

## CHAPTER 16

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### ESTIMATING EQUITY VALUE PER SHARE

In Chapter 15, we considered how best to estimate the value of the operating assets of the firm. To get from that value to the firm value, you have to consider cash, marketable securities and other non-operating assets held by a firm. In particular, you have to value holdings in other firms and deal with a variety of accounting techniques used to record such holdings. To get from firm value to equity value, you have to determine what should be subtracted out from firm value – i.e, the value of the non-equity claims in the firm.

Once you have valued the equity in a firm, it may appear to be a relatively simple exercise to estimate the value per share. All it seems you need to do is divide the value of the equity by the number of shares outstanding. But, in the case of some firms, even this simple exercise can become complicated by the presence of management and employee options. In this chapter, we will measure the magnitude of this option overhang on valuation and then consider ways of incorporating the effect into the value per share.

#### **The Value of Non-operating Assets**

Firms have a number of assets on their books that can be categorized as non-operating assets. The first and obvious one is cash and near-cash investments – investments in riskless or very low-risk investments that most companies with large cash balances make. The second is investments in equities and bonds of other firms, sometimes for investment reasons and sometimes for strategic ones. The third is holdings in other firms, private and public, which are categorized in a variety of ways by accountants. Finally, there are assets that firms own that do not generate cash flows but nevertheless could have value – for instance undeveloped land in New York or Tokyo.

#### ***Cash and Near Cash Investments***

Investments in short-term government securities or commercial paper, which can be converted into cash quickly and with very low cost, are considered near-cash investments. In this section, we will consider how best to deal with these investments in valuation.

### *Operating Cash Requirements*

If a firm needs cash for its operations – an operating cash balance – you should consider such cash part of working capital requirements rather than as a source of additional value. Any cash and near-cash investments that exceed the operating cash requirements can be then added on to the value of operating assets. How much cash does a firm need for its operations? The answer depends upon both the firm and the economy in which the firm operates. A small retail firm in an emerging market, where cash transactions are more common than credit card transactions, may require an operating cash balance that is substantial. In contrast, a manufacturing firm in a developed market may not need any operating cash. In fact, if the cash held by a firm is interest-bearing and the interest earned on the cash reflects a fair rate of return<sup>1</sup>, you would not consider that cash to be part of working capital. Instead, you would add it to the value of operating assets to value the firm.

### *Dealing with Non-operating Cash holdings*

There are two ways in which we can deal with cash and marketable securities in valuation. One is to lump them in with the operating assets and value the firm (or equity) as a whole. The other is to value the operating assets and the cash and marketable securities separately.

### *Consolidated Valuation*

Is it possible to consider cash as part of the total assets of the firm and to value it on a consolidated basis? The answer is yes and it is, in a sense, what we do when we forecast the total net income for a firm and estimate dividends and free cash flows to equity from those forecasts. The net income will then include income from investments in government securities, corporate bonds and equity investments<sup>2</sup>. While this approach has the advantage of simplicity and can be used when financial investments comprise a small

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<sup>1</sup> Note that if the cash is invested in riskless assets such as treasury bills, the riskless rate is a fair rate of return.

<sup>2</sup> Thus, if cash represents 10% of the firm value, the unlevered beta used will be a weighted average of the beta of the operating assets and the beta of cash (which is zero).

percent of the total assets, it becomes much more difficult to use when financial investments represent a larger proportion of total assets for two reasons.

- The cost of equity or capital used to discount the cash flows has to be adjusted on an ongoing basis for the cash. In specific terms, you would need to use an unlevered beta that represents a weighted average of the unlevered beta for the operating assets of the firm and the unlevered beta for the cash and marketable securities. For instance, the unlevered beta for a steel company where cash represents 10% of the value would be a weighted average of the unlevered beta for steel companies and the beta of cash (which is usually zero). If the 10% were invested in riskier securities, you would need to adjust the beta accordingly. While this can be done if you use bottom-up betas, you can see that it would be much more difficult to do if you obtain a beta from a regression.<sup>3</sup>
- As the firm grows, the proportion of income that is derived from operating assets is likely to change. When this occurs, you have to adjust the inputs to the valuation model – cash flows, growth rates and discount rates – to maintain consistency.

What will happen if you do not make these adjustments? You will tend to misvalue the financial assets. To see why, assume that you were valuing the steel company described above, with 10% of its value coming from cash. This cash is invested in government securities and earns an appropriate rate – say 5%. If this income is added on to the other income of the firm and discounted back at a cost of equity appropriate for a steel company – say 11% - the value of the cash will be discounted. A billion dollars in cash will be valued at \$800 million, for instance, because the discount rate used is incorrect.

### *Separate Valuation*

It is safer to separate cash and marketable securities from operating assets and to value them individually. We do this almost always when we use the firm valuation approaches described in the last chapter. This is because we use operating income to estimate free cash flows to the firm and operating income generally does not include

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<sup>3</sup> The unlevered beta that you can back out of a regression beta reflects the average cash balance (as a percent of firm value) over the period of the regression. Thus, if a firm maintains this ratio at a constant level, you might be able to arrive at the correct unlevered beta.

income from financial assets. If, however, this is not the case and some of the investment income has found its way into the operating income, you would need to back it out before you did the valuation. Once you value the operating assets, you can add the value of the cash and marketable securities to it to arrive at firm value.

Can this be done with the FCFE valuation models described in Chapter 14? While net income includes income from financial assets, we can still separate cash and marketable securities from operating assets, if we wanted to. To do this, we would first back out the portion of the net income that represents the income from financial investments (interest on bonds, dividends on stock) and use this adjusted net income to estimate free cash flows to equity. These free cash flows to equity would be discounted back using a cost of equity that would be estimated using a beta that reflected only the operating assets. Once the equity in the operating assets has been valued, you could add the value of cash and marketable securities to it to estimate the total value of equity.

*Illustration 16.1: Consolidated versus Separate Valuation*

To examine the effects of a cash balance on firm value, consider a firm with investments of \$1,200 million in non-cash operating assets and \$200 million in cash. For simplicity, let us assume the following.

- The non-cash operating assets have a beta of 1.00 and are expected to earn \$120 million in net income each year in perpetuity and there are no reinvestment needs.
- The cash is invested at the riskless rate, which we assume to be 4.5%.
- The market risk premium is assumed to be 5.5%

Under these conditions, we can value the equity, using both the consolidated and separate approaches.

Let us first consider the consolidated approach. Here, we will estimate a cost of equity for all of the assets (including cash) by computing a weighted average beta of the non-cash operating and cash assets.

$$\begin{aligned} &= (\text{Beta}_{\text{Non-cash assets}})(\text{Weight}_{\text{Non-cash assets}}) + (\text{Beta}_{\text{Cash assets}})(\text{Weight}_{\text{Cash assets}}) \\ \text{Beta of the firm} &= (1.00) \frac{1200}{1400} + (0.00) \frac{200}{1400} = 0.8571 \end{aligned}$$

$$\text{Cost of Equity for the firm} = 4.5\% + 0.8571 (5.5\%) = 9.21\%$$

Expected Earnings for the firm

= Net Income from operating assets + Interest income from cash

= (120 + 0.045 \* 200)

= 129 million (which is also the FCFE since there are no reinvestment needs)

$$= \frac{\text{FCFE}}{\text{Cost of equity}}$$

$$\begin{aligned} \text{Value of the equity} &= \frac{129}{0.0921} \\ &= \$1400 \text{ million} \end{aligned}$$

The equity is worth \$1,400 million.

Now, let us try to value them separately, beginning with the non-cash investments.

$$\begin{aligned} \text{Cost of Equity for non-cash investments} &= \text{Riskless rate} + \text{Beta} * \text{Risk Premium} \\ &= 4.5\% + 1.00(5.5\%) = 10\% \end{aligned}$$

Expected earnings from operating assets = \$120 million (which is the FCFE from these assets)

$$\begin{aligned} &= \frac{\text{Expected Earnings}}{\text{Cost of Equity for non - cash assets}} \\ \text{Value of non-cash assets} &= \frac{120}{0.10} \\ &= \$1,200 \text{ million} \end{aligned}$$

To this, we can add the value of the cash, which is \$ 200 million, to get a value for the equity of \$1,400 million.

To see the potential for problems with the consolidated approach, note that if you had discounted the total FCFE of \$129 million at the cost of equity of 10% (which reflects only the operating assets) you would value the firm at \$1,290 million. The loss in value of \$110 million can be traced to the mishandling of cash.

Interest income from cash = 4.5% \* 200 = \$ 9 million

If you discount the cash at 10%, you would value the cash at \$90 million instead of the correct value of \$200 million – hence the loss in value of \$ 110 million.

*Should you ever discount cash?*

In the illustration above, cash was reduced in value for the wrong reason – a riskless cash flow was discounted at a discount rate that reflects risky investments. However, there two conditions under which you might legitimately apply a discount to a cash balance.

1. The cash held by a firm is invested at a rate that is lower than the market rate, given the riskiness of the investment
2. The management is not trusted with the large cash balance because of its past track record on investments.

### *1. Cash Invested at below-market Rates*

The first and most obvious condition occurs when much or all the cash balance does not earn a market interest rate. If this is the case, holding too much cash will clearly reduce the firm's value. While most firms in the United States can invest in government bills and bonds with ease today, the options are much more limited for small businesses and for firms outside the United States. When this is the case, a large cash balance earning less than a fair return can destroy value over time.

#### *Illustration 16.2: Cash Invested at below market rates*

In Illustration 16.1, we assumed that cash was invested at the riskless rate. Assume, instead, that the firm was able to earn only 3% on its cash balance, while the riskless rate is 4.5%. The estimated value of the cash kept in the firm would then be

$$\text{Estimated value of cash invested at 3\%} = \frac{(0.03)(200)}{0.045} = 133.33$$

The value of cash that is invested at a lower rate is \$133.33 million. In this scenario, if the cash is returned to stockholders, it would yield them a surplus value of \$66.67 million. In fact, liquidating any asset that has a return less than the required return would yield the same result, as long as the entire investment can be recovered on liquidation<sup>4</sup>.

### *2. Distrust of Management:*

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<sup>4</sup> While this assumption is straight forward with cash, it is less so with real assets, where the liquidation value may reflect the poor earning power of the asset. Thus, the potential surplus from liquidation may not be as easily claimed.

While making a large investment in low-risk or no-risk marketable securities by itself is value neutral, the burgeoning cash balance can tempt managers to accept large investments or make acquisitions even if these investments earn sub-standard returns. In some cases, these actions may be taken to prevent the firm from becoming a takeover target<sup>5</sup>. To the extent that stockholders anticipate such sub-standard investments, the current value of the firm may reflect the cash at a discounted level. The discount is likely to be largest at firms with few investment opportunities and poor management and there may be no discount at all in firms with significant investment opportunities and good management.

*Illustration 16.3: Discount for Poor Investments in the Future*

Return now to the firm described in Illustration 16.1, where the cash is invested at the riskless rate of 4.5%. Normally, we would expect this firm to trade at a total value of \$1,400 million. Assume, however, that the managers of this firm have a history of poor acquisitions and that the presence of a large cash balance increases the probability from 0% to 30% that the management will try to acquire another firm. Further, assume that the market anticipates that they will overpay by \$50 million on this acquisition. The cash will then be valued at \$185 million.

Estimated Discount on Cash Balance

$$\begin{aligned}
 &= ( \text{Probability}_{\text{acquisition}} ) ( \text{Expected (Overpayment)}_{\text{acquisition}} ) \\
 &= (0.3)(\$50 \text{ million}) \\
 &= \$15 \text{ million}
 \end{aligned}$$

$$\begin{aligned}
 \text{Value of Cash} &= \text{Cash Balance} - \text{Estimated Discount} = \$ 200 \text{ million} - \$ 15 \text{ million} \\
 &= \$ 185 \text{ million}
 \end{aligned}$$

The two factors that determine this discount – the incremental likelihood of a poor investment and the expected net present value of the investment – are likely to be based upon investors’ assessments of management quality.

***Investments in Risky Securities***

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<sup>5</sup> Firms with large cash balances are attractive targets, since the cash balance reduces the cost of making the acquisition.

So far in this chapter, we have looked at how much firms should hold in the form of cash and near-cash investments. In some cases, firms invest in risky securities, which can range from investment-grade bonds to high-yield bonds to publicly traded equity in other firms. In this section, we examine the motivation, consequences and accounting for such investments.

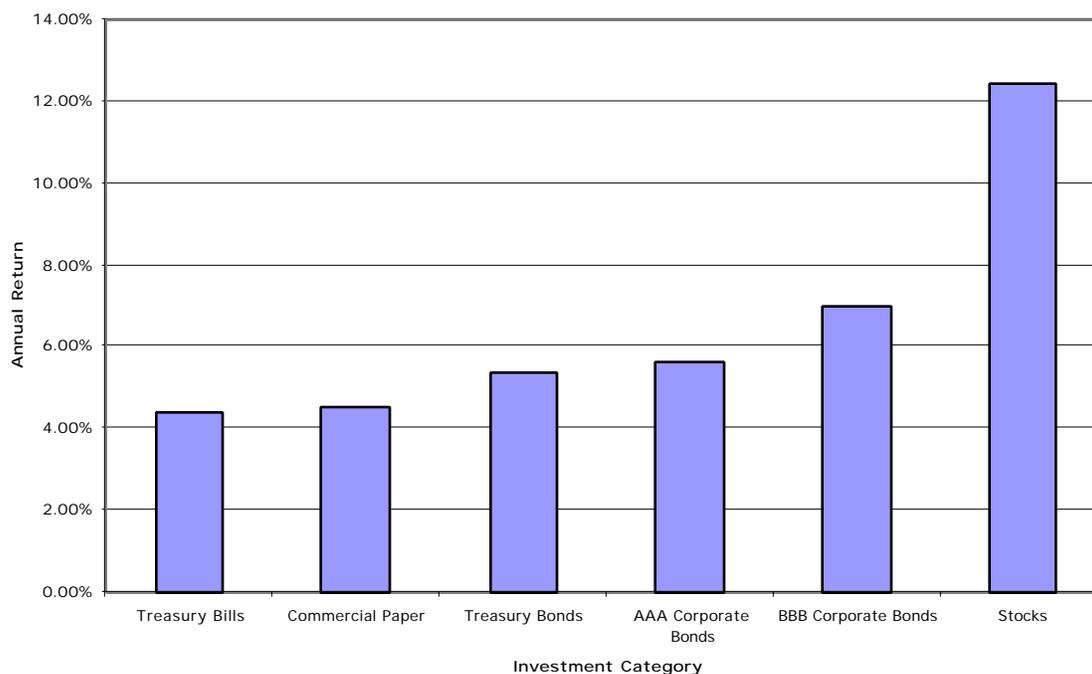
#### *Reasons for holding risky securities*

Why do firms invest in risky securities? Some firms do so for the allure of the higher returns they can expect to make investing in stocks and corporate bonds, relative to treasury bills. In recent years, there has also been a trend for firms to take equity positions in other firms to further their strategic interests. Still other firms take equity positions in firms they view as under valued by the market. And finally, investing in risky securities is part of doing business for banks, insurance companies and other financial service companies.

#### *To make a higher return*

Near-cash investments such as treasury bills and commercial paper are liquid and have little or no risk, but they also earn low returns. When firms have substantial amounts invested in marketable securities, they can expect to earn considerably higher returns by investing in riskier securities. For instance, investing in corporate bonds will yield a higher interest rate than investing in treasury bonds and the rate will increase with the riskiness of the investment. Investing in stocks will provide an even higher expected return, though not necessarily a higher actual return, than investing in corporate bonds. Figure 16.1 summarizes returns on risky investments – corporate bonds, high-yield bonds and equities – and compares them to the returns on near-cash investments between 1989-98.

Figure 16.1: Returns on Investments - 1990-2000



Source: Federal Reserve

However, while investing in riskier investments may earn a higher return for the firm, it does not make the firm more valuable. In fact, using the same reasoning that we used to analyze near-cash investments, we can conclude that investing in riskier investments and earning a fair market return (which would reward the risk) has to be value neutral.

#### *To invest in under valued securities*

A good investment is one that earns a return greater than its required return. That principle, developed in the context of investments in projects and assets, applies just as strongly to financial investments. A firm that invests in under valued stocks is accepting positive net present value investments, since the return it will make on these equity investments will exceed the cost of equity on these investments. Similarly, a firm that invests in under priced corporate bonds will also earn an excess return and a positive net present value.

How likely is it that firms will find under valued stocks and bonds to invest in? It depends upon how efficient markets are and how good the managers of the firm are at finding under valued securities. In unique cases, a firm may be more adept at finding good

investments in financial markets than it is at competing in product markets. Consider the case of Berkshire Hathaway, a firm which has been a vehicle for Warren Buffet's investing acumen over the last few decades. At the end of the second quarter of 1999, Berkshire Hathaway had \$69 billion invested in securities of other firms. Among its holdings were investments of \$12.4 billion in Coca Cola, \$6.6 billion in American Express and \$3.9 billion in Gillette. While Berkshire Hathaway also has real business interests, including ownership of a well regarded insurance company (GEICO), investors in the firm get a significant portion of their value from the firm's passive equity investments.

Notwithstanding Berkshire Hathaway's success, most firms in the United States steer away from looking for bargains among financial investments. Part of the reason for this is their realization that it is difficult to find under valued securities in financial markets. Part of the reluctance on the part of firms to make investments can be traced to a recognition that investors in firms like Proctor and Gamble and Coca Cola invest in them because of these firms' competitive advantages in product markets (brand name, marketing skills, etc.) and not for their perceived skill at picking stocks.

### *Strategic Investments*

During the 1990s, Microsoft accumulated a huge cash balance in excess of \$20 billion. It used this cash to make a series of investments in the equity of software, entertainment and internet related firms. It did so for several reasons<sup>6</sup>. First, it gave Microsoft a say in the products and services these firms were developing and pre-empted competitors from forming partnerships with the firms. Second, it allowed Microsoft to work on joint products with these firms. In 1998 alone, Microsoft announced investments in 14 firms including ShareWave, General Magic, RoadRunner and Qwest Communications. In an earlier investment in 1995, Microsoft invested in NBC to create the MSNBC network to give it a foothold in the television and entertainment business.

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<sup>6</sup> One of Microsoft's oddest investments was in one of its primary competitors, Apple Computer, early in 1998. The investment may have been intended to fight the anti-trust suit brought against Microsoft by the Justice Department.

Can strategic investments be value enhancing? As with all investments, it depends upon how much is invested and what the firm receives as benefits in return. If the side-benefits and synergies that are touted in these investments exist, investing in the equity of other firms can earn much higher returns than the hurdle rate and create value. It is clearly a much cheaper option than acquiring the entire equity of the firm.

### *Business Investments*

Some firms hold marketable securities not as discretionary investments, but because of the nature of their business. For instance, insurance companies and banks often invest in marketable securities in the course of their business, the former to cover expected liabilities on insurance claims and the latter in the course of trading. While these financial service firms have financial assets of substantial value on their balance sheets, these holdings are not comparable to those of the firms described so far. In fact, they are more akin to the raw material used by manufacturing firms than to discretionary financial investments.

### *Dealing with marketable securities in valuation*

Marketable securities can include corporate bonds, with default risk embedded in them, and traded equities, which have even more risk associated with them. As the marketable securities held by a firm become more risky, the choices on how to deal with them become more complex. You have three ways of accounting for marketable securities.

1. The simplest and most direct approach is to estimate the current market value of these marketable securities and add the value on to the value of operating assets. For firms valued on a going-concern basis, with a large number of holdings of marketable securities, this may be the only practical option.
2. The second approach is to estimate the current market value of the marketable securities and net out the effect of capital gains taxes that may be due if those securities were sold today. [NOTE: I removed this sentence because the structure is very confusing and I think everyone knows what is capital gain tax.] This is the best way of estimating value when valuing a firm on a liquidation basis.
3. The third and most difficult way of incorporating the value of marketable securities into firm value is to value the firms that issued these securities and

estimate the value of these securities. This approach tends to work best for firms that have relatively few, but large, holdings in other publicly traded firms.

*Illustration 16.4: Microsoft's cash and marketable securities*

Over the last decade, Microsoft has accumulated a huge cash balance, largely as a consequence of holding back on free cash flows to equity that could have been paid to stockholders. In June 2000, for instance, the firm reported the following holdings of near-cash investments:

*Table 16.1: Cash and Near-cash Investments: Microsoft*

	1999	2000
Cash and equivalents:		
Cash	\$635	\$849
Commercial paper	\$3,805	\$1,986
Certificates of deposit	\$522	\$1,017
U.S. government and agency securities	\$0	\$729
Corporate notes and bonds	\$0	\$265
Money market preferreds	\$13	\$0
Cash and equivalents	\$4,975	\$4,846
Short-term investments:		
Commercial paper	\$1,026	\$612
U.S. government and agency securities	\$3,592	\$7,104
Corporate notes and bonds	\$6,996	\$9,473
Municipal securities	\$247	\$1,113
Certificates of deposit	\$400	\$650
Short-term investments	\$12,261	\$18,952
<i>Cash and short-term investments</i>	<i>\$17,236</i>	<i>\$23,798</i>

When valuing Microsoft, we should clearly consider this \$24 billion investment as part of the firm's value. The interesting question is whether there should be a discount, reflecting investor's fears about poor investments in the future. Over its life, Microsoft has not been punished for holding on to cash, largely as a consequence of its impeccable track record in both delivering ever-increasing profits on the one hand and high stock returns on the other. The last two years have not been good ones for the firm, but investors will probably give the firm the benefit of the doubt at least for the near future. We would add the cash balance at face value to the value of Microsoft's operating assets.

The more interesting component is the \$17.7 billion in 2000 that Microsoft shows as investments in riskier securities. Microsoft reports the following information about these investments.

*Table 16:2: Investments in Risky Securities and Investments*

	<i>Cost Basis</i>	<i>Unrealized</i>		<i>Recorded Basis</i>
		<i>Gains</i>	<i>Losses</i>	
<i>Debt securities recorded at market:</i>				
Within one year	\$498	\$27	\$0	\$525
Between 2 and 10 years	\$388	\$11	-\$3	\$396
Between 10 and 15 years	\$774	\$14	-\$93	\$695
Beyond 15 years	\$4,745		-\$933	\$3,812
Debt securities recorded at market	\$6,406	\$52	-\$1,029	\$5,429
<i>Equities</i>				
Common stock and warrants	\$5,815	\$5,655	-\$1,697	\$9,773
Preferred stock	\$2,319			\$2,319
Other investments	\$205			\$205
Equity and other investments	\$14,745	\$5,707	-\$2,726	\$17,726

Microsoft has generated a paper profit of almost \$3 billion on its original cost of \$14.745 billion and reports a current value of \$17.726 billion. Most of these investments are traded in the market and are recorded at market value. The easiest way to deal with these investments is to add the market value on to the value of the operating assets of the firm to arrive at firm value. The most volatile item is the investment in common stock of other firms. The value of these holdings has almost doubled, as reflected in the recorded basis of \$9,773 million. Should we reflect this at current market value when we value Microsoft? The answer is generally yes. However, if these investments are overvalued, we risk building in this overvaluation into the valuation. The alternative is to value each of the equities that the firm has invested in, using a discounted cash flow model, but this will become increasingly cumbersome as the number of equity holdings increases.

In summary, then, you would add the values of both the near-cash investments of \$23.798 billion and the equity investments of \$17,726 billion to the value of the operating assets of Microsoft.

*Premiums or Discounts on Marketable Securities?*

As a general rule, you should not attach a premium or discount for marketable securities. Thus, you would add the entire value of \$17,726 million to the value of Microsoft. There is an exception to this rule, though, and it relates to firms that make it their business to buy and sell financial securities. These are the closed-end mutual funds, of which there are several hundred listed on the US stock exchanges, and investment companies, such as Fidelity and T. Rowe Price. Closed-end mutual funds sell shares to investors and use the funds to invest in financial assets. The number of shares in a closed-end fund remains fixed and the share price changes. Since the investments of a closed-end fund are in publicly traded securities, this sometimes creates a phenomenon where the market value of the shares in a closed-end fund is greater than or less than the market value of the securities owned by the fund. For these firms, it is appropriate to attach a discount or premium to the marketable securities to reflect their capacity to generate excess returns on these investments.

A closed-end mutual fund that consistently finds undervalued assets and delivers much higher returns than expected (given the risk) should be valued at a premium on the value of their marketable securities. The amount of the premium will depend upon how large the excess return is and how long you would expect the firm to continue to make these excess returns. Conversely, a closed-end fund that delivers returns that are much lower than expected should trade at a discount on the value of the marketable securities. The stockholders in this fund would clearly be better off if it were liquidated, but that may not be a viable option.

*Illustration 16.5: Valuing a closed-end fund*

The Pierce Regan Asia fund is a closed-end fund with investments in traded Asian stocks, valued at \$4 billion at today's market prices. The fund has earned a return of 13% over the last 10 years, but based upon the riskiness of its investments and the performance of the Asian market over the period, it should have earned 15%. Looking forward, your expected return for the Asian market for the future is 12%, but you expect the Pierce Regan fund to continue to underperform the market by 2%.

To estimate the discount from its net assets you would expect to see on the fund, let us begin by assuming that the fund will continue in perpetuity and earning 2% less than the return on the market index also in perpetuity.

$$\begin{aligned} &= \frac{(\text{Excess Return})(\text{Fund Value})}{\text{Expected return on the market}} \\ \text{Estimated discount} &= \frac{(0.10 - 0.12)(4000)}{0.12} \\ &= -\$667 \text{ million} \end{aligned}$$

On a percent basis, the discount represents 16.67% of the market value of the investments. [NOTE: There is a short cut: % discount =  $\frac{0.10 - 0.12}{0.12} = -16.67\%$  ]

If you assume that the fund will either be liquidated or begin earning the expected return at a point in the future – say 10 years from now – the expected discount will become smaller.

### ***Holdings in Other Firms***

In this category, you consider a broader category of non-operating assets, where you look at holdings in other companies, public as well as private. You begin by looking at the differences in accounting treatment of different holdings and how this treatment can affect the way they are reported in financial statements.

#### *Accounting Treatment*

The way in which these assets are valued depends upon the way the investment is categorized and the motive behind the investment. In general, an investment in the securities of another firm can be categorized as a minority, passive investment; a minority, active investment; or a majority, active investment, and the accounting rules vary depending upon the categorization.

#### *Minority, Passive Investments*

If the securities or assets owned in another firm represent less than 20% of the overall ownership of that firm, an investment is treated as a minority, passive investment. These investments have an acquisition value, which represents what the firm originally paid for the securities, and often a market value. Accounting principles require that these assets be sub-categorized into one of three groups - investments that will be held to

maturity, investments that are available for sale and trading investments. The valuation principles vary for each.

- For investments that will be held to maturity, the valuation is at historical cost or book value and interest or dividends from this investment are shown in the income statement.
- For investments that are available for sale, the valuation is at market value, but the unrealized gains or losses are shown as part of the equity in the balance sheet and not in the income statement. Thus, unrealized losses reduce the book value of the equity in the firm and unrealized gains increase the book value of equity.
- For trading investments, the valuation is at market value and the unrealized gains and losses are shown in the income statement.

Firms are allowed an element of discretion in the way they classify investments and, subsequently, in the way they value these assets. This classification ensures that firms such as investment banks, whose assets are primarily securities held in other firms for purposes of trading, revalue the bulk of these assets at market levels each period. This is called marking-to-market and provides one of the few instances in which market value trumps book value in accounting statements.

#### *Minority, Active Investments*

If the securities or assets owned in another firm represent between 20% and 50% of the overall ownership of that firm, an investment is treated as a minority, active investment. While these investments have an initial acquisition value, a proportional share (based upon ownership proportion) of the net income and losses made by the firm in which the investment was made is used to adjust the acquisition cost. In addition, the dividends received from the investment reduce the acquisition cost. This approach to valuing investments is called the equity approach.

The market value of these investments is not considered until the investment is liquidated, at which point the gain or loss from the sale, relative to the adjusted acquisition cost is shown as part of the earnings in that period.

### *Majority, Active Investments*

If the securities or assets owned in another firm represent more than 50% of the overall ownership of that firm, an investment is treated as a majority active investment<sup>7</sup>. In this case, the investment is no longer shown as a financial investment but is instead replaced by the assets and liabilities of the firm in which the investment was made. This approach leads to a consolidation of the balance sheets of the two firms, where the assets and liabilities of the two firms are merged and presented as one balance sheet. The share of the firm that is owned by other investors is shown as a minority interest on the liability side of the balance sheet. A similar consolidation occurs in the other financial statements of the firm as well, with the statement of cash flows reflecting the cumulated cash inflows and outflows of the combined firm. This is in contrast to the equity approach, used for minority active investments, in which only the dividends received on the investment are shown as a cash inflow in the cash flow statement.

Here again, the market value of this investment is not considered until the ownership stake is liquidated. At that point, the difference between the market price and the net value of the equity stake in the firm is treated as a gain or loss for the period.

### *Valuing Cross Holdings in other Firms*

Given that the holdings in other firms can be accounted for in three different ways, how do you deal with each type of holding in valuation? The best way to deal with each of them is exactly the same. You would value the equity in each holding separately and estimate the value of the proportional holding. This would then be added on to the value of the equity of the parent company. Thus, to value a firm with minority holdings in three other firms, you would value the equity in each of these firms, take the percent share of the equity in each and add it to the value of equity in the parent company.

When income statements are consolidated, you would first need to strip the income, assets and debt of the subsidiary from the parent company's financials before you do any of the above. If you do not do so, you will double count the value of the subsidiary.

Why, you might ask, do we not value the consolidated firm? You could, and in some cases because of the absence of information, you might have to. The reason we would suggest separate valuations is that the parent and the subsidiaries may have very different characteristics – costs of capital, growth rates and reinvestment rates. Valuing the combined firm under these circumstances may yield misleading results. There is another reason. Once you have valued the consolidated firm, you will have to subtract out the portion of the equity in the subsidiary that the parent company does not own. If you have not valued the subsidiary separately, it is not clear how you would do this. Note that the conventional practice of netting out the minority interest does not accomplish this, because minority interest reflects book rather than market value.

As a firm's holdings become more numerous, estimating the values of the holdings will become more onerous. If the holdings are publicly traded, substituting in the market values of the holdings for estimated value is an alternative worth exploring. While you risk building into your valuation any mistakes the market might be making in valuing these holdings, this approach is more time efficient.

### **Estimating the Value of Holdings in Private Companies**

When a publicly traded firm has a cross holding in a private company, it is often difficult to obtain information on the private company and to value it. Consequently, you might have to make your best estimate of how much this holding is worth, with the limited information that you have available. One way to do this is to estimate the multiple of book value at which firms in the same business (as the private business in which you have holdings) typically trade at and apply this multiple to the book value of the holding in the private business. . Assume for instance that you are trying to estimate the value of the holdings of a pharmaceutical firm in 5 privately held biotechnology firms, and that these holdings collectively have a book value of \$ 50 million. If biotechnology firms typically trade at 10 times book value, the estimated market value of these holdings would be \$ 500 million.

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<sup>7</sup> Firms have evaded the requirements of consolidation by keeping their share of ownership in other firms below 50%.

In fact, this approach can be generalized to estimate the value of complex holdings, where you lack the information to estimate the value for each holding or if there are too many such holdings. For example, you could be valuing a Japanese firm with dozens of cross holdings. You could estimate a value for the cross holdings by applying a multiple of book value to their cumulative book value.

*Illustration 16.6: Valuing Holdings in other company*

Segovia Entertainment is an entertainment firm that operates in a wide range of entertainment businesses. The firm reported \$300 million in operating income (EBIT) on capital invested of \$1,500 million in the current year; the total debt outstanding is \$500 million. A portion of the operating income (\$100 million), capital invested (\$400 million) and debt outstanding (\$150 million) represent Segovia's holdings in Seville Television, a television station owner. Segovia owns only 51% of Seville and Seville's financials are consolidated with Segovia.<sup>8</sup> In addition, Segovia owns 15% of LatinWorks, a record and CD company. These holdings have been categorized as minority passive investments and the dividends from the investment are shown as part of Segovia's net income but not as part of its operating income. LatinWorks reported operating income of \$75 million on capital invested of \$250 million in the current year; the firm has \$ 100 million in debt outstanding. We will assume the following:

- The cost of capital for Segovia Entertainment, without considering either its holdings in either Seville or LatinWorks, is 10%. The firm is in stable growth, with operating income (again not counting the holdings) growing 5% a year in perpetuity.
- Seville Television has a cost of capital of 9% and it is also in stable growth, with operating income growing 5% a year in perpetuity
- LatinWorks has a cost of capital of 12% and it is in stable growth, with operating income growing 4.5% a year in perpetuity.
- None of the firms has a significant balance of cash and marketable securities

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<sup>8</sup> Consolidation in the U.S. requires that you consider 100% of the subsidiary, even if you own less. There are other markets in the world where consolidation requires only that you consider the portion of the firm that you own.

- The tax rate for all of these firms is 40%.

We can value Segovia Entertainment in three steps:

1. Value the equity in the operating assets of Segovia, without counting any of the holdings. To do this, we first have to cleanse the operating income of the consolidation.

Operating income from Segovia's operating assets = \$ 300 - \$ 100 = \$ 200 million

Capital invested in Segovia's operating assets = \$1500 - \$ 400 = \$ 1100 million

Debt in Segovia's operating assets = \$ 500 - \$ 150 = \$ 350 million

Return on capital invested in Segovia's operating assets =  $\frac{200(1-0.4)}{1100} = 10.91\%$

Reinvestment rate =  $\frac{g}{\text{ROC}} = \frac{5\%}{10.91\%} = 45.83\%$

$$= \frac{\text{EBIT}(1-t)(1-\text{Reinvestment rate})(1+g)}{\text{Cost of capital} - g}$$

Value of Segovia's operating assets =  $\frac{200(1-0.4)(1-0.4583)(1.05)}{0.10-0.05}$   
= \$1,365 million

Value of equity = Value of operating assets - Value of debt  
= 1365 - 350 = \$1,015 million

2. Value the 51% of equity in Seville Enterprises.

Operating income from Seville's operating assets = \$ 100 million

Capital invested in Seville's operating assets = \$ 400 million

Debt invested in Seville = \$ 150 million

Return on capital invested in Seville's operating assets =  $\frac{100(1-0.4)}{400} = 15\%$

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

$$\begin{aligned} &= \frac{\text{EBIT}(1-t)(1-\text{Reinvestment rate})(1+g)}{\text{Cost of capital} - g} \\ \text{Value of Seville's operating assets} &= \frac{100(1-0.4)(1-0.3333)(1.05)}{0.09-0.05} \\ &= \$1,050 \text{ million} \end{aligned}$$

$$\begin{aligned} \text{Value of Seville's equity} &= \text{Value of operating assets} - \text{Value of debt} \\ &= 1050 - 150 = \$900 \text{ million} \end{aligned}$$

$$\text{Value of Segovia's equity stake in Seville} = 0.51 (900) = \$ 459 \text{ million}$$

### 3. Value the 15% stake in LatinWorks

$$\text{Operating income from LatinWorks's operating assets} = \$ 75 \text{ million}$$

$$\text{Capital invested in LatinWorks's operating assets} = \$ 250 \text{ million}$$

$$\text{Return on capital invested in LatinWorks's operating assets} = \frac{75(1-0.4)}{250} = 18\%$$

$$\text{Reinvestment rate} = \frac{g}{\text{ROC}} = \frac{4.5\%}{18\%} = 25\%$$

$$\begin{aligned} &= \frac{\text{EBIT}(1-t)(1-\text{Reinvestment rate})(1+g)}{\text{Cost of capital} - g} \\ \text{Value of LatinWorks's operating assets} &= \frac{75(1-0.4)(1-0.25)(1.045)}{0.12-0.045} \\ &= \$470.25 \text{ million} \end{aligned}$$

$$\begin{aligned} \text{Value of LatinWork's's equity} &= \text{Value of operating assets} - \text{Value of debt} \\ &= 470.25 - 100 = \$370.25 \text{ million} \end{aligned}$$

$$\text{Value of Segovia's equity stake in LatinWorks} = 0.15 (370.25) = \$ 55 \text{ million}$$

The value of Segovia as a firm can now be computed (assuming that it has no cash balance).

$$\begin{aligned} \text{Value of equity in Segovia} &= \text{Value of equity in Segovia} + 51\% \text{ of equity in Seville} + 15\% \text{ of equity in LatinWorks} \\ &= \$1,015 + \$459 + \$55 = \$1,529 \text{ million} \end{aligned}$$

To provide a contrast, consider what would have happened if we had used the consolidated income statement and Segovia's cost of capital to do this valuation. We would have valued Segovia and Seville together.

$$\text{Operating income from Segovia's consolidated assets} = \$ 300 \text{ million}$$

$$\text{Capital invested in Segovia's consolidated assets} = \$1,500 \text{ million}$$

Consolidated Debt = \$ 500 million

$$\text{Return on capital invested in Segovia's operating assets} = \frac{300(1 - 0.4)}{1500} = 12\%$$

$$\text{Reinvestment rate} = \frac{g}{\text{ROC}} = \frac{5\%}{12\%} = 41.67\%$$

$$\begin{aligned} \text{Value of Segovia's operating assets} &= \frac{\text{EBIT}(1 - t)(1 - \text{Reinvestment rate})(1 + g)}{\text{Cost of capital} - g} \\ &= \frac{300(1 - 0.4)(1 - 0.4167)(1.05)}{0.10 - 0.05} \\ &= \$2,205 \text{ million} \end{aligned}$$

Value of equity in Segovia:

$$\begin{aligned} &= \text{Value of operating assets} - \text{Consolidated debt} - \text{Minority Interests in Seville} + \\ &\text{Minority interest in LatinWorks} \\ &= 2205 - 500 - 122.5 + 22.5 = \$1,605 \text{ million} \end{aligned}$$

Note that the minority interests in Seville are computed as 49% of the book value of equity at Seville.

$$\begin{aligned} \text{Book Value of Equity in Seville} &= \text{Capital invested in Seville} - \text{Seville's debt} \\ &= 400 - 150 = 250 \end{aligned}$$

$$\begin{aligned} \text{Minority interest} &= (1 - \text{Parent company holding}) \text{ Book value of equity} \\ &= (1 - 0.51) 250 = \$122.5 \text{ million} \end{aligned}$$

The minority interests in LatinWorks are computed as 15% of the book value of equity in LatinWorks which is \$250 million (Capital invested – Debt outstanding). It would be pure chance if the value from this approach were equal to the true value of equity, estimated above, of \$1,529 million.

You can see from the discussion of how best to value holdings in other firms that you need a substantial amount of information to value holdings correctly. This information may be difficult to come by when the holdings are in private companies.

### **The Value of Transparency**

The difficulty we often face in identifying and valuing holdings in other companies highlights a cost faced by firms that have complicated cross-holding structures and that make little or no effort to explain what they own to investors. In fact, many companies

seem to have adopted a strategy of making it difficult for their own stockholders to see what they own, lest they be questioned about the wisdom of their choices. Not surprisingly, the values of these firms often understate the value of these hidden holdings.

Many firms outside the United States use, as an excuse, the argument that the disclosure laws are not as strict in their countries as they are in the United States; but disclosure laws provide a floor for information that has to be revealed to markets and not a ceiling. For instance, InfoSys, an Indian software company has one of the most informative financial reports of any company anywhere in the world. In fact, the firm has reaped substantial financial rewards because of its openness, as investors are better able to gauge how the firm is doing and tend to be much more willing to listen to management views.

So, what can firms that find themselves in these straits do to improve their value? First, they can break down complicated holdings structures that impede understanding and valuation. Second, they can adopt a strategy of revealing as much as they can to investors about their holdings – private as well as public. Third, they need to stick with this strategy when they have bad news to report. A firm that is generous with positive information and stingy with negative information will rapidly lose credibility as an information source.

### *Other Non-Operating Assets*

Firms can have other non-operating assets, but they are likely to be of less importance than those listed above. In particular, firms can have unutilized assets that do not generate cash flows and have book values that bear little resemblance to market values. An example would be prime real estate holdings that have appreciated significantly in value since the firm acquired them, but produce little if any cash flows. An open question also remains about overfunded pension plans. Do the excess funds belong to stockholders and, if so, how do you incorporate the effect into value?

### *Unutilized Assets*

The strength of discounted cash flow models is that they estimate the value of assets based upon expected cash flows that these assets generate. In some cases, however,

this can lead to assets of substantial value being ignored in the final valuation. For instance, assume that a firm owns a plot of land that has not been developed and that the book value of the land reflects its original acquisition price. The land obviously has significant market value but does not generate any cash flow for the firm yet. If a conscious effort is not made to bring the expected cash flows from developing the land into the valuation, the value of the land will be left out of the final estimate.

How do you reflect the value of such assets in firm value? An inventory of all such assets (or at least the most valuable ones) is a first step, followed up by estimates of market value for each of the assets. These estimates can be obtained by looking at what the assets would fetch in the market today or by projecting the cash flows that could be generated if the assets were developed and discounting the cash flows at the appropriate discount rate.

The problem with incorporating unutilized assets into firm value is an informational one. Firms do not reveal their unutilized assets as part of their financial statements. While it may sometimes be possible to find out about such assets as investors or analysts, it is far more likely that they will be uncovered only when you have access to information about what the firm owns and uses.

### *Pension Fund Assets*

Firms with defined pension liabilities sometimes accumulate pension fund assets in excess of these liabilities. While the excess does belong to stockholders, they usually face a tax liability if they claim it. The conservative rule in dealing with overfunded pension plans would be to assume that the social and tax costs of reclaiming the excess funds are so large that few firms would ever even attempt to do it. The more realistic approach would be to add the after-tax portion of the excess funds into the valuation.

As an illustration, consider a firm that reports pension fund assets that exceed its liabilities by \$ 1 billion. Since a firm that withdraws excess assets from a pension fund is taxed at 50% on these withdrawals (in the United States), you would add \$ 500 million to the estimated value of the operating assets of the firm. This would reflect the 50% of the excess assets that the firm will be left with after paying the taxes.*cash.xls*: There is a

dataset on the web that summarizes the value of cash and marketable securities by industry group in the United States for the most recent quarter.

### **Firm Value and Equity Value**

Once you have estimates of the values of the operating assets, cash and marketable securities and the other non-operating assets owned by a firm, you can estimate the value of the firm as the sum of the three components. To get to the value of the equity from the firm value, you subtract out the non-equity claims on the firm. Non-equity claims would include debt and preferred stock, though the latter are often treated as equity in financial statements. What debt should you subtract out and should you subtract out future debt issues? We will consider these questions now.

#### ***What non-equity claims should be subtracted out?***

The general rule that you should use is that the debt you subtract from the value of the firm should be at least equal to the debt that you use to compute the cost of capital. Thus, if you decide to capitalize operating leases as debt, as we did with the Gap in the last chapter, to compute the cost of capital, you should subtract out the debt value of operating leases from the value of operating assets to estimate the value of equity. If the firm you are valuing has preferred stock, you would use the market value of the stock (if it is traded) or estimate a market value<sup>9</sup> (if it is not) and deduct it from firm value to get to the value of common equity.

There may be other claims on the firm that do not show up in debt that you should subtract out from firm value.

- *Expected liabilities on lawsuits:* You could be analyzing a firm that is the defendant in a lawsuit, where it potentially could have to pay tens of millions of dollars in damages. You should estimate the probability that this will occur and use this probability to estimate the expected liability. Thus, if there is a 10% chance that

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<sup>9</sup> Estimating market value for preferred stock is relatively simple. Preferred stock generally is perpetual and the estimated market value of the preferred stock is therefore:

$$\text{Value of preferred stock} = \frac{\text{Preferred Dividend}}{\text{Cost of preferred stock}}$$

you could lose a case that you are defending and the expected damage award is \$1 billion, you would reduce the value of the firm by \$100 million (probability \* expected damages). If the expected liability is not anticipated until several years from now, you would compute the present value of the payment.

- *Unfunded Pension and Health Care Obligations:* If a firm has significantly underfunded a pension or a health plan, it will need to set aside cash in future years to meet these obligations. While it would not be considered debt for cost of capital purposes, it should be subtracted from firm value to arrive at equity value.
- *Deferred Tax Liability:* The deferred tax liability that shows up on the financial statements of many firms reflects the fact that firms often use tax deferral strategies that reduce their taxes in the current year while increasing their taxes in the future years. Of the three items listed here, this one is the least clearly defined, since it is not clear when or even whether the obligation will come due. Ignoring it, though, may be foolhardy, since the firm could find itself making these tax payments in the future. The most sensible way of dealing with this item is to consider it an obligation, but one that will come due only when the firm's growth rate moderates. Thus, if you expect your firm to be in stable growth in 10 years, you would discount the deferred tax liability back ten years and deduct this amount from the firm value to get to equity value.

### ***What about future claims?***

As you forecast earnings growth for your firm, you generally also assume that the firm will increase its debt as it grows. A question that arises then is whether you should be subtracting out the value of these future debt issues when estimating equity value today. The answer is no, since the value of the equity is a current value and these future claims do not exist today. To illustrate, assume that you have a firm with no debt today and that you assume that it will have a 30% debt ratio in stable growth. Assume further that your estimate of the terminal value for this firm is \$10 billion in 5 years. You are implicitly assuming that your firm will borrow \$3 billion in 5 years to raise its debt ratio

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The cost of preferred stock should be higher than the pre-tax cost of debt, since debt has a prior claim on the cash flows and assets of the firm.

to 30%. This higher debt ratio may affect your firm value today, but the value of equity today is the firm value less the current debt.

### **Management and Employee Options**

Firms use options to reward managers as well as other employees. There are two effects that these options have on value per share. One is created by options that have already been granted. These options, most of which have exercise prices well below the stock price, reduce the value of equity per share, since a portion of the existing equity in the firm has to be set aside to meet these eventual option exercises. The other is the likelihood that these firms will use options on a continuing basis to reward employees or to compensate them. These expected option grants reduce the portion of the expected future cash flows that accrue to existing stockholders.

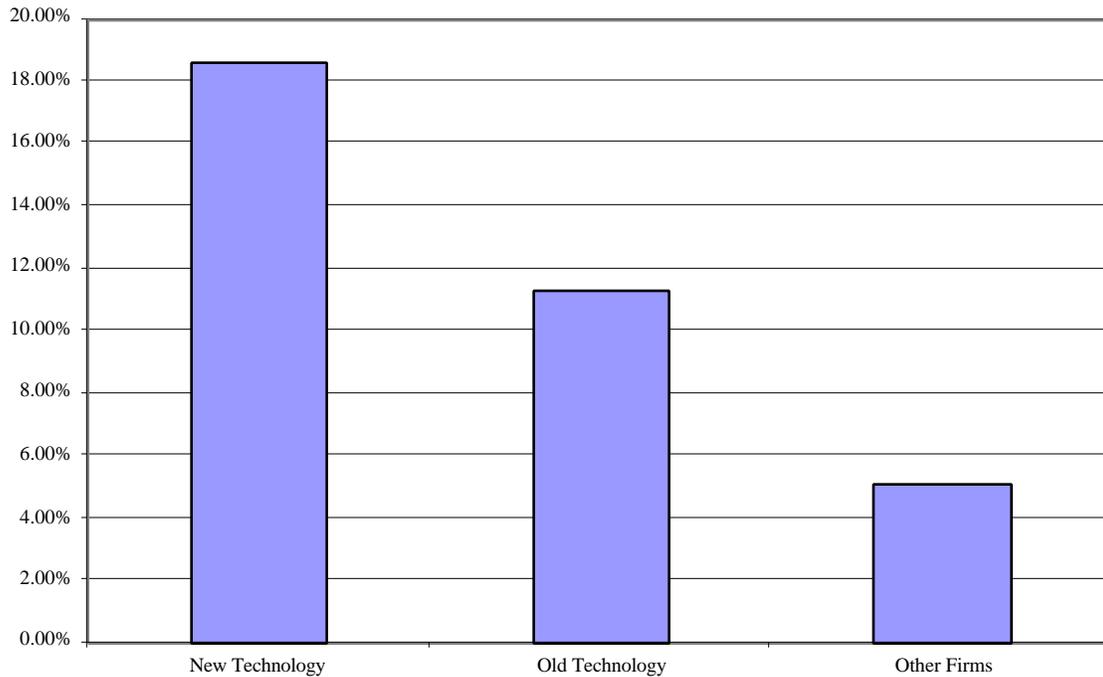
### ***The Magnitude of the Option Overhang***

The use of options in management compensation packages is not new to firms. Many firms in the 1970s and 1980s initiated option-based compensation packages to induce top managers to think like stockholders in their decision making. In most cases, though, the drain on value created by these options was small enough that you could ignore it and not affect the value per share substantially. In the last decade, however, the surge in both the number and the value of technology firms has highlighted the importance of dealing with these options in valuation.

What is different about technology firms? One is that management contracts at these firms are much more heavily weighted towards options than are those at other firms. The second is that the paucity of cash at these firms has meant that options are granted not just to top managers but to employees all through the organization, making the total option grants much larger. The third is that some of the smaller firms have used options to meet operating expenses and pay for supplies.

Figure 16.2 summarizes the number of options outstanding as a percent of outstanding stock at technology firms and compares them to options outstanding at non-technology firms.

Figure 16.2: Options as % of outstanding stock



As Figure 16.2 makes clear, the overhang is larger for younger new technology firms.

### *Characteristics of Option Grants*

Firms that use employee options usually restrict when and whether these options can be exercised. It is standard, for instance, that the options granted to an employee cannot be exercised until they are vested. For this to occur, the employee usually has to remain for a period that is specified with the contract. While firms do this to keep employee turnover low, it also has implications for option valuation that are examined later. Firms that issue options do not face any tax consequences in the year in which they make the issue. When the options are exercised, however, they are allowed to treat the difference between the stock price and the exercise price as an employee expense. This tax deductibility also has implications for option value.

### *Options in Existence*

Given the large number of options outstanding at many technology firms, your first task is to consider ways in which you can incorporate their effect into value per share. The section begins by presenting the argument for why these outstanding options

matter when computing value per share and then considering four ways in which you can incorporate their effect on value.

*Why they affect value per share?*

Why do existing options affect value per share? Note that not all options do. In fact, options issued and listed by the options exchanges have no effect on the value per share of the firms on which they are issued. The options issued by firms do have an effect on value per share, since there is a chance that they will be exercised in the near or far future. Given that these options offer the right to individuals to buy stock at a fixed price, they will be exercised only if the stock price rises above that exercise price. When they are exercised, the firm has two choices, both of which have negative consequences for existing stockholders. It can issue additional shares to cover the option exercise. But this increases the number of shares outstanding and reduces the value per share to existing stockholders.<sup>10</sup> Alternatively, it can use cashflows from operations to buy back shares in the open market and use these shares to meet the option exercise. This reduces the cash flows available to current equity investors in future periods and makes their equity less valuable today.

*Ways of Incorporating existing options into value*

There are four approaches that are used to incorporate the effect of options that are already outstanding into the value per share. However, the first three approaches can lead to misleading estimates of value.

*I. Use fully diluted number of shares to estimate per-share value*

The simplest way to incorporate the effect of outstanding options on value per share is to divide the value of equity by the number of shares that will be outstanding if all options are exercised today – the fully diluted number of shares. While this approach has

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<sup>10</sup> This would be dilution in the true sense of the word, rather than the term that is used to describe any increase in the number of shares outstanding. The reason there is dilution is the additional shares are issued only to the option holders at a price below the current price. In contrast, the dilution that occurs in a rights issue where every stockholder gets the right to buy additional shares at a lower price is value neutral. The shares will trade at a lower price but everyone will have more shares outstanding.

the virtue of simplicity, it will lead to too low of an estimate of value per share for two reasons.

- It considers all options outstanding, not just the ones that are in the money and vested. To be fair, there are variants of this approach where the shares outstanding are adjusted to reflect only in-the-money and vested options.
- It does not incorporate the expected proceeds from exercise, which will comprise a cash inflow to the firm.

Finally, this approach does not take into consideration the time premium of the options into the valuation.

*Illustration 16.7: Fully Diluted Approach to estimating Value per Share: Commerce One*

Commerce One, as a young and fast-growing B2B business, used options liberally in the period 1996 to 2000 to compensate employees. Table 16.3 summarizes the options granted, exercised and canceled each year and also provides information on the total number of options outstanding at the firm at the end of each of these years.

*Table 16.3: Options Granted, Exercised and Canceled: Commerce One (in '000s)*

	Granted	Exercised	Canceled	Outstanding
1998	7336	462	1338	11334
1999	26288	7431	2995	17195
2000	29023	8033	2275	45911

At the end of 2000, Commerce One had options on 45.911 million shares outstanding, with a wide range of exercise prices and expiration dates. Table 16.4 summarizes the details of these options.

*Table 16.4: Details of Options outstanding: Commerce One*

<i>Exercise Price Range</i>	<i>Number of options</i>	<i>Remaining life</i>	<i>Average exercise price</i>	<i>Exercisable &amp; Vested</i>	<i>Average Exercise price</i>
\$ 0.00 - \$ 0.40	4,771,451	7.26	\$0.19	1,889,590	\$0.13
\$ 0.67 - \$ 3.50	7,414,524	8.38	\$2.33	1,672,662	\$2.32
\$ 4.71 - \$ 24.61	5,498,253	8.75	\$15.42	1,036,632	\$14.07
\$25.31 - \$	2,746,602	9.73	\$27.88	274,724	\$27.56

28.81					
\$30.00 - \$ 33.00	4,851,300	9.29	\$32.70	1,053,513	\$32.80
\$34.17 - \$ 54.69	5,032,969	9.38	\$42.75	631,181	\$42.48
\$54.88 - \$ 62.81	7,926,752	9.39	\$59.75	919,951	\$56.86
\$64.19 - \$ 75.07	5,000,268	9.36	\$72.12	837,853	\$73.15
\$78.50 - \$101.81	2,103,829	9.2	\$86.94	387,099	\$89.94
\$104.44	565,275	9.16	\$104.44	117,755	\$104.44
Total	45,911,223	8.92	\$35.49	8,820,960	\$28.16

For the number of options, the total for remaining life and average exercise price is the weighted average. For the exercisable and vested options, the total for average exercise price is the weighted average.

To apply the fully diluted approach to estimate the per share value, we first estimated the total value of equity for Commerce One using a discounted cash flow model. The value we obtained was \$4,941 million<sup>11</sup>. At the end of 2000, Commerce One had 228.32 million shares outstanding. To estimate the value of equity per share, we use the total number of shares that would be outstanding if all options were exercised.

$$\begin{aligned} &= \frac{\text{Value of Equity}}{\text{Shares outstanding} + \text{Shares in options}} \\ \text{Value of Equity per share} &= \frac{4941}{228.32 + 45.911} \\ &= \$18.02 \end{aligned}$$

Note, though, that some of these options are not vested or exercisable. If we considered only exercisable options, we would estimate a value of equity per share that is higher.

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<sup>11</sup> The details of this valuation are in Chapter 23.

$$\begin{aligned}
 &= \frac{\text{Value of Equity}}{\text{Shares outstanding} + \text{Exercisable options}} \\
 \text{Value of Equity per share} &= \frac{4941}{228.32 + 8.821} \\
 &= \$20.84
 \end{aligned}$$

## *II. Estimate expected option exercises in the future and build in expected dilution*

In this approach, you forecast when in the future options will be exercised and build in the expected cash outflows associated with the exercise by assuming that the firm will go out and buy back stock to cover the exercise. The biggest limitation of this approach is that it requires estimates of what the stock price will be in the future and when options will be exercised on the stock. Given that your objective is to examine whether the price today is correct, forecasting future prices to estimate the current value per share seems circular. In general, this approach is neither practical nor is it particularly useful in coming up with reasonable estimates of value.

## *III. Treasury Stock Approach*

This approach is a variant of the fully diluted approach. Here, the number of shares is adjusted to reflect options that are outstanding, but the expected proceeds from the exercise (exercise price \* number of options) are added to the value of equity. Similar to the fully diluted approach, this approach does not consider the time premium on the options and there is no effective way of dealing with vesting. Generally, this approach, by under estimating the value of options granted, will over estimate the value of equity per share.

The biggest advantage of this approach is that it does not require a value per share (or stock price) to incorporate the option value into per-share value. As you will see with the last (and recommended) approach, there is a circularity that is created when the stock price is used in estimating value per share.

### *Illustration 16.8: Treasury Stock Approach: Commerce One*

To estimate the value per share with the treasury stock approach for Commerce One, we consider the expected proceeds for the exercise of the options today. To

simplify calculations, we use the total number of options outstanding and the weighted average exercise price from Table 16.4.

$$\begin{aligned}
 & \text{Expected proceeds from option exercise} \\
 &= (\text{Number of options})(\text{Weighted Exercise price}) \\
 &= (45.911)(35.49) \\
 &= \$1,629 \text{ million}
 \end{aligned}$$

We add the expected proceeds from option exercise to the value of equity that we estimated for Commerce One and then divide by the total number of shares outstanding to estimate the value of equity per share:

$$\begin{aligned}
 &= \frac{\text{Value of Equity} + \text{Expected Proceeds}}{\text{Shares outstanding} + \text{Shares underlying options}} \\
 \text{Value per share} &= \frac{4941 + 1629}{228.32 + 45.911} \\
 &= \$23.96
 \end{aligned}$$

Here again, we could have used the modified approach of looking only at in-the-money options.

$$\begin{aligned}
 & \text{Expected proceeds from option exercise} \\
 &= (\text{Number of exercisable options})(\text{Weighted Exercise price}) \\
 &= (8.821)(28.16) \\
 &= \$248 \text{ million}
 \end{aligned}$$

$$\begin{aligned}
 &= \frac{\text{Value of Equity} + \text{Expected Proceeds from in -the -money options}}{\text{Shares outstanding} + \text{Exercisable options}} \\
 \text{Value per share} &= \frac{4941 + 248}{228.32 + 8.821} \\
 &= \$21.88
 \end{aligned}$$

Note that the value per share using this approach is higher than the value per share using the fully diluted approach. The difference is greatest when options have a higher exercise price relative to the current stock price. The estimated value per share still ignores the time premium of the options.

#### *IV. Value Options using option pricing model*

The correct approach to dealing with options is to estimate the value of the options today, given today's value per share and the time premium on the option. Once this value has been estimated, it is subtracted from the equity value and divided by the number of shares outstanding to arrive at value per share.

$$\text{Value of Equity per share} = \frac{\text{Value of Equity} - \text{Value of Options outstanding}}{\text{Primary number of shares outstanding}}$$

In valuing these options, however, there are four measurement issues that you have to confront. One relates to the fact that not all of the options outstanding are vested, and that some of the non-vested options might never be vested. The second relates to the stock price to use in valuing these options. As the description in the last paragraph, the value per share is an input to the process as well as the output. The third issue is taxation. Since firms are allowed to deduct a portion of the expense associated with option exercises, there may be a potential tax saving when the options are exercised. The final issue relates to private firms or firms on the verge of a public offering, like Rediff.com. Key inputs to the option pricing model, including the stock price and the variance, cannot be obtained for these firms, but the options have to be valued nevertheless.

### *Dealing with Vesting*

As noted earlier in the chapter, firms granting employee options usually require that the employee receiving the options stay with the firm for a specified period for the option to be vested. Consequently, when you examine the options outstanding at a firm, you are looking at a mix of vested and non-vested options. The non-vested options should be worth less than the vested options, but the probability of vesting will depend upon how in-the-money the options are and the period left for an employee to vest. While there have been attempts<sup>12</sup> to develop option pricing models that allow for the possibility that employees may leave a firm before vesting and forfeit the value of their options, the likelihood of such an occurrence when a manager's holdings are substantial should be small. Carpenter (1998) developed a simple extension of the standard option

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<sup>12</sup> Cuny and Jorion (1995) examine the valuation of options when there is the possibility of forfeiture.

pricing model to allow for early exercise and forfeiture and used it to value executive options.

*Which stock price?*

The answer to this question may seem obvious. Since the stock is traded and you can obtain a stock price, it would seem that you should be using the current stock price to value options. However, you are valuing these options to arrive at a value per share that you will then compare to the market price to decide whether a stock is under or over valued. Thus, using the current market price to arrive at the value of the options and then using this option value to estimate an entirely different value per share seems inconsistent.

There is a solution. You can value the options using the estimated value per share. This creates circular reasoning in your valuation. In other words, you need the option value to estimate value per share and value per share to estimate the option value. We would recommend that the value per share be initially estimated using the treasury stock approach and that you then converge on the proper value per share by iteration.<sup>13</sup>

There is another related issue. When options are exercised, they increase the number of shares outstanding and, by doing so, there can have an effect on the stock price. In conventional option pricing models, the exercise of the option does not affect the stock price. These models have to be adapted to allow for the dilutive effect of option exercise. This can be done fairly simply by adjusting the current stock price for the expected effects of dilution.

*Taxation*

When options are exercised, the firm can deduct the difference between the stock price at the time and the exercise price as an employee expense for tax purposes. This potential tax benefit reduces the drain on value created by having options outstanding. One way in which you could estimate the tax benefit is to multiply the difference between the stock price today and the exercise price by the tax rate; clearly, this would make sense only if the options are in-the-money. While this does not allow for the

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<sup>13</sup> The value per share, obtained using the treasury stock approach, will become the stock price in the option pricing model. The option value that results from using this price is used to compute a new value per share which is fed back into the option pricing model and so on.

expected price appreciation over time, it has the benefit of simplicity. An alternative way of estimating the tax benefit is to compute the after-tax value of the options.

After-tax Value of Options = Value from option pricing model (1- tax rate)

This approach is also straightforward and allows you to consider the tax benefits from option exercise in valuation. One of the advantages of this approach is that it can be used to consider the potential tax benefit even when options are out of the money.

#### *Non-traded Firms*

A couple of key inputs to the option pricing model – the current price per share and the variance in stock prices – cannot be obtained if a firm is not publicly traded. There are two choices in this scenario for the current share price. One is to revert to the treasury stock approach to estimate the value of the options outstanding and abandon the option pricing models. The other is to stay with the option pricing models and to estimate the value per share, from the discounted cash flow model. The variance of similar firms that are publicly traded can be used to estimate the value of the options.

#### *Illustration 16.9: Option Value Approach: Commerce One*

We use an option pricing model and adjust for dilution to value all outstanding options at Commerce One. To estimate the value of the options, we first estimate the standard deviation in stock prices<sup>14</sup> over the previous 2 years. Weekly returns are used to make this estimate and this estimate is annualized<sup>15</sup>. All options, vested as well as non-vested, are valued and there is no adjustment for non-vesting.

*Table 16.5: Inputs to the Black-Scholes Model: Commerce One Options*

Current stock price = \$8.28
Weighted average exercise price per option = \$35.49
Weighted average maturity of options = 8.92 years
Standard deviation in stock price = 135%
Riskless rate = 5.40%

<sup>14</sup> The variance estimate is actually on the natural log of the stock prices. This allows you to cling to at least the possibility of a normal distribution. Neither stock prices nor stock returns can be normally distributed since prices cannot fall below zero and returns cannot be lower than -100%.

<sup>15</sup> All of the inputs to the Black Scholes model have to be in annual terms. To annualize a weekly variance, you multiply it by 52.

Number of options outstanding = 45.911  
 Number of shares outstanding = 228.32  
 Value of options outstanding = \$349 million  
 After-tax value of options outstanding =  $349(1 - 0.35) = \$227$  million

In estimating the after-tax value of the options at Commerce One, we have used their prospective marginal tax rate of 35%. If the options are exercised prior to these firms reaching their marginal tax rates, the tax benefit is lower since the expenses are carried forward and offset against income in future periods.

The value per share can now be computed by subtracting the value of the options outstanding from the value of equity and dividing by the primary number of shares outstanding. Again, using Commerce One, we estimate a value for equity per share.

$$\begin{aligned} \text{Value of equity per share} &= \frac{\text{Value of Equity} - \text{Value of options outstanding}}{\text{Number of shares outstanding}} \\ &= \frac{4941 - 227}{228.32} = \$ 20.65 \text{ per share} \end{aligned}$$

The inconsistency averred to earlier is clear when you compare the value per share that is estimated here (\$20.65) to the price per share (\$8.28) that we used to estimate the value of the options. For instance, Commerce One's value per share is \$20.65, whereas the price per share used in the option valuation is \$8.28. If you choose to iterate, you would revalue the options using the estimated value of \$20.65, which would increase the value of the options and decrease the value per share, leading to a second iteration and a third one and so on. The values converge to yield a consistent estimate.

Estimated value of options with estimated value per share = \$543 million

$$\begin{aligned} \text{Value per share} &= \frac{\text{Value of Equity} - \text{Value of options outstanding}}{\text{Number of shares outstanding}} \\ &= \frac{4941 - 835(1 - 0.35)}{228.32} = \$19.26 \text{ per share} \end{aligned}$$

The options are also valued using the same value per share.

### **The Repricing of Options: Effects on Value**

In recent years, firms that have seen their stock price drop have often reset their exercise prices on options closer to the market price to make them more attractive to

management. This practice is obviously hazardous to stockholders since it increases the value of the option overhang. In fact, if this practice is egregious at a firm, you should value the options with an exercise price of zero which would make them each worth as much as a regular share. In effect, the fully diluted estimate of value per share will be the value you get even if you used the option pricing model.

### ***Future Option Grants***

While incorporating options that are already outstanding is fairly straightforward, incorporating the effects of future option grants is much more complicated. In this section, the argument for why these option issues affect value is presented and how to incorporate these effects into value.

#### *Why future options issues affect value*

Just as options outstanding currently represent potential dilution or cash outflows to existing equity investors, expected option grants in the future will affect value per share by increasing the number of shares outstanding in future periods. The simplest way of thinking about this expected dilution is to consider the terminal value in the discounted cash flow model. As constructed in the last chapter, the terminal value is discounted to the present and divided by the shares outstanding today to arrive at the value per share. However, expected option issues in the future will increase the number of shares outstanding in the terminal year and therefore reduce the portion of the terminal value that belongs to existing equity investors.

#### *Ways of Incorporating Effect into Value per Share*

It is much more difficult to incorporate the effect of expected option issues into value than existing options outstanding. This is because you have to forecast not only how many options will be issued by a firm in future periods, but also what the terms of these options will be. While this may be possible for a couple of periods with proprietary information (the firm lets you know how much it plans to issue and at what terms), it will become more difficult in circumstances beyond that point. You will consider a way in which you can obtain an estimate of the option value and look at two ways of dealing with this estimate.

*Estimate option value as an operating or capital expense*

You can estimate the value of options that will be granted in future periods as a percentage of revenues or operating income. By doing so, you can avoid having to estimate the number and terms of future option issues. Estimation will also become easier since you can draw on the firm's own history (by looking at the value of option grants in previous years as a proportion of firm value) and the experiences of more mature firms in the sector. Generally, as firms become larger, the value of options granted as a percent of revenues should become smaller.

Having estimated the value of expected future option issues, you are left with another choice. You can consider this value each period as an operating expense and compute the operating income, after the expense. You are assuming, then, that option issues form part of annual compensation. Alternatively, you can treat it as a capital expense and amortize it over multiple periods. While the cash flow in the current period is unaffected by this distinction, it has consequences for the return on capital and reinvestment rates that you measure for a firm.

It is important that you do not double count future option issues. The current operating expenses of the firm already include the expenses associated with option exercises in the current period. The operating margins and returns on capital that you might derive by looking at industry averages reflect the effects of option exercise in the current period for the firms in the industry. If the effect on operating income of option exercise in the current period is less than the expected value of new option issues, you have to allow for an additional expense associated with option issues. Conversely, if a disproportionately large number of options were exercised in the last period, you have to reduce the operating expenses to allow for the fact that the expected effect of option issues in future periods will be smaller.

**Value per Share when voting rights vary**

When you divide the value of the equity by the number of shares outstanding, you assume that the shares all have the same voting rights. If different classes of shares have different voting rights, the value of equity per share has to reflect these differences, with the shares with more voting rights having higher value. Note, though, that the total value

of equity is still unchanged. To illustrate, assume that the value of equity in a firm is \$500 million and that there are 50 million shares outstanding; 25 million of these shares have voting rights and 25 million do not. Furthermore, assume that the voting shares will have a value 10% higher than the non-voting shares. To estimate the value per share:

$$\begin{aligned} \text{Value per non-voting share} &= \frac{\$500 \text{ million}}{(25 \text{ million})(1.10) + 25 \text{ million}} \\ &= \$9.52 \end{aligned}$$

$$\text{Value per voting share} = \$ 9.52 (1.10) = \$ 10.48$$

The key issue that you face in valuation then is in coming up with the discount to apply for non-voting shares or, alternatively, the premium to attach to voting shares.

### ***Voting Shares versus Non-voting Shares***

What premium should be assigned to the voting shares? You have two choices. One is to look at studies that empirically examine the size of the premium for voting rights and to assign this premium to all voting shares. Lease, McConnell and Mikkelsen(1983) examined 26 firms that had two classes of common stock outstanding; they concluded that the voting shares traded at a premium relative to non-voting shares.<sup>16</sup> The premium, on average, amounted to 5.44% and the voting shares sold at a higher price in 88% of the months for which data were available. In four firms that also had voting preferred stock, however, the voting common stock traded at a discount of about 1.17% relative to non-voting shares.

The other option is to be more discriminating and vary the premium depending upon the firm. Voting rights have value because they give shareholders a say in the management of the firm. To the extent that voting shares can make a difference — by removing incumbent management, forcing management to change policy, or selling to a hostile bidder in a takeover — their price will reflect the possibility of a change in the

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<sup>16</sup> The two classes of stock received the same dividend.

way the firm is run.<sup>17</sup> Non-voting shareholders, on the other hand, do not participate in these decisions.

### **Estimating the Premium for Voting Rights**

If one class of shares has significantly more voting rights than another, you would expect it to trade at a higher price. Estimating the premium for voting rights can be fairly complicated. While many analysts prefer to use ad hoc approaches, you can estimate a more precise estimate of the relative value of voting shares by valuing the firm twice – once under incumbent management and once with a new (and better) management. For instance, assume that you value a firm at \$ 800 million with existing management and \$1,200 million with new management. The value of control at this firm is \$ 400 million. If you assume that this firm has 10 million voting shares and 10 million non-voting shares, you could estimate the voting share premium by estimating two per-share values:

$$\begin{aligned} \text{Value per share for non-voting shares} &= \text{Status Quo Value} / (\text{Voting} + \text{Non-voting shares}) \\ &= 800 / (10 + 10) = \$ 40 \end{aligned}$$

$$\begin{aligned} \text{Value per share for voting shares} &= \text{Value per share without voting rights} + (\text{Value of firm} \\ &\text{with superior management} - \text{Value of Firm- Status Quo}) / \text{Number of Voting Shares} \\ &= \$ 40 + (1200 - 800)/10 = \$ 80 \text{ per share} \end{aligned}$$

The voting share premium will decrease as the difference between optimal and current value decreases and also if the likelihood of a hostile takeover lessens.

The voting share premium will decrease as the difference between optimal and current value decreases and also if the likelihood of a hostile takeover lessens.



*warrants.xls*: This spreadsheet allows you to value the options outstanding in a firm, allowing for the dilution effect.

### **Summary**

Incorporating the value of non-operating assets into firm value can be very simple to do in some cases – cash and near-cash investments – and very complicated in other cases – holdings in private companies. The principle, though, should remain the same.

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<sup>17</sup>In some cases, the rights of non-voting stockholders are protected in the specific instance of a takeover by forcing the bidder to buy the non-voting shares as well.

You want to estimate a fair value for these non-operating assets and bring them into value. As we noted, it is often better to value non-operating assets separately from operating assets, but the absence of information may impede this process.

The existence of options and the possibility of future option grants make getting from equity value to value per share a complicated exercise. To deal with options outstanding at the time of the valuation, there are four approaches. The simplest is to estimate the value per share by dividing the value of equity by the fully diluted number of shares outstanding. This approach ignores both the expected proceeds from exercising the options and the time value of the options. The second approach of forecasting expected option exercises in the future and estimating the effect on value per share is not only tedious but unlikely to work. In the third (treasury stock) approach, you add the expected proceeds from option exercise to the value of equity and then divide by the fully diluted number of shares outstanding. While this approach does consider the expected proceeds from exercise, it still ignores the option time premium. In the final and the preferred approach, the options are valued using an option pricing model and the value is subtracted from the value of equity. The resulting estimate is divided by the primary shares outstanding to arrive at the value of equity per share. While the current price of the stock is usually used in option pricing models, the value per share estimated from the discounted cash flow valuation can be substituted to arrive at a more consistent estimate. To deal with expected option grants in the future, the current operating income has to be dissected to consider how much of an effect option exercises in the current period had on operating expenses. If the options granted during the period had more value than the option expense resulting from exercise of options granted in prior periods, the current operating income has to be adjusted down to reflect the difference. Industry average margins and returns on capital will also have to be adjusted for the same reason.

Once the value per share of equity has been estimated, that value may need to be adjusted for differences in voting rights. Shares with disproportionately high voting rights will sell at a premium relative to shares with low or no voting rights. The difference will be larger for firms that are badly managed and smaller for well-managed firms.

### Problems

1. ABV Inc. has earnings before interest and taxes of \$250 million, expected to grow 5% a year forever; the tax rate is 40%. Its cost of capital is 10%, reinvestment rate is 33.33% and it has 200 million shares outstanding. If the firm has \$500 million in cash and marketable securities, and \$750 million in debt outstanding, estimate the value of equity per share.
2. How would your answer to the previous problem change if you were told that ABV had options outstanding, for 50 million shares, and that each option had a value of \$5.
3. If you were told that the average exercise price of the 50 million options in the previous problem was \$6, estimate the value per share for ABV, using the treasury stock approach.
4. LSI Logic has 1 billion shares outstanding, trading at \$25 per share. The firm also has \$5 billion in debt outstanding. The cost of equity is 12.5% and the cost of debt, after-taxes, is 5%. If the firm has \$3 billion in cash outstanding and is fairly valued, estimate how much the firm earned in operating income in the current year. (The return on capital is 15%, the tax rate is 30% and earnings are growing 6% a year in perpetuity)
5. Lava Lamps Inc. had \$800 million in earnings before interest and taxes last year. It has just acquired a 50% stake in General Lamps Inc., which had \$400 million in earnings before interest and taxes last year. Because Lava Lamps has a majority active stake, it has been asked to consolidate last year's income statements for the two firms. What earnings before interest and taxes would you see in the consolidated statement?
6. Genome Sciences is a bio-technology firm that had after-tax operating income of \$ 300 million last year; these earnings are expected to grow 6% a year forever. The reinvestment rate is 40% and the firm has a cost of capital of 12%. Genome also owns 10% of the stock of Gene Therapies Inc., another publicly traded firms. Gene Therapies has 100 million shares outstanding, trading at \$50 per share. If Genome has \$800 million in debt outstanding, estimate the value of equity per share in Genome Sciences. (Genome has 50 million shares outstanding.)

