a new debt ratio and cost of capital, and reestimate firm and equity value. You would continue until the debt and equity values in the cost of capital computation converge on the estimated values.<sup>3</sup>

#### ILLUSTRATION 24.5: Estimating Cost of Debt

We will use different approaches to estimate the cost of debt for the Yankees and InfoSoft. For the Yankees, we will use the interest rate from the most recent loans that the firm has taken:

$$\text{Interest rate on debt} = 7.00\%$$

Using the Yankees' tax rate of 40%, we obtain an after-tax cost of debt:

$$\text{After-tax cost of debt} = 7\%(1 - .4) = 4.2\%$$

For InfoSoft, we will use the interest coverage ratio estimated using the operating income and interest expenses from the most recent year. InfoSoft had earnings before interest and taxes of \$2 million and had interest expenses of \$265,000.

$$\text{Interest coverage ratio} = \text{EBIT}/\text{Interest expenses} = 2,000/265 = 7.55$$

Using Table 24.1, we estimate a synthetic rating of A+ for InfoSoft:

$$\text{Rating based on interest coverage ratio} = \text{A+}$$

The default spread associated with A+-rated bonds in the market at the time of this valuation was 0.80%, and the Treasury bond rate was 6%. Since we are valuing InfoSoft for an initial public offering, we assume that there is no additional private firm spread.

$$\text{Interest rate on debt} = 6\% + 0.80\% = 6.80\%$$

Finally, we attach a corporate marginal tax rate of 35%, rather than InfoSoft's current tax rate (because the initial public offering will change the firm's tax status), to yield an after-tax cost of debt.

$$\text{After-tax cost of debt} = 6.80\%(1 - .35) = 4.42\%$$

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<sup>3</sup>The values will always converge.

**ILLUSTRATION 24.6: Estimating Cost of Capital**

To estimate the cost of capital for the New York Yankees and InfoSoft, we will stay consistent with the assumptions we have made about leverage so far in this chapter. The Yankees, we assumed, would stay close to a management target debt-to-equity ratio of 25%, which translates into a market debt-to-capital ratio of 20%. For InfoSoft, we used the industry-average debt-to-equity ratio of 7.09%, which results in a debt-to-capital ratio of 6.62%.<sup>4</sup>

For the Yankees, given that we are valuing the firm for sale to a private entity, we estimated a total beta of 2.07. Using the Treasury bond rate of 6% prevalent at the time of this valuation and a market risk premium of 4%, we estimate a cost of equity of 14.28%.

$$\text{Cost of equity} = 6\% + 2.07(4\%) = 14.28\%$$

Using the cost of debt of 4.2% estimated in Illustration 24.3, we can estimate the cost of capital:

$$\text{Cost of capital} = 14.28\%(.80) + 4.2\%(.20) = 12.26\%$$

For InfoSoft, where we are pricing an initial public offering, we use the market beta estimate of 1.29. Using the Treasury bond rate of 6% and a risk premium of 4% yields a cost of equity of 11.16%.

$$\text{Cost of equity} = 6\% + 1.29(4\%) = 11.16\%$$

With the after-tax cost of debt of 4.42% estimated in Illustration 24.4 and the industry-average debt ratio of 6.62%, we estimate a cost of capital of 10.71% for InfoSoft.

$$\text{Cost of capital} = 11.16\%(.9338) + 4.42\%(.0662) = 10.71\%$$

**Cash Flows**

The definitions of the cash flow to equity and cash flow to the firm are identical for both private and publicly traded firms. The cash flow to equity is the cash flow after taxes, debt payments and issues, and reinvestment needs. The cash flow to the firm is the cash flow after taxes and reinvestment needs, but before debt payments. There are three issues that do affect estimation of cash flows with private firms. The first is that many private firms do not adequately consider the salaries for owner-managers, since many owners do not distinguish between income that they receive as dividends and income they receive as salaries. The second is the intermingling of personal and business expenses that often occurs at small private businesses that can cause income to be mismeasured. The third is the effect of taxes on value, since individual tax status and tax rates vary much more widely than corporate tax rates.

**Owner Salaries and Equity Cash Flows** In valuing firms, we draw a simple distinction between salaries and dividends. Salaries are compensation for professional

<sup>4</sup>Debt to capital = Debt-to-equity ratio/(1 + Debt-to-equity ratio).

services rendered to the firm and should be treated as operating expenses. Dividends or other equity cash withdrawals from the firm are returns on equity capital invested and determine the value of equity. The separation between managers and stockholders in publicly traded firms results in a distinction between salaries (which are paid to managers) and dividends (which are paid to stockholders) that is clear. In a private business, the owner is often the firm's manager and its only equity investor. If the private firm is not incorporated, the income earned by the owner is taxed at the same rate, whether it is categorized as a salary or as a dividend. Consequently, an owner will be indifferent between receiving a salary of \$10,000 and a dividend of \$90,000 and a salary of \$90,000 and a dividend of \$10,000. As a consequence, owners do not pay themselves a salary in many small private firms, or even if they do, the salary does not reflect the services they render to the firm.

When valuing a private firm, we generally make forecasts based on the operating income reported by the firm. If that operating income does not reflect a salary adjustment for the owner, it will be overstated and result in a value that is too high. To get a more precise estimate of operating income, we have to estimate the appropriate compensation for the owner-managers, based on the role they play in the firm and the cost of hiring replacements for them. Thus, the owner of a private business might play several roles—cashier, accountant, stockperson, and salesperson, and the management salary would have to include the cost of hiring a person or two to provide the same services.

**Intermixing Business and Personal Expenses** The intermingling of business and personal expenses is a particular problem in small private business, since owners often have absolute power over many aspects of the business. Many private business owners maintain offices in their residences, have vehicles that they maintain for personal and business use, and share other services between work and home. In some cases, family members are hired to fill phantom positions in order to distribute income or to reduce taxes.

If personal expenses are consolidated with business expenses or are otherwise a part of business expenses, the operating income for a private firm has to be estimated prior to these expenses. The problem with making these adjustments, however, is that private firm owners are usually not forthcoming about the extent of these expenses, and there may be tax consequences.

**Tax Effects** When valuing publicly traded firms, the tax rate that we use in valuation is defined to be the marginal corporate tax rate. While different firms may face different marginal tax rates, the differences in tax rates across potential buyers of a private firm can be much larger. In fact, the tax rate can vary from the corporate tax rate (if the potential buyer is a corporation) to the highest marginal tax rate for individuals (if the potential buyer is a wealthy individual) to a lower marginal tax rate if the potential buyer is an individual with lower income. The tax rate will affect both the cash flows (through the after-tax operating income) and the cost of capital (through the cost of debt). As a consequence, the value of a private firm can vary across different buyers.

**ILLUSTRATION 24.7: Estimating Operating Income**

To estimate the cash flows for the Yankees, we reconstruct the operating income statement based on publicly available information.<sup>5</sup> We begin in the following table by estimating the revenues of the Yankees and contrasting them with the revenues of two other baseball teams:

	<i>Pittsburgh Pirates</i>	<i>Baltimore Orioles</i>	<i>New York Yankees</i>
Net home game receipts	\$22,674,597	\$ 47,353,792	\$ 52,000,000
Road receipts	\$ 1,613,172	\$ 7,746,030	\$ 9,000,000
Concessions and parking	\$ 3,755,965	\$ 22,725,449	\$ 25,500,000
National TV revenues	\$15,000,000	\$ 15,000,000	\$ 15,000,000
Local TV revenues	\$11,000,000	\$ 18,183,000	\$ 90,000,000
National licensing	\$ 4,162,747	\$ 3,050,949	\$ 6,000,000
Stadium advertising	\$ 100,000	\$ 4,391,383	\$ 5,500,000
Other revenues	\$ 1,000,000	\$ 9,200,000	\$ 6,000,000
Total revenues	\$59,306,481	\$127,650,602	\$209,000,000

The expenses are estimated similarly in the next table, with a comparison again to two other teams in professional baseball:

	<i>Pittsburgh Pirates</i>	<i>Baltimore Orioles</i>	<i>New York Yankees</i>
Player salaries	\$33,155,366	\$ 62,771,482	\$ 91,000,000
Team operating expenses	\$ 6,239,025	\$ 6,803,907	\$ 7,853,000
Player development	\$ 8,136,551	\$ 12,768,399	\$ 15,000,000
Stadium and game operations	\$ 5,270,986	\$ 4,869,790	\$ 7,800,000
Other player costs	\$ 2,551,000	\$ 6,895,751	\$ 7,500,000
General and administrative costs	\$ 6,167,617	\$ 9,321,151	\$ 11,000,000
Broadcasting	\$ 1,250,000	\$ —	\$ —
Rent and amortization	\$ —	\$ 6,252,151	\$ —
Total operating expenses	\$62,770,545	\$109,682,631	\$140,153,000

While deducting operating expenses from revenues would normally yield operating income, the operating expenses for the Yankees include \$4.5 million in expenses that we are not considering to be part of operations.<sup>6</sup> The following table summarizes these adjustments for the Yankees:

	<i>Pittsburgh Pirates</i>	<i>Baltimore Orioles</i>	<i>New York Yankees</i>
Total revenues	\$59,306,481	\$127,650,602	\$209,000,000
Total operating expenses	\$62,770,545	\$109,682,631	\$140,153,000
EBIT	(\$ 3,464,064)	\$ 17,967,971	\$ 68,847,000
Adjustments	\$ 1,500,000	\$ 2,200,000	\$ 4,500,000
Adjusted EBIT	(\$ 1,964,064)	\$ 20,167,971	\$ 73,347,000
Taxes (at 40%)	(\$ 785,626)	\$ 8,067,189	\$ 29,338,800
EBIT(1 – Tax rate)	(\$ 1,178,439)	\$ 12,100,783	\$ 44,008,200

InfoSoft, though a private firm, has essentially been run like a public firm, probably as a lead-in to the initial public offering. The following table reflects the operating income for InfoSoft, and cor-

<sup>5</sup>The numbers in the tables are estimates based on the fragments of public information that are available on professional baseball teams and the filings of the only publicly traded professional baseball team—the Cleveland Indians.

<sup>6</sup>Delicately put, these would include what we categorize as personal expenses that the owner-manager charges to the firm, and could include employees who owe their employment status to their relationship to the owner-manager.

rects the operating income for the capitalization of R&D expenses; this is a correction we employed for publicly traded high-technology firms as well. Note that the after-tax operating income incorporates the tax advantage of expensing all of R&D expenses.<sup>7</sup>

*Adjusted Operating Income—InfoSoft (in '000s)*

Sales and other operating revenues	\$20,000.00	
– Operating costs and expenses	\$13,000.00	
– Depreciation	\$ 1,000.00	
– Research and development expenses	\$ 4,000.00	
Operating income	\$ 2,000.00	
<i>Adjusted operating income:</i>	<i>Pretax</i>	<i>After-tax</i>
Operating income	\$2,000.00	\$1,300.00
+ R&D expenses	\$4,000.00	\$4,000.00
– Amortization of research assets	\$2,367.00	\$2,367.00
Adjusted operating income	\$3,633.00	\$2,933.00

## Growth

The growth rate for a private firm can be estimated by looking at the past (historical growth) or from fundamentals (the reinvestment rate and return on capital). This section will consider some of the issues in estimating private firm growth.

**Estimating Growth** In estimating growth for publicly traded firms, we noted that we could draw on three sources—historical growth, analyst estimates, and fundamentals. With private firms, we will not find analyst estimates of growth, and historical growth numbers have to be used with caution. The shifting accounting standards that characterize many private firms will mean that reported earnings changes over time may not reflect actual earnings changes. Furthermore, the fact that earnings are measured annually, rather than quarterly, and the reality that private firms tend to be younger than publicly traded firms will mean far less data in the historical growth estimate.

As a consequence of these gaps in past growth and analyst estimates, there is an even greater reliance on fundamentals in private firms. The expected growth rate in operating income is the product of the reinvestment rate and the return on capital, though changes in return on capital in existing assets can create an additional impact.

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

In making the estimates of reinvestment rates and returns on capital for private firms, we can draw on the experience of publicly traded firms in the business.

<sup>7</sup>If you multiply the operating income of \$3,633 by (1 – Tax rate), you would obtain \$2,362 million. The higher after-tax operating income we obtain of \$2,933 million reflects the additional \$571 million in tax benefits from R&D [(\$4,000 – \$2,367) × .35 = 571].

**ILLUSTRATION 24.8: Estimating Growth**

The process of estimating growth is different for the two firms under consideration in this chapter. With the Yankees we are looking at a valuable asset, but one whose cash flows are unlikely to grow at rate higher than the inflation rate in perpetuity. Consequently, we will assume a growth rate of 3% in nominal terms in perpetuity. While this might seem unduly low for a team that has won the World Series four of the past five years,<sup>8</sup> the current revenues and operating income reflect these successes. Depressing though it might be to fans, the Yankees will not always be world champions, and there will be some lean years ahead. The expected growth rate of 3% can be considered a smoothed growth rate over good times and bad. To estimate how much the team will need to reinvest to generate this growth, we will assume a return on capital of 20%.<sup>9</sup> This yields a reinvestment rate of:

$$\text{Reinvestment rate} = \text{Growth rate} / \text{Return on capital} = 3\% / 20\% = 15\%$$

To estimate the growth rate at InfoSoft, we follow a more conventional route. We first estimate the return that they earn on their capital invested currently, by dividing the after-tax operating income from the most recent year by the adjusted capital invested<sup>10</sup> at the beginning of the year. We use the adjusted operating income from the preceding table.

$$\begin{aligned} \text{Return on capital} &= \text{EBIT}(1 - t) / \text{BV of capital} \\ &= \$2,933 / \$12,933 = 23.67\% \end{aligned}$$

We then estimate InfoSoft's reinvestment rate by dividing its reinvestment in capital expenditures (including R&D)<sup>11</sup> and working capital in the most recent year by the after-tax operating income.

$$\begin{aligned} \text{Reinvestment rate} &= (\text{Net cap ex} + \text{R\&D} - \text{Amortization} + \Delta \text{WC}) / \text{EBIT}(1 - t) \\ &= (\$2,633 + 500) / \$2,933 = 106.82\% \end{aligned}$$

The expected growth rate in operating income for InfoSoft for the immediate future is based on the assumption that the return on capital and reinvestment rate will remain unchanged over the next five years.

$$\text{Expected growth rate} = 23.67\% \times 1.0682 = 25.28\%$$

If we had expected the return on capital or the reinvestment rate to change over time, we would have reflected those changes in this growth rate.

**Persistence of Growth** In valuing publicly traded firms, we generally assumed infinite lives, even though we did allow for the risk that the firm would not survive. With private firms, the perpetual life assumption has to be made with far more caution. Unlike publicly traded firms, where the transition from one CEO to another is common, the transition is much more complicated in a private firm since the

<sup>8</sup>This statement will clearly date this book. As a Yankees fan, I hope it remains true in future years.

<sup>9</sup>This is the weak link in this valuation. Since the book value of capital at the Yankees does not really reflect the true capital invested, it cannot be used to obtain the return on capital. We are assuming that the most valuable franchise in sports earns an excess return, partly due to brand name and partly due to location—it helps to be in the biggest media market in the United States.

<sup>10</sup>The capital invested reflects the value of the research asset.

<sup>11</sup>Reinvestment = Net cap ex + R&D expense – Amortization = \$1,000 + \$4,000 – \$2,367 = \$2,633.

owner-manager generally does not want to pass the reins of power to an outsider. Instead, the owner looks to the next generation in his or her family for the successor, a process that is not always successful.

What are the implications for valuation? One is that the terminal value for a private firm will be lower than the terminal value for a publicly traded firm. If we assume, in fact, that the firm will cease operations at some point in time in the future—say when the current owner retires—we would use a liquidation value for the assets as the terminal value. In general, liquidation values are lower than the value of continuing operations. The other is that private firms where owners plan for the transition to the next generation will be worth more than private firms that do not make these arrangements.

Some private firms, especially as they get larger, resemble publicly traded firms in terms of having professional managers. With these firms, the assumption of infinite growth that we used with publicly traded firms can be sustained.

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**ILLUSTRATION 24.9: Closure in Valuation and Terminal Values**

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Neither of the two firms that we are valuing are valued with finite lives. With InfoSoft, the reason is simple. We are assuming a growing and healthy publicly traded firm, based on our projections over the next 5 years. The firm should be worth more based on continuing operations than from liquidation. Consequently, we assume an expected growth rate of 5% beyond year 5 for the firm. As the firm becomes larger, it will become more and more difficult for it to sustain its current return on capital of 23.67%. We will assume that the return on capital will drop to the industry average of 17.20%. These two assumptions yield a reinvestment rate of 29.07% after year 5:

$$\text{Reinvestment rate} = \text{Expected growth rate} / \text{Return on capital} = 5\% / 17.2\% = 29.07\%$$

While we do value the Yankees for sale in a private transaction, it remains a valuable franchise and should not lack for potential buyers, even if the owner or owners no longer are interested in running it. That is why we assumed a growth rate of 3% in perpetuity.

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## **Illiquidity Discounts**

When you take an equity position in an entity, you generally would like to have the option to liquidate that position if you need to. The need for liquidity arises not only because of cash flow considerations but also because you might want to change your portfolio holdings. With publicly traded firms, liquidation is simple and generally has a low cost—the transaction costs for liquid stocks are a small percent of the value. With equity in a private business, liquidation costs as a percent of firm value can be substantial. Consequently, the value of equity in a private business may need to be discounted for this potential illiquidity. This section will consider the determinants of this discount and how best to estimate it.

**Determinants of Illiquidity Discount** The illiquidity discount is likely to vary across both firms and buyers, which renders rules of thumb useless. Let us consider first four factors that may cause the discount to vary across firms:



1. *Liquidity of assets owned by the firm.* The fact that a private firm is difficult to sell may be rendered moot if its assets are liquid and can be sold with no significant loss in value. A private firm with significant holdings of cash and marketable securities should have a lower illiquidity discount than one with factories or other assets for which there are relatively few buyers.
2. *Financial health and cash flows of the firm.* A private firm that is financially healthy should be easier to sell than one that is not healthy. In particular, a firm with strong income and positive cash flows should be subject to a smaller illiquidity discount than one with negative income and cash flows.
3. *Possibility of going public in the future.* The greater the likelihood that a private firm can go public in the future, the lower should be the illiquidity discount attached to its value. In effect, the probability of going public is built into the valuation of the private firm. To illustrate, the owner of a private e-commerce firm in 1998 or 1999 would not have had to apply much of an illiquidity discount to his or her firm's value, if any, because of the ease with which these firms could be taken public in those years.
4. *Size of the firm.* If we state the illiquidity discount as a percent of the value of the firm, it should become smaller as the size of the firm increases. In other words, the illiquidity discount should be smaller as a percent of firm value for private firms like Cargill and Koch Industries, which are worth billions of dollars, than it should be for a small firm worth \$15 million.

The illiquidity discount is also likely to vary across potential buyers because the desire for liquidity varies with individuals. It is likely that those buyers who have deep pockets and see little or no need to cash out their equity positions will attach much lower illiquidity discounts to value for similar firms than buyers that have less of a safety margin.

**Empirical Evidence and Typical Practice** How large is the illiquidity discount attached to private firm valuations? This is a very difficult question to answer empirically because the discount itself cannot be observed. Even if we were able to obtain the terms of all private firm transactions, note that what is reported is the price at which private firms are bought and sold. The value of these firms is not reported, and the illiquidity discount is the difference between the value and the price.

In fact, much of the evidence on illiquidity discounts comes from examining restricted stock at publicly traded firms. Restricted securities are securities issued by a publicly traded company, but not registered with the SEC, that can be sold through private placements to investors but cannot be resold in the open market for a two-year holding period, and only limited amounts can be sold after that. When this stock is issued, the issue price is set much lower than the prevailing market price, which is observable, and the difference is viewed as a discount for illiquidity. The results of three studies that have looked at the magnitude of this discount are summarized as follows:

1. Maher examined restricted stock purchases made by four mutual funds in the period 1969–1973 and concluded that they traded at an average discount of 35.43 percent on publicly traded stock in the same companies.
2. Moroney reported a mean discount of 35 percent for acquisitions of 146 restricted stock issues by 10 investment companies, using data from 1970.

3. Silber examined restricted stock issues from 1984 to 1989 and found that the median discount for restricted stock was 33.75 percent.

In summary, then, there seems to be a substantial discount attached, at least on average, when an investment is not liquid. Much of the practice of estimating illiquidity discounts seems to build on these averages. For instance, rules of thumb often set the illiquidity discount at 20 to 30 percent of estimated value, and there seems to be little or no variation across firms.

Silber (1991) also examined factors that explained differences in discounts across different restricted stocks by relating the size of the discount to observable firm characteristics including revenues and the size of the restricted stock offering. He reported the following regression:

$$\ln(\text{RPRS}) = 4.33 + 0.036 \ln(\text{REV}) - 0.142 \ln(\text{RBRT}) \\ + 0.174 \text{ DERN} + 0.332 \text{ DCUST}$$

where RPRS = Restricted stock price/Unrestricted stock price = 1 – Illiquidity discount

REV = Revenues of the private firm (in millions of dollars)

RBRT = Restricted block relative to total common stock in %

DERN = 1 if earnings are positive; 0 if earnings are negative

DCUST = 1 if there is a customer relationship with the investor; 0 otherwise

The illiquidity discount tends to be smaller for firms with higher revenues, decreases as the block offering decreases, and is lower when earnings are positive and when the investor has a customer relationship with the firm.

These findings are consistent with some of the determinants that we identified in the previous section for the illiquidity premium. In particular, the discounts tend to be smaller for large firms (at least as measured by revenues) and for healthy firms (with positive earnings being the measure of financial health). This would suggest that the conventional practice of using constant discounts across private firms is wrong and that we should be adjusting for differences across firms.

**Estimating the Illiquidity Discount** If we do decide to adjust the illiquidity discount to reflect the differences across private firms, we are faced with an estimation question. How are we going to measure these differences and build them into an estimate? There are two ways of doing this. The first is to extend the analysis done for restricted securities into the illiquidity discount; in other words, we could adjust the discount factor for the magnitude of a firm's revenues and whether it has positive earnings. The second is to apply some of the empirical work that has been done examining the magnitude of the bid-ask spread for publicly traded firms to estimating illiquidity discounts.

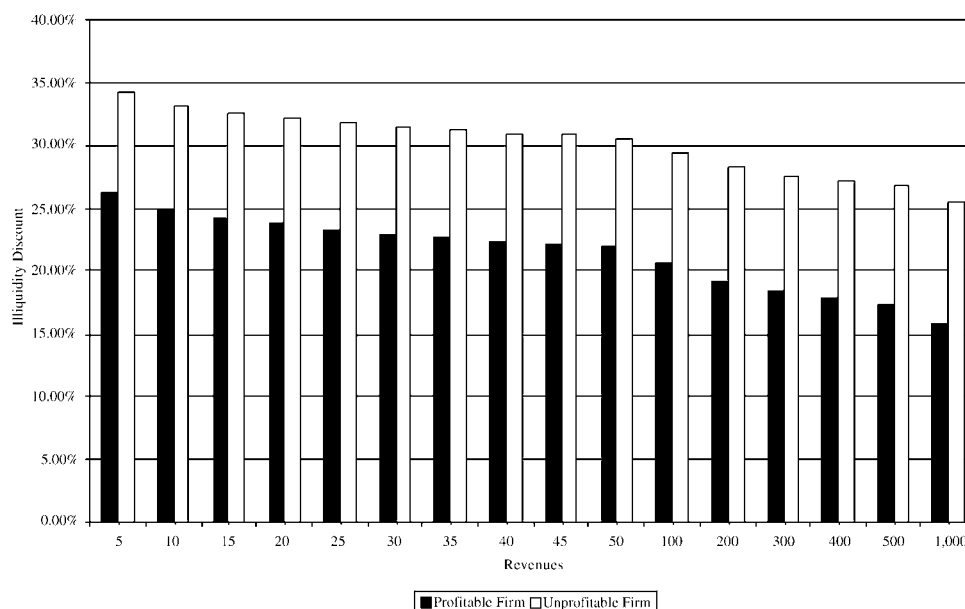
**Adjusted Discount Factors** Consider again the regression that Silber presents on restricted stock. Not only does it yield a result specific to restricted stock, but it also provides a measure of how much lower the discount should be as a function of revenues. A firm with revenue of \$20 million should have a illiquidity discount that is 1.19 percent lower than a firm with revenues of \$10 million. Thus we could establish a benchmark discount for a profitable firm with specified revenues (say \$10

million) and adjust this benchmark discount for individual firms that have revenues much higher or lower than this number. The regression can also be used to differentiate between profitable and unprofitable firms. Figure 24.1 presents the difference in illiquidity discounts across both profitable and unprofitable firms with different revenues, using a benchmark discount of 25 percent for a firm with positive earnings and \$10 million in revenues.

There are clearly dangers associated with extending a regression run on a small number of restricted stock to estimating discounts for private firms, but it does provide at least a road map for adjusting discount factors.

**Bid-Ask Spread Approach** The biggest limitation of using studies based on restricted stock is that the samples are small. We would be able to make far more precise estimates if we could obtain a large sample of firms with illiquidity discounts. We would argue that such a sample exists, if we consider the fact that an asset that is publicly traded is not completely liquid. In fact, liquidity varies widely across publicly traded stock. A small company listed over-the-counter is much less liquid than a company listed on the New York Stock Exchange, which in turn is much less liquid than a large-capitalization company that is widely held. In fact, the difference between the bid price and the ask price that we observe on publicly traded assets can be viewed as a measure of the cost of instant liquidity. An investor who buys an asset, changes his or her mind, and decides to sell the asset immediately will pay the bid-ask spread.

While the bid-ask spread might only be a quarter or half a dollar, it looms as a much larger cost when it is stated as a percent of the price per unit. For a stock that is trading at \$2, with a bid-ask spread of  $\frac{1}{4}$ , this cost is 12.5 percent. For higher-price and very liquid stocks, the illiquidity discount may be less than 0.5 percent of the price, but it is not zero.



**FIGURE 24.1** Illiquidity Discounts: Base Discount of 25 Percent for Profitable Firm with \$10 Million in Revenues

What relevance does this have for illiquidity discounts on private companies? Think of equity in a private company as a stock that never trades. On the continuum just described, you would expect the bid-ask spread to be high for such a stock, and this would essentially measure the illiquidity discount.

To make estimates of the illiquidity discounts using the bid-ask spread as the measure, you would need to relate the bid-ask spread of publicly traded stocks to variables that can be measured for a private business. For instance, you could regress the bid-ask spread against the revenues of the firm and a dummy variable reflecting whether the firm is profitable, and extend the regression done on restricted stocks to a much larger sample. You could even consider the trading volume for publicly traded stocks as an independent variable and set it to zero for a private firm. Using data from the end of 2000, for instance, we regressed the bid-ask spread for Nasdaq stocks against revenues, a dummy variable for positive earnings, cash as a percent of firm value, and trading volume.

$$\text{Spread} = 0.145 - 0.0022 \ln(\text{Annual revenues}) - 0.015(\text{DERN}) \\ - 0.016(\text{Cash/Firm value}) - 0.11(\$ \text{ Monthly trading volume/Firm value})$$

Plugging in the corresponding values—with a trading volume of zero—for a private firm should yield an estimate of the bid-ask spread for the firm.

#### ILLUSTRATION 24.10: Estimating the Illiquidity Discount for the New York Yankees

We can use both approaches described earlier to estimate the illiquidity discount on the Yankees.

##### RESTRICTED STOCK APPROACH

To estimate the illiquidity discount for the Yankees, we assume that the base discount for a firm with \$10 million in revenues would be 25%. The Yankees' revenues of \$209 million should result in a lower discount on the organization's value. We estimate the difference in the illiquidity discount between a firm with \$10 million in revenue and \$209 million in revenue to be 19.10%. To do this, we first estimated the illiquidity discount in the Silber equation for a firm with \$10 million in revenues.

$$\text{Expected illiquidity discount} = \frac{100 - \exp[4.33 + 0.036 \ln(10) - 0.142 \ln(100) + 0.174(1)]}{100} = 48.94\%$$

We then reestimated the illiquidity discount with revenues of \$209 million:

$$\text{Expected illiquidity discount} = \frac{100 - \exp[4.33 + 0.036 \ln(209) - 0.142 \ln(100) + 0.174(1)]}{100} = 43.04\%$$

$$\text{Difference in discount} = 48.94\% - 43.04\% = 5.90\%$$

The estimated illiquidity discount for the Yankees would therefore be 19.10%, which is the base discount of 25% adjusted for the revenue difference.

##### BID-ASK SPREAD APPROACH

We could substitute in the revenues of the Yankees (\$209 million) the fact that it has positive earnings and the cash as a percent of revenues held by the firm (3%):

$$\text{Spread} = 0.145 - 0.0022 \ln(\text{Annual revenues}) - 0.015(\text{DERN}) - 0.016(\text{Cash/Firm value}) \\ - 0.11(\$ \text{ Monthly trading volume/Firm value}) \\ = 0.145 - 0.0022 \ln(209) - 0.015(1) - 0.016(.03) - 0.11(0) = .1178 \text{ or } 11.78\%$$



**liqdisc.xls:** This spreadsheet allows you to estimate the illiquidity discount for private firms using both the restricted stock approach and the bid-ask spread approach.

## VALUATION MOTIVES AND VALUE ESTIMATES

In the preceding section, we considered how best to estimate the inputs to use in valuing a private firm. As we considered each input, though, we noted that the process of estimation might be different depending on the potential buyer of the firm. With betas, for instance, we argued that the market beta should be used if the potential buyer is a publicly traded firm or a stock market investor (in an initial public offering) and that a total beta should be used if the potential buyer is a private party. We made similar arguments about the cost of debt and cash flows. Table 24.2 summarizes the differences in the way we estimate the inputs to valuation for different valuation motives.

The results of using different approaches to estimating discount rates and cash flows, depending on the potential buyer, can have significant effects on value. In general, a private business that is up for sale will be valued much more highly by a publicly traded firm than by a private entity. This can be traced to the fact that the discount rates are higher when we assume that the buyer is not diversified. Thus the owners of private businesses who are interested in selling their businesses will be well served looking for potential buyers who are publicly traded firms. While they might not be able to extract the entire value, they can try to obtain at least a share of the additional value created because the marginal investors are diversified.

The same implications arise when looking at the alternative of going public. The value that a firm can obtain from a public offering will exceed the value that it will receive from a private entity. The values obtained from an initial public offering and sale to a publicly traded firm will be based on similar discount rates, but may vary because of cost and revenue synergies. If the potential for these synergies is large, selling to a publicly traded firm may result in a higher value than going public.

**TABLE 24.2** Estimation of Inputs for Valuation: Valuation Motives

	Valuation for Sale to a Private Entity	Valuation for Sale to a Publicly Traded Firm or for an Initial Public Offering
Cost of equity	Based on total beta, with correlation reflecting diversification of potential buyer	Based on market beta, since marginal investor is diversified
Cost of debt	May reflect additional spread associated with being a private business	Based on synthetic rating, estimated by looking at publicly traded firms
Operating cash flows	Private business tax rate used in valuation	Corporate marginal tax rates used in valuation
Firm life	Finite life terminal value or liquidation value	Perpetual life when estimating terminal value
Illiquidity discount	Value discounted for illiquidity	No illiquidity discount

**ILLUSTRATION 24.11: Valuing the New York Yankees for a Private Sale**

The inputs for valuing the Yankees as a business are in place. We have estimated the cost of capital of 12.26% in Illustration 24.6, the adjusted after-tax operating income of \$44.008 million in Illustration 24.7, and expected growth rate of 3% and reinvestment rate of 15% in Illustration 24.8. These estimates yield a value of \$415 million for the Yankees:

$$\begin{aligned}\text{Value of the Yankees} &= \text{EBIT}(1 - t)(1 - \text{Reinvestment rate})(1 + g)/(\text{Cost of capital} - g) \\ &= \$44.008 \text{ million}(1 - .15)(1.03)/(.1226 - .03) = \$415 \text{ million}\end{aligned}$$

Since this a valuation for a private sale, we would apply the illiquidity discount of 11.78% estimated in Illustration 24.10.

$$\text{Value of the Yankees with discount} = \$415 \text{ million}(1 - .1178) = \$366.1 \text{ million}$$

This valuation is a conservative one, and the actual value may well exceed this for two reasons. The first is that publicly traded television and cable companies have expressed interest in the Yankees. Following up, if we substitute in the market beta of 1.03 for the total beta of 2.07, we obtain a cost of capital of 8.95%. This results in a value of \$647 million, which no longer has to be discounted for illiquidity:

$$\text{Value to diversified buyer} = \$44.008 \text{ million}(1 - .15)(1.03)/(.0895 - .03) = \$647 \text{ million}$$

The second is the power that sports teams seem to have to extort subsidies and financial assistance from the cities that they represent. For instance, if the Yankees can get New York City to pick up the tab for the reinvestment needs (15% of the after-tax operating income), the value of the Yankees would increase to \$762 million.

$$\text{Value with subsidies} = \$44.008 \text{ million}(1.03)/(.0895 - .03) = \$762 \text{ million}$$

Of course, the presence of synergies to the buyer may cause the value to increase even further.

**ILLUSTRATION 24.12: Valuing InfoSoft**

The inputs for valuing InfoSoft are summarized in the following table. We assume that InfoSoft will maintain a reinvestment rate of 112.17% and a return on capital of 23.67% for the next five years, allowing its operating earnings to grow 25.28% a year. At the end of five years, we assume that the firm will be in stable growth, growing 5% a year.

<i>Length</i>	<i>High-Growth Phase: Five Years</i>	<i>Stable-Growth Phase: Forever after Year 5</i>
<i>Growth inputs</i>		
Reinvestment rate	106.82%	29.07%
Return on capital	23.67%	17.2%
Expected growth rate	25.28%	5.00%
<i>Cost of capital inputs</i>		
Beta	1.29	1.20
Cost of debt	6.80%	6.80%
Debt ratio	6.62%	6.62%
Cost of capital	10.71%	10.38%

As noted in an earlier section, we use the corporate tax rate of 35% in this valuation because InfoSoft is being valued for an initial public offering. In addition, we added the cash and marketable securities, valued at \$500,000, to the value of the operating assets of the firm. The valuation is summarized in Figure 24.2. Based on our assumptions, we would value the equity in InfoSoft at \$69.826 million.

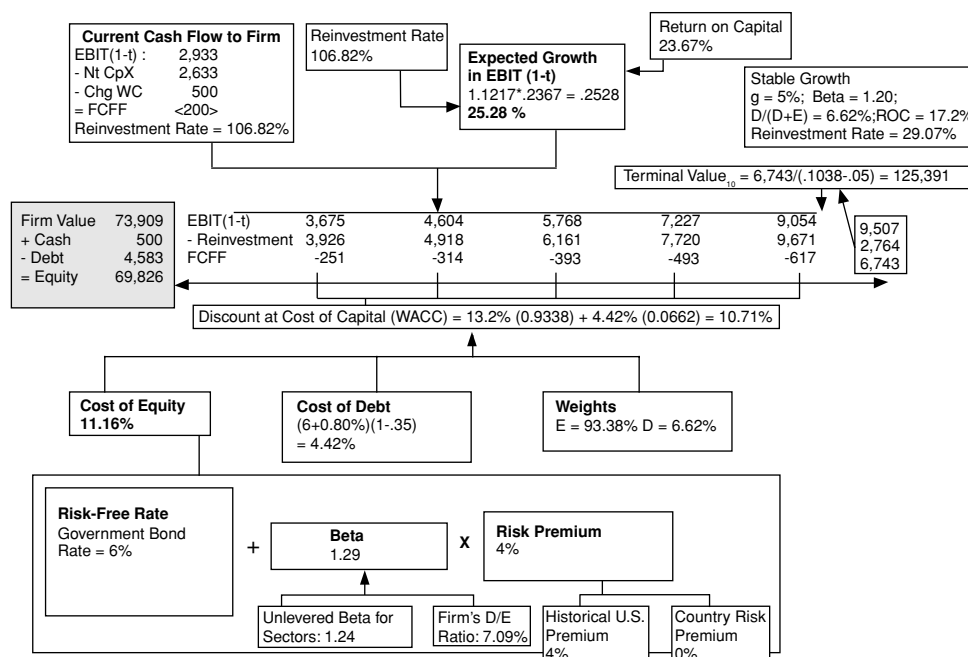


FIGURE 24.2 InfoSoft: A Valuation

## Control Issues

When valuing a firm, you always need to consider the competence and strengths of the management of the firm. With private firms, where the owner is also the manager, this consideration carries special weight, since the owner has absolute control. In a publicly traded firm, in contrast, incompetent management can often be replaced, if enough stockholders can be convinced that it is in their best interests to do so.

There are implications for valuation if a portion of a private firm is offered for sale. If that portion provides a controlling interest (i.e., the right to pick the firm's management), it should have a substantially higher value than if it does not provide this power. Normally, this would mean that 51 percent of a private firm's equity should trade at a substantial premium over 49 percent. This applies whether a firm is being sold to a private entity or a publicly traded firm, and may arise in an initial public offering. If, for instance, only nonvoting shares or shares with diluted voting rights are offered to investors in the public offering, they should trade at a discount on shares with full voting rights.

While the intuition about the value of control is simple, estimating how much it is worth is a little more difficult. We will defer a full discussion of the topic until the next chapter, on acquisitions, but we will value it as the difference between two values—the value of the firm run optimally and the value of the firm with the incumbent management. For instance, if the value of a private firm run by incumbent

management is \$100 million and the value of the firm run optimally is \$150 million, the difference in values between the 51 percent and 49 percent shares can be computed as follows:

$$\begin{aligned}\text{Value of controlling interest} &= 51\% \text{ of optimal value} = .51 \times 150 = \$76.5 \text{ million} \\ \text{Value of noncontrolling interest} &= 49\% \text{ of status quo value} = .49 \times 100 = \$49 \text{ million}\end{aligned}$$

The additional 2 percent interest (from 49 to 51 percent) has a disproportionate effect on value because of control. This value of control will be greatest for private firms that are poorly run and will be close to zero for well-run firms.

In fact, the same approach can be used to compute the discount that nonvoting shares will trade at relative to voting shares in initial public offerings. For instance, assume that this private firm creates 10 million voting shares and offers 70 percent to the public. Since the potential for changing management is created by this offering, the value per share will fall between \$10 and \$15, depending on the probability that is attached to the management change. Thus, if the probability of the management change is 60 percent, the value per share will be \$13.

$$\begin{aligned}\text{Value per share} &= \frac{\text{Status quo value}}{\text{Number of shares}} + \frac{(\text{Optimal value} - \text{Status quo value}) \times \text{Probability of change}}{\text{Number of shares}} \\ &= \$100/10 + [(150 - 100) \times .6]/10 = \$13\end{aligned}$$

Now assume that this firm had issued 9 million nonvoting shares, with management retaining 1 million voting shares with complete control. In this case, the nonvoting shares will get little or none of the estimated value change from optimal management. In fact, the values of the two classes can be estimated as follows:

$$\begin{aligned}\text{Value per nonvoting share} &= \frac{\text{Status quo value}}{(\text{Number of voting shares} + \text{Nonvoting shares})} \\ &= \$100/(9 + 1) = \$10 \text{ per share} \\ \text{Value per voting share} &= \frac{\text{Status quo value}}{(\text{Number of voting shares} + \text{Nonvoting shares})} \\ &\quad + \frac{(\text{Optimal value} - \text{Status quo value}) \times \text{Probability of change}}{\text{Number of voting shares}} \\ &= \$100/(9 + 1) + [(150 - 100) \times .6]/1 = \$40\end{aligned}$$

The voting shares in this case would trade at an enormous premium over the nonvoting shares, but that is because we have assumed that the probability of change is still 60 percent. If the incumbent managers are much more likely to fight a change in management, this probability will drop and reduce the premium with it.



**ILLUSTRATION 24.13: Estimating a Per-Share Value for InfoSoft**

In the previous illustration, we valued the equity in InfoSoft at \$69.826 million. Assume that the firm decides to create 5 million shares—4 million shares will be nonvoting shares and 1 million will be voting shares. In the initial offering, only the nonvoting shares will be sold to the public, and the current owners will retain all of the voting shares.

To value the voting and nonvoting shares, we need to value InfoSoft under optimal management. Assume that the firm would be worth \$75 million under optimal management.<sup>12</sup> The value of the voting and nonvoting shares can then be computed:

$$\begin{aligned}\text{Value per nonvoting share} &= \frac{\text{Status quo value}}{(\text{Number of voting shares} + \text{Number of nonvoting shares})} \\ &= \$69.826 / (4 + 1) = \$13.97\end{aligned}$$

Assume that the fact that incumbent managers will retain the voting shares reduces the probability of management change to 25%.

$$\begin{aligned}\text{Value per voting share} &= \frac{\text{Status quo value}}{(\text{Number of voting shares} + \text{Number of nonvoting shares})} \\ &\quad + \frac{(\text{Optimal value} - \text{Status quo value}) \times \text{Probability of change}}{\text{Number of voting shares}} \\ &= \$69.826 / (4 + 1) + (75 - 69.826) \times .25 / 1 = \$15.26\end{aligned}$$

**VALUING PRIVATE EQUITY**

Earlier in this chapter, we considered how venture capitalists value firms. In the past decade, private equity has emerged as competition to traditional venture capital. Private equity can come from a variety of sources—wealthy individual investors, private equity funds, and corporations with excess funds to invest. Like venture capitalists, private equity investors invest in private firms (often early in the life cycle) in return for a share in the ownership in the firm.

In valuing a private equity stake, we confront many of the issues that we have raised in the chapter:

- While private equity investors tend to be more diversified than venture capitalists, the cost of equity used to value a private equity investment may still be higher than the cost of equity used to value a publicly traded firm. The degree of nondiversification can vary across investors. A publicly traded firm like Microsoft that makes private equity investments should not use a higher cost of equity, whereas an investor who is not diversified may have to make an adjustment similar to the one described for the owners of private firms.
- Private equity investors often provide cash to cash-starved firms in return for a minority stake in the firms. Consequently, the issues of precash versus postcash valuations and the value of control often come up with private equity valuations.

<sup>12</sup>InfoSoft was revalued at its optimal debt ratio. We assumed that the existing investment policy was optimal.

### PRECASH AND POSTCASH VALUATIONS

When valuing private companies, many analysts draw a distinction between precash and postcash valuations. In general, this is done especially when an infusion of cash is anticipated either from venture capitalists or from an initial public offering. The precash valuation values the firm before the cash influx and the postcash valuation values it after.

There are two reasons why the two valuations may be different. The first is that the firm may face capital rationing constraints without the infusion of the cash, resulting in a scaling down of how much the firm can reinvest. If the firm's return on capital is greater than the cost of capital, this will cause the value to be lower before the cash influx. The second is that the value of cash and marketable securities will be added to the value of the operating assets to arrive at firm value. After a large cash influx, firms may have excess cash to invest in marketable securities, which when added to the value of operating assets will increase value. If the cash is taken out of the firm, though, by the existing owners, you should not add the cash to the value.

Which of these two values should be used to estimate the value per share in a public offering? Since stockholders in the firm will hold stock in the post-cash firm, the postcash value should be used. In the case of a venture capitalist, though, the answer may be different. If the venture capitalist has bargaining power—she is the only person who is interested in providing venture capital—she can ask for a share of the firm value based on the precash valuation, arguing that the increase in value is feasible only with the additional venture capital. If two or more venture capitalists are interested in the firm, odds are that the postcash valuations will be the basis for deciding how much of the firm will be yielded to the venture capitalist.

#### ILLUSTRATION 24.14: Valuing a Private Equity Stake

Assume that you work for a publicly traded firm and have been asked to value a potential stake in a small, privately held firm that wants you to invest \$10 million in its equity, which it plans to use to expand operations.

First, you would value the private firm assuming that you do not invest the \$10 million. Based on the projected cash flows, assume that you value the equity in the firm at \$30 million:

$$\text{Precash valuation} = \$30 \text{ million}$$

Now assume that your investment of \$10 million will allow the firm to grow faster and that the present value of the expected cash flows is \$50 million for the equity. (This present value does not include the cash inflow of \$10 million from the private equity investment.)

$$\text{Postcash valuation} = \$50 \text{ million} + \$10 \text{ million} = \$60 \text{ million}$$

The key question, assuming that you decide to make this investment, is the percentage of the private firm you should demand in return for the \$10 million investment. At the minimum, you would demand a share of the postcash valuation:

$$\text{Share of ownership}_{\text{minimum}} = \text{Cash invested} / \text{Postcash valuation} = 10/60 = 16.66\%$$

However, you would bargain for a larger share. At the limit, you could argue for a share of the precash valuation:

$$\begin{aligned} \text{Share of ownership}_{\text{maximum}} &= \text{Cash investment} / (\text{Precash valuation} + \text{Cash investment}) \\ &= 10 / (30 + 10) = 25\% \end{aligned}$$

## CONCLUSION

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The value of a private firm is the present value of the cash flows it is expected to generate, discounted back at a rate that reflects both the risk in the private firm and the mix of debt and equity it uses. While this statement is identical to the one used to describe the value of a publicly traded firm, there are differences in the way we estimate these inputs for private firms, and even among private firms, depending on the motive for the valuation.

When valuing a private firm for sale to an individual or private entity, we have to consider three specific issues. The first is that the cost of equity, which we have hitherto assumed to be determined purely by the risk that cannot be diversified, might have to be adjusted for the fact that the potential buyer is not well diversified. The second is that equity holdings in private businesses are illiquid, leading to a discount on the estimated value. The discounts on restricted stock issues made by publicly traded firms or the bid-ask spreads of these firms may provide us with useful information on how large this discount should be. The third is that a controlling interest in equity of a private firm can trade at a significant premium over a minority interest.

The valuation of a private firm for sale to a publicly traded firm or initial public offering follows a much more conventional route. We can continue to assume that the cost of equity should be based only on nondiversifiable risk and there is no need for an illiquidity discount. There can still be a control value if less than a controlling interest is sold to the publicly traded firm or if nonvoting shares are issued in the initial public offering.

## QUESTIONS AND SHORT PROBLEMS

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1. You have been asked to value Barrista Espresso, a chain of espresso coffee shops that have opened on the East Coast of the United States.
  - The company had earnings before interest and taxes of \$10.50 million in the most recent year on revenues of \$50 million. However, the founders of the company had never charged themselves a salary, which would have amounted to \$1 million if based on comparable companies.
  - The tax rate is 36% for all firms, and working capital is 10% of revenues.
  - The capital expenditures in the most recent year amounted to \$4.5 million, while depreciation was only \$1 million.
  - Earnings, revenues, and net capital expenditures are expected to grow 30% a year for five years, and 6% after that forever.
  - The comparable firms have an average beta of 1.3567 and an average D/E ratio of 13.65%. The average correlation with the market is 0.50. Barrista Espresso is expected to maintain a debt ratio of 12% and face a cost of debt of 8.75%. The risk-free rate is 6%, and the market risk premium is 5.5%.
  - a. Estimate the value of Barrista Espresso as a firm.
  - b. Estimate the value of equity in Barrista Espresso.
  - c. Would your valuation be different if you were valuing the firm for an IPO?
2. You have valued a business, using discounted cash flow models, at \$250 million for a private sale. The business, which does make money, had revenues of \$200 million in the most recent year. (The average firm has revenues of \$10 million.) How much of a liquidity discount would you apply to this firm:

- a. Based on the Silber regression?
- b. Based on correcting the average discount (25%) for the size of the firm?
3. You are valuing a bed-and-breakfast in Vermont with the following information:
  - The business had pretax operating income of \$100,000 in the most recent year. This income has grown 5% a year for the past three years, and is expected to continue growing at that rate for the foreseeable future.
  - About 40% of this operating income can be attributed to the fact that the owner is a master chef. He does not plan to stay on if the business is sold.
  - The business is financed equally with debt and equity. The pretax cost of borrowing is 8%. The beta for publicly traded firms in the hospitality business is 1.10. The Treasury bond rate is 7%, the market risk premium is 5.5%, and the tax rate is 40%.
  - The capital maintenance expenditure, net of depreciation, was \$10,000 in the most recent year, and it is expected to grow at the same rate as operating income.
  - The business is expected to have an operating life of 10 years, after which the building will be sold for \$500,000, net of capital gains taxes.
  - a. Value the business for sale.
  - b. How much would the value change if the owner offered to stay on for the next three years?
4. You have been asked by the owner of Tectonics Software, a small firm that produces and sells computer software, to come up with an estimate of value for the firm for an initial public offering. The firm had revenues of \$20 million in the most recent year, on which it made earnings before interest and taxes of \$2 million. The firm had debt outstanding of \$10 million, on which pretax interest expenses amounted to \$1 million. The book value of equity is \$10 million. The average unlevered beta of publicly traded software firms is 1.20, and the average market value of equity of these firms is, on average, three times the book value of equity. All firms face a 40% tax rate. Capital expenditures amounted to \$1 million in the most recent year and were twice the depreciation charge in that year. Both items are expected to grow at the same rate as revenues for the next five years. The return on capital after year 5 is expected to be 15%. The revenues of this firm are expected to grow 20% a year for the next five years and 5% after that, and the operating margins will remain at existing levels. The Treasury bond rate is 6%.
  - a. Estimate the cost of capital for the firm.
  - b. Estimate the value of the equity in the firm.
  - c. If the firm plans to issue 1 million shares, estimate the value per share.
5. How would your answer to (4) change if you were valuing Tectonics Software for sale to a private individual? The individual in question has a portfolio that is not diversified and has a correlation of 0.60 with the market index. In addition, use the following bid-ask spread equation to estimate the illiquidity discount:

$$\text{Bid-ask spread} = 0.14 - 0.015 \ln(\text{Revenues})$$

Estimate the value of equity in the private transaction.

## Aquisitions and Takeovers

**F**irms are acquired for a number of reasons. In the 1960s and 1970s, firms such as Gulf & Western and ITT built themselves into conglomerates by acquiring firms in other lines of business. In the 1980s, corporate giants like Time Inc., Beatrice Foods, and RJR Nabisco were acquired by other firms, their own management, or wealthy raiders, who saw potential value in restructuring or breaking up these firms. The 1990s saw a wave of consolidation in the media business as telecommunications firms acquired entertainment firms, and entertainment firms acquired cable businesses. Through time, firms have also acquired or merged with other firms to gain the benefits of synergy, in the form of either higher growth or lower costs.

Acquisitions seem to offer firms a shortcut to their strategic objectives, but the process has its costs. This chapter examines the four basic steps in an acquisition, starting with establishing an acquisition motive, continuing with the identification and valuation of a target firm, and following up with structuring and paying for the deal. The final, and often the most difficult, step is making the acquisition work after the deal is consummated.

### BACKGROUND ON ACQUISITIONS

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When we talk about acquisitions or takeovers, we are talking about a number of different types of transactions. These transactions can range from one firm merging with another firm to create a new firm to managers of a firm acquiring the firm from its stockholders and creating a private firm. This section begins by looking at the different forms taken by acquisitions, continues by providing an overview on the acquisition process, and concludes by examining the history of the acquisitions in the United States.

### Classifying Acquisitions

There are several ways in which a firm can be acquired by another firm. In a merger, the boards of directors of two firms agree to combine and seek stockholder approval for the combination. In most cases, at least 50 percent of the shareholders of the target and the bidding firm have to agree to the merger. The target firm ceases to exist and becomes part of the acquiring firm; Digital Equipment Corporation was absorbed by Compaq after it was acquired in 1997. In a consolidation, a new firm is created after the merger, and both the acquiring firm and target firm stockholders receive stock in this firm; Citigroup, for instance, was the firm created after the consolidation of Citicorp and Travelers' Group.

In a tender offer, one firm offers to buy the outstanding stock of the other firm at a specific price and communicates this offer in advertisements and mailings to stockholders. By doing so, it bypasses the incumbent management and board of directors of the target firm. Consequently, tender offers are used to carry out hostile takeovers. The acquired firm will continue to exist as long as there are minority stockholders who refuse the tender. From a practical standpoint, however, most tender offers eventually become mergers if the acquiring firm is successful in gaining control of the target firm.

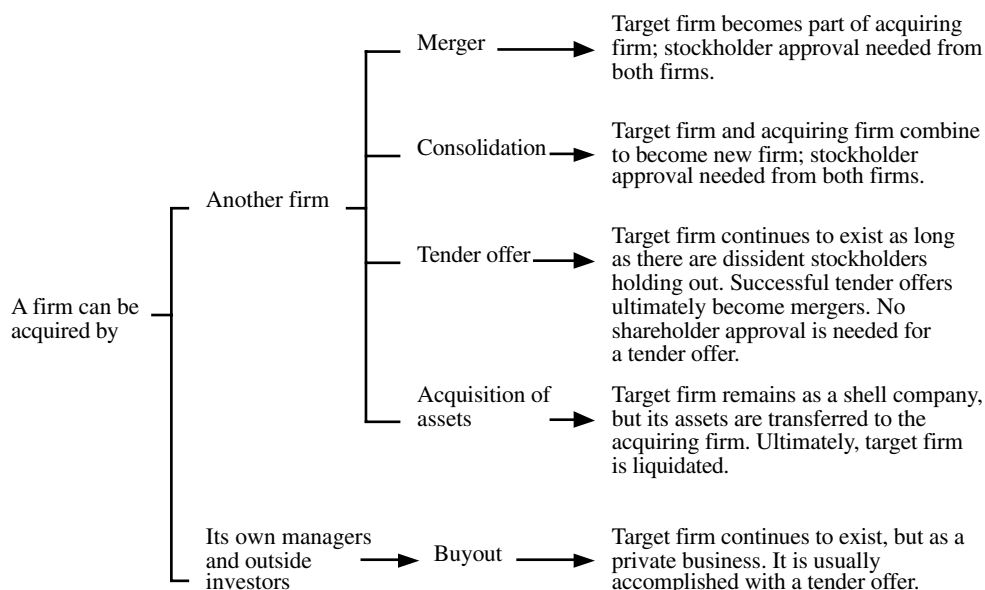
In a purchase of assets, one firm acquires the assets of another, though a formal vote by the shareholders of the firm being acquired is still needed.

There is a one final category of acquisitions that does not fit into any of the four described so far. Here, a firm is acquired by its own management or by a group of investors, usually with a tender offer. After this transaction, the acquired firm can cease to exist as a publicly traded firm and become a private business. These acquisitions are called management buyouts if managers are involved, and leveraged buyouts if the funds for the tender offer come predominantly from debt. This was the case, for instance, with the leveraged buyouts of firms such as RJR Nabisco in the 1980s.

Figure 25.1 summarizes the various transactions and the consequences for the target firm.

### Process of an Acquisition

Acquisitions can be friendly or hostile events. In a friendly acquisition, the managers of the target firm welcome the acquisition and in some cases seek it out. In a hostile acquisition, the target firm's management does not want to be acquired.



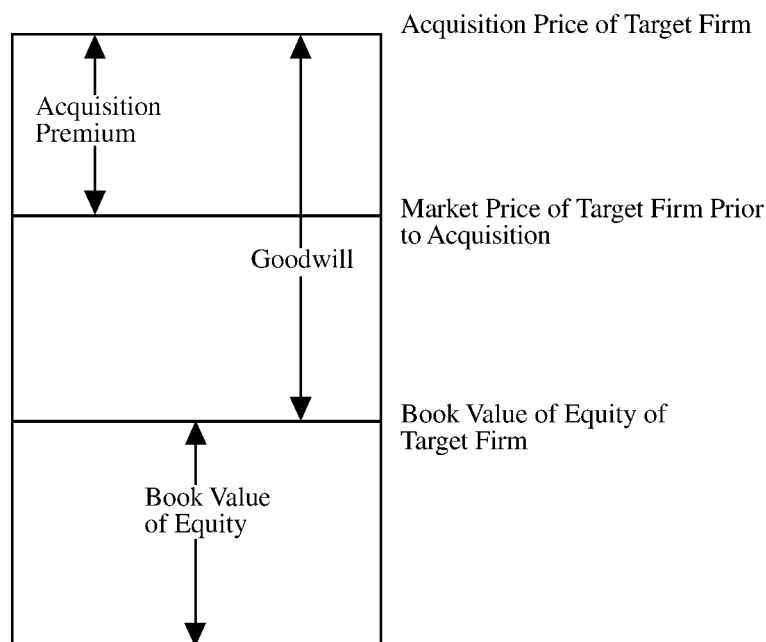
**FIGURE 25.1** Classification of Acquisitions

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The acquiring firm offers a price higher than the target firm's market price prior to the acquisition and invites stockholders in the target firm to tender their shares for the price.

In both friendly and hostile acquisitions, the difference between the acquisition price and the market price prior to the acquisition is called the acquisition premium. The acquisition price, in the context of mergers and consolidations, is the price that will be paid by the acquiring firm for each of the target firm's shares. This price is usually based on negotiations between the acquiring firm and the target firm's managers. In a tender offer, it is the price at which the acquiring firm receives enough shares to gain control of the target firm. This price may be higher than the initial price offered by the acquirer, if there are other firms bidding for the same target firm or if an insufficient number of stockholders tender at that initial price. For instance, in 1991 AT&T initially offered to buy NCR for \$80 per share, a premium of \$25 over the stock price at the time of the offer. AT&T ultimately paid \$110 per share to complete the acquisition.

There is one final comparison that can be made, and that is between the price paid on the acquisition and the accounting book value of the equity in the firm being acquired. Depending on how the acquisition is accounted for, this difference will be recorded as goodwill on the acquiring firm's books or not be recorded at all. Figure 25.2 presents the breakdown of the acquisition price into these component parts.



**FIGURE 25.2** Breaking Down the Acquisition Price

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## **EMPIRICAL EVIDENCE ON THE VALUE EFFECTS OF TAKEOVERS**

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Many researchers have studied the effects of takeovers on the value of both the target firm and the bidder firm. The evidence indicates that the stockholders of target firms are the clear winners in takeovers; they earn significant excess returns<sup>1</sup> not only around the announcement of the acquisitions, but also in the weeks leading up to it. Jensen and Ruback (1983) reviewed 13 studies that look at returns around takeover announcements and reported an average excess return of 30 percent to target stockholders in successful tender offers and 20 percent to target stockholders in successful mergers. Jarrell, Brickley, and Netter (1988) reviewed the results of 663 tender offers made between 1962 and 1985 and noted that premiums averaged 19 percent in the 1960s, 35 percent in the 1970s, and 30 percent between 1980 and 1985. Many of the studies report an increase in the stock price of the target firm prior to the takeover announcement, suggesting either a very perceptive financial market or leaked information about prospective deals.

Some attempts at takeovers fail, either because the bidding firm withdraws the offer or because the target firm fights it off. Bradley, Desai, and Kim (1983) analyzed the effects of takeover failures on target firm stockholders and found that, while the initial reaction to the announcement of the failure is negative, albeit statistically insignificant, a substantial number of target firms are taken over within 60 days of the first takeover failing, eventually earning significant excess returns (50 percent to 66 percent).

The effect of takeover announcements on bidder firm stock prices is not as clear-cut. Jensen and Ruback report excess returns of 4 percent for bidding firm stockholders around tender offers and no excess returns around mergers. Jarrell, Brickley, and Netter, in their examination of tender offers from 1962 to 1985, note a decline in excess returns to bidding firm stockholders from 4.4 percent in the 1960s to 2 percent in the 1970s to -1 percent in the 1980s. Other studies indicate that approximately half of all bidding firms earn negative excess returns around the announcement of takeovers, suggesting that shareholders are skeptical about the perceived value of the takeover in a significant number of cases.

When an attempt at a takeover fails, Bradley, Desai, and Kim (1983) report negative excess returns of 5 percent to bidding firm stockholders around the announcement of the failure. When the existence of a rival bidder is figured in, the studies indicate significant negative excess returns (of approximately 8 percent) for bidder firm stockholders who lose out to a rival bidder within 180 trading days of the announcement, and no excess returns when no rival bidder exists.

## **STEPS IN AN ACQUISITION**

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There are four basic and not necessarily sequential steps in acquiring a target firm. The first is the development of a rationale and a strategy for doing acquisitions, and what this strategy requires in terms of resources. The second is the

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<sup>1</sup>Excess returns represent returns over and above the returns you would have expected an investment to make, after adjusting for risk and market performance.



choice of a target for the acquisition and the valuation of the target firm, with premiums for the value of control and any synergy. The third is the determination of how much to pay on the acquisition, how best to raise funds to do it, and whether to use stock or cash. This decision has significant implications for the choice of accounting treatment for the acquisition. The final step in the acquisition, and perhaps the most challenging one, is to make the acquisition work after the deal is complete.

### Developing an Acquisition Strategy

Not all firms that make acquisitions have acquisition strategies, and not all firms that have acquisition strategies stick with them. This section considers a number of different motives for acquisitions and suggests that a coherent acquisition strategy has to be based on one or another of these motives.

**Acquire Undervalued Firms** Firms that are undervalued by financial markets can be targeted for acquisition by those who recognize this mispricing. The acquirer can then gain the difference between the value and the purchase price as surplus. For this strategy to work, however, three basic components need to come together:

1. *A capacity to find firms that trade at less than their true value.* This capacity would require either access to better information than is available to other investors in the market or a better analytical tools than those used by other market participants.
2. *Access to the funds that will be needed to complete the acquisition.* Knowing a firm is undervalued does not necessarily imply having capital easily available to carry out the acquisition. Access to capital depends on the size of the acquirer—large firms will have more access to capital markets and internal funds than smaller firms or individuals—and upon the acquirer's track record—a history of success at identifying and acquiring undervalued firms will make subsequent acquisitions easier.
3. *Skill in execution.* If the acquirer, in the process of the acquisition, drives the stock price up to and beyond the estimated value, there will be no value gained from the acquisition. To illustrate, assume that the estimated value for a firm is \$100 million and that the current market price is \$75 million. In acquiring this firm, the acquirer will have to pay a premium. If that premium exceeds 33 percent of the market price, the price exceeds the estimated value, and the acquisition will not create any value for the acquirer.

While the strategy of buying undervalued firms has a great deal of intuitive appeal, it is daunting, especially when acquiring publicly traded firms in reasonably efficient markets, where the premiums paid on market prices can very quickly eliminate the valuation surplus. The odds are better in less efficient markets or when acquiring private businesses.

**Diversify to Reduce Risk** A strong argument was made in Chapter 4 that diversification reduces an investor's exposure to firm-specific risk. In fact, the risk and return models used in this book have been built on the presumption that the firm-specific risk will be diversified away and hence will not be rewarded. By buy-

ing firms in other businesses and diversifying, acquiring firms' managers believe, they can reduce earnings volatility and risk, and increase potential value.

Although diversification has benefits, it is an open question whether it can be accomplished more efficiently by investors diversifying across traded stocks or by firms diversifying by acquiring other firms. If we compare the transaction costs associated with investor diversification with the costs and the premiums paid by firms doing the same, investors in most publicly traded firms can diversify far more cheaply than firms can.

There are two exceptions to this view. The first is in the case of a private firm, where the owner may have all or most of his or her wealth invested in the firm. Here, the argument for diversification becomes stronger, since the owner alone is exposed to all risk. This risk exposure may explain why many family-owned businesses in Asia, for instance, diversified into multiple businesses and became conglomerates. The second, albeit weaker, case is the closely held firm, whose incumbent managers may have the bulk of their wealth invested in the firm. By diversifying through acquisitions, they reduce their exposure to total risk, though other investors (who presumably are more diversified) may not share their enthusiasm.

**Create Operating or Financial Synergy** The third reason to explain the significant premiums paid in most acquisitions is synergy. Synergy is the potential additional value from combining two firms. It is probably the most widely used and misused rationale for mergers and acquisitions.

**Sources of Operating Synergy** Operating synergies are those synergies that allow firms to increase their operating income, increase growth, or do both. Operating synergies can be categorized into four types:

1. *Economies of scale* that may arise from the merger, allowing the combined firm to become more cost-efficient and profitable.
2. *Greater pricing power* from reduced competition and higher market share, which should result in higher margins and operating income.
3. *Combination of different functional strengths*, as would be the case when a firm with strong marketing skills acquires a firm with a good product line.
4. *Higher growth in new or existing markets*, arising from the combination of the two firms. This would be case when a U.S. consumer products firm acquires an emerging market firm, with an established distribution network and brand name recognition, and uses these strengths to increase sales of its products.

Operating synergies can affect margins and growth, and through these the value of the firms involved in the merger or acquisition.

**Sources of Financial Synergy** With financial synergies, the payoff can take the form of either higher cash flows or a lower cost of capital (discount rate). Included are the following:

- A combination of a firm with excess cash or *cash slack* (and limited project opportunities) and a firm with high-return projects (and limited cash) can yield a payoff in terms of higher value for the combined firm. The increase in value comes from the projects that were taken with the excess cash that otherwise would not

have been taken. This synergy is likely to show up most often when large firms acquire smaller firms, or when publicly traded firms acquire private businesses.

- **Debt capacity** can increase, because when two firms combine, their earnings and cash flows may become more stable and predictable. This, in turn, allows them to borrow more than they could have as individual entities, which creates a tax benefit for the combined firm. This tax benefit can either be shown as higher cash flows or take the form of a lower cost of capital for the combined firm.
- **Tax benefits** can arise either from the acquisition taking advantage of tax laws or from the use of net operating losses to shelter income. Thus, a profitable firm that acquires a money-losing firm may be able to use the net operating losses of the latter to reduce its tax burden. Alternatively, a firm that is able to increase its depreciation charges after an acquisition will save in taxes, and increase its value.

Clearly, there is potential for synergy in many mergers. The more important issues are whether that synergy can be valued and, if so, how to value it.

**Empirical Evidence on Synergy** Synergy is a stated motive in many mergers and acquisitions. Bhidé (1993) examined the motives behind 77 acquisitions in 1985 and 1986, and reported that operating synergy was the primary motive in one-third of these takeovers. A number of studies examine whether synergy exists and, if it does, how much it is worth. If synergy is perceived to exist in a takeover, the value of the combined firm should be greater than the sum of the values of the bidding and target firms, operating independently.

$$V(AB) > V(A) + V(B)$$

where  $V(AB)$  = Value of a firm created by combining A and B (synergy)

$V(A)$  = Value of firm A, operating independently

$V(B)$  = Value of firm B, operating independently

Studies of stock returns around merger announcements generally conclude that the value of the combined firm does increase in most takeovers and that the increase is significant. Bradley, Desai, and Kim (1988) examined a sample of 236 interfirm tender offers between 1963 and 1984 and reported that the combined value of the target and bidder firms increased 7.48 percent (\$117 million in 1984 dollars), on average, on the announcement of the merger. This result has to be interpreted with caution, however, since the increase in the value of the combined firm after a merger is also consistent with a number of other hypotheses explaining acquisitions, including undervaluation and a change in corporate control. It is thus a weak test of the synergy hypothesis.

The existence of synergy generally implies that the combined firm will become more profitable or grow at a faster rate after the merger than will the firms operating separately. A stronger test of synergy is to evaluate whether merged firms improve their performance (profitability and growth) *relative to their competitors*, after takeovers. On this test, as shown later in this chapter, many mergers fail.

**Take Over Poorly Managed Firms and Change Management** Some firms are not managed optimally, and other individuals often believe they can run them better than the current managers. Acquiring poorly managed firms and removing incumbent

management, or at least changing existing management policy or practices, should make these firms more valuable, allowing the acquirer to claim the increase in value. This value increase is often termed the value of control.

**Prerequisites for Success** While this corporate control story can be used to justify large premiums over the market price, the potential for its success rests on the following:

- The poor performance of the firm being acquired should be attributable to the incumbent management of the firm, rather than to market or industry factors that are not under management control.
- The acquisition has to be followed by a change in management practices, and the change has to increase value. Actions that enhance value increase cash flows from existing assets, increase expected growth rates, increase the length of the growth period, or reduce the cost of capital.
- The market price of the acquisition should reflect the status quo—the current management of the firm and their poor business practices. If the market price already has the control premium built into it, there is little potential for the acquirer to earn the premium.

In the past two decades, corporate control has been increasingly cited as a reason for hostile acquisitions.

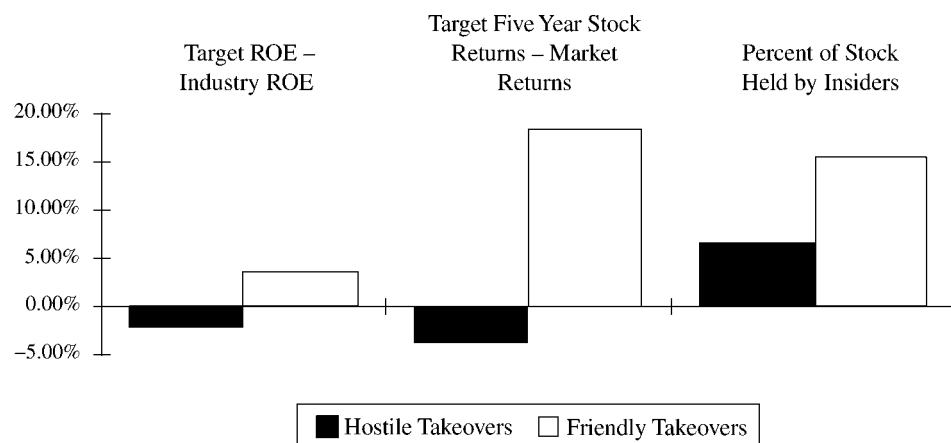
**Empirical Evidence on the Value of Control** The strongest support for the existence of a market for corporate control lies in the types of firms that are typically acquired in hostile takeovers. Research indicates that the typical target firm in a hostile takeover has the following characteristics:

- It has underperformed other stocks in its industry and the overall market, in terms of returns to its stockholders in the years preceding the takeover.
- It has been less profitable than firms in its industry in the years preceding the takeover.
- It has a much lower stock holding by insiders than do firms in its peer groups.

In a comparison of target firms in hostile and friendly takeovers, Bhidé illustrates their differences. His findings are summarized in Figure 25.3. As you can see, target firms in hostile takeovers have earned a 2.2 percent lower return on equity, on average, than other firms in their industry; they have earned returns for their stockholders that are 4 percent lower than the market; and only 6.5% of their stock is held by insiders.

There is also evidence that firms make significant changes in the way they operate after hostile takeovers. In his study, Bhidé examined the aftermaths of hostile takeovers and noted the following four changes:

1. Many of the hostile takeovers were followed by an increase in debt, which resulted in a downgrading of the debt. The debt was quickly reduced with proceeds from the sale of assets, however.
2. There was no significant change in the amount of capital investment in these firms.
3. Almost 60 percent of the takeovers were followed by significant divestitures, in



**FIGURE 25.3** Target Characteristics—Hostile versus Friendly Takeover

Source: Bhidé.

which half or more of the firm was divested. The overwhelming majority of the divestitures were units in business areas unrelated to the company's core business (i.e., they constituted reversal of corporate diversification done in earlier time periods).

4. There were significant management changes in 17 of the 19 hostile takeovers, with the replacement of the entire corporate management team in seven of the takeovers.

Thus, contrary to popular view,<sup>2</sup> most hostile takeovers are not followed by the acquirer stripping the assets of the target firm and leading it to ruin. Instead, target firms refocus on their core businesses and often improve their operating performance.

**Cater to Managerial Self-Interest** In most acquisitions, it is the managers of the acquiring firm who decide whether to carry out the acquisition and how much to pay for it, rather than the stockholders of the same firm. Given these circumstances, the motive for some acquisitions may not be stockholder wealth maximization, but rather managerial self-interest, manifested in any of the following motives for acquisitions:

- *Empire building.* Some top managers' interests seem to lie in making their firms the largest and most dominant firms in their industry or even in the entire market. This objective, rather than diversification, may explain the acquisition strategies of firms like Gulf & Western and ITT<sup>3</sup> in the 1960s and 1970s. Note that both firms had strong-willed CEOs (Charles Bludhorn in the case of Gulf

<sup>2</sup>Even if it is not the popular view, it is the populist view that has found credence in Hollywood, in movies like *Wall Street* and *Other People's Money*, and in books such as *Barbarians at the Gate*.

<sup>3</sup>In a delicious irony, ITT itself became the target of a hostile acquisition bid by Hilton Hotels and responded by shedding what it termed its noncore businesses (i.e., all the businesses it had acquired during its conglomerate period).

### SHOULD THERE BE AN EGO DISCOUNT?

If managerial self-interest and egos can cause firms to pay too much on acquisitions, should the values of firms run by strong-willed CEOs be discounted? In a sense, this discount is probably already applied if the firm's current return on capital and reinvestment rate reflect the failed acquisitions of the past, and we assume that the firm will continue to generate the same return on capital in the future.

By the same token, though, this is a good reason to revisit a firm valuation when there is a change at the top. If the new CEO does not seem to have the same desire to empire-build or overpay on acquisitions as the old one, the firm's future return on capital can be expected to be much higher than its past return on capital, and its value will rise.

& Western and Harold Geneen in the case of the ITT) during their acquisitive periods.

- *Managerial ego*. It is clear that some acquisitions, especially when there are multiple bidders for the same firm, become tests of machismo<sup>4</sup> for the managers involved. Neither side wants to lose the battle, even though winning might cost their stockholders billions of dollars.
- *Compensation and side benefits*. In some cases, mergers and acquisitions can result in the rewriting of management compensation contracts. If the potential private gains to the managers from the transaction are large, it might blind them to the costs created for their own stockholders.

In a 1981 paper titled "The Hubris Hypothesis," Roll suggested that we might be underestimating how much of the acquisition process and the prices paid can be explained by managerial pride and ego.

### Choosing a Target Firm and Valuing Control/Synergy

Once a firm has an acquisition motive, there are two key questions that need to be answered. The first relates to how to best identify a potential target firm for an acquisition, given the motives described in the previous section. The second is the more concrete question of how to value a target firm, again given the different motives that we have outlined in the last section.

**Choosing a Target Firm** Once a firm has identified the reason for its acquisition program, it has to find the appropriate target firm.

- If the motive for acquisitions is undervaluation, the target firm must be undervalued. How such a firm will be identified depends on the valuation approach

<sup>4</sup>An interesting question that is whether these bidding wars will become less likely as more women rise to become CEOs of firms. They might bring in a different perspective on what winning and losing in a merger means.

and model used. With relative valuation, an undervalued stock is one that trades at a multiple (of earnings, book value, or sales) well below that of the rest of the industry, after controlling for significant differences on fundamentals. Thus a bank with a price-to-book value ratio of 1.2 would be an undervalued bank if other banks have similar fundamentals (return on equity, growth, and risk) but trade at much higher price-to-book value ratios. In discounted cash flow valuation approaches, an undervalued stock is one that trades at a price well below the estimated discounted cash flow value.

- If the motive for acquisitions is diversification, the most likely target firms will be in businesses that are unrelated to and uncorrelated with the business of the acquiring firm. Thus, a cyclical firm should try to acquire countercyclical or at least noncyclical firms to get the fullest benefit from diversification.
- If the motive for acquisitions is operating synergy, the typical target firm will vary depending on the source of the synergy. For economies of scale, the target firm should be in the same business as the acquiring firm. Thus, the acquisition of Security Pacific by Bank of America was motivated by potential cost savings from economies of scale. For functional synergy, the target firm should be strongest in those functional areas where the acquiring firm is weak. For financial synergy, the target firm will be chosen to reflect the likely source of the synergy—a risky firm with limited or no standalone capacity for borrowing, if the motive is increased debt capacity, or a firm with significant net operating losses carried forward, if the motive is tax benefits.
- If the motive for the merger is control, the target firm will be a poorly managed firm in an industry where there is potential for excess returns. In addition, its stock holdings will be widely dispersed (making it easier to carry out the hostile acquisition) and the current market price will be based on the presumption that incumbent management will continue to run the firm.
- If the motive is managerial self-interest, the choice of a target firm will reflect managerial interests rather than economic reasons.

Table 25.1 summarizes the typical target firm, given the motive for the takeover.

**TABLE 25.1** Target Firm Characteristics Given Acquisition Motive

If Motive Is	Then the Target Firm
Undervaluation	Trades at a price below the estimated value.
Diversification	Is in a business different from the acquiring firm's business.
Operating synergy	Has the characteristics that create the operating synergy. <i>Cost savings:</i> In same business to create economies of scale. <i>Higher growth:</i> Has potential to open up new markets or expand existing ones.
Financial synergy	Has the characteristics that create financial synergy. <i>Tax savings:</i> Provides a tax benefit to acquirer. <i>Debt capacity:</i> Is unable to borrow money or pay high interest rates. <i>Cash slack:</i> Has great projects/no funds.
Control	Is a badly managed firm whose stock has underperformed the market.
Manager's interests	Has characteristics that best meet CEO's ego and power needs.

Source: *Corporate Finance: Theory and Practice*, Second Edition, by Aswath Damodaran, copyright © 2001 by John Wiley & Sons, Inc. This material is used by permission of John Wiley & Sons, Inc.

There are two final points worth making here before moving on to valuation. The first is that firms often choose a target firm and a motive for the acquisition simultaneously, rather than sequentially. That does not change any of the analysis in these sections. The other point is that firms often have more than one motive in an acquisition—say, control and synergy. If this is the case, the search for a target firm should be guided by the dominant motive.

**Valuing the Target Firm** The valuation of an acquisition is not fundamentally different from the valuation of any firm, although the existence of control and synergy premiums introduces some complexity into the valuation process. Given the interrelationship between synergy and control, the safest way to value a target firm is in steps, starting with a status quo valuation of the firm, and following up with a value for control and a value for synergy.

**Status Quo Valuation** The valuation of the target firm starts by estimating the firm value with existing investing, financing, and dividend policies. This valuation, termed the status quo valuation, provides a base from which control and synergy premiums can be estimated. All of the basic principles presented in the earlier chapters on valuation continue to apply here. In particular, the value of the firm is a function of its cash flows from existing assets, the expected growth in these cash flows during a high-growth period, the length of the high-growth period, and the firm's cost of capital.

#### ILLUSTRATION 25.1: A Status Quo Valuation of Digital Equipment Corporation

In 1997, Digital Equipment, a leading manufacturer of mainframe computers, was the target of an acquisition bid by Compaq, which was at that time the leading personal computer manufacturer in the world. The acquisition was partly motivated by the belief that Digital was a poorly managed firm and that Compaq would be a much better manager of Digital's assets. In addition, Compaq expected synergies in the form of both cost savings (from economies of scale) and higher growth (from Compaq selling to Digital's customers).

To analyze the acquisition, we begin with a status quo valuation of Digital. At the time of the acquisition, Digital had the following characteristics:

- Digital had earnings before interest and taxes of \$391.38 million in 1997, which translated into a pretax operating margin of 3% on revenues of \$13,046 million and an after-tax return on capital of 8.51%; the firm had a tax rate of 36%.
- Based on its beta of 1.15, an after-tax cost of borrowing of 5%, and a debt ratio of approximately 10%, the cost of capital for Digital in 1997 was 11.59%. (The Treasury bond rate at the time of the analysis was 6% and we used a risk premium of 5.5%.)

$$\text{Cost of equity} = 6\% + 1.15(5.5\%) = 12.33\%$$

$$\text{Cost of capital} = 12.33\%(.9) + 5\%(.1) = 11.59\%$$

- Digital had capital expenditures of \$475 million<sup>5</sup> and depreciation of \$461 million, and working capital is 15% of revenues.
- Operating income, net capital expenditures, and revenues were expected to grow 6% a year for the next five years.
- After year 5, operating income and revenues were expected to grow 5% a year forever. After year 5, capital expenditures were expected to be 110% of depreciation, with depreciation

<sup>5</sup>The reinvestment rate is therefore low when we look at net capital expenditures. However, the large working capital investment pushes it up.



growing at 5%. The debt ratio remained at 10%, but the after-tax cost of debt dropped to 4% and the beta dropped to 1.

The value of Digital, based on these inputs, was estimated to be \$2,110.41 million.

Year	EBIT(1 - t)	Net Cap Ex	Change in WC	FCFF <sup>6</sup>	Terminal Value	PV
1	\$265.51	\$14.84	\$117.41	\$133.26		\$ 119.42
2	\$281.44	\$15.73	\$124.46	\$141.25		\$ 113.43
3	\$298.33	\$16.67	\$131.93	\$149.73		\$ 107.75
4	\$316.23	\$17.67	\$139.84	\$158.71		\$ 102.35
5	\$335.20	\$18.74	\$148.23	\$168.24	\$2,717.35	\$1,667.47
Terminal year	\$351.96	\$64.78	\$130.94	\$156.25		
Firm value						\$2,110.41

Note that the terminal value is computed using the free cash flow to the firm in year 6 and the new cost of capital after year 5:

$$\text{New cost of equity after year 5} = 6\% + 1.00(5.5\%) = 11.5\%$$

$$\text{New cost of capital after year 5} = 11.50\%(.9) + 4\%(.1) = 10.75\%$$

$$\text{Terminal value} = \$156.25 / (.1075 - .05) = \$2,717.35$$

**Value of Corporate Control** Many hostile takeovers are justified on the basis of the existence of a market for corporate control. Investors and firms are willing to pay large premiums over the market price to control the management of firms, especially those that they perceive to be poorly run. This section explores the determinants of the value of corporate control and attempts to value it in the context of an acquisition.

**Determinants of the Value of Corporate Control** The value of wresting control of a firm from incumbent management is inversely proportional to the perceived quality of that management and its capacity to maximize firm value. In general, the value of control will be much greater for a poorly managed firm that operates at below optimum capacity than for a well-managed firm.

The value of controlling a firm comes from changes made to existing management policy that can increase the firm value. Assets can be acquired or liquidated, the financing mix can be changed and the dividend policy reevaluated, and the firm can be restructured to maximize value. If we can identify the changes that we would make to the target firm, we can value control. The value of control can then be written as:

$$\begin{aligned} \text{Value of control} &= \text{Value of firm optimally managed} \\ &\quad - \text{Value of firm with current management} \end{aligned}$$

The value of control is negligible for firms that are operating at or close to their optimal value, since a restructuring will yield little additional value. It can be substantial for firms operating at well below optimal, since a restructuring can lead to a significant increase in value.

<sup>6</sup>To estimate FCFF in year 1,

$$\begin{aligned} \text{FCFF}_1 &= \text{EBIT}(1 - t)(1 + g) - \text{Net cap ex}(1 + g) - \text{Revenue}(g)/(\text{WC as \% of revenues}) \\ &= \$391.38(1 - .36)(1.06) - (475 - 461)(1.06) - \$13,046(.06)(.15) = \$133.26 \text{ million} \end{aligned}$$

**ILLUSTRATION 25.2: The Value of Control at Digital**

We said earlier that one of the reasons Digital was targeted by Compaq was that it was viewed as poorly managed. Assuming that Compaq was correct in its perceptions, we valued control at Digital by making the following assumptions:

- Digital will raise its debt ratio to its optimal of 20%. The beta will increase, but the cost of capital will decrease.  
     New beta = 1.25 (Unlevered beta = 1.07; Debt/equity ratio = 25%)  
     Cost of equity =  $6\% + 1.25(5.5\%) = 12.88\%$   
     New after-tax cost of debt = 5.25%; the firm is riskier, and its default risk will increase  
     Cost of capital =  $12.88\%(0.8) + 5.25\%(0.2) = 11.35\%$
- Digital will raise its return on capital to 11.35%, which is its cost of capital. (Pretax operating margin will go up to 4%, which is close to the industry average.)
- The reinvestment rate remains unchanged, but the increase in the return on capital will increase the expected growth rate in the next five years to 10%.
- After year 5, the beta will drop to 1, and the after-tax cost of debt will decline to 4%, as in the previous example. The cost of capital will drop to 10% as a consequence.

The effect of these assumptions on the cash flows and present values is listed in the following table:

Year	EBIT(1 - t)	Net Cap Ex	Change in WC	FCFF	Terminal Value	PV
1	\$367.38	\$15.40	\$195.69	\$156.29		\$ 140.36
2	\$404.11	\$16.94	\$215.26	\$171.91		\$ 138.65
3	\$444.52	\$18.63	\$236.78	\$189.11		\$ 136.97
4	\$488.98	\$20.50	\$260.46	\$208.02		\$ 135.31
5	\$537.87	\$22.55	\$286.51	\$228.82	\$6,584.62	\$3,980.29
Terminal year	\$564.77	\$77.96	\$157.58	\$329.23		
Firm value						\$4,531.59

The lower cost of capital and higher growth rate increase the firm value from the status quo valuation of \$2,110.41 million to \$4,531.59 million. We can then estimate the value of control:

Value of firm (optimally managed)	\$4,531.59 million
Value of firm (status quo)	\$2,110.41 million
Value of control	\$2,421.18 million

**Valuing Operating Synergy** There is a potential for operating synergy, in one form or the other, in many takeovers. Some disagreement exists, however, over whether synergy can be valued and, if so, what that value should be. One school of thought argues that synergy is too nebulous to be valued and that any systematic attempt to do so requires so many assumptions that it is pointless. If this is true, a firm should not be willing to pay large premiums for synergy it cannot attach a value to.

While valuing synergy requires us to make assumptions about future cash flows and growth, the lack of precision in the process does not mean we cannot obtain an unbiased estimate of value. Thus we maintain that synergy can be valued by answering two fundamental questions:

1. *What form is the synergy expected to take?* Will it reduce costs as a percentage of sales and increase profit margins (e.g., when there are economies of scale)?

Will it increase future growth (e.g., when there is increased market power) or the length of the growth period? Synergy, to have an effect on value, has to influence one of the four inputs into the valuation process—cash flows from existing assets, higher expected growth rates (market power, higher growth potential), a longer growth period (from increased competitive advantages), or a lower cost of capital (higher debt capacity).

2. *When will the synergy start affecting cash flows?* Synergies can sometimes show up instantaneously, but they are more likely to show up over time. Since the value of synergy is the present value of the cash flows created by it, the longer it takes for it to show up, the smaller its value.

Once we answer these questions, we can estimate the value of synergy using an extension of discounted cash flow techniques. First, we value the firms involved in the merger independently, by discounting expected cash flows to each firm at the weighted average cost of capital for that firm. Second, we estimate the value of the combined firm, with no synergy, by adding the values obtained for each firm in the first step. Third, we build in the effects of synergy into expected growth rates and cash flows, and we value the combined firm with synergy. The difference between the value of the combined firm with synergy and the value of the combined firm without synergy provides a value for synergy.

Figure 25.4 summarizes the effects of synergy and control in valuing a target firm for an acquisition. Notice the difference between Figure 25.2, which is based on the market price of the target firm before and after the acquisition, and Figure 25.4, where

Component	Valuation Guidelines	Should You Pay?
Synergy	Value the combined firm with synergy built in. This value may include: <ul style="list-style-type: none"> <li>• A higher growth rate in revenues: <i>growth synergy</i>.</li> <li>• Higher margins because of <i>economies of scale</i>.</li> <li>• Lower taxes because of tax benefits: <i>tax synergy</i>.</li> <li>• Lower cost of debt: <i>financing synergy</i>.</li> <li>• Higher debt ratio because of lower risk: <i>debt capacity</i>.</li> </ul> Subtract the value of the target firm (with control premium) + value of the bidding firm (preacquisition). This is the value of synergy.	Which firm is indispensable for synergy? <ul style="list-style-type: none"> <li>• If it is the target, you should be willing to pay up to the value of synergy.</li> <li>• If it is the bidder, you should not.</li> </ul>
Control Premium	Value the company as if optimally managed. This will usually mean altering investment, financing, and dividend policy: <p><i>Investment policy:</i> Earn higher returns on projects and divest unproductive projects.</p> <p><i>Financing policy:</i> Move to a better financing structure (e.g., optimal capital structure).</p> <p><i>Dividend policy:</i> Return cash for which the firm has no need.</p> Practically, <ul style="list-style-type: none"> <li>• Look at industry averages as optimal.</li> <li>• Do a full-fledged corporate financial analysis to compute optimal debt ratio.</li> </ul>	If motive is control or in a standalone valuation, this is the maximum you should pay.
Status Quo Valuation	Value the company as is, with existing inputs for investment, financing, and dividend policy.	If motive is undervaluation, the status quo value is the maximum you should pay.

**FIGURE 25.4** Valuing an Acquisition

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we are looking at the value of the target firm with and without the premiums for control and synergy. A fair-value acquisition, which would leave the acquiring firm neither better nor worse off, would require that the total price (in Figure 25.2) be equal to the consolidated value (in Figure 25.4) with the synergy and control benefits built in.

### ILLUSTRATION 25.3: Valuing Synergy: Compaq and Digital

Returning to the Compaq/Digital merger, note that synergy was one of the stated reasons for the acquisition. To value this synergy, we needed to first value Compaq as a standalone firm. To do this, the following assumptions were made:

- Compaq had earnings before interest and taxes of \$2,987 million on revenues of \$25,484 million. The tax rate for the firm is 36%.
- The firm had capital expenditures of \$729 million and depreciation of \$545 million in the most recent year; working capital is 15% of revenues.
- The firm had a debt-to-capital ratio of 10%, a beta of 1.25, and an after-tax cost of debt of 5%.
- The operating income, revenues, and net capital expenditures are all expected to grow 10% a year for the next five years.
- After year 5, operating income and revenues are expected to grow 5% a year forever, and capital expenditures are expected to be 110% of depreciation. In addition, the firm will raise its debt ratio to 20%, the after-tax cost of debt will drop to 4%, and the beta will drop to 1.00.

Based on these inputs, the value of the firm can be estimated as follows:

Year	$EBIT(1 - t)$	Net Cap Ex	Change in WC	FCFF	Terminal Value	PV
1	\$2,102.85	\$202.40	\$382.26	\$1,518.19		\$ 1,354.47
2	\$2,313.13	\$222.64	\$420.49	\$1,670.01		\$ 1,329.24
3	\$2,544.45	\$244.90	\$462.53	\$1,837.01		\$ 1,304.49
4	\$2,798.89	\$269.39	\$508.79	\$2,020.71		\$ 1,280.19
5	\$3,078.78	\$296.33	\$559.67	\$2,222.78	\$56,654.81	\$33,278.53
Terminal year	\$3,232.72	\$ 92.16	\$307.82	\$2,832.74		
Firm value						\$38,546.91

The value of Compaq is \$38.547 billion.

The value of the combined firm (Compaq and Digital), with no synergy, should be the sum of the values of the firms valued independently. To avoid double counting the value of control, we add the value of Digital, optimally managed, that was estimated in Illustration 25.2, to the value of Compaq to arrive at the value of the combined firm:

Value of Digital (optimally managed)	\$4,531.59 million
Value of Compaq (status quo)	\$38,546.91 million
Value of combined firm	\$43,078.50 million

This would be the value of the combined firm in the absence of synergy.

To value the synergy, we made the following assumptions about the way in which synergy would affect cash flows and discount rates at the combined firm:

- The combined firm will have some economies of scale, allowing it to increase its current after-tax operating margin slightly. The annual dollar savings will be approximately \$100 million. This will translate into a slightly higher pretax operating margin:

$$\begin{aligned} \text{Current operating margin} &= (EBIT_{\text{Compaq}} + EBIT_{\text{Digital}}) / (\text{Sales}_{\text{Compaq}} + \text{Sales}_{\text{Digital}}) \\ &= (2,987 + 522) / (25,484 + 13,046) = 9.11\% \end{aligned}$$

$$\text{New operating margin} = (2,987 + 522 + 100) / (25,484 + 13,046) = 9.36\%$$

- The combined firm will also have a slightly higher growth rate of 10.50% in revenues, operating income, and net cap ex over the next five years because of operating synergies.
- The beta of the combined firm was computed in three steps. We first estimated the unlevered betas for Digital and Compaq:

$$\text{Digital's unlevered beta} = 1.25/[1 + (1 - .36)(.25)] = 1.07$$

$$\text{Compaq's unlevered beta} = 1.25/[1 + (1 - .36)(.10/.90)] = 1.17$$

We then weighted these unlevered betas by the values of these firms to estimate an unlevered beta for the combined firm; Digital has a firm value of \$4.5 billion, and Compaq's firm value was \$38.6 billion.<sup>7</sup>

$$\text{Unlevered beta for combined firm} = 1.07 \times (4.5/43.1) + 1.17(38.6/43.1) = 1.16$$

We then used the debt-to-equity ratio for the combined firm to estimate a new levered beta and cost of capital for the firm. The debt-to-equity ratio for the combined firm, estimated by cumulating the outstanding debt and market value of equity at the two firms, is 13.64%:

$$\text{New levered beta} = 1.16[1 + (1 - 0.36)(.1364)] = 1.26$$

$$\text{Cost of capital} = 12.93\%(.88) + 5\%(.12) = 11.98\%$$

Based on these assumptions, the cash flows and value of the combined firm, with synergy, can be estimated:

Year	EBIT(1 - t)	Net Cap Ex	Change in WC	FCFF	Terminal Value	PV
1	\$2,552.28	\$218.79	\$606.85	\$1,726.65		\$ 1,541.95
2	\$2,820.27	\$241.76	\$670.57	\$1,907.95		\$ 1,521.59
3	\$3,116.40	\$267.15	\$740.98	\$2,108.28		\$ 1,501.50
4	\$3,443.63	\$295.20	\$818.78	\$2,329.65		\$ 1,481.68
5	\$3,805.21	\$326.19	\$904.75	\$2,574.26	\$66,907.52	\$39,463.87
Terminal year	\$3,995.47	\$174.02	\$476.07	\$3,345.38		
Firm value						\$45,510.58

The value of the combined firm, with synergy, is \$45,510.58 million. This can be compared to the value of the combined firm without synergy of \$43,078.50 million, and the difference is the value of the synergy in the merger.

Value of combined firm (with synergy)	\$45,510.58 million
Value of combined firm (with no synergy)	\$43,078.50 million
Value of synergy	\$2,422.08 million

This valuation is based on the presumption that synergy will be created instantaneously. In reality, it can take years before the firms are able to see the benefits of synergy. A simple way to account for the delay is to consider the present value of synergy. Thus, if it will take Compaq and Digital three years to create the synergy, the present value of synergy can be estimated, using the combined firm's cost of capital as the discount rate:

$$\text{Present value of synergy} = \$2,422 \text{ million}/(1.1198)^3 = \$1,724.86 \text{ million}$$



**synergy.xls:** This spreadsheet allows you to estimate the approximate value of synergy in a merger or acquisition.

<sup>7</sup>The values that we used were the values that we estimated for the two firms.

**Valuing Financial Synergy** Synergy can also be created from purely financial factors. We will consider three legitimate sources of financial synergy: better use for excess cash or cash slack, a greater tax benefit from accumulated losses or tax deductions, and an increase in debt capacity and therefore firm value. The discussion begins, however, with diversification, which though a widely used rationale for mergers is not a source of increased value by itself.

**Diversification** A takeover motivated only by diversification considerations has no effect on the combined value of the two firms involved in the takeover when the two firms are both publicly traded and when the investors in the firms can diversify on their own. Consider the following example. Dalton Motors, which is an automobile parts manufacturing firm in a cyclical business, plans to acquire Lube & Auto, which is an automobile service firm whose business is noncyclical and high-growth, solely for the diversification benefit. The characteristics of the two firms are as follows:

	<i>Lube &amp; Auto</i>	<i>Dalton Motors</i>
Current free cash flow to the firm	\$100 million	\$200 million
Expected growth rate—next five years	20%	10%
Expected growth rate—after year 5	6%	6%
Debt/(Debt + Equity)	30%	30%
After-tax cost of debt	6%	5.40%
Beta for equity—next five years	1.20	1.00
Beta for equity—after year 5	1.00	1.00

The treasury bond rate is 7 percent, and the market premium is 5.5 percent. The calculations for the weighted average cost of capital and the value of the firms are shown in Table 25.2:

**TABLE 25.2** Value of Lube & Auto, Dalton Motors, and Combined Firm

	<b>Lube &amp; Auto</b>	<b>Dalton Motors</b>	<b>Combined Firm</b>
Debt (%)	30%	30%	30%
Cost of debt	6.00%	5.40%	5.65%
Equity (%)	70%	70%	70%
Cost of equity	13.60%	12.50%	12.95%
Cost of capital—year 1	11.32%	10.37%	10.76%
Cost of capital—year 2	11.32%	10.37%	10.76%
Cost of capital—year 3	11.32%	10.37%	10.77%
Cost of capital—year 4	11.32%	10.37%	10.77%
Cost of capital—year 5	11.32%	10.37%	10.77%
Cost of capital after	10.55%	10.37%	10.45%
FCFF in year 1	\$ 120.00	\$ 220.00	\$ 340.00
FCFF in year 2	\$ 144.00	\$ 242.00	\$ 386.00
FCFF in year 3	\$ 172.80	\$ 266.20	\$ 439.00
FCFF in year 4	\$ 207.36	\$ 292.82	\$ 500.18
FCFF in year 5	\$ 248.83	\$ 322.10	\$ 570.93
Terminal value	\$5,796.97	\$7,813.00	\$13,609.97
Present value	\$4,020.91	\$5,760.47	\$ 9,781.38

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The cost of equity and debt for the combined firm is obtained by taking the weighted average of the individual firm's costs of equity (debt); the weights are based on the relative market values of equity (debt) of the two firms. Since these relative market values change over time, the costs of equity and debt for the combined firm also change over time. The value of the combined firm is exactly the same as the sum of the values of the independent firms, indicating that there is no value gain from diversification.

This equality does not imply, however, that the shareholders in the bidding and target firms are indifferent about such takeovers, since the bidding firm pays a significant premium over the market price. To the extent that these firms were correctly valued before the merger (market value of Lube & Auto = \$4,020.91; market value of Dalton Motors = \$5,760.47), the payment of a premium over the market price will transfer wealth from the bidding firm to the target firm.

The absence of added value from this merger may seem puzzling, given the fact that the two firms are in unrelated businesses and thus should gain some diversification benefit. In fact, if the earnings of the two firms are not highly correlated, the variance in earnings of the combined firm should be significantly lower than the variance in earnings of the individual firms operating independently. This reduction in earnings variance does not affect value, however, because it is firm-specific risk, which is assumed to have no effect on expected returns. (The betas, which are measures of market risk, are always value-weighted averages of the betas of the two merging firms.) But what about the impact of reduced variance on debt capacity? Firms with lower variability in earnings can increase debt capacity and thus value. This can be a real benefit of conglomerate mergers, and will be considered separately later in this section.

**Cash Slack** Managers may reject profitable investment opportunities if they have to raise new capital to finance them. Myers and Majluf (1984) suggest that since managers have more information than investors about prospective projects, new stock may have to be issued at less than true value to finance these projects, leading to the rejection of good projects and to capital rationing for some firms. It may therefore make sense for a company with excess cash and no investment opportunities to take over a cash-poor firm with good investment opportunities, or vice versa. The additional value of combining these two firms is the present value of the projects that would not have been taken if they had stayed apart, but can now be taken because of the availability of cash.

Cash slack can be a potent rationale for publicly traded firms that have ready access to capital and want to acquire small, private firms that have capital constraints. It may also explain why acquisition strategies concentrating on buying smaller, private firms have worked fairly well in practice. Blockbuster Inc. (video rental), Browning and Ferris (waste disposal), and Service Merchandise (funeral homes) are good examples.

**Tax Benefits** Several possible tax benefits accrue from takeovers. If one of the firms has tax deductions that it cannot use because it is losing money, whereas the other firm has income on which it pays significant taxes, combining the two firms can result in tax benefits that can be shared by the two firms. The value of this synergy is the present value of the tax savings that result from this merger. In addition, the assets of the firm being taken over can be written up to reflect new market values in some forms of mergers, leading to higher tax savings from depreciation in future years.

**ILLUSTRATION 25.4: Tax Benefits of Writing Up Asset Values after Takeover: Congoleum Inc.**

One of the earliest leveraged buyouts (LBOs) occurred in 1979 and involved Congoleum Inc., a diversified firm in shipbuilding, flooring, and automotive accessories. Congoleum's own management bought out the firm. The favorable treatment that would be accorded the firm's assets by tax authorities was a major reason behind the takeover. After the takeover—estimated to cost approximately \$400 million—the firm was allowed to write up its assets to reflect their new market values and to claim depreciation on these new values. The estimated change in depreciation and the present value effect of this depreciation tax benefit, based on a tax rate of 48%, discounted at the firm's cost of capital of 14.5%, are shown in the following table:

<i>Year</i>	<i>Depreciation Before</i>	<i>Depreciation After</i>	<i>Change in Depreciation</i>	<i>Tax Savings</i>	<i>Present Value</i>
1980	\$ 8.00	\$ 35.51	\$ 27.51	\$13.20	\$11.53
1981	\$ 8.80	\$ 36.26	\$ 27.46	\$13.18	\$10.05
1982	\$ 9.68	\$ 37.07	\$ 27.39	\$13.15	\$ 8.76
1983	\$ 10.65	\$ 37.95	\$ 27.30	\$13.10	\$ 7.62
1984	\$ 11.71	\$ 21.23	\$ 9.52	\$ 4.57	\$ 2.32
1985	\$ 12.65	\$ 17.50	\$ 4.85	\$ 2.33	\$ 1.03
1986	\$ 13.66	\$ 16.00	\$ 2.34	\$ 1.12	\$ 0.43
1987	\$ 14.75	\$ 14.75	\$ 0.00	\$ 0.00	\$ 0.00
1988	\$ 15.94	\$ 15.94	\$ 0.00	\$ 0.00	\$ 0.00
1989	\$ 17.21	\$ 17.21	\$ 0.00	\$ 0.00	\$ 0.00
1980–1989	\$123.05	\$249.42	\$126.37	\$60.66	\$41.76

Note that the increase in depreciation occurs in the first seven years, primarily as a consequence of higher asset values and accelerated depreciation. After year 7, however, the old and new depreciation schedules converge. The present value of the additional tax benefits from the higher depreciation, based amounted to \$41.76 million, about 10% of the overall price paid on the transaction.

In recent years, the tax code covering asset revaluations has been significantly tightened. While acquiring firms can still reassess the value of the acquired firm's assets, they can do so only up to fair value.

**Debt Capacity** If the cash flows of the acquiring and target firms are less than perfectly correlated, the cash flows of the combined firm will be less variable than the cash flows of the individual firms. This decrease in variability can result in an increase in debt capacity and in the value of the firm. The increase in value, however, has to be weighed against the immediate transfer of wealth to existing bondholders in both firms from the stockholders of both the acquiring and target firms. The bondholders in the premerger firms find themselves lending to a safer firm after the takeover. The interest rates they are receiving are based on the riskier premerger firms, however. If the interest rates are not renegotiated, the bonds will increase in price, increasing the bondholders' wealth at the expense of the stockholders.

There are several models available for analyzing the benefits of higher debt ratios as a consequence of takeovers. Lewellen analyzes the benefits in terms of reduced default risk, since the combined firm has less variable cash flows than do the individual firms. He provides a rationale for an increase in the value of debt after the merger, but at the expense of equity investors. It is not clear, therefore, that the value of the firm will increase after the merger. Stapleton evaluates the benefits of



higher debt capacity after mergers using option pricing. He shows that the effect of a merger on debt capacity is always positive, even when the earnings of the two firms are perfectly correlated. The debt capacity benefits increase as the earnings of the two firms become less correlated and as investors become more risk averse.

Consider again the merger of Lube & Auto and Dalton Motors. The value of the combined firm was the same as the sum of the values of the independent firms. The fact that the two firms were in different business lines reduced the variance in earnings, but value was not affected, because the capital structure of the firm remained unchanged after the merger and the costs of equity and debt were the weighted averages of the individual firms' costs.

The reduction in variance in earnings can increase debt capacity, which can increase value. If, after the merger of these two firms, the debt capacity for the combined firm were increased to 40 percent from 30 percent (leading to an increase in the beta to 1.21 and no change in the cost of debt), the value of the combined firm after the takeover can be estimated as shown in Table 25.3. As a consequence of the added debt, the value of the firm will increase from \$9,781.38 million to \$11,429.35 million.

**Increase Growth and Price-Earnings Multiples** Some acquisitions are motivated by the desire to increase growth and price-cash flow (or price-earnings) multiples. Though the benefits of higher growth are undeniable, the price paid for that growth will determine whether such acquisitions make sense. If the price paid for the growth exceeds the fair market value, the stock price of the acquiring firm will decline even though the expected future growth in its cash flows may increase as a consequence of the takeover.

This can be seen in the previous example. Dalton Motors, with projected

**TABLE 25.3** Value of Debt Capacity—Lube & Auto and Dalton Motors

	Lube & Auto	Dalton Motors	Combined Firm— No New Debt	Combined Firm— Added Debt
Debt (%)	30%	30%	30%	40%
Cost of debt	6.00%	5.40%	5.65%	5.65%
Equity (%)	70%	70%	70%	60%
Cost of equity	13.60%	12.50%	12.95%	13.65%
Cost of capital—year 1	11.32%	10.37%	10.76%	10.45%
Cost of capital—year 2	11.32%	10.37%	10.76%	10.45%
Cost of capital—year 3	11.32%	10.37%	10.77%	10.45%
Cost of capital—year 4	11.32%	10.37%	10.77%	10.45%
Cost of capital—year 5	11.32%	10.37%	10.77%	10.45%
Cost of capital after	10.55%	10.37%	10.45%	9.76%
FCFF in year 1	\$ 120.00	\$ 220.00	\$ 340.00	\$ 340.00
FCFF in year 2	\$ 144.00	\$ 242.00	\$ 386.00	\$ 386.00
FCFF in year 3	\$ 172.80	\$ 266.20	\$ 439.00	\$ 439.00
FCFF in year 4	\$ 207.36	\$ 292.82	\$ 500.18	\$ 500.18
FCFF in year 5	\$ 248.83	\$ 322.10	\$ 570.93	\$ 570.93
Terminal value	\$5,796.97	\$7,813.00	\$13,609.97	\$16,101.22
Present value	\$4,020.91	\$5,760.47	\$ 9,781.38	\$11,429.35

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**HOW OFTEN DOES SYNERGY ACTUALLY SHOW UP?**

McKinsey & Co. examined 58 acquisition programs between 1972 and 1983 for evidence on two questions: (1) Did the return on the amount invested in the acquisitions exceed the cost of capital? (2) Did the acquisitions help the parent companies outperform the competition? They concluded that 28 of the 58 programs failed both tests, and six failed at least one test. In a follow-up study of 115 mergers in the United Kingdom and the United States in the 1990s, McKinsey concluded that 60 percent of the transactions earned returns on capital less than the cost of capital and that only 23 percent earned excess returns.<sup>8</sup> In 1999, KPMG examined 700 of the most expensive deals between 1996 and 1998 and concluded that only 17 percent created value for the combined firm, 30 percent were value-neutral, and 53 percent destroyed value.<sup>9</sup>

A study looked at the eight largest bank mergers in 1995<sup>10</sup> and concluded that only two (Chase/Chemical, First Chicago/NBD) subsequently outperformed the bank-stock index. The largest, Wells Fargo's acquisition of First Interstate, was a significant failure. Sirower (1996) takes a detailed look at the promises and failures of synergy and draws the gloomy conclusion that synergy is often promised but seldom delivered.

The most damaging piece of evidence on the outcome of acquisitions is the large number of acquisitions that are reversed within fairly short time periods. Mitchell and Lehn note that 20.2 percent of the acquisitions made between 1982 and 1986 were divested by 1988. Studies that have tracked acquisitions for longer time periods (10 years or more) have found the divestiture rate of acquisitions rises to almost 50 percent, suggesting that few firms enjoy the promised benefits from acquisitions. In another study, Kaplan and Weisbach (1992) found that 44 percent of the mergers they studied were reversed, largely because the acquirer paid too much or because the operations of the two firms did not mesh.

growth in cash flows of 10 percent, acquires Lube & Auto, which is expected to grow 20 percent. The fair market value for Lube & Auto is \$4,020.91. If Dalton Motors pays more than this amount to acquire Lube & Auto, its stock price will decline, even though the combined firm will grow at a faster rate than Dalton Motors alone. Similarly, Dalton Motors, which sells at a lower multiple of cash flow than Lube & Auto, will increase its value as a multiple of cash flow after the acquisition, but the effect on the stockholders in the firm will still be determined by whether the price paid on the acquisition exceeds the fair value.

<sup>8</sup>This study was referenced in an article titled "Merger Mayhem" that appeared in *Barron's* on April 20, 1998.

<sup>9</sup>KPMG measured the success at creating value by comparing the postdeal stock price performance of the combined firm to the performance of the relevant industry segment for a year after the deal was completed.

<sup>10</sup>This study was done by Keefe, Bruyette, and Woods, an investment bank. It was referenced in an article titled "Merger Mayhem" in *Barron's*, April 20, 1998.

## **TAKEOVER VALUATION: BIASES AND COMMON ERRORS**

The process of takeover valuation has potential pitfalls and biases that arise from the desire of the management of both the bidder and target firms to justify their points of view to their stockholders. The bidder firm aims to convince its stockholders that it is getting a bargain (i.e., that it is paying less than what the target firm is truly worth). In friendly takeovers, the target firm attempts to show its stockholders that the price it is receiving is a fair price (i.e., it is receiving at least what it is worth). In hostile takeovers, there is a role reversal, with bidding firms trying to convince target firm stockholders that they are not being cheated out of their fair share, and target firms arguing otherwise. Along the way, there are a number of common errors and biases in takeover valuation.

### **Use of Comparable Firms and Multiples**

The prices paid in most takeovers are justified using the following sequence of actions: The acquirer assembles a group of firms comparable to the one being valued, selects a multiple to value the target firm, computes an average multiple for the comparable firms, and then makes subjective adjustments to this average. Each of these steps provides an opening for bias to enter into the process. Since no two firms are identical, the choice of comparable firms is a subjective one and can be tailored to justify the conclusion we want to reach. Similarly, in selecting a multiple, there are a number of possible choices—price-earnings ratios, price-cash flow ratios, price-book value ratios, and price-sales ratios, among others—and the multiple chosen will be the one that best suits our biases. Finally, once the average multiple has been obtained, subjective adjustments can be made to complete the story. In short, there is plenty of room for a biased firm to justify any price, using reasonable valuation models.

In some acquisition valuations, only firms that have been target firms in acquisitions are used as comparable firms, with the prices paid on the acquisitions being used to estimate multiples. The average multiple paid, which is called a transaction multiple, is then used to justify the price paid in an acquisition. This clearly creates a biased sample, and the values estimated using transactions multiples will generally be too high.

### **Mismatching Cash Flows and Discount Rates**

One of the fundamental principles of valuation is that cash flows should be discounted using a consistent discount rate. Cash flows to equity should be discounted at the cost of equity and cash flows to the firm at the cost of capital; nominal cash flows should be discounted at the nominal discount rate and real cash flows at the real rate; after-tax cash flows should be discounted at the after-tax discount rate and pretax cash flows at the pretax rate. The failure to match cash flows with discount rates can lead to significant under- or overvaluation. Two of the more common mismatches include:

1. *Using the bidding firm's cost of equity or capital to discount the target firm's cash flows.* If the bidding firm raises the funds for the takeover, it is argued, its cost of equity should be used. This argument fails to take into account the fundamental

investment principle that it is not who raises the money that determines the cost of equity as much as what the money is raised for. The same firm will face a higher cost of equity for funds raised to finance riskier projects and a lower cost of equity to finance safer projects. Thus the cost of equity in valuing the target will reflect that firm's riskiness (i.e., it is the target firm's cost of equity). Note also that since the cost of equity, as we have defined it, includes only nondiversifiable risk, arguments that the risk will decrease after the merger cannot be used to reduce the cost of equity if the risk being decreased is firm-specific risk.

2. *Using the cost of capital to discount the cash flows to equity.* If the bidding firm uses a mix of debt and equity to finance the acquisition of a target firm, the argument goes, the cost of capital should be used in discounting the target firm's cash flows to equity (cash flows left over after interest and principal payments). By this reasoning, the value of a share in IBM to an investor will depend on how the investor finances his or her acquisition of the share—increasing if the investor borrows to buy the stock (since the cost of debt is less than the cost of equity) and decreasing if the investor buys the stock using his or her own cash. The bottom line is that discounting the cash flows to equity at the cost of capital to obtain the value of equity is always wrong and will result in a significant overvaluation of the equity in the target firm.

### **Subsidizing the Target Firm**

The value of the target firm should not include any portion of the value that should be attributed to the acquiring firm. For instance, assume that a firm with excess debt capacity or a high debt rating uses a significant amount of low-cost debt to finance an acquisition. If we estimated a low cost of capital for the target firm with a high debt ratio and a low after-tax cost of debt, we would overestimate the value of the firm. If the acquiring firm paid this price on the acquisition, it would represent a transfer of wealth from the acquiring firm's stockholders to the target firm's stockholders. Thus, it is not appropriate to use the acquiring firm's cost of debt or debt capacity to estimate the cost of capital for the target firm.

## **STRUCTURING THE ACQUISITION**

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Once the target firm has been identified and valued, the acquisition moves forward into the structuring phase. There are three interrelated steps in this phase. The first is the decision on how much to pay for the target firm, given that we have valued it with synergy and control built into the valuation. The second is the determination of how to pay for the deal (i.e., whether to use stock, cash, or some combination of the two) and whether to borrow any of the funds needed. The final step is the choice of the accounting treatment of the deal because it can affect both taxes paid by stockholders in the target firm and how the purchase is accounted for in the acquiring firm's income statement and balance sheets.

### **Deciding on an Acquisition Price**

The preceding section explained how to value a target firm with control and synergy considerations built into the value. This value represents a ceiling on the price

that the acquirer can pay on the acquisition rather than a floor. If the acquirer pays the full value, there is no surplus value to claim for the acquirer's stockholders and the target firm's stockholders get the entire value of the synergy and control premiums. This division of value is unfair if the acquiring firm plays an indispensable role in creating the synergy and control premiums.

Consequently, the acquiring firm should try to keep as much of the premium as it can for its stockholders. Several factors, however, will act as constraints. They include:

- *The market price of the target firm, if it is publicly traded, prior to the acquisition.* Since acquisitions have to be based on the current market price, the greater the current market value of equity, the lower the potential for gain to the acquiring firm's stockholders. For instance, if the market price of a poorly managed firm already reflects a high probability that the management of the firm will be changed, there is likely to be little or no value gained from control.
- *The relative scarcity of the specialized resources that the target and the acquiring firm bring to the merger.* Since the bidding firm and the target firm are both contributors to the creation of synergy, the sharing of the benefits of synergy among the two parties will depend in large part on whether the bidding firm's contribution to the creation of the synergy is unique or easily replaced. If it can be easily replaced, the bulk of the synergy benefits will accrue to the target firm. If it is unique, the benefits will be shared much more equitably. Thus, when a firm with cash slack acquires a firm with many high-return projects, value is created. If there are a large number of firms with cash slack and relatively few firms with high-return projects, the bulk of the value of the synergy will accrue to the latter.
- *The presence of other bidders for the target firm.* When there is more than one bidder for a firm, the odds are likely to favor the target firm's stockholders. Bradley, Desai, and Kim (1988) examined an extensive sample of 236 tender offers made between 1963 and 1984 and concluded that the benefits of synergy accrue primarily to the target firms when multiple bidders are involved in the takeover. They estimated the market-adjusted stock returns around the announcement of the takeover for the successful bidder to be 2 percent in single-bidder takeovers and -1.33% in contested takeovers.

### **Payment for the Target Firm**

Once a firm has decided to pay a given price for a target firm, it has to follow up by deciding how it is going to pay for this acquisition. In particular, decisions have to be made about the following aspects of the deal: debt versus equity and cash versus stock.

**Debt versus Equity** A firm can raise the funds for an acquisition from either debt or equity. The mix will generally depend on the excess debt capacities of both the acquiring and the target firms. Thus, the acquisition of a target firm that is significantly underlevered may be carried out with a larger proportion of debt than the

acquisition of one that is already at its optimal debt ratio. This, of course, is reflected in the value of the firm through the cost of capital. It is also possible that the acquiring firm has excess debt capacity and that it uses its ability to borrow money to carry out the acquisition. Although the mechanics of raising the money may look the same in this case, it is important that the value of the target firm not reflect this additional debt. As noted in the last section, the cost of capital used in valuing the acquisition should not reflect this debt raised. The additional debt has nothing to do with the target firm, and building it into the value will only result in the acquiring firm paying a premium for a value enhancement that rightfully belongs to its own stockholders.

**Cash versus Stock** There are three ways in which a firm can use equity in a transaction. The first is to use cash balances that have been built up over time to finance the acquisition. The second is to issue stock to the public, raise cash, and use the cash to pay for the acquisition. The third is to offer stock as payment for the target firm, where the payment is structured in terms of a stock swap—shares in the acquiring firm in exchange for shares in the target firm. The question of which of these approaches is best utilized by a firm cannot be answered without looking at the following factors:

- *The availability of cash on hand.* Clearly, the option of using cash on hand is available only to those firms that have accumulated substantial amounts of cash.
- *The perceived value of the stock.* When stock is issued to the public to raise new funds or when it is offered as payment on acquisitions, the acquiring firm's managers are making a judgment about what the perceived value of the stock is. In other words, managers who believe that their stock is trading at a price significantly below value should not use stock as currency on acquisitions, since what they gain on the acquisitions can be more than lost in the stock issue. However, firms that believe their stocks are overvalued are much more likely to use stock as currency in transactions. The stockholders in the target firm are also aware of this, and may demand a larger premium when the payment is made entirely in the form of the acquiring firm's stock.
- *Tax factors.* When an acquisition is a stock swap, the stockholders in the target firm may be able to defer capital gains taxes on the exchanged shares. Since this benefit can be significant in an acquisition, the potential tax gains from a stock swap may be large enough to offset any perceived disadvantages.

The final aspect of a stock swap is the setting of the terms of the stock swap (i.e., the number of shares of the acquired firm that will be offered per share of the acquiring firm). While this amount is generally based on the market price at the time of the acquisition, the ratio that results may be skewed by the relative mispricing of the two firms' securities, with the more overpriced firm gaining at the expense of the more underpriced (or at least less overpriced) firm. A fairer ratio would be based on the relative values of the two firms' shares. This can be seen quite clearly in the following illustration.

**ILLUSTRATION 25.5: Setting the Exchange Ratio**

We will begin by reviewing our valuation for Digital in Figure 25.5. The value of Digital with the synergy and control components is \$6,964 million. This is obtained by adding the value of control (\$2,421 million) and the value of synergy (\$2,422 million) to the status quo value of \$2,110 million. Digital also has \$1,006 million in debt, and 146.789 million shares outstanding. The maximum value per share for Digital can then be estimated as follows:

$$\begin{aligned}\text{Maximum value per share for Digital} &= (\text{Firm value} - \text{Debt}) / \text{Number of shares outstanding} \\ &= (\$6,964 - \$1,006) / 146.789 = \$40.59\end{aligned}$$

The estimated value per share for Compaq is \$27, based on the total value of the firm of \$38,546.91 million, the debt outstanding of \$3.2 billion, and 1,305.76 million shares.

$$\text{Value per share for Compaq} = (\$38,546.91 - \$3,200) / 1,305.76 = \$27.00$$

The appropriate exchange ratio, based on value per share, can be estimated:

$$\begin{aligned}\text{Exchange ratio}_{\text{Compaq, Digital}} &= \text{Value per share}_{\text{Digital}} / \text{Value per share}_{\text{Compaq}} \\ &= \$40.59 / \$27.00 = 1.50 \text{ Compaq shares per Digital share}\end{aligned}$$

If the exchange ratio is set above this number, Compaq stockholders will lose to the benefit of Digital stockholders. If it is set below, Digital stockholders will lose to the benefit of Compaq stockholders.

In fact, Compaq paid \$30 in cash and offered 0.945 shares of Compaq stock for every Digital share. Assessing the value of this offer,

Value per Digital share (Compaq offer) = \$30 + 0.945 (\$27.07)	\$55.58
Value per Digital share (assessed value)	\$40.59
Overpayment by Compaq	\$14.99

Based on our assessments of value and control, Compaq overpaid on this acquisition for Digital.



**exchratio.xls:** This spreadsheet allows you to estimate the exchange ratio on an acquisition, given the value of control and synergy.

**Accounting Considerations**

There is one final decision that seems to play a disproportionate role in the way in which acquisitions are structured and in setting their terms, and that is the accounting treatment. This section describes the accounting choices and examines why firms choose one over the other.

**Purchase versus Pooling** There are two basic choices in accounting for a merger or acquisition. In purchase accounting, the entire value of the acquisition is reflected on the acquiring firm's balance sheet, and the difference between the acquisition price and the restated value of the assets of the target firm<sup>11</sup> is shown as goodwill for the acquiring firm. The goodwill is then written off (amortized) over a

<sup>11</sup>The acquiring firm is allowed to restate the assets that are on the books at fair value. This changes the tax basis for the assets, and can affect depreciation in subsequent periods.

Component	Valuation Guidelines	Value
Synergy	Value the combined firm with synergy built in. In the case of Compaq/Digital, the synergy comes from: <ul style="list-style-type: none"> <li>• Annual cost savings, expected to be \$100 million.</li> <li>• Slightly higher growth rate.</li> </ul>	\$2,422 million
Control Premium	Value Digital as if optimally managed. This was done by assuming: <ul style="list-style-type: none"> <li>• Higher margins and a return on capital equal to the cost of capital.</li> <li>• Higher debt ratio and a lower cost of capital.</li> </ul>	\$2,421 million
Status Quo Valuation	Value Digital as is, with existing inputs for investment, financing, and dividend policy.	\$2,110 million

**FIGURE 25.5** Valuing Digital for Compaq

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period of 40 years, reducing reported earnings in each year. The amortization is not tax deductible and thus does not affect cash flows. If an acquisition qualifies for pooling, the book values of the target and acquiring firms are aggregated. The premium paid over market value is not shown on the acquiring firm's balance sheet.

For an acquisition to qualify for pooling, the merging firms have to meet the following conditions:

- Each of the combining firms has to be independent; pooling is not allowed when one of the firms is a subsidiary or division of another firm in the two years prior to the merger.
- Only voting common stock can be issued to cover the transaction; the issue of preferred stock or multiple classes of common stock is not allowed.
- Stock buybacks or any other distributions that change the capital structure prior to the merger are prohibited.
- No transactions that benefit only a group of stockholders are allowed.
- The combined firm cannot sell a significant portion of the existing businesses of the combined companies, other than duplicate facilities or excess capacity.

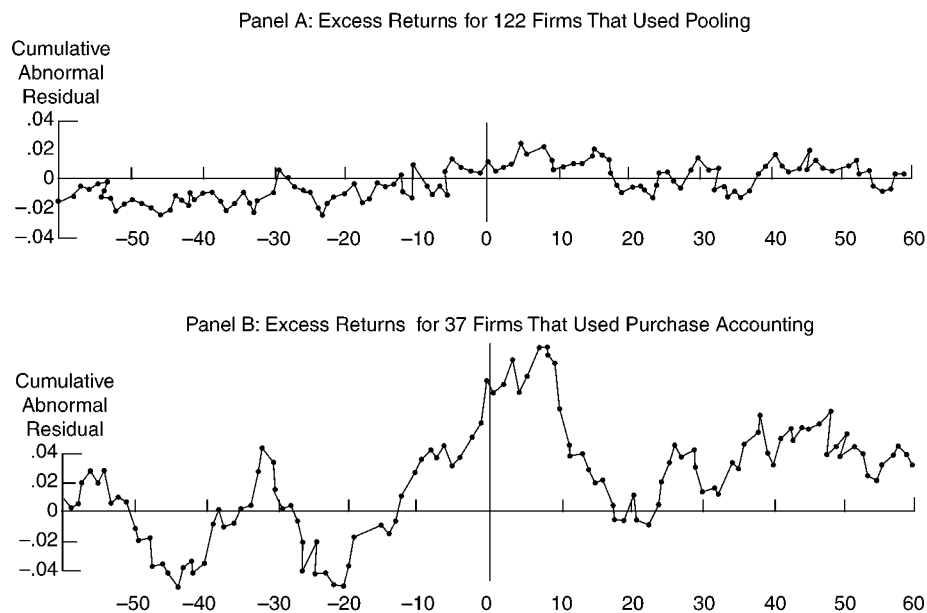
The question whether an acquisition will qualify for pooling seems to weigh heavily on the managers of acquiring firms. Some firms will not make acquisitions if they do not qualify for pooling, or they will pay premiums to ensure that they do qualify. Furthermore, as the conditions for pooling make clear, firms are con-



strained in what they can do after the merger. Firms seem to be willing to accept these constraints, such as restricting stock buybacks and major asset divestitures, just to qualify for pooling.

The bias toward pooling may seem surprising, since this choice does not affect cash flows and value, but it is really not surprising when we consider the source of the bias. Firms are concerned about the effects of the goodwill amortization on their earnings, and about stockholder reactions to the lower earnings. Are firms that use purchase accounting punished by markets when they report lower earnings in subsequent periods? Hong, Kaplan, and Mandelkar (1978) examined the monthly excess returns of 122 firms that acquired other firms between 1954 and 1964 using the pooling technique for 60 months after the acquisition. They compared these findings to 37 acquisitions that used the purchase approach to see if markets were fooled by the pooling technique. They found no evidence that the pooling raised stock prices or that the purchase technique lowered prices. The results are shown in Figure 25.6.

Note that there are no positive excess returns associated with pooling in the 60 months following the merger, nor are there negative excess returns associated with purchase in the same time period. Lindenberg and Ross (1999) studied 387 pooling and 1,055 purchase transactions between 1990 and 1999. They found that the stock price reaction to the acquisition announcement is more positive for purchase transactions than for pooling transactions, and that the market value of firms that use purchase accounting is not adversely affected by the reduction in earnings associated with amortization. They concluded that the earnings multiples of firms that use purchase accounting adjust to offset the decrease in earnings caused by amortization. To illustrate, a 10 percent decrease in earnings because of goodwill amortization is accompanied by a 12.1 percent increase in the price-earnings ratio; the net



**FIGURE 25.6** Pooling versus Purchase Accounting: Effect on Excess Returns

effect is that stock price does not drop. Thus markets seem to discount the negative earnings effect of amortizing goodwill.

There is another consideration, as well. When pooling is used, the shareholders of the acquired firm can transfer their cost basis<sup>12</sup> to the shares they receive in the acquiring firm and not pay capital gains taxes until they sell these shares. When purchase accounting is used, the stockholders of the acquired firm have to recognize the capital gain at the time of the transaction, even if they receive stock in the acquiring firm. Given the substantial premiums paid on acquisitions, this may be a significant factor in why firms choose to use pooling.

**In-Process R&D** In the past few years, another accounting choice has entered the mix, especially for acquisitions in the technology sector. Here, firms that qualify can follow up an acquisition by writing off all or a significant proportion of the premium paid on the acquisition as in-process R&D. The net effect is that the firm takes a one-time charge at the time of the acquisition that does not affect operating earnings,<sup>13</sup> and it eliminates or drastically reduces the goodwill that needs to be amortized in subsequent periods. The one-time expense is not tax-deductible and has no cash flow consequences. In acquisitions such as Lotus by IBM and MCI by WorldCom, the in-process R&D charge allowed the acquiring firms to write off a significant portion of the acquisition price at the time of the deal.

The potential to reduce the dreaded goodwill amortization with a one-time charge is appealing for many firms, and studies find that firms try to take maximum advantage of this option. Jeng and Lev (1998) documented this tendency and also noted that firms that qualify for this provision tend to pay significantly larger premiums on acquisitions than firms that do not.

In early 1999, as both the accounting standards board and the SEC sought to crack down on the misuse of in-process R&D, the top executives at high-technology firms fought back, claiming that many acquisitions that were viable now would not be in the absence of this provision. It is revealing of managers' obsession with reported earnings that a provision that has no effects on cash flows, discount rates, and value is making such a difference in whether acquisitions get done.

**Final Considerations** The managers of acquiring firms clearly weigh in the accounting effects of acquisitions, even when accounting choices have little or no effect on cash flows. This behavior is rooted in a fear of how much financial markets will punish firms that report lower earnings, largely as a consequence of the write-off of goodwill. Given the transparency of this write-off (firms report earnings before and after goodwill amortization), this fear seems to be misplaced, and the empirical evidence backs that up.

When accounting choices weigh disproportionately in the outcome, the results can be expensive for stockholders in the acquiring firm. In particular,

- Firms will reject some good acquisitions simply because they fail to meet the pooling test or because in-process R&D cannot be written off.

<sup>12</sup>For tax purposes, the cost basis reflects what you originally paid for the shares.

<sup>13</sup>The write-off of in-process R&D is viewed as a nonrecurring charge and is shown separately from operating income.

- Firms will overpay on acquisitions just to qualify for favorable accounting treatment.
- To meet the requirements for pooling, firms will often acquire entire companies rather than the divisions that they are interested in and defer asset divestitures that make economic sense.

If the signals emerging from both the SEC and Financial Accounting Standards Board (FASB) have any basis, the rules for both pooling and writing off in-process R&D will be substantially tightened. In fact, it looks likely that firms will not be able to use pooling past 2001 and that they will have to write off goodwill over a much shorter period than the current 40 years.<sup>14</sup> These changes, though bitterly opposed by many top managers, should be welcomed by stockholders.

### **ANALYZING MANAGEMENT AND LEVERAGED BUYOUTS**

The first section, when describing the different types of acquisitions, pointed out two important differences between mergers and buyouts. The first is that, unlike a merger, a buyout does not involve two firms coming together and creating a consolidated entity. Instead, the target firm is acquired by a group of investors that may include the management of the firm. The second is that the target firm in a buyout usually becomes a private business. Some buyouts in the 1980s also used large proportions of debt, leading to their categorization as leveraged buyouts. Each of these differences does have an effect on how we approach the valuation of buyouts.

#### **IMPROVING THE ODDS OF SUCCESS ON MERGERS**

The evidence on mergers adding value is murky at best and negative at worst. Considering all the contradictory evidence contained in different studies,<sup>15</sup> we conclude that:

- Mergers of equals (firms of equal size) seem to have a lower probability of succeeding than acquisitions of a smaller firm by a much larger firm.<sup>16</sup>
- Cost-saving mergers, where the cost savings are concrete and immediate, seem to have a better chance of delivering on synergy than mergers based on growth synergy.
- Acquisition programs that focus on buying small private businesses for consolidations have had more success than acquisition programs that concentrate on acquiring publicly traded firms.
- Hostile acquisitions seem to do better at delivering improved postacquisition performance than friendly mergers.

<sup>14</sup>Given the formidable lobbying skills of incumbent managers, we would not be surprised to see this change modified or delayed.

<sup>15</sup>Some of this evidence is anecdotal and is based on the study of just a few mergers.

<sup>16</sup>This might well reflect the fact that failures of mergers of equals are much more visible than failures of the small firm/large firm combinations.

### Valuation of a Buyout

The fact that buyouts involve only the target firm and that there is no acquiring firm to consider makes valuation much more straightforward. Clearly, there is no potential for synergy and therefore no need to value it. However, the fact that the managers of a firm are also the acquirers of the firm does create two issues. The first is that managers have access to information that investors do not have. This information may allow managers to conclude, with far more certainty than would an external acquirer, that their firm is undervalued. This may be one reason for the buyout. The second is that the management of the firm remains the same after the buyout, but the way in which investment, financing, and dividend decisions are made may change. This happens because managers, once they become owners, may become much more concerned about maximizing firm value.

The fact that firms that are involved in buyouts become private businesses can also have an effect on value. Chapter 24 noted that investments in private businesses are much more difficult to liquidate than investments in publicly traded firms. This can create a significant discount on value. One reason this discount may be smaller in the case of buyouts is that many of them are done with the clear intention, once the affairs of the firm have been put in order, of taking the firm public again.

If going private is expected to increase managers' responsiveness to value maximization in the long term—since they are part owners of the firm—the way to incorporate this in value is to include it in the cash flows. The increased efficiency can be expected to increase cash flows if it increases operating margins. The emphasis on long-term value should be visible in investment choices and should lead to a higher return on capital and higher growth. This advantage has to be weighed against the capital rationing the firm might face because of limited access to financial markets, which might reduce future growth and profits. The net effect will determine the change in value. The empirical evidence on going-private transactions, however, is clear-cut. DeAngelo, DeAngelo, and Rice (1984) reported, for example, an average abnormal return of 30 percent for 81 firms in their sample that went private. Thus financial markets, at least, seem to believe that there is value to be gained for some public firms in going private.

### Valuing a Leveraged Buyout

We have seen that leveraged buyouts are financed disproportionately with debt. This high leverage is justified in several ways. First, if the target firm initially has too little debt relative to its optimal debt ratio, the increase in debt can be explained partially by the increase in value moving to the optimal ratio provides. The debt level in most leveraged buyouts exceeds the optimal debt ratio, however, which means that some of the debt will have to be paid off quickly in order for the firm to reduce its cost of capital and its default risk. A second explanation is provided by Michael Jensen, who proposes that managers cannot be trusted to invest free cash flows wisely for their stockholders; they need the discipline of debt payments to maximize cash flows on projects and firm value. A third rationale is that the high debt ratio is temporary and will disappear once the firm liquidates assets and pays off a significant portion of the debt.

The extremely high leverage associated with leveraged buyouts creates two problems in valuation, however. First, it significantly increases the riskiness of the cash

flows to equity investors in the firm by increasing the fixed payments to debt holders in the firm. Thus, the cost of equity has to be adjusted to reflect the higher financial risk the firm will face after the leveraged buyout. Second, the expected decrease in this debt over time, as the firm liquidates assets and pays off debt, implies that the cost of equity will also decrease over time. Since the cost of debt and debt ratio will change over time as well, the cost of capital will also change in each period.

In valuing a leveraged buyout, then, we begin with the estimates of free cash flow to the firm, just as we did in traditional valuation. However, instead of discounting these cash flows back at a fixed cost of capital, we discount them back at a cost of capital that will vary from year to year. Once we value the firm, we then can compare the value to the total amount paid for the firm.

#### ILLUSTRATION 25.6: Valuing a Leveraged Buyout: Congoleum Inc.

The managers of Congoleum Inc. targeted the firm for a leveraged buyout in 1979.<sup>17</sup> They planned to buy back the stock at \$38 per share (it was trading at \$24 prior to the takeover) and to finance the acquisition primarily with debt. The breakdown of the cost and financing of the deal is:

##### *Cost of Takeover*

Buy back stock: $\$38 \times 12.2$ million shares	\$463.60 million
Expenses of takeover	\$ 7.00 million
Total cost	\$470.60 million

##### *Financing Mix for Takeover*

Equity:	\$117.30 million
Debt	\$327.10 million
Preferred stock (@13.5%)	\$ 26.20 million
Total proceeds	\$470.60 million

There were three sources of debt:

1. Bank debt of \$125 million, at a 14% interest rate, to be repaid in annual installments of \$16.666 million starting in 1980.
2. Senior notes of \$115 million, at 11.25% interest rate, to be repaid in equal annual installments of \$7.636 million each year from 1981.
3. Subordinated notes of \$92 million, at 12.25% interest, to be repaid in equal annual installments of \$7.636 million each year from 1989.

The firm also assumed \$12.2 million of existing debt, at the advantageous rate of 7.50%; this debt would be repaid in 1982.<sup>18</sup>

The firm projected operating income (EBIT), capital spending, depreciation, and change in working capital from 1980 to 1984 as shown in the following table (in millions of dollars):

<sup>17</sup>The numbers in this illustration were taken from the Harvard Business School case titled "Congoleum." The case is reprinted in Fruhan, Kester, Mason, Piper, and Ruback (1992).

<sup>18</sup>The debt value exceeds the transaction amount, reflecting transaction costs and investment banking fees.

Year	EBIT	Capital Spending	Depreciation	$\Delta$ Working Capital
Current	\$ 89.80	\$ 6.8	\$ 7.5	\$ 4.0
1980	\$ 71.69	\$15.0	\$35.51	\$ 2.0
1981	\$ 90.84	\$16.2	\$36.26	\$14.0
1982	\$115.73	\$17.5	\$37.07	\$23.3
1983	\$133.15	\$18.9	\$37.95	\$11.2
1984	\$137.27	\$20.4	\$21.93	\$12.8

The earnings before interest and taxes were expected to grow 8% after 1984, and the capital spending was expected to be offset by depreciation.<sup>19</sup>

Congoleum had a beta of 1.25 in 1979 prior to the leveraged buyout. The Treasury bond rate at the time of the leveraged buyout was 9.5%, and the tax rate was 48%.

We begin the analysis by estimating the expected cash flows to the firm from 1980 to 1985. To obtain these estimates, we subtract the net capital expenditures and changes in working capital (which were provided) from the after-tax operating income.

	1980	1981	1982	1983	1984	1985
EBIT	\$71.69	\$90.84	\$115.73	\$133.15	\$137.27	\$148.25
– EBIT (t)	\$34.41	\$43.60	\$ 55.55	\$ 63.91	\$ 65.89	\$ 71.16
= EBIT (1 - t)	\$37.28	\$47.24	\$ 60.18	\$ 69.24	\$ 71.38	\$ 77.09
+ Depreciation	\$35.51	\$36.26	\$ 37.07	\$ 37.95	\$ 21.93	\$ 21.62
– Capital expenditures	\$15.00	\$16.20	\$ 17.50	\$ 18.90	\$ 20.40	\$ 21.62
– $\Delta$ WC	\$ 2.00	\$14.00	\$ 23.30	\$ 11.20	\$ 12.80	\$ 5.00
= FCFF	\$55.79	\$53.30	\$ 56.45	\$ 77.09	\$ 60.11	\$ 72.09

We follow up by estimating the cost of capital for the firm each year, based on our estimates of debt and equity each year. The value of debt for future years is estimated based on the repayment schedule, and it decreases over time. The value of equity in each of the future years is estimated by discounting the expected cash flows in equity beyond that year at the cost of equity. (This explains why the equity in 1980 is greater than the book value of equity.)

	1980	1981	1982	1983	1984	1985
Debt	\$327.10	\$309.96	\$285.17	\$260.62	\$236.04	\$211.45
Equity	\$275.39	\$319.40	\$378.81	\$441.91	\$504.29	\$578.48
Preferred stock	\$26.20	\$26.20	\$26.20	\$26.20	\$26.20	\$26.20
Debt/capital	52.03%	47.28%	41.32%	35.76%	30.79%	25.91%
Equity/capital	43.80%	48.72%	54.89%	60.64%	65.79%	70.88%
Preferred stock/capital	4.17%	4.00%	3.80%	3.60%	3.42%	3.21%
Beta	2.02547	1.87988	1.73426	1.62501	1.54349	1.4745
Cost of equity	20.64%	19.84%	19.04%	18.44%	17.99%	17.61%
After-tax cost of debt	6.53%	6.53%	6.53%	6.53%	6.53%	5.00%
Cost of preferred stock	13.51%	13.51%	13.51%	13.51%	13.51%	13.51%
Cost of capital	13.00%	13.29%	13.66%	14.00%	14.31%	14.21%

An alternative approach to estimating equity that does not require iterations or circular reasoning is to use the book value of equity rather than the estimated market value in calculating debt-equity ratios.<sup>20</sup>

<sup>19</sup>We have used the assumptions provided by the investment banker in this case. It is troubling, however, that the firm has an expected growth rate of 8 percent a year forever without reinvesting any money back.

<sup>20</sup>The book value of equity can be obtained as follows:

$$\text{BV of equity}_t = \text{BV of equity}_{t-1} + \text{Net income}_t$$

It is assumed that there will be no dividends paid to equity investors in the initial years of a leveraged buyout.

The cash flows to the firm and the cost of capital in the terminal year (1985), in conjunction with the expected growth rate of 8%,<sup>21</sup> are used to estimate the terminal value of equity (at the end of 1984):

$$\begin{aligned}\text{Terminal value of firm (end of 1984)} &= \text{FCFE}_{1985} / (k_{e,1985} - .08) \\ &= \$72.09 / (.1421 - .08) = \$1,161 \text{ million}\end{aligned}$$

The expected cash flows to the firm and the terminal value were discounted back to the present at the cost of capital to yield a present value of \$820.21 million.<sup>22</sup> Since the acquisition of Congoleum cost only \$470.6 million, this acquisition creates value for the acquiring investors.



**merglbo.xls:** This spreadsheet allows you to evaluate the cash flows and the value of a leveraged buyout.

## CONCLUSION

Acquisitions take several forms and occur for different reasons. Acquisitions can be categorized based on what happens to the target firm after the acquisition. A target firm can be consolidated into the acquiring entity (merger), create a new entity in combination with the acquiring firm, or remain independent (buyout).

There are four steps in analyzing acquisitions. First, we specify the reasons for acquisitions and list five: the undervaluation of the target firm, benefit from diversification, the potential for synergy, the value created by changing the way the target firm is run and management self-interest. Second, we choose a target firm whose characteristics make it the best candidate, given the motive chosen in the first step. Third, we value the target firm, assuming it would continue to be run by its current managers and then revalue it assuming better management. We define the difference between these two values as the value of control. We also value each of the different sources of operating and financial synergy and consider the combined value as the value of total synergy. Fourth, we look at the mechanics of the acquisition. We examine how much the acquiring firm should consider paying, given the value estimated in the prior step for the target firm, including control and synergy benefits. We also look at whether the acquisition should be financed with cash or stock, and how the choice of the accounting treatment of the acquisition affects this choice.

Buyouts share some characteristics with acquisitions, but they also vary on a couple of important ones. The absence of an acquiring firm, the fact that the managers of the firm are its acquirers, and the conversion of the acquired firm into a private business all have implications for value. If the buyout is financed predominantly with debt, making it a leveraged buyout, the debt ratio will change in future years, leading to changes in the costs of equity, debt, and capital in those years.

<sup>21</sup>While this may seem to be a high growth rate to sustain forever, it would have been appropriate in 1979. Inflation and interest rates were much higher then than in the 1990s.

<sup>22</sup>When the cost of capital changes on a year-to-year basis, the discounting has to be based on a cumulative cost. For instance, the cash flow in year 3 will be discounted back as follows:

$$\text{PV of cash flow in year 3} = 56.45 / (1.13)(1.1329)(1.1366)$$

## QUESTIONS AND SHORT PROBLEMS

1. The following are the details of two potential merger candidates, Northrop and Grumman, in 1993:

	<i>Northrop</i>	<i>Grumman</i>
Revenues	\$4,400.00	\$3,125.00
Cost of goods sold (without depreciation)	87.50%	89.00%
Depreciation	\$200.00	\$74.00
Tax rate	35.00%	35.00%
Working capital	10% of revenue	10% of revenue
Market value of equity	\$2,000.00	\$1,300.00
Outstanding debt	\$160.00	\$250.00

Both firms are expected to grow 5% a year in perpetuity. Capital spending is expected to be 20% of depreciation. The beta for both firms is 1, and both firms are rated BBB, with an interest rate on their debt of 8.5% (The Treasury bond rate is 7%, and the risk premium is 5.5%.)

As a result of the merger, the combined firm is expected to have a cost of goods sold of only 86% of total revenues. The combined firm does not plan to borrow additional debt.

- Estimate the value of Grumman, operating independently.
  - Estimate the value of Northrop, operating independently.
  - Estimate the value of the combined firm, with no synergy.
  - Estimate the value of the combined firm, with synergy.
  - How much is the operating synergy worth?
2. In the Grumman-Northrop example described in the previous question, the combined firm did not take on additional debt after the acquisition. Assume that as a result of the merger the firm's optimal debt ratio increases to 20% of total capital from current levels. (At that level of debt, the combined firm will have an A rating, with an interest rate on its debt of 8%.) If it does not increase debt, the combined firm's rating will be A+ (with an interest rate of 7.75%).
- Estimate the value of the combined firm if it stays at its existing debt ratio.
  - Estimate the value of the combined firm if it moves to its optimal debt ratio.
  - Who gains this additional value if the firm moves to the optimal debt ratio?
3. In April 1994, Novell, Inc. announced its plan to acquire WordPerfect Corporation for \$1.4 billion. At the time of the acquisition, the relevant information about the two companies was as follows:

	<i>Novell</i>	<i>WordPerfect</i>
Revenues	\$1,200.00	\$600.00
Cost of goods sold (without depreciation)	57.00%	75.00%
Depreciation	\$42.00	\$25.00
Tax rate	35.00%	35.00%
Capital spending	\$75.00	\$40.00
Working capital (as % of revenue)	40.00%	30.00%
Beta	1.45	1.25
Expected growth rate in revenues/EBIT	25.00%	15.00%
Expected period of high growth	10 years	10 years
Growth rate after high-growth period	6.00%	6.00%
Beta after high-growth period	1.10	1.10



Capital spending will be 115% of depreciation after the high-growth period. Neither firm has any debt outstanding. The Treasury bond rate is 7%.

- a. Estimate the value of Novell, operating independently.
  - b. Estimate the value of WordPerfect, operating independently.
  - c. Estimate the value of the combined firm, with no synergy.
  - d. As a result of the merger, the combined firm is expected to grow 24% a year for the high-growth period. Estimate the value of the combined firm with the higher growth.
  - e. What is the synergy worth? What is the maximum price Novell can pay for WordPerfect?
4. Assume, in the Novell-WordPerfect merger described in the preceding question, that it will take five years for the firms to work through their differences and start realizing their synergy benefits. What is the synergy worth under these circumstances?
5. In 1996, Aetna, a leading player in health insurance, announced its intentions to acquire U.S. Healthcare, the nation's largest health maintenance organization, and provided synergy as a rationale. On the announcement of the merger, Aetna's stock price, which was \$57, dropped to \$52.50, while U.S. Healthcare's stock price surged from \$31 to \$37.50. Aetna had 400 million shares, and U.S. Healthcare had 50 million shares outstanding at the time of the announcement.
- a. Estimate the value, if any, that financial markets are attaching to synergy in this merger.
  - b. How would you reconcile the market reaction to the rationale presented by management for the acquisition?
6. IH Corporation, a farm equipment manufacturer, has accumulated almost \$2 billion in losses over the past seven years of operations and is in danger of not being able to carry forward these losses. EG Corporation, an extremely profitable financial service firm, which had \$3 billion in taxable income in its most recent year, is considering acquiring IH Corporation. The tax authorities will allow EG Corporation to offset its taxable income with the carried-forward losses. The tax rate for EG Corporation is 40%, and the cost of capital is 12%.
- a. Estimate the value of the tax savings that will occur as a consequence of the merger.
  - b. What is the value of the tax savings if the tax authorities allow EG Corporation to spread the carried-forward losses over four years (i.e., allow \$200 million of the carried-forward losses to offset income each year for the next four years)?
7. You are considering a takeover of PMT Corporation, a firm that has significantly underperformed its peer group over the past five years, and you wish to estimate the value of control. The data on PMT Corporation, the peer group, and the best-managed firm in the group are:

	<i>PMT Corporation</i>	<i>Peer Group</i>	<i>Best-Managed Firm</i>
Return on assets (after-tax)	8.00%	12.00%	18.00%
Dividend payout ratio	50.00%	30.00%	20.00%
Debt-equity ratio	10.00%	50.00%	50.00%
Interest rate on debt	7.50%	8.00%	8.00%
Beta	Not available	1.30	1.30

PMT Corporation reported earnings per share of \$2.50 in the most recent time period and is expected to reach stable growth in five years, after which the growth rate is expected to be 6% for all firms in this group. The beta during the stable-growth period is expected to be 1 for all firms. There are 100 million shares outstanding, and the Treasury bond rate is 7% (the tax rate is 40% for all firms).

- a. Value the equity in PMT Corporation assuming that the current management continues in place.
  - b. Value the equity in PMT Corporation assuming that it improves its performance to peer group levels.
  - c. Value the equity in PMT Corporation assuming that it improves its performance to the level of the best managed firm in the group.
8. You are attempting to do a leveraged buyout of Boston Turkey but have run into some roadblocks. You have some partially completed projected cash flow statements and need help to complete them.

	<i>Year 1</i>	<i>Year 2</i>	<i>Year 3</i>	<i>Year 4</i>	<i>Year 5</i>	<i>Terminal Year</i>
Revenues	\$1,100,000	\$1,210,000	\$1,331,000	\$1,464,100	\$1,610,510	\$1,707,141
– Expenses	\$ 440,000	\$ 484,000	\$ 532,400	\$ 585,640	\$ 644,204	\$ 682,856
– Depreciation	\$ 100,000	\$ 110,000	\$ 121,000	\$ 133,100	\$ 146,410	\$ 155,195
= EBIT	\$ 560,000	\$ 616,000	\$ 677,600	\$ 745,360	\$ 819,896	\$ 869,090
– Interest	\$ 360,000	\$ 324,000	\$ 288,000	\$ 252,000	\$ 216,000	\$ 180,000
Taxable income	\$ 200,000	\$ 292,000	\$ 389,600	\$ 493,360	\$ 603,896	\$ 689,090
– Tax	\$ 80,000	\$ 116,800	\$ 155,840	\$ 197,344	\$ 241,558	\$ 275,636
= Net income	\$ 120,000	\$ 175,200	\$ 233,760	\$ 296,016	\$ 362,338	\$ 413,454

The capital expenditures are expected to be \$120,000 next year and to grow at the same rate as revenues for the rest of the period. Working capital will be kept at 20% of revenues (revenues this year were \$1 million).

The leveraged buyout will be financed with a mix of \$1 million of equity and \$3 million of debt (at an interest rate of 12%). Part of the debt will be repaid by the end of year 5, and the debt remaining at the end of year 5 will remain on the books permanently.

- a. Estimate the cash flows to equity and the firm for the next five years.
- b. The cost of equity in year 1 has been computed. Compute the cost of equity each year for the rest of the period (use book value of equity for the calculation).

<i>Item</i>	<i>Year 1</i>
Equity	\$1,000,000
Debt	\$3,000,000
Debt-equity ratio	3
Beta	2.58
Cost of equity	24.90%

- c. Compute the terminal value of the firm.
- d. Evaluate whether the leveraged buyout will create value.

9. J & L Chemical is a profitable chemical manufacturing firm. The business, however, is highly cyclical, and the profits of the firm have been volatile. The management of the firm is considering acquiring a food-processing firm to reduce the earnings volatility and exposure to economic cycles.
- a. Would such an action be in the best interests of stockholders? Explain.
  - b. Would your analysis be any different if J & L was a private firm? Explain.
  - c. Is there any condition under which you would argue for such an acquisition for a publicly traded firm?