In Chapter 7, we looked at the wide range of choices available to firms to raise capital. In Chapter 8, we developed the tools needed to estimate the optimal debt ratio for a firm. Here we discuss how firms can use this information to choose the mix of debt and equity they use to finance investments, and on the financing instruments they can employ to reach that mix.

We begin by examining whether, having identified an optimal debt ratio, firms should move to that debt ratio from current levels. A variety of concerns may lead a firm not to use its excess debt capacity if it is under levered, or to lower its debt if it is over levered. A firm that decides to move from its current debt level to its optimal financing mix has two decisions to make. First, it has to consider how quickly it wants to move. The degree of urgency will vary widely across firms, depending on how much of a threat they perceive from being under- (or over-)levered. The second decision is whether to increase (or decrease) the debt ratio by recapitalizing investments, divesting assets and using the cash to reduce debt or equity, investing in new projects with debt or equity, or changing dividend policy.

In the second part of this chapter, we will consider how firms should choose the right financing vehicle for raising capital for their investments. We argue that a firm’s choice of financing should be determined largely by the nature of the cash flows on its assets. Matching financing choices to asset characteristics decreases default risk for any given level of debt and allows the firm to borrow more. We then consider a number of real-world concerns including tax law, the views of ratings agencies, and information effects that might lead firms to modify their financing choices.

A Framework for Capital Structure Changes

A firm whose actual debt ratio is very different from its optimal has several choices to make. First, it has to decide whether to move toward the optimal or to preserve the status quo. Second, once it decides to move toward the optimal, the firm has to choose between changing its leverage quickly or moving more deliberately. This decision
may also be governed by pressure from external sources, such as impatient stockholders or bond ratings agency concerns. Third, if the firm decides to move gradually to the optimal, it has to decide whether to use new financing to invest in new projects, or to shift its financing mix on existing projects.

In the previous chapter, we presented the rationale for moving toward the optimal in terms of the value that could be gained for stockholders by doing so. Conversely, the cost of preserving the status quo is that this potential value increment is lost. Although managers nominally make this decision of whether to move towards their optimal debt ratios, they will often find themselves under some pressure from stockholders if they are under levered, or under threat of bankruptcy if they are overlevered, to move toward their optimal debt ratios.

**Immediate or Gradual Change**

In Chapter 7 we discussed the trade-off between using debt and using equity. In Chapter 8, we developed a number of approaches used to determine the optimal financing mix for a firm. The next logical step, it would seem, is for firms to move to this optimal mix. In this section, we will first consider what might lead some firms not to make this move; we follow up by looking at some of the subsequent decisions firms that changing the mix requires.

**No Change, Gradual Change, or Immediate Change**

Previously we implicitly assumed that firms that have debt ratios different from their optimal debt ratios, once made aware of this gap, will want to move to the optimal ratios. That does not always turn out to be the case. There are a number of firms that look under levered, using any of the approaches described in the last section, but choose not to use their excess debt capacity. Conversely, there are a number of firms with too much debt that choose not to pay it down. At the other extreme are firms that shift their financing mix overnight to reflect the optimal mix. In this section, we look at the factors a firm might have to consider in deciding whether to leave its debt ratio unchanged, change gradually, or change immediately to the optimal mix.
**To Change or Not to Change**

Firms that are under- or overlevered might choose not to move to their optimal debt ratios for a number of reasons. Given our identification of the optimal debt ratio as the mix at which firm value is maximized, this inaction may seem not only irrational but value-destroying for stockholders. In some cases, it is. In some cases, however, not moving to the optimal may be consistent with value maximization.

Let’s consider underlevered firms first. The first reason a firm may choose not to move to its optimal debt ratio is that it does not view its objective as maximizing firm value. If the objective of a firm is to maximize net income or maintain a high bond rating, having less debt is more desirable than having more. Stockholders should clearly take issue with managers who avoid borrowing because they have an alternative objective and force them to justify their use of the objective.

Even when firms agree on firm value maximization as the objective, there are a number of reasons why underlevered firms may choose not to use their excess debt capacity.

- When firms borrow, the debt usually comes with covenants that restrict what the firm can do in the future. Firms that value flexibility may choose not to use their excess debt capacity.
- The flexibility argument can also be extended to cover future financing requirements. Firms that are uncertain about future financing needs may want to preserve excess debt capacity to cover these needs.
- In closely held or private firms, the likelihood of bankruptcy that comes with debt may be weighted disproportionately in making the decision to borrow.\(^1\)

These are all viable reasons for not using excess debt capacity, and they may be consistent with value maximization. We should, however, put these reasons to the financial test. For instance, we estimated in Illustration 7.3 that the value of Disney as a firm will increase almost $3 billion if it moves to its optimal debt ratio. If the reason

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\(^1\)We do consider the likelihood of default in all the approaches described in the last chapter. However, this consideration does not allow for the fact that cost of default may vary widely across firms. The manager of a publicly traded firm may lose only his or her job in the event of default, whereas the owner of a private business may lose both wealth and reputation if he or she goes bankrupt.
given by the firm’s management for not using excess debt capacity is the need for financing flexibility, the value of this flexibility has to be greater than $3 billion.

Firms that have too much debt, relative to their optimal level, should have a fairly strong incentive to try reducing debt. Here again, there might be reasons why a firm may choose not to take this path. The primary fear of over levered firms is bankruptcy. If the government makes a practice of shielding firms from the costs associated with default, by either bailing out those that default on their debt or backing up the loans made to them by banks, firms may choose to remain overlevered. This would explain why Korean firms, which looked overlevered using any financial yardstick in the 1990s, did nothing to reduce their debt ratios until the government guarantee collapsed.

**In Practice: Valuing Financial Flexibility as an Option**

If we assume unlimited and costless access to capital markets, a firm will always be able to fund a good project by raising new capital. If, on the other hand, we assume that there are internal or external constraints on raising new capital, financial flexibility can be valuable. To value this flexibility as an option, assume that a firm has expectations about how much it will need to reinvest in future periods based on its own past history and current conditions in the industry. Assume also that a firm has expectations about how much it can raise from internal funds and its normal access to capital markets in future periods. There is uncertainty about future reinvestment needs; for simplicity, we will assume that the capacity to generate funds is known with certainty to the firm. The advantage (and value) of having excess debt capacity or large cash balances is that the firm can meet any reinvestment needs, in excess of funds available, using its debt capacity. The payoff from these projects, however, comes from the excess returns the firm expects to make on them.

With this framework, we can specify the types of firms that will value financial flexibility the most.

a. **Access to capital markets**: Firms with limited access to capital markets—private business, emerging market companies, and small market cap companies—should value financial flexibility more that those with wider access to capital.
b. *Project quality:* The value of financial flexibility accrues not just from the fact that excess debt capacity can be used to fund projects but from the excess returns that these projects earn. Firms in mature and competitive businesses, where excess returns are close to zero, should value financial flexibility less than firms with substantial competitive advantages and high excess returns.

c. *Uncertainty about future investment needs:* Firms that can forecast their reinvestment needs with certainty do not need to maintain excess debt capacity because they can plan to raise capital well in advance. Firms in volatile businesses where investment needs can shift dramatically from period to period will value financial flexibility more.

The bottom line is that firms that value financial flexibility more should be given more leeway to operate with debt ratios below their theoretical optimal debt ratios (where the cost of capital is minimized). Using the same logic, firms should value financial flexibility more in periods of market crisis than when markets are buoyant and functioning well.

**Gradual versus Immediate Change**

Many firms attempt to move to their optimal debt ratios, either gradually over time or immediately. The advantage of an immediate shift to the optimal debt ratio is that the firm immediately receives the benefits of the optimal leverage, which include a lower cost of capital and a higher value. The disadvantage of a sudden change in leverage is that it changes both the way managers make decisions and the environment in which these decisions are made. If the optimal debt ratio has been incorrectly estimated, a sudden change may also increase the risk that the firm has to backtrack and reverse its financing decisions. To illustrate, assume that a firm’s optimal debt ratio has been calculated to be 40 percent and the firm moves to this optimal from its current debt ratio of 10 percent. A few months later, the firm discovers that its optimal debt ratio is really 30 percent. It will then have to repay some of the debt it has taken on to get back to the optimal leverage.
Gradual versus Immediate Change for Underlevered Firms

For underlevered firms, the decision to increase the debt ratio to the optimal either quickly or gradually is determined by four factors:

1. Degree of Confidence in the Optimal Leverage Estimate: The greater the possible error in the estimate of optimal financial leverage, the more likely the firm will choose to move gradually to the optimal.

2. Comparability to Industry: When the optimal debt ratio for a firm differs markedly from that of the industry to which the firm belongs, analysts and ratings agencies might not look favorably on the change, and the firm is much less likely to shift to the optimal quickly.

3. Likelihood of a Takeover: Empirical studies of the characteristics of target firms in acquisitions have noted that underlevered firms are much more likely to be acquired than are overlevered firms. Often, the acquisition is financed at least partially by the target firm’s unused debt capacity. Consequently, firms with excess debt capacity that delay increasing debt run the risk of being taken over. The greater this risk, the more likely the firm will choose to take on additional debt quickly. Several additional factors may determine the likelihood of a takeover. One is the prevalence of antitakeover laws (at the state level) and amendments in the corporate charter designed specifically to prevent hostile acquisitions. Another is the size of the firm. Because raising financing for an is far more difficult for acquiring a $100 billion firm than for a $1 billion firm, larger firms may feel more protected from the threat of hostile takeovers. The third factor is the extent of holdings by insiders and managers in the company. Insiders and managers with substantial stakes may be able to prevent hostile acquisitions. The final factor is the stock price performance of the firm; stockholders in firms where stock prices have dropped significantly over time tend to be much more receptive to the entreaties of hostile acquirers.

4. Need for Financial Flexibility: On occasion, firms may require excess debt capacity to meet unanticipated needs for funds, either to maintain existing projects or to invest in

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See Palepu, K., 1986, Predicting Takeover Targets: A Methodological and Empirical Analysis, Journal of Accounting and Economics, v5, 3-35. He notes that one of the variables that seems to predict a takeover is a low debt ratio in conjunction with poor operating performance.
new ones. Firms that need and value this flexibility will be less likely to shift quickly to their optimal debt ratios and use up their excess debt capacity.

9.1. **Insider Holdings and Leverage**

Closely held firms (where managers and insiders hold a substantial portion of the outstanding stock) are less likely to increase leverage quickly than firms with widely dispersed stockholdings.

a. True
b. False

Explain.

**Illustration 9.1: Debt Capacity and Takeovers**

The Disney acquisition of Capital Cities in 1996, although a friendly acquisition, illustrates some of advantages to a firm of acquiring an underlevered firm. At the time of the acquisition, Capital Cities had $657 million in debt and 154.06 million shares outstanding, trading at $100 per share. Its market value debt to capital ratio was only 4.07 percent. With a beta of 0.95, a borrowing rate of 7.70 percent, and a corporate tax rate of 43.50 percent, this yielded a cost of capital of 11.90 percent. (The Treasury bond rate at the time of the analysis was 7 percent.)

Cost of Capital

\[
\text{Cost of Capital} = \text{Cost of Equity}\left(\frac{\text{Equity}}{\text{Debt} + \text{Equity}}\right) + \text{Cost of Debt}\left(\frac{\text{Debt}}{\text{Debt} + \text{Equity}}\right)
\]

\[
= 12.23\% \left[\frac{15,406}{(15,406 + 657)}\right] + 7.70\% \left(1 - 0.435\right) \left[\frac{657}{(15,406 + 657)}\right]
\]

\[
= 11.90\%
\]

Table 9.1 summarizes the costs of equity, debt, and capital, as well as the estimated firm values and stock prices at different debt ratios for Capital Cities:

**Table 9.1 Costs of Financing, Firm Value, and Debt Ratios: Capital Cities**

<table>
<thead>
<tr>
<th>Debt Ratio</th>
<th>Beta</th>
<th>Cost of Equity</th>
<th>Interest Coverage Ratio</th>
<th>Bond Rating</th>
<th>Interest Rate</th>
<th>Cost of Debt</th>
<th>Cost of Capital</th>
<th>Firm Value (in millions)</th>
<th>Stock Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00%</td>
<td>0.93</td>
<td>12.10%</td>
<td>∞</td>
<td>AAA</td>
<td>7.30%</td>
<td>4.12%</td>
<td>12.10%</td>
<td>$15,507</td>
<td>$96.41</td>
</tr>
<tr>
<td>10.00%</td>
<td>0.99</td>
<td>12.42%</td>
<td>10.73</td>
<td>AAA</td>
<td>7.30%</td>
<td>4.12%</td>
<td>11.59%</td>
<td>$17,007</td>
<td>$106.15</td>
</tr>
<tr>
<td>20.00%</td>
<td>1.06</td>
<td>12.82%</td>
<td>4.75</td>
<td>A</td>
<td>8.25%</td>
<td>4.66%</td>
<td>11.19%</td>
<td>$18,399</td>
<td>$115.19</td>
</tr>
</tbody>
</table>
Note that the firm value is maximized at a debt ratio of 30 percent, leading to an increase in the stock price of $23.69 over the market price of $100.

Although debt capacity was never stated as a reason for the acquisition of Capital Cities, Disney borrowed about $10 billion for this acquisition and paid $125 per share. Capital Cities’ stockholders could well have achieved the same premium if management had borrowed the money and repurchased stock. Although Capital Cities stockholders did not lose as a result of the acquisition, they would have (at least based on our numbers) if Disney had paid a smaller premium on the acquisition.

**Gradual versus Immediate Change for Overlevered Firms**

Firms that are overlevered also have to decide whether they should shift gradually or immediately to the optimal debt ratios. As in the case of underlevered firms, the precision of the estimate of the optimal leverage will play a role, with more precise estimates leading to quicker adjustments. So will comparability to other firms in the sector. When most or all of the firms in a sector become overlevered, as was the case with the telecommunications sector in the late 1990s, firms seem to feel little urgency to reduce their debt ratios, even though they might be struggling to make their payments. In contrast, the pressure to reduce debt is much greater when a firm has a high debt ratio in a sector where most firms have lower debt ratios.

The other factor, in the case of overlevered firms, is the possibility of default. Too much debt also results in higher interest rates and lower ratings on the debt. Thus, the greater the chance of bankruptcy, the more likely the firm is to move quickly to reduce debt and move to its optimal. How can we assess the probability of default? If firms are rated, their bond ratings offer a noisy but simple measure of default risk. A firm with a below investment grade rating (below BBB) has a significant probability of default. Even
if firms are not rated, we can use their synthetic ratings (based on interest coverage ratios) to come to the same conclusion.

9.2. Indirect Bankruptcy Costs and Leverage

In Chapter 7, we talked about indirect bankruptcy costs, where the perception of default risk affected sales and profits. Assume that a firm with substantial indirect bankruptcy costs has too much debt. Is the urgency to get back to an optimal debt ratio for this firm greater than or lesser than it is for a firm without such costs?

a. Greater
b. Lesser

Explain.

Implementing Changes in Financial Mix

A firm that decides to change its financing mix has several alternatives. In this section, we begin by considering the details of each of these alternatives to changing the financing mix, and we conclude by looking at how firms can choose the right approach for themselves.

Ways of Changing the Financing Mix

There are four basic paths available to a firm that wants to change its financing mix. One is to change the current financing mix using new equity to retire debt or new debt to reduce equity; this is called recapitalization. The second path is to sell assets and use the proceeds to pay off debt, if the objective is to reduce the debt ratio, or to buy back stock or pay dividends to reduce equity, if the objective is to increase the debt ratio. The third is to use a disproportionately high debt or equity ratio, relative to the firm’s current ratios, to finance new investments over time. The value of the firm increases, but the debt ratio will also change in the process. The fourth option is to change the proportion of earnings that a firm returns to its stockholders in the form of dividends or by buying back stock. As this proportion changes, the debt ratio will also change over time.
Recapitalization

The simplest and often the quickest way to change a firm’s financial mix is to change the way existing investments are financed. Thus, an underlevered firm can increase its debt ratio by borrowing money and buying back stock or replacing equity with debt of equal market value.

- **Borrowing money and buying back stock (or paying a large dividend)** increases the debt ratio because the borrowing increases the debt, whereas the equity repurchase or dividend payment concurrently reduces the equity; the former accomplishes this by reducing the number of shares outstanding and the latter by lowering the stock price. Many companies have used this approach to increase leverage quickly, largely in response to takeover attempts. For example, in 1985, to stave off a hostile takeover, Atlantic Richfield borrowed $4 billion and repurchased stock to increase its debt to capital ratio from 12 percent to 34 percent.³

- In a **debt-for-equity swap**, a firm replaces equity with debt of equivalent market value by swapping the two securities. Here again, the simultaneous increase in debt and the decrease in equity causes the debt ratio to increase substantially. In many cases, firms offer equity investors a combination of cash and debt in lieu of equity. In 1986, for example, Owens Corning gave its stockholders $52 in cash and debt with a face value of $35, for each outstanding share, thereby increasing its debt and reducing equity.

In each of these cases, the firm may be restricted by bond covenants that explicitly prohibit these actions or impose large penalties on the firm. The firm will have to weigh these restrictions against the benefits of the higher leverage and the increased value that flows from it. A recapitalization designed to increase the debt ratio substantially is called a **leveraged recapitalization**, and many of these recapitalizations are motivated by a desire to prevent a hostile takeover.⁴

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³The stock buyback increased the stock price and took away a significant rationale for the acquisition.

⁴An examination of twenty-eight recapitalizations between 1985 and 1988 indicates that all but five were motivated by the threat of hostile takeovers.
Though it is far less common, firms that want to lower their debt ratios can adopt a similar strategy. An overlevered firm can attempt to renegotiate debt agreements and try to convince some of the lenders to take an equity stake in the firm in lieu of some or all of their debt in the firm. It can also try to get lenders to offer more generous terms, including longer maturities and lower interest rates. Finally, the firm can issue new equity and use it pay off some of the outstanding debt. The best bargaining chip such a firm possesses is the possibility of default, because default creates substantial losses for lenders. In the late 1980s, for example, many U.S. banks were forced to trade in their Latin American debt for equity stakes or receive little or nothing on their loans.

*Divestiture and Use of Proceeds*

Firms can also change their debt ratios by selling assets and using the cash they receive from the divestiture to reduce debt or equity. Thus an underlevered firm can sell some of its assets and use the proceeds to repurchase stock or pay a large dividend. Although this action reduces the equity outstanding at the firm, it will increase the debt ratio of the firm only if the firm already has some debt outstanding. An overlevered firm may choose to sell assets and use the proceeds to retire some of the outstanding debt and reduce its debt ratio.

If a firm chooses this path, the choice of which assets to divest is critical. Firms usually want to divest themselves of investments that are earning less than their required returns, but that cannot be the overriding consideration in this decision. The key question is whether there are potential buyers for the asset who are willing to pay fair value or more for it, where the fair value measures how much the asset is worth to the firm, based on its expected cash flows.

### 9.3. Asset Sales to Reduce Leverage

Assume that a firm has decided to sell assets to pay off its debt. In deciding which assets to sell, the firm should

- a. sell its worst performing assets to raise the cash.
- b. sell its best performing assets to raise the cash.
- c. sell its most liquid assets to raise the cash.
- d. none of the above (specify the alternative).
Explain.

Financing New Investments

Firms can also change their debt ratios by financing new investments disproportionately with debt or equity. If they use a much higher proportion of debt in financing new investments than their current debt ratio, they will increase their debt ratios. Conversely, if they use a much higher proportion of equity in financing new investments than their existing equity ratio, they will decrease their debt ratios.

There are two key differences between this approach and the previous two. First, because new investments are spread out over time, the debt ratio will adjust gradually over the period. Second, the process of investing in new assets will increase both the firm value and the dollar debt that goes with any debt ratio. For instance, if Disney decides to increase its debt ratio to 30 percent and proposes to do so by investing in a new theme park, the value of the firm will increase from the existing level to reflect the new assets created by the investment.

Changing Dividend Payout

We will not be considering dividend policy in detail until the next chapter, but we will mention here that a firm can change its debt ratio over time by changing the proportion of its earnings that it returns to stockholders in each period. Increasing the proportion of earnings paid out in dividends (the dividend payout ratio) or buying back stock each period will increase the debt ratio for two reasons. First, the payment of the dividend or buying back stock will reduce the equity in the firm; holding debt constant, this will increase the debt ratio. Second, paying out more of the earnings to stockholders increases the need for external financing to fund new investments; if firms fill this need with new debt, the debt ratio will be increased even further. (Decreasing the proportion of earnings returned to stockholders will have the opposite effects.)

Firms that choose this route have to recognize that debt ratios will increase gradually over time. In fact, the value of equity in a firm can be expected to increase each period by the expected price appreciation rate. This rate can be obtained from the cost of

\[ \text{Cost of Equity} = \text{Risk-Free Rate} + \text{Equity Risk Premium} \]

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5The payment of dividends takes cash out of the firm and puts it in the hands of stockholders. The firm has to become less valuable as a result of the action. The stock price reflects this effect.
equity, after netting out the expected portion of the return that will come from dividends. This portion is estimated with the dividend yield, which measures the expected dollar dividend as a percent of the current stock price:

\[
\text{Expected Price Appreciation} = \text{Cost of Equity} - \text{Expected Dividend Yield}
\]

To illustrate, in 2009 Disney had a cost of equity of 7.51% and an expected dollar dividend per share of $0.35. Based on the stock price of $24.34, the expected price appreciation can be computed:

\[
\text{Expected Price Appreciation}_{\text{Disney}} = 7.51\% - \left( \frac{0.35}{24.34} \right) = 6.07\%
\]

Disney’s market value of equity can be expected to increase 6.07 percent next period. The dollar debt would have to increase by more than that amount for the debt ratio to increase.

### 9.4. Dollar Debt versus Debt Ratio

Assume that a firm worth $1 billion has no debt and needs to get to a 20 percent debt ratio. How much would the firm need to borrow if it wants to buy back stock?

- a. $200 million
- b. $250 million
- c. $260 million
- d. $160 million

How much would it need to borrow if it were planning to invest in new projects (with zero net present value)? What if the projects had an NPV of $50 million?

### Choosing between the Alternatives

Given the choice between recapitalizing, divesting, financing new investments, and changing dividend payout, how can a firm choose the right way to change debt ratios? The choice will be determined by three factors. The first is the *urgency with which the firm is trying to move to its optimal debt ratio*. Recapitalizations and divestitures can be accomplished in a few weeks and can change debt ratios significantly. Financing new investments or changing dividend payout, on the other hand, is a long-term strategy to change debt ratios. Thus, a firm that needs to change its debt ratio quickly—because it is either under threat of a hostile takeover or faces imminent default—is more likely to use recapitalizations than to finance new investments.
The second factor is the *quality of new investments*. In the earlier chapters on investment analysis, we defined a good investment as one that earns a positive NPV and a return greater than its hurdle rate. Firms with good investments will gain more by financing these new investments with new debt if the firm is underlevered, or with new equity if the firm is overlevered. Not only will the firm value increase by the value gain we computed in Chapter 8, based on the change in the cost of capital, but the positive NPV of the project will also accrue to the firm. On the other hand, using excess debt capacity or new equity to invest in poor projects is a bad strategy, because the projects will destroy value.

The final consideration is the *marketability of existing investments*. Two considerations go into marketability. One is whether existing investments earn excess returns; firms are often more willing to divest themselves of assets that are earning less than the required return. The other (and in our view the more important) consideration is whether divesting these assets will generate a price high enough to compensate the firm for the cash flows lost by selling them. Ironically, firms often find that their best investments are more likely to meet the second criterion than their worst investments.

We summarize our conclusions about the right route to follow to the optimal, based on all these determinants, in Table 9.2.

*Table 9.2 Optimal Route to Financing Mix*

<table>
<thead>
<tr>
<th>Desired Speed of Adjustment</th>
<th>Marketability of Existing Investments</th>
<th>Quality of New Investments</th>
<th>Optimal Route to Increasing Debt Ratio</th>
<th>Optimal Route to Decreasing Debt Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urgent</td>
<td>Poor</td>
<td>Poor</td>
<td>Recapitalize; Borrow money and buy back stock</td>
<td>Recapitalize: Issue equity and pay off debt</td>
</tr>
<tr>
<td>Urgent</td>
<td>Good</td>
<td>Good</td>
<td>Divest assets and buy back stock; finance new investments with debt.</td>
<td>Divest assets and retire debt; finance new investments with equity.</td>
</tr>
<tr>
<td>Urgent</td>
<td>Good</td>
<td>Poor</td>
<td>Divest and buy back stock</td>
<td>Divest and retire debt</td>
</tr>
<tr>
<td>Gradual</td>
<td>Neutral or poor</td>
<td>Neutral or poor</td>
<td>Increase payout to stockholders</td>
<td>Retire debt each year using earnings</td>
</tr>
<tr>
<td>Gradual</td>
<td>Good</td>
<td>Neutral or poor</td>
<td>Divest and increase payout to stockholders</td>
<td>Divest and retire debt over time</td>
</tr>
<tr>
<td>Gradual</td>
<td>Neutral or poor</td>
<td>Good</td>
<td>Finance new investments with debt.</td>
<td>Finance new investments with equity.</td>
</tr>
</tbody>
</table>

We also summarize our discussion of whether a firm should shift to its financing mix quickly or gradually, as well as the question of how to make this shift, in Figure 9.1.
Although we have presented this choice in stark terms, where firms decide to use one or another of the four alternatives described, a combination of actions may be what is needed to get a firm to its desired debt ratio. This is especially likely when the firm is large and the change in debt ratio is significant. In the illustrations following this section, we consider four companies. The first, Nichols Research, is a small firm that gets to its optimal debt ratio by borrowing money and buying back stock. The other two, Disney and Tata Chemicals, choose a combination of new investments and recapitalization, Disney to increase its debt ratio and Time Warner to decrease its debt ratio. The fourth, Aracruz Celulose, raises equity to reduce its debt ratio, since the firm faces some urgency and its investments are earning less than the cost of capital.

**Illustration 9.2 Increasing Financial Leverage Quickly: Nichols Research**

In 1994, Nichols Research, a firm that provides technical services to the defense industry, had debt outstanding of $6.8 million and market value of equity of $120 million. Based on its EBITDA of $12 million, Nichols had an optimal debt ratio of 30
percent, which would lower the cost of capital to 12.07 percent (from the current cost of capital of 13 percent) and increase the firm value to $146 million (from $126.8 million). There are a number of reasons for arguing that Nichols should increase its leverage quickly:

• Its small size, in conjunction with its low leverage and large cash balance ($25.3 million), make it a prime target for an acquisition.

• Although 17.6 percent of the shares are held by owners and directors, this amount unlikely to hold off a hostile acquisition, because institutions own 60 percent of the outstanding stock.

• The firm has been reporting steadily decreasing returns on its projects, due to the shrinkage in the defense budget. In 1994, the return on capital was only 10 percent, which was much lower than the cost of capital.

If Nichols decides to increase leverage, it can do so in a number of ways:

• It can borrow enough money to get to 30 percent of its overall firm value ($146 million at the optimal debt ratio) and buy back stock. This would require $37 million in new debt to get to a total dollar debt level of $44 million.

• It can borrow $37 million and pay a special dividend of that amount.

• It can use the cash balance of $25 million to buy back stock or pay dividends, and increase debt to 30 percent of the remaining firm value (30 percent of $121 million). This would require approximately $29.5 million in new debt, which can be used to buy back stock.

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**The Shock of Debt: A Behavioral Perspective**

Increasing the debt ratio significantly overnight may reduce a firm’s cost of capital but it does change the characteristics of the firm. Managers who are accustomed to operating in the relatively low-stress environment of a predominantly equity funded firm have to adjust quickly to the cash-flow demands of a highly levered firm. While the

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6 We assume that the optimal debt ratio will be unaffected by the paying out of the special dividend. It is entirely possible that the paying out of the cash will make the firm riskier (leading to a higher unlevered beta) and lower the optimal debt ratio.

7 $29.5 million = $121 million \( \times 0.40 – 6.9 \) million
argument posed by Jensen and others is that this will lead to the more discipline on the part of management in risk assessment and project selection, there are potentially unhealthy responses to having to making larger debt payments:

a. **Decision paralysis:** Since every risky investment or decision can potentially cause default, managers may hold back on committing to new investments that they perceive as uncertain.

b. **Short term focus:** The need to make interest and principal payments on debt may induce managers to choose projects that generate short term payoffs over longer terms investments that create more value for the business.

c. **Self-selection problem:** In earlier chapters, we noted that some managers are more prone to over optimism than others. These over optimistic managers are more likely to perceive higher earnings in the future and follow up by borrowing large amounts of money.

Studies that have looked at firms that have gone through significant increases in debt (in leveraged recapitalization and leveraged buyouts) find, at least on average, that managers are able to cope reasonably well with the demands of debt payments and that operating performance improves after the leverage increase.

**Illustration 9.3 Decreasing Leverage Quickly: Aractuz Celulose**

In chapter 8, we noted the perilous state of Aracruz Celulose, a firm with R$ 9.8 billion in debt and a debt ratio of 52% and an optimal debt ratio of 10%, even if we assume that earnings bounce to back to normalized levels. In fact, the interest expenses that will accrue from the existing debt will be higher than the normalized operating income, which puts the firm on a pathway to default and bankruptcy. Consequently, we believe that the firm needs to act quickly to reduce its debt ratio and list out the possible options:

a. **Equity for Debt Swap:** The first and least painful option is to get lenders to the firm to agree to exchange their debt for equity in the firm. While this will increase the number of shares outstanding and reduce the control that the existing inside stockholders have over the firm, it is the option least likely to disrupt operations and most in tune with current financial conditions.
b. **Issue new equity and retire debt:** While Aracruz’s stock price plummeted during the last nine months of 2008, it has shown signs of recovery in the last few months. If that recovery continues, aided and abetted by an increase in commodity prices, Aracruz may be able to issue new stock and use the proceeds to retire a significant portion of the debt.

c. **Sell assets to pay down debt:** This is the least desirable scenario, since it indicates that the firm has run out of options. However, if debt holders do not agree to swaps and issuing new equity becomes a non-viable option, the firm may be forced to sell some or a large portion of its assets, perhaps at bargain basement prices, and use the proceeds to pay down debt.

Given the need to retire debt, it is clear that Aracruz is in no position to pay dividends to stockholders. Consequently, we believe that Aracruz should suspend paying dividends, even if this gives control rights to preferred stockholders. Desperate times call for desperate measures.

*Illustration 9.4 Charting a Framework for Increasing Leverage: Disney*

Reviewing the capital structure analysis done for Disney in Chapter 8, we see that it had a debt ratio of approximately 27 percent in early 2009, with $16.7 billion in debt (estimated market value) and $45.2 billion in equity. Its optimal debt ratio, based on minimizing cost of capital, was 40 percent. Table 9.3 summarizes the debt ratios, costs of capital, and firm value at debt ratios ranging from 0 percent to 90 percent.

*Table 9.3 Debt Ratio, Cost of Capital, and Firm Value: Disney*

<table>
<thead>
<tr>
<th>Debt Ratio</th>
<th>Cost of capital</th>
<th>Firm Value (G)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>7.90%</td>
<td>$58,499.82</td>
</tr>
<tr>
<td>10%</td>
<td>7.68%</td>
<td>$60,373.92</td>
</tr>
<tr>
<td>20%</td>
<td>7.45%</td>
<td>$62,371.16</td>
</tr>
<tr>
<td>30%</td>
<td>7.32%</td>
<td>$63,595.96</td>
</tr>
<tr>
<td>40%</td>
<td>7.32%</td>
<td>$63,650.81</td>
</tr>
<tr>
<td>50%</td>
<td>7.33%</td>
<td>$63,556.35</td>
</tr>
<tr>
<td>60%</td>
<td>7.40%</td>
<td>$62,873.20</td>
</tr>
<tr>
<td>70%</td>
<td>9.49%</td>
<td>$47,883.80</td>
</tr>
<tr>
<td>80%</td>
<td>10.46%</td>
<td>$43,090.17</td>
</tr>
<tr>
<td>90%</td>
<td>11.34%</td>
<td>$39,497.05</td>
</tr>
</tbody>
</table>
The optimal debt ratio for Disney is 40 percent, because the cost of capital is minimized and the firm value is maximized at this debt level. Even with constraints and allowing for distress costs, the optimal debt ratio is between 30 and 35%.

In early 2009, Disney looked like it was not under any immediate pressure to increase its leverage, partly because of its size ($61.9 billion) and partly because its stock price and earnings have recovered from their lows of 2003. Let us assume, therefore, that Disney decides to increase its leverage over time toward its optimal level.

The question of how to increase leverage over time can be best answered by looking at the quality of the projects that Disney had available to it in 2008. In Chapter 5, we compute the return on capital that Disney earned in 2008 to be 9.29%, higher than its current cost of capital of 7.51% and much higher than the cost of capital of 7.32% at the optimal debt ratio. If we assume that these positive excess returns are likely to continue into the future, the path to a higher optimal debt ratio is to invest in more projects, using disproportionately more debt in these investments.

To make forecasts of changes in leverage over time, we made the following assumptions:

- Revenues, operating earnings, capital expenditures, and depreciation are expected to grow 5 percent a year from 2009 to 2013 (based on analyst estimates of growth). The current value for each of these items is provided in Table 9.4.
- In 2008, noncash working capital was 2.28 percent of revenues, and that ratio is expected to be unchanged over the next five years.
- The interest rate on new debt is expected to be 6 percent, which is Disney’s pretax cost of debt. The bottom-up unlevered beta is 0.7333 and the current levered beta is 0.90, as estimated in Chapter 4.
- The dividend payout ratio in 2008 was 15.36%.
- The Treasury bond rate is 3.5%, and the risk premium is assumed to be 6%.

---

8See Jensen’s alpha calculation in Chapter 4. Over the past five years, Disney has earned an excess return of 5.62% a year.

9The correct comparison should be to the cost of capital that Disney will have at its optimal debt ratio. It is, however, even better if the return on capital also exceeds the current cost of capital, because it will take time to get to the optimal.
To estimate the expected market value of equity in future periods, we will use the cost of equity computed from the beta in conjunction with dividends. The estimated values of debt and equity, over time, are estimated as follows.

\[
\text{Equity}_t = \text{Equity}_{t-1} (1 + \text{Cost of Equity}_{t-1}) - \text{Dividends}_t,
\]

The rationale is simple: The cost of equity measures the expected return on the stock, inclusive of price appreciation and the dividend yield, and the payment of dividends reduces the value of equity outstanding at the end of the year. The value of debt is estimated by adding the new debt taken on to the debt outstanding at the end of the previous year.

We begin this analysis by looking at what would happen to the debt ratio if Disney maintains its existing payout ratio of 15.36 percent, does not buy back stock, and applies excess funds to pay off debt. Table 9.4 uses the expected capital expenditures and noncash working capital needs over the next five years, in conjunction with external financing needs, to estimate the debt ratio in each year.

**Table 9.4 Estimated Debt Ratios with Existing Payout Ratios: Disney (Notice that cash outflows are shown as positive and cash inflows as negative)**

<table>
<thead>
<tr>
<th></th>
<th>Current Year</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equity</td>
<td>$45,193</td>
<td>$48,521</td>
<td>$52,014</td>
<td>$55,677</td>
<td>$59,517</td>
<td>$63,537</td>
</tr>
<tr>
<td>Debt</td>
<td>$16,682</td>
<td>$14,768</td>
<td>$12,697</td>
<td>$10,458</td>
<td>$8,036</td>
<td>$5,417</td>
</tr>
<tr>
<td>Debt/(Debt+Equity)</td>
<td>26.96%</td>
<td>23.33%</td>
<td>19.62%</td>
<td>15.81%</td>
<td>11.90%</td>
<td>7.86%</td>
</tr>
<tr>
<td>Revenues</td>
<td>$36,990</td>
<td>$38,840</td>
<td>$40,781</td>
<td>$42,821</td>
<td>$44,962</td>
<td>$47,210</td>
</tr>
<tr>
<td>Non-cash working capital</td>
<td>$844</td>
<td>$886</td>
<td>$931</td>
<td>$977</td>
<td>$1,026</td>
<td>$1,077</td>
</tr>
<tr>
<td>Capital Expenditures</td>
<td>$3,389</td>
<td>$3,559</td>
<td>$3,737</td>
<td>$3,924</td>
<td>$4,120</td>
<td>$4,326</td>
</tr>
<tr>
<td>+ Chg in Work. Cap</td>
<td>$40</td>
<td>$42</td>
<td>$44</td>
<td>$47</td>
<td>$49</td>
<td>$51</td>
</tr>
<tr>
<td>- Depreciation</td>
<td>$1,593</td>
<td>$1,673</td>
<td>$1,756</td>
<td>$1,844</td>
<td>$1,936</td>
<td>$2,033</td>
</tr>
<tr>
<td>- Net Income</td>
<td>$4,324</td>
<td>$4,540</td>
<td>$4,838</td>
<td>$5,157</td>
<td>$5,499</td>
<td>$5,864</td>
</tr>
<tr>
<td>+ Dividends</td>
<td>$664</td>
<td>$697</td>
<td>$743</td>
<td>$792</td>
<td>$844</td>
<td>$900</td>
</tr>
<tr>
<td>= Debt issued (repaid)</td>
<td>($1,823)</td>
<td>($1,915)</td>
<td>($2,071)</td>
<td>($2,239)</td>
<td>($2,422)</td>
<td>($2,619)</td>
</tr>
<tr>
<td>Beta</td>
<td>0.90</td>
<td>0.87</td>
<td>0.84</td>
<td>0.82</td>
<td>0.79</td>
<td>0.77</td>
</tr>
<tr>
<td>Cost of Equity</td>
<td>8.91%</td>
<td>8.73%</td>
<td>8.57%</td>
<td>8.41%</td>
<td>8.27%</td>
<td>8.13%</td>
</tr>
</tbody>
</table>

---

10 The effect of dividends on the market value of equity can best be captured by noting the effect the payment on dividends has on stock prices on the ex-dividend day. Stock prices tend to drop on ex-dividend day by about the same amount as the dividend paid.
There are two points to note in these forecasts. The first is that the net income is adjusted for the change in interest expenses that will occur as a result of the debt being paid off. The second is that the beta is adjusted to reflect the changing debt to equity ratio from year to year.

Disney produces a cash surplus every year, because internal cash flows (net income + depreciation) are well in excess of capital expenditures and working capital needs. If this is applied to paying off debt, the increase in the market value of equity over time will cause the debt ratio to drop from 27% to 7.86 percent by the end of year five.

If Disney wants to increase its debt ratio to 35 percent, it will need to do one or a combination of the following:

1. Increase its dividend payout ratio. The higher dividend increases the debt ratio in two ways. It increases the need for debt financing in each year, and it reduces the expected price appreciation on the equity. In Table 9.5, for instance, increasing the dividend payout ratio to 75% results in a debt ratio of 30.85% at the end of the fifth year.

<table>
<thead>
<tr>
<th>Current Year</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equity</td>
<td>$45,193</td>
<td>$45,813</td>
<td>$46,356</td>
<td>$46,810</td>
<td>$47,164</td>
</tr>
<tr>
<td>Debt</td>
<td>$16,682</td>
<td>$17,475</td>
<td>$18,316</td>
<td>$19,206</td>
<td>$20,149</td>
</tr>
<tr>
<td>Debt/(Debt+Equity)</td>
<td>26.96%</td>
<td>27.61%</td>
<td>28.32%</td>
<td>29.09%</td>
<td>29.93%</td>
</tr>
<tr>
<td>Revenues</td>
<td>$36,990</td>
<td>$38,840</td>
<td>$40,781</td>
<td>$42,821</td>
<td>$44,962</td>
</tr>
<tr>
<td>Capital Expenditures</td>
<td>$3,389</td>
<td>$3,559</td>
<td>$3,737</td>
<td>$3,924</td>
<td>$4,120</td>
</tr>
<tr>
<td>+ Chg in Work. Cap</td>
<td>$40</td>
<td>$42</td>
<td>$44</td>
<td>$47</td>
<td>$49</td>
</tr>
<tr>
<td>- Depreciation</td>
<td>$1,593</td>
<td>$1,673</td>
<td>$1,756</td>
<td>$1,844</td>
<td>$1,936</td>
</tr>
<tr>
<td>- Net Income</td>
<td>$4,324</td>
<td>$4,540</td>
<td>$4,738</td>
<td>$4,943</td>
<td>$5,157</td>
</tr>
<tr>
<td>+ Dividends</td>
<td>$664</td>
<td>$3,405</td>
<td>$3,553</td>
<td>$3,707</td>
<td>$3,868</td>
</tr>
<tr>
<td>= Debt issued (repaid)</td>
<td>$(1,823)</td>
<td>$793</td>
<td>$840</td>
<td>$890</td>
<td>$943</td>
</tr>
<tr>
<td>Beta</td>
<td>0.90</td>
<td>0.91</td>
<td>0.91</td>
<td>0.92</td>
<td>0.93</td>
</tr>
<tr>
<td>Cost of Equity</td>
<td>8.91%</td>
<td>8.94%</td>
<td>8.98%</td>
<td>9.02%</td>
<td>9.07%</td>
</tr>
<tr>
<td>Growth Rate</td>
<td>5.00%</td>
<td>5.00%</td>
<td>5.00%</td>
<td>5.00%</td>
<td>5.00%</td>
</tr>
<tr>
<td>Dividend Payout Ratio</td>
<td>15.36%</td>
<td>75.00%</td>
<td>75.00%</td>
<td>75.00%</td>
<td>75.00%</td>
</tr>
</tbody>
</table>
In other words, the dividend payout ratio would have to be increased five-fold for Disney’s debt ratio to rise to 31% over the next 5 years and even more so, if the objective is to increase the debt ratio to 35% or higher.

2. Repurchase stock each year. This affects the debt ratio in much the same way as increasing dividends, because it increases debt requirements and reduces equity. If Disney bought back 7.5 percent of the stock outstanding each year, the debt ratio at the end of year five would rise to almost 36%, as shown in Table 9.6.

Table 9.6 Estimated Debt Ratio with Equity Buyback of 7.5% a Year

<table>
<thead>
<tr>
<th></th>
<th>Current Year</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equity</td>
<td>$45,193</td>
<td>$44,882</td>
<td>$44,592</td>
<td>$44,320</td>
<td>$44,062</td>
<td>$43,815</td>
</tr>
<tr>
<td>Debt</td>
<td>$16,682</td>
<td>$18,407</td>
<td>$20,066</td>
<td>$21,658</td>
<td>$23,179</td>
<td>$24,625</td>
</tr>
<tr>
<td>Debt/(Debt+Equity)</td>
<td>26.96%</td>
<td>29.08%</td>
<td>31.03%</td>
<td>32.83%</td>
<td>34.47%</td>
<td>35.98%</td>
</tr>
<tr>
<td>Revenues</td>
<td>$36,990</td>
<td>$38,840</td>
<td>$40,781</td>
<td>$42,821</td>
<td>$44,962</td>
<td>$47,210</td>
</tr>
<tr>
<td>Capital Expenditures</td>
<td>$3,389</td>
<td>$3,559</td>
<td>$3,737</td>
<td>$3,924</td>
<td>$4,120</td>
<td>$4,326</td>
</tr>
<tr>
<td>+ Chg in Work. Cap</td>
<td>$40</td>
<td>$42</td>
<td>$44</td>
<td>$47</td>
<td>$49</td>
<td>$51</td>
</tr>
<tr>
<td>- Depreciation</td>
<td>$1,593</td>
<td>$1,673</td>
<td>$1,756</td>
<td>$1,844</td>
<td>$1,936</td>
<td>$2,033</td>
</tr>
<tr>
<td>- Net Income</td>
<td>$4,324</td>
<td>$4,540</td>
<td>$4,703</td>
<td>$4,876</td>
<td>$5,061</td>
<td>$5,258</td>
</tr>
<tr>
<td>+ Dividends</td>
<td>$664</td>
<td>$697</td>
<td>$722</td>
<td>$749</td>
<td>$777</td>
<td>$807</td>
</tr>
<tr>
<td>+ Stock Buybacks</td>
<td>$3,639</td>
<td>$3,616</td>
<td>$3,593</td>
<td>$3,573</td>
<td>$3,553</td>
<td>$3,553</td>
</tr>
<tr>
<td>= Debt issued (repaid)</td>
<td>($1,823)</td>
<td>$1,724</td>
<td>$1,660</td>
<td>$1,592</td>
<td>$1,521</td>
<td>$1,446</td>
</tr>
<tr>
<td>Beta</td>
<td>0.90</td>
<td>0.92</td>
<td>0.94</td>
<td>0.96</td>
<td>0.97</td>
<td>0.99</td>
</tr>
<tr>
<td>Cost of Equity</td>
<td>8.91%</td>
<td>9.02%</td>
<td>9.13%</td>
<td>9.23%</td>
<td>9.33%</td>
<td>9.43%</td>
</tr>
<tr>
<td>Growth Rate</td>
<td>5.00%</td>
<td>5.00%</td>
<td>5.00%</td>
<td>5.00%</td>
<td>5.00%</td>
<td>5.00%</td>
</tr>
<tr>
<td>Dividend Payout Ratio</td>
<td>15.36%</td>
<td>15.36%</td>
<td>15.36%</td>
<td>15.36%</td>
<td>15.36%</td>
<td>15.36%</td>
</tr>
</tbody>
</table>

In this scenario, Disney will need to borrow money each year to cover its stock buybacks and the debt ratio increases to 35.98% by the end of year five.

3. Increase capital expenditures each year. The first two approaches increase the debt ratio by shrinking the equity, whereas the third approach increases the scale of the firm. It does so by increasing the capital expenditures, which incidentally includes acquisitions of other firms, and financing these expenditures with debt. Disney could increase its debt ratio fairly significantly by increasing capital expenditures. In Table 9.7, we estimate the

---

11 Stock buyback in year t= (Market Value of Equity_{t-1} \cdot (1+Cost of Equity)_{t-1}-Dividends_{t-1}) \cdot (Buyback \%)
debt ratio for Disney if it doubles its capital expenditures (relative to the estimates in the earlier tables) and meets its external financing needs with debt.

Table 9.7 Estimated Debt Ratio with 100% Higher Capital Expenditures

<table>
<thead>
<tr>
<th></th>
<th>Current Year</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equity</td>
<td>$45,193</td>
<td>$48,521</td>
<td>$52,111</td>
<td>$55,985</td>
<td>$60,166</td>
<td>$64,681</td>
</tr>
<tr>
<td>Debt</td>
<td>$16,682</td>
<td>$18,326</td>
<td>$20,125</td>
<td>$22,092</td>
<td>$24,244</td>
<td>$26,597</td>
</tr>
<tr>
<td>Debt/(Debt+Equity)</td>
<td>26.96%</td>
<td>27.42%</td>
<td>27.86%</td>
<td>28.30%</td>
<td>28.72%</td>
<td>29.14%</td>
</tr>
<tr>
<td>Revenues</td>
<td>$36,990</td>
<td>$38,840</td>
<td>$40,781</td>
<td>$42,821</td>
<td>$44,962</td>
<td>$47,210</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Expenditures</td>
<td>$3,389</td>
<td>$7,118</td>
<td>$7,474</td>
<td>$7,847</td>
<td>$8,240</td>
</tr>
<tr>
<td>+ Chg in Work. Cap</td>
<td>$40</td>
<td>$42</td>
<td>$44</td>
<td>$47</td>
<td>$49</td>
</tr>
<tr>
<td>- Depreciation</td>
<td>$1,593</td>
<td>$1,673</td>
<td>$1,756</td>
<td>$1,844</td>
<td>$1,936</td>
</tr>
<tr>
<td>- Net Income</td>
<td>$4,324</td>
<td>$4,540</td>
<td>$4,706</td>
<td>$4,874</td>
<td>$5,045</td>
</tr>
<tr>
<td>+ Dividends</td>
<td>$664</td>
<td>$697</td>
<td>$743</td>
<td>$792</td>
<td>$844</td>
</tr>
<tr>
<td>+ Stock Buybacks</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>= Debt issued (repaid)</td>
<td>($1,823)</td>
<td>$1,644</td>
<td>$1,799</td>
<td>$1,967</td>
<td>$2,152</td>
</tr>
<tr>
<td>Beta</td>
<td>0.90</td>
<td>0.91</td>
<td>0.91</td>
<td>0.91</td>
<td>0.92</td>
</tr>
<tr>
<td>Cost of Equity</td>
<td>8.91%</td>
<td>8.93%</td>
<td>8.95%</td>
<td>8.98%</td>
<td>9.00%</td>
</tr>
<tr>
<td>Growth Rate</td>
<td>5.00%</td>
<td>5.00%</td>
<td>5.00%</td>
<td>5.00%</td>
<td>5.00%</td>
</tr>
<tr>
<td>Dividend Payout Ratio</td>
<td>15.36%</td>
<td>15.36%</td>
<td>15.36%</td>
<td>15.36%</td>
<td>15.36%</td>
</tr>
</tbody>
</table>

With the higher capital expenditures and maintaining the existing dividend payout ratio of 15.36%, the debt ratio is 29.14% by the end of year five. This is the riskiest strategy of the three because it presupposes the existence of enough good investments (or acquisitions) to cover $25 billion in new investments over the next five years. It may, however, be the strategy that seems most attractive to management intent on building a global entertainment empire. In the process of expanding, though, Disney will have to figure out ways of keeping its return on capital above its cost of capital.

9.5. Cash Balances and Changing Leverage

Companies with excess debt capacity often also have large cash balances. Which of the following actions by a company with a large cash balance will increase its debt ratio?

a. Using the cash to acquire another company
b. Paying a large special dividend
c. Paying off debt
d. Buying back stock

Explain.

*Illustration 9.5 Decreasing Leverage Gradually: Tata Chemicals*

In 2009, Tata Chemicals had Rs 26.9 billion rupees in debt outstanding, representing a debt ratio of 34.02%. In chapter 8, we computed the optimal debt ratio for the firm to be about 10% but there is little threat of bankruptcy, partly because the firm has enough operating income to cover its interest expenses comfortably and partly because it has the backing of the Tata Group’s ample financial resources. Table 9.8 examines the effect on leverage of cutting dividends to zero and using operating cash flows to invest in new projects and repay debt.

*Table 9.8 Estimated Debt Ratios: Tata Chemicals*

<table>
<thead>
<tr>
<th>Equity</th>
<th>Current Year</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rs 52,160</td>
<td>Rs 59,187</td>
<td>Rs 67,129</td>
<td>Rs 75,832</td>
<td>Rs 85,364</td>
<td>Rs 95,794</td>
<td></td>
</tr>
<tr>
<td>Debt</td>
<td>Rs 26,892</td>
<td>Rs 24,324</td>
<td>Rs 21,381</td>
<td>Rs 18,008</td>
<td>Rs 14,143</td>
<td>Rs 9,714</td>
</tr>
<tr>
<td>Debt/(Debt+Equity)</td>
<td>34.02%</td>
<td>29.13%</td>
<td>24.16%</td>
<td>19.19%</td>
<td>14.21%</td>
<td>9.21%</td>
</tr>
<tr>
<td>Revenues</td>
<td>Rs 59,757</td>
<td>Rs 64,538</td>
<td>Rs 69,701</td>
<td>Rs 75,277</td>
<td>Rs 81,299</td>
<td>Rs 87,803</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Capital Expenditures</th>
<th>Current Year</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rs 2,162</td>
<td>Rs 2,335</td>
<td>Rs 2,522</td>
<td>Rs 2,723</td>
<td>Rs 2,941</td>
<td>Rs 3,177</td>
<td></td>
</tr>
<tr>
<td>+ Chg in Work. Cap</td>
<td>Rs 742</td>
<td>Rs 802</td>
<td>Rs 866</td>
<td>Rs 935</td>
<td>Rs 1,010</td>
<td>Rs 1,091</td>
</tr>
<tr>
<td>- Depreciation</td>
<td>Rs 1,582</td>
<td>Rs 1,709</td>
<td>Rs 1,845</td>
<td>Rs 1,993</td>
<td>Rs 2,152</td>
<td>Rs 2,324</td>
</tr>
<tr>
<td>- Net Income</td>
<td>Rs 3,700</td>
<td>Rs 3,996</td>
<td>Rs 4,485</td>
<td>Rs 5,039</td>
<td>Rs 5,664</td>
<td>Rs 6,373</td>
</tr>
<tr>
<td>+ Dividends</td>
<td>Rs 664</td>
<td>Rs 0</td>
<td>Rs 0</td>
<td>Rs 0</td>
<td>Rs 0</td>
<td>Rs 0</td>
</tr>
<tr>
<td>= Debt issued (repaid)</td>
<td>(Rs 1,714)</td>
<td>(Rs 2,568)</td>
<td>(Rs 2,943)</td>
<td>(Rs 3,373)</td>
<td>(Rs 3,865)</td>
<td>(Rs 4,429)</td>
</tr>
</tbody>
</table>

| Beta | 0.90 | 0.90 | 0.85 | 0.82 | 0.78 | 0.75 |
| Cost of Equity | 13.47% | 13.42% | 12.97% | 12.57% | 12.22% | 11.90% |
| Growth Rate | 8.00% | 8.00% | 8.00% | 8.00% | 8.00% | 8.00% |
| Dividend Payout Ratio | 17.94% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |

Allowing for a growth rate of 8 percent in operating income, Tata Chemicals repays Rs 17 billion of its outstanding debt in the first year. By the end of the fifth year, the growth in equity and the reduction in debt combine to lower the debt ratio to 9.21 percent.

*Chgcapstru.xls: This spreadsheet allows you to estimate the effects of changing dividend policy or capital expenditures on debt ratios over time.*
9.6. Investing in Other Business Lines

In the analysis above, we have argued that firms should invest in projects as long as the return on equity is greater than the cost of equity. Assume that a firm is considering acquiring another firm with its debt capacity. In analyzing the return on equity the acquiring firm can make on this investment, we should compare the return on equity to

a. the cost of equity of the acquiring firm.
b. the cost of equity of the acquired firm.
c. a blended cost of equity of the acquired and acquiring firm.
d. none of the above.

Explain.

In Practice: Security Innovation and Changing Capital Structure

The changes in leverage discussed so far in this chapter have been accomplished using traditional securities, such as straight debt and equity, but firms that have specific objectives on leverage may find certain products that are designed to meet those objectives. Consider a few examples:

- Hybrid securities (such as convertible bonds) are combinations of debt and equity that change over time as the firm changes. To be more precise, if the firm prospers and its equity value increases, the conversion option in the convertible bond will become more valuable, thus increasing the equity component of the convertible bond and decreasing the debt component (as a percent of the value of the bond). If the firm does badly and its stock price slides, the conversion option (and the equity component) will become less valuable, and the debt ratio of the firm will increase.

- An alternative available to a firm that wants to increase leverage over time is a forward contract to buy a specified number of shares of equity in the future. These contracts lock the firms into reducing their equity over time and may carry a more positive signal to financial markets than would an announcement of plans to
repurchase stock, because firms are not obligated to carry through on these announcements.

- A firm with high leverage, faced with a resistance from financial markets to common stock issues, may consider more inventive ways of raising equity, such as using warrants and contingent value rights. Warrants represent call options on the firm’s equity, whereas contingent value rights are put options on the firm’s stock. The former have appeal to those who are optimistic about the future of the company and the latter make sense for risk averse investors who are concerned about the future.

Choosing the Right Financing Instruments

In Chapter 7 we presented a variety of ways in which firms can raise debt and equity. Debt can be bank debt or corporate bonds, can vary in maturity from short to long term, can have fixed or floating rates, and can be in different currencies. In the case of equity there are fewer choices, but firms can still raise equity from common stock, warrants, or contingent value rights. Although we suggested broad guidelines that could be used to determine when firms should consider each type of financing, we did not develop a methodology by which a specific firm can pick the right kind of financing.

In this section, we lay out a sequence of steps by which a firm can choose the right financing instruments. This analysis is useful not only in determining what kind of securities should be issued to finance new investments but also in highlighting limitations in a firm’s existing financing choices. The first step in the analysis is an examination of the cash flow characteristics of the assets or projects that will be financed; the objective is to try matching the cash flows on the liability stream as closely as possible to the cash flows on the asset stream. We then superimpose a series of considerations that may lead the firm to deviate from or modify these financing choices.

First, we consider the tax savings that may accrue from using different financing vehicles and weigh the tax benefits against the costs of deviating from the optimal choices. Next, we examine the influence that equity research analysts and ratings agency views have on the choice of financing vehicles; instruments that are looked on favorably by either or (better still) both groups will clearly be preferred to those that evoke strong
negative responses from one or both groups. We also factor in the difficulty that some firms might have in conveying information to markets; in the presence of asymmetric information, firms may have to make financing choices that do not reflect their asset mix. Finally, we allow for the possibility that firms may want to structure their financing to reduce agency conflicts between stockholders and bondholders.

I. Matching Financing Cash Flows with Asset Cash Flows

The first and most important characteristic a firm has to consider in choosing the financing instrument it will use to raise funds is the cash flow patterns of the assets to be financed.

Why Match Asset Cash Flows to Cash Flows on Liabilities?

We begin with the premise that the cash flows of a firm’s liability stream should match the cash flows of the assets that they finance. Let us begin by defining firm value as the present value of the cash flows generated by the assets owned by the firm. This firm value will vary over time, not only as a function of firm-specific factors (such as project success) but also as a function of broader macroeconomic variables, such as interest rates, inflation rates, economic cycles, and exchange rates. Figure 9.2 represents the time series of firm value for a hypothetical firm, where all the changes in firm value are assumed to result from changes in macroeconomic variables.

*Figure 9.2: Firm Value over time with Short Term Debt*

This firm can choose to finance these assets with any financing mix it wants. The value of equity at any point in time is the difference between the value of the firm and the value of outstanding debt. Assume, for instance, that the firm chooses to finance the assets...
shown in Figure 9.2 using very short-term debt and that the value of this debt is unaffected by changes in macroeconomic variables. Figure 9.3 provides the firm value, debt value, and equity value over time for the firm.

*Figure 9.3: Firm Value over time with Long Term Debt*

![Graph showing firm value, debt value, and equity value over time.]

Note that there are periods when the firm value drops below the debt value, which would suggest that the firm is technically bankrupt in those periods. Firms that weigh this possibility into their financing decision will therefore borrow less.

Now consider a firm that finances the assets described in Figure 9.2 with debt that matches the assets exactly in terms of cash flows and also in terms of the sensitivity of debt value to changes in macroeconomic variables. Figure 9.4 provides the firm value, debt value, and equity value for this firm.

*Figure 9.4: Firm Value over time with Long Term Debt*

![Graph showing firm value, debt value, and value of equity over time.]

Because debt value and firm value move together, the possibility of default is eliminated. This, in turn, will allow the firm to carry much more debt, and the added debt should
provide tax benefits that make the firm more valuable. Thus, matching liability cash flows to asset cash flows allows firms to have higher optimal debt ratios.

9.7. The Rationale for Asset and Liability Matching

In Chapter 4, we argued that firms should focus on only market risk, because firm-specific risk can be diversified away. By the same token, it should not matter if firms use short-term debt to finance long-term assets, because investors in these firms can diversify away this risk anyway.

a. True
b. False

Comment.

Matching Liabilities to Assets

The first step every firm should take toward making the right financing choices is to understand how cash flows on its assets vary over time. In this section, we consider five aspects of financing choices and how they are guided by the nature of the cash flows generated by assets. We begin by looking at the question of financing maturity, that is, the choice between long-term, medium-term, and short-term debt, and we argue that this choice will be determined by how long-term asset cash flows are. Next, we examine the choice between fixed and floating rate debt and how this choice will be affected by the way inflation affects the cash flows on the assets financed by the debt. Third, we look at the currency of in which the debt is to be denominated and link it to the currency in which asset cash flows are generated. Fourth, we evaluate when firms should use convertible debt instead of straight rate debt and how this determination should be linked to how much growth there is in asset cash flows. Finally, we analyze other features that can be attached to debt and how these features can be used to insulate a firm against specific factors that affect cash flows on assets, either positively or negatively.

A. Financing Maturity

Firms can issue debt of varying maturities, ranging from very short-term to very long-term. In making this choice, they should first be guided by how long-term the cash flows on their assets are. For instance, firms should not finance assets that generate cash
flows over the short term (say, two to three years) using twenty-year debt. In this section, we begin by examining how best to assess the life of assets and liabilities, and then we consider alternative strategies to matching financing with asset cash flows.

**Measuring the Cash Flow Lives of Liabilities and Assets**

When we talk about projects as having a ten-year life or a bond as having a thirty-year maturity, we are referring to the time when the project ends or the bond comes due. The cash flows on the project, however, occur over the ten-year period, and there are usually interest payments on the bond every six months until maturity. The *duration* of an asset or liability is a weighted maturity of all the cash flows on that asset or liability, where the weights are based on both the timing and the magnitude of the cash flows. In general, larger and earlier cash flows are weighted more than smaller and later cash flows. The duration of a thirty-year bond, with coupons every six months, will be lower than thirty years, and the duration of a ten-year project, with cash flows each year, will generally be lower than ten years.

A simple measure of duration for a bond, for instance, can be computed as follows:

$$\text{Duration of Bond} = \frac{\text{dP/dr}}{(1 + r)} = \left[ \frac{\sum_{t=1}^{N} t \times \text{Coupon}_t + N \times \text{Face Value}}{(1 + r)^t} \right] \left[ \frac{\sum_{t=1}^{N} \text{Coupon}_t + \text{Face Value}}{(1 + r)^N} \right]$$

where $N$ is the maturity of the bond, and $t$ is when each coupon comes due. Holding other factors constant, the duration of a bond will increase with the maturity of the bond and decrease with the coupon rate on the bond. For example, the duration of a 7 percent, thirty-year coupon bond, when interest rates are 8 percent and coupons are paid each year, can be written as follows:

---

12This measure of duration is called *Macaulay duration*, and it makes same strong assumptions about the yield curve; specifically, the yield curve is assumed to be flat and move in parallel shifts. Other duration measures change these assumptions. For purposes of our analysis, however, a rough measure of duration will suffice.
What does the duration tell us? First, it provides a measure of when, on average, the cash flows on this bond come due, factoring in both the magnitude of the cash flows and the present value effects. This 30-year bond, for instance, has cash flows that come due in about 12.41 years, after considering both the coupons and the face value. Second, it is an approximate measure of how much the bond price will change for small changes in interest rates. For instance, this thirty-year bond will drop in value by approximately 12.41 percent for a 1 percent increase in interest rates. Note that the duration is lower than the maturity. This will generally be true for coupon-bearing bonds, though special features in the bond may sometimes increase duration. This measure of duration can be extended to any asset with expected cash flows. Thus, the duration of a project or asset can be estimated in terms of its predebt operating cash flows:

$$\text{Duration of Project/Asset} = \frac{dPV}{dr} = \frac{\sum_{t=1}^{N} CF_t (1+r)^t + N \times \text{Terminal Value}}{\sum_{t=1}^{N} (1+r)^t (1+r)^{N-t}}$$

where $CF_t$ is the after-tax cash flow on the project in year $t$ and the terminal value is a measure of how much the project is worth at the end of its lifetime of $N$ years. The duration of an asset measures both when, on average, the cash flows on that asset come due and how much the value of the asset changes for a 1 percent change in interest rates.

One limitation of this analysis of duration is that it keeps cash flows fixed while interest rates change. On real projects, however, the cash flows will be adversely affected by the increases in interest rates, and the degree of the effect will vary from business to business—more for cyclical firms (automobiles, housing) and less for noncyclical firms.
(food processing). Thus the actual duration of most projects will be higher than the estimates obtained by keeping cash flows constant. One way of estimating duration without depending on the traditional bond duration measures is to use historical data. If the duration is, in fact, a measure of how sensitive asset values are to interest rate changes, and a time series of data of asset value and interest rate changes is available, a regression of the former on the latter should yield a measure of duration:

\[ \Delta \text{Asset Value}_t = a + b \Delta \text{Interest Rate}_t \]

In this regression, the coefficient \( b \) on interest rate changes should be a measure of the duration of the assets. For firms with publicly traded stocks and bonds, the asset value is the sum of the market values of the two. For a private company or for a public company with a short history, the regression can be run, using changes in operating income as the dependent variable:

\[ \Delta \text{Operating Income}_t = a + b \Delta \text{Interest Rate}_t \]

Here again, the coefficient \( b \) is a measure of the duration of the assets.

**Illustration 9.6 Calculating Duration for Rio Disney**

In this application, we will calculate duration using the traditional measures for Rio Disney, which we analyzed in Chapter 5. The cash flows for the project are summarized in Table 9.9, together with the present value estimates, calculated using the cost of capital for this project of 8.62%.

**Table 9.9 Calculating a Project’s Duration: Rio Disney**

<table>
<thead>
<tr>
<th>Year (t)</th>
<th>Annual Cashflow</th>
<th>Terminal Value</th>
<th>Present Value @ 8.62%</th>
<th>Present value *t</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-$2,000</td>
<td></td>
<td>-$2,000</td>
<td>$0</td>
</tr>
<tr>
<td>1</td>
<td>-$1,000</td>
<td></td>
<td>-$921</td>
<td>-$921</td>
</tr>
<tr>
<td>2</td>
<td>-$860</td>
<td></td>
<td>-$729</td>
<td>-$1,457</td>
</tr>
<tr>
<td>3</td>
<td>-$270</td>
<td></td>
<td>-$211</td>
<td>-$632</td>
</tr>
<tr>
<td>4</td>
<td>$332</td>
<td></td>
<td>$239</td>
<td>$956</td>
</tr>
<tr>
<td>5</td>
<td>$453</td>
<td></td>
<td>$300</td>
<td>$1,500</td>
</tr>
<tr>
<td>6</td>
<td>$502</td>
<td></td>
<td>$305</td>
<td>$1,833</td>
</tr>
<tr>
<td>7</td>
<td>$538</td>
<td></td>
<td>$302</td>
<td>$2,112</td>
</tr>
<tr>
<td>8</td>
<td>$596</td>
<td></td>
<td>$307</td>
<td>$2,460</td>
</tr>
<tr>
<td>9</td>
<td>$660</td>
<td></td>
<td>$313</td>
<td>$2,821</td>
</tr>
<tr>
<td>10</td>
<td>$692</td>
<td>$10,669</td>
<td>$4,970</td>
<td>$49,704</td>
</tr>
</tbody>
</table>

Duration of the Project = 58,375/2,050 = 20.29 years
This would suggest that the cash flows on this project come due, on average, in about 20 years. The duration is longer than the life of the project because the cash flows in the first few years are negative.

9.8. **Project Life and Duration**

In investment analyses, analysts often cut off project lives at an arbitrary point and estimate a salvage or a terminal value. If these cash flows are used to estimate project duration, we will tend to

a. understate duration.
b. overstate duration.
c. not affect the duration estimate.

Explain.

*Duration Matching Strategies*

We just considered ways of estimating the duration of assets and liabilities. The basic idea is to match the duration of a firm’s assets to the duration of its liabilities. This can be accomplished in two ways: by matching individual assets and liabilities, or by matching the assets of the firm with its collective liabilities. In the first approach, the Disneyworld Bangkok project would be financed with bonds with duration of approximately twenty-four years. Although this approach provides a precise matching of each asset’s characteristics to those of the financing used for it, it has several limitations. First, it is expensive to arrange separate financing for each project, given the issuance costs associated with raising funds. Second, this approach ignores interactions and correlations between projects that might make project-specific financing suboptimal for the firm. Consequently, this approach works only for companies that have very large, independent projects.

It is far more straightforward, and often cheaper, to match the duration of a firm’s collective assets to the duration of its collective liabilities. If there is a significant difference, the firm might have to consider changing the duration of its liabilities. For instance, if Disney’s assets have a duration of fifteen years, and its liabilities have a duration of only five years, the firm should try to extend the duration of its liabilities. It
can do so in one of three ways. First, it can finance its new investments with debt of much longer duration; thus, using 100-year bonds to finance the new theme park will increase the weighted average duration of all its debt. Second, it can repay some of its short-term debt and replace it with long-term debt. Third, it can exchange or swap short-term debt for long-term debt.

9.9. **Project and Firm Duration**

Which of the following types of firms should be most likely to use project-specific financing (as opposed to financing the portfolio of projects)?

a. Firms with a few large homogeneous projects
b. Firms with a large number of small homogeneous projects
c. Firms with a few large heterogeneous projects
d. Firms with a large number of small heterogeneous projects

**Explain.**

### B. The Fixed/Floating Rate Choice

One of the most common choices firms face is whether to make the coupon rate on bonds (and the interest rate on bank loans) a fixed rate or a floating rate, pegged to an index rate such as the LIBOR. In making this decision, we once again examine the characteristics of the projects being financed with the debt. In particular, we argue that the use of **floating rate debt** should be more prevalent for firms that are uncertain about the duration of future projects and that have cash flows that move with the inflation rate.

**Uncertainty about Future Projects**

The duration of assets and liabilities can be synchronized because assets and projects are well identified, interest rate sensitivity can be estimated and the appropriate maturity for financing can be ascertained. For some firms, this estimation may be difficult to do, however. The firm might be changing its business mix by divesting itself of some assets and acquiring new ones. Alternatively, the industry to which the firm belongs might be changing. In such cases, the firm may use short-term or floating rate.
loans that are easy to change, until it feels more certain about its future investment plans.

**Cash Flows and Inflation**

Floating rate loans have interest payments that increase as market interest rates rise and fall as rates fall. If a firm has assets whose earnings increase as interest rates go up and decrease as interest rates go down, it should finance those assets with floating rate loans. The expected inflation rate is a key ingredient determining interest rates. On floating rate loans, this rate will lead to high interest payments in periods when inflation is high and low interest payments in periods when inflation is low. Firms whose earnings increase in periods of high inflation and decrease in periods with low inflation should therefore also be more likely to use floating rate loans.

A number of factors determine whether a firm’s earnings move with inflation. One critical ingredient is the degree of pricing power the firm possesses. Firms that have significant pricing power, either because they produce a unique product or because they are price leaders in their industries, have a much higher chance of being able to increase their earnings as inflation increases. Consequently, these firms should gain more by using floating rate debt. Firms that do not have pricing power are much more likely to see cash flows decline with unexpected inflation, and they should be more cautious about using floating rate debt.

**C. The Currency Choice**

| **PERLS:** A bond, denominated in the domestic currency, where the principal payment at maturity is based on the domestic currency equivalent of a fixed foreign currency amount. For instance, this could be a dollar-denominated bond with the payment at maturity set equal to the dollar value of |

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14The presence of derivatives provides an alternative for firms that are faced with this uncertainty. They can use the financing mix that is most appropriate given their current asset mix and use derivatives to manage the intermediate risk.
1,000 Euros. Thus, if the dollar strengthens against the Euro during the life of the bond, the principal payment will decrease.

Many of the points we have made about interest rate risk exposure also apply to currency risk exposure. If any of a firm’s assets or projects creates cash flows denominated in a currency other than the one in which the equity is denominated, currency risk exists. The liabilities of a firm can be issued in these currencies to reduce the currency risk. A firm that expects 20 percent of its cash flows to be in Euros, for example, would attempt to issue Euro-denominated debt in the same proportion to mitigate the currency risk. If the Euro weakens and the assets become less valuable, the value of the debt will decline proportionately.

In recent years, firms have used more sophisticated variations on traditional bonds to manage foreign exchange risk on investments. For instance, Philip Morris issued a dual currency bond in 1985—coupon payments were made in Swiss francs, and the principal payment was in U.S. dollars. In 1987, Westinghouse issued principal exchange rate–linked securities (PERLS), in which the principal payment was the U.S. dollar value of 70.13 New Zealand dollars. Finally, firms have issued bonds embedded with foreign currency options called indexed currency option notes (ICON), which combine a fixed rate bond with an option on a foreign currency. This approach is likely to work only for firms that have fairly predictable currency flows, however. For firms that do not have predictable currency flows, currency options or futures may be a cheaper way to manage currency risk, because the currency exposure changes from period to period.

D. The Choice between Straight and Convertible Bonds

Firms vary in terms of how much of their value comes from projects or assets they already own and how much comes from future growth. Firms that derive the bulk of their value from future growth should use different types of financing and design their financing differently than do those that derive most of their value from assets in place. This is so because the current cash flows on high growth firms will be low relative to the market value. These cash flows can be expected to grow substantially over time as the firm invests in new projects. Accordingly, the financing approach should not create large cash outflows early; it can create substantial cash outflows later, however, reflecting the
cash flow patterns of the firm. In addition, the financing should exploit the value that the perception of high growth adds to securities, and it should put relatively few constraints on investment policies.

Straight bonds do not quite fit the bill, because they create large interest payments and do not gain much value from the high growth perceptions. Furthermore, they are likely to include covenants designed to protect the bondholders, which restrict investment and future financing policy. Convertible bonds, by contrast, create much lower interest payments, impose fewer constraints, and gain value from higher growth perceptions. They might be converted into common stock, but only if the firm is successful. In 1999, for instance, Amazon.com, the online retailer, raised $1.25 billion from a convertible bond issue with a coupon rate of 3.5 percent.

E. Special Financing Features

Every firm is exposed to risk, coming from macroeconomic sources (such as recessions), acts of God (such as the weather), acts of competitors or technological shifts. If a firm’s exposure to any or all these sources of risk is substantial, it may choose not to borrow, rather than risk default. One way firms can partially protect themselves against this default risk is to incorporate special features into bonds or debt, shielding themselves against the most serious risk or risks. Two examples of bonds provide good illustrations:

• Insurance companies, for instance, have issued bonds whose payments can be drastically curtailed if there is a catastrophe that creates a substantial liability for the insurance company. By doing so, they reduce their debt payments in those periods when their overall cash flows are most negative, thereby reducing their likelihood of default.15

• Companies in commodity businesses have issued bonds whose principal and interest payments are tied to the price of the commodity. Because the operating cash flows in

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15As an example of a catastrophe bond issue, consider the bond issue made by USAA Insurance Company. The company privately placed $477 million of these bonds, backed up by reinsurance premiums, in June 1997. The company was protected in the event of any hurricane that created more that $1 billion in damage to the East Coast anytime before June 1998. The bonds came in two classes; in the first class, called principal-at-risk, the company could reduce the principal on the bond in the event of a hurricane; in the second class, which was less risky to investors, the coupon payments would be suspended in the event of a hurricane, but the principal would be protected. In return, in October 1997 the investors in these bonds
these firms are also positively correlated with commodity prices, adding this feature to debt decreases the likelihood of default and allows the firm to use more debt. In 1980, for instance, Sunshine Mining issued fifteen-year silver-linked bond issues, which combined a debt issue with an option on silver prices. As silver prices increased, the coupon rate on the bond increased; as silver prices decreased, the coupon rate on the bond decreased as well.

In Practice: Customized Bonds

In keeping with the notion of customizing bonds to match asset cash flows, firms have come up with increasingly creative solutions in recent years. In this endeavor, they have been assisted by two developments. The first is that investors in bond markets are more open to both pricing and buying complex bonds than they were in the 1970s and even the 1980s. The second is that advancements in option pricing allow us to value complicated securities with multiple options embedded in them. Consider a few examples:

• In the early 1990s, David Bowie acquired the rights to all of his songs, bundled them, and sold bonds backed by sales of his recording. What made the bonds unique was the fact that the interest rate on the bonds was tied to the sales of his recordings—higher (lower) rates with higher (lower) sales.

• In 2001, an Italian soccer team issued bonds to fund the construction of a stadium but tied the interest rate on the bond to the success of the team. Specifically, the interest rate on the bond would rise if the team stayed in the first division (and drew larger crowds and revenues) and drop if the team dropped to the second division.

9.10. Special Features and Interest Rates

Adding special features to bonds, such as linking coupon payments to commodity prices or catastrophes, will reduce their attractiveness to investors and make the interest rates paid on them higher. It follows then that

a. companies should not add these special features to bonds.

were earnings an extra yield of almost 1.5 percent on the principal-at-risk bonds and almost 0.5 percent on
b. adding these special features cannot create value for the firm if the bonds are fairly priced.
c. adding special features can still create value even if the bonds are fairly priced. Explain.

Market Timing, Interest Rate Illusions and Mismatched Debt: A Behavioral Perspective

The argument that we should match the cash flow on debt to the cash flow on assets is based on the premise that managers are not very good at timing markets and/or assessing what types of debt are cheap or expensive. That premise may not be wrong but that does not stop managers from trying to use what they perceive to be “cheap” debt, even if it results in mismatching debt to assets.

a. **Playing the term structure:** In the last chapter, we presented evidence that managers try to time markets with equity and bond issues, issuing more equity when they feel that their stock is over priced and less equity when they feel it is over priced. There is also evidence that the managers are more likely to use short term debt, when the yield curve is “too steep” and more long term debt, when it is “too flat”.

b. **The convertible option:** The use of convertible securities – convertible bonds and preferred stock – increases when managers perceive their stock to be over priced and decreases when it is considered under priced.

c. **The Interest rate illusion:** When comparing different types of borrowing, some managers find themselves comparing the interest rates on the debt issues, with the view that lower interest rates represent cheaper financing. It is this rationale that allows some managers to think that short term debt is cheaper than long term debt and that convertible debt is less expensive than straight debt. In emerging markets, borrowing in the local currency (with higher expected inflation) looks more expensive than borrowing in a foreign currency.

the principal-protected bonds.
As a consequence of these factors, the debt used by a firm can be at variance with the assets funded with this debt. While it may be impractical and perhaps even unwise to ask managers to stop trying to pick the cheapest debt, there are three things we can do to minimize potential damage:

- We can impose constraints that prevent the mismatch from becoming too severe. For instance, a firm whose assets are 20% short term and 80% long term may specify that short term debt cannot exceed 40% of overall debt.
- We can use the derivatives and swaps markets to hedge some of the mismatch risk, at least at the aggregate level. Thus, a firm that chooses to use Japanese yen to fund Euro assets, because managers believe that Yen debt is cheaper than Euro debt, can use currency futures to hedge some of its Yen/Euro risk exposure.

### II. Tax Implications

As firms become more creative with their financing choices and structure debt that behaves more like equity, there is a danger that the tax authorities might decide to treat the financing as equity and prevent the firm from deducting interest payments. Because the primary benefit of borrowing is a tax benefit, it is important that firms preserve and, if possible, increase this tax benefit.

It is also conceivable that the favorable tax treatment of some financing choices may encourage firms to use them more than others, even if it means deviating from the choices that would be dictated by the asset characteristics. Thus, a firm that has assets that generate cash flows in Japanese yen may decide to issue dollar-denominated bonds to finance these assets if it derives a larger tax benefit from issuing dollar debt than yen debt.

The danger of structuring financing with the intention of saving on taxes is that changes in the tax law can very quickly render the benefit moot and leave the firm with a financing mix unsuited to its asset mix.

### III. Views of Ratings Agencies, Equity Research Analysts, and Regulatory Authorities

Firms are rightfully concerned about the views of equity research analysts and ratings agencies on their actions, but in our view they often overestimate the influence of
both groups. Analysts represent stockholders, and ratings agencies represent bondholders; consequently they take very different views of the same actions. For instance, analysts may view a stock repurchase by a company with limited project opportunities as a positive action, whereas ratings agencies may view it as negative and lower ratings in response. Analysts and ratings agencies also measure the impact of financing choices made by a firm using very different criteria. In general, analysts view a firm’s actions through the prism of higher earnings per share and by looking at the firm relative to comparable firms, using multiples such as price earnings or price to book value ratios. Ratings agencies, on the other hand, measure the effect of actions on the financial ratios, such as debt ratios and coverage ratios, which they then use to assess default risk and assign ratings.

Given the weight attached to the views of both these groups, firms sometimes design securities with the intent of satisfying both. In some cases, they find ways of raising funds that seem to make both groups happy, at least on the surface. To illustrate, consider the use of leasing, before generally accepted accounting principles required capitalizing of leases. Leasing increased the real leverage of the company, and thus, the earnings per share, but it did not affect the measured leverage of the company because it was not viewed as debt. To the degree that analysts and ratings agencies rely on quantitative measures and do not properly factor in the effects of these actions, firms can exploit their limitations. In fact, they still do with operating leases. In a more recent example, a security labeled as trust preferred stock has become popular largely because of the different ways in which it is viewed by various entities. It is viewed as debt by the equity research analysts and tax authorities, with the preferred dividend being tax-deductible. Trust preferred is viewed as equity by ratings agencies, allowing the firms issuing it to retain high ratings.16

When securities are designed in such a way, the real question is whether the markets are fooled and, if so, for how long. A firm that substitutes leases and trust preferred for debt may fool the ratings agencies and even the debt markets for some

---

16Ratings agencies initially treated trust preferred as equity. Over time, they have become more cautious. By the late 1990s, firms were being given credit for only a portion of the trust preferred (about 40 percent).
period of time, but it cannot evade the reality that it is much more levered and hence much riskier.

This balancing act becomes even more precarious for regulated firms such as banks and insurance companies. These firms also have to make sure that any financing actions they take are viewed favorably by regulatory authorities. For instance, financial service firms have to maintain equity capital ratios that exceed regulatory minimums. However, regulatory authorities use a different definition of equity capital than ratings agencies and equity research analysts, and firms can exploit these differences. For instance, banks are among the heaviest users of conventional preferred stock, because preferred stock is treated as equity by bank regulators. In the past few years, insurance companies in the United States have issued surplus notes,\textsuperscript{17} which are considered debt for tax purposes and equity under insurance accounting rules, enabling them to have the best of both worlds—they can issue debt, while counting it as equity.\textsuperscript{18}

### IV. The Effects of Asymmetric Information

Firms generally have more information about their future prospects than do financial markets. This asymmetry in information creates friction when firms try to raise funds. In particular, firms with good prospects try to distinguish themselves from firms without such prospects by taking actions that are costly and difficult to imitate. Firms also try to design securities to reduce the effect of uncertainty in future cash flows on bondholders. In the process, they may issue securities that are not optimal from the standpoint of matching their asset cash flows but are specifically designed to convey information to financial markets and reduce the effects of uncertain cash flows on value.

A number of researchers have used this information asymmetry argument to draw very different conclusions about the debt structure firms should use. Myers (1977) argued that firms tend to under invest as a consequence of the asymmetry of information. One proposed solution to the problem is to issue short-term debt, even if the assets being

\textsuperscript{17}Surplus notes are bonds where the interest payments need to be made only if the firm is profitable. If it is not, the interest payments are cumulated and paid in subsequent periods.

\textsuperscript{18}In recent years, insurance companies have issued billions of dollars of surplus notes in the private placement market.
financed are long-term assets.\textsuperscript{19} Flannery (1986) and Kale and Noe (1990) note that although both short-term and long-term debt will be mispriced in the presence of asymmetric information, long-term debt will be mispriced more.\textsuperscript{20} Consequently, they argue that high-quality firms will issue short-term debt, and low-quality firms will issue long-term debt. Goswami, Noe, and Rebello (1995) analyze the design of securities and relate it to uncertainty about future cash flows.\textsuperscript{21} They conclude that if the asymmetry of information concerns uncertainty about long-term cash flows, firms should issue coupon-bearing long-term debt with restrictions on dividends. In contrast, firms with uncertainty about near-term cash flows and significant refinancing risk should issue long-term debt without restrictions on dividend payments. When uncertainty about information is uniformly distributed across time, firms should finance with short-term debt.

V. Implications for Agency Costs

The final consideration in designing securities is the provision of features intended to reduce the agency conflicts between stockholders and bondholders. As we noted in Chapter 7, differences between bondholders and stockholders on investment, financing, and dividend policy decisions can influence financing decisions, by increasing either the costs of borrowing or the constraints associated with borrowing. In some cases, firms design securities with the specific intent of reducing this conflict and its associated costs.

- We explained that convertible bonds are a good choice for growth companies because of their cash flow characteristics. Convertible bonds can also reduce the anxiety of bondholders about equity investors investing in riskier projects and expropriating wealth, by allowing bondholders to become stockholders if the stock price increases enough.


• More corporate bonds include embedded put options that allow bondholders to put the bonds back at face value if the firm takes a specified action (such as increasing leverage) or if its rating drops. In a variation, in 1988, Manufacturer Hanover issued rating-sensitive notes promising bondholders higher coupons if the firm’s rating deteriorated over time. Thus, bond investors would be protected in the event of a downgrade.

• In the same time period, Merrill Lynch introduced liquid yield option notes (LYONs), which incorporated put and conversion features to protect against both the risk shifting and claim substitution to which bondholders are exposed.

  Barclay and Smith (1996) examined debt issues by U.S. companies between 1981 and 1993 and concluded that high-growth firms are more likely to issue short-term debt with higher priority.\textsuperscript{22} This finding is consistent with both the information asymmetry argument and the agency cost argument, because lenders are more exposed to both costs with high growth firms.

**In Summary**

In choosing the right financing vehicles to use, firms should begin by examining the characteristics of the assets they are financing and try to match the maturity, interest rate, currency mix, and special features of their financing to these characteristics. They can then superimpose tax considerations, the views of analysts and ratings agencies, agency costs, and the effects of asymmetric information to modify this financing mix. Figure 9.5 summarizes the discussion.

In Practice: The Role of Derivatives and Swaps

In the past thirty years, the futures and options markets have developed to the point that firms can hedge exchange rate, interest rate, commodity price, and other risks using derivatives. In fact, firms can use derivatives to protect themselves against risk exposures generated by mismatching debt and assets. Thus, a firm that borrows in dollars to fund projects denominated in yen can use dollar/yen forward, futures, and options contracts to reduce or even eliminate the resulting risk. Given the existence of these derivatives, you may wonder why it is even necessary to go through the process we have just described to arrive at the perfect debt. We would offer two reasons. The first is that the use of derivatives can be costly, if used recurrently. Thus, a firm with a stable portion of its revenues coming from yen will find it cheaper to use yen debt rather than derivatives to correct mismatched debt. Derivatives are useful, however, to hedge against risk exposure that is transient and volatile. A company like Boeing, for instance, whose currency exposure can shift from year to year depending on its customers to will find it...
cheaper to use derivatives to hedge the shifting risk. The second problem with derivatives is that although they are widely available in some cases, they are much more difficult to find in others. Thus, a Brazilian firm that borrows in U.S. dollars to fund Brazilian real–denominated projects will find it very difficult to hedge against risk beyond the short term because there are no long-term forward and futures contracts available for dollars versus Brazilian real.

What about swaps? Swaps can be useful for firms that have a much better reputation among investors in one country (usually, the domestic market in which they operate) than in other markets. In such cases, these firms may choose to raise their funds domestically even for overseas projects because they get better terms on financing. This creates a mismatch between cash inflows and outflows, which can be resolved by using currency swaps, where a firm’s liabilities in one currency can be swapped for liabilities in another currency. This enables the firm to take advantage of its reputation effect and match cash flows at the same time. Generally speaking, swaps can be used to take advantage of any market imperfections that a firm might observe. Thus, if floating rate debt is attractively priced relative to fixed rate debt, a firm that does not need floating rate debt can issue it and then swap it for fixed rate debt at a later date.

Illustration 9.7: Coming Up with the Financing Details: Disney

In this example, we describe how we would make financing choices for Disney, using two approaches, one intuitive and the other more quantitative. Both approaches should be considered in light of the analysis done in the previous chapter, which suggested that Disney had untapped debt potential that could be used for future projects.

Intuitive Approach

The intuitive approach begins with an analysis of the characteristics of a typical project and uses it to make recommendations for the firm’s financing. For Disney, the analysis is complicated by the fact that as a diverse entertainment business with theme park holdings, its typical project varies by type of business. In Chapter 4, we broke down Disney into four businesses—studio entertainment, media networks, park resorts, and consumer products. In Table 9.10 we consider the typical project in each business and the appropriate debt for each:
### Table 9.10 Designing Disney’s Perfect Debt: Intuitive Analysis

<table>
<thead>
<tr>
<th>Business</th>
<th>Project Cash Flow Characteristics</th>
<th>Type of Financing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Studio entertainment</td>
<td>Movie projects are likely to&lt;br&gt;1. Be short-term&lt;br&gt;2. Have cash outflows primarily in dollars (because Disney makes most of its movies in the U.S.), but cash inflows could have a substantial foreign currency component (because of overseas revenues)&lt;br&gt;3. Have net cash flows that are heavily driven by whether the movie is a hit, which is often difficult to predict</td>
<td>Debt should be&lt;br&gt;1. Short-term&lt;br&gt;2. Primarily dollar debt&lt;br&gt;3. If possible, tied to the success of movies (<em>Lion King</em> or <em>Mulan</em> bonds)</td>
</tr>
<tr>
<td>Media networks</td>
<td>Projects are likely to be&lt;br&gt;1. Short-term&lt;br&gt;2. Primarily in dollars, though foreign component is growing&lt;br&gt;3. Driven by advertising revenues and show success (Nielsen ratings)</td>
<td>Debt should be&lt;br&gt;1. Short-term&lt;br&gt;2. Primarily dollar debt&lt;br&gt;3. If possible, linked to network ratings</td>
</tr>
<tr>
<td>Park resorts</td>
<td>Projects are likely to be&lt;br&gt;1. Very long-term&lt;br&gt;2. Primarily in dollars, but a significant proportion of revenues come from foreign tourists, who are likely to stay away if the dollar strengthens&lt;br&gt;3. Affected by success of studio entertainment and media networks divisions</td>
<td>Debt should be&lt;br&gt;1. Long-term&lt;br&gt;2. Mix of currencies, based on tourist makeup</td>
</tr>
<tr>
<td>Consumer products</td>
<td>Projects are likely to be short- to medium-term and linked to the success of the movie division; most of Disney’s product offerings are derived from their movie productions</td>
<td>Debt should be&lt;br&gt;a. Medium-term&lt;br&gt;b. Dollar debt</td>
</tr>
</tbody>
</table>

### A Quantitative Approach

A quantitative approach estimates Disney’s sensitivity to changes in a number of macro-economic variables, using two measures: Disney’s firm value (the market value of debt and equity) and its operating income.

**Value Sensitivity to Factors: Past Data**

The value of a firm is the obvious choice when it comes to measuring its sensitivity to changes in interest rates, inflation rates, or currency rates, because firm
value reflects the effect of these variables on current and future cash flows as well as on discount rates. We begin by collecting past data on firm value, operating income, and the macroeconomic variables against which we want to measure its sensitivity. In the case of the Disney, we choose four broad measures (See Table 9.11):

- **Long-term Treasury bond rate**, because the sensitivity of firm value to changes in interest rates provides a measure of the duration of the projects. It also provides insight into whether the firm should use fixed or floating rate debt; a firm whose operating income increases or decreases with interest rates should consider using floating rate loans.

- **Real GDP (gross domestic product)**, because the sensitivity of firm value to this variable provides a measure of the cyclicality of the firm.

- **Exchange rates**, because the sensitivity of firm value to currency movements provides a measure of the exposure to currency rate risk and thus helps determine what the currency mix for the debt should be.

- **Inflation rate**, because the sensitivity of firm value to the inflation rate helps determine whether the interest rate on the debt should be fixed or floating rate debt.

**Table 9.11 Disney's Firm Value and Macroeconomic Variables**

<table>
<thead>
<tr>
<th>Date</th>
<th>Operating Income (OI)</th>
<th>Firm Value (V)</th>
<th>% Chg in OI</th>
<th>% Chg in V</th>
<th>Change in T.Bond rate</th>
<th>% Chg in GDP</th>
<th>% Change in CPI</th>
<th>% Change in US $</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>$7,404</td>
<td>$72,357</td>
<td>8.42%</td>
<td>-6.55%</td>
<td>-1.44%</td>
<td>-1.18%</td>
<td>-4.26%</td>
<td>10.88%</td>
</tr>
<tr>
<td>2007</td>
<td>$6,829</td>
<td>$77,428</td>
<td>27.53%</td>
<td>-2.13%</td>
<td>-0.65%</td>
<td>2.93%</td>
<td>2.19%</td>
<td>-11.30%</td>
</tr>
<tr>
<td>2006</td>
<td>$5,355</td>
<td>$79,116</td>
<td>30.39%</td>
<td>35.81%</td>
<td>0.30%</td>
<td>3.40%</td>
<td>-1.84%</td>
<td>-2.28%</td>
</tr>
<tr>
<td>2005</td>
<td>$4,107</td>
<td>$58,256</td>
<td>1.46%</td>
<td>3.09%</td>
<td>0.16%</td>
<td>3.68%</td>
<td>0.66%</td>
<td>3.98%</td>
</tr>
<tr>
<td>2004</td>
<td>$4,048</td>
<td>$56,510</td>
<td>49.21%</td>
<td>8.41%</td>
<td>0.13%</td>
<td>3.72%</td>
<td>1.34%</td>
<td>-3.92%</td>
</tr>
<tr>
<td>2003</td>
<td>$2,713</td>
<td>$52,125</td>
<td>13.80%</td>
<td>19.03%</td>
<td>0.05%</td>
<td>4.32%</td>
<td>-0.65%</td>
<td>-14.59%</td>
</tr>
<tr>
<td>2002</td>
<td>$2,384</td>
<td>$43,792</td>
<td>-15.82%</td>
<td>-7.02%</td>
<td>-0.97%</td>
<td>2.80%</td>
<td>1.44%</td>
<td>-11.17%</td>
</tr>
<tr>
<td>2001</td>
<td>$2,832</td>
<td>$47,099</td>
<td>12.16%</td>
<td>-46.31%</td>
<td>-0.18%</td>
<td>-0.04%</td>
<td>-2.50%</td>
<td>7.45%</td>
</tr>
<tr>
<td>2000</td>
<td>$2,525</td>
<td>$87,716</td>
<td>-22.64%</td>
<td>34.80%</td>
<td>-0.98%</td>
<td>2.24%</td>
<td>0.96%</td>
<td>7.73%</td>
</tr>
<tr>
<td>1999</td>
<td>$3,264</td>
<td>$65,073</td>
<td>-15.07%</td>
<td>1.50%</td>
<td>1.56%</td>
<td>4.70%</td>
<td>1.04%</td>
<td>1.68%</td>
</tr>
<tr>
<td>1998</td>
<td>$3,843</td>
<td>$64,110</td>
<td>-2.59%</td>
<td>-1.63%</td>
<td>-1.03%</td>
<td>4.51%</td>
<td>0.11%</td>
<td>-4.08%</td>
</tr>
<tr>
<td>1997</td>
<td>$3,945</td>
<td>$65,173</td>
<td>30.46%</td>
<td>19.16%</td>
<td>-0.63%</td>
<td>4.33%</td>
<td>-1.43%</td>
<td>9.40%</td>
</tr>
<tr>
<td>1996</td>
<td>$3,024</td>
<td>$54,695</td>
<td>33.68%</td>
<td>70.95%</td>
<td>0.80%</td>
<td>4.43%</td>
<td>0.31%</td>
<td>4.14%</td>
</tr>
<tr>
<td>1995</td>
<td>$2,262</td>
<td>$31,995</td>
<td>25.43%</td>
<td>38.75%</td>
<td>-2.09%</td>
<td>2.01%</td>
<td>-0.08%</td>
<td>-0.71%</td>
</tr>
<tr>
<td>1994</td>
<td>$1,804</td>
<td>$23,059</td>
<td>15.59%</td>
<td>3.69%</td>
<td>1.92%</td>
<td>4.12%</td>
<td>0.27%</td>
<td>-5.37%</td>
</tr>
<tr>
<td>1993</td>
<td>$1,560</td>
<td>$22,238</td>
<td>21.23%</td>
<td>8.65%</td>
<td>-0.83%</td>
<td>2.50%</td>
<td>-0.72%</td>
<td>0.56%</td>
</tr>
<tr>
<td>1992</td>
<td>$1,287</td>
<td>$20,467</td>
<td>28.18%</td>
<td>26.57%</td>
<td>-0.02%</td>
<td>4.15%</td>
<td>0.64%</td>
<td>6.89%</td>
</tr>
<tr>
<td>1991</td>
<td>$1,004</td>
<td>$16,171</td>
<td>-21.98%</td>
<td>27.90%</td>
<td>-1.26%</td>
<td>1.09%</td>
<td>-2.89%</td>
<td>0.69%</td>
</tr>
</tbody>
</table>
Enterprise Value = Market Value of Equity + Book Value of Debt - Cash. CPI = Consumer Price Index.

Once these data have been collected, we can estimate the sensitivity of firm value to changes in the macroeconomic variables by regressing changes in firm value each year against changes in each of the individual variables.

I. Sensitivity to Changes in Interest Rates

As discussed earlier, the duration of a firm’s projects provides useful information for determining the maturity of its debt. Although bond-based duration measures may provide some answers, they will understate the duration of assets or projects if the cash flows on these assets or projects themselves vary with interest rates. Regressing changes in firm value at Disney against changes in interest rates over this period yields the following result (with \( t \)-statistics in brackets): 23

\[
\text{Change in Firm Value} = 0.1949 + 2.9439 \times (\text{Change in Interest Rates})
\]

\( (2.89) \quad (0.50) \)

Based on this regression, Disney’s firm value increase as interest rates go up, indicating that its assets have very short duration. However, the standard error on the coefficient is so large that we are reluctant to draw strong conclusions based on this regression.

II. Sensitivity to Changes in the Economy

Is Disney a cyclical firm? One way to answer this question is to measure the sensitivity of firm value to changes in economic growth. Regressing changes in firm value against changes in the real GDP over this period yields the following result:

\[
\text{Change in Firm Value} = -0.0826 + 8.89 \times (\text{GDP Growth})
\]

\( (0.65) \quad (2.36) \)

---

23To ensure that the coefficient on this regression is a measure of duration, we compute the change in the interest rate as follows: \( (r_t - r_{t-1})/(1 + r_{t-1}) \). Thus, if the long-term bond rate goes from 8 percent to 9 percent, we compute the change to be \((0.09 - 0.08)/1.08\).
Disney’s value as a firm has been affected significantly by economic growth. Again, to the extent that we trust the coefficients from this regression, this would suggest that Disney is a cyclical firm whose value increases in good times and decreases in bad times.

**III. Sensitivity to Changes in the Inflation Rates**

We earlier made the argument, based on asset/liability matching, that firms whose values tend to move with inflation should be more likely to issue floating rate debt. To examine whether Disney fits this pattern, we regressed changes in firm value against changes in the inflation rate over this period with the following result:

\[
\text{Change in Firm Value} = 0.18 + 2.71 (\text{Change in Inflation Rate})
\]

\[
(2.90) \quad (0.80)
\]

Disney’s firm value is unaffected by changes in inflation because the coefficient on inflation is not statistically different from zero. Interest payments have to be made out of operating cash flows, so we will also have to look at how operating income changes with inflation before we can make a final decision on this issue.

**IV. Sensitivity to Changes in the Dollar**

We can answer the question of how sensitive Disney’s value is to changes in currency rates by looking at how the firm’s value changes as a function of changes in currency rates. Regressing changes in firm value against changes in the dollar over this period yields the following regression:

\[
\text{Change in Firm Value} = 0.17 - 0.65 (\text{Change in Dollar})
\]

\[
(2.63) \quad (0.80)
\]

At least in general terms. Disney’s firm value decreases as the dollar strengthens. However, the relationship between value and exchange rates is weak, indicating that there are aspects of Disney’s business that are helped by a stronger dollar.

**Cash Flow Sensitivity to Factors: Past Data**

In some cases, it is more reasonable to estimate the sensitivity of operating cash flows directly against changes in interest rates, inflation, and other variables. This is particularly true when we are designing interest payments on debt, because these payments are to be made out of operating income. For instance, although our regression of firm value against inflation rates showed a negative relationship and led to the
conclusion that Disney should not issue floating rate debt, we might reverse our view if operating income were positively correlated with inflation rates. For Disney, we repeated the analysis using operating income as the dependent variable, rather than firm value. Because the procedure for the analysis is similar, we summarize the conclusions here.

- Regressing changes in operating cash flow against changes in interest rates over this period yields the following result:

\[
\text{Change in Operating Income} = 0.1958 + 6.5439 \times (\text{Change in Interest Rates})
\]

\[(2.56) (0.97)\]

Disney’s operating income, unlike its firm value, has moved with interest rates, albeit in the opposite directions. Again, this result has to be considered with caution in light of the low t-statistics on the coefficients.

- Regressing changes in operating cash flow against changes in real GDP over this period yields the following regression:

\[
\text{Change in Operating Income} = 0.04 + 6.06 \times (\text{GDP Growth})
\]

\[(0.22) (1.30)\]

Disney’s operating income, like its firm value, does increase with operating income, confirming the conclusion that Disney is a cyclical firm.

- Regressing changes in operating cash flow against changes in the dollar over this period yields the following regression:

\[
\text{Change in Operating Income} = 0.19 - 1.57 \times (\text{Change in Dollar})
\]

\[(2.63) (1.73^b)\]

Disney’s operating income, like its firm value, is negatively affected by a stronger dollar but the relationship is much stronger.

- Regressing changes in operating cash flow against changes in inflation over this period yields the following result:

\[
\text{Change in Operating Income} = 0.22 + 8.79 \times (\text{Change in Inflation Rate})
\]

\[(3.28) (2.40)\]

Unlike firm value, which sees only minor effects from changes in inflation, Disney’s operating income moves strongly with inflation, rising as inflation increases. This would suggest that Disney has substantial pricing power, allowing it to transmit
inflation increases into its prices and operating income. This makes a strong case for the use of floating rate debt.

The question of what to do when operating income and firm value have different results can be resolved fairly simply. For issues relating to the overall design of the debt, the firm value regression should be relied on more; for issues relating to the design of interest payments on the debt, the operating income regression should be used more. Thus, for the duration measure, the regression of firm value on interest rates should generally give a more precise estimate. For the inflation rate sensitivity, because it affects the choice of interest payments (fixed or floating), the operating income regression should be relied on more.

**Bottom-Up Estimates for Debt Design**

While this type of analysis yields quantitative results, those results should be taken with a grain of salt. They make sense only if the firm has been in its current business for a long time and expects to remain in it for the foreseeable future. In today’s environment, in which firms find their business mixes changing dramatically from period to period as they divest some businesses and acquire new ones, it is unwise to base too many conclusions on a historical analysis. In such cases, we might want to look at the characteristics of the industry in which a firm plans to expand, rather than using past earnings or firm value as a basis for the analysis. Furthermore, the small sample sizes used tend to yield regression estimates that are not statistically significant (as is the case with the duration estimate that we obtained for Disney from the firm value regression).

To illustrate, we looked at the sector estimates for each of the sensitivity measures for the entertainment, theme park and consumer product businesses:

<table>
<thead>
<tr>
<th>Business</th>
<th>Interest rates</th>
<th>GDP Growth</th>
<th>Inflation</th>
<th>Currency</th>
<th>Weights</th>
</tr>
</thead>
<tbody>
<tr>
<td>Studio entertainment</td>
<td>- 3.70</td>
<td>0.56</td>
<td>1.41</td>
<td>-1.23</td>
<td>9.88%</td>
</tr>
<tr>
<td>Media networks</td>
<td>- 4.50</td>
<td>0.70</td>
<td>3.05</td>
<td>-1.58</td>
<td>58.92%</td>
</tr>
<tr>
<td>Park resorts</td>
<td>- 0.22</td>
<td>-</td>
<td>-3.21</td>
<td></td>
<td>29.88%</td>
</tr>
</tbody>
</table>

---

24 These sector estimates were obtained by aggregating the firm values of all firms in a sector on a quarter-by-quarter basis going back twelve years, and then regressing changes in this aggregate firm value against changes in the macroeconomic variable each quarter.
<table>
<thead>
<tr>
<th></th>
<th>6.47</th>
<th>1.45</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumer</td>
<td>4.88</td>
<td>0.13</td>
</tr>
<tr>
<td>products</td>
<td></td>
<td>5.51</td>
</tr>
<tr>
<td>Disney</td>
<td>5.01</td>
<td>0.54</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>1.32%</td>
<td></td>
</tr>
</tbody>
</table>

These bottom-up estimates, akin to bottom-up betas, suggest that Disney should be issuing long-term fixed-rate debt with a duration of 5.01 years and that firms in this sector are relatively unaffected by movements in the overall economy. Like Disney, firms in these businesses tend to be hurt by a stronger dollar, but unlike Disney, they do not have much pricing power (note the negative coefficient on inflation). The sector averages also have the advantage of being more precise than the firm-specific estimates and can be relied on more.

**Overall Recommendations**

Based on the analyses of firm value and operating income, as well as the sector averages, our recommendations would essentially match those of the intuitive approach, but they would have more depth to because of the additional information we have acquired from the quantitative analysis:

- The debt issued should be long-term and should have duration of approximately five years.
- A significant portion of the debt should be floating rate debt, reflecting Disney’s capacity to pass inflation through to its customers and the fact that operating income tends to increase as interest rates go up.
- Given Disney’s sensitivity to a stronger dollar, a significant portion of the debt should be in foreign currencies. The specific currency used and the magnitude of the foreign currency debt should reflect where Disney generates its revenues. Based on 2009 numbers, this would indicate that about 20 percent of the debt should be in Euros and about 10 percent of the debt in yen, reflecting Disney’s larger exposures in Europe and Japan. As its businesses expand into Latin America (ESPN and broadcasting) and emerging Asia (Hong Kong Disney), it may want to consider using debt in other currencies as well.
These conclusions can be used to both design the new debt issues that the firm will be making going forward, and to evaluate the existing debt on the firm’s books to see if there is a mismatching of assets and financing in the current firm. Examining Disney’s debt at the end of 2008, we note the following:

- Disney has $16 billion in debt with a face-value weighted average maturity of 5.38 years. Allowing for the fact that the maturity of debt is higher than the duration, this would indicate that Disney’s debt is of the right maturity.
- Of the debt, about 10% is yen denominated debt but the rest is in US dollars. Based on our analysis, we would suggest that Disney increase its proportion of debt in other currencies to about 20% in Euros and about 5% in Chinese Yuan.
- Disney has no convertible debt and about 24% of its debt is floating rate debt, which is appropriate given its status as a mature company with significant pricing power. In fact, we would argue for increasing the floating rate portion of the debt to about 40%.

If Disney accepts the recommendation that its debt should be more more foreign currency and more floating rate debt, it can get there in two ways:

- It can swap some of its existing fixed rate, dollar debt for floating rate, foreign currency debt. Given Disney’s standing in financial markets and its large market capitalization, this should not be difficult to do.
- If Disney is planning new debt issues, either to get to a higher debt ratio or to fund new investments, it can use primarily floating rate, foreign currency debt to fund these new investments. Although it may be mismatching the funding on these investments, its debt matching will become better at the company level.

macrodur.xls: This spreadsheet allows you to estimate the sensitivity of firm value and operating income to changes in macroeconomic variables.

There is a data set online that summarizes the results of regressing firm value against macroeconomic variables, by sector, for U.S. companies.
Illustration 9.8 Estimating the Right Financing Mix for Bookscape, Aracruz, Tata Chemicals and Deutsche Bank

Although we will not examine the right financing type for Bookscape, Aracruz, and Deutsche Bank in the same level of detail as we did for Disney, we will summarize, based on our understanding of their businesses, what we think will be the best kind of financing for each of these firms:

- **Bookscape**: Given Bookscape’s dependence on revenues at its New York bookstore, we would design the debt to be
  - Long-term, because the store is a long-term investment;
  - Dollar-denominated, because all the cash flows are in dollars; and
  - Fixed rate debt, because Bookscape’s lack of pricing power makes it unlikely that they can keep pace with inflation.

It is worth noting that operating leases fulfill all of these conditions, making it the appropriate debt for Bookscape. Because that is the only debt that Bookscape carries currently, we would suggest no changes.

- **Aracruz**: Aracruz operates most of its paper plants in Brazil, but gets a significant proportion of its products overseas. A significant portion of its revenues in 2008 were from other countries, and the bulk of these revenues were dollar-denominated, while its operating expenses are in $R. Given this structure, we would design debt to be
  - Long term, because a typical paper plant has a life in excess of twenty years;
  - Dollar-denominated, because the cash inflows are primarily in dollars; and
  - Given the volatility of paper prices, we would try to link the interest rate on debt to pulp prices, if possible.

The existing debt at Aracruz is primarily $R debt with an average maturity of 3.20 years. Although this may reflect the difficulties that Brazilian firms have faced in borrowing long-term historically, the constraints on borrowing long-term are easing for many emerging market companies that derive the bulk of their revenues in dollars.

- **Tata Chemicals**: As an manufacturing firm, with the bulk of its revenues in India, Tata Chemicals should stick with debt that has the following characteristics:
  - Medium to long term debt, reflecting the life of the plant and equipment used to produce its fertilizer and chemical products
o Fixed rate debt, since the company is unlikely to have much pricing power in this business.

o Rupee denominated debt, since almost 90% of Tata Chemical’s revenues come from India.

The existing debt at Tata Chemicals matches this ideal debt for the most part (since it is fixed rate and rupee based), though the average maturity of the existing debt, at about 3 years, is lower than what we would expect for the firm. While part of the reason for this mismatch is that banks in India may be unwilling to lend for longer periods, the expansion of corporate bond markets in India should increase access to longer term borrowing.

- Deutsche Bank: In the case of Deutsche Bank, we will steer away from explicit recommendations of what type of debt should be used for two reasons. The first is that the maturity structure for a bank’s assets, especially its investments in securities, can be volatile and the bank’s borrowing should reflect this volatility. The second is that banks can legitimately claim that their expertise lies in detecting what types of borrowing are cheapest at any point in time and that they can exploit mismatches to their benefit.

Summary

In this chapter, we examine how firms move toward their optimal debt ratios, and how they choose the right financing vehicles to use, to finance both existing assets and new investments.

Some firms that are under- or overlevered may choose to not change their debt ratios to the optimal level. This may arise either because they do not share the objective of maximizing firm value that underlies optimal debt ratios, or because they feel that the costs of moving to the optimal outweigh the benefits. Firms that do decide to change their financing mixes can change either gradually or quickly. Firms are much more likely to change their financing mixes quickly if external pressure is brought to bear on the firm. For underlevered firms, the pressure takes the form of hostile acquisitions, whereas for overlevered firms, the threat is default and bankruptcy. Firms that are not under external
pressure for change have the luxury of changing toward their optimal debt ratios gradually.

Firms can change their debt ratios in four ways. They can recapitalize existing investments, using new debt to reduce equity or new equity to retire debt. They can divest existing assets and use the cash to reduce equity or retire debt. They can invest in new projects and finance them disproportionately with debt or equity. Finally, they can increase or decrease the proportion of their earnings that are returned to stockholders in the form of dividends or stock buybacks. To decide between these alternatives, firms have to consider how quickly they need to change their debt ratios, the quality of the new investments they have, and the marketability of existing investments.

In the final section, we examined how firms choose between financing vehicles. Matching cash flows on financing to the cash flows on assets reduces default risk and increases the debt capacity of firms. Applying this principle, long-term assets should be financed with long-term debt, assets with cash flows that move with inflation should be financed with floating rate debt, assets with cash flows in a foreign currency should be financed with debt in the same currency, and assets with growing cash flows should be financed with convertible debt. This matching can be done intuitively, by looking at a typical project, or based on historical data. Changes in operating income and value can be regressed against changes in macroeconomic variables to measure the sensitivity of the firm to these variables. The results can then be used to design the optimal financing vehicle for the firm.
Live Case Study

Mechanics of Moving to the Optimal

**Objective:** To determine whether your firm should move to its optimal mix (and if so, how) and to analyze the right type of debt for your firm.

**Key Questions**

- If your firm’s actual debt ratio is different from its “recommended” debt ratio, how should they get from the actual to the optimal? In particular,
  a. should they do it gradually over time or should they do it right now?
  b. should they alter their existing mix (by buying back stock or retiring debt), should they invest in new projects with debt or equity or should they change how much they return to stockholders?
- What type of financing should this firm use? In particular,
  a. should the financing be short-term or long-term?
  b. what currency should it be in?
  c. what special features should the financing have?

**Framework for Analysis**

1. **The Immediacy Question**
   - If the firm is underlevered, does it have the characteristics of a firm that is a likely takeover target? (Target firms in hostile takeovers tend to be smaller, have poorer project and stock price performance than their peer groups, and have lower insider holdings.)
   - If the firm is overlevered, is it in danger of bankruptcy? (Look at the bond rating if the company is rated. A junk bond rating suggests high bankruptcy risk.)

2. **Alter Financing Mix or Take Projects**
   - What kind of projects does this firm expect to have? Can it expect to make excess returns on these projects? (Past project returns is a reasonable place to start—see the section under investment returns.)
   - What type of stockholders does this firm have? If cash had to be returned to them, would they prefer dividends or stock buybacks? (Again, look at the
past. If the company has paid high dividends historically, it will end up with investors who like dividends.)

3. Financing Type

- How sensitive has this firm’s value been to changes in macroeconomic variables such as interest rates, currency movements, inflation, and the economy?
- How sensitive has this firm’s operating income been to changes in the same variables?
- How sensitive is the sector’s value and operating income to the same variables?
- What do the answers to the last three questions tell you about the kind of financing that this firm should use?

Getting Information on Mechanics of Capital Structure

To get the inputs needed to estimate the capital structure mechanics, you can get the information on macroeconomic variables such as interest rates, inflation, gross national product growth and exchange rates from my Web site. You can get historical information on your own firm by looking at the Value Line page for your firm, which has information for the last fifteen years on revenues and operating income.

Online sources of information: www.stern.nyu.edu/~adamodar/cfin2E/project/data.htm.
Problems and Questions

(In the problems below, you can use a risk premium of 5.5% and a tax rate of 40% if either is not specified)

1. BMD is a firm with no debt on its books currently and a market value of equity of $2 billion. Based on its EBITDA of $200 million, it can afford to have a debt ratio of 50 percent, at which level the firm value should be $300 million higher.

   a. Assuming that the firm plans to increase its leverage instantaneously, what are some of the approaches it could use to get to 50 percent?

   b. Is there a difference between repurchasing stock and paying a special dividend? Why or why not?

   c. If BMD has a cash balance of $250 million at this time, will it change any of your analysis?

2. MiniSink is a manufacturing company that has $100 million in debt outstanding and 9 million shares trading at $100 per share. The current beta is 1.10, and the interest rate on the debt is 8 percent. In the latest year, MiniSink reported a net income of $7.50 per share, and analysts expect earnings growth to be 10 percent a year for the next five years. The firm faces a tax rate of 40 percent and pays out 20 percent of its earnings as dividends (the Treasury bond rate is 7 percent).

   a. Estimate the debt ratio each year for the next five years, assuming that the firm maintains its current payout ratio.

   b. Estimate the debt ratio each year for the next five years, assuming that the firm doubles its dividends and repurchases 5 percent of the outstanding stock every year.

3. IOU has $5 billion in debt outstanding (carrying an interest rate of 9 percent), and 10 million shares trading at $50 per share. Based on its current EBIT of $200 million, its optimal debt ratio is only 30 percent. The firm has a beta of 1.20, and the current Treasury bond rate is 7 percent. Assuming that the operating income will increase 10 percent a year for the next five years and that the firm’s depreciation and capital
expenditures both amount to $100 million annually for each of the five years, estimate the debt ratio for IOU if it

a. maintains its existing policy of paying $50 million a year in dividends for the next five years.

b. eliminates dividends.

4. DGF Corporation has come to you for some advice on how best to increase their leverage over time. In the most recent year, DGF had an EBITDA of $300 million, owed $1 billion in both book value and market value terms, and had a net worth of $2 billion (the market value was twice the book value). It had a beta of 1.30, and the interest rate on its debt is 8 percent (the Treasury bond rate is 7 percent). If it moves to its optimal debt ratio of 40 percent, the cost of capital is expected to drop by 1 percent.

a. How should the firm move to its optimal? In particular, should it borrow money and take on projects or should it pay dividends/repurchase stock?

b. Are there any other considerations that may affect your decision?

5. STL has asked you for advice on putting together the details of the new debt issues it is planning to make. What information would you need to obtain to provide this advice?

6. Assume now that you have uncovered the following facts about the types of projects STL takes:

- The projects are primarily infrastructure projects, requiring large initial investments and long gestation periods.
- Most of the new projects will be in emerging markets, and the cash flows are expected to be in the local currencies, when they do occur.
- The magnitude of the cash flows will largely depend on how quickly the economies of the emerging markets grow in the long run.

How would you use this information in the design of debt?

7. You are attempting to structure a debt issue for Eaton Corporation, a manufacturer of automotive components. You have collected the following information on the market values of debt and equity for the past ten years:
<table>
<thead>
<tr>
<th>Year</th>
<th>Market Value of Equity (in millions $)</th>
<th>Debt (in millions $)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1985</td>
<td>1,824.9</td>
<td>436</td>
</tr>
<tr>
<td>1986</td>
<td>2,260.6</td>
<td>632</td>
</tr>
<tr>
<td>1987</td>
<td>2,389.6</td>
<td>795</td>
</tr>
<tr>
<td>1988</td>
<td>1,960.8</td>
<td>655</td>
</tr>
<tr>
<td>1989</td>
<td>2,226</td>
<td>836</td>
</tr>
<tr>
<td>1990</td>
<td>1,875.9</td>
<td>755</td>
</tr>
<tr>
<td>1991</td>
<td>2,009.7</td>
<td>795</td>
</tr>
<tr>
<td>1992</td>
<td>2,589.3</td>
<td>833</td>
</tr>
<tr>
<td>1993</td>
<td>3,210</td>
<td>649</td>
</tr>
<tr>
<td>1994</td>
<td>3,962.7</td>
<td>1,053</td>
</tr>
</tbody>
</table>

In addition, you have the following information on the changes in long-term interest rates, inflation rates, gross national product (GNP), and exchange rates over the same period.

<table>
<thead>
<tr>
<th>Year</th>
<th>Long Bond Rate</th>
<th>GNP Growth</th>
<th>Weighted Dollar</th>
<th>Inflation Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1985</td>
<td>11.40%</td>
<td>6.44%</td>
<td>125.95</td>
<td>3.50%</td>
</tr>
<tr>
<td>1986</td>
<td>9.00%</td>
<td>5.40%</td>
<td>112.89</td>
<td>1.90%</td>
</tr>
<tr>
<td>1987</td>
<td>9.40%</td>
<td>6.90%</td>
<td>95.88</td>
<td>3.70%</td>
</tr>
<tr>
<td>1988</td>
<td>9.70%</td>
<td>7.89%</td>
<td>95.32</td>
<td>4.10%</td>
</tr>
<tr>
<td>1989</td>
<td>9.30%</td>
<td>7.23%</td>
<td>102.26</td>
<td>4.80%</td>
</tr>
<tr>
<td>1990</td>
<td>9.30%</td>
<td>5.35%</td>
<td>96.25</td>
<td>5.40%</td>
</tr>
<tr>
<td>1991</td>
<td>8.80%</td>
<td>2.88%</td>
<td>98.82</td>
<td>4.20%</td>
</tr>
<tr>
<td>1992</td>
<td>8.10%</td>
<td>6.22%</td>
<td>104.58</td>
<td>3.00%</td>
</tr>
<tr>
<td>1993</td>
<td>7.20%</td>
<td>5.34%</td>
<td>105.22</td>
<td>3.00%</td>
</tr>
<tr>
<td>1994</td>
<td>8.00%</td>
<td>5.97%</td>
<td>98.6</td>
<td>2.60%</td>
</tr>
</tbody>
</table>
Using this information,

a. Estimate the duration of this firm’s projects. How would you use this information in designing the debt issue?

b. How cyclical is this company? How would that affect your debt issue?

c. Estimate the sensitivity of firm value to exchange rates. How would you use this information in designing the debt issue?

d. How sensitive is firm value to inflation rates? How would you use this information in designing the debt issue?

e. What factors might lead you to override the results of this analysis?

8. Repeat the analysis in Problem 7 for a private firm that has provided you with the following estimates of operating income for the ten years, for which you have the macroeconomic data:

<table>
<thead>
<tr>
<th>Year</th>
<th>Operating Income (in $ thousands)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1985</td>
<td>463.05</td>
</tr>
<tr>
<td>1986</td>
<td>411.696</td>
</tr>
<tr>
<td>1987</td>
<td>483.252</td>
</tr>
<tr>
<td>1988</td>
<td>544.633</td>
</tr>
<tr>
<td>1989</td>
<td>550.65</td>
</tr>
<tr>
<td>1990</td>
<td>454.875</td>
</tr>
<tr>
<td>1991</td>
<td>341.481</td>
</tr>
<tr>
<td>1992</td>
<td>413.983</td>
</tr>
<tr>
<td>1993</td>
<td>567.729</td>
</tr>
<tr>
<td>1994</td>
<td>810.968</td>
</tr>
</tbody>
</table>
9. Assuming that you do the analysis in Problem 8 with both firm value and operating income, what are the reasons for the differences you might find in the results, using each? When would you use one over the other?

10. Pfizer, a major pharmaceutical company, has a debt ratio of 10.30 percent and is considering increasing its debt ratio to 30 percent. Its cost of capital is expected to drop from 14.51 percent to 13.45 percent. Pfizer had an EBIT of $2 billion in 1995, and a book value of capital (debt + equity) of approximately $8 billion. It also faced a tax rate of 40 percent on its income. The stock in the firm is widely held, but the corporate charter includes significant antitakeover restrictions.

   a. Should Pfizer move to its desired debt ratio quickly or gradually? Explain.

   b. Given the choice in part a, explain how you would move to the optimal?

   c. Pfizer is considering using the excess debt capacity for an acquisition. What are some of the concerns it should have?

11. Upjohn, also a major pharmaceutical company, is considering increasing its debt ratio from 11 percent to 40 percent, which is its optimal debt ratio. Its beta is 1.17, and the current Treasury bond rate is 6.50 percent. The return on equity was 14.5 percent in the most recent year, but it is dropping as health care matures as a business. The company has also been mentioned as a possible takeover target and is widely held.

   a. Would you suggest that Upjohn move to the optimal ratio immediately? Explain.

   b. How would you recommend that Upjohn increase its debt ratio?

12. U.S. steel companies have generally been considered mature in terms of growth and often take on high leverage to finance their plant and equipment. Steel companies in some emerging markets often have high growth rates and good growth prospects. Would you expect these companies to also have high leverage? Why or why not?
13. You are trying to decide whether the debt structure that Bethlehem Steel has currently is appropriate, given its assets. You regress changes in firm value against changes in interest rates, and arrive at the following equation

\[ \text{Change in Firm Value} = 0.20\% - 6.33 \times (\text{Change in Interest Rates}) \]

a. If Bethlehem Steel has primarily short-term debt outstanding, with a maturity of one year, would you deem the debt structure appropriate?

b. Why might Bethlehem Steel be inclined to use short-term debt to finance longer-term assets?

14. Railroad companies in the United States tend to have long-term, fixed rate, dollar denominated debt. Explain why.

15. The following table summarizes the results of regressing changes in firm value against changes in interest rates for six major footwear companies:

\[ \text{Change in Firm Value} = a + b(\text{Change in Long-Term Interest Rates}) \]

<table>
<thead>
<tr>
<th>Company</th>
<th>Intercept ((a))</th>
<th>Slope Coefficient ((b))</th>
</tr>
</thead>
<tbody>
<tr>
<td>LA Gear</td>
<td>-0.07</td>
<td>-4.74</td>
</tr>
<tr>
<td>Nike</td>
<td>0.05</td>
<td>-11.03</td>
</tr>
<tr>
<td>Stride Rite</td>
<td>0.01</td>
<td>-8.08</td>
</tr>
<tr>
<td>Timberland</td>
<td>0.06</td>
<td>-22.50</td>
</tr>
<tr>
<td>Reebok</td>
<td>0.04</td>
<td>-4.79</td>
</tr>
<tr>
<td>Wolverine</td>
<td>0.06</td>
<td>-2.42</td>
</tr>
</tbody>
</table>

a. How would you use these results to design debt for each of these companies?

b. How would you explain the wide variation across companies? Would you use the average across the companies in any way?
16. You have run a series of regressions of firm value changes at Motorola, the semiconductor company, against changes in a number of macroeconomic variables. The results are summarized here:

Change in Firm Value = 0.05 – 3.87 (Change in Long-Term Interest Rate)

Change in Firm Value = 0.02 + 5.76 (Change in Real GNP)

Change in Firm Value = 0.04 – 2.59 (Inflation Rate)

Change in Firm Value = 0.05 – 3.40 ($/DM)

a. Based on these regressions, how would you design Motorola’s financing?

b. Motorola, like all semiconductor companies, is sensitive to the health of high-technology companies. Is there any special feature you can add to the debt to reflect this dependence?
At the end of each year, every publicly traded company has to decide whether to return cash to its stockholders and, if so, how much in the form of dividends. The owner of a private company has to make a similar decision about how much cash he or she plans to withdraw from the business and how much to reinvest. This is the dividend decision, and we begin this chapter by providing some background on three aspects of dividend policy. One is a purely procedural question about how dividends are set and paid out to stockholders. The second is an examination of widely used measures of how much a firm pays in the dividends. The third is an empirical examination of some patterns that firms follow in dividend policy.

Having laid this groundwork, we look at three schools of thought on dividend policy. The dividend irrelevance school believes that dividends do not really matter because they do not affect firm value. This argument is based on two assumptions. The first is that there is no tax disadvantage to an investor to receiving dividends, and the second is that firms can raise funds in capital markets for new investments without bearing significant issuance costs. The proponents of the second school feel that dividends are bad for the average stockholder because of the tax disadvantage they create, which results in lower value. Finally, there are those in a third group who argue that dividends are clearly good because stockholders (at least some of them) like them and react accordingly when dividends are increased.

Although dividends have traditionally been considered the primary approach for publicly traded firms to return cash or assets to their stockholders, they comprise only one of many ways available to the firm to accomplish this objective. In particular, firms can return cash to stockholders through equity repurchases, where the cash is used to buy back outstanding stock in the firm and reduce the number of shares outstanding. In addition, firms can return some of their assets to their stockholders in the form of spin-offs and split-offs. This chapter will focus on dividends specifically, but the next chapter will examine the other alternatives available to firms and how to choose between dividends and these alternatives.
**Background on Dividend Policy**

In this section, we consider three issues. First, how do firms decide how much to pay in dividends, and how do those dividends actually get paid to the stockholders? We then consider two widely used measures of how much a firm pays in dividends, the dividend payout ratio and the dividend yield. We follow up by looking at some empirical evidence on firm behavior in setting and changing dividends.

**The Dividend Process**

Firms in the United States generally pay dividends every quarter, whereas firms in other countries typically pay dividends on a semi-annual or annual basis. Let us look at the time line associated with dividend payment and define different types of dividends.

**The Dividend Payment Time Line**

Dividends in publicly traded firms are usually set by the board of directors and paid out to stockholders a few weeks later. There are several key dates between the time the board declares the dividend until the dividend is actually paid.

- The first date of note is the *dividend declaration date*, the date on which the board of directors declares the dollar dividend that will be paid for that quarter (or period). This date is important because by announcing its intent to increase, decrease, or maintain dividend, the firm conveys information to financial markets. Thus, if the firm changes its dividends, this is the date on which the market reaction to the change is most likely to occur.

- The next date of note is the *ex-dividend date*, at which time investors must have bought the stock to receive the dividend. Because the dividend is not received by investors buying stock after the ex-dividend date, the stock price will generally fall on that day to reflect that loss.

- At the close of the business a few days after the ex-dividend date, the company closes its stock transfer books and makes up a list of the shareholders to date on the *holder-of-record date*. These shareholders will receive the dividends. There should be generally be no price effect on this date.

- The final step involves mailing out the dividend checks on the *dividend payment date*. In most cases, the payment date is two to three weeks after the holder-of-record date.
Although stockholders may view this as an important day, there should be no price impact on this day either.

Figure 10.1 presents these key dates on a time line.

*Figure 10.1 The Dividend Timeline*

<table>
<thead>
<tr>
<th>Announcement Date</th>
<th>Ex-Dividend day</th>
<th>Holder-of-record day</th>
<th>Payment day</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 to 3 weeks</td>
<td>2-3 days</td>
<td>2-3 weeks</td>
<td></td>
</tr>
</tbody>
</table>

Board of Directors announces quarterly dividend per share
Stock has to be bought by this date for investor to receive dividends
Company closes books and records owners of stock
Dividend is paid to stockholders

**Types of Dividends**

There are several ways to classify dividends. First, dividends can be paid in cash or as additional stock. *Stock dividends* increase the number of shares outstanding and generally reduce the price per share. Second, the dividend can be a *regular dividend*, which is paid at regular intervals (quarterly, semi-annually, or annually), or a *special dividend*, which is paid in addition to the regular dividend. Most U.S. firms pay regular dividends every quarter; special dividends are paid at irregular intervals. Finally, firms sometimes pay dividends that are in excess of the retained earnings they show on their books. These are called *liquidating dividends* and are viewed by the Internal Revenue Service as return on capital rather than ordinary income. As a result, they can have different tax consequences for investors.

**Measures of Dividend Policy**

We generally measure the dividends paid by a firm using one of two measures. The first is the *dividend yield*, which relates the dividend paid to the price of the stock:

\[
\text{Dividend Yield} = \frac{\text{Annual Dividends per Share}}{\text{Price per Share}}
\]

The dividend yield is significant because it provides a measure of that component of the total return that comes from dividends, with the balance coming from price appreciation.

\[
\text{Expected Return on Stock} = \text{Dividend Yield} + \text{Price Appreciation}
\]

Some investors also use the dividend yield as a measure of risk and as an investment screen, that is, they invest in stocks with high dividend yields. Studies indicate that stocks
with high dividend yields, after adjusting for market performance and risk, earn excess returns.

Figure 10.2 tracks dividend yields on the 2,700 listed stocks in the United States that paid dividends on the major exchanges in January 2009 and contrasts them with the yields a year earlier.

![Figure 10.2: Dividend Yields for US Stocks - January 2008 vs January 2009](image)

Estimated using Value Line data on companies in January 2009.

The median dividend yield among dividend paying stocks in January 2009 is about 3%, significantly higher than the median dividend yield of 2% in January 2008. The reason for the increase, though, was not higher dividends in 2009 but lower stock prices, as a consequence of the market collapse in the last quarter of 2008. In both time periods, almost 65% of the overall sample of 7200 companies paid no dividends, making zero the median dividend yield across all companies.

The second widely used measure of dividend policy is the **dividend payout** ratio, which relates dividends paid to the earnings of the firm.

---

**Dividend Yield:** The dollar dividend per share divided by the current price per share.

**Dividend Payout:** The dividend paid as a percent of the net income of the firm. If the earnings are negative, it is not meaningful.
Dividend Payout Ratio = Dividends/Earnings

The payout ratio is used in a number of different settings. It is used in valuation as a way of estimating dividends in future periods, because most analysts estimate growth in earnings rather than dividends. Second, the retention ratio—the proportion of the earnings reinvested in the firm (Retention Ratio = 1 – Dividend Payout Ratio)—is useful in estimating future growth in earnings; firms with high retention ratios (low payout ratios) generally have higher growth rates in earnings than firms with lower retention ratios (higher payout ratios). Third, the dividend payout ratio tends to follow the life cycle of the firm, starting at zero when the firm is in high growth and gradually increasing as the firm matures and its growth prospects decrease. Figure 10.3 graphs the dividend payout ratios of U.S. firms that paid dividends in January 2009.

Figure 10.3: Dividend payout ratios for US companies- January 2009

Estimated using Value Line data on companies in January 2009.

The payout ratios greater than 100 percent represent firms that paid out more than their earnings as dividends and about 120 firms paid out dividends, even though they reported losses for the year. The median dividend payout ratio in January 2009 among dividend-paying stocks, was about 35 percent, whereas the average payout ratio was approximately 40 percent.
Finally, we look at how current dividend yields and payout ratios measure up against historical numbers by looking at the average dividend yield and payout ratio for stocks in the S&P 500 from 1960 to 2008 in Figure 10.4:

![Figure 10.4: Dividend Yield and Payout on S&P 500: 1960 - 2008](image)

Note that the dividend yield went through an extended period of decline from 1980 (when it was about 5.5% to less than 2% for much of the last decade, before bouncing back in 2008. The dividend payout ratio has also decline for much of the last decade, but the drop is less dramatic. While some of the decline in both can be attributed to rising values for the denominators – stock prices for dividend yields and earnings for payout ratios – some of it can also be accounted for by a shift towards growth firms in the S&P 500 index and a move from dividends to stock buybacks across companies. We will return to examine this trend in chapter 11.

---

10.1. Dividends that Exceed Earnings

Companies should never pay out more than 100 percent of their earnings as dividends.

a. True
b. False
Empirical Evidence on Dividend Policy

We observe several interesting patterns when we look at the dividend policies of firms in the United States in the past fifty years. First, dividends tend to lag behind earnings; that is, increases in earnings are followed by increases in dividends, and decreases in earnings sometimes by dividend cuts. Second, dividends are “sticky” because firms are typically reluctant to change dividends; in particular, firms avoid cutting dividends even when earnings drop. Third, dividends tend to follow a much smoother path than do earnings. Finally, there are distinct differences in dividend policy over the life cycle of a firm, resulting from changes in growth rates, cash flows, and project availability.

Dividends Tend to Follow Earnings

It should not come as a surprise that earnings and dividends are positively correlated over time because dividends are paid out of earnings. Figure 10.5 shows the movement in both earnings and dividends between 1960 and 2008 for companies in the S&P 500.
Take note of two trends in this graph. First, dividend changes trail earnings changes over time. Second, the dividend series is much smoother than is the earnings series.

In the 1950s, John Lintner studied the way firms set dividends and noted three consistent patterns. First, firms set target dividend payout ratios, by deciding on the fraction of earnings they are willing to pay out as dividends in the long term. Second, they change dividends to match long-term and sustainable shifts in earnings, but they increase dividends only if they feel they can maintain these higher dividends. Because firms avoid cutting dividends, dividends lag earnings. Finally, managers are much more concerned about changes in dividends than about levels of dividends.

Target Dividend Payout Ratio: The desired proportion of earnings that a firm wants to pay out in dividends.

---

Fama and Babiak identified a lag between earnings and dividends by regressing changes in dividends against changes in earnings in both current and prior periods. They confirmed Lintner’s findings that dividend changes tend to follow earnings changes.

10.2. Determinants of Dividend Lag
Which of the following types of firms is likely to wait least after earnings go up before increasing dividends?

a. A cyclical firm, whose earnings have surged because of an economic boom.
b. A pharmaceutical firm whose earnings have increased steadily over the past five years, due to a successful new drug.
c. A personal computer manufacturer, whose latest laptop’s success has translated into a surge in earnings.

Explain.

Dividends Are Sticky

Firms generally do not change their dollar dividends frequently. This reluctance to change dividends, which results in sticky dividends, is rooted in several factors. One is the firm’s concern about its capability to maintain higher dividends in future periods. Another is that markets tend to take a dim view of dividend decreases, and the stock price drops to reflect that. Figure 10.6 provides a summary of the percentages of all US firms that increased, decreased, or left unchanged their annual dividends per share from 1989 to 2008.

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As you can see, in most years the number of firms that do not change their dollar dividends far exceeds the number that do. Among the firms that change dividends, a much higher percentage, on average, increase dividends than decrease them. Even in 2008, a crisis year by most measures, the number of firms that increased dividends outnumbers the firm that cut dividends.³

³ In the last quarter of 2008, in the midst of the biggest financial market crisis of the last 50 years, 27 firms in the S&P 500 cut dividends (the highest number in a quarter in history) but 32 firms increased dividends.
do not reflect that volatility and that firms do not actively reassess how much they should pay in dividends.

Cyert and March provide an explanation for the Lintner findings, grounded in what they call “uncertainty avoidance”. They argue that managers attempt to avoid anticipating or forecasting future events by using decision rules that emphasize short-term feedback from the economic environment. Put another way, firms adopt standardized rules that do not eliminate uncertainty but make dealing with it more tractable. In the context of dividend policy, their model predicts that managers will

a. Set a level of dividends (payout ratios) by looking at industry norms
b. Focus on changes in dividends in response to changes in earnings.
c. Use simple rules of thumb on how to adjust dividends, such as raising dividends only if earnings increase 30% or more.
d. Avoid adjusting dividends in response to changes in stockholder attitudes, if these changes are viewed as short-term changes.

These predictions are well in line with the findings in the Lintner study.

Dividends Follow a Smoother Path than Earnings

As a result of the reluctance to raise dividends until the firm feels able to maintain them and to cut dividends unless they absolutely have to, dividends follow a much smoother path than earnings. This view that dividends are not as volatile as earnings on a year-to-year basis is supported by a couple of empirical facts. First, the variability in historical dividends is significantly lower than the variability in historical earnings. Using annual data on aggregate earnings and dividends from 1960 to 2008, for instance, the standard deviation of year-to-year changes in dividends is 5.17%, whereas the standard deviation in year-to-year changes in earnings is about 14.69%. Second, the standard deviation in earnings yields across companies is significantly higher than the standard deviation in dividend yields. In other words, the variation in earnings yields across firms is much greater than the variation in dividend yields.

A Firm’s Dividend Policy Tends to Follow the Life Cycle of the Firm

In previous chapters, we introduced the link between a firm’s place in the life cycle and its financing mix and choices. In particular, we noted five stages in the growth life cycle—start-up, rapid expansion, high growth, mature growth, and decline. In this section, we will examine the link between a firm’s place in the life cycle and its dividend policy. Not surprisingly, firms adopt dividend policies that best fit where they are currently in their life cycles. For instance, high-growth firms with great investment opportunities do not usually pay dividends, whereas stable firms with larger cash flows and fewer projects tend to pay more of their earnings out as dividends. Figure 10.7 looks at the typical path that dividend payout follows over a firm’s life cycle.

Figure 10.7: Life Cycle Analysis of Dividend Policy

This intuitive relationship between dividend policy and growth is emphasized when we look at the relationship between a firm’s payout ratio and its expected growth rate. For instance, we classified firms on the New York Stock Exchange in January 2009 into six groups, based on analyst estimates of expected growth rates in earnings per share.
for the next five years and estimated the dividend payout ratios and dividend yields for each class; these are reported in Figure 10.8.

*Figure 10.8: Dividend Yield and Payout Ratio - Growth Class*

Source: Value Line Database projected for firms in January 2009

The firms with the highest expected growth rates pay the lowest dividends, both as a percent of earnings (payout ratio) and as a percent of price (dividend yield).  

### 10.3. Dividend Policy at Growth Firms

Assume that you are following a growth firm whose growth rate has begun easing. Which of the following would you most likely observe in terms of dividend policy at the firm?

- An immediate increase of dividends to reflect the lower reinvestment needs
- No change in dividend policy, and an increase in the cash balance
- No change in dividend policy, and an increase in acquisitions of other firms

Explain.

---

5These are growth rates in earnings for the next 5 years projected by Value Line for firms in January 2004.
**Differences in Dividend Policy across Countries**

Figures 10.5 to 10.8 showed several trends and patterns in dividend policies at U.S. companies. They share some common features with firms in other countries, and there are some differences. As in the United States, dividends in other countries are sticky and follow earnings. However, there are differences in the magnitude of dividend payout ratios across countries. Figure 10.9 shows the proportion of earnings paid out in dividends in the G-7 countries in 1982–84 and again in 1989–91, with an update for 2009 values.\(^6\)

![Figure 10.9: Dividend Payout Ratios - G7 Countries](image)

*Source:* Rajan and Zingales.

These differences can be attributed to:

1. **Differences in Stage of Growth:** Just as higher-growth companies tend to pay out less of their earnings in dividends (see Figure 10.8), countries with higher growth pay out less in dividends. For instance, Japan had much higher expected growth in 1982–84 than the

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other G-7 countries and paid out a much smaller percentage of its earnings as dividends. As Japan’s growth declined, its payout ratio has risen.

2. Differences in Tax Treatment: Unlike the United States, where dividends are doubly taxed, some countries provide at least partial protection against the double taxation of dividends. For instance, Germany taxes corporate retained earnings at a higher rate than corporate dividends and the United Kingdom allows investors to offset corporate taxes against taxes due on dividends, thus reducing the effective tax rate on dividends.

3. Differences in Corporate Control: When there is a separation between ownership and management, as there is in many large publicly traded firms, and where stockholders have little control over managers, the dividends paid by firms will be lower. Managers, left to their own devices, have an incentive to accumulate cash. Russia, with its abysmal corporate governance system, has a dividend payout ratio of less than 10% in 2009. Not surprisingly, the dividend payout ratios of companies in most emerging markets are much lower than the dividend payout ratios in the G-7 countries. The higher growth and relative power of incumbent management in these countries contribute to keeping these payout ratios low.

10.4. Dividend Policies and Stock Buyback Restrictions

Some countries do not allow firms to buy back stock from their stockholders. Which of the following would you expect of dividend policies in these countries (relative to countries that don’t restrict stock buybacks)?

Higher portion of earnings will be paid out in dividends; more volatile dividends
Lower portion of earnings will be paid out in dividends; more volatile dividends
Higher portion of earnings will be paid out in dividends; less volatile dividends
Lower portion of earnings will be paid out in dividends; less volatile dividends

Explain.

countrystats.xls: There is a data set online that summarizes dividend yields and payout ratios for different markets, globally.
**Illustration 10.1 Dividends, Dividend Yields, and Payout Ratios**

In this illustration, we will examine the dollar dividends paid at Disney, Aracruz, Tata Chemicals and Deutsche Bank in 2007 and 2008. For each year we will also compute the dividend yield and dividend payout ratio for each firm.

<table>
<thead>
<tr>
<th></th>
<th>Disney</th>
<th>Aracruz</th>
<th>Tata Chemicals</th>
<th>Deutsche Bank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dividends per share</td>
<td>$0.35</td>
<td>$0.35</td>
<td>R$ 0.43</td>
<td>Rs 8.00</td>
</tr>
<tr>
<td>Earnings per share</td>
<td>$2.25</td>
<td>$2.28</td>
<td>R$ 1.01</td>
<td>Rs 42.82</td>
</tr>
<tr>
<td>Stock price at end of year</td>
<td>$32.28</td>
<td>$22.69</td>
<td>R$ 15.97</td>
<td>Rs 413.05</td>
</tr>
<tr>
<td>Dividend Yield</td>
<td>1.08%</td>
<td>1.54%</td>
<td>2.69%</td>
<td>1.94%</td>
</tr>
<tr>
<td>Dividend Payout</td>
<td>15.56%</td>
<td>15.35%</td>
<td>42.43%</td>
<td>-7.97%</td>
</tr>
</tbody>
</table>

Looking across the four companies over the two years, there are some interesting differences that emerge:

- Of the four companies, Deutsche Bank had the highest dividend yield in 2007 but slashed dividends drastically for 2008, as the market crisis unfolded.
- Disney paid the same dividends per share each year and had relatively stable payout ratios and dividend yields over the two periods.
- The payout ratio for Tata Chemicals jumped in 2008, mostly because the stock price dropped by more than 50% during the year.
- Both Deutsche and Aracruz paid dividends in 2008, in spite of negative earnings, a testimonial to the stickiness of dividends.

Aracruz, in particular, will have trouble, maintaining its existing dividends but it is faced with a dilemma that pits control interests against cash flow constraints. As noted earlier in the book, Aracruz, like most Brazilian companies, maintains two classes of shares—voting share (called common and held by insiders) and nonvoting shares (called preferred shares, held by outside investors). The dividend policies are different for the two classes with preferred shares getting higher dividends. In fact, the failure to pay a mandated dividend to preferred stockholders (usually set at a payout ratio of 35 percent) can result in preferred stockholders getting some voting control of the firm. Effectively, this puts a

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7 The dividends for these years are actually paid in the subsequent years by these companies. Deutsche Bank’s dividend of 0.50 Euros per share for 2008 was paid out in May 2009.
floor on the dividend payout ratio unless the voting shareholders are willing to concede control and give voting rights to the preferred shareholders, in return for cutting dividends.

**When Are Dividends Irrelevant?**

There is a school of thought that argues that what a firm pays in dividends is irrelevant and that stockholders are indifferent about receiving dividends. Like the capital structure irrelevance proposition, the dividend irrelevance argument has its roots in a paper crafted by Miller and Modigliani.⁸

**The Underlying Assumptions**

The underlying intuition for the dividend irrelevance proposition is simple. Firms that pay more dividends offer less price appreciation but must provide the same total return to stockholders, given their risk characteristics and the cash flows from their investment decisions. Thus, if there are no taxes, or if dividends and capital gains are taxed at the same rate, investors should be indifferent to receiving their returns in dividends or price appreciation.

For this argument to work, in addition to assuming that there is no tax advantage or disadvantage associated with dividends, we also have to assume the following:

- There are no transaction costs associated with converting price appreciation into cash, by selling stock. If this were *not* true, investors who need cash urgently might prefer to receive dividends.
- Firms that pay too much in dividends can issue stock, again with no issuance or transaction costs, and use the proceeds to invest in good projects. Managers of firms that pay too little in dividends do not waste the cash pursuing their own interests (i.e., managers with large surplus cash flows do not use them to invest in bad projects). Consequently, the investment decisions of the firm are unaffected by its dividend decisions, and the firm’s operating cash flows are the same no matter which dividend policy is adopted.

---

• There is also an implicit assumption that this stock is fairly priced. Under these assumptions, neither the firms paying the dividends nor the stockholders receiving them will be adversely affected by firms paying either too little or too much in dividends.

10.5. **Dividend Irrelevance**

Based on the Miller-Modigliani assumptions, dividends are least likely to affect value for what types of firms?

a. Small companies with substantial investment needs
b. Large companies with significant insider holdings
c. Large companies with significant holdings by pension funds (which are tax-exempt) and minimal investment needs

Explain.

**A Proof of Dividend Irrelevance**

To provide a formal proof of irrelevance, assume that LongLast Corporation, an unlevered furniture manufacturing firm, has operating income after taxes of $100 million, is growing at 5 percent a year, and has a cost of capital of 10 percent. Furthermore, assume that this firm has reinvestment needs of $50 million, also growing at 5 percent a year, and there are 105 million shares outstanding. Finally, assume that this firm pays out residual cash flows as dividends each year. The value of LongLast can be estimated as follows:

\[
\text{Free Cash Flow to the Firm} = \text{EBIT} (1 - \text{Tax Rate}) - \text{Reinvestment Needs} = \$100 \text{ million} - \$50 \text{ million} = \$50 \text{ million}
\]

\[
\text{Value of the Firm} = \frac{\text{FCFF}_0 (1 + g)}{(\text{Cost of capital} - g)} = \frac{50(1.05)}{(.10 - .05)} = \$1,050 \text{ million}
\]

\[
\text{Price per Share} = \frac{\$1,050 \text{ million}}{105 \text{ million}} = \$10.00
\]

Based on its cash flows, this firm could pay out $50 million in dividends.

\[
\text{Dividend per Share} = \frac{\$50 \text{ million}}{105 \text{ million}} = \$0.476
\]

\[
\text{Total Value per Share} = \$10.00 + \$0.476 = \$10.476
\]

The total value per share measures what stockholders gets in price and dividends from their stock holdings.
**Scenario 1: LongLast Doubles Dividends**

To examine how the dividend policy affects firm value, assume that LongLast is told by an investment banker that its stockholders would gain if the firm paid out $100 million in dividends instead of $50 million. It now has to raise $50 million in new financing to cover its reinvestment needs. Assume that LongLast can issue new stock with *no issuance cost* to raise these funds. If it does so, the firm value will remain unchanged, because the value is determined not by the dividend paid but by the cash flows generated on the projects. Because the growth rate and the cost of capital are unaffected, we get:

\[
\text{Value of the Firm} = \frac{\text{FCFF}_0(1 + g)}{(\text{Cost of capital} - g)} = \frac{50(1.05)}{(.10 - .05)} = $1,050 \text{ million}
\]

The existing stockholders will receive a much larger dividend per share, because dividends have been doubled:

Dividends per share = $100 million/105 million shares = $0.953

To estimate the price per share at which the new stock will be issued, note that after the new stock issue of $50 million, the old stockholders in the firm will own only $1,000 million of the total firm value of $1,050 million.

Value of the Firm for Existing Stockholders after Dividend Payment = $1,000 million

Price per Share = $1,000 million/105 million = $9.523

The price per share is now lower than it was before the dividend increase, but it is exactly offset by the increase in dividends.

Value Accruing to Stockholder = $9.523 + $0.953 = $10.476

Thus, if the operating cash flows are unaffected by dividend policy, we can show that the firm value will be unaffected by dividend policy and that the average stockholder will be indifferent to dividend policy, because he or she receives the same total value (price + dividends) under any dividend payment.

**Scenario 2: LongLast Stops Paying Dividends**

To consider an alternate scenario, assume that LongLast pays out no dividends and retains the residual $50 million as a cash balance. The value of the firm to existing stockholders can then be computed as follows:

\[
\text{Value of Firm} = \text{Present Value of After-Tax Operating CF} + \text{Cash Balance}
\]
\[
\frac{50(1.05)}{(.10 \cdot .05)} + \text{\$50 million} = \text{\$1,100 million}
\]

Value per Share = \$1,100 million/\text{105 million shares} = \$10.476

Note that the total value per share remains at \$10.476. In fact, as shown in Table 10.1, the value per share remains \$10.476 no matter how much the firm pays in dividends.

Table 10.1 Value per Share to Existing Stockholders from Different Dividend Policies

<table>
<thead>
<tr>
<th>Value of Firm (Operating CF)</th>
<th>Dividends</th>
<th>Value to Existing Stockholders</th>
<th>Price per Share</th>
<th>Dividends per Share</th>
<th>Total Value per Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1,050</td>
<td>$—</td>
<td>$1,100</td>
<td>$10.476</td>
<td>$-</td>
<td>$10.476</td>
</tr>
<tr>
<td>$1,050</td>
<td>$10.00</td>
<td>$1,090</td>
<td>$10.381</td>
<td>$0.095</td>
<td>$10.476</td>
</tr>
<tr>
<td>$1,050</td>
<td>$20.00</td>
<td>$1,080</td>
<td>$10.286</td>
<td>$0.190</td>
<td>$10.476</td>
</tr>
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<td>$1,050</td>
<td>$30.00</td>
<td>$1,070</td>
<td>$10.190</td>
<td>$0.286</td>
<td>$10.476</td>
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<td>$1,050</td>
<td>$40.00</td>
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</tr>
<tr>
<td>$1,050</td>
<td>$50.00</td>
<td>$1,050</td>
<td>$10.000</td>
<td>$0.476</td>
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</tr>
<tr>
<td>$1,050</td>
<td>$60.00</td>
<td>$1,040</td>
<td>$9.905</td>
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<td>$1,050</td>
<td>$70.00</td>
<td>$1,030</td>
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<tr>
<td>$1,050</td>
<td>$80.00</td>
<td>$1,020</td>
<td>$9.714</td>
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<tr>
<td>$1,050</td>
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<td>$1,010</td>
<td>$9.619</td>
<td>$0.857</td>
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</tr>
<tr>
<td>$1,050</td>
<td>$100.00</td>
<td>$1,000</td>
<td>$9.524</td>
<td>$0.952</td>
<td>$10.476</td>
</tr>
</tbody>
</table>

When LongLast pays less than \$50 million in dividends, the cash accrues in the firm and adds to its value. The increase in the stock price again is offset by the loss of cash flows from dividends. When it pays out more, the price decreases but is exactly offset by the increase in dividends per share.

Note, however, that the value per share remains unchanged because we assume that there are no tax differences to investors between receiving dividends and capital gains, that firms can raise new capital with no issuance costs, and that firms do not change their investment policy even when they have excess cash. These assumptions eliminate the costs associated with paying either more in dividends or less.
Implications of Dividend Irrelevance

If dividends are, in fact, irrelevant, firms are spending a great deal of time pondering an issue about which their stockholders are indifferent. A number of strong implications emerge from this proposition. Among them, the value of equity in a firm should not change as its dividend policy changes. This does not imply that the price per share will be unaffected, however, because larger dividends should result in lower stock prices and more shares outstanding. In addition, in the long run, there should be no correlation between dividend policy and stock returns. Later in this chapter, we will examine some studies that have attempted to examine whether dividend policy is actually irrelevant in practice.

The assumptions needed to arrive at the dividend irrelevance proposition may seem so onerous that many reject it without testing it. That would be a mistake, however, because the argument does contain a valuable message: Namely, a firm that has invested in bad projects cannot hope to resurrect its image with stockholders by offering them higher dividends. Conversely, a firm that has a history of making good investments will be forgiven by stockholders, even if it chooses not to pay out what it can afford to in dividends. This may yield some insight into why investors are much more sanguine about cash being accumulated in some companies than in others.

The “Dividends Are Bad” School

In the United States, dividends have historically been taxed at much higher rates than capital gains. Based on this tax disadvantage, the second school of thought on dividends argued that dividend payments reduce the returns to stockholders after personal taxes. Stockholders, they posited, would respond by reducing the stock prices of the firms making these payments, relative to firms that do not pay dividends. Consequently, firms would be better off either retaining the money they would have paid out as dividends or repurchasing stock. In 2003, the basis for this argument was largely eliminated when the tax rate on dividends was reduced to match the tax rate on capital gains. In this section,
we will consider both the history of tax-disadvantaged dividends and the potential effects of the tax law changes.\(^9\)

**The History of Dividend Taxation**

The tax treatment of dividends varies widely depending on who receives the dividend. Individual investors were until 2003 taxed at ordinary tax rates, corporations are sheltered from paying taxes on at least a portion of the dividends they receive, and pension funds are not taxed at all.

**Individuals**

Since the inception of income taxes in the early twentieth century in the United States, dividends received on investments have been treated as ordinary income when received by individuals and taxed at ordinary tax rates. In contrast, the price appreciation on an investment has been treated as capital gains and taxed at a different and much lower rate. Figure 10.10 graphs the highest marginal tax rate on dividends in the United States and the highest marginal capital gains tax rate since 1954 (when capital gains taxes were introduced).

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\(^9\)Adding to the uncertainty is the fact that the tax changes of 2003 are not permanent and are designed to sunset (disappear) in 2010. It is unclear whether the tax disadvantages of dividends have disappeared for the long term or only until 2010.
Barring a brief period after the 1986 tax reform act, when dividends and capital gains were both taxed at 28 percent, the capital gains tax rate has been significantly lower than the ordinary tax rate in the United States. In 2003, the tax rate on dividends was dropped to 15 percent to match the tax rate on capital gains, thus nullifying the tax disadvantage of dividends. However, that change in the tax law is expected to be repealed in 2010, returning the tax rates to pre-2001 numbers.

There are two points worth making about this chart. The first is that these are the highest marginal tax rates and that most individuals are taxed at lower rates. In fact, some older and poorer investors may pay no taxes on income if it falls below the threshold for taxes. The second and related issue is that the capital gains taxes can be higher for some of these individuals than the ordinary tax rate they pay on dividends. Overall, however, wealthier individuals have more invested in stocks than poorer individuals, and it seems fair to conclude that individuals have collectively paid significantly more taxes on the income that they have received in dividends than capital gains profits over the past few decades.
**Institutional Investors**

About two-thirds of all traded equities are held by institutional investors rather than individuals. These institutions include mutual funds, pension funds, and corporations, and dividends get taxed differently in the hands of each.

- Pension funds are tax-exempt. They are allowed to accumulate both dividends and capital gains without having to pay taxes. There are two reasons for this tax treatment. One is to encourage individuals to save for their retirement and to reward savings (as opposed to consumption). The other reason for this is that individuals will be taxed on the income they receive from their pension plans and that taxing pension plans would in effect tax the same income twice.

- Mutual funds are not directly taxed, but investors in them are taxed for their share of the dividends and capital gains generated by the funds. If high-tax-rate individuals invest in a mutual fund that invests in stocks that pay high dividends, these high dividends will be allocated to the individuals based on their holdings and taxed at their individual tax rates.

- Corporations are given special protection from taxation on dividends they receive on their holdings in other companies, with 70 percent of the dividends exempt from taxes. In other words, a corporation with a 40 percent tax rate that receives $100 million in dividends will pay only $12 million in taxes. Here again, the reasoning is that dividends paid by these corporations to their stockholders will ultimately be taxed.

**Tax Treatment of Dividends in Other Markets**

Many countries have plans in place to protect investors from the double taxation of divided. There are two ways in which they can do this. One is to allow corporations to claim a full or partial tax deduction for dividends paid. The other is to give partial or full tax relief to individuals who receive dividends.

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10 The exemption increases as the proportion of the stock held increases. Thus, a corporation that owns 10 percent of another company’s stock has 70 percent of dividends exempted. This rises to 80 percent if the company owns between 20 and 80 percent of the stock and to 100 percent if the company holds more than 80 percent of the outstanding stock.
Corporate Tax Relief

In some countries, corporations are allowed to claim a partial or full deduction for dividends paid. This brings their treatment into parity with the treatment of the interest paid on debt, which is entitled to a full deduction in most countries. Among the Organisation for Economic Cooperation and Development (OECD) countries, the Czech Republic and Iceland offer partial deductions for dividend payments made by companies, but no country allows a full deduction. In a variation, Germany until recently applied a higher tax rate to income that was retained by firms than to income that was paid out in dividends. In effect, this gives a partial tax deduction to dividends.

Why don’t more countries offer tax relief to corporations? There are two factors. One is the presence of foreign investors in the stock who now also share in the tax windfall. The other is that investors in the stock may be tax-exempt or pay no taxes, which effectively reduces the overall taxes paid on dividends to the treasury to zero.

Individual Tax Relief

There are far more countries that offer tax relief to individuals than to corporations. This tax relief can take several forms:

- **Tax credit for taxes paid by corporation:** Individuals can be allowed to claim the taxes paid by the corporation as a credit when computing their own taxes. In the example earlier, where a company paid 30 percent of its income of $100 million as taxes and then paid its entire income as dividends to individuals with 40 percent tax rates, the individuals would be allowed to claim a tax credit of $30 million against the taxes owed, thus reducing taxes paid to $10 million. In effect, this will mean that only individuals with marginal tax rates that exceed the corporate tax rate will be taxed on dividends. Australia, Finland, Mexico, and New Zealand allow individuals to get a full credit for corporate taxes paid. Canada, France, the United Kingdom, and Turkey allow for partial tax credits.

- **Lower tax rate on dividends:** Dividends get taxed at a lower rate than other income to reflect the fact that it is paid out of after-tax income. In some countries, the tax rate on dividends is set equal to the capital gains tax rate. South Korea, for instance, has a flat tax rate of 16.5 percent for dividend income. This is the path
that the United States chose in 2003 to grant relief from double taxation to stock investors.

In summary, it is far more common for countries to provide tax relief to investors than to corporations. Part of the reason for this is political. By focusing on individuals, you can direct the tax relief only toward domestic investors and only to those investors who pay taxes in the first place.

**Timing of Tax Payments**

When the 1986 tax reform was signed into law, equalizing tax rates on ordinary income and capital gains, some believed that all the tax disadvantages of dividends had disappeared. Others noted that even with the same tax rates, dividends carried a tax disadvantage because the investor had no choice as to when to report the dividend as income; taxes were due when the firm paid out the dividends. In contrast, investors retained discretionary power over when to recognize and pay taxes on capital gains, because such taxes were not due until the stock was sold. This timing option allowed the investor to reduce the tax liability in one of two ways. First, by taking capital gains in periods of low income or capital losses to offset against the gain, the investor could now reduce the taxes paid. Second, deferring a stock sale until an investor’s death could result in tax savings, especially if the investor is not subject to estate taxes.

**Assessing Investor Tax Preferences for Dividends**

As you can see from the foregoing discussion, the tax rate on dividends can vary widely for different investors—individual, pension fund, mutual fund, or corporation—receiving the dividends and even for the same investor on different investments. It is difficult therefore to look at a company’s investor base and determine their preferences for dividends and capital gains. A simple way to measure the tax disadvantage associated with dividends is to measure the price change on the ex-dividend date and compare it to the actual dividend paid. The stock price on the ex-dividend day should drop to reflect the loss in dividends to those buying the stock after that day. It is not clear, however, whether the price drop will be equal to the dividends if dividends and capital gains are taxed at different rates.
To see the relationship between the price drop and the tax rates of the marginal investor, assume that investors in a firm acquired stock at some point in time at a price $P$, and that they are approaching an ex-dividend day, in which the dividend is known to be $D$. Assume that each investor in this firm can either sell the stock before the ex-dividend day at a price $P_B$ or wait and sell it after the stock goes ex-dividend at a price $P_A$. Finally, assume that the tax rate on dividends is $t_o$ and that the tax rate on capital gains is $t_{cg}$. The cash flows the investor will receive from selling before the stock goes ex-dividend is

$$\text{CF}_B = P_B - (P_B - P)t_{cg}$$

In this case, by selling before the ex-dividend day, the investor receives no dividend. If the sale occurs after the ex-dividend day, the cash flow is

$$\text{CF}_A = P_A - (P_A - P)t_{cg} + D(1 - t_o)$$

If the cash flow from selling before the ex-dividend day were greater than the cash flow from selling after for all investors, they would all sell before, resulting in a drop in the stock price. Similarly, if the cash flows from selling after the ex-dividend day were greater than the cash flows from selling before for all investors, every one would sell after, resulting in a price drop after the ex-dividend day. To prevent either scenario, the marginal investors in the stock have to be indifferent between selling before and after the ex-dividend day. This will occur only if the cash flows from selling before are equal to the cash flows from selling after:

$$P_B - (P_B - P)t_{cg} = P_A - (P_A - P)t_{cg} + D(1 - t_o)$$

This can be simplified to yield the following ex-dividend day equality:

$$\frac{P_B - P_A}{D} = \frac{(1 - t_o)}{(1 - t_{cg})}$$

Thus, a necessary condition for the marginal investor to be indifferent between selling before and after the ex-dividend day is that the price drop on the ex-dividend day must reflect the investor’s tax differential between dividends and capital gains.

By turning this equation around, we would argue that by observing a firm’s stock price behavior on the ex-dividend day and relating it to the dividends paid by the firm; we can, in the long run, form some conclusions about the tax disadvantage the firm’s stockholders attach to dividends. In particular:
If | Tax Treatment of Dividends and Capital Gains
---|---
\( P_B - P_A = D \) | Marginal investor is indifferent between dividends and capital gains
\( P_B - P_A < D \) | Marginal investor is taxed more heavily on dividends
\( P_B - P_A > D \) | Marginal investor is taxed more heavily on capital gains

Although there are obvious measurement problems associated with this measure, it does provide some interesting insight into how investors view dividends.

The first study of ex-dividend day price behavior was completed by Elton and Gruber in 1970.\(^{11}\) They examined the behavior of stock prices on ex-dividend days for stocks listed on the NYSE between 1966 and 1969. Based on their finding that the price drop was only 78 percent of the dividends paid, Elton and Gruber concluded that dividends are taxed more heavily than capital gains. They also estimated the price change as a proportion of the dividend paid for firms in different dividend yield classes and reported that price drop is larger, relative to the dividend paid, for firms in the highest dividend yield classes than for firms in lower dividend yield classes. This difference in price drops, they argued, reflected the fact that investors in these firms are in lower tax brackets. Their conclusions were challenged, however, by some who argued justifiably that the investors trading on the stock on ex-dividend days are not the normal investors in the firm; rather, they are short-term, tax-exempt investors interested in capturing the difference between dividends and the price drops.

**Implications**

There is no argument that dividends have historically been treated less favorably than capital gains by the tax authorities. In the United States, the double taxation of dividends, at least at the level of individual investors, should have created a strong disincentive to pay or to increase dividends. Other implications of the tax disadvantage argument include the following:

• Firms with an investor base composed primarily of individuals typically should have paid lower dividends than do firms with investor bases predominantly made up of tax-exempt institutions.
• The higher the income level (and hence the tax rates) of the investors holding stock in a firm, the lower the dividend paid out by the firm.
• As the tax disadvantage associated with dividends increased, the aggregate amount paid in dividends should have decreased. Conversely, if the tax disadvantage associated with dividends decreased, the aggregate amount paid in dividends should have increased.

The tax law changes of 2003 changed the terms of this debate, at least for the short term. By reducing the tax rate on dividends, they made dividends more attractive at least to individual investors than they were prior to the change. We would expect companies to pay more dividends in response and there is some evidence that companies changed dividend policy in response to the tax law change. Technology companies like Microsoft that had never paid dividends before have initiated dividends. In Figure 10.11, we look at the percent of S&P 500 companies that pay dividends by year and the at the market capitalization of dividend payers as a percent of the market capitalization of the S&P 500 from 1960 to 2008.
There was an uptick in both the number of companies paying dividends in 2003 and the dividends paid, reversing a long decline in both statistics. However, dividends leveled off after 2004 and companies continued the trend of shifting towards stock buybacks and the market crisis of 2008 resulted in a reversal of much of the post-2003 gain in dividends.

**In Practice: From sticky to flexible dividend payouts**

When firms increase dividends, the biggest peril that they face is being unable to sustain these dividends, given volatile earnings. In other words, the inability to cut dividends acts as an impediment to initiating and increasing dividends in the first place.

There are two ways that firms can alleviate the problem of “sticky dividends”.

- One is to shift to a policy of residual dividends, where dividends paid are a function of the earnings in the year rather than a function of dividends last year. Note that the sticky dividend phenomenon in the United States, where companies are reluctant to change their dollar dividends, is not universal. In countries like Brazil, companies target dividend payout ratios rather than dollar dividends and there is no reason why U.S. companies cannot adopt a similar practice. A firm that targets a constant dividend payout ratio will pay more dividends when its earnings are high and less
when its earnings are low, and the signaling effect of lower dividends will be mitigated if the payout policy is clearly stated up front.

- The other option is to adopt a policy of regular dividends that will be based on sustainable and predictable earnings and to supplement these with special dividends when earnings are high. In this form, the special dividends will take the place of stock buybacks.

In summary, we should expect to see more creative dividend policies, in the face of increased uncertainty about future earnings and cash flows. In 2004, British Petroleum provided a preview of innovations to come by announcing that they would supplement their regular dividends with any extra cash flows generated if the oil price stayed above $30 a barrel, thus creating dividends that are tied more closely to their cash flows.

10.6. Corporate Tax Status and Dividend Policy

Corporations are exempt from paying taxes on 70 percent of the dividends they receive from their stock holdings in other companies, whereas they face a capital gains tax rate of 20 percent. If all the stock in your company is held by other companies, and the ordinary tax rate for companies is 36 percent,

a. dividends have a tax advantage relative to capital gains.

b. capital gains have a tax advantage relative to dividends.

c. dividends and capital gains are taxed at the same rate.

Explain.

The “Dividends Are Good” School

Notwithstanding the tax disadvantages, firms continue to pay dividends and many investors view such payments positively. A third school of thought that argues dividends are good and can increase firm value. Some of the arguments used are questionable, but some have a reasonable basis in fact. We consider both in this section.

Some Reasons for Paying Dividends that Do Not Measure Up

Some firms pay and increase dividends for the wrong reasons. We will consider two of those reasons in this section.
**The Bird-in-the-Hand Fallacy**

One reason given for the view that investors prefer dividends to capital gains is that dividends are certain, whereas capital gains are uncertain. Proponents of this view of dividend policy feel that risk-averse investors will therefore prefer the former. This argument is flawed. The simplest response is to point out that the choice is not between certain dividends today and uncertain capital gains at some unspecified point in the future but between dividends today and an almost equivalent amount in price appreciation today. This comparison follows from our earlier discussion, where we noted that the stock price dropped by slightly less than the dividend on the ex-dividend day. By paying the dividend, the firm causes its stock price to drop today.

Another response to this argument is that a firm’s value is determined by the cash flows from its projects. If a firm increases its dividends but its investment policy remains unchanged, it will have to replace the dividends with new stock issues. The investor who receives the higher dividend will therefore find him- or herself losing, in present value terms, an equivalent amount in price appreciation.

**Temporary Excess Cash**

In some cases, firms are tempted to pay or initiate dividends in years in which their operations generate excess cash. Although it is perfectly legitimate to return excess cash to stockholders, firms should also consider their own long-term investment needs. If the excess cash is a temporary phenomenon, resulting from having an unusually good year or a nonrecurring action (such as the sale of an asset), and the firm expects cash shortfalls in future years, it may be better off retaining the cash to cover some or all these shortfalls. Another option is to pay the excess cash as a dividend in the current year and issue new stock when the cash shortfall occurs. The substantial expense associated with new security issues makes this a costly strategy in the long run. Figure 10.12 summarizes the cost of issuing bonds and common stock by size of issue in the United States.\(^{12}\)

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Because issuance costs increase as the size of the issue decreases and for common stock issues, small firms should be especially cautious about paying out temporary excess cash as dividends. This said, it is important to note that some companies do pay dividends and issue stock during the course of the same period, mostly out of a desire to maintain their dividends. Figure 10.13 reports new stock issues by firms as a percentage of firm value, classified by their dividend yields, between 2005 and 2007.

*Source:* Ibbotson, Sindelar, and Ritter.
Although it is not surprising that stocks that pay no dividends are most likely to issue stock, it is surprising that firms in the highest dividend yield class also issue significant proportions of new stock (approximately half of all the firms in this class also make new stock issues). This suggests that many of these firms are paying dividends on the one hand and issuing stock on the other, creating significant issuance costs for their stockholders in the process.

**Some Good Reasons for Paying Dividends**

Although the tax disadvantages of dividends were clear before 2003, especially for individual investors, there were some good reasons why firms that were paying dividends during the prior years did not suspend them. First, some investors liked to receive dividends and did not care about the tax disadvantage, either because they paid no or very low taxes or because they needed the regular cash flows. Firms that had paid dividends over long periods were likely to have accumulated investors with these

*Source: Compustat database, 1998.*
characteristics, and cutting or eliminating dividends would not have been viewed favorably by this group.

Second, changes in dividends allow firms to signal to financial markets how confident they feel about future cash flows. Firms that are more confident about their future are therefore more likely to raise dividends; stock prices often increase in response. Cutting dividends is viewed by markets as a negative signal about future cash flows, and stock prices often decline in response. Third, firms can use dividends as a tool for altering their financing mix and moving closer to an optimal debt ratio. Finally, the commitment to pay dividends can help reduce the conflicts between stockholders and managers by reducing the cash flows available to managers.

Some Investors Like Dividends

Prior to the tax law change in 2003, many in the “dividends are bad” school of thought argued that rational investors should have rejected dividends due to their tax disadvantage. Whatever you might have thought of the merits of that argument, some investors had a strong preference for dividends and viewed large dividends positively. The most striking empirical evidence for this came from studies of companies that had two classes of shares: one that paid cash dividends, and another that paid an equivalent amount of stock dividends; thus, investors are given a choice between dividends and capital gains.

In 1978, John Long studied the price differential on Class A and B shares traded on Citizens Utility.\(^\text{13}\) Class B shares paid a cash dividend, and Class A shares paid an equivalent stock dividend. Moreover, Class A shares could be converted at little or no cost to Class B shares at the option of its stockholders. Thus, an investor could choose to buy Class B shares to get cash dividends or Class A shares to get an equivalent capital gain. During the period of this study, the tax advantage was clearly on the side of capital gains; thus, we would expect to find Class B shares selling at a discount on Class A shares. The study found, surprisingly, that the Class B shares sold at a premium over

Class A shares. Figure 10.14 reports the price differential between the two share classes over the period of the analysis.

*Figure 10.14 Price Differential on Citizens Utility Stock*

Although it may be tempting to attribute this phenomenon to the irrational behavior of investors, such is not the case. Not all investors liked dividends—many felt its tax burden—but there were also many who viewed dividends positively. These investors may not have been paying much in taxes and consequently did not care about the tax disadvantage associated with dividends. Or they might have needed and valued the cash flow generated by the dividend payment. Why, you might ask, did they not sell stock to raise the cash flow they needed? The transaction costs and the difficulty of breaking up small holdings and selling unit shares may have made selling small amounts of stock infeasible.¹⁴

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¹⁴Consider a stockholder who owns 100 shares trading at $20 per share, on which she receives a dividend of $0.50 per share. If the firm did not pay a dividend, the stockholder would have to sell 2.5 shares of stock to raise the $5 that would have come from the dividend.
Bailey extended Long’s study to examine Canadian utility companies, which also offered dividend and capital gains shares, and had similar findings.\textsuperscript{15} Table 10.2 summarizes the price premium at which the dividend shares sold.

\textit{Table 10.2 Price Differential between Cash and Stock Dividend Shares}

<table>
<thead>
<tr>
<th>Company</th>
<th>Premium on Cash Dividend Shares over Stock Dividend Shares</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consolidated Bathurst</td>
<td>19.30%</td>
</tr>
<tr>
<td>Donfasco</td>
<td>13.30%</td>
</tr>
<tr>
<td>Dome Petroleum</td>
<td>0.30%</td>
</tr>
<tr>
<td>Imperial Oil</td>
<td>12.10%</td>
</tr>
<tr>
<td>Newfoundland Light &amp; Power</td>
<td>1.80%</td>
</tr>
<tr>
<td>Royal Trustco</td>
<td>17.30%</td>
</tr>
<tr>
<td>Stelco</td>
<td>2.70%</td>
</tr>
<tr>
<td>TransAlta</td>
<td>1.10%</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>7.54%</strong></td>
</tr>
</tbody>
</table>


Note once again that on average the cash dividend shares sell at a premium of 7.5 percent over the stock dividend shares. We caution that although these findings do not indicate that \textit{all} stockholders like dividends, they do indicate that the stockholders in these specific companies liked cash dividends so much that they were willing to overlook the tax disadvantage that existed during the period and paid a premium for shares that offered them.

\textit{Why do some investors like dividends? A Behavioral Perspective}

Until the tax law was changed in 2003, dividends were taxed at much higher tax rates than capital gains. In fact, in most corporate finance books written in the 1970s and 1980s, the chapter on dividend policy was titled “The Dividend Puzzle”. Rational investors, it was argued, would prefer that firms buy back stock (rather than pay...
dividends) and rational managers would oblige by eliminating dividends. Notwithstanding this argument, firms that had paid dividends in the past continued to do so, with little or no opposition from their stockholders. With the rise of behavioral finance, there have been attempts to explain the “irrational” liking for dividends manifested by some investors. Shefrin and Statman (1984) provide three possible explanations for why investors may like dividends:

a. **Absence of self control**: To the extent that investors have trouble controlling consumption and resisting temptation, they look for simple rules that prevent them from indulgence. One simple rule with stocks that protects investors from over-spending may be to consume the dividend but leave the principal untouched.

b. **Mental Accounting**: With some utility functions, the utility gained by investors from a gain that is broken down into dividends and capital gains may be greater than the utility from the same gain, if delivered entirely as a capital gain. For instance, investors may get more utility when they receive $1 in dividends and $4 in capital gains than from a capital gain of $5.

c. **Regret avoidance**: Investors regret mistakes, but they regret errors of commission more than errors of omission. An investor who buys a non-dividend stock that goes down may be forced to sell the stock to generate cash, and is thus forced to confront his or her error. In contrast, an investor who buys a dividend paying stock that goes down may be able to get by without selling the stock and feels less regret.

Shefrin and Statman are not claiming that all investors are susceptible to these phenomena but even if a subset of investors are, they will like dividends, tax disadvantages notwithstanding.

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**The Clientele Effect**

Stockholders examined in the studies just described clearly like cash dividends. At the other extreme are companies that pay no dividends, whose stockholders seem perfectly content with that policy. Given the vast diversity of stockholders, it is not

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surprising that over time, investors tended to invest in firms whose dividend policies matched their preferences. Stockholders in high tax brackets who did not need the cash flow from dividend payments tended to invest in companies that paid low or no dividends. By contrast, those in low tax brackets who needed the cash from dividend payments, and tax-exempt institutions that needed current cash flows, invested in companies with high dividends. This clustering of stockholders in companies with dividend policies that match their preferences is called the \textit{clientele effect}.

The existence of a clientele effect is supported by empirical evidence. One study looked at the portfolios of 914 investors to see whether they were affected by their tax brackets. The study found that older and poorer investors were more likely to hold high-dividend-paying stocks than were younger and wealthier investors.

In another study, dividend yields were regressed against the characteristics of the investor base of a company (including age, income, and differential tax rates).\textsuperscript{17}

\[
\text{Dividend Yield}_t = a + b \beta_t + c \text{ Age}_t + d \text{ Income}_t + e \text{ Differential Tax Rate}_t + \epsilon_t
\]

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Implies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>4.22%</td>
<td></td>
</tr>
<tr>
<td>Beta coefficient</td>
<td>–2.145</td>
<td>Higher beta stocks pay lower dividends.</td>
</tr>
<tr>
<td>Age/100</td>
<td>3.131</td>
<td>Firms with older investors pay higher dividends.</td>
</tr>
<tr>
<td>Income/1,000</td>
<td>–3.726</td>
<td>Firms with wealthier investors pay lower dividends.</td>
</tr>
<tr>
<td>Differential tax rate</td>
<td>–2.849</td>
<td>If ordinary income is taxed at a higher rate than capital gains, the firm pays less dividends.</td>
</tr>
</tbody>
</table>


Not surprisingly, this study found that safer companies, with older and poorer investors, tended to pay more in dividends than companies with wealthier and younger investors. Overall, dividend yields decreased as the tax disadvantage of dividends increased.

10.7. **Dividend Clientele and Tax-Exempt Investors**

Pension funds are exempt from paying taxes on either ordinary income or capital gains and also have substantial ongoing cash flow needs. What types of stocks would you expect these funds to buy?

a. Stocks that pay high dividends

b. Stocks that pay no or low dividends

Explain.

**Consequences of the Clientele Effect**

The existence of a clientele effect has some important implications. First, it suggests that firms get the investors they deserve, because the dividend policy of a firm attracts investors who like it. Second, it means that firms will have a difficult time changing an established dividend policy, even if it makes complete sense to do so. For instance, U.S. telephone companies have traditionally paid high dividends and acquired an investor base that liked these dividends. In the 1990s, many of these firms entered new businesses (entertainment, multimedia, etc.), with much larger reinvestment needs and less stable cash flows. Although the need to cut dividends in the face of the changing business mix might seem obvious, it was nevertheless a hard sell to stockholders, who had become used to the dividends.

The clientele effect also provides an alternative argument for the irrelevance of dividend policy, at least when it comes to valuation. In summary, if investors migrate to firms that pay the dividends that most closely match their needs, no firm’s value should be affected by its dividend policy. Thus, a firm that pays no or low dividends should not be penalized for doing so, because its investors do not want dividends. Conversely, a firm that pays high dividends should not have a lower value, because its investors like dividends. This argument assumes that there are enough investors in each dividend clientele to allow firms to be fairly valued, no matter what their dividend policy.

**Empirical Evidence on the Clientele Effect**

If there is a strong enough clientele effect, the returns on stocks should not be affected over long periods by the dividend payouts of the underlying firms. If there is a
tax disadvantage associated with dividends, the returns on stocks that pay high dividends should be higher than the returns on stocks that pay low dividends to compensate for the tax differences. Finally, if there is an overwhelming preference for dividends, these patterns should be reversed.

In their study of the clientele effect, Black and Scholes created twenty-five portfolios of NYSE stocks, classifying firms into five quintiles based on dividend yield, and then subdivided each group into five additional groups based on risk (beta) each year for thirty-five years, from 1931 to 1966.\textsuperscript{18} When they regressed total returns on these portfolios against the dividend yields, the authors found no statistically significant relationship between them. These findings were contested in a study in 1979 by Litzenberger and Ramaswamy, who used updated dividend yields every month and examined whether the total returns in ex-dividend months were correlated with dividend yields.\textsuperscript{19} They found a strong positive relationship between total returns and dividend yields, supporting the hypothesis that investors are averse to dividends. They also estimated that the implied tax differential between capital gains and dividends was approximately 23 percent. Miller and Scholes countered by arguing that this finding was contaminated by the stock price effects of dividend increases and decreases.\textsuperscript{20} In response, Litzenberger and Ramaswamy removed from the sample all cases in which the dividends were declared and paid in the same month and concluded that the implied tax differential was only 4 percent, which was not significantly different from zero.

In the interest of fairness, we should point out that most studies of the clientele effect have concluded that total returns and dividend yields are positively correlated. Although many of them contend that this is true because the implied tax differential between dividends and capital gains is significantly different from zero, there are alternative explanations for the phenomena. In particular, although one may disagree with Miller and Scholes’s conclusions, their argument—that the higher returns on stocks that


pay high dividends might have nothing to do with the tax disadvantages associated with dividends but may instead be a reflection of the price increases associated with unexpected dividend increases—has both a theoretical and an empirical basis.

10.8. Dividend Clientele and Changing Dividend Policy

Phone companies in the United States have for long had the following features: They are regulated, have stable earnings, low reinvestment needs and pay high dividends. Many of these phone companies are now considering entering the multimedia age and becoming entertainment companies, which requires more reinvestment and creates more volatility in earnings. If you were the CEO of the phone company, would you
a. announce an immediate cut in dividends as part of a major capital investment plan?
b. continue to pay high dividends, and use new stock issues to finance the expansion?
c. do something else?

Explain.

Dividends Operate as an Information Signal

Financial markets examine every action a firm takes for implications for future cash flows and firm value. When firms announce changes in dividend policy, they are conveying information to markets, whether or not they intend to do so.

Financial markets tend to view announcements made by firms about their future prospects with a great deal of skepticism, because firms routinely make exaggerated claims. At the same time, some firms with good investment prospects are undervalued by markets. How do such firms convey information credibly to markets? Signaling theory suggests that these firms need to take actions that cannot be easily imitated by firms without good projects. Increasing dividends is viewed as one such action. By increasing dividends, firms create a cost to themselves, because they commit to paying these dividends in the long run. Their willingness to make this commitment indicates to investors that they believe they have the capacity to generate these cash flows in the long run. This positive signal should therefore lead investors to reevaluate the cash flows and firm values and increase the stock price.
Decreasing dividends is a negative signal, largely because firms are reluctant to cut dividends. Thus, when a firm takes this action, markets see it as an indication that this firm is in substantial, long-term financial trouble. Consequently, such actions lead to a drop in stock prices.

The empirical evidence concerning price reactions to dividend increases and decreases is consistent, at least on average, with this signaling theory. Figure 10.15 summarizes the average excess returns around dividend changes for firms.\textsuperscript{21}

\textit{Figure 10.15 Excess Returns around Announcements of Dividend Changes}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure1015}
\caption{Excess Returns around Announcements of Dividend Changes}
\end{figure}

\textit{Source:} Aharony and Swary.

We should view this explanation for dividend increases and decreases cautiously, however. Although it is true that firms with good projects may use dividend increases to convey information to financial markets, is it the most efficient way? For smaller firms, which have relatively few signals available to them, the answer might be yes. For larger firms, which have many ways of conveying information to markets, dividends might not

be the least expensive or the most effective signals. For instance, information may be more effectively and economically conveyed through an analyst report on the company.

There is another reason for skepticism. An equally plausible story can be told about how an increase in dividends sends a negative signal to financial markets. Consider a firm that has never paid dividends in the past but has registered extraordinary growth and high returns on its projects. When this firm first starts paying dividends, its stockholders may consider this an indication that the firm’s projects are neither as plentiful nor as lucrative as they used to be. However, Palepu and Healy found that the initiation of dividends does not signal a decline in earnings growth in a study of 151 firms from 1970 to 1979.²²

## 10.9. Dividends as Signals

Silicon Electronics, a company with a history of not paying dividends, high earnings growth, and reinvestment back into the company, announces that it will be initiating dividends. You would expect the stock price to

a. go up.
b. go down.
c. remain unchanged.

Explain.

### Dividend Policy Is a Tool for Changing Financing Mix

Dividend policy cannot be analyzed in a vacuum. Firms can use dividend policy as a tool to change their debt ratios. We previously examined how firms that want to increase or decrease leverage can do so by changing their dividend policy: increasing dividends increases financial leverage over time, and decreasing dividends reduces leverage.

When dividends increase, stockholders sometimes get a bonus in the form of a wealth transfer from lenders to the firm. Lenders would rather have firms accumulate cash than pay it out as dividends. The payment of dividends takes cash out of the firm,

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and this cash could have been used to cover outstanding interest or principal payments. Not surprisingly, bond prices decline on the announcement of large increases in dividends. It is equity investors who gain from the loss in market value faced by bondholders. Bondholders, of course, try to protect themselves against this loss by restricting how much firms can pay out in dividends.

A Catering Explanation for Dividends: A Behavioral Perspective

In conventional corporate finance, firms trade off the costs of paying dividends (the differential tax costs to their investors, the issuance costs of new financing) against the benefits of dividends (signaling benefits and reduced agency costs) to determine whether they should pay dividends. Baker and Wurgler offer an alternative explanation where firms cater to the investor desire for dividends. Looking at the time period between 1963 and 2000, they use the difference between the market to book ratios of dividend payers and dividend non-payers as a measure of investor demand for dividends; when investors, in the aggregate, like dividends, dividend payers trade at a premium over non-payers, and when investors do not want dividends, dividend payers trade at a discount. They find that the dividends paid by firms can be better explained by investor demand for dividends, with more firms paying dividends when dividend payers trade at a premium, and fewer firms paying dividends when dividend payers trade at a discount.

The catering rationale for dividends is more an explanation for how firms set dividends in the aggregate and less about dividend policy in individual firms, but it does point to an important. Investor preferences for dividends shift over time and firms have to respond to changes in these preferences. Managers, when setting dividend policy, have to be aware not only of what investors, in the aggregate, think about dividends but also of what investors in their firm think about dividends. It would seem to use that the catering explanation is a dynamic version of the clientele story, where the preferences for dividends on the part of investors in a firm can change over time, and dividend policy has to change with it.
Managerial Interests and Dividend Policy

We have considered dividend policy almost entirely from the perspective of equity investors in the firm. In reality, though, managers set dividend policy, and it should come as no surprise that there may be a potential for a conflict of interests between stockholders and managers.

The Source of the Conflict

When examining debt policy, we noted that one reason for taking on more debt was to induce managers to be more disciplined in their project choices. Implicit in this free cash flow argument is the assumption that accumulated cash, if left to the discretion of the managers of the firm, would be wasted on poor projects. If this is true, we can argue that forcing a firm to make a commitment to pay dividends provides an alternative way of forcing managers to be disciplined in project choice by reducing the cash that is available for discretionary uses.

If this is the reason stockholders want managers to commit to paying larger dividends, firms in which there is a clear separation between ownership and management, should pay larger dividends than should firms with substantial insider ownership and involvement in managerial decisions.

What Do Managers Believe about Dividend Policy?

Given the pros and cons for paying dividends and the lack of a consensus on the effect of dividends on value, it is worth considering what managers factor in when they make dividend decisions. Baker, Farrelly, and Edelman (1985) surveyed managers on their views on dividend policy and reported the level of agreement with a series of statements. Table 10.3 summarizes their findings.

Table 10.3 Management Beliefs about Dividend Policy

<table>
<thead>
<tr>
<th>Statement of Management Beliefs</th>
<th>Agree</th>
<th>No Opinion</th>
<th>Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. A firm’s dividend payout ratio affects the price of the stock.</td>
<td>61%</td>
<td>33%</td>
<td>6%</td>
</tr>
</tbody>
</table>

2. Dividend payments provide a signaling device of future prospects.  

| Percentage Distribution | 52% | 41% | 7% |

3. The market uses divided announcements as information for assessing firm value.

| Percentage Distribution | 43% | 51% | 6% |

4. Investors have different perceptions of the relative riskiness of dividends and retained earnings.

| Percentage Distribution | 56% | 42% | 2% |

5. Investors are basically indifferent with regard to returns from dividends and capital gains.

| Percentage Distribution | 6% | 30% | 64% |

6. A stockholder is attracted to firms that have dividend policies appropriate to the stockholder’s tax environment.

| Percentage Distribution | 44% | 49% | 7% |

7. Management should be responsive to shareholders’ preferences regarding dividends.

| Percentage Distribution | 41% | 49% | 10% |

It is quite clear from this survey that, rightly or wrongly, managers believe that their dividend payout ratios affect firm value and operate as signals of future prospects. They also operate under the presumption that investors choose firms with dividend policies that match their preferences and that management should be responsive to their needs.

In an updated and comprehensive survey of dividend policy published in 2004, Brav, Graham, Harvey, and Michaely conclude that management’s focus is not on the level of dividends but on changes in these dividends. Indicating a shift from views in prior studies, many managers in this survey saw little gain from increasing dividends, even in response to higher earnings and preferred stock buybacks instead. In fact, many managers in companies that paid dividends regret the level of dividends paid by their firms, indicating that they would have set the dividend at a much lower level if they had the choice. In contrast to the survey quoted in the last paragraph, managers also rejected the idea that dividends operate as useful financial signals. From the survey, the authors conclude that the rules of the game for dividends are the following: do not cut dividends,

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have a dividend policy similar to your peer group, preserve a good credit rating, maintain flexibility, and do not take actions that reduce earnings per share.

10.10. Corporate Governance and Dividend Policy
In countries where stockholders have little or no control over incumbent managers, you would expect dividends paid by companies to be
a. lower than dividends paid in other countries.
b. higher than dividends paid in other countries.
c. about the same as dividends paid in other countries.

Managerial Traits and Dividends: A Behavioral Perspective
Managers have the discretion to determine how much a firm pays as dividends. Not surprisingly, managerial traits play a role in how much dividends get paid in the first place and, by extension, how much cash is accumulated. In particular, studies indicate that the following factors affect dividend policy:

a. Managerial over confidence: A common theme across all aspects of corporate finance is that the decisions made by managers can be affected by their confidence. In addition to borrowing too much money, issuing too little new equity, over estimating the cash flows and benefits from acquisitions and investing in too many projects, over confident managers also tend to pay too little in dividends. Dividend payout ratios at firms run by overconfident CEOs are lower than otherwise similar firms run by less confident CEOs.

b. Conservative vs Aggressive managers: To examine how managerial style affects corporate finance decisions, Schoar and Betrand tracked 500 top managers as they moved across firms to see how much their styles affected policy. They find that management predispositions follow them from firm to firm. In other words, CEOs that were acquirers at one firm brought that acquisitive streak to the next firm that they moved on to. Looking at dividend policy, they noted that conservative managers tended to pay less dividends and accumulate more cash than aggressive managers at firms with similar characteristics. As an aside, they find that managers with earlier
birth cohorts are more conservative than other managers and that executives with MBAs are more aggressive than executives without.
The bottom line is that dividend policy is set by managers, some of whom are more willing to pay out dividends than others.

Conclusion

There are three schools of thought on dividend policy. The first is that dividends are neutral and neither increase nor decrease value. Stockholders are therefore indifferent between receiving dividends and enjoying price appreciation. This view is based on the assumptions that there are no tax disadvantages to investors associated with receiving dividends, relative to capital gains, and that firms can raise external capital for new investments without issuance costs.

The second view is that dividends destroy value for stockholders because they are taxed at much higher rates than capital gains. Until the tax code was changed in 2003, the evidence for this tax disadvantage was strong both in the tax code and in markets, when we examine how stock prices change on ex-dividend days. On average, stock prices decline by less than the amount of the dividend, suggesting that stockholders in most firms consider dividends to be less attractive than equivalent capital gains.

The third school of thought makes the argument that dividends can be value increasing, at least for some firms. In particular, firms that have accumulated stockholders who prefer dividends to capital gains should continue to pay large, increasing dividends to keep their investor clientele happy. Furthermore, increasing dividends can operate as a positive signal to financial markets and allow a firm to change its financing mix over time. Finally, forcing firms to pay out dividends reduces the cash available to managers for new investments. If managers are not investing with the objective of maximizing stockholder wealth, this can make stockholders better off.
Live Case Study
The Trade-Off on Dividend Policy

**Objective** To examine how much cash your firm has returned to its stockholders and in what form (dividends or stock buybacks) and to evaluate whether the trade-off favors returning more or less.

**Key Questions**
- Has this firm ever paid out dividends? If yes, is there a pattern to the dividends over time?
- Given this firm’s characteristics today, do you think that this firm should be paying more dividends, less dividends, or no dividends at all?

**Framework for Analysis**

1. **Historical Dividend Policy**
   - How much has this company paid in dividends over the past few years?
   - How have these dividends related to earnings in these years?

2. **Firm Characteristics**
   - How easily can the firm convey information to financial markets? In other words, how necessary is it for them to use dividend policy as a signal?
   - Who are the marginal stockholders in this firm? Do they like dividends or would they prefer stock buybacks?
   - How well can this firm forecast its future financing needs? How valuable is preserving flexibility to this firm?
   - Are there any significant bond covenants that you know of that restrict the firm’s dividend policy?
   - How does this firm compare with other firms in the sector in terms of dividend policy?

**Getting Information on Dividend Policy**

You can get information about dividends paid back over time from the financial statements of the firm. (The statement of changes in cash flows is usually the best
source.) To find typical dividend payout ratios and yields for the sector in which this firm operates examine the data set on industry averages on my Web site.

*Online Sources of Information*

[www.stern.nyu.edu/~adamodar/cfin2E/roject/data.htm](http://www.stern.nyu.edu/~adamodar/cfin2E/roject/data.htm)
Problems and Questions

(In the problems below, you can use a risk premium of 5.5% and a tax rate of 40% if either is not specified)

1. If Consolidated Power is priced at $50.00 with dividend, and its price falls to $46.50 when a dividend of $5.00 is paid, what is the implied marginal rate of personal taxes for its stockholders? Assume that the tax on capital gains is 40 percent of the personal income tax.

2. You are comparing the dividend policies of three dividend-paying utilities. You have collected the following information on the ex-dividend behavior of these firms.

<table>
<thead>
<tr>
<th></th>
<th>NE Gas</th>
<th>SE Bell</th>
<th>Western Electric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price before</td>
<td>50</td>
<td>70</td>
<td>100</td>
</tr>
<tr>
<td>Price after</td>
<td>48</td>
<td>67</td>
<td>95</td>
</tr>
<tr>
<td>Dividends/share</td>
<td>4</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

If you were a tax-exempt investor, which company would you use to make “dividend arbitrage” profits? How would you go about doing so?

3. Southern Rail has just declared a dividend of $1. The average investor in Southern Rail faces an ordinary tax rate of 50 percent. Although the capital gains rate is also 50 percent, it is believed that the investor gets the advantage of deferring this tax until future years (the effective capital gains rate will therefore be 50 percent discounted back to the present). If the price of the stock before the ex-dividend day is $10 and it drops to $9.20 by the end of the ex-dividend day, how many years is the average investor deferring capital gains taxes? (Assume that the opportunity cost used by the investor in evaluating future cash flows is 10 percent.)

4. LMN Corporation, a real estate company, is planning to pay a dividend of $0.50 per share. Most of the investors in LMN are other corporations that pay 40 percent of their ordinary income and 28 percent of their capital gains as taxes. However, they are allowed to exempt 85 percent of the dividends they receive from taxes. If the shares are selling at
$10 per share, how much would you expect the stock price to drop on the ex-dividend day?

5. UJ Gas is a utility that has followed a policy of increasing dividends every quarter by 5 percent over dividends in the prior year. The company announces that it will increase quarterly dividends from $1.00 to $1.02 next quarter. What price reaction would you expect to the announcement? Why?

6. Microsoft, which has had a history of high growth and pays no dividends, announces that it will start paying dividends next quarter. How would you expect its stock price to react to the announcement? Why?

7. JC Automobiles is a small auto parts manufacturing firm, that has paid $1.00 in annual dividends each year for the past five years. It announces that dividends will increase to $1.25 next year. What would you expect the price reaction to be? Why? If your answer is different from the previous problem, explain the reasons for the difference.

8. Would your answer be different for the previous problem if JC Automobiles were a large firm followed by thirty-five analysts? Why or why not?

9. WeeMart, a retailer of children’s clothes, announces a cut in dividends following a year in which both revenues and earning dropped significantly. How would you expect its stock price to react? Explain.

10. RJR Nabisco, in response to stockholder pressure in 1996, announced a significant increase in dividends paid to stockholders financed by the sale of some of its assets. What would you expect the stock price to do? Why?

11. RJR Nabisco also had $10 billion in bonds outstanding at the time of the dividend increase in Problem 10. How would you expect the bonds to react to the announcement? Why?

12. When firms increase dividends, stock prices tend to increase. One reason given for this price reaction is that dividends operate as a positive signal. What is the increase in
dividends signaling to markets? Will markets always believe the signal? Why or why not?
ANALYZING CASH RETURNED TO STOCKHOLDERS

Companies have always returned cash to stockholders in the form of dividends, but over the past few years, they have increasingly turned to stock buybacks as an alternative. How much have companies returned to their stockholders, and how much could they have returned? As stockholders in these firms, would we want them to change their policies and return more or less than they are currently? In this chapter, we expand our definition of cash returned to stockholders to include stock buybacks. As we will document, firms in the United States have turned been buying back stock to either augment regular dividends or, in some cases, to substitute for cash dividends.

Using this expanded measure of actual cash flows returned to stockholders, we consider two ways in firms can analyze whether they are returning too little or too much to stockholders. First, we examine how much cash is left over after reinvestment needs have been met and debt payments made. We consider this cash flow to be the cash available for return to stockholders and compare it to the actual amount returned. We categorize firms into those that return more to stockholders than they have available in this cash flow, firms that return what they have available, and those that return less than they have available. We then examine the firms that consistently return more or less cash than they have available and the consequences of these policies. For this part of the analysis, we bring in two factors—the quality of the firm’s investments and the firm’s plans to change its financing mix. We argue that stockholders are more willing to trust management with excess free cash flow if the firm has a track record of good investments. Also, firms that return more cash than they have available are on firm ground if they are trying to increase their debt ratios.

In the second approach to analyzing dividend policy, we consider how much comparable firms in the industry pay as dividends. Many firms set their dividend policies by looking at their peer groups. We discuss this practice and suggest some refinements in it to allow for the vast differences that often exist between firms in the same sector.

In the last part of this chapter, we look at how firms that decide they are paying too much or too little in dividends can change their dividend policies. Because firms tend to attract stockholders who like their existing dividend policies, and because dividends
convey information to financial markets, changing dividends can have unintended and negative consequences. We suggest ways firms can manage a transition from a high dividend payout to a low dividend payout or vice versa.

**Cash Returned to Stockholders**

In the previous chapter, we considered the decision about how much to pay in dividends and three schools of thought about whether dividend policy affected firm value. Until the middle of the 1980s, dividends remained the primary mechanism for firms to return cash to stockholders. Starting in that period, we have seen firms increasingly turn to buying back their own stock, using either cash on hand or borrowed money, as a mechanism for returning cash to their stockholders.

**The Effects of Buying Back Stock**

First let’s consider the effect of a stock buyback on the firm doing the buyback. The stock buyback requires cash, just as a dividend would, and thus has the same effect on the assets of the firm—a reduction in the cash balance. Just as a dividend reduces the book value of the equity in the firm, a stock buyback reduces the book value of equity. Thus, if a firm with a book value of equity of $1 billion buys back $400 million in equity, the book value of equity will drop to $600 million. Both a dividend payment and a stock buyback reduce the overall market value of equity in the firm, but the way they affect the market value is different. The dividend reduces the market price on the ex-dividend day and does not change the number of shares outstanding. A stock buyback reduces the number of shares outstanding and is often accompanied by a stock price increase. For instance, if a firm with 100 million shares outstanding trading at $10 per share buys back 10 million shares, the number of shares will decline to 90 million, but the stock price may increase to $10.50. The total market value of equity after the buyback will be $945 million, a drop in value of 5.5 percent.

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1The stock buyback is at market value. Thus, when the market value is significantly higher than the book value of equity, a buyback of stock will reduce the book value of equity disproportionately. For example, if the market value is five times the book value of equity, buying back 10 percent of the stock will reduce the book value of equity by 50 percent.
Unlike a dividend, which returns cash to all stockholders in a firm, a stock buyback returns cash selectively to those stockholders who choose to sell their stock to the firm. The remaining stockholders get no cash; they gain indirectly from the stock buyback if the stock price increases. In the example above, stockholders in the firm will find the value of their holdings increasing by 5 percent after the stock buyback.

**In Practice: How Do You Buy Back Stock?**

The process of repurchasing equity will depend largely on whether the firm intends to repurchase stock in the open market at the prevailing market price or to make a more formal tender offer for its shares. There are three widely used approaches to buying back equity:

- **Repurchase Tender Offers:** In a repurchase tender offer, a firm specifies a price at which it will buy back shares, the number of shares it intends to repurchase, and the period of time for which it will keep the offer open and invites stockholders to submit their shares for the repurchase. In many cases, firms retain the flexibility to withdraw the offer if an insufficient number of shares are submitted or to extend the offer beyond the originally specified time period. This approach is used primarily for large equity repurchases.

- **Open Market Repurchases:** In the case of open market repurchases, firms buy shares in the market at the prevailing market price. Although firms do not have to disclose publicly their intent to buy back shares in the market, they do have to comply with SEC requirements to prevent price manipulation or insider trading. Finally, open market purchases can be spread out over much longer time periods than tender offers and are more widely used for smaller repurchases. In terms of flexibility, an open market repurchase affords the firm much more freedom in deciding when to buy back shares and how many shares to repurchase.

- **Privately Negotiated Repurchases:** In privately negotiated repurchases, firms buy back shares from a large stockholder in the company at a negotiated price. This method is not as widely used as the first two and may be employed by managers or owners as a way of consolidating control and eliminating a troublesome stockholder.
The Magnitude of Stock Buybacks

In the past decade, more firms have used equity repurchases as an alternative to paying dividends. Figure 11.1 summarizes dividends paid and equity repurchases at U.S. corporations between 1989 and 2008.

![Figure 11.1: Stock Buybacks and Dividends: Aggregate for US Firms - 1989-2008](image)

Source: Standard & Poors.

It is worth noting that although aggregate dividends at all U.S. firms have grown at a rate of about 1.18 percent a year over this ten-year period, stock buybacks have grown 9.83 percent a year. In another interesting shift, the proportion of cash returned to stockholders in the form of stock buybacks has climbed from 32 percent in 1989 to about 57 percent in 2002. Stock buybacks, in the aggregate, exceeded dividends, in the aggregate, in 1999 for the first time in U.S. corporate history. Although the slowdown in the economy resulted in both dividends and stock buybacks decreasing in 2001 and 2002, buybacks still exceeded dividends in 2002.
This shift has been much less dramatic outside the United States. Firms in other countries have been less likely to use stock buybacks to return cash to stockholders for a number of reasons. First, until 2003, dividends in the United States faced a much higher tax burden, relative to capital gains, than dividends paid in other countries. Many European countries, for instance, allow investors to claim a tax credit on dividends to compensate for taxes paid by the firms paying them. Stock buybacks, therefore, provided a much greater tax benefit to investors in the United States than they did to investors outside the United States by shifting income from dividends to capital gains. Second, stock buybacks were prohibited or tightly constrained in many countries, at least until very recently. Third, a strong reason for the increase in stock buybacks in the United States was pressure from stockholders on managers to pay out idle cash. This pressure was far less in the weaker corporate governance systems that exist outside the United States.

For the rest of this section, we will be using the phrase “dividend policy” to mean not just what gets paid out in dividends but also the cash returned to stockholders in the form of stock buybacks.

*Illustration 11.1 Dividends and Stock Buybacks: Disney, Aracruz, Tata Chemicals and Deutsche Bank*

In Table 11.1, we consider how much Disney, Aracruz, and Deutsche Bank have returned to stockholders in dividends and how much stock they have bought back each year between 2004 and 2008. (Aracruz and Disney’s numbers are in millions of US dollars, whereas Tata Chemicals and Deutsche Bank are reported in their local currencies).

*Table 11.1 Cash Returned to Stockholders: Disney, Aracruz, and Deutsche Bank (in Millions)*

<table>
<thead>
<tr>
<th>Year</th>
<th>Disney</th>
<th>Aracruz</th>
<th>Tata Chemicals</th>
<th>Deutsche Bank</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dividends</td>
<td>Buybacks</td>
<td>Dividends</td>
<td>Buybacks</td>
</tr>
<tr>
<td>2004</td>
<td>$430</td>
<td>$335</td>
<td>$74</td>
<td>$0</td>
</tr>
<tr>
<td>2005</td>
<td>$490</td>
<td>$2,420</td>
<td>$109</td>
<td>$0</td>
</tr>
</tbody>
</table>

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2 This may be changing as well. In 2003, large European companies bought back more stock than their U.S. counterparts.
<table>
<thead>
<tr>
<th>Year</th>
<th>Dividends ($)</th>
<th>Dividends ($€)</th>
<th>Dividends (Rs)</th>
<th>Dividends (€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>$519</td>
<td>$6,898</td>
<td>$199</td>
<td>$0</td>
</tr>
<tr>
<td>2007</td>
<td>$637</td>
<td>$6,923</td>
<td>$139</td>
<td>$0</td>
</tr>
<tr>
<td>2008</td>
<td>$664</td>
<td>$4,453</td>
<td>$252</td>
<td>$0</td>
</tr>
</tbody>
</table>

All four companies paid dividends over the five-year period, but there are interesting differences between the companies. Disney, and Tata Chemicals increased dividends in each of the five years, but Aracruz had more volatile dividends over the period, with dividends dropping significantly in 2007. This reflects the convention of focusing on absolute dividends in the United States and India, but the practice of maintaining payout ratios in Brazil. Deutsche Bank had a precipitous drop in dividends in 2008, reflecting the effects of the market crisis and the desire to maintain regulatory capital ratios.

Looking at stock buybacks, Disney has been the most active player buying stock in all five years, with buybacks exceeding $6 billion in 2006 and 2007. None of the other companies have bought back stock. These differences reflect the markets in which these firms operate. As noted earlier, companies in the United States have generally bought back more stock than their counterparts in other markets.

**Reasons for Stock Buybacks**

Firms that want to return substantial amounts of cash to their stockholders can either pay large special dividends or buy back stock. There are several advantages to both the firm and its stockholders to using stock buybacks as an alternative to dividend payments. There are four significant advantages to the firm:

- Unlike regular dividends, which typically commit the firm to continue payment in future periods, equity repurchases are one-time returns of cash. Consequently, firms with excess cash that are uncertain about their ability to continue generating these cash flows in future periods should repurchase stocks rather than pay dividends. (They could also choose to pay special dividends, because these do not commit the firm to making similar payments in the future.)

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3 The key difference with treasury stock that stays on the books is that the number of shares in the company remains unchanged. In the U.S., companies are not allowed to keep treasury stock on their books for extended periods.
• The decision to repurchase stock affords a firm much more flexibility to reverse itself and spread the repurchases over a longer period than does a decision to pay an equivalent special dividend. In fact, there is substantial evidence that many firms that announce ambitious stock repurchases do reverse themselves and do not carry the plans through to completion.

• Equity repurchases may provide a way of increasing insider control in firms, because they reduce the number of shares outstanding. If the insiders do not tender their shares back, they will end up holding a larger proportion of the firm and, consequently, having greater control.

• Finally, equity repurchases may provide firms with a way of supporting their stock prices when they are declining. For instance, in the aftermath of the stock market crash of 1987, many firms initiated stock buyback plans to keep prices from falling further with partial success.

There are two potential benefits that stockholders might perceive in stock buybacks:

• Equity repurchases may offer tax advantages to stockholders. This was clearly true before 2003, because dividends were taxed at ordinary tax rates, whereas the price appreciation that results from equity repurchases was taxed at capital gains rates. Even when dividends and capital gains are taxed at the same rate, stockholders have the option not to sell their shares back to the firm and therefore do not have to realize the capital gains in the period of the equity repurchases whereas they have no choice when it comes to dividends.

• Equity repurchases are much more selective in terms of paying out cash only to those stockholders who need it. This benefit flows from the voluntary nature of stock buybacks: Those who need the cash can tender their shares back to the firm, and those who do not can continue to hold on to them.

In summary, equity repurchases allow firms to return cash to stockholders and still maintain flexibility for future periods.

---

4 This will be true only if the price decline is not supported by a change in the fundamentals—drop in earnings, declining growth, and so on. If the price drop is justified, a stock buyback program can, at best, provide only temporary respite.
Intuitively, we would expect stock prices to increase when companies announce that they will be buying back stock. Studies have looked at the effect on stock price of the announcement that a firm plans to buy back stock. There is strong evidence that stock prices increase in response. Lakonishok and Vermaelen examined a sample of 221 repurchase tender offers that occurred between 1962 and 1986 and at stock price changes in the fifteen days around the announcement.\(^5\) Table 11.2 summarizes the fraction of shares bought back in these tender offers and the change in stock price for two subperiods: 1962–79 and 1980–86.

<table>
<thead>
<tr>
<th>Table 11.2 Returns around Stock Repurchase Tender Offers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage of shares purchased</td>
</tr>
<tr>
<td>Abnormal return to all stockholders</td>
</tr>
</tbody>
</table>

The abnormal return represents the return earned by these stocks over and above what you would have expected them to earn, given their risk and the market performance over the period. On average, across the entire period, the announcement of a stock buyback increased stock value by 14.29 percent.

**In Practice: Equity Repurchase and the Dilution Illusion**

Some equity repurchases are motivated by the desire to reduce the number of shares outstanding and therefore increase the earnings per share. If we assume that the firm’s price earnings ratio will remain unchanged, reducing the number of shares will usually lead to higher earnings per share and a higher price. This provides a simple rationale for many companies embarking on equity repurchases.

There is a problem with this reasoning, however. Although the reduction in the number of shares might increase earnings per share, the increase is usually caused by higher debt ratios and not by the stock buyback per se. In other words, a special dividend of the same amount would have resulted in the same returns to stockholders.

Furthermore, the increase in debt ratios should increase the riskiness of the stock and lower the price earnings ratio. Whether a stock buyback will increase or decrease the price per share will depend on whether the firm is moving to its optimal debt ratio by repurchasing stock, in which case the price will increase, or moving away from it, in which case the price will drop.

To illustrate, assume that an all equity-financed firm in the specialty retailing business, with 100 shares outstanding, has $100 in earnings after taxes and a market value of $1,500. Assume that this firm borrows $300 and uses the proceeds to buy back twenty shares. As long as the after-tax interest expense on the borrowing is less than $20, this firm will report higher earnings per share after the repurchase. If the firm’s tax rate is 50 percent, for instance, the effect on earnings per share is summarized in the table below for two scenarios: one where the interest expense is $30 and one where the interest expense is $55. As long as the interest expense is greater than $40 ($20 after taxes), the firm will report higher earnings per share after the repurchase.

**Effect of Stock Repurchase on Earnings per Share**

<table>
<thead>
<tr>
<th>After Repurchase</th>
<th>Interest Expense = $30</th>
<th>Interest Expense = $55</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EBIT</strong></td>
<td>$200</td>
<td>$200</td>
</tr>
<tr>
<td>– Interest</td>
<td>$0</td>
<td>$30</td>
</tr>
<tr>
<td>= Taxable income</td>
<td>$200</td>
<td>$170</td>
</tr>
<tr>
<td>– Taxes</td>
<td>$100</td>
<td>$85</td>
</tr>
<tr>
<td>= Net income</td>
<td>$100</td>
<td>$85</td>
</tr>
<tr>
<td># Shares</td>
<td>100</td>
<td>80</td>
</tr>
<tr>
<td>Earnings per share</td>
<td>$1.00</td>
<td>$1.125</td>
</tr>
</tbody>
</table>

If we assume that the price earnings ratio remains at 15, the price per share will change in proportion to the earnings per share. Realistically, however, we should expect to see a drop in the price earnings ratio as the increase in debt makes the equity in the firm riskier. Whether the drop will be sufficient to offset or outweigh an increase in earnings per share will depend on whether the firm has excess debt capacity and whether, by going to a 20 percent debt ratio, it is moving closer to its optimal debt ratio.
Choosing between Dividends and Equity Repurchases

Firms that plan to return cash to their stockholders can either pay them dividends or buy back stock. How do they choose? The choice will depend on the following factors:

• Sustainability and Stability of Excess Cash Flow: Both equity repurchases and increased dividends are triggered by a firm’s excess cash flows. If the excess cash flows are temporary or unstable, firms should repurchase stock; if they are stable and predictable, paying dividends provides a stronger signal of future project quality.

• Stockholder Tax Preferences: If stockholders are taxed at much higher rates on dividends than capital gains, they will be better off if the firm repurchases stock. If, on the other hand, stockholders are taxed less on dividends, they will gain if the firm pays a special dividend.

• Predictability of Future Investment Needs: Firms that are uncertain about the magnitude of future investment opportunities should use equity repurchases as a way of returning cash to stockholders. The flexibility that is gained by avoiding what may be perceived as a fixed obligation will be useful, if they need cash flows in future periods to fund attractive new investments.

• Undervaluation of the Stock: For two reasons, an equity repurchase makes even more sense when managers believe their stock is undervalued. First, if the stock remains undervalued, the remaining stockholders will benefit if managers buy back stock at less than true value. The difference between the true value and the market price paid on the buyback will be accrue to those stockholders who do not sell their stock back. Second, the stock buyback may send a signal to financial markets that the stock is undervalued, and the market may react accordingly by pushing up the price.

• Management Compensation: Managers often receive options on the stock of the companies that they manage. The prevalence and magnitude of such option-based compensation can affect whether firms use dividends or buy back stock. The payment of dividends reduces stock prices while leaving the number of shares unchanged. The buying back of stock reduces the number of shares, and the share price usually increases on the buyback. Because options become less valuable as the stock price decreases and more valuable as the stock price increases, managers with significant option positions may be more likely to buy back stock than pay dividends.
Bartov, Krinsky, and Lee examined three of these determinants—undervaluation, management compensation, and institutional investor holdings (as a proxy for stockholder tax preferences)—of whether firms buy back stock or pay dividends. They looked at 150 firms announcing stock buyback programs between 1986 and 1992 and compared these firms to others in their industries that chose to increase dividends instead. Table 11.3 reports on the characteristics of the two groups.

Table 11.3 Characteristics of Firms Buying Back Stock versus Those Increasing Dividends

<table>
<thead>
<tr>
<th></th>
<th>Firms Buying Back Stock</th>
<th>Firms Increasing Dividends</th>
<th>Difference Is Significant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Book/market</td>
<td>56.90%</td>
<td>51.70%</td>
<td>Yes</td>
</tr>
<tr>
<td>Options/shares</td>
<td>7.20%</td>
<td>6.30%</td>
<td>No</td>
</tr>
<tr>
<td># of institutional holders</td>
<td>219.4</td>
<td>180</td>
<td>yes</td>
</tr>
</tbody>
</table>

Although the option holdings of managers seemed to have had no statistical impact on whether firms bought back stock or increased dividends, firms buying back stock had higher book to market ratios than firms increasing dividends and more institutional stockholders. The higher book to price ratio can be viewed as an indication that these firms are more likely to view themselves as undervalued. The larger institutional holding might suggest a greater sensitivity to the tax advantage of stock buybacks.

Stock Buybacks: A Behavioral Perspective

The explosive growth in stock buybacks in the United States in the last two decades can only partially be explained by financial rationale. In fact, many of the stories offered for stock buybacks – the tax disadvantages associated with dividends, their impact on earnings per share – have always been in existence and cannot be used to rationalize behavior in the last twenty years. There are three behavioral rationale that have been offered for the growth of buybacks:

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a. **Herd behavior:** In the chapter on capital structure, we noted the pull that industry averages and peer group behavior have on debt policy. The same phenomenon applies in dividend policy, as firms attempt to not only keep their dividends in line with the rest of the sector but attempt to buy back stock to match other firms that may have done so. The fact that stock buybacks often tend to be clustered in sectors can be viewed as evidence of this phenomenon.

b. **Framing and Anchoring:** Earlier in this chapter, we pointed to the dividend illusion and noted that the increases in earnings per share that follow stock buybacks will not always translate into higher price per share, since the price earnings will decrease to reflect the higher risk in the firm. To the extent that managers think in per share terms and have in mind a “right PE ratio” for their firms, they may believe that stock buybacks always lead to higher stock prices. If investors share these same views, stock prices will increase in the aftermath of buybacks, at least for the short term.

c. **Over optimism:** More optimistic managers believe that their stocks are under valued and are therefore more likely to initiate and carry through stock buybacks than their less optimistic brethren. Consequently, the same market timing imperatives that drive financing choices (debt versus equity) affect stock buyback decisions.

In summary, it can be argued that once some firms started buying back stock in the 1980s and were successful with that tactic (in terms of higher stock prices), other firms imitated them, thus creating a trend that has continued for more than two decades.

### 11.1. Stock Buybacks and Stock Price Effects

For which of the following types of firms would a stock buyback be most likely to lead to a drop in the stock price?

- a. Companies with a history of poor project choice
- b. Companies that borrow money to buy back stock
- c. Companies that are perceived to have great investment opportunities

Explain.
A Cash Flow Approach to Analyzing Dividend Policy

Given what firms are returning to their stockholders in the form of dividends or stock buybacks, how do we decide whether they are returning too much or too little? In the cash flow approach, we follow four steps. We first measure how much cash is available to be paid out to stockholders after meeting debt service and reinvestment needs and compare this amount to the amount actually returned to stockholders. We then have to consider how good existing and new investments in the firm are. Third, based on the cash payout and project quality, we consider whether firms should be accumulating more cash or less. Finally, we look at the relationship between dividend policy and debt policy.

Step 1: Measuring Cash Available to Be Returned to Stockholders

To estimate how much cash a firm can afford to return to its stockholders, we begin with the net income—the accounting measure of the stockholders’ earnings during the period—and convert it to a cash flow by subtracting out a firm’s reinvestment needs, broken up into two components:

- **Investments in long term assets**: Any capital expenditures, defined broadly to include acquisitions, are subtracted from the net income, because they represent cash outflows. Depreciation and amortization, on the other hand, are added back in because they are noncash charges. The difference between capital expenditures and depreciation is referred to as *net capital expenditures* and is usually a function of the growth characteristics of the firm. High-growth firms tend to have high net capital expenditures relative to earnings, whereas low-growth firms may have low (and sometimes even negative) net capital expenditures.

- **Investments in short term assets**: Increases in working capital drain a firm’s cash flows, whereas decreases in working capital increase the cash flows available to equity investors. Firms that are growing fast, in industries with high working capital requirements (retailing, for instance), typically have large increases in working capital. Because we are interested in the cash flow effects, we consider only changes in *noncash working capital* in this analysis.

Finally, equity investors also have to consider the effect of changes in the levels of debt on their cash flows. Repaying the principal on existing debt represents a cash outflow, but
the debt repayment may be fully or partially financed by the issue of new debt, which is a cash inflow. Again, netting the repayment of old debt against the new debt issues provides a measure of the cash flow effects of changes in debt.

Allowing for the cash flow effects of net capital expenditures, changes in working capital, and net changes in debt on equity investors, we can define the cash flows left over after these changes as the free cash flow to equity (FCFE):

\[
\text{Free Cash Flow to Equity (FCFE)} = \text{Net Income} - (\text{Capital Expenditures} - \text{Depreciation}) - (\text{Change in Noncash Working Capital}) + (\text{New Debt Issued} - \text{Debt Repayments})
\]

This is the cash flow available to be paid out as dividends.

This calculation can be simplified if we assume that the net capital expenditures and working capital changes are financed using a fixed mix of debt and equity. If \( \delta \) is the proportion of the net capital expenditures and working capital changes raised from debt financing, the effect on cash flows to equity of these items can be represented as follows:

\[
\text{Equity Reinvestment Associated with Capital Expenditure Needs} = (\text{Capital Expenditures} - \text{Depreciation})(1 - \delta)
\]

\[
\text{Equity Reinvestment Associated with Working Capital Needs} = (\Delta \text{Non-cash Working Capital})(1 - \delta)
\]

Accordingly, the cash flow available for equity investors after meeting capital expenditure and working capital needs is:

\[
\text{Free Cash Flow to Equity} = \text{Net Income} - (\text{Capital Expenditures} - \text{Depreciation})(1 - \delta) - (\Delta \text{Non-cash Working Capital})(1 - \delta)
\]

Note that the net debt payment item is eliminated, because debt repayments are financed with new debt issues to keep the debt ratio fixed. If the target or optimal debt ratio of the firm is used to forecast the free cash flow to equity that will be available in future periods, it is particularly useful to assume that a specified proportion of net capital expenditures and working capital needs will be financed with debt. Alternatively, in

---

7The mix has to be fixed in book value terms.
examining past periods, we can use the firm’s average debt ratio over the period to arrive at approximate free cash flows to equity.

**In Practice: Estimating the FCFE at a Financial Service Firm**

Estimating FCFE is straightforward for most manufacturing firms, because the net capital expenditures, noncash working capital needs, and debt ratio can be obtained from the financial statements. In contrast, the estimation of FCFE is difficult for financial service firms for several reasons. First, estimating net capital expenditures and noncash working capital for a bank or insurance company is difficult because all the assets and liabilities are in the form of financial claims. Second, it is difficult to define short-term debt for financial service firms, again due to the complexity of their balance sheets.

To estimate the FCFE for a bank, we redefine reinvestment as investment in regulatory capital. After all, a financial service firm can grow its business only to the extent that its has the book value of equity to back up that growth and maintain regulatory capital ratios (including any safety buffers that it may have built in). In chapter 8, we looked at regulatory capital ratios and how they affect financing choices at banks and insurance companies. Since any dividends paid deplete equity capital and retained earnings increase that capital, the free cash flow to equity for a financial service firm can be written as follows:

\[
FCFE_{\text{Bank}} = \text{Net Income} - \text{Increase in Regulatory Capital Base (Book Equity)}
\]

As a simple example, consider a bank with $ 10 billion in loans outstanding and book equity (Tier 1 capital) of $ 750 million. Assume that the bank wants to maintain its existing capital ratio of 7.5%, intends to grow its loan base by 10% (to $11 billion) and expects to generate $ 150 million in net income next year. We can estimate the FCFE next year:

\[
FCFE = $150 \text{ million} - (11,000 - 10,000) \times 0.075 = $75 \text{ million}
\]

As a follow up, assume that this bank wants to increase its regulatory capital ratio to 8% (for precautionary purposes) while increasing its loan base to $ 11 billion. The total book equity next year will have to rise to $880 million (8% of $ 11 billion) and the FCFE will be lower:

\[
FCFE = $ 150 \text{ million} - (880 - 750) = $20 \text{ million}
\]
This computation obviously becomes more complex if a firm is involved in multiple businesses, with different regulatory capital requirements on each. To estimate FCFE, we have to estimate growth and capital requirements in each business separately.

Putting together the pieces, the FCFE (and potential dividends) at a financial service firm will be a function of the following:

a. Growth in asset base: Since the regulatory capital is tied to the size of the asset base, the higher the growth rate in the asset base, the greater will be the investment in regulatory capital. Holding all else constant, higher growth firms should have lower FCFE and dividends than more mature firms.

b. Desired capital ratio: The reinvestment in regulatory capital, for a given growth rate in the asset base, will depend upon the equity capital ratio that the firm wants to maintain on that asset base. While regulatory requirements play a key role in determining this ratio, it will also depend upon the safety buffer the firm desires to build into its capital. Put more simply, conservative financial service firms will have higher target capital ratios and reinvest more than more aggressive firms, for a given growth rate, leading to lower FCFE for the former.

c. Profitability: Ultimately, dividends have to be paid out of net income. Other things remaining equal, the more profits that a firm can generate on a given asset and book equity base, the more it will be able to generate in FCFE. The return on equity, which scales profits to book equity capital, therefore becomes a key factor in how much a firm can generate in FCFE. Firm that generate higher returns on equity, for a given growth rate and desired capital ratio, will generate more in FCFE.

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*DividendsBank.xls*: This spreadsheet allows you to estimate the free cash flow to equity for a financial service firm for the future.

**Illustration 11.2 Estimating FCFE: Disney, Aracruz, Tata Chemicals and Deutsche Bank**

In Table 11.4, we estimate the FCFE for Disney from 1999 to 2008, using historical information from their financial statements.

**Table 11.4 Estimates of FCFE for Disney: 1999-2008 (in millions)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Net Income</th>
<th>Capital Expenditures</th>
<th>Depreciation</th>
<th>Chg in WC</th>
<th>Change in Net Debt</th>
<th>FCFE</th>
</tr>
</thead>
</table>
The depreciation numbers also include amortization and the capital expenditures include cash acquisitions. Increases in noncash working capital, shown as positive numbers, represent a drain on the cash, whereas decreases in noncash working capital, shown as negative numbers, represent positive cash flows. In 1999, for example, noncash working capital decreased by $363 million, increasing the cash available for stockholders in that year by the same amount. Finally, the net cash flow from debt is the cash generated by the issuance of new debt, netted out against the cash outflow from the repayment of old debt. Again, using 1999 as an example, Disney issued $176 million more in new debt than it paid off on old debt, and this represents a positive cash flow in that year. We have computed two measures of FCFE, one before the net debt cash flow and one after. Using 1999 as an illustration, we compute each as follows:

\[
\text{FCFE}_{\text{Before Debt CF}} = \text{Net Income} + \text{Depreciation} - \text{Capital Expenditures} - \text{Change in Noncash Working Capital} = 1300 + 3779 - 6113 - (-363) = -671 \text{ million}
\]

\[
\text{FCFE}_{\text{After Debt CF}} = \text{FCFE}_{\text{Before Debt CF}} + \text{Net Debt CF} = -671 + 176 = -495 \text{ million}
\]

As Table 11.4 indicates, Disney had negative free cash flows to equity in three of the ten years. The average annual FCFE before net debt issues over the period was $1918 million, and the average net debt issued over the period was $21 million, resulting in an average annual FCFE after net debt issues of $1,939 million. We can compute Disney’s FCFE each year using the approximation that we described in the last section. To do this, we first have to compute the net debt cash flows as percent of reinvestment needs over this period. Using the aggregate values from table 11.4 for debt cash flows, capital
expenditures, depreciation, and changes in noncash working capital between 1999 and 2008, we estimate the average debt ratio:

\[
\text{Average Debt Ratio} = \frac{\text{Net Debt Issued}}{(\text{Cap Ex} - \text{Depreciation} + \text{Chg in WC})} = \frac{207}{(20,693 - 16,906 - 825)} = 6.99\%
\]

The FCFE each year can then be estimated using the average debt ratio, instead of the actual net debt cash flows. Table 11.5 contains the estimates of FCFE each year using this approach for Disney.

**Table 11.5. Approximate FCFE for Disney from 1999 to 2008 (in millions)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Net Income</th>
<th>(Cap Ex - Depreciation) (1-DR)</th>
<th>Chg in WC (1-DR)</th>
<th>FCFE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>$1,300</td>
<td>$2,171</td>
<td>-$338</td>
<td>-$533</td>
</tr>
<tr>
<td>2000</td>
<td>$920</td>
<td>-$1,027</td>
<td>-$1,101</td>
<td>$3,048</td>
</tr>
<tr>
<td>2001</td>
<td>-$158</td>
<td>$243</td>
<td>$227</td>
<td>-$628</td>
</tr>
<tr>
<td>2002</td>
<td>$1,236</td>
<td>$1,985</td>
<td>$25</td>
<td>-$774</td>
</tr>
<tr>
<td>2003</td>
<td>$1,267</td>
<td>-$40</td>
<td>-$246</td>
<td>$1,553</td>
</tr>
<tr>
<td>2004</td>
<td>$2,345</td>
<td>$255</td>
<td>$47</td>
<td>$2,043</td>
</tr>
<tr>
<td>2005</td>
<td>$2,533</td>
<td>$327</td>
<td>$251</td>
<td>$1,954</td>
</tr>
<tr>
<td>2006</td>
<td>$3,374</td>
<td>-$127</td>
<td>-$126</td>
<td>$3,628</td>
</tr>
<tr>
<td>2007</td>
<td>$4,687</td>
<td>-$804</td>
<td>$42</td>
<td>$5,449</td>
</tr>
<tr>
<td>2008</td>
<td>$4,427</td>
<td>$539</td>
<td>$451</td>
<td>$3,436</td>
</tr>
<tr>
<td>Aggregate</td>
<td>$21,931</td>
<td>$3,522</td>
<td>-$767</td>
<td>$19,176</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td></td>
<td></td>
<td>$1,918</td>
</tr>
</tbody>
</table>

Note that the average FCFE between 1999 and 2008 remains unchanged at $1,918 million a year when we use the approximation. The FCFE in each year is different, though, from the estimates in Table 11.5, because we are smoothing out the effects of the cash flows from debt.

A similar estimation of FCFE was done for Aracruz from 2002 to 2008 in Table 11.6, again using historical information. Since the cash flow statement in US dollars, filed in the United States, is more complete than the $R counterpart, we will report all the values in US dollars.

**Table 11.6 FCFE for Aracruz in US$ from 2002 to 2008 (in millions)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Net Capital</th>
<th>Depreciation</th>
<th>Change in</th>
<th>Change in Net</th>
<th>FCFE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>$3,000</td>
<td>$1,000</td>
<td>$800</td>
<td>$200</td>
<td>$1,000</td>
</tr>
<tr>
<td>2003</td>
<td>$3,200</td>
<td>$1,200</td>
<td>$1,000</td>
<td>$2,000</td>
<td>$1,200</td>
</tr>
<tr>
<td>2004</td>
<td>$3,400</td>
<td>$1,400</td>
<td>$1,200</td>
<td>$3,200</td>
<td>$1,400</td>
</tr>
<tr>
<td>2005</td>
<td>$3,600</td>
<td>$1,600</td>
<td>$1,400</td>
<td>$4,400</td>
<td>$1,600</td>
</tr>
<tr>
<td>2006</td>
<td>$3,800</td>
<td>$1,800</td>
<td>$1,600</td>
<td>$5,600</td>
<td>$1,800</td>
</tr>
<tr>
<td>2007</td>
<td>$4,000</td>
<td>$2,000</td>
<td>$1,800</td>
<td>$6,800</td>
<td>$2,000</td>
</tr>
<tr>
<td>2008</td>
<td>$4,200</td>
<td>$2,200</td>
<td>$2,000</td>
<td>$8,000</td>
<td>$2,200</td>
</tr>
<tr>
<td>Aggregate</td>
<td>$24,000</td>
<td>$6,000</td>
<td>$7,200</td>
<td>$14,400</td>
<td>$6,000</td>
</tr>
<tr>
<td>Average</td>
<td>$2,400</td>
<td>$1,200</td>
<td>$800</td>
<td>$2,800</td>
<td>$1,200</td>
</tr>
</tbody>
</table>
Between 2002 and 2007, Aracruz reported an almost four-fold increase in net income, but aggregate free cash flows to equity averaged only $79.65 million a year, over the period. In 2008, Aracruz reported a net loss of $1.239 billion, largely because of misguided betas on currency derivatives, but the FCFE for 2008 was positive, as the firm borrowed more than $3 billion to cover its losses. The average FCFE over the 2002-08 time period is $229.41 million, with the cash flows from debt counted in, but -$271.70 million, without debt cash flows.

Using the same procedure, we estimate the FCFE for Tata Chemicals from 2004 to 2008 in table 11.7:

Table 11.7 FCFE for Tata Chemicals from 2003 to 2008 (in millions)

<table>
<thead>
<tr>
<th>Year</th>
<th>Net Income</th>
<th>Capital Expenditures</th>
<th>Depreciation</th>
<th>Change in WC</th>
<th>Change in Net Debt</th>
<th>FCFE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003-04</td>
<td>Rs 3,418</td>
<td>Rs 357</td>
<td>Rs 1,442</td>
<td>-Rs 557</td>
<td>-Rs 2,771</td>
<td>Rs 2,289</td>
</tr>
<tr>
<td>2004-05</td>
<td>Rs 4,550</td>
<td>Rs 692</td>
<td>Rs 1,377</td>
<td>-Rs 493</td>
<td>Rs 5,448</td>
<td>Rs 11,176</td>
</tr>
<tr>
<td>2005-06</td>
<td>Rs 5,156</td>
<td>Rs 11,730</td>
<td>Rs 1,389</td>
<td>Rs 2,823</td>
<td>Rs 867</td>
<td>-Rs7,141</td>
</tr>
<tr>
<td>2006-07</td>
<td>Rs 6,338</td>
<td>Rs 1,196</td>
<td>Rs 1,504</td>
<td>-Rs 1,662</td>
<td>-Rs 4,411</td>
<td>Rs 3,896</td>
</tr>
<tr>
<td>2007-08</td>
<td>Rs 11,571</td>
<td>Rs 28,956</td>
<td>Rs 1,488</td>
<td>Rs 88</td>
<td>Rs 17,054</td>
<td>Rs 1,069</td>
</tr>
<tr>
<td>Aggregate</td>
<td>Rs 31,033</td>
<td>Rs 42,930</td>
<td>Rs 7,199</td>
<td>Rs 200</td>
<td>Rs 16,187</td>
<td>Rs 11,290</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Rs 2,258</td>
</tr>
</tbody>
</table>

While the net income for Tata Chemicals increased every year between 2003 and 2008, the FCFE follow a rockier path, with big swings in the cash flows for three reasons. The first is that non-cash working capital is volatile, with big increases in some years and large decreases in others. The second is that there are spikes in the capital expenditures in 2005-06 and 2007-08, reflecting large investments in subsidiaries in those years. Finally, the cash flow from net debt is negative in two of the five years and is a very large
positive number in 2007-08, reflecting the fact that Tata funded its large capital expenditures that year, primarily with debt. Over the five-year period, the average FCFE was Rs 2.258 billion.

To estimate the FCFE for Deutsche Bank, we use the approach described in the last section, where we define reinvestment in regulatory capital as reinvestment. Rather than look backwards, we decided to focus on estimating future FCFE. We begin with the current values for the asset base and regulatory capital at the end of 2008:

Current value of Asset Base (end of 2008) = 312.885 billion Euros  
Current value of Regulatory Capital (Book Equity) = 31.914 billion Euros

While Deutsche Bank reported a loss of 4.12 billion Euros in 2008, much of the loss can be attributed to write-offs of investments, in the aftermath of the market crisis in the last quarter of 2008. Though it is unlikely that Deutsche Bank will revert back to the 6 billion Euros in profits it reported in 2007, we assume that the normalized net income for 2008 will be 3 billion Euros. With these estimates, we obtain a current regulatory capital ratio of 10.2% and a current return on equity of 9.40%:

Current Regulatory Capital Ratio = \frac{\text{Regulatory Capital}}{\text{Asset Base}} = \frac{31,914}{312,885} = 10.2%  
Current Return on Equity = \frac{\text{Net Income}}{\text{Regulatory Capital (Book Equity)}} = \frac{3.00}{31,914} = 9.40%

As a final piece for the estimation of FCFE, we estimate three values. First, we assume that the expected growth in the asset base will be 4% a year for the next 5 years and 3% thereafter. Second, we assume a target regulatory capital ratio of 10% in year 5, based on Deutsche Bank’s own statements in early 2009; note that this value is well above the regulatory requirement of 6-7% and reflects Deutsche Bank’s conservative outlook. Third, we assume only a modest improvement in the return on equity from the current value of 9.40% to 10% in year 5 and beyond.

To estimate the regulatory capital and net income in each of the next 5 years, we assume that the improvements will occur in equal annual increments over each of the

---

8 To normalize the net income, we looked at profits prior to write-offs. In the first quarter of 2009, Deutsche Bank reported a bounce back to profitability, generating 1.2 billion in Euros in profits. Analysts estimate that Deutsche will generate profits in excess of 4 billion Euros for the year, but we have chosen to be conservative in our estimates.
years. Table 11.8 summarizes the estimates of regulatory capital, net income and FCFE for the next six years.

Table 11.8: Expected FCFE – Deutsche Bank (in millions of Euros)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Asset Base</td>
<td>€312,882</td>
<td>€325,398</td>
<td>€338,414</td>
<td>€351,950</td>
<td>€366,028</td>
<td>€380,669</td>
<td>€392,089</td>
</tr>
<tr>
<td>Capital ratio</td>
<td>10.20%</td>
<td>10.16%</td>
<td>10.12%</td>
<td>10.08%</td>
<td>10.04%</td>
<td>10.00%</td>
<td>10.00%</td>
</tr>
<tr>
<td>Regulatory Capital</td>
<td>€31,914</td>
<td>€33,060</td>
<td>€34,247</td>
<td>€35,477</td>
<td>€36,749</td>
<td>€38,067</td>
<td>€39,209</td>
</tr>
<tr>
<td>Change in</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>regulatory capital</td>
<td>€1,146</td>
<td>€1,187</td>
<td>€1,229</td>
<td>€1,273</td>
<td>€1,318</td>
<td>€1,142</td>
<td></td>
</tr>
<tr>
<td>ROE</td>
<td>9.40%</td>
<td>9.52%</td>
<td>9.64%</td>
<td>9.76%</td>
<td>9.88%</td>
<td>10.00%</td>
<td>10.00%</td>
</tr>
<tr>
<td>Net Income</td>
<td>€3,000</td>
<td>€3,147</td>
<td>€3,302</td>
<td>€3,463</td>
<td>€3,631</td>
<td>€3,807</td>
<td>€3,921</td>
</tr>
<tr>
<td>- Investment in</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regulatory Capital</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FCFE</td>
<td>€2,001</td>
<td>€2,114</td>
<td>€2,233</td>
<td>€2,358</td>
<td>€2,489</td>
<td>€2,779</td>
<td></td>
</tr>
</tbody>
</table>

Based on our estimates, Deutsche Bank should be able to return about 2 billion in Euros in dividends in 2009 to its equity investors. Note, though, that the regulatory definition of equity includes both preferred and common stockholders and that preferred stockholders have fixed and prior claims to the dividends; the dividends to common stockholders represent the residual FCFE. Just as an illustration assume that Deutsche Bank’s existing capital base includes 5 billion Euros in preferred stock with a dividend set at 8% of face value. The FCFE available for common stockholders in 2009 can then be computed as follows:

Total FCFE in 2009  =  2,001 million Euros
Preferred Dividends  = .08 (5,000)  =  400 million Euros
FCFE for common equity  =  1,601 million Euros

This can be repeated for subsequent years.

11.2. Defining FCFE

The reason that the net income is not the amount that a company can afford to pay out in dividends is because
a. earnings are not cash flows.
b. some of the earnings have to be reinvested back in the firm to create growth.
c. there may be cash inflows or outflows associated with the use of debt.
Measuring the Payout Ratio

The conventional measure of dividend policy—the dividend payout ratio—gives us the value of dividends as a proportion of earnings. In contrast, our approach measures the total cash returned to stockholders as a proportion of FCFE:

\[
\text{Dividend Payout Ratio} = \frac{\text{Dividends}}{\text{Earnings}}
\]

\[
\text{Cash to Stockholders to FCFE Ratio} = \frac{(\text{Dividends} + \text{Equity Repurchases})}{\text{FCFE}}
\]

The ratio of cash returned to stockholders to FCFE shows how much of the cash available to be paid out to stockholders is actually returned to them in the form of dividends and stock buybacks. If this ratio over time is equal or close to 100 percent, the firm is paying out all that it can to its stockholders. If it is significantly less than 100 percent, the firm is paying out less than it can afford and is using the difference to increase its cash balance or to invest in marketable securities. If it is significantly over 100 percent, the firm is paying out more than it can afford and is either drawing on an existing cash balance or issuing new securities (stocks or bonds).

Illustration 11.3 Comparing Dividend Payout Ratios to FCFE Payout Ratios: Disney and Tata Chemicals

In the following analysis, we compare the dividend payout ratios to the cash to stockholders (dividends and stock buybacks) as a percent of FCFE for Disney and Tata Chemicals. Table 11.9 shows both numbers for Disney from 1999 to 2008.

<table>
<thead>
<tr>
<th>Year</th>
<th>Dividends</th>
<th>Earnings</th>
<th>Payout Ratio</th>
<th>Cash Returned</th>
<th>FCFE</th>
<th>Cash/FCFE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>$0.00</td>
<td>$1,300.00</td>
<td>0.00%</td>
<td>$19.00</td>
<td>-$495.00</td>
<td>-3.84%</td>
</tr>
<tr>
<td>2000</td>
<td>$434.00</td>
<td>$920.00</td>
<td>47.17%</td>
<td>$600.00</td>
<td>$5,326.00</td>
<td>11.27%</td>
</tr>
<tr>
<td>2001</td>
<td>$438.00</td>
<td>-$158.00</td>
<td>-277.22%</td>
<td>$1,511.00</td>
<td>-$740.00</td>
<td>-204.19%</td>
</tr>
<tr>
<td>2002</td>
<td>$428.00</td>
<td>$1,236.00</td>
<td>34.63%</td>
<td>$428.00</td>
<td>-$2,817.00</td>
<td>-15.19%</td>
</tr>
<tr>
<td>2003</td>
<td>$429.00</td>
<td>$1,267.00</td>
<td>33.86%</td>
<td>$429.00</td>
<td>$2,719.00</td>
<td>15.78%</td>
</tr>
<tr>
<td>2004</td>
<td>$430.00</td>
<td>$2,345.00</td>
<td>18.34%</td>
<td>$765.00</td>
<td>$4,223.00</td>
<td>18.12%</td>
</tr>
<tr>
<td>2005</td>
<td>$490.00</td>
<td>$2,533.00</td>
<td>19.34%</td>
<td>$2,910.00</td>
<td>$2,610.00</td>
<td>111.49%</td>
</tr>
<tr>
<td>2006</td>
<td>$519.00</td>
<td>$3,374.00</td>
<td>15.38%</td>
<td>$7,417.00</td>
<td>$2,706.00</td>
<td>274.09%</td>
</tr>
<tr>
<td>2007</td>
<td>$637.00</td>
<td>$4,687.00</td>
<td>13.59%</td>
<td>$7,560.00</td>
<td>$2,810.00</td>
<td>269.04%</td>
</tr>
</tbody>
</table>
As you can see, Disney paid out 20.38 percent of its aggregate earnings as dividends over this period. Over the same period, it returned 139.53 percent of its FCFE to its stockholders in the form of dividends and stock buybacks. Though the payout ratio suggests that the firm is retaining a significant portion of its earnings, the cash returned as a percent of FCFE suggests that Disney has paid out far more than it had available to pay during the period.

Table 11.10 shows dividend payout ratios and cash returned to stockholders as a percent of FCFE for Tata Chemicals from 2002 to 2008.

Table 11.10 Tata Chemicals: Dividends as Percentage of Earnings and Cash Returned as Percent of FCFE (in millions)

<table>
<thead>
<tr>
<th>Year</th>
<th>Dividends</th>
<th>Net Income</th>
<th>Payout ratio</th>
<th>Cash returned</th>
<th>FCFE</th>
<th>Cash/FCFE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003-04</td>
<td>Rs 1,306.50</td>
<td>Rs 3,418.40</td>
<td>38.22%</td>
<td>Rs 1,306.50</td>
<td>Rs 2,289.10</td>
<td>57.07%</td>
</tr>
<tr>
<td>2004-05</td>
<td>Rs 1,338.20</td>
<td>Rs 4,550.00</td>
<td>29.41%</td>
<td>Rs 1,338.20</td>
<td>Rs 11,176.40</td>
<td>11.97%</td>
</tr>
<tr>
<td>2005-06</td>
<td>Rs 1,589.30</td>
<td>Rs 5,155.60</td>
<td>30.83%</td>
<td>Rs 1,589.30</td>
<td>-Rs 7,140.90</td>
<td>-22.26%</td>
</tr>
<tr>
<td>2006-07</td>
<td>Rs 1,715.70</td>
<td>Rs 6,338.40</td>
<td>27.07%</td>
<td>Rs 1,715.70</td>
<td>Rs 3,896.30</td>
<td>44.03%</td>
</tr>
<tr>
<td>2007-08</td>
<td>Rs 2,009.60</td>
<td>Rs 11,571.00</td>
<td>17.37%</td>
<td>Rs 2,009.60</td>
<td>Rs 1,068.60</td>
<td>188.06%</td>
</tr>
<tr>
<td>Aggregate</td>
<td>Rs 7,959.30</td>
<td>Rs 31,033.40</td>
<td>25.65%</td>
<td>Rs 7,959.30</td>
<td>Rs 11,289.50</td>
<td>70.50%</td>
</tr>
</tbody>
</table>

Tata paid out about 25.7% of its earnings as dividends and returned about 70.5% of its FCFE to its stockholders. The remaining potential dividend (the 29.5% of FCFE that did not get paid out) was held back by the firm and reinvested in other firms in the Tata group.

With Aracruz, the comparison is moot, since we know that the aggregate FCFE would have been negative between 2002 and 2008 without the significant borrowings in 2008 (see table 11.6). Since Aracruz paid out significant dividends over this period, it is quite clear that these dividends are not being funded from operations. We will return to examine both why Aracruz is in this bind and ways that it may be able to release itself from the cash flow constraint in future years.

9To compute the payout ratio over the entire period, we first aggregated earnings and dividends over the entire period and then divided the aggregate dividends by the aggregate earnings. This avoids the problems created by averaging ratios where outliers (very high ratios) are common.
Dividends.xls: This spreadsheet allows you to estimate the free cash flow to equity and the cash returned to stockholders for a period of up to ten years.

There is a data set online that summarizes dividends, cash returned to stockholders, and FCFE by sector in the United States.

Why Firms May Not Pay Out What Is Available

For several reasons, many firms pay out less to stockholders, in the form of dividends and stock buybacks, than they have available in free cash flows to equity. The reasons vary from firm to firm and we list some here.

- The managers of a firm may gain by retaining cash rather than paying it out as a dividend. The desire for empire building makes increasing the size of the firm an objective on its own. Alternatively, management may feel the need to build up a cash cushion to tide them over periods when earnings may dip; in such periods, the cash cushion may help buffer the earnings drop and may allow managers to remain in control.
- The firm may be unsure about its future financing needs and may choose to retain some cash to take on unexpected investments or meet unanticipated needs.
- The firm may have volatile earnings and may retain cash to help smooth out dividends over time.
- Bondholders may impose restrictions on cash payments to stockholders, which may prevent the firm from returning available cash flows to its stockholders.

At the other end of the spectrum, there are firms that pay out more cash than they generate in FCFE though this is a less common phenomenon. Here again, there are several possible reasons.

- When earnings are volatile and swing from period to period, firms may choose to pay more than their FCFE in down periods and hope to make up for it when earnings recover.
- Firms that have historically paid high dividends often are under pressure to maintain those dividends even when earnings drop, for fear of sending a bad signal to the market.
• Firms that are under levered can use a policy of returning more cash to their stockholders as a way of reducing equity and increasing debt ratios. Finally, firms that are part of larger groups, as Tata Chemicals illustrates, can hold back cash to invest in other companies in the group.

11.3. What Happens to the FCFE that Are Not Paid Out?

In 2003, Microsoft had FCFE of roughly $9 billion, paid no dividends, and bought back no stock. Where would you expect to see the difference of $9 billion show up in Microsoft’s financial statements?

a. It will be invested in new projects.
b. It will be in retained earnings, increasing the book value of equity.
c. It will increase the cash balance of the company.
d. None of the above.

Explain.

Evidence on Dividends and FCFE

We can observe the tendency of firms to pay out less to stockholders than they have available in FCFE by examining cash returned to stockholders paid as a percentage of FCFE. In 2008, for instance, the median cash returned to FCFE ratio across dividend paying firms listed in the United States was about 55%. However, there were scores of firms that paid out more in dividends than they have available in FCFE. Figure 11.2 provides a breakdown of US firms in 2008, based upon how much they paid in dividends, relative to what they had available in FCFE.
Note that there are about 755 firms that pay less in dividends than they have available in FCFE, and they have to finance these dividend payments either out of existing cash balances or by making new stock and debt issues. Note that there are 550 firms in this period that paid dividends even though they had negative FCFE. These firms will have to come up with enough funds, either from existing cash balances or new stock issues, to cover both the dividends and the cash deficit. A large number of firms (3011) pay no dividends but that makes sense, given the fact that they have negative FCFE.

That still leaves us with 2555 firms that pay out no dividends, even though they have positive FCFE, and about 805 firms that pay out less in dividends than they have available in FCFE. However, that does not necessarily mean that these firms are accumulating cash, since some of them buy back their own stock in large quantities. With the rest of the firms, the cash that is not paid out is accumulated as a balance and it does help explain how some firms end up with outsized cash balances, relative to value.


**Dividends.xls:** This spreadsheet allows you to estimate the FCFE for a firm over a period for up to ten years and compare it to dividends paid.
Step 2: Assessing Project Quality

The alternative to returning cash to stockholders is reinvestment. Consequently, a firm’s investment opportunities influence its dividend policy. Other things remaining equal, a firm with better projects typically has more flexibility in setting dividend policy and defending it against stockholder pressure for higher dividends. But how do we define a good project?

According to our analysis of investment decisions, a good project is one that earns at least the hurdle rate, which is the cost of equity if cash flows are estimated on an equity basis, or the cost of capital if cash flows are measured on a pre-debt basis. In theory, we could estimate the expected cash flows on every project available to the firm and calculate the internal rates of return (IRR) or net present value (NPV) of each project to evaluate project quality. There are several practical problems with this, however. First, we have to be able to obtain the detailed cash flow estimates and hurdle rates for all available projects, which can be daunting if the firm has dozens or even hundreds of projects. The second problem is that even if these cash flows are available for existing projects, they will not be available for future projects.

As an alternative approach to measuring project quality, we can use one or more of the measures we developed in Chapter 5 to evaluate a firm’s current project portfolio:

- **Accounting return differentials,** where we compare the accounting return on equity to the cost of equity and the accounting return on capital to the cost of capital.
- **Economic value added (EVA),** which measures the excess return earned on capital invested in existing investments and can be computed either on an equity or capital basis.

We did note the limitations of each of these approaches in Chapter 5, but they still provide a measure of the quality of a firm’s existing investments.

Using past project returns as a measure of future project quality can result in errors if a firm is making a transition from one stage in its growth cycle to the next or if it is in the process of restructuring. In such situations, it is entirely possible that the expected returns on new projects will differ from past project returns. Consequently, it may be worthwhile scrutinizing past returns for trends that may carry over into the future. The average return on equity or capital for a firm will not reveal these trends very well.
because they are slow to reflect the effects of new projects, especially for large firms. An alternative accounting return measure, which better captures year-to-year shifts, is the *marginal return on equity or capital*, which is defined as follows:

\[
\text{Marginal Return on Equity}_t = \frac{\text{Net Income}_t - \text{Net Income}_{t-1}}{\text{Book Value of Equity}_{t-1} - \text{Book Value of Equity}_{t-2}}
\]

\[
\text{Marginal Return on Capital}_t = \frac{\text{EBIT}(1-t)_t - \text{EBIT}(1-t)_{t-1}}{\text{Book Value of Capital}_{t-1} - \text{Book Value of Capital}_{t-2}}
\]

Although the marginal return on equity (capital) and the average return on equity (capital) will move in the same direction, the marginal returns typically change much more than do the average returns, the difference being a function of the size of the firm. These marginal returns can be used to compute the quality of the new projects.

The alternative to using accounting returns to measure the quality of a firm’s projects is to look at how well or badly a firm’s stock has done in financial markets. In Chapter 4, we compared the returns earned by a stock to the returns earned on the market after adjusting for risk (Jensen’s Alpha). The risk-adjusted excess return that we estimated becomes a measure of whether a stock has under- or outperformed the market. A positive excess return would then be viewed as an indication that a firm has done better than expected, whereas a negative excess return would indicate that a firm has done worse than anticipated.

Finally, accounting income and stock returns may vary year to year, not only because of changes in project quality but also because of fluctuations in the business cycles and interest rates. Consequently, the comparisons between returns and hurdle rates should be made over long enough periods, say, five to ten years, to average out these other effects.

*Illustration 11.4 Evaluating Project Quality at Disney, Aracruz and Tata Chemicals*

In Illustration 6.10, we examined the quality of existing investments at Disney, Aracruz and Tata Chemicals, using both accounting returns and EVA and stock price performance at each of these companies was evaluated using Jensen’s alpha in chapter 4. Table 11.11 summarizes our findings.

*Table 11.11: Project Returns and Stock Price Performance*
In summary, we concluded that Disney earns positive excess returns on its projects, Tata Chemicals breaks even and that Aracruz earns negative excess returns and that the stock price performance reflects these excess returns.

In the following analysis, we revisit both accounting and market measures of return at Disney, Aracruz and Tata Chemicals over recent time periods and compare them to the appropriate hurdle rates to evaluate the quality of the projects taken at each firm during the period. In this analysis, though, we could be faulted for focusing on performance over short time periods and failing to adjust the cost of equity for actual market performance. We will try to remedy both defects in this illustration.

We begin with an analysis of Disney’s accounting return on equity, the return from holding the stock, and the required return (given the beta and market performance during each year) from 1999 to 2008 as shown in Table 11.12.10

**Table 11.12 Return on Equity, Return on Stock, and Cost of Equity: Disney**

<table>
<thead>
<tr>
<th>Year</th>
<th>ROE</th>
<th>Return on Stock</th>
<th>Cost of Equity</th>
<th>Accounting Excess Return</th>
<th>Market Excess Return</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>6.71%</td>
<td>-1.80%</td>
<td>19.27%</td>
<td>-12.56%</td>
<td>-21.07%</td>
</tr>
<tr>
<td>2000</td>
<td>4.39%</td>
<td>-0.36%</td>
<td>-7.57%</td>
<td>11.96%</td>
<td>7.21%</td>
</tr>
<tr>
<td>2001</td>
<td>-0.66%</td>
<td>-27.68%</td>
<td>-10.31%</td>
<td>9.66%</td>
<td>-17.37%</td>
</tr>
<tr>
<td>2002</td>
<td>5.45%</td>
<td>-20.27%</td>
<td>-19.64%</td>
<td>25.09%</td>
<td>-0.63%</td>
</tr>
<tr>
<td>2003</td>
<td>5.40%</td>
<td>44.36%</td>
<td>25.70%</td>
<td>-20.30%</td>
<td>18.65%</td>
</tr>
<tr>
<td>2004</td>
<td>9.86%</td>
<td>20.19%</td>
<td>9.77%</td>
<td>0.09%</td>
<td>10.42%</td>
</tr>
<tr>
<td>2005</td>
<td>9.71%</td>
<td>-12.81%</td>
<td>4.67%</td>
<td>5.05%</td>
<td>-17.48%</td>
</tr>
<tr>
<td>2006</td>
<td>12.87%</td>
<td>44.25%</td>
<td>14.54%</td>
<td>12.87%</td>
<td>29.71%</td>
</tr>
<tr>
<td>2007</td>
<td>14.73%</td>
<td>-3.49%</td>
<td>5.40%</td>
<td>9.33%</td>
<td>-8.89%</td>
</tr>
<tr>
<td>2008</td>
<td>14.40%</td>
<td>-28.62%</td>
<td>-32.81%</td>
<td>47.20%</td>
<td>4.18%</td>
</tr>
</tbody>
</table>

* Cost of Equity = Riskfree rate at start of year + Beta (Return on S&P 500 for year – Riskfree rate)

10 For instance, to estimate the expected return in 1999, we use the following: Expected Return in 1999 = Risk-Free Rate at Beginning of 1999 + Beta (Return on Market in 1999 – Risk-Free Rate at Beginning of 1999). An average beta of 0.9011 was used over the entire period for Disney.
As you can see, the trend lines favor Disney, with negative accounting and market returns in the early years followed by positive excess returns on both dimensions in recent years. To provide some history on these measures, the return on equity for the firm, which exceeded 20% in the years prior to the acquisition of Capital Cities/ABC in 1996, plummeted in the years after to single digits, and the excess returns were negative for much of 1997-2004. Since Bob Iger replaced Michael Eisner as CEO in 2005, the company has done better and its performance may have earned it a reprieve when it comes to dividend policy.

Repeating this analysis for Aracruz for 2002 to 2008 yields a different conclusion. Table 11.13 summarizes returns on equity, returns on the stock, and the required return at the firm for each year between 2002 and 2008.

<table>
<thead>
<tr>
<th>Year</th>
<th>ROE</th>
<th>Return on Stock</th>
<th>Cost of Equity</th>
<th>Accounting Excess Return</th>
<th>Market Excess Return</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>13.90%</td>
<td>6.11%</td>
<td>-39.49%</td>
<td>53.39%</td>
<td>45.59%</td>
</tr>
<tr>
<td>2003</td>
<td>17.40%</td>
<td>94.57%</td>
<td>48.70%</td>
<td>-31.30%</td>
<td>45.87%</td>
</tr>
<tr>
<td>2004</td>
<td>25.49%</td>
<td>13.56%</td>
<td>17.73%</td>
<td>7.76%</td>
<td>-4.17%</td>
</tr>
<tr>
<td>2005</td>
<td>37.70%</td>
<td>11.40%</td>
<td>6.21%</td>
<td>31.49%</td>
<td>5.19%</td>
</tr>
<tr>
<td>2006</td>
<td>43.15%</td>
<td>58.50%</td>
<td>23.74%</td>
<td>19.41%</td>
<td>34.76%</td>
</tr>
<tr>
<td>2007</td>
<td>32.64%</td>
<td>25.49%</td>
<td>6.10%</td>
<td>26.53%</td>
<td>19.39%</td>
</tr>
<tr>
<td>2008</td>
<td>-51.91%</td>
<td>-81.91%</td>
<td>-64.86%</td>
<td>12.95%</td>
<td>-17.05%</td>
</tr>
</tbody>
</table>

For much of this period, Aracruz performed well, earning high returns on equity on its projects and earning excess returns for its stockholders. However, 2008 was a devastating year, as losses on derivatives wiped out profits from prior years and the stock price plummeted. While much of the volatility in earnings and returns from year to year, in prior years, can be attributed to commodity price variation, the losses in 2008 can be attributed mostly to failures on the part of management.

Finally, we look at Tata Chemicals and estimate the accounting and market-based excess returns from 2003-2008 in Table 11.14.

<table>
<thead>
<tr>
<th>Year</th>
<th>ROE</th>
<th>Return on Stock</th>
<th>Cost of Equity</th>
<th>Accounting Excess Returns</th>
<th>Market Excess Return</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003-04</td>
<td>16.80%</td>
<td>11.53%</td>
<td>14.30%</td>
<td>2.50%</td>
<td>-2.77%</td>
</tr>
<tr>
<td>2004-05</td>
<td>22.78%</td>
<td>46.14%</td>
<td>42.02%</td>
<td>-19.25%</td>
<td>4.12%</td>
</tr>
</tbody>
</table>
Across the five-year period, Tata Chemicals delivered a stock return and return on equity that roughly matched up to the cost of equity over the period. In effect, the firm’s performance has been neutral over the period.

### Dividends.xls

This spreadsheet allows you to estimate the average return on equity and cost of equity for a firm for a period of up to ten years.

#### 11.4. Historical, Average, and Projected Returns on Capital

You have been asked to judge the quality of the projects available at Super Meats, a meat processing company. It has earned an average return on capital of 10 percent over the previous five years, but its marginal return on capital last year was 14 percent. The industry average return on capital is 12 percent, and it is expected that Super Meats will earn this return on its projects over the next five years. If the cost of capital is 12.5 percent, which of the following conclusions would you draw about Super Meat’s projects?

- a. It invested in good projects over the last five years.
- b. It invested in good projects last year.
- c. It can expect to invest in good projects over the next five years.

In terms of setting dividend policy, which of these conclusions matter the most?

#### In Practice: Dealing with Accounting Returns

Accounting rates of return, such as return on equity and capital, are subject to abuse and manipulation. For instance, decisions on how to account for acquisitions (purchase or pooling), choice of depreciation methods (accelerated versus straight line), and whether to expense or capitalize an item (R&D) can all affect reported income and book value. In addition, in any specific year, the return on equity and capital can be biased upward or downward depending on whether the firm had an unusually good or bad year. To estimate a fairer measure of returns on existing projects, we recommend the following:
1. Normalize the income before computing returns on equity or capital. For Aracruz, using the average income over the past three years, instead of the depressed income in 1996, provides returns on equity or capital that are much closer to the required returns.

2. Back out cosmetic earnings effects caused by accounting decisions, such as the one on pooling versus purchase. This is precisely why we should consider Disney’s income prior to the amortization of the Capital Cities acquisition in computing returns on equity and capital.

3. If there are operating expenses designed to create future growth, rather than current income, capitalize those expenses and treat them as part of book value while computing operating income prior to those expenses. This is what we did with Bookscape when we capitalized operating leases and treated them as part of the capital base and used the adjusted values in computing return on capital.

Step 3: Evaluating Dividend Policy

Once we have measured a firm’s capacity to pay dividends and assessed its project quality, we can decide whether the firm should continue its existing policy of returning cash to stockholders, return more cash, or return less. The assessment will depend on how much of the FCFE is returned to stockholders each period and how good the firm’s project opportunities are. There are four possible scenarios:

- **A firm may have good projects and may be paying out more (in dividends and stock buybacks) than its FCFE.** In this case, the firm is losing value in two ways. First, by paying too much in dividends, it creates a cash shortfall that has to be met by issuing more securities. Second, the cash shortfall often creates capital rationing constraints; as a result, the firm may reject good projects it otherwise would have taken.

- **A firm may have good projects and may be paying out less than its FCFE as a dividend.** Although it will accumulate cash as a consequence, the firm can legitimately argue that it will have good projects in the future in which it can invest the cash, though investors may wonder why it did not take the projects in the current period.
• A firm may have poor projects and may be paying out less than its FCFE as a dividend. This firm will also accumulate cash, but it will find itself under pressure from stockholders to distribute the cash because of their concern that the cash will be used to finance poor projects.

• A firm may have poor projects and may be paying out more than its FCFE as a dividend. This firm first has to deal with its poor project choices, possibly by cutting back on those investments that make returns below the hurdle rate. Because the reduced capital expenditure will increase the FCFE, this may take care of the dividend problem. If it does not, the firm will have to cut dividends as well.

Figure 11.3 illustrates the possible combinations of cash payout and project quality.

**Figure 11.3 Analyzing Dividend Policy**

<table>
<thead>
<tr>
<th>Quality of projects taken: ROE versus Cost of Equity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor projects</td>
</tr>
<tr>
<td>Cash Surplus + Poor Projects</td>
</tr>
<tr>
<td>Intel</td>
</tr>
<tr>
<td>Significant pressure to pay out more to stockholders as dividends or stock buybacks</td>
</tr>
<tr>
<td>Cash Deficit + Poor Projects</td>
</tr>
<tr>
<td>Disney</td>
</tr>
<tr>
<td>Cut out dividends but real problem is in investment policy.</td>
</tr>
<tr>
<td>Cash Deficit + Good Projects</td>
</tr>
<tr>
<td>Apple</td>
</tr>
<tr>
<td>Maximum flexibility in setting dividend policy</td>
</tr>
<tr>
<td>Cash Surplus + Good Projects</td>
</tr>
<tr>
<td>Tata Chemicals</td>
</tr>
<tr>
<td>Cash Surplus + Poor Projects</td>
</tr>
<tr>
<td>Aracruz</td>
</tr>
</tbody>
</table>

In this matrix, Disney with its combination of good investments (at least in recent years) and too much cash returned to its stockholders falls into the quadrant where reducing the payout makes sense. Since much of the cash payout is in the form of stock buybacks, this
would suggest that Disney reduce its buybacks. Tata Chemicals, with its combination of neutral investments and cash build-up, could be targeted for more dividends if the quality of its projects deteriorates. Finally, Aracruz poses the toughest challenge, since it clearly is paying out too much in dividends, relative to cash available, but also has the worst track record of the three companies in terms of project returns and stock price performance. Reducing dividends is part of the solution but it has to be combined with more discipline in investment analysis and better risk controls.

Note, however, that the pressure to pay dividends comes from the lack of trust in management rather than greed on the part of stockholders. For a contrast, consider Apple and Google, two companies that generated billions in FCFE in 2008 and returned little to their stockholders, while accumulating large cash balances. The high returns earned on projects and superior stock price performance at both companies earned them the flexibility to pay out far less in cash than they generated, with little protest from stockholders. In contrast, Intel has struggled to convince stockholders to allow it to retain a large cash balance, largely because its project and stock returns have lagged in recent years.

**Consequences of Payout Not Matching FCFE**

The consequences of the cash payout to stockholders not matching the FCFE can vary depending on the quality of a firm’s projects. In this section, we examine the consequences of paying out too little or too much for firms with good projects and for firms with bad projects. We also look at how managers in these firms may justify their payout policy and how stockholders are likely to react to the justification.

**A. Poor Projects and Low Payout**

There are firms that invest in poor projects and accumulate cash by not returning any to stockholders. We discuss stockholder reaction and management response to the dividend policy.

**Consequences of Low Payout**

When a firm pays out less than it can afford to in dividends, it accumulates cash. If a firm does not have good projects in which to invest this cash, it faces several possibilities. In the most benign case, the cash accumulates in the firm and is invested in
financial assets. Assuming that these financial assets are fairly priced, the investments are zero NPV projects and should not negatively affect firm value. There is the possibility, however, that the firm may find itself the target of an acquisition, financed in part by its large holdings of liquid assets.

In the more damaging scenario, as the cash in the firm accumulates, the managers may be tempted to invest in projects that do not meet their hurdle rates, either to reduce the likelihood of a takeover or to earn higher returns than they would on financial assets.11 These actions will lower the value of the firm. Another possibility is that the management may decide to use the cash to finance an acquisition. This hurts stockholders in the firm because some of their wealth is transferred to the stockholders of the acquired firms. The managers will claim that such acquisitions have strategic and synergistic benefits. The evidence indicates, however, that most firms that have financed takeovers with large cash balances, acquired over years of paying low dividends while generating a high FCFE, have reduced stockholder value.

**Stockholder Reaction**

Because of the negative consequences of building large cash balances, stockholders of firms that pay insufficient dividends and do not have “good” projects pressure managers to return more of the cash. This is the basis for the free cash flow hypothesis, where dividends serve to reduce free cash flows available to managers and, by doing so, reduce the losses management actions can create for stockholders.

**Management’s Defense**

Not surprisingly, managers of firms that pay out less in dividends than they can afford view this policy as being in the best long-term interests of the firm. They maintain that although the current project returns may be poor, future projects will both be more plentiful and have higher returns. Such arguments may be believable initially, but they become more difficult to sustain if the firm continues to earn poor returns on its projects. Managers may also claim that the cash accumulation is needed to meet demands arising from future contingencies. For instance, cyclical firms will often state that large cash

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11This is especially likely if the cash is invested in Treasury bills or other low-risk, low-return investments. On the surface, it may seem better for the firm to take on risky projects that earn, say 7 percent, than invest in Treasure bills and make 3 percent, though this clearly does not make sense after adjusting for the risk.
balances are needed to tide them over the next recession. Again, although there is some truth to this view, whether the cash balance that is accumulated is reasonable has to be assessed by looking at the experience of the firm in prior recessions.

Finally, in some cases, managers will justify a firm’s cash accumulation and low dividend payout based on the behavior of comparable firms. Thus, a firm may claim that it is essentially matching the dividend policy of its closest competitors and that it has to continue to do so to remain competitive. The argument that “every one else does it” cannot be used to justify a bad dividend policy, however.

Although all these justifications seem consistent with stockholder wealth maximization or the best long-term interests of the firm, they may really be smoke screens designed to hide the fact that this dividend policy serves managerial rather than stockholder interests. Maintaining large cash balances and low dividends provides managers with two advantages: It increases the funds that are directly under their control and thus increases their power to direct future investments, and it increases their margin for safety by stabilizing earnings and thus protecting their jobs.

**B. Good Projects and Low Payout**

Although the outcomes for stockholders in firms with poor projects and low dividend payout ratios range from neutral to terrible, the results may be more positive for firms that have a better selection of projects and whose management have had a history of earning high returns for stockholders.

**Consequences of Low Payout**

The immediate consequence of paying out less in dividends than is available in FCFE is the same for firms with good projects as it is for firms with poor projects: The cash balance of the firm increases to reflect the cash surplus. The long-term effects of cash accumulation are generally much less negative for these firms, however, for the following reasons:

- These firms have projects that earn returns greater than the hurdle rate, and it is likely that the cash will be used productively in the long run.
- The high returns earned on internal projects reduce both the pressure and the incentive to invest the cash in poor projects or in acquisitions.
• Firms that earn high returns on their projects are much less likely to be targets of takeovers, reducing the threat of hostile acquisitions.

To summarize, firms that have a history of investing in good projects and expect to continue to have such projects in the future may be able to sustain a policy of retaining cash rather than paying out dividends. In fact, they can actually create value in the long run by using this cash productively.

Stockholder Reaction

Stockholders are much less likely to feel a threat to their wealth in firms that have historically shown good judgment in picking projects. Consequently, they are more likely to agree when managers in those firms withhold cash rather than pay it out. Although there is a solid basis for arguing that managers cannot be trusted with large cash balances, this proposition does not apply equally across all firms. The managers of some firms earn the trust of their stockholders because of their capacity to deliver extraordinary returns on both their projects and their stock over long periods of time. These managers will be generally have much more flexibility in determining dividend policy.

The notion that greedy stockholders force firms with great investments to return too much cash too quickly is not based in fact. Rather, stockholder pressure for dividends or stock repurchases is greatest in firms whose projects yield marginal or poor returns and least in firms whose projects have high returns.

Management Responses

Managers in firms that have posted stellar records in project and stock returns clearly have a much easier time convincing stockholders of the desirability of withholding cash rather than paying it out. The most convincing argument for retaining funds for reinvestment is that the cash will be used productively in the future and earn excess returns for the stockholders. Not all stockholders will agree with this view, especially if they feel that future projects will be less attractive than past projects, which might occur if the industry in which the firm operates is maturing. For example, many specialty retail firms, such as The Limited, found themselves under pressure to return more cash to stockholders in the early 1990s as margins and growth rates in the business declined.
C. Poor Projects and High Payout

In many ways, the most troublesome combination of circumstances occurs when firms pay out much more in dividends than they can afford, and at the same time earn disappointing returns on their projects. These firms have problems with both their investment and their dividend policies, and the latter cannot be solved adequately without addressing the former.

Consequences of High Payout

When a firm pays out more in dividends than it has available in FCFE, it is creating a cash deficit that has to be funded by drawing on the firm’s cash balance, by issuing stock to cover the shortfall, or by borrowing money to fund its dividends. If the firm uses its cash reserves, it will reduce equity and raise its debt ratio. If it issues new equity, the drawback is the issuance cost of the stock. By borrowing money, the firm increases its debt while reducing equity and increasing its debt ratio.

Because the FCFE is after capital expenditures, this firm’s real problem is not that it pays out too much in dividends, but that it invests too heavily in bad projects. Cutting back on these projects would therefore increase the FCFE and might eliminate the cash shortfall created by paying dividends.

Stockholder Reaction

The stockholders of a firm that pays more in dividends than it has available in FCFE faces a dilemma. On the one hand, they may want the firm to reduce its dividends to eliminate the need for additional borrowing or equity issues each year. On the other hand, the management’s record in picking projects does not evoke much trust that the firm is using funds wisely, and it is likely that the funds saved by not paying the dividends will be used on other poor projects. Consequently, these firms will first have to solve their investment problems by cutting back on poor projects, which, in turn, will increase the FCFE. If the cash shortfall persists, the firm should then cut back on dividends.

It is therefore entirely possible, especially if the firm is underleveraged to begin with, that the stockholders will not push for lower dividends but will try to convince managers to improve project choice instead. It is also possible that they will encourage
the firm to eliminate enough poor projects that the FCFE covers the expected dividend payment.

Management Responses

The managers of firms with poor projects and dividends that exceed FCFE may not think that they have investment problems rather than dividend problems. They may also disagree that the most efficient way of dealing with these problems is to eliminate some of the capital expenditures. In general, their views will be the same as managers who have a poor investment track record. They will claim the period used to analyze project returns was not representative, it was an industry-wide problem that will pass, or the projects have long gestation periods.

Overall, it is unlikely that these managers will convince the stockholders of their good intentions on future projects. Consequently, there will be a strong push toward cutbacks in capital expenditures, especially if the firm is borrowing money to finance the dividends and does not have much excess debt capacity.

11.5. Stockholder Pressure and Dividend Policy

Which of the following companies would you expect to see under greatest pressure from its stockholders to buy back stock or pay large dividends? (All of the companies have costs of capital of 12 percent.)

a. A company with a historical return on capital of 25 percent, and a small cash balance.
b. A company with a historical return on capital of 6 percent, and a small cash balance.
c. A company with a historical return on capital of 25 percent, and a large cash balance.
d. A company with a historical return on capital of 6 percent, and a large cash balance.

The managers at the company argue that they need the cash to do acquisitions. Would this make it more or less likely that stockholders will push for stock buybacks?

a. More likely
b. Less likely

D. Good Projects and High Payout

The costs of trying to maintain unsustainable dividends are most evident in firms that have a selection of good projects to choose from. The cash that is paid out as
dividends could well have been used to invest in some of these projects, leading to a much higher return for stockholders and higher stock prices for the firm.

Consequences of High Payout

When a firm pays out more in dividends than it has available in FCFE, it creates a cash shortfall. If this firm also has good projects available but cannot invest in them because of capital rationing constraints, the firm is paying a hefty price for its dividend policy. Even if the projects are passed up for other reasons, the cash this firm is paying out as dividends would earn much better returns if left to accumulate in the firm.

Dividend payments also create a cash deficit that now has to be met by issuing new securities. Issuing new stock carries a potentially large issuance cost, which reduces firm value. But if the firm issues new debt, it might become overleveraged, and this may reduce value.

Stockholder Reaction

The best course of action for stockholders is to insist that the firm pay out less in dividends and invest in better projects. If the firm has paid high dividends for an extended period of time and has acquired stockholders who value high dividends even more than they value the firm’s long-term health, reducing dividends may be difficult. Even so, stockholders may be much more amenable to cutting dividends and reinvesting in the firm, if the firm has a ready supply of good projects at hand.

Management Responses

The managers of firms that have good projects while paying out too much in dividends have to figure out a way to cut dividends while differentiating themselves from those firms that are cutting dividends due to declining earnings. The initial suspicion with which markets view dividend cuts can be overcome (at least partially) by providing markets with information about project quality at the time of the dividend cut. If the dividends have been paid for a long time, however, the firm may have stockholders who like the high dividends and may not particularly be interested in the projects that the firm has available. If this is the case, the initial reaction to the dividend cut, no matter how carefully packaged, will be negative. However, as disgruntled stockholders sell their holdings, the firm will acquire new stockholders who may be more willing to accept the lower dividend and higher investment policy.
In summary
Looking across the four scenarios, it is quite clear that investor assessments of dividend policy and reactions to cash accumulation cannot be separated from evaluations of investment policy. Firms are judged based upon their track records, and investors are more likely to trust successful firms with their cash than firms that have a history of poor investments and bad management. Figure 11.4 provides a summary of the four scenarios described above:

Figure 11.4: A Framework for Analyzing Dividend Policy

<table>
<thead>
<tr>
<th>How much did the firm pay out?</th>
<th>How much could it have afforded to pay out?</th>
</tr>
</thead>
<tbody>
<tr>
<td>What it could have paid out</td>
<td>What it actually paid out</td>
</tr>
<tr>
<td>Net Income</td>
<td>Dividends</td>
</tr>
<tr>
<td>(Cap Ex - Depr’n) (1-DR)</td>
<td>+ Equity Repurchase</td>
</tr>
<tr>
<td>Chg Working Capital (1-DR)</td>
<td></td>
</tr>
<tr>
<td>= FCFE</td>
<td></td>
</tr>
</tbody>
</table>

Firm pays out too little
FCFE > Dividends

Do you trust managers in the company with your cash?
Look at past project choice:
Compare ROE to Cost of Equity
ROC to WACC

Firm pays out too much
FCFE < Dividends

What investment opportunities does the firm have?
Look at past project choice:
Compare ROE to Cost of Equity
ROC to WACC

Firm has history of good project choice
Give managers the flexibility to keep cash and set dividends

Firm has history of poor project choice
Force managers to justify holding cash or return cash to stockholders

Firm should cut dividends and reinvest more
Firm should deal with its investment problem first and then cut dividends

Firm has good projects
Firm has poor projects

11.6. Dividend Policy and High-Growth Firms
High-growth firms are often encouraged to start paying dividends to expand their stockholder base, because there are stockholders who will not or cannot hold stock that do not pay dividends. Do you agree with this rationale?

a. Yes
b. No

Explain.

**Step 4: Interaction between Dividend Policy and Financing Policy**

The analysis of dividend policy is further enriched—and complicated—if we bring in the firm’s financing decisions as well. In Chapter 9 we noted that one of the ways a firm can increase leverage over time is by increasing dividends or repurchasing stock; at the same time, it can decrease leverage by cutting or not paying dividends. Thus we cannot decide how much a firm should pay in dividends without determining whether it is under- or overlevered and whether or not it intends to close this leverage gap.

An underlevered firm may be able to pay more than its FCFE as dividend and may do so intentionally to increase its debt ratio. An overlevered firm, on the other hand, may have to pay less than its FCFE as dividends because of its desire to reduce leverage. In some of the scenarios already described, leverage can be used to strengthen the suggested recommendations. For instance, an under levered firm with poor projects and a cash flow surplus has an added incentive to raise dividends and reevaluate investment policy because it will be able to increase its leverage by doing so. In some cases, however, the imperatives of moving to an optimal debt ratio may act as a barrier to carrying out changes in dividend policy. Thus, an overlevered firm with poor projects and a cash flow surplus may find the cash better spent reducing debt rather than paying out dividends.

**Illustration 11.5 Analyzing the Dividend Policy of Disney, Aracruz, Tata Chemicals and Deutsche Bank**

Using the cash flow approach, we are now in a position to analyze Disney’s dividend policy. To do so, we will draw on three findings:

- While Disney has a payout ratio of 20%, it has returned almost 140% of its FCFE over the last decade to stockholders, primarily through stock buybacks.
• While Disney’s project returns and stock price performance lagged in the early part of
the last decade (1999-2008), it has improved significantly on both measures in the last
four years and now delivers excess returns on both dimensions.
• Finally, in our analysis in Chapter 8, we noted that Disney was slightly underlevered,
with an actual debt ratio of 27 percent and an optimal debt ratio of between 30 and 40
percent, depending upon assumptions about operating income.

Given this combination of findings, we would recommend that Disney reduce its stock
buybacks for the near term, in the face of a slowing economy and potentially lower
earnings. If earnings stay healthy, Disney can go back to using buybacks as a way of
moving towards it optimal debt ratio. In table 11.15, we forecast the FCFE for the next 5
years, assuming that Disney funds 40% of its reinvestment needs with debt each year.

Table 11.15 Forecasted FCFE and Cash Available for Stock Buybacks: Disney (in
millions)

<table>
<thead>
<tr>
<th></th>
<th>Current</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Income</td>
<td>$4,324</td>
<td>$4,540</td>
<td>$4,767</td>
<td>$5,006</td>
<td>$5,256</td>
<td>$5,519</td>
</tr>
<tr>
<td>- (Cap Ex – Depreciation) (1 – 0.40)</td>
<td>$1,078</td>
<td>$1,132</td>
<td>$1,188</td>
<td>$1,248</td>
<td>$1,310</td>
<td>$1,376</td>
</tr>
<tr>
<td>- Change in Working Capital (1 - 40)</td>
<td>$25</td>
<td>$27</td>
<td>$28</td>
<td>$29</td>
<td>$31</td>
<td></td>
</tr>
<tr>
<td>FCFE</td>
<td>$3,383</td>
<td>$3,552</td>
<td>$3,730</td>
<td>$3,916</td>
<td>$4,112</td>
<td></td>
</tr>
<tr>
<td>Expected Dividends</td>
<td>$697</td>
<td>$732</td>
<td>$769</td>
<td>$807</td>
<td>$847</td>
<td></td>
</tr>
<tr>
<td>Cash available for stock buybacks</td>
<td>$2,686</td>
<td>$2,820</td>
<td>$2,961</td>
<td>$3,109</td>
<td>$3,265</td>
<td></td>
</tr>
</tbody>
</table>

Note that we have assumed that revenues, net income, dividends, capital expenditures
and depreciation are expected to grow 5 percent a year for the next five years and that
working capital remains at its existing percentage (2.28 percent) of revenues. Based on
these forecasts, and assuming that Disney maintains its existing dividend, Disney should
have about $14,842 million in excess cash that it can return to its stockholders in stock
buybacks over the period.

Turning our attention to Aracruz, we review our findings on the company in both
this chapter and prior ones:
• Aracruz has paid out far more in dividends than it has available in FCFE and has
funded the deficit primarily with new debt.
• As a result of the borrowing, Aracruz is significantly over levered, with a debt to capital ratio in excess of 50% and an optimal debt ratio, computed in chapter 8, of about 10%.

• While Aracruz delivered high returns between 2002 and 2007, we suspect that some or much of these returns were the result of speculation on currency derivatives during that period. The unraveling of this strategy in 2008 generated billions of dollars in losses and makes us wary about management capabilities in the firm to manage risk and deliver performance.

Taken as a whole, we see few alternatives to Aracruz other than cutting or even eliminating dividends and using the cash to pay down debt.

With Tata Chemicals, our analysis so far has led us to the following conclusions about the firm:

• Tata Chemicals has paid out about 70% of its FCFE as dividends each year and has redirected the withheld cash to other companies in the Tata Group.

• While Tata Chemical’s stock price performance looks good in absolute terms, much of that performance can be attributed to the performance of the Indian stock market. On a risk-adjusted basis, Tata Chemicals has delivered excess returns close to zero on both its projects and the stock.

• Tata Chemicals is over levered with a debt to capital ratio of 34% and an optimal debt ratio of 10%, though it is not clear how much of this debt is being subsidized by the Tata Group.

Unlike Aracruz, Tata Chemicals is not in financial distress and has some leeway to use its dividend policy to adjust its capital structure over time. We would recommend that Tata Chemicals continue its existing dividend policy and that it redirect some of its excess cash to paying down debt.

Finally, with Deutsche Bank, we draw on the estimates of expected future FCFE that we made in table 11.8. Recapping, we assumed a target regulatory capital ratio of 10% and estimated the reinvestment that would be needed in future years to sustain a modest growth rate of 4% for the next 5 years. In table 11.16, we reproduce the expected FCFE and net income and compute an aggregate dividend payout ratio that would be appropriate for Deutsche Bank for the future.
Table 11.16: Expected FCFE and Net Income: Deutsche Bank

<table>
<thead>
<tr>
<th>Year</th>
<th>FCFE</th>
<th>Net Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>2,001 €</td>
<td>3,147 €</td>
</tr>
<tr>
<td>2010</td>
<td>2,114 €</td>
<td>3,302 €</td>
</tr>
<tr>
<td>2011</td>
<td>2,233 €</td>
<td>3,463 €</td>
</tr>
<tr>
<td>2012</td>
<td>2,358 €</td>
<td>3,631 €</td>
</tr>
<tr>
<td>2013</td>
<td>2,779 €</td>
<td>3,807 €</td>
</tr>
<tr>
<td>Aggregate</td>
<td>11,486 €</td>
<td>17,349 €</td>
</tr>
</tbody>
</table>

Based upon these estimates, Deutsche Bank can afford to pay out about 66% of its earnings as dividends:

\[
\text{Potential Payout Ratio} = \frac{\text{FCFE}}{\text{Earnings}} = \frac{11,486}{17,349} = 66\%
\]

Given the uncertainties in the banking sector about potential losses on securities and regulatory changes, we would hold off on making major changes in dividend policy until some of the uncertainty is resolved.

**A Comparable Firm Approach to Analyzing Dividend Policy**

So far, we have examined the dividend policy of a firm by looking at its cash flows and the quality of its investments. There are managers who believe that their dividend policies are judged relative to those of their competitors. This comparable-firm approach to analyzing dividend policy is often used narrowly, by looking at only firms that are in the same industry group or sector. As we will illustrate, it can be used more broadly, by looking at the determinants of dividend policy across all firms in the market.

**Using Firms in the Industry**

In the simplest form of this approach, a firm’s dividend yield and payout are compared to those of firms in its industry and accordingly judged to be adequate, excessive, or inadequate. Thus, a utility stock with a dividend yield of 3.5 percent may be criticized for paying out an inadequate dividend if utility stocks, on average, have a much higher dividend yield. In contrast, a computer software firm that has a dividend yield of 1.0 percent may be viewed as paying too high a dividend if software firms pay a much lower dividend on average.
Although comparing a firm to comparable firms on dividend yield and payout may have some intuitive appeal, it can be misleading. First, it assumes that all firms within the same industry group have the same net capital expenditure and working capital needs. These assumptions may not be true if firms are in different stages of the life cycle. Second, even if the firms are at the same stage in their life cycles, the entire industry may have a dividend policy that is unsustainable or suboptimal. Third, it does not consider stock buybacks as an alternative to dividends. The third criticism can be mitigated when the approach is extended to compare cash returned to stockholders, rather than just dividends.

There is a data set online that summarizes the dividend yields and payout ratios by sector for U.S. companies.

**Illustration 11.6 Analyzing Disney’s Dividend Payout Using Comparable Firms**

In comparing Disney’s dividend policy to its peer group, we analyze the dividend yields and payout ratios of comparable firms in 2008, as shown in Table 11.17. We defined comparable firms as entertainment companies with a market capitalization in excess of $500 million.

**Table 11.17 Payout Ratios and Dividend Yields: Entertainment Companies**

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Market Cap</th>
<th>Payout Ratio</th>
<th>Dividend Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>Astral Media Inc. 'A'</td>
<td>$1,221.70</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>CBS Corp. 'B'</td>
<td>$5,103.70</td>
<td>53.52%</td>
<td>14.22%</td>
</tr>
<tr>
<td>Central European Media Enterps</td>
<td>$827.70</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Corus Entertainment Inc</td>
<td>$806.50</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>CTC Media Inc</td>
<td>$715.10</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Discovery Communications Inc</td>
<td>$3,860.60</td>
<td>NA</td>
<td>0.00%</td>
</tr>
<tr>
<td>Disney (Walt)</td>
<td>$41,114.70</td>
<td>17.11%</td>
<td>1.67%</td>
</tr>
<tr>
<td>DreamWorks Animation</td>
<td>$2,074.30</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Hearst-Argyle Television Inc</td>
<td>$589.10</td>
<td>40.59%</td>
<td>4.46%</td>
</tr>
<tr>
<td>IAC/InterActiveCorp</td>
<td>$2,215.30</td>
<td>NA</td>
<td>0.00%</td>
</tr>
<tr>
<td>Lions Gate Entertainment Corp</td>
<td>$705.60</td>
<td>NA</td>
<td>0.00%</td>
</tr>
<tr>
<td>News Corp.</td>
<td>$23,245.30</td>
<td>9.07%</td>
<td>1.35%</td>
</tr>
<tr>
<td>Regal Entertainment Group</td>
<td>$1,447.60</td>
<td>176.09%</td>
<td>12.70%</td>
</tr>
<tr>
<td>Scripps Networks</td>
<td>$3,422.30</td>
<td>NA</td>
<td>0.00%</td>
</tr>
<tr>
<td>Time Warner</td>
<td>$34,112.40</td>
<td>22.17%</td>
<td>2.63%</td>
</tr>
<tr>
<td>Viacom Inc. 'B'</td>
<td>$10,669.30</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>World Wrestling Ent.</td>
<td>$749.50</td>
<td>198.45%</td>
<td>13.79%</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>39.77%</td>
<td>2.99%</td>
</tr>
</tbody>
</table>
Of the seventeen companies in this group, only seven paid dividends. Relative to the other companies in this sector, Disney pays low dividends. The interesting question, though, is whether Disney should be setting dividend policy based on entertainment firms, most of which are smaller, riskier and much less diversified than Disney, or on large firms in other businesses that resemble it in terms of cash flows and risk.

For Deutsche Bank, we used large money-center European banks as comparable firms. Table 11.18 provides the listing of the firms, as well as their dividend yields and payout ratios.

*Table 11.18 Payout Ratios and Dividend Yields: European Banks (based on dividends paid in 2008)*

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Dividend Yield</th>
<th>Dividend Payout</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSBC Holdings plc (LSE:HSBA)</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Banco Santander, S.A. (CATS:SAN)</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Intesa Sanpaolo SpA (CM:ISP)</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Banco Bilbao Vizcaya Argentaria (CATS:BBVA)</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>BNP Paribas (ENXTPA:BNP)</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>UBS AG (VIRTX:UBSN)</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>UniCredit Italiano S.p.A. (CM:UCG)</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Royal Bank of Scotland Group plc (LSE:RBS)</td>
<td>22.06%</td>
<td>98.61%</td>
</tr>
<tr>
<td>Credit Suisse Group (VIRTX:CSGN)</td>
<td>8.68%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Societe Generale Group (ENXTPA:GLE)</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Standard Chartered PLC (LSE:STAN)</td>
<td>2.84%</td>
<td>22.98%</td>
</tr>
<tr>
<td>Credit Agricole SA (ENXTPA:ACA)</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Barclays plc (LSE:BARC)</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Nordea Bank AB (OM:NDA SEK)</td>
<td>9.00%</td>
<td>45.03%</td>
</tr>
<tr>
<td>Deutsche Bank AG (DB:DBK)</td>
<td>15.80%</td>
<td>119.37%</td>
</tr>
<tr>
<td>Banca Monte dei Paschi di Siena SpA (CM:BMPS)</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Lloyds TSB Group plc (LSE:LLOY)</td>
<td>35.76%</td>
<td>87.14%</td>
</tr>
<tr>
<td>Banco Popular Espanol SA (CATS:POP)</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>KBC Group NV (ENXTBR:KBC)</td>
<td>17.04%</td>
<td>152.94%</td>
</tr>
<tr>
<td>Svenska Handelsbanken AB (OM:SHB A)</td>
<td>11.54%</td>
<td>60.24%</td>
</tr>
<tr>
<td>National Bank of Greece SA (ATSE:ETE)</td>
<td>2.64%</td>
<td>12.49%</td>
</tr>
<tr>
<td>Unione di Banche Italiane Scpa (CM:UBI)</td>
<td>8.89%</td>
<td>64.61%</td>
</tr>
<tr>
<td>Average</td>
<td>6.10%</td>
<td>30.16%</td>
</tr>
</tbody>
</table>

*Source: Capital IQ.*
On both dividend yield and payout ratios, Deutsche Bank pays a much higher dividend than the typical European bank, if we use dividends paid in May 2008. However, Deutsche Bank had cut the dividends it will be paying in May 2009 by almost 90%, reducing both its dividend yield and payout ratio well below the industry average.

For Aracruz and Tata Chemicals, we looked at the average dividend yield and payout ratios of three sets of comparable firms in their businesses—emerging market companies, US companies and all companies listed globally. Table 11.19 summarizes these statistics.

Table 11.19 Dividend Yield and Payout Ratios for Comparable Companies: Aracruz & Tata Chemicals

<table>
<thead>
<tr>
<th></th>
<th>Paper &amp; Pulp</th>
<th>Tata</th>
<th>Diversified Chemicals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Aracruz</td>
<td>Emerging</td>
<td>US</td>
</tr>
<tr>
<td>Dividend Yield</td>
<td>8.19%</td>
<td>3.15%</td>
<td>2.08%</td>
</tr>
<tr>
<td>Payout</td>
<td>NA</td>
<td>43.93%</td>
<td>28.92%</td>
</tr>
</tbody>
</table>

Aracruz has a higher dividend yield than comparable companies, but that statistic reflects the collapse of its stock price, and Aracruz’s payout ratio cannot be computed because it lost money in 2008. In summary, this does back up our earlier contention that Aracruz is paying out too much in dividends and has to cut dividends. Tata Chemicals pays more in dividends than comparable companies on both a yield and payout basis.

With all four companies, the dangers of basing dividend policy based on comparable firms are clear. The “right” amount to pay in dividends will depend heavily on what we define “comparable” to be. If managers are allowed to pick their peer group, it is easy to justify even the most irrational dividend policy.

11.7. Peer Group Analysis

Assume that you are advising a small, high-growth bank, which is concerned about the fact that its dividend payout and yield are much lower than other banks. The CEO of the bank is concerned that investors will punish the bank for its dividend policy. What do you think?
a. I think that the bank will be punished for its errant dividend policy.
b. I think that investors are sophisticated enough for the bank to be treated fairly.
c. I think that the bank will not be punished for its low dividends as long as it tries to convey information to its investors about the quality of its projects and growth prospects.

Using the Market

The alternative to using only comparable firms in the same industry is to study the entire population of firms and try to estimate the variables that cause differences in dividend payout across firms. We outlined some of the determinants of dividend policy in the last chapter, and we could try to arrive at more specific measures of each of these determinants. For instance,

- **Growth Opportunities**: Firms with greater growth opportunities should pay out less in dividends than firms without these opportunities. Consequently, dividend payout ratios (yields) and expected growth rates in earnings should be negatively correlated with each other.

- **Investment Needs**: Firms with larger investment needs (capital expenditures and working capital) should pay out less in dividends than firms without these needs. Dividend payout ratios and yields should be lower for firms with significant capital expenditure needs.

- **Insider Holdings**: As noted earlier in the chapter, firms where stockholders have less power are more likely to hold on to cash and not pay out dividends. Hence, dividend payout ratios and insider holdings should be negatively correlated with each other.

- **Financial Leverage**: Firms with high debt ratios should pay lower dividends, because they have already precommitted their cash flows to make debt payments. Therefore, dividend payout ratios and debt ratios should be negatively correlated with each other.

Because there are multiple measures that can be used for each of these variables, we chose specific proxies—analyst estimates of growth in earnings per share for growth opportunities (EGR), percent of stock held by insiders for insider holdings (INS), and the standard deviation in stock prices (STD) as a measure of equity risk. Using data from
2008, we regressed dividend yields and payout ratios against all of these variables and arrived at the following regression equations (t-statistics are in brackets below coefficients):

\[
\begin{align*}
\text{PYT} &= 0.683 - 0.185 \text{ROE} - 1.07 \text{STD} - 0.313 \text{EGR} \\
&\quad (27.41) \quad (3.06) \quad (10.85) \quad (2.60)
\end{align*}
\]

\[R^2 = 13.3\%\]

\[
\begin{align*}
\text{YLD} &= 0.039 - 0.039 \text{STD} - 0.010 \text{INS} - 0.093 \text{EGR} \\
&\quad (37.38) \quad (9.39) \quad (2.62) \quad (16.23)
\end{align*}
\]

\[R^2 = 32.2\%\]

The regressions explain about 32% of the differences in dividend yields and 13% of the differences in payout ratios across firms in the United States. The two strongest factors are earnings growth and equity risk, with higher-growth, higher-risk firms paying out less of their earnings as dividends and having lower dividend yields. In addition, firms with high insider holdings tend to pay out less in dividends than do firms with low insider holdings, and firms with high capital expenditures needs seem to pay less in dividends than firms without these needs.

There is a data set online that summarizes the results of regressing dividend yield and payout ratio against fundamentals for U.S. companies.

**Illustration 11.7 Analyzing Dividend Payout Using the Cross-Sectional Regression**

To illustrate the applicability of the market regression in analyzing the dividend policy of Disney, we estimate the values of the independent variables in the regressions for the firm.

- Insider holdings at Disney (as % of outstanding stock) = 7.70%
- Standard Deviation in Disney stock prices = 19.30%
- Disney’s ROE = 13.05%
- Expected growth in earnings per share (Analyst estimates) = 14.50%

Substituting into the regression equations for the dividend payout ratio and dividend yield, we estimate a predicted payout ratio:

\[
\begin{align*}
\text{Predicted Payout} &= 0.683 - 0.185 (0.1305) - 1.07 (0.1930) - 0.313 (0.145) = 0.4069 \\
\text{Predicted Yield} &= 0.039 - 0.039 (0.1930) - 0.010 (0.077) - 0.093 (0.145) = 0.0172
\end{align*}
\]
Based on this analysis, Disney with its dividend yield of 1.67% and a payout ratio of approximately 20% is paying too little in dividends. This analysis, however, fails to factor in the huge stock buybacks made by Disney over the last few years.

**Managing Changes in Dividend Policy**

In Chapter 10, we noted the tendency on the part of investors to buy stocks with dividend policies that meet their specific needs. Thus, at least prior to 2003, investors who wanted high current cash flows and did not care much about the tax consequences migrated to firms that paid high dividends; those who wanted price appreciation and were concerned about the tax differential held stock in firms that paid low or no dividends. One consequence of this clientele effect is that changes in dividends, even if entirely justified by the cash flows, may not be well received by stockholders. In particular, a firm with high dividends that cuts them drastically may find itself facing unhappy stockholders. At the other extreme, a firm with a history of not paying dividends that suddenly institutes a large dividend may also find that its stockholders are not pleased.

Is there a way in which firms can announce changes in dividend policy that minimizes the negative fallout that is likely to occur? In this section, we will examine dividend changes and the market reaction to them and draw broader lessons for all firms that may plan to make such changes.

**Empirical Evidence**

Firms may cut dividends for several reasons; some clearly have negative implications for future cash flows and the current value of the firm, whereas others have more positive implications. In particular, the value of firms that cut dividends because of poor earnings and cash flows should drop, whereas the value of firms that cut dividends because of a dramatic improvement in project choice should increase. At the same time, financial markets tend to be skeptical of the latter claims, especially if the firm making the claims reports lower earnings and has a history of poor project returns. Thus, there is value to examining closely timed earnings and dividend cut announcements, to see if the market reaction changes as a consequence.
Woolridge and Ghosh looked at 408 firms that cut dividends, and the actions taken or information provided by these firms in conjunction with the dividend cuts. In particular, they examined three groups of companies: The first group announced an earnings decline or loss with the dividend cut; the second had made a prior announcement of earnings decline or loss; and the third made a simultaneous announcement of growth opportunities or higher earnings. The results are summarized in Table 11.20.

Table 11.20 Excess Returns around Dividend Cut Announcements

<table>
<thead>
<tr>
<th>Category</th>
<th>Periods Around Announcement Date</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Prior Quarter</td>
<td>Announcement Period</td>
<td>Quarter After</td>
<td></td>
</tr>
<tr>
<td>Simultaneous announcement of earnings decline/loss ($N = 176$)</td>
<td>–7.23%</td>
<td>–8.17%</td>
<td>+1.80%</td>
<td></td>
</tr>
<tr>
<td>Prior announcement of earnings decline or loss ($N = 208$)</td>
<td>–7.58%</td>
<td>–5.52%</td>
<td>+1.07%</td>
<td></td>
</tr>
<tr>
<td>Simultaneous announcement of investment or growth opportunities ($N = 16$)</td>
<td>–7.69%</td>
<td>–5.16%</td>
<td>+8.79%</td>
<td></td>
</tr>
</tbody>
</table>

We can draw several interesting conclusions from this study. First, the vast number of firms announcing dividend cuts did so in response to earnings declines (384) rather than in conjunction with investment or growth opportunities (16). The market seems to react negatively to all of them, however, suggesting that it does not attach much credibility to the firm’s statements. The negative reaction to the dividend cut seems to persist in the case of the firms with the earnings declines, whereas it is reversed in the case of the firms with earnings increases or better investment opportunities.

Woolridge and Ghosh also found that firms that announced stock dividends or stock repurchases in conjunction with the dividend cuts fared much better than firms that did not. Finally, they noted the tendency across the entire sample for prices to correct

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themselves, at least partially, in the year following the dividend cut. This would suggest that markets tend to overreact to the initial dividend cut, and the price recovery can be attributed to the subsequent correction.

In an interesting case study, Soter, Brigham, and Evason looked at Florida Power & Light's dividend cut in 1994. FPL was the first healthy utility in the United States to cut dividends by a significant amount (32 percent). At the same time as it cut dividends, FPL announced that it was buying back 10 million shares over the next three years and emphasized that dividends would be linked more directly to earnings. On the day of the announcement, the stock price dropped 14 percent but recovered this amount in the month after the announcement and earned a return of 23.8 percent in the year after, significantly more than the S&P 500 over the period (11.2 percent) and other utilities (14.2 percent).

Lessons for Firms

There are several lessons for a firm that plans to change its dividend policy. First, no matter how good the rationale may be to cut dividends, it should expect markets to react negatively to the initial announcement for two reasons. The first reason is the well-founded skepticism with which markets greet any statement by the firm about dividend cuts. A second is that large dividend changes typically make the existing investor clientele unhappy. Although other stockholders may be happy with the new dividend policy, the transition will take time, during which stock prices fall. Second, if a firm has good reasons for cutting dividends, such as an increase in project availability, it will gain at least partial protection by providing information to markets about these projects.

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Dividend cuts and Investor reaction: A Behavioral Perspective

There are few corporate finance actions that managers dread more than cutting dividends, which may explain why they happen so infrequently. When firms that are paying too much, either because earnings have dropped or investment opportunities have

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increased, the rationale for cutting dividends may seem simple, there are reasons why these firms choose to put off making this decision:

a. **Indiscriminate investors**: There is evidence that the stock prices of firms that cut dividends drop, at the time of the announcement, no matter what the reasons for the action. In other words, investors seem to treat firms that cut dividends because of operating problems (declining earnings and losses) the same way that they treat firms that cut dividends to invest in potentially lucrative investments.

b. **Stock price drift**: Michaely, Thaler and Womack looked at 887 dividend omissions between 1964 and 1987 dividends find evidence that stock prices continue to drift downwards in the weeks after a dividend decrease. While some of this downward drift can be attributed to higher risk, it is possible that some of it is due to herd behavior on the part of investors. Boehme and Sorescu contest this conclusion by noting that the price drift is isolated to smaller firms.

There is, however, some good news for firms that do need to reduce dividends. Firms that can frame dividend decreases in terms that appeal to investors may be able to overcome the generally negative reaction from investors, at least over longer time periods. Bulan, Subramaniam and Talan divide dividend omissions into good and bad omissions based upon two factors. They find that firms that confront and deal with dividend problems early and use the cash from dividend omissions to retire debt see their stock prices recover more quickly than firms that allow the pain to linger and misuse the cash from dividend omissions.

**Conclusion**

We began this chapter by expanding our definition of cash returned to stockholder to include stock buybacks with dividends. Firms in the United States especially have turned to buying back stock and returning cash selectively to those investors who need it.

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With this expanded definition, we first used a cash flow–based approach to decide whether a firm is paying too much or too little to its stockholders. To form this judgment, we first estimate what the firm has available to pay out to its stockholders; we measure this cash flow by looking at the cash left over after reinvestment needs have been and debt has been serviced, and call it the free cash flow to equity. We then looked at the quality of the firm’s projects; firms with better projects get more leeway from equity investors to accumulate cash than firms with poor projects. We next consider the effect of wanting to increase or decrease the debt ratio on how much cash is returned to stockholders. Finally, we consider all three factors—the cash flow available for stockholders, the returns on existing investments, and the need to increase or decrease debt ratios—in coming up with broad conclusions about dividend policy. Firms with a good track record in investing can pay out less in dividends than is available in cash flows, and not face significant pressure from stockholders to pay out more. When the managers of firms are not trusted by their stockholders to invest wisely, firms are much more likely to face pressure to return excess cash to stockholders.

We also analyzed a firm’s dividend policy by looking at the dividend policies of comparable firms in the business. In this approach, a firm paying out less in dividends than comparable firms would be viewed as paying too little and one that is paying out more would be viewed as paying too much. We used both a narrow definition of comparable firms (firms in the same line of business) and a broader definition (all firms). We controlled for differences in risk and growth across firms using a multiple regression.

We closed the chapter by looking at how firms that intend to change their dividend policy can minimize the side costs of doing so. This is especially true when firms have to reduce their dividends to meet legitimate reinvestment needs. Although the initial reaction to the announcement of a dividend cut is likely to be negative, firms can buffer some of the impact by providing information to markets about the investments that they plan to accept with the funds.

Given the tax law changes, at least in the United States, in 2003, it may be time to revisit the whole basis for dividend policy. Historically, in the United States and Western Europe, firms have locked themselves into a dance with investors where they institute dividends and are then committed to maintaining these dividends, in good times and in
bad. In fact, much of what we observe in dividend policy—from sticky dividends to the reluctance to increase dividends in the face of good news and to cut dividends in the face of bad news—can be traced to this commitment. This commitment has also led companies to increasingly shift to stock buybacks as an alternative to dividends. If dividends no longer have a tax disadvantage, it is time for firms to shift to a more flexible dividend payout policy, where dividends reflect what they can afford to pay rather than their historical dividends.
Live Case Study
A Framework for Analyzing Dividends

Objective To determine whether your firm should change its dividend policy, based on an analysis of its investment opportunities and comparable firms.

Key Questions
• How much could this firm have returned to its stockholders over the past few years? How much did it actually return?
• Given this dividend policy and the current cash balance of this firm, would you push the firm to change its dividend policy (return more or less cash to its owners)?
• How does this firm’s dividend policy compare to those of its peer group and to the rest of the market?

Framework for Analysis
1. Cash Return to Stockholders
   • How much has the firm paid out in dividends each year for the past few years?
   • How much stock has it bought back each year for the past few years?
   • Cumulatively, how much cash has been returned to stockholders each year for the past few years?

2. Affordable Dividends
   • What was the FCFE that this firm had over the last few years?
   • What is the current cash balance for this firm?

3. Management Trust
   • How well have the managers of the firm picked investments, historically? (Look at the investment return section.)
   • Is there any reason to believe that future investments of this firm will be different from the historical record?

4. Changing Dividend Policy
   • Given the relationship between dividends and FCFE and the trust you have in the management of this firm, would you change this firm’s dividend policy?

5. Comparing to Sector and Market
• Relative to the sector to which this firm belongs, does it pay too much or too little in dividends? (Do a regression, if necessary.)
• Relative to the rest of the firms in the market, does it pay too much or too little in dividends? (Use the market regression, if necessary.)

Getting Information on Analyzing Dividend Policy

You can get the information that you need to estimate FCFE and returns on equity from past financials. You will also need a beta (see risk and return section) and a debt ratio (see risk and return section) to estimate the free cash flows to equity. Finally, you will need stock returns for your stock and the returns on a market index over the period of your analysis.

Online Sources of

Information

www.stern.nyu.edu/~adamodar/cfin2E/project/data.htm.
Questions and Problems

(In the problems below, you can use a risk premium of 5.5% and a tax rate of 40% if either is not specified)

1. Stock buybacks really do not return cash to stockholders, because only those who sell back stock receive the cash. Is this statement true or false? Explain.

2. Between 1988 and 2008, we saw an increase in the percent of cash returned to stockholders in the form of dividends. Why?

3. Lube Oil, a chain of automobile service stations, reports net income of $100 million after depreciation of $50 million. The firm has capital expenditures of $80 million, and the noncash working capital increased from $25 to $40 million. Estimate the firm’s FCFE, assuming that the firm is all equity financed.

4. Lube Oil, in Question 3, paid a dividend of $20 million and bought back $25 million in stock. Estimate how much the cash balance of the firm changed during the year.

5. How would your answers to the last two questions change if you were told that Lube Oil started the year with $120 million in debt and ended the year with $135 million?

6. Now assume that Lube Oil has a return on equity of 5 percent and a cost of equity of 10 percent. As a stockholder in Lube Oil, would you want the firm to change its dividend policy? Why or why not?

7. Tech Products reported a net loss of $80 million for the latest financial year. In addition, the firm reported a net capital expenditure of $70 million, and a change in noncash working capital of $10 million. Finally, the firm had $10 million in debt at the start of the year that it paid off during the year. Estimate the FCFE.

8. Tech Products, from Question 7, pays a dividend of $40 million. Assuming that the firm started the period with no cash, how did it raise the funding for the dividend payment?
9. New Age Telecomm is a young, high-growth telecommunications firm. It pays no dividends, though the average dividend payout for other firms in the telecommunications sector is 40 percent. Is New Age paying too little in dividends? Why or why not?

10. The following is a regression of dividend payout ratios on the risk and ln(market capitalization: in millions) of chemical firms:

Dividend Payout Ratio = 0.14 + 0.05 [ln (Market Capitalization in millions)] – 0.1 (Beta)

Harman Chemicals has a market capitalization of $1.5 billion and a beta of 1.2. It pays out 22 percent of its earnings as dividends. How does this dividend payout compare to the industry?

11. JLChem Corporation, a chemical manufacturing firm with changing investment opportunities, is considering a major change in dividend policy. It currently has 50 million shares outstanding and pays an annual dividend of $2 per share. The firm current and projected income statement are provided below (in millions):

<table>
<thead>
<tr>
<th></th>
<th>Current</th>
<th>Projected for Next Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBITDA</td>
<td>$1,200</td>
<td>$1,350</td>
</tr>
<tr>
<td>– Depreciation</td>
<td>$200</td>
<td>$250</td>
</tr>
<tr>
<td>EBIT</td>
<td>$1,000</td>
<td>$1,100</td>
</tr>
<tr>
<td>– Interest expense</td>
<td>$200</td>
<td>$200</td>
</tr>
<tr>
<td>EBT</td>
<td>$800</td>
<td>$900</td>
</tr>
<tr>
<td>– Taxes</td>
<td>$320</td>
<td>$360</td>
</tr>
<tr>
<td>Net income</td>
<td>$480</td>
<td>$540</td>
</tr>
</tbody>
</table>

The firm’s current capital expenditure is $500 million. It is considering five projects for the next year:

<table>
<thead>
<tr>
<th>Project</th>
<th>Investment</th>
<th>Beta</th>
<th>IRR (Using Cash Flows to Equity)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>$190 mil</td>
<td>0.6</td>
<td>12.0%</td>
</tr>
<tr>
<td>B</td>
<td>$200 mil</td>
<td>0.8</td>
<td>12.0%</td>
</tr>
<tr>
<td>C</td>
<td>$200 mil</td>
<td>1.0</td>
<td>14.5%</td>
</tr>
<tr>
<td>D</td>
<td>$200 mil</td>
<td>1.2</td>
<td>15.0%</td>
</tr>
</tbody>
</table>
The firm’s current beta is 1.0, and the current Treasury bill rate is 5.5 percent. The firm expects working capital to increase $50 million both this year and next. The firm plans to finance its net capital expenditures and working capital needs with 30 percent debt.

a. What is the firm’s current payout ratio?

b. What proportion of its current FCFE is it paying out as dividends?

c. What would your projected capital expenditure be for next year (i.e., which of the five projects would you accept and why)?

d. How much cash will the company have available to pay out as dividends next year? (What is the maximum amount the company can pay out as dividends?)

e. Would you pay out this maximum amount as dividends? Why or why not? What other considerations would you bring to this decision?

f. JKL Corporation currently has a cash balance of $100 million (after paying the current year’s dividends). If it pays out $125 million as dividends next year, what will its projected cash balance be at the end of the next year?

12. GL Corporation, a retail firm, is making a decision on how much it should pay out to its stockholders. It has $100 million in investible funds. The following information is provided about the firm:

- It has 100 million shares outstanding, each share selling for $15. The beta of the stock is 1.25 and the risk-free rate is 8 percent. The expected return on the market is 16 percent.
- The firm has $500 million of debt outstanding. The marginal interest rate on the debt is 12 percent.
- The corporate tax rate is 50 percent.
- The firm has the following investment projects:

<table>
<thead>
<tr>
<th>Project</th>
<th>Investment Requirement</th>
<th>After-Tax Return on Capital</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>$15 million</td>
<td>27%</td>
</tr>
<tr>
<td>B</td>
<td>$10 million</td>
<td>20%</td>
</tr>
<tr>
<td>C</td>
<td>$25 million</td>
<td>16%</td>
</tr>
</tbody>
</table>
The firm plans to finance all its investment needs at its current debt ratio.

a. Should the company return money to its stockholders?

b. If so, how much should be returned to stockholders?

13. InTech, a computer software firm that has never paid dividends before, is considering whether it should start doing so. This firm has a cost of equity of 22 percent and a cost of debt of 10 percent (the tax rate is 40 percent). The firm has $100 million in debt outstanding and 50 million shares outstanding, selling for $10 per share. The firm currently has net income of $90 million and depreciation charges of $10 million. It also has the following projects available:

<table>
<thead>
<tr>
<th>Project</th>
<th>Initial Investment</th>
<th>Annual EBIT</th>
<th>Salvage</th>
<th>Lifetime</th>
<th>Depreciation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$10 million</td>
<td>$1 mil</td>
<td>$500,000</td>
<td>5 years</td>
<td>$2.5 mil</td>
</tr>
<tr>
<td>2</td>
<td>$40 million</td>
<td>$5 mil</td>
<td>$1 million</td>
<td>10 years</td>
<td>$10 mil</td>
</tr>
<tr>
<td>3</td>
<td>$50 million</td>
<td>$5 mil</td>
<td>$1 million</td>
<td>10 years</td>
<td>$10 mil</td>
</tr>
</tbody>
</table>

The firm plans to finance its future capital investment needs using 20 percent debt.

a. Which of these projects should the firm accept?

b. How much (if any) should the firm pay out as dividends?

14. LimeAde, a large soft drink manufacturing firm, is faced with the decision of how much to pay out as dividends to its stockholders. It expects to have a net income of $1,000 (after depreciation of $500), and it has the following projects:

<table>
<thead>
<tr>
<th>Project</th>
<th>Initial Investment</th>
<th>Beta</th>
<th>IRR (to Equity Inv)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>$500</td>
<td>2.0</td>
<td>21%</td>
</tr>
<tr>
<td>B</td>
<td>$600</td>
<td>1.5</td>
<td>20%</td>
</tr>
<tr>
<td>C</td>
<td>$500</td>
<td>1.0</td>
<td>12%</td>
</tr>
</tbody>
</table>

The firm’s beta is 1.5 and the current risk-free rate is 6 percent. The firm plans to finance net capital expenditures (Cap Ex – Depreciation) and working capital with 20 percent debt. The firm also has current revenues of $5,000, which it expects to grow at 8 percent.
Working capital will be maintained at 25 percent of revenues. How much should the firm return to its stockholders as a dividend?

15. NoLone, an all-equity manufacturing firm, has net income of $100 million currently and expects this number to grow at 10 percent a year for the next three years. The firm’s working capital increased by $10 million this year and is expected to increase by the same dollar amount each of the next three years. The depreciation is $50 million and is expected to grow 8 percent a year for the next three years. Finally, the firm plans to invest $60 million in capital expenditure for each of the next three years. The firm pays 60 percent of its earnings as dividends each year. NoLone has a cash balance currently of $50 million. Assuming that the cash does not earn any interest, how much would you expect to have as a cash balance at the end of the third year?

16. Boston Turkey is a publicly traded firm, with the following income statement and balance sheet from its most recent financial year:

**Income Statement**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenues</td>
<td>$1,000,000</td>
</tr>
<tr>
<td>− Expenses</td>
<td>$400,000</td>
</tr>
<tr>
<td>− Depreciation</td>
<td>$100,000</td>
</tr>
<tr>
<td>EBIT</td>
<td>$500,000</td>
</tr>
<tr>
<td>− Interest Expense</td>
<td>$100,000</td>
</tr>
<tr>
<td>Taxable Income</td>
<td>$400,000</td>
</tr>
<tr>
<td>− Tax</td>
<td>$160,000</td>
</tr>
<tr>
<td>Net Income</td>
<td>$240,000</td>
</tr>
</tbody>
</table>

**Balance Sheet**

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property, plant, and equipment</td>
<td>Accounts payable</td>
</tr>
<tr>
<td>$1,500,000</td>
<td>$500,000</td>
</tr>
</tbody>
</table>
Land and buildings | $500,000 | Long-term debt | $1,000,000
Current assets | $1,000,000 | Equity (100,000 shares) | $1,500,000
Total | $3,000,000 | Total | $3,000,000

Boston Turkey expects its revenues to grow 10 percent next year and its expenses to remain at 40 percent of revenues. The depreciation and interest expenses will remain unchanged at $100,000 next year. The working capital, as a percentage of revenue, will also remain unchanged next year.

The managers of Boston Turkey claim to have several projects available to choose from next year, in which they plan to invest the funds from operations, and they suggest that the firm really should not be paying dividends. The projects have the following characteristics:

<table>
<thead>
<tr>
<th>Project</th>
<th>Equity Investment</th>
<th>Expected Annual Cash Flow to Equity</th>
<th>Beta</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>$100,000</td>
<td>12,500</td>
<td>1.00</td>
</tr>
<tr>
<td>B</td>
<td>$100,000</td>
<td>14,000</td>
<td>1.50</td>
</tr>
<tr>
<td>C</td>
<td>$50,000</td>
<td>8,000</td>
<td>1.80</td>
</tr>
<tr>
<td>D</td>
<td>$50,000</td>
<td>12,000</td>
<td>2.00</td>
</tr>
</tbody>
</table>

The Treasury bill rate is 3 percent, and the Treasury bond rate is 6.25 percent. The firm plans to finance 40 percent of its future net capital expenditures (Cap Ex – Depreciation) and working capital needs with debt.

a. How much can the company afford to pay in dividends next year?
b. Now assume that the firm actually pays out $1.00 per share in dividends next year. The current cash balance of the firm is $150,000. How much will the cash balance of the firm be at the end of next year, after the payment of the dividend?

17. Z-Tec, a firm providing Internet services, reported net income of $10 million in the most recent year, while making $25 million in capital expenditures (depreciation was $5 million). The firm had no working capital needs and uses no debt.

a. Can the firm afford to pay out dividends right now? Why or why not?
b. Assuming net income grows 40 percent a year and that net capital expenditures grow 10 percent a year, when will the firm be in a position to pay dividends?

18. You are analyzing the dividend policy of Conrail, a major railroad, and you have collected the following information from the past five years.

<table>
<thead>
<tr>
<th>Year</th>
<th>Net Income (Million)</th>
<th>Capital Expenditure (Million)</th>
<th>Depreciation (Million)</th>
<th>Noncash Working Capital (Million)</th>
<th>Dividends (Million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1991</td>
<td>$240</td>
<td>$314</td>
<td>$307</td>
<td>$35</td>
<td>$70</td>
</tr>
<tr>
<td>1992</td>
<td>$282</td>
<td>$466</td>
<td>$295</td>
<td>$(110)</td>
<td>$80</td>
</tr>
<tr>
<td>1993</td>
<td>$320</td>
<td>$566</td>
<td>$284</td>
<td>$215</td>
<td>$95</td>
</tr>
<tr>
<td>1994</td>
<td>$375</td>
<td>$490</td>
<td>$278</td>
<td>$175</td>
<td>$110</td>
</tr>
<tr>
<td>1995</td>
<td>$441</td>
<td>$494</td>
<td>$293</td>
<td>$250</td>
<td>$124</td>
</tr>
</tbody>
</table>

The average debt ratio during this period was 40 percent, and the total noncash working capital at the end of 1990 was $10 million.

a. Estimate how much Conrail could have paid in dividends during this period.

b. If the average return on equity during the period was 13.5 percent, and Conrail had a beta of 1.25, what conclusions would you draw about their dividend policy? (The average Treasure bond rate during the period was 7 percent, and the average return on the market was 12.5 percent during the period.)

19. Assume now that you have been asked to forecast cash flows that you will have available to repurchase stock and pay dividends during the next five years for Conrail (from Problem 18). In making these forecasts, you can assume the following:

- Net income is anticipated to grow 10 percent a year from 1995 levels for the next five years.
- Capital expenditures and depreciation are expected to grow 8 percent a year from 1995 levels.
- The revenues in 1995 were $3.75 billion and are expected to grow 5 percent each year for the next five years. The working capital as a percent of revenues is expected to remain at 1995 levels.
- The proportion of net capital expenditures and depreciation that will be financed with debt will drop to 30 percent.
a. Estimate how much cash Conrail will have available to pay dividends or repurchase stocks over the next five years.

b. How will the perceived uncertainty associated with these cash flows affect your decision on dividends and equity repurchases?

20. Cracker Barrel, which operates restaurants and gift stores, is reexamining its policy of paying minimal dividends. In 1995, Cracker Barrel reported net income of $66 million; it had capital expenditures of $150 million in that year and claimed depreciation of only $50 million. The working capital in 1995 was $43 million on sales of $783 million. Looking forward, Cracker Barrel expects the following:

- Net income is expected to grow 17 percent a year for the next five years.
- During the five years, capital expenditures are expected to grow 10 percent a year, and depreciation is expected to grow 15 percent a year.
- The working capital as a percent of revenues is expected to remain at 1995 levels, and revenues are expected to grow 10 percent a year during the period.
- The company has not used debt to finance its net capital expenditures and does not plan to use any for the next five years.

a. Estimate how much cash Cracker Barrel would have available to pay out to its stockholders over the next five years.

b. How would your answer change if the firm plans to increase its leverage by borrowing 25 percent of its net capital expenditure and working capital needs?

21. Assume that Cracker Barrel, from Problem 20, wants to continue with its policy of not paying dividends. You are the CEO of Cracker Barrel and have been confronted by dissident stockholders, demanding to know why you are not paying out your FCFE (estimated in the previous problem) to your stockholders. How would you defend your decision? How receptive will stockholders be to your defense? Would it make any difference that Cracker Barrel has earned a return on equity of 25 percent over the previous five years and that its beta is only 1.2?

22. Manpower, which provides nongovernment employment services in the United States, reported net income of $128 million in 1995. It had capital expenditures of $50 million and
depreciation of $24 million in 1995, and its working capital was $500 million (on revenues of $5 billion). The firm has a debt ratio of 10 percent and plans to maintain this debt ratio.

a. Estimate how much Manpower will have available to pay out as dividends next year.

b. The current cash balance is $143 million. If Manpower is expected to pay $12 million in dividends next year and repurchase no stock, estimate the expected cash balance at the end of the next year.

23. How would your answers to the previous problem change if Manpower in plans to pay off its outstanding debt of $100 million next year and become a debt-free company?

24. You are an institutional investor and have the collected the following information on five maritime firms to assess their dividend policies.

<table>
<thead>
<tr>
<th>Company</th>
<th>FCFE</th>
<th>Dividends Paid</th>
<th>ROE</th>
<th>Beta</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alexander &amp; Brown</td>
<td>$55</td>
<td>$35</td>
<td>8%</td>
<td>0.80</td>
</tr>
<tr>
<td>American President</td>
<td>$60</td>
<td>$12</td>
<td>14.5%</td>
<td>1.30</td>
</tr>
<tr>
<td>OMI</td>
<td>–$15</td>
<td>$5</td>
<td>4.0%</td>
<td>1.25</td>
</tr>
<tr>
<td>Overseas Shipholding</td>
<td>$20</td>
<td>$12</td>
<td>1.5%</td>
<td>0.90</td>
</tr>
<tr>
<td>Sea Containers</td>
<td>–$5</td>
<td>$8</td>
<td>14%</td>
<td>1.05</td>
</tr>
</tbody>
</table>

The average risk-free rate during the period was 7 percent, and the average return on the market was 12 percent.

a. Assess which of these firms you would pressure to pay more in dividends.

b. Which of the firms would you encourage to pay less in dividends?

c. How would you modify this analysis to reflect your expectations about the future of the entire sector?

25. You are analyzing the dividend policy of Black and Decker, a manufacturer of tools and appliances. The following table summarizes the dividend payout ratios, yields, and expected growth rates of other firms in the waste disposal business.

<table>
<thead>
<tr>
<th>Company</th>
<th>Payout Ratio</th>
<th>Dividend Yield</th>
<th>Ex. Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fedders</td>
<td>11%</td>
<td>1.2%</td>
<td>11.0%</td>
</tr>
</tbody>
</table>

11.67
Maytag | 37% | 2.8% | 23.0%
National Presto | 67% | 4.9% | 13.5%
Toro | 15% | 1.5% | 16.5%
Whirlpool | 30% | 2.5% | 20.5%
Black & Decker | 24% | 1.3% | 23.0%

a. Compare Black and Decker’s dividend policy to those of its peers, using the average dividend payout ratios and yields.

b. Do the same comparison, controlling for differences in expected growth.

26. The following regression was run using all NYSE firms in 1995

\[
\text{YIELD} = 0.0478 - 0.0157 \text{BETA} + 0.0000008 \text{MKTCAP} + 0.006797 \text{DBTRATIO} + 0.0002 \text{ROE} - 0.09 \text{NCEX/TA}
\]

\[
R^2 = 12.88\%
\]

where BETA = beta of the stock, MKTCAP = market value of equity + book value of debt, DBTRATIO = book value of debt/MKTCAP, ROE = return on equity in 1994, and NCEX/TA = (capital expenditures – depreciation)/total assets. The corresponding values for Black and Decker, in 1995, were as follows:

- Beta = 1.30
- MKTCAP = $5,500 million
- DBTRATIO = 35%
- ROE = 14.5%
- NCEX/TA = 4.00%

Black and Decker had a dividend yield of 1.3 percent and a dividend payout ratio of 24 percent in 1995.

a. Estimate the dividend yield for Black and Decker, based on the regression.

b. Why might your answer be different using this approach than the answer to the prior question, where you used only the comparable firms?

27. Handy and Harman, a leading fabricator of precious metal alloys, pays out only 23 percent of its earnings as dividends. The average dividend payout ratio for metal fabricating firms is 45 percent. The average growth rate in earnings for the entire sector is 10 percent (Handy and Harman is expected to grow 23 percent). Should Handy and
Harman pay more in dividends just to get closer to the average payout ratio? Why or why not?
In this chapter, we look at how to value a firm and its equity, given what we now know about investment, financing, and dividend decisions. We will consider three approaches to valuation. The first and most fundamental approach to valuing a firm is discounted cash flow valuation, which extends the present value principles that we developed to analyze projects to value a firm. The value of any firm is determined by four factors—its capacity to generate cash flows from assets in place, the expected growth rate of these cash flows, the length of time it will take for the firm to reach stable growth, and the cost of capital. Consequently, to increase the value of a firm, we have to change one or more of these variables.

The second way of valuing a firm or its equity is to based the value on how the market is valuing similar or comparable firms; this approach is called relative valuation. This approach can yield values that are different from a discounted cash flow valuation, and we will look at some of the reasons these differences occur.

The third approach to valuing a firm applies for highly levered firms, where the equity acquires the characteristics of a call option. In this special case, equity becomes more valuable, as debt maturity increases and the volatility in asset value goes up. Equity investors, in effect, derive their value from the expectation (or hope) that asset value will increase over time.

In a departure from previous chapters, we will take the perspective of investors in financial markets in estimating value. Investors assess the value of a firm’s stock to decide whether to buy the stock or, if they already own it, whether to continue holding it.

Discounted Cash Flow Valuation

In discounted cash flow valuation, we estimate the value of any asset by discounting the expected cash flows on that asset at a rate that reflects their riskiness. In a sense, we measure the intrinsic value of an asset. The value of any asset is a function of the cash flows generated by that asset, the life of the asset, the expected growth in the cash flows, and the riskiness associated with these cashflows. In other words, it is the present value of the expected cash flows on that asset.
Value of Asset = \sum_{t=1}^{t=N} \frac{E(Cash Flow_t)}{(1 + r)^t}

where the asset has a life of \( N \) years and \( r \) is the discount rate that reflects both the riskiness of the cash flows and financing mix used to acquire the asset. If we view a firm as a portfolio of assets, this equation can be extended to value a firm, using cash flows to the firm over its life and a discount rate that reflects the collective risk of the firm’s assets.

This process is complicated by the fact that although some of the assets of a firm have already been created, and thus are assets-in-place, a significant component of firm value reflects expectations about future investments. Thus we not only need to measure the cash flows from current investments but also must estimate the expected value from future investments. In the sections that follow, we will introduce the discounted cash flow model in steps. We begin by discussing two different ways of approaching valuation—equity and firm valuation—and then move on to consider how best to estimate the inputs into valuation models. We then consider how to go from the value of a firm to the value of equity per share.

**Equity Valuation versus Firm Valuation**

There are two paths to discounted cash flow valuation—the first is to value just the equity stake in the business; the second is to value the entire firm, including equity and any other claims in the firm (from bondholders, preferred stockholders, etc.). Although both approaches discount expected cash flows, the relevant cash flows and discount rates are different for each.

The **value of equity** is obtained by discounting expected cash flows to equity—that is, the residual cash flows after meeting all operating expenses, tax obligations, and interest and principal payments—at the cost of equity—that is, the rate of return required by equity investors in the firm.

\[
Value of Equity = \sum_{t=1}^{t=n} \frac{CF \text{ to Equity}_t}{(1 + k_e)^t}
\]
where $CF_t =$ expected cash flow to equity in period $t$, and $k_e =$ cost of equity. The dividend discount model is a special case of equity valuation, where the value of a stock is the present value of expected future dividends.

The **value of the firm** is obtained by discounting expected cash flows to the firm, that is, residual cash flows after meeting all operating expenses, taxes and reinvestment needs, but prior to debt payments—at the weighted average cost of capital (WACC)—that is, the cost of the different components of financing used by the firm, weighted by their market value proportions.

$$\text{Value of Firm} = \sum_{t=1}^{T} \frac{CF_t}{(1 + \text{WACC})^t}$$

where $CF_t =$ expected cash flow to firm in period $t$, and $\text{WACC} =$ weighted average cost of capital. Although the two approaches use different definitions of cash flow and discount rates, they will yield consistent estimates of the value of equity as long as the same set of assumptions is applied for both. It is important to avoid mismatching cash flows and discount rates, because discounting cash flows to equity at the weighted average cost of capital will lead to an upwardly biased estimate of the value of equity, whereas discounting cash flows to the firm at the cost of equity will yield a downwardly biased estimate of the value of the firm.

### 12.1 Firm Valuation and Leverage

It is often argued that equity valuation requires more assumptions than firm valuation, because cash flows to equity require explicit assumptions about changes in leverage, whereas cash flows to the firm are predebt cash flows and do not require assumptions about leverage. Is this true?

a. Yes
b. No

Explain.
Choosing the Right Valuation Model

All discounted cash flow models ultimately boil down to estimating four inputs—current cash flows, an expected growth rate in these cash flows, a point in time when the firm will be growing at a rate it can sustain forever, and a discount rate to use in discounting these cash flows. In this section, we will examine the choices available in terms of each of these inputs.

In terms of cash flows, there are three choices—dividends or free cash flows to equity (FCFE) for equity valuation models, and free cash flows to the firm (FCFF) for firm valuation models. Discounting dividends usually provides the most conservative estimate of value for the equity in any firm, because most firms pay less in dividends than they can afford to. In the dividend policy section, we noted that the FCFE, that is, the cash flow left over after meeting all investment needs and making debt payments, is the amount that a firm can pay in dividends. The value of equity, based on the FCFE, will therefore yield a more realistic estimate of value for equity, especially in the context of a takeover, since the acquirer can lay claim to the entire FCFE rather than just the dividends. Even if a firm is not the target of a takeover, it can be argued that the value of equity has to reflect the possibility of a takeover, and hence the expected FCFE. The choice between FCFE and FCFF is really a choice between equity and firm valuation. Done consistently, both approaches should yield the same values for the equity in a business. As a practical concern, however, cash flows to equity are after net debt issues or payments and become much more difficult to estimate when financial leverage is changing over time, whereas cash flows to the firm are predebt cash flows and are unaffected by changes in financial leverage. Ease of use dictates that firm valuation will be more straightforward under this scenario.

Although we can estimate cash flows from the most recent financial statements, the challenge in valuation is in estimating them in future years. In most valuations, this takes the form of an expected growth rate in earnings that is then used to forecast earnings and cash flows in future periods. The growth rates estimated should be consistent with our definition of cash flows. When forecasting cash flows to equity, we will generally forecast growth in net income or earnings per share that are measures of
equity earnings. When forecasting cash flows to the firm, the growth rate that matters is the growth rate in operating earnings.\footnote{We should generally become much more conservative in our growth estimates as we move up the income statements. Generally, growth in earnings per share will be lower than the growth in net income, and growth in net income will be lower than the growth in operating income.}

The choice of discount rates will be dictated by the choice in cash flows. If the cash flow being discounted is dividends or FCFE, the appropriate discount rate is the cost of equity. If the cash flow being discounted is the cash flow to the firm, the discount rate has to be the cost of capital.

The final choice that all discounted cash flow models have to make relates to expected growth patterns. Because firms have infinite lives, the way we apply closure is to estimate a terminal value at a point in time and dispense with estimating cash flows beyond that point. To do this in the context of discounted cash flow valuation, we have to assume that the growth rate in cash flows beyond this point in time are constant forever, an assumption that we refer to as stable growth. If we do this, the present value of these cash flows can be estimated as the present value of a growing perpetuity. There are three questions that every valuation then has to answer:

1. How long into the future will a company be able to grow at a rate higher than the stable growth rate?
2. How high will the growth rate be during the high-growth period, and what pattern will it follow?
3. What will happen to the firm’s fundamentals (risk, cash flow patterns, etc.) as the expected growth rate changes?

At the risk of being simplistic, we can broadly classify growth patterns into three categories—firms that are in stable growth already, firms that expect to maintain a constant high growth rate for a period and then drop abruptly to stable growth, and firms that will have high growth for a specified period and then grow through a transition phase to reach stable growth at some point in the future. As a practical point, it is important that as the growth rate changes, the firm’s risk and cash flow characteristics change as well. In general, as expected growth declines toward stable growth, firms should see their risk
approach the average and reinvestment needs decline. These choices are summarized in Figure 12.1.

**Figure 12.1 The Ingredients in a Valuation**

Cashflows can be
- After debt payments to equity
  - Dividends
  - Free Cashflow to Equity
- Before debt payments to firm
  - Free Cashflow to Firm

Growth rate can be
- In Equity Earnings
  - Net Income
  - Earnings per share
- In Operating Earnings

Firm is in stable growth which it can sustain forever

Expected Cashflows during extraordinary growth phase
Terminal Value

Discount the cashflows and terminal value to the present

Present value is
- Value of equity, if cashflows to equity discounted at cost of equity
- Value of operating assets of the firm, if cashflows to firm discounted at the cost of capital

Discount Rate can be
- Cost of equity, if cashflows are equity cashflows
- Cost of capital, if cashflows are to the firm

We will examine each of these valuation models in more detail in the next section.

![model.xls](image-url): This spreadsheet allows you to pick the right discounted cash flow valuation model for your needs, given the characteristics of the business you are valuing.

**In Practice: What Is a Stable Growth Rate?**

Determining when your firm will be in stable growth is difficult to do without first defining what we mean by a stable growth rate. There are two insights to keep in mind when estimating a stable growth rate. First, because the growth rate in the firm’s cash flows is expected to last forever, the firm’s other measures of performance (including revenues, earnings, and reinvestment) can be expected to grow at the same rate. Consider the long-term consequences of a firm whose earnings grow 6 percent a year forever while its dividends grow at 8 percent. Over time, the dividends will exceed earnings. Similarly, if a firm’s earnings grow at a faster rate than its dividends in the long run, the payout ratio will converge toward zero, which is also not a steady state. The second issue relates to what growth rate is reasonable as a stable growth rate. Again, the assumption that this growth rate will last forever establishes rigorous constraints on reasonableness. In the long run, a firm cannot grow at a rate significantly greater than the growth rate in the economy in which it operates. Thus, a firm that grows at 8 percent
forever in an economy growing at 4 percent will eventually become larger than the economy. In practical terms, if the valuation is done in nominal (real) terms, the stable growth rate cannot be larger than the nominal (real) growth rate in the economy in which the firm operates.

Can a stable growth rate be much lower than the growth rate in the economy? There are no logical or mathematical limits on the downside. Firms that have stable growth rates much lower than the growth rate in the economy will become smaller in proportion to the economy over time. Because there is no economic basis for arguing that this cannot happen, there is no reason to prevent analysts from using a stable growth rate much lower than the nominal growth rate in the economy. In fact, the stable growth rate can be a negative number. Using a negative stable growth rate will ensure that your firm peaks in the last year of high growth and becomes smaller each year after that.

There is one rule of thumb that works well in setting a cap on the stable growth rate. The stable growth rate should not exceed the risk-free rate used in a valuation. Why should the two be related? The risk-free rate can be decomposed into an expected inflation rate and an expected real interest rate. If we assume that the real growth rate of an economy will be equal to the real interest rate in the long run, the risk-free rate becomes a proxy for the nominal growth rate in the economy.

12.2 Cyclical Firms and Constant Growth Rates

Models built on the assumption of an expected constant growth rate over time cannot be used for cyclical firms, whose earnings growth is likely to be very volatile over time—high during economic booms, and very low or negative during recessions.

a. True
b. False

Explain.

Estimation in Discounted Cash Flow Models

Although all discounted cash flow models require the same four ingredients—cash flows, a discount rate, a period of high growth, and a growth rate during the
period—there are different estimation challenges we face with each model. In this section, we will begin by estimating these inputs to the simplest of the three models, the dividend discount model, and then extend the discussion to cash flow to equity and firm valuation models.

**1. Dividend Discount Models**

When an investor buys stock, he or she generally expects to get two types of cash flows—dividends during the holding period and an expected price at the end of the holding period. Because this expected price is itself determined by future dividends, the value of a stock is the present value of just expected dividends. The dividend discount model is therefore the most direct and most conservative way of valuing a stock because it counts only those cash flows that are actually paid out to stockholders.

**Setting Up the Model**

In its most general form, the value of a stock in the dividend discount model is the present value of the expected dividends on the stock in perpetuity.

\[
\text{Value per share of stock} = \sum_{t=1}^{\infty} \frac{\text{Expected Dividends in period } t}{(1 + \text{Cost of Equity})^t}
\]

Because we cannot estimate dividends in perpetuity, we generally allow for a period where dividends can grow at extraordinary rates, but we allow for closure in the model by assuming that the growth rate will decline to a stable rate that can be sustained forever at some point in the future. By assuming stable growth at some point in the future, we can stop estimating annual dividends and estimate what we think the stock will be worth at the end of the extraordinary growth period.

\[
\text{Value}_0 = \sum_{t=1}^{n} \frac{\text{E(Dividends)}_t}{(1 + r)^t} + \frac{\text{Terminal Value}_n}{(1 + r)^n} \quad \text{where Terminal Value}_n = \frac{\text{E(Dividends)}_{n+1}}{(r_n - g_n)}
\]
where \( r \) is the cost of equity and \( g_n \) is the expected growth rate in dividends in perpetuity after year \( n \). Note that it is possible for a firm to already be in stable growth, in which case this model collapses into its simplest form:

\[
\text{Value of a Stock in Stable Growth} = \frac{\text{Expected Dividends Next Year}}{r_n - g_n}
\]

This model is called the Gordon growth model and is a special case of the dividend discount model. It can be used only for firms that are already in stable growth.3

**Estimating Model Inputs**

By breaking down the general version of the dividend discount model, we find four basic components. The first is the length of the high-growth period, during which the firm can sustain extraordinary growth. The second is the expected dividends each year during the high-growth period. The third is the cost of equity that stockholders will demand for holding the stock, based on their assessments of risk. The final input is the expected price at the end of the high-growth period—the **terminal value**. In this section, we will consider the challenges associated with estimating each of these components.

**a. Length of High-Growth Period**

The question of how long a firm will be able to sustain high growth is perhaps the most difficult to answer in a valuation, but two points are worth keeping in mind. One is that it is not a question of whether but when; all firms will ultimately become stable-growth firms, because high growth makes firms larger, and the firm’s size will eventually become a barrier to further growth. The second is that high growth in valuation, at least high growth that creates value, comes from firms earning high returns on their marginal investments. Using the terminology that we have used before in investment analysis, it comes from firms having a return on equity (capital) that is well in excess of the cost of equity (capital). Thus, when we assume that a firm will experience

---

2 The cost of equity can be different for the high-growth and stable growth periods. Hence, \( r_n \) is the cost of equity for the stable growth period.

3 When the Gordon growth model is used to value high-growth companies, it is entirely possible that \( g > r \) and the model will yield a negative value. If this occurs, the problem is not with the model but in its misapplication to a high-growth firm.
high growth for the next five or ten years, we also implicitly assume that it will earn
excess returns (over and above the cost of equity or capital) during that period. In a
competitive market, these excess returns will eventually draw in new competitors, and the
excess returns will disappear.

We should look at three factors when considering how long a firm will be able to
maintain high growth.

1. **Size of the Firm in relation to the market:** Smaller firms are much more likely to
earn excess returns and maintain them than otherwise similar larger firms. This is so
because they have more room to grow and a larger potential market. When looking at
the size of the firm, we should look not only at its current market share but also the
potential growth in the total market for its products or services. Thus, Microsoft may
have a large market share of the computer software market, but it may be able to
grow in spite of it because the entire software market is growing. On the other hand,
Boeing dominates the market for commercial aircraft, but we do not expect the
overall market for aircraft to increase substantially. Boeing, therefore, is far more
constrained in terms of future growth.

2. **Existing Growth Rate and Excess Returns:** Although the returns we would like to
estimate are the marginal returns on new investments, there is a high correlation
between the returns on current investments and these marginal returns. Thus, a firm
earning excess returns of 20 percent on its current investments is far more likely to
have large positive excess returns on its marginal investments and a long growth
period than a firm currently earning excess returns of 2 percent. There are cases
where this rule will not work, such as in industries going through major restructuring.

3. **Magnitude and Sustainability of Competitive Advantages:** This is perhaps the most
critical determinant of the length of the high-growth period. If there are significant
barriers to entry and sustainable competitive advantages, firms can maintain high
growth for longer periods. On the other hand, if there are no or only minor barriers to
entry, or if the firm’s existing competitive advantages are fading, we should be far
more conservative about allowing for long growth periods. The quality of existing
management also influences growth. Some top managers have the capacity to make the strategic choices that increase competitive advantages and create new ones.\textsuperscript{4}

Again, the sensitivity of value to changes in the length of the high-growth period can always be estimated. Some analysts use growth periods greater than ten years, but the combination of high growth rates and long periods creates a potent mix in terms of increasing the size of the firm, in many cases well beyond the realm of what is reasonable. Looking back, there are very few firms that have been able to grow at high rates for more than ten years.

\textit{Illustration 12.1 Length of High-Growth Period}

To assess how long high growth will last at Disney, Aracruz, and Tata Chemicals, we assessed their standings on each of the above characteristics in Table 12.1.

\textit{Table 12.1 Assessment of Length of High-Growth Period}

<table>
<thead>
<tr>
<th></th>
<th>Disney</th>
<th>Aracruz</th>
<th>Tata Chemicals</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Firm size/market size</strong></td>
<td>Firm is one of the largest players in the entertainment and theme park business, but the businesses are being redefined and are expanding.</td>
<td>Firm has a small market share of the paper/pulp business, but the business is mature.</td>
<td>Firm has a large market share of Indian (domestic) market, but is small by global standards. Domestic market is also growing.</td>
</tr>
<tr>
<td><strong>Current excess returns</strong></td>
<td>Firm is earning less than its cost of capital and has done so for past few years.</td>
<td>Returns on capital are largely a function of paper/pulp prices, but on average have been less than the cost of capital.</td>
<td>Firm has a return on capital that is roughly equal to its cost of capital.</td>
</tr>
<tr>
<td><strong>Competitive advantages</strong></td>
<td>Has some of the most recognized brand names in the world. Knows more about operating theme parks than any other firm in the world. Has skilled</td>
<td>Cost advantages because of access to Brazilian rain forests. Has invested in newer, updated plants and has skilled workforce.</td>
<td>Has cost advantages, because of lower labor and production costs in India.</td>
</tr>
</tbody>
</table>

\textsuperscript{4}Jack Welch at GE and Robert Goizueta at Coca-Cola are good examples of CEOs who made a profound difference in the growth of their firms and the market assessment of their values.
Using the same template for Deutsche Bank, its size and maturity work against high growth in its asset base, but in the current banking turmoil, Deutsche Bank’s biggest competitive advantage is its safety and stability, as competitors are forced to raise fresh capital to meet regulatory requirements. As a consequence, we expect Deutsche Bank’s income to rebound from current levels over the next five years. What about Bookscape? The single biggest competitive advantage possessed by this firm is its long-term lease at favorable terms in a superb location in New York City. It is unlikely that the firm will be able to replicate this advantage elsewhere. In addition, this is a private firm, which leads us to conclude that there will be no high-growth period.

12.3. Length of High-Growth Period and Barriers to Entry

Assume that you are analyzing two firms, both of which are enjoying high growth. The first firm is Earthlink Network, an Internet service provider, which operates in an environment with few barriers to entry and extraordinary competition. The second firm is Biogen, a biotechnology firm that is enjoying growth from two drugs for which it owns patents for the next decade. Assuming that both firms are well managed, which of the two firms would you expect to have a longer high-growth period?

a. Earthlink Network
b. Biogen

Both are well managed and should have the same high-growth period

b. Expected Dividends during High-Growth Period

The first step in estimating expected dividends during the high-growth period is to estimate the expected earnings for each year. This can be done in one of two ways—you
can apply an expected growth rate to current earnings, or you can begin by estimating future revenues first and then estimate net profit margins in each year. The first approach is easier, but the second provides for more flexibility because margins can change over time. The resulting expected earnings are paired with estimated dividend payout ratios in each period, which may change over the high-growth period. This may seem like an awkward procedure, because expected dividends could well be estimated using the current dividends and applying a dividend growth rate, but it is used for two reasons. First, most analyst projections for growth are stated in terms of revenues and earnings rather than dividends. Second, separating earnings forecasts from dividend payout provides more flexibility in terms of changing dividend payout ratios as earnings growth rates change. In particular, it allows us to raise dividend payout ratios as earnings growth rates decline.

The growth rate in earnings can be estimated using one of three approaches. The first is to look at the past and measure the **historical growth rate in earnings** over previous years. When measuring earnings growth, we have to consider how far back to go in time and whether to use arithmetic average or geometric average growth rates. In general, geometric growth rates yield more meaningful values than arithmetic average growth rates.

The second is to look at estimates made by others following the same stock. In fact, growth estimates made by equity research analysts following a stock are public information and are easily accessible. The third is to consider the fundamentals and to estimate a growth rate based on a firm’s investment policy. In particular, the growth in earnings per share of a firm can be written as the product of two variables—the percentage of the net income retained in the firm to generate future growth (retention ratio) and the return earned on equity in these new investments:

---

5 Arithmetic average growth rates represent simple averages of growth rates over multiple years. The geometric average growth rate is a compounded growth rate.
Expected Growth Rate = Retention Ratio \times Return on Equity

Thus, a firm with a return on equity of 20 percent and a retention ratio of 70 percent should have earnings growth of 14 percent a year. Reverting back to the discussion of dividend policy in Chapter 10, note that the retention ratio and the payout ratio are two sides of the same coin:

Retention Ratio = 1 – Payout Ratio

Because the retention ratio cannot exceed 100 percent, the expected growth in earnings per share in the long run for a firm cannot exceed its return on equity.

Assuming that we can obtain all three estimates of the growth rate in earnings for a firm, which one should we use in valuing a company? Past growth should be weighted least, because earnings are volatile and past growth has generally not been highly correlated with future growth.\(^7\) Analyst estimates are useful signposts of what the investment community thinks about a company and could include information that is not in the financial statements. In particular, it could reflect changes in both the company’s management and strategic plans. However, trusting analysts, no matter how well informed they may be, to come up with the most important input in a valuation is not prudent. Ultimately, the fundamental growth equation offers the most promise because it relates growth back to what the firm does and also constrains us to pay for growth (by requiring firms to reinvest) as we estimate value.

\(^7\)I/B/E/S, First Call, and Zacks are services that track equity research analyst forecasts continuously, and the consensus estimate across all analysts is publicly available.

\(^6\)One of the most famous studies of growth was titled “Higgledy Piggledy Growth” (I. M. D. Little, 1962, *Higgledy Piggledy Growth*, Oxford: Institute of Statistics) precisely because earnings growth was so difficult to predict based on history.

### 12.4. Differences in Growth Rates

The growth rates from historical earnings, analyst projections, and fundamentals can often be very different. These differences can be best explained by which of the following statements?

a. The past is not always a good indicator of the future
b. Analysts are biased toward making optimistic estimates of growth.
c. The inputs used to estimate fundamental growth reflect what happened last year rather than what we expect will happen in the future.

d. All of the above.

Illustration 12.2 Growth in Earnings per Share: Deutsche Bank in early 2008

In January 2008, in calmer times, we estimated the earnings growth for Deutsche Bank, using fundamentals. In 2007, Deutsche Bank reported net income of 6.51 billion Euros on a book value of equity of 33.475 billion Euros at the start of the year (end of 2006). The resulting return on equity is 19.45%:

\[
\text{Return on Equity} = \frac{\text{Net Income}_{2007}}{\text{Book Value of Equity}_{2006}} = \frac{6,510}{33,475} = 19.45\%
\]

In 2007, Deutsche Bank paid out 2.146 billion Euros to equity investors. The resulting retention ratio is 67.03%.

\[
\text{Retention Ratio} = 1 - \frac{\text{Dividends}}{\text{Net Income}} = 1 - \frac{2,146}{6,510} = 67.03\%
\]

If Deutsche Bank maintains the return on equity (ROE) and retention ratio that it delivered in 2007 for the long run, its expected growth rate in earnings will be strong.

\[
\text{Expected Growth Rate}_{\text{Existing Fundamentals}} = \text{Retention Ratio} \times \text{ROE} = 0.6703 \times 0.1945 = 13.04\%
\]

The danger with this estimate is that it is based upon 2007, a very profitable year for Deutsche Bank. If we replace the net income in 2007 with average net income from 2003 to 2007, we arrive at lower estimates of ROE and expected growth rate:

\[
\text{Normalized Return on Equity} = \frac{\text{Average Net Income}_{2003-07}}{\text{Book Value of Equity}_{2006}} = \frac{3,954}{33,475} = 11.81\%
\]

\[
\text{Normalized Retention Ratio} = 1 - \frac{\text{Dividends}}{\text{Net Income}} = 1 - \frac{2,146}{3,954} = 45.72\%
\]

\[
\text{Expected Growth Rate}_{\text{Normalized Fundamentals}} = \text{Retention Ratio} \times \text{ROE} = 0.4572 \times 0.1181 = 5.40\%
\]

How does this contrast and compare to the historical growth in net income at Deutsche Bank? Deutsche Bank’s net income grew from 1.365 billion Euros in 2003 to 6.510 billion Euros in 2007, resulting in a compounded earnings growth rate of 47.78%.
Compounded Earnings Growth Rate = \left( \frac{\text{Net Income}_{2007}}{\text{Net Income}_{2003}} \right)^{1/4} - 1 = \left( \frac{6,510}{1,365} \right)^{1/4} - 1 = 47.78\%

This high growth rate, however, reflects the fact that the net income at Deutsche Bank was depressed between 2001 and 2003 and that much of this growth reflect a recovery back to more normal earnings levels.

In hindsight, all of these estimates of earnings growth would have been wrong, since the financial crisis in 2008 caused billions of dollars in write-offs at Deutsche Bank and the firm reported a loss of 3.896 billion Euros for the year. In the first quarter of 2009, Deutsche Bank reported a return to profitability and net income in excess of 1 billion Euros.

c. Cost of Equity

The dividends and terminal price should be discounted back at a rate that reflects the risk in the investment to stockholders to arrive at the current value. In Chapter 4, we argued that the only risk that diversified investors see in a stock is market risk, and this risk can be measured with a beta (in the capital asset pricing model) or multiple betas (in the arbitrage pricing or multifactor models). The same reasoning applies here. In fact, the costs of equity that we estimated for Disney, Deutsche Bank, and Aracruz in Chapter 4 will be the costs of equity that will be used if we were valuing stock in these companies using a dividend discount model. The only point that relates specifically to valuation is that high-growth firms tend to have higher betas than low-growth firms. Building on this premise, it is important that as we change growth rates over time, we also adjust risk accordingly. Thus, when a firm goes from high growth to low growth, its beta should be moved toward one to reflect the lower growth.

d. Terminal Value

The last component of the model is the value attached to the equity at the end of a period of high growth. This value is estimated from expected dividends in the first time period following the high-growth period, the cost of equity in the stable phase, and the expected stable growth rate in dividends as follows:

\[
\text{Value of Equity in year } n = \frac{\text{Expected Dividends}_{n+1}}{r_n - g_n}
\]
where \( r_n \) is the cost of equity in the stable growth period and \( g_n \) is the expected growth rate in dividends beyond year \( n \) (forever).

Before you estimate terminal value, you need to map out a path for the earnings growth during the high growth phase to move toward the stable growth rate. The simplest assumption to make is that your earnings growth rate is constant for the high-growth period, after which the growth rate drops to the stable level, as shown in Figure 12.2.

*Figure 12.2: Two-Stage Growth Model*

This is a two-stage model, and its limitation is obvious. It assumes that the growth rate is high during the initial period and is transformed overnight to a lower, stable rate at the end of the period. Although these sudden transformations in growth can happen, it is much more realistic to assume that the shift from high growth to stable growth happens gradually over time. The assumption that the growth rate drops precipitously from its level in the initial phase to a stable rate also implies that this model is more appropriate for firms with modest growth rates in the initial phase. For instance, it is more reasonable to assume that a firm growing at 8 percent in the high-growth period will see its growth rate drop to 4 percent, than it is for a firm growing at 40 percent in the high-growth period. If we assume that the growth rate and payout ratio are fixed for the high-growth period, the present value of the dividends during the high-growth period can be estimated as follows:

\[ \text{PV of dividends during high-growth period} = \frac{g}{r_n - g_n} \]

Unlike the stable growth model equation, this one can be used even if the expected growth rate exceeds the discount rate. Although this makes the denominator negative, it will also result in a negative numerator, and the net effect will be positive. The only condition when it will not work if \( g = r_n \), but the PV of
PV of High-growth dividends\(d_0\) = \[\frac{\text{Dividends}_0 \times (1 + g) \times \left(1 - \frac{(1 + g)^n}{(1 + r)^n}\right)}{r - g}\]

A more general formulation would allow for growth during the high-growth period, followed by a gradual reduction to stable growth over a transition period, as illustrated in Figure 12.3.

*Figure 12.3: High Growth followed by transition*

This model allows for growth rates and payout ratios to change gradually during the transition period.

Whatever path you devise to get your firm to stable growth, it is not just the growth rate that should change in stable growth. The other characteristics of the firm should also change to reflect the stable growth rates.

- The cost of equity should be more reflective of that of a mature firm. If it is being estimated using a beta, that beta should be closer to one in stable growth even though it can take on very high or very low values in high growth.
- The dividend payout ratio, which is usually low or zero for high-growth firms, should increase as the firm becomes a stable-growth firm. In fact, drawing on the fundamental growth equation from the last section, we can estimate the payout ratio in stable growth:

\[
\text{dividends in that case will just be the product of the number of years of growth and dividends today because the growth and the discounting effects each year will cancel out.}
\]
Dividend Payout Ratio = 1 – Retention Ratio = 1 – \frac{g_{\text{Stable}}}{\text{ROE}_{\text{Stable}}}

If we expect the stable growth rate to be 4 percent and the return on equity in stable growth to be 12 percent, the payout ratio in stable growth will be 66.67 percent (1 – 4/12).

- The return on equity in stable growth, if used to estimate the payout ratio, should be also reflective of a stable-growth firm. The most conservative estimate to make in stable growth is that the return on equity will be equal to the cost of equity, thus denying the firm the possibility of excess returns in perpetuity. If this is too rigid a framework, you can assume that the return on equity will converge on an industry average in the stable-growth phase.

If there is a transition period for growth, as in Figure 12.3, the betas and payout ratios should adjust in the transition period, as the growth rate changes.

![12.5. Terminal Value and Present Value](image)

The bulk of the present value in most discounted cash flow valuations comes from the terminal value. Therefore it is reasonable to conclude that the assumptions about growth during the high-growth period do not affect value as much as assumptions about the terminal value.

a. True

b. False

Explain.

**Closing Thoughts on the Dividend Discount Model**

Many analysts view the dividend discount model as outmoded, but it is a useful starting point in valuing all companies and may be the only choice in valuing companies where estimating cash flows is not feasible. As noted in Chapter 11, estimating free cash flows for financial service companies is often difficult both because the line between operating and capital expenses is fuzzy and because working capital, defined broadly, could include just about all of the balance sheet. Although we can arrive at approximations of cash flows by making assumptions about capital expenditures, we are
often left in the uncomfortable position of assuming that dividends represent FCFE for these firms. Even for firms where we can estimate FCFE with reasonable precision, the dividend discount model allows us to estimate a “floor value” in most cases because firms tend to pay out less in dividends than they have available in FCFE.

It is often argued that the dividend discount model cannot be used to value high-growth companies that pay little in dividends. That is true only if we use the inflexible version of the model whereby future dividends are estimated by growing current dividends. In the more flexible version, where both payout ratios and earnings growth can change over time, the dividend discount model can be extended to cover all types of firms.

There is one final point worth making in this section. We can estimate the value of equity on a per-share basis by using dividends per share, or we can obtain the aggregate value of equity using total dividends paid. The two approaches will yield the same results if there are no management options, warrants, or convertible bonds outstanding. If there are equity options, issued by the firm, that are outstanding, it is safest to value the equity on an aggregate basis. We will consider how best to deal with equity options in arriving at a value per share later in this chapter.

12.6. Payout Ratios and Expected Growth

The dividend discount model cannot be used to value stock in a company with high growth that does not pay dividends.

a. True
b. False

Explain.

Valndata.xls: This file online contains the industry averages by sector for returns on capital, retention ratios, debt equity ratios, and interest rates.
Illustration 12.3 Valuing Equity Using the Dividend Discount Model: Deutsche Bank in January 2008

In Illustration 12.2, we estimated the annual growth rate of 5.40% for the next five years at Deutsche Bank at the start of 2008, using normalized earnings from 2003 to 2007 to compute the return on equity, retention ratio and expected growth rate.

Normalized growth rate in net income = 5.40%

Normalized dividend payout ratio = 54.28%

In the analysis that follows, we will value Deutsche Bank at the start of 2008, using this growth rate. In 2007, Deutsche Bank paid out dividends of 2,146 million Euros on normalized net income of 3,954 million Euros. In chapter 4, we estimated a beta of 1.162 for Deutsche Bank, which used in conjunction with the Euro risk-free rate of 4% (in January 2008) and a risk premium of 4.50% (the mature market risk premium in early 2008), yielded a cost of equity of 9.23%.\(^9\)

\[
\text{Cost of Equity}_{\text{January 2008}} = \text{Riskfree Rate}_{\text{January 2008}} + \text{Beta} \times \text{Mature Market Risk Premium}
\]

\[
= 4.00\% + 1.162 \times (4.5\%) = 9.23\%
\]

Based on these inputs, we estimate the expected net income and dividends for the next five years and the present value of these dividends in Table 12.2.

Table 12.2 Present Value of Expected Dividends for High-Growth Period

<table>
<thead>
<tr>
<th>Year</th>
<th>Net Income</th>
<th>Payout Ratio</th>
<th>Dividends</th>
<th>PV @ 9.23%</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>4,167 €</td>
<td>54.28%</td>
<td>2,262 €</td>
<td>2,071 €</td>
</tr>
<tr>
<td>2009</td>
<td>4,392 €</td>
<td>54.28%</td>
<td>2,384 €</td>
<td>1,998 €</td>
</tr>
<tr>
<td>2010</td>
<td>4,629 €</td>
<td>54.28%</td>
<td>2,513 €</td>
<td>1,928 €</td>
</tr>
<tr>
<td>2011</td>
<td>4,879 €</td>
<td>54.28%</td>
<td>2,648 €</td>
<td>1,861 €</td>
</tr>
<tr>
<td>2012</td>
<td>5,143 €</td>
<td>54.28%</td>
<td>2,791 €</td>
<td>1,795 €</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9,653 €</td>
</tr>
</tbody>
</table>

\(^9\) In truth, we should be estimating a beta at the start of 2008, instead of using the beta that we estimated at the start of 2009. However, the difference should be small enough to not affect value by much.
Note that we could have arrived at the same present value using the shortcut described earlier (because the payout ratio and the cost of equity remain unchanged for the high-growth period):

\[
PV_{\text{High-growth dividends}} = \frac{2,146 \times (1.054) \times \left(1 - \frac{(1.054)^5}{(1.0923)^5}\right)}{0.0923 - 0.054} = 9,653 \text{ million Euros}
\]

At the end of year five, we will assume that Deutsche Bank’s earnings growth will drop to 3 percent and stay at that level in perpetuity. In keeping with the assumption of stable growth, we will also assume that

- The beta will drop marginally to 1, resulting in a slightly lower cost of equity of 8.50%.

Cost of Equity = Risk-Free Rate + Beta * Risk Premium = 4% + 4.50% = 8.50%

- The return on equity will drop to the cost of equity of 8.50 percent, thus preventing excess returns from being earned in perpetuity.

- The payout ratio will adjust to reflect the stable period growth rate and return on equity.

\[
\text{Stable Period Payout Ratio} = 1 - \frac{g}{\text{ROE}} = 1 - \frac{0.03}{0.085} = 0.6471 \text{ or 64.71%}
\]

The expected dividends in year six is calculated using this payout ratio:

\[
\text{Expected Dividends in Year 6} = \text{Expected Net Income}_5 \times (1 + g_{\text{Stable}}) \times \text{Stable Payout Ratio}
\]

\[
= €5,143 \times (1.03) \times 0.6471 = €3,427 \text{ million}
\]

The value of equity at the end of the fifth year can be estimated using these inputs:

\[
\text{Terminal Value} = \frac{\text{Expected Dividends}_6}{(\text{Cost of Equity} - g)} = \frac{3,247}{(0.085 - 0.03)} = 62,318 \text{ million Euros}
\]

The present value of the terminal value is computed using the high-growth period cost of equity:

\[
\text{PV of Terminal Value} = \frac{\text{Terminal Value}_n}{(1 + \text{Cost of Equity}_{\text{High growth}})^n} = \frac{62,318}{(1.0923)^5} = 40,079 \text{ mil Euros}
\]

The total value of equity is the sum of this value and the present value of the expected dividends in the high growth period:

\[
\text{Value of equity} = \text{PV of Expected Dividends in High Growth} + \text{PV of Terminal Value}
\]

\[
= €9,653 + €40,079 = €49,732 \text{ million Euros}
\]
Dividing this value by the number of shares outstanding at the start of 2008 yields the value of equity per share:

\[
\text{Value of equity per share} = \frac{\text{Value of Equity}}{\# \text{ Shares}} = \frac{49,732}{474.2} = 104.88 \text{ Euros/share}
\]

The market price of Deutsche Bank at the time of this valuation was 89 Euros per share. Based on our assumptions, Deutsche Bank looked under valued at the start of 2008.

Illustration 12.4 Valuing Equity in more unsettled times: Deutsche Bank in 2009

In the last illustration, we estimated a value of 105 Euros/share for Deutsche Bank at the beginning of 2008, and concluded that it was under valued at its then prevailing stock price of 89 Euros/share. During 2008, the landscape for financial service firms changed, as banks entered crisis mode and financial markets collapsed. After taking billions of dollars of write offs, Deutsche Bank reported a loss of 3,835 million Euros for 2008 and cut dividends to 285 million Euros. While neither of these numbers represents a stable starting point, we made the following assumptions to value Deutsche Bank:

a. **Net Income bounce back**: We will assume that net income will bounce back to 3.147 billion Euros in 2009, and base this assumption on the improved earnings for the first quarter of 2009 reported by Deutsche Bank (1.12 billion Euros in quarterly profits) and the average net income between 2003 and 2007 (approximately 3.95 billion Euros).

b. **Asset Base and Target ROE**: We will assume that the current asset base for the firm (312,882 million Euros) will grow 4% a year for the next five years and that the return on equity will improve to 10% over this period.

c. **Potential dividends**: Rather than focus on current dividends, which have been cut drastically, we estimate the potential dividends, based upon the assumption that the firm will move towards a target regulatory capital ratio of 10%. (We are replicating the analysis we did in chapter 11, to estimate FCFE)

d. **Cost of Equity**: To arrive at the cost of equity, we use the beta of 1.162 that we estimated in chapter 4, in conjunction with the Euro riskfree rate of 3.6% at the start of 2009 and the updated equity risk premium of 6% for mature markets:

\[
\text{Cost of equity} = \text{Riskfree Rate} + \beta \times (\text{Equity Risk Premium})
\]

\[
= 3.6\% + 1.162 \times (6\%) = 10.572\%
\]
Table 12.3 summarizes the estimates of net income, potential dividends and the present value of these dividends over the next 5 years:

**Table 12.3: Expected Potential Dividends over next 5 years: Deutsche Bank in 2009**

<table>
<thead>
<tr>
<th></th>
<th>Current</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asset Base</td>
<td>€312,882</td>
<td>€325,398</td>
<td>€338,414</td>
<td>€351,950</td>
<td>€366,028</td>
<td>€380,669</td>
<td></td>
</tr>
<tr>
<td>Capital ratio</td>
<td>10.20%</td>
<td>10.16%</td>
<td>10.12%</td>
<td>10.08%</td>
<td>10.04%</td>
<td>10.00%</td>
<td></td>
</tr>
<tr>
<td>Regulatory Capital</td>
<td>€31,914</td>
<td>€33,060</td>
<td>€34,247</td>
<td>€35,477</td>
<td>€36,749</td>
<td>€38,067</td>
<td></td>
</tr>
<tr>
<td>Change in Regulatory</td>
<td>€1,146</td>
<td>€1,187</td>
<td>€1,229</td>
<td>€1,273</td>
<td>€1,318</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ROE</td>
<td>9.40%</td>
<td>9.52%</td>
<td>9.64%</td>
<td>9.76%</td>
<td>9.88%</td>
<td>10.00%</td>
<td></td>
</tr>
<tr>
<td>Net Income</td>
<td>€3,000</td>
<td>€3,147</td>
<td>€3,302</td>
<td>€3,463</td>
<td>€3,631</td>
<td>€3,807</td>
<td></td>
</tr>
<tr>
<td>Investment in</td>
<td>€1,146</td>
<td>€1,187</td>
<td>€1,229</td>
<td>€1,273</td>
<td>€1,318</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regulatory Capital</td>
<td>€2,001</td>
<td>€2,114</td>
<td>€2,233</td>
<td>€2,358</td>
<td>€2,489</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FCFE (Potential</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dividend)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Present value @</td>
<td>€1,810</td>
<td>€1,729</td>
<td>€1,652</td>
<td>€1,578</td>
<td>€1,506</td>
<td>8,275</td>
<td></td>
</tr>
<tr>
<td>10.572%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

At the end of year 5, we assume that the firm will be in stable growth, growing 3% a year in perpetuity. In addition, we will also assume that

a. The beta will decrease to 1, resulting in a drop of cost of equity to 9.60%.

\[
\text{Cost of equity} = \text{Riskfree Rate} + \text{Beta} \times \text{Equity Risk Premium} = 3.6% + 1 \times (6\%) = 9.60\%
\]

b. The return on equity after year 5 will be equal to the stable period cost of equity of 9.60%.

c. Given the expected growth rate of 3% after year 5 and the stable ROE of 9.60%, the payout ratio in stable growth is 68.75%.

\[
\text{Stable Payout Ratio} = 1 - \frac{\text{Stable growth Rate}}{\text{Stable ROE}} = 1 - \frac{.03}{.096} = 68.75\%
\]

The value of equity at the end of year 5 can be estimated as follows:

\[
\text{Terminal Value} = \frac{\text{Expected Dividends}_6}{(\text{Cost of Equity} - g)} = \frac{3,807(1.03)(.6875)}{(.096 - .03)} = 39,728 \text{ million Euros}
\]

Discounting the terminal value back at the cost of equity for the high growth period:

\[
\text{PV of Terminal Value} = \frac{\text{Terminal Value}_6}{(1 + \text{Cost of Equity})^{\text{High growth}}} = \frac{39,728}{(1.10572)^5} = 24,036 \text{ mil Euros}
\]
Adding the present value of dividends to this number yields the value of equity for Deutsche Bank in early 2009:

\[ \text{Value of equity} = 8,275 \text{ million } € + 24,036 \text{ million } € = 32,311 \text{ million } € \]

Dividing by the number of shares outstanding at the start of 2009 (581.85 million), we can obtain the value of equity per share:

\[ \text{Value of equity per share} = \frac{\text{Value of Equity}}{\# \text{ Shares}} = \frac{32,311}{581.85} = 55.53 \text{ Euros/share} \]

In June 2009, Deutsche Bank was trading at 48.06 Euros per share and thus remains under valued.

---

**Valuation Biases: A Behavioral Perspective**

In theory, we start with the financial fundamentals and move “objectively” from the numbers to the value of the firm, making reasonable assumptions along the way. In practice, though, valuations are not just subjective but are contaminated by biases that analysts bring to the process. In fact, there are at least three sources of bias.

a. **Anchoring bias:** When valuing a company, we generally look for a number to use as a basis or comparison and that number then affects the valuation. With publicly traded companies, for instance, the market price becomes a logical anchor to compare our estimates of value to. In fact, it is not uncommon to see analysts change their assumptions to move their valuations closer to the stock price.

b. **Recency bias:** There is evidence that when data is presented sequentially, the most recent data is weighted too much (relative to its importance) and less recent data too little. In the context of valuing companies, this often manifests itself as too great a dependence on how these companies have done in the most recent year and too little attention paid to historical data. As a consequence, we tend to overvalue companies after good years and undervalue companies after bad years.

c. **Confirmation bias:** There is some evidence that analysts who form a perception of what the fair value is early in the process tend to then model the data to confirm that perception.

As a result of these biases, we would argue that in many valuations, the value gets set first and the valuation follows.
As a confession, the valuations of Deutsche Bank in 2008 and 2009 in this chapter reflect some of these biases. While some of the drop in value per share (from 105 Euros/share to 56 Euros/share can be attributed to changing fundamentals, some of it also reflects the effect of not only the market crisis but also seeing the drop in Deutsche Bank’s stock price form 89 Euros to 48 Euros between the two valuations. Put another way, it is entirely possible that I am over reacting to recent events (by raising the equity risk premium from 4.5% to 6%) and under valuing Deutsche Bank as a consequence.

II. FCFE Models

In Chapter 11, while developing a framework for analyzing dividend policy, we estimated the free cash flow to equity as the cash flow that the firm can afford to pay out as dividends and contrasted it with the actual dividends. We noted that many firms do not pay out their FCFE as dividends; thus, the dividend discount model may not capture their true capacity to generate cash flows for stockholders. A more appropriate model is the FCFE model.

Setting Up the Model

The FCFE is the residual cash flow left over after meeting interest and principal payments and providing for reinvestment to maintain existing assets and create new assets for future growth. The FCFE is measured as follows:

$$FCFE = \text{Net Income} + \text{Depreciation} - \text{Capital Expenditures} - \Delta \text{Working Capital} - \text{Principal Repayments} + \text{New Debt Issues}$$

where $\Delta \text{Working Capital}$ is the change in noncash working capital.

In the special case where the capital expenditures and the working capital are financed at the target debt ratio $\delta$ and principal repayments are made from new debt issues, the FCFE is measured as follows:

$$FCFE = \text{Net Income} - (1-\delta)(\text{Capital Expenditures} - \text{Depreciation}) - (1-\delta)\Delta \text{Working Capital}$$

There is one more way in which we can present the FCFE. If we define the portion of the net income that equity investors reinvest back into the firm as the equity reinvestment rate, we can state the FCFE as a function of this rate.
Equity Reinvestment Rate =
\[ \frac{\text{Capital Expenditures} - \text{Depreciation} + \Delta \text{Working Capital}}{\text{Net Income}} \times (1 - \delta) \]

FCFE = Net Income \( (1 - \text{Equity Reinvestment Rate}) \)

Once we estimate the FCFE, the general version of the FCFE model resembles the dividend discount model, with FCFE replacing dividends in the equation:

Value of the Stock = PV of FCFE during High Growth + PV of Terminal Price

\[ \text{Value}_0 = \sum_{t=1}^{n} \frac{E(FCFE)_t}{(1+r)^t} + \frac{\text{Terminal Value}_n}{(1+r)^n} \]

where \( \text{Terminal Value}_n = \frac{E(FCFE)_{n+1}}{(r_n - g_n)} \)

where the expected FCFEs are estimated each year for the high growth period, \( r \) is the cost of equity, and \( g_n \) is the stable growth rate.

There is one key difference between the two models, though. Although the dividends can never be less than zero, the FCFE can be negative. This can occur even if earnings are positive, if the firm has substantial working capital and capital expenditure needs. In fact, the expected FCFE for many small, high-growth firms will be negative at least in the early years, when reinvestment needs are high, but will become positive as the growth rates and reinvestment needs decrease.

**In Practice: Estimating Capital Expenditure and Working Capital Needs**

Two components go into estimating reinvestments. The first is net capital expenditures, which is the difference between capital expenditures and depreciation. Although these numbers can easily be obtained for the current year for any firm in the United States, they should be used with the following caveats:

1. Firms seldom have smooth capital expenditure streams. They can go through periods when capital expenditures are very high, followed by periods of relatively light expenditures. Consequently, when estimating the capital expenditures to use for forecasting future cash flows, we should look at capital expenditures over time and normalize them by taking an average, or we should look at industry norms.

---

\(^{10}\)It is surprisingly difficult to obtain the capital expenditure numbers even for large, publicly traded firms in some markets outside the United States. Accounting standards in these markets often allow firms to lump investments together and report them in the aggregate.
2. If we define capital expenditures as expenses designed to generate benefits over many years, research and development (R&D) expenses are really capital expenditures. Consequently, R&D expenses need to be treated as capital expenditures, and the research asset that is created as a consequence needs to be amortized, with the amortization showing up as part of depreciation.\textsuperscript{11}

3. Finally, when estimating capital expenditures, we should not distinguish between internal investments (which are usually categorized as capital expenditures in cash flow statements) and external investments (which are acquisitions). The capital expenditures of a firm therefore need to include acquisitions, whether they are funded with stock or cash. Because firms seldom make acquisitions every year, and each acquisition has a different price tag, the point about normalizing capital expenditures applies even more strongly to this item.

The second component of reinvestment is the cash that needs to be set aside for working capital needs. As in the chapters on investment analysis, we define working capital needs as noncash working capital, and the cash flow effect is the period-to-period change in this number. Again, although we can estimate this change for any year using financial statements, it has to be used with caution. Changes in noncash working capital are volatile, with big increases in some years followed by big decreases in the following years. To ensure that the projections are not the result of an unusual base year, we tie the changes in working capital to expected changes in revenues or costs of goods sold at the firm over time. For instance, we use the noncash working capital as a percent of revenues, in conjunction with expected revenue changes each period, to estimate projected changes in noncash working capital. As a final point, noncash working capital can be negative, which can translate into positive cash flows from working capital as revenue increases. It is prudent, when this occurs, to set noncash working capital needs to zero.\textsuperscript{12}

---

\textsuperscript{11}Capitalizing R&D is a three-step process. First, you need to specify, on average, how long it takes for research to pay off (amortizable life). Second, you have to collect R&D expenses from the past for an equivalent period. Third, the past R&D expenses have to be written off (straight line) over the amortizable life.

\textsuperscript{12}Although it is entirely possible that firms can generate positive cash flows from working capital decreasing for short periods, it is dangerous to assume that this can occur forever.
Estimating Model Inputs

Just as in the dividend discount model, there are four basic inputs needed for this model to be usable. First, the length of the high-growth period is defined. Second, the FCFE each period during the growth period is computed; this means that net capital expenditures, working capital needs, and the debt financing mix are all estimated for the high-growth period. Third, the rate of return stockholders will demand for holding the stock is estimated. Finally, the terminal value of equity at the end of the high-growth period is calculated, based on the estimates of stable growth, the FCFE, and required return after the high-growth ends. Of the four inputs, the length of the high-growth period and the rate of return required by stockholders are the same for the dividend discount and FCFE valuation models. On the other two, the differences in the other two inputs are minor but still worth emphasizing.

a. Estimating FCFE during High-Growth Period

As in the dividend discount model, we start with the earnings per share and estimate expected growth in earnings. Thus the entire discussion about earnings growth in the dividend discount model applies here as well. The only difference is in the estimation of fundamental growth. When estimating fundamental growth in the dividend discount model, we used the retention ratio and the return on equity to estimate the expected growth in earnings. When estimating fundamental growth in the FCFE valuation model, it is more consistent to use the equity reinvestment rate defined in the last section and the return on equity to estimate expected growth:

Expected Growth in Net Income = Equity Reinvestment Rate * Return on Equity

Unlike the retention ratio, which cannot exceed 100 percent or be less than 0 percent, the equity reinvestment rate can be negative (if capital expenditures drop below depreciation) or greater than 100 percent. If the equity reinvestment rate is negative and is expected to remain so for the foreseeable future, the expected growth in earnings will be negative. If the equity reinvestment rate is greater than 100 percent, the net income can grow at a rate
higher than the return on equity, though the firm will have to issue new stock to fund the reinvestment.\textsuperscript{13}

Once the earnings are estimated, the net capital expenditures, working capital needs, and debt financing needs have to be specified to arrive at the FCFE. Just as the dividend payout ratio was adjusted to reflect changes in expected growth, the net capital expenditure and working capital needs should change as the growth rate changes. In particular, high growth companies will have relatively higher net capital expenditures and working capital needs. In other words, the equity reinvestment rate will generally be high in high growth and decline as the growth rate declines. A similar point can be made about leverage. High-growth, high-risk firms generally do not use much leverage to finance investment needs; as the growth tapers off, however, the firm will be much more willing to use debt, suggesting that debt ratios will increase as growth rates drop.

There is one final point worth making about equity valuations. Because the net income includes both income from operations and income from cash and marketable securities, we have two choices when it comes to equity valuations. The first and easier (albeit less precise) option is to discount the total FCFE (including the income from cash holdings) at a cost of equity that is adjusted to reflect the cash holdings.\textsuperscript{14} The present value of equity will then incorporate the cash holdings of the company. The second and more precise way is to discount the net income, without including the interest income from cash, at a cost of equity that reflects only the operations of the firm and then to add the cash and marketable securities on to this present value at the end.

Capex.xls: This file online contains the industry averages by sector for net capital expenditures and working capital as a percent of revenues.

\textsuperscript{13}If the equity reinvestment rate exceeds 100 percent, the net income of the firm is insufficient to cover the equity reinvestment needs of the firm. Fresh equity will have to be issued to fund the difference. This will increase the number of shares outstanding.

\textsuperscript{14}The beta for equity will be based on an unlevered beta, adjusted for the cash holdings of the company. In other words, if the company is 20 percent cash and 80 percent operations, the unlevered beta will be estimated attaching a 20 percent weight to cash and a beta of zero for cash.
Illustration 12.5 Estimating Growth Rate in Net Income

Like many manufacturing firms, Tata Chemicals has volatile reinvestment outlays and the cash flows from debt swing wildly from year to year. In Table 12.4, we report net income and equity reinvestment (capital expenditures – depreciation + change in noncash working capital – net cash flow from debt) each year from 2004 to 2008.

Table 12.4 Equity Reinvestment and Net Income at Tata Chemicals: 2004-08

<table>
<thead>
<tr>
<th>Year</th>
<th>Net Income</th>
<th>Cap Ex</th>
<th>Depreciation</th>
<th>Change in WC</th>
<th>Change in Debt</th>
<th>Equity Reinvestment</th>
<th>Equity Reinvestment Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003-04</td>
<td>$3,418</td>
<td>$357</td>
<td>$1,442</td>
<td>-$557</td>
<td>-$2,771</td>
<td>$1,129</td>
<td>33.04%</td>
</tr>
<tr>
<td>2004-05</td>
<td>$4,550</td>
<td>$692</td>
<td>$1,377</td>
<td>-$493</td>
<td>$5,448</td>
<td>-$6,626</td>
<td>-145.64%</td>
</tr>
<tr>
<td>2005-06</td>
<td>$5,156</td>
<td>$11,730</td>
<td>$1,389</td>
<td>$2,823</td>
<td>$867</td>
<td>$12,297</td>
<td>238.51%</td>
</tr>
<tr>
<td>2006-07</td>
<td>$6,338</td>
<td>$1,196</td>
<td>$1,504</td>
<td>-$1,662</td>
<td>-$4,411</td>
<td>$2,442</td>
<td>38.53%</td>
</tr>
<tr>
<td>2007-08</td>
<td>$11,571</td>
<td>$28,956</td>
<td>$1,488</td>
<td>$88</td>
<td>$17,054</td>
<td>$10,502</td>
<td>90.76%</td>
</tr>
<tr>
<td>Aggregate</td>
<td>$31,033</td>
<td>$42,930</td>
<td>$7,199</td>
<td>$200</td>
<td>$16,187</td>
<td>$19,744</td>
<td>63.62%</td>
</tr>
</tbody>
</table>

Rather than base the equity reinvestment rate on the most recent year’s numbers, we will use the aggregate values for each of the variables over the entire period to compute a normalized equity reinvestment rate:

\[
\text{Equity Reinvestment Rate} = \frac{\text{Equity Reinvestment}_{\text{Total 2004-08}}}{\text{Net Income}_{\text{Total 2004-08}}} = \frac{19,744}{31,033} = 63.62\%
\]

To estimate the return on equity, we look at the same time period and look at the net income and the book value of equity each year from 2004 to 2008 in table 12.5:

Table 12.5: Net Income and ROE – 2003-2008

<table>
<thead>
<tr>
<th>Year</th>
<th>Net Income</th>
<th>BV of Equity</th>
<th>ROE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003-04</td>
<td>$3,418</td>
<td>$20,353</td>
<td>16.80%</td>
</tr>
<tr>
<td>2004-05</td>
<td>$4,550</td>
<td>$19,978</td>
<td>22.78%</td>
</tr>
<tr>
<td>2005-06</td>
<td>$5,156</td>
<td>$39,451</td>
<td>13.07%</td>
</tr>
<tr>
<td>2006-07</td>
<td>$6,338</td>
<td>$37,258</td>
<td>17.01%</td>
</tr>
<tr>
<td>2007-08</td>
<td>$11,571</td>
<td>$61,952</td>
<td>18.68%</td>
</tr>
<tr>
<td>Aggregate</td>
<td>$31,033</td>
<td>$178,992</td>
<td>17.34%</td>
</tr>
</tbody>
</table>

The normalized return on equity over the period is computed using the aggregated values of net income and book value of equity:

\[
\text{Return on Equity} = \frac{\text{Net Income}_{\text{Total 2004-08}}}{\text{Book Value of Equity}_{\text{Total 2004-08}}} = \frac{31,033}{178,992} = 17.34\%
\]
The expected growth in net income can be computed as the product of the ROE and the equity reinvestment rate.

Expected Growth in Net Income = Equity Reinvestment Rate * ROE

\[ = 63.62\% \times 17.34\% = 11.03\% \]

Based on fundamentals, we would expect Tata Chemical’s net income to grow 11.03% a year.

**In Practice: Paths to a Higher ROE**

The expected growth rate in earnings per share and net income are dependent on the return on equity that a firm makes on its new investments. The higher the return on equity, the higher the expected growth rate in earnings. But how do firms generate higher returns on equity? Algebraically, the return on equity can be decomposed into a return on capital and a leverage effect:

\[
\text{ROE} = \frac{\text{Return on Capital}}{\text{Equity}} + \frac{\text{Debt}}{\text{Equity}} (\text{Return on Capital} - \text{After-tax Cost of Debt})
\]

The second term in the equation reflects the influence of debt. To the extent that a firm can earn a return on capital that exceeds the after-tax cost of debt, its return on equity will increase as it uses more debt. A firm with a return on capital of 12 percent, a debt to equity ratio of 0.5, and an after-tax cost of debt of 4 percent will have a return on equity of 16 percent. Lest firms view this as a free lunch, we hasten to point out that using more debt will also increase the firm’s beta and cost of equity and the value of equity may very well decrease with higher borrowing, even though the return on equity and expected growth rate may be higher.

**b. Estimating Terminal Value**

As with the dividend discount model, the terminal value in the FCFE model is determined by the stable growth rate and cost of equity. The difference between this model and the dividend discount model lies primarily in the cash flow used to calculate the terminal price: The latter uses expected dividends in the period after high growth, whereas the former uses the FCFE in that period:

\[
\text{Terminal value of Equity}_n = \frac{\text{FCFE}_{n+1}}{r - g_n}
\]
In estimating that cash flow, the net capital expenditures and working capital needs should be consistent with the definition of stability. The simplest way to ensure this is to estimate an equity reinvestment rate from the stable period return on equity:

$$\text{Equity Reinvestment Rate in Stable Growth} = 1 - \frac{g_{\text{Stable}}}{\text{ROE}_{\text{Stable}}}$$

This is exactly the same equation we used to compute the retention ratio in stable growth in the dividend discount model.

Many analysts assume that stable-growth firms have capital expenditures that offset depreciation and no working capital requirements. This will yield a equity reinvestment rate of zero, which is consistent only with a stable growth rate of zero. Using a stable growth rate of 3 or 4 percent while allowing for no reinvestment essentially allows your firm to grow without paying for the growth and will yield too high a value for the firm.

**Reconciling FCFE and Dividend Discount Model Valuations**

The FCFE discounted cash flow model can be viewed as an alternative to the dividend discount model. Because the two approaches sometimes provide different estimates of value, however, it is worth examining why this occurs.

There are two conditions under which the value obtained from using the FCFE in discounted cash flow valuation will be the same as the value obtained from using the dividend discount model. The first is obvious: When the dividends are equal to the FCFE, the value will be the same. The second is more subtle: When the FCFE is greater than dividends, but the excess cash (FCFE – Dividends) is invested in projects with a net present value of zero, the values will also be similar. For instance, investing in financial assets that are fairly priced should yield an NPV of zero.\(^{15}\)

More often, the two models will provide different estimates of value. First, when the FCFE is greater than the dividend and the excess cash either earns below-market returns or is invested in negative NPV projects, the value from the FCFE model will be greater than the value from the dividend discount model. This is not uncommon. There

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\(^{15}\)Mechanically, this will work out only if you keep track of the cash build-up in the dividend discount model and add it to the terminal value. If you do not do this, you will under value your firm with the dividend discount model.
are numerous case studies of firms having accumulated large cash balances by paying out low dividends relative to FCFE that have chosen to use this cash to finance unwise takeovers (the price paid is greater than the value received). Second, the payment of smaller dividends than the firm can afford lowers debt-equity ratios; accordingly, the firm may become underleveraged, reducing its value.

In those cases where dividends are greater than FCFE, the firm will have to issue new shares or borrow money to pay these dividends, leading to at least one of three possible negative consequences. One is the flotation cost on these security issues, which can be substantial for equity issues. Second, if the firm borrows the money to pay the dividends, the firm may become overleveraged (relative to the optimal), leading to a loss in value. Finally, paying too much in dividends can lead to capital rationing constraints, whereby good projects are rejected, resulting in a loss of wealth.

When the two models yield different values, two questions remain: (1) What does the difference between the two models tell us? (2) Which of the two models is appropriate to use in evaluating the market price? In most cases, the value from the FCFE model will exceed the value from the dividend discount model. The difference between the value obtained from the FCFE model and that obtained from the dividend discount model can be considered one component of the value of controlling a firm—that is, it measures the value of controlling dividend policy. In a hostile takeover, the bidder can expect to control the firm and change the dividend policy (to reflect FCFE), thus capturing the higher FCFE value. In the more infrequent case—the value from the dividend discount model exceeds the value from the FCFE—the difference has less economic meaning but can be considered a warning on the sustainability of expected dividends.

As for which of the two values is more appropriate for evaluating the market price, the answer lies in the openness of the market for corporate control. If there is a significant probability that a firm can be taken over or its management changed, the market price will reflect that likelihood; in that case, the value from the FCFE model would be a more appropriate benchmark. As changes in corporate control become more difficult, either because of a firm’s size and/or legal or market restrictions on takeovers,
the value from the dividend discount model will provide a more appropriate benchmark for comparison.

### 12.7. FCFE and Discount Dividend Value

Most firms can be valued using FCFE and discount dividend valuation models. Which of the following statements would you most agree with on the relationship between these two values?

- a. The FCFE value will always be higher than the discount dividend value.
- b. The FCFE value will usually be higher than the discount dividend value.
- c. The discount dividend value will usually be higher than the FCFE value.
- d. The discount dividend value will generally be equal to the FCFE value.

---

**Illustration 12.6 FCFE Valuation: Tata Chemicals**

To value Tata Chemicals using the FCFE model, we will use the expected growth in net income that we estimated in Illustration 12.4 and value the equity in operating assets first and then add on the value of cash and other non-operating assets. Summarizing the basic information that we will be using:

- Rather than use the net income from 2007-08 as the base year income, we used the normalized return on equity of 17.34% (from illustration 11.5) and the current book value of equity (Rs 35,717 million) to estimate the base year net income:
  
  \[
  \text{Normalized Net Income} = \text{Current Book Value of Equity} \times \text{Normalized ROE} \\
  = 35,717 \times 0.1734 = \text{Rs, 6193 million}
  \]

- We will use the average equity reinvestment rate of 63.62 percent, based on the average values from 2004-08, that we computed in Illustration 12.5 as the equity reinvestment rate for the next five years. In conjunction with the normalized return on equity of 17.34% that we computed in that illustration, we estimate an expected growth rate of 11.03 percent a year for the next five years.
In Illustration 4.9, we estimated a beta for equity of 0.945 for Tata Chemical’s operating assets. With a nominal rupee risk-free rate of 4 percent and an equity risk premium of 10.51% for India (also estimated in Chapter 4), we arrive at a cost of equity of 13.93%.

\[
\text{Cost of Equity} = 4\% + 0.945(10.51\%) = 13.93\%
\]

After year five, we will assume that the beta will increase to 1 and that the equity risk premium will decline to 7.5 percent. The resulting cost of equity is 11.5 percent.

\[
\text{Cost of Equity in Stable Growth} = 4\% + 1(7.5\%) = 11.5\%
\]

After year five, we will assume that the growth in net income will drop to 4% and that the return on equity will rise to 11.5% (which is also the cost of equity). The equity reinvestment rate in stable growth can then be estimated as follows:

\[
\text{Equity Reinvestment Rate}_{\text{Stable Growth}} = \frac{\text{Expected Growth Rate}}{\text{Return on Equity}} = \frac{4\%}{11.5\%} = 34.78\%
\]

To value the equity in Tata Chemicals, we begin by estimating the FCFE from operations in Table 12.6.

**Table 12.6 Expected FCFE at Tata Chemicals, 2009-2013**

<table>
<thead>
<tr>
<th></th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Income</td>
<td>Rs 6,876</td>
<td>Rs 7,634</td>
<td>Rs 8,476</td>
<td>Rs 9,411</td>
<td>Rs 10,449</td>
<td></td>
</tr>
<tr>
<td>Equity Reinvestment Rate</td>
<td>63.62%</td>
<td>63.62%</td>
<td>63.62%</td>
<td>63.62%</td>
<td>63.62%</td>
<td></td>
</tr>
<tr>
<td>FCFE</td>
<td>Rs 2,501</td>
<td>Rs 2,777</td>
<td>Rs 3,084</td>
<td>Rs 3,423</td>
<td>Rs 3,801</td>
<td></td>
</tr>
<tr>
<td>Cost of Equity</td>
<td>13.93%</td>
<td>13.93%</td>
<td>13.93%</td>
<td>13.93%</td>
<td>13.93%</td>
<td></td>
</tr>
<tr>
<td>Present Value</td>
<td>Rs 2,195</td>
<td>Rs 2,160</td>
<td>Rs 2,085</td>
<td>Rs 2,032</td>
<td>Rs 1,980</td>
<td>Rs 10,433</td>
</tr>
</tbody>
</table>

FCFE = Net Income \(\times (1 – \text{Reinvestment Rate})\).

To estimate the terminal value of equity, we first estimate the FCFE in year six:

\[
\text{FCFE in Year 6} = \text{Net Income in Year 6} \times (1 – \text{Equity Reinvestment Rate}_{\text{Stable Growth}})
\]

\[
= 10,449(1.04)(1 – 0.3478) = Rs 7,087 \text{ million}
\]

---

16We used the equity beta of just the operating assets in this valuation. If we had chosen to include the cash from financial holdings as part of net income, we would have adjusted the beta for Tata Chemical’s cross holdings.

17We halved the country risk premium from 7.67 percent to 3.84 percent%. We assume that as Brazil grows, it will become a less risky country in which to invest.
The terminal value is then computed using the stable period cost of equity of 11.5 percent:

\[
\text{Terminal Value of Equity} = \frac{7,087}{0.115 - 0.04} = \text{Rs 94,497 million}
\]

The current value of equity is the sum of the present values of the expected cash flows in Table 12.3, the present value of the terminal value of equity, and the value of cash and non-operating assets today:

\[
\begin{align*}
\text{Present Value of FCFEs in High-Growth Phase} & = \text{Rs 10,433} \\
+ \text{Present Value of Terminal Equity Value} & = \frac{94,497}{1.1393^5} = \text{Rs 49,231} \\
= \text{Value of Equity in Operating Assets} & = \text{Rs 59,664} \\
+ \text{Value of Cash and Marketable Securities} & = \text{Rs 1,759} \\
\text{Value of Equity in Firm} & = \text{Rs 61,423}
\end{align*}
\]

Dividing by the 235.17 million shares outstanding yields a value per share of Rs 261, about 20% higher than the stock price of Rs 222 at the time of the valuation (June 2009).

### In Practice: Reconciling Value with the Market Price

When you value a company and arrive at a number very different from the market price, there are three possible explanations. The first is that we are mistaken in our assumptions and that our valuations are wrong while the market is right. Without resorting to the dogma of efficient markets, this is a reasonable place to start because this is the most likely scenario. The second is that the market is wrong and we are right, in which case we have to decide whether we have enough confidence in our valuations to act on them. If we find a company to be undervalued, this would require buying and holding the stock. If the stock is overvalued, we would have to sell short. The problem, though, is that there is no guarantee that markets, even if they are wrong, will correct their mistakes in the near future. In other words, a stock that is overvalued can become even more overvalued, and a stock that is undervalued may stay that way for years, wreaking havoc on our portfolio. This also makes selling short a much riskier strategy because we generally can do so only for a few months.

One way to measure market expectations is to solve for a growth rate that will yield the market price. In the Tata Chemicals valuation, for instance, we would need an expected growth rate of 7% in earnings over the next five years to justify the current...
Market price. This is called an implied growth rate and can be compared to the estimate of growth we used in the valuation of 11.03%.

**III. Free Cash Flow to the Firm Models**

The dividend discount and FCFE models are models for valuing the equity in a firm directly. The alternative is to value the entire business and then to use this value to arrive at a value for the equity. That is precisely what we try and do in firm valuation models, where we focus on the operating assets of the firm and the cash flows they generate.

*Setting Up the Model*

The cash flow to the firm can be measured in two ways. One is to add up the cash flows to all of the different claim holders in the firm. Thus, the cash flows to equity investors (which take the form of dividends or stock buybacks) are added to the cash flows to debt holders (interest and net debt payments) to arrive at the cash flow to the firm. The other approach to estimating cash flow to the firm, which should yield equivalent results, is to estimate the cash flows to the firm prior to debt payments but after reinvestment needs have been met:

\[
\text{EBIT} (1 - \text{Tax Rate}) - (\text{Capital Expenditures} - \text{Depreciation}) - \text{Change in Noncash Working Capital} = \text{Free Cash Flow to the Firm}
\]

The difference between capital expenditures and depreciation (net capital expenditures) and the increase in noncash working capital represents the reinvestment made by the firm to generate future growth. Another way of presenting the same equation is to add the net capital expenditures and the change in working capital and state that value as a percentage of the after-tax operating income. This ratio of reinvestment to after-tax operating income is called the *reinvestment rate*, and the FCFF can be written as:

\[
\text{Reinvestment Rate} = \frac{(\text{Capital Expenditures} - \text{Depreciation} + \Delta \text{Working Capital})}{\text{EBIT} (1 - \text{tax rate})}
\]

\[
\text{Free Cash Flow to the Firm} = \text{EBIT} (1 - t)(1 - \text{Reinvestment Rate})
\]
Note that the reinvestment rate can exceed 100 percent if the firm has substantial reinvestment needs. If that occurs, the FCFF will be negative even though after-tax operating income is positive. The cash flow to the firm is often called an unlevered cash flow, because it is unaffected by debt payments or the tax benefits flowing from these payments.

As with the dividends and the FCFE, the value of the operating assets of a firm can be written as the present value of the expected cash flows during the high-growth period and a terminal value at the end of the period:

$$\text{Value}_0 = \sum_{i=1}^{n} \frac{E(FCFF)_i}{(1+r)^i} + \frac{\text{Terminal Value}_n}{(1+r)^n}$$

where Terminal Value

$$\text{Terminal Value}_n = \frac{E(FCFF)_{n+1}}{(r_n - g_n)}$$

where \( r \) is the cost of capital and \( g_n \) is the expected growth rate in perpetuity.

**Estimating Model Inputs**

As with the dividend discount and the FCFE discount models, there are four basic components that go into the value of the operating assets of the firm—a period of high growth, the FCFF during that period, the cost of capital to use as a discount rate, and the terminal value for the operating assets of the firm. We have additional steps to take to get to the value of equity per share. In particular, we have to incorporate the value of nonoperating assets, subtract out debt, and then consider the effect of options outstanding on the equity of the firm.

**a. Estimating FCFF during High-Growth Period**

We base our estimate of a firm’s value on expected future cash flows, not current cash flows. The forecasts of earnings, net capital expenditures, and working capital will yield these expected cash flows. One of the most significant inputs into any valuation is the expected growth rate in operating income. As with the growth rates we estimated for dividends and net income, the variables that determine expected growth are simple. The

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18In practical terms, this firm will need external financing, either from debt or equity or both, to cover the excess reinvestment.
19The tax benefits from interest payments, which are real cash benefits, show up in the discount rate, when we compute the after-tax cost of debt. If we add this tax benefit as a cash flow to the FCFF, we double count the tax benefit.
expected growth in operating income is a product of a firm’s reinvestment rate, that is, the proportion of the after-tax operating income that is invested in net capital expenditures and noncash working capital, and the quality of these reinvestments, measured as the after-tax return on the capital invested.

\[
\text{Expected Growth}_{E_{\text{BIT}}} = \text{Reinvestment Rate} \times \text{Return on Capital}
\]

where

\[
\text{Reinvestment Rate} = \frac{\text{Capital Expenditure} - \text{Depreciation} + \Delta \text{Non-cash WC}}{\text{EBIT} \times (1 - \text{tax rate})}
\]

\[
\text{Return on Capital} = \frac{\text{EBIT}(1-t)}{(\text{BV of Equity} + \text{BV of Debt} - \text{Cash})}
\]

Both measures should be forward-looking, and the return on capital should represent the expected return on capital on future investments. In the rest of this section, we consider how best to estimate the reinvestment rate and the return on capital.

The reinvestment rate is often measured using a firm’s past history on reinvestment. Although this is a good place to start, it is not necessarily the best estimate of the future reinvestment rate. A firm’s reinvestment rate can ebb and flow, especially in firms that invest in relatively few large projects or acquisitions. For these firms, looking at an average reinvestment rate over time may be a better measure of the future. In addition, as firms grow and mature, their reinvestment needs (and rates) tend to decrease. For firms that have expanded significantly over the past few years, the historical reinvestment rate is likely to be higher than the expected future reinvestment rate. For these firms, industry averages for reinvestment rates may provide a better indication of the future than using numbers from the past. Finally, it is important that we continue treating R&D expenses and operating lease expenses consistently. The R&D expenses in particular need to be categorized as part of capital expenditures for purposes of measuring the reinvestment rate.

The return on capital is often based on the firm’s return on capital on existing investments, where the book value of capital is assumed to measure the capital invested in these investments. Implicitly, we assume that the current accounting return on capital is a good measure of the true returns earned on existing investments, and that this return is a good proxy for returns that will be made on future investments. This assumption, of course, is open to question if the book value of capital is not a good measure of the
capital invested in existing projects and/or if the operating income is mismeasured or volatile. Given these concerns, we should consider not only a firm’s current return on capital but also any trends in this return as well as the industry average return on capital. If the current return on capital for a firm is significantly higher than the industry average, the forecasted return on capital should be set lower than the current return to reflect the erosion that is likely to occur as competition responds.

Finally, any firm that earns a return on capital greater than its cost of capital is earning an excess return. These excess returns are the result of a firm’s competitive advantages or barriers to entry into the industry. High excess returns locked in for very long periods imply that a firm has a permanent competitive advantage.

**In Practice: After-Tax Operating Income**

The income statement for a firm provides a measure of the operating income of the firm in the form of the EBIT and a tax rate in the form of an effective tax rate. Because the operating income we would like to estimate is before capital and financing expenses, we have to make at least two adjustments to the accounting operating income:

- The first adjustment is for financing expenses that accountants treat as operating expenses. The most significant example is operating leases. Because these lease payments constitute firm commitments into the future, they are tax-deductible, and the failure to make lease payments can result in bankruptcy, so we treat these expenses as financial expenses. The adjustment, which we describe in detail in Chapter 4, results in an increase in both the operating income and the debt outstanding at the firm.

- The second adjustment is to correct for the incidence of one-time or irregular income and expenses. Any expense (or income) that is truly a one-time expense (or income) should be removed from the operating income and should not be used in forecasting future operating income. Although this would seem to indicate that all extraordinary charges should be expunged from operating income, there are some extraordinary charges that seem to occur at regular intervals—say, once every four or five years. Such expenses should be viewed as irregular rather than extraordinary expenses and should be built into forecasts. The easiest way to do this is to annualize the expense.
Put simply, this would mean taking one-fifth of any expense that occurs once every five years, and computing the income based on this apportioned expense.

As for the tax rate, the effective tax rates reported by most firms are much lower than the marginal tax rates. As with the operating income, we should look at the reasons for the difference and see if these firms can maintain their lower tax rates. If they cannot, it is prudent to shift to marginal tax rates in computing future after-tax operating income.

Illustration 12.7 Estimating Growth Rate in Operating Income: Disney

We begin by estimating the reinvestment rate and return on capital for Disney in 2008 using the numbers from the latest financial statements. We converted operating leases into debt and adjusted the operating income and capital expenditure accordingly.\(^{20}\)

\[
\text{Reinvestment Rate}_{2008} = \frac{(\text{Cap Ex} - \text{Depreciation} + \text{Chg in WC})}{\text{EBIT} \times (1 - t)} = \frac{(2,752 - 1,839 + 241)}{7,030 \times (1 - .38)} = 26.48\%
\]

We include $516 million in acquisitions made during 2008 in capital expenditures, but this is a volatile item. Disney does not make large acquisitions every year, but it does so infrequently - $7.5 billion to buy Pixar in 2006 and $11.5 billion to buy Capital Cities in 1996. Averaging out acquisitions from 1994-2008, we estimate an average annual value of $1,761 million for acquisitions over this period. Replacing the current year’s acquisition with this normalized value yields a higher reinvestment rate:

\[
\text{Reinvestment Rate}_{2008} = \frac{(3,939 - 1,839 + 241)}{7,030 \times (1 - .38)} = 53.72\%
\]

We compute the return on capital, using operating income in 2008 and capital invested at the start of 2008 (end of 2007):

\[
\text{Return on Capital}_{2008} = \frac{\text{EBIT} \times (1 - t)}{\text{(BV of Equity + BV of Debt - Cash)}} = \frac{7,030 \times (1 - .38)}{(30,753 + 16,892 - 3,670)} = 9.91\%
\]

\(^{20}\)The book value of debt is augmented by the $1,720 million in present value of operating lease commitments. The unadjusted operating income for Disney was $6,726 million. The operating lease adjustment adds the current year’s operating lease expense to capital expenditures ($550 million), and subtracts out the depreciation on the leased asset to depreciation ($246 million) to arrive at an adjusted operating income of $7,030 million.
If Disney maintains its 2008 reinvestment rate and return on capital for the next few years, its growth rate will be only 2.35 percent.

Expected Growth Rate from Existing Fundamentals = 53.72% * 9.91% = 5.32%

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Valuing Growth Companies: A Behavioral Perspective

In theory, we should expect to see larger valuation errors with growth companies than with mature companies, because there is more firm-specific uncertainty that we face in valuing growth companies, insofar as we have to estimate how long growth will last and how high growth will be during the period. In practice, we generally find support for this hypothesis but we also find that there is more bias in the valuation of growth companies. In particular, there is evidence to suggest that high growth (and high PE) stocks tend to earn returns that are too low and are thus priced too high, relative to low growth stocks. There are three reasons why this may occur:

a. **Over confidence**: Through this book, we have chronicled the effects of over confidence on corporate finance decisions. Over confident managers tend to take too many investments, over pay on acquisitions and borrow too much. Over confident investors tend to under estimate the likelihood that firms will fail and over estimate future potential. While all valuations are affected by this over confidence, the effects on value are much greater with growth companies, where failure is much more likely and future potential accounts for a much larger proportion of value.

b. **Scaling biases**: For better or worse, analysts tend to look at growth rates in recent periods and extrapolate that growth into future periods. While this practice again may affect all valuations, it has a much bigger effect when valuing small companies that have been able to post very high growth rates (reflecting their small size) in recent time periods.

There is a final factor that may be at play here. The analysts, managers and appraisers who are attracted to the sectors with high growth (technology, for instance) may represent the most over optimistic individuals in the overall population and their valuations will reflect that selection bias.
There is a data set online that summarizes reinvestment rates and return on capital by industry group in the United States for the most recent quarter.

b. Estimating Cost of Capital

Unlike equity valuation models, where the cost of equity is used to discount cash flows to equity, the cost of capital is used to discount cash flows to the firm. The cost of capital is a composite cost of financing that includes the costs of both debt and equity and their relative weights in the financing structure:

\[
\text{Cost of Capital} = k_{\text{equity}} \left( \frac{\text{Equity}}{\text{Debt} + \text{Equity}} \right) + k_{\text{debt}} \left( \frac{\text{Debt}}{\text{Debt} + \text{Equity}} \right)
\]

where the cost of equity represents the rate of return required by equity investors in the firm and the cost of debt measures the current cost of borrowing, adjusted for the tax benefits of borrowing. The weights on debt and equity have to be market value weights. We discussed the cost of capital estimation extensively earlier in this book, in the context of both investment analysis and capital structure. We will consider each of the inputs in the model in the context of valuing a firm.

The cost of equity, as we have defined it through this book, is a function of the non-diversifiable risk in an investment, which in turn is measured by a beta (in the single factor model) or betas (in the multiple factor models). We argued that the beta(s) are better measured by looking at the average beta(s) of other firms in the business, that is, bottom-up estimates, and reflecting a firm’s current business mix and leverage. This argument is augmented when we value companies by the fact that a firm’s expected business mix and financial leverage can change over time, and its beta will change with both. As the beta changes, the cost of equity will also change from year to year.

Just as the cost of equity can change over time as a firm’s exposure to market risk changes, so can the cost of debt as its exposure to default risk changes. The default risk of a firm can be expected to change for two reasons. One is that the firm’s size will change as we project earnings further into the future; the volatility in these earnings is also likely to change over time. The second reason is that changes occur in financial leverage. If we expect a firm’s financial leverage to change over time, it will affect its capacity to service debt and hence its cost of borrowing. The after-tax cost of debt can also change as a consequence of expected changes in the tax rate over time.
As a firm changes its leverage, the weights attached to equity and debt in the cost of capital computation will change. Should a firm’s leverage be changed over the forecast period? The answer to this depends on two factors. The first is whether the firm is initially under- or overlevered. If it is at its appropriate leverage, there is a far smaller need to change leverage in the future. The second is the views of the firm’s management and the degree to which they are responsive to the firm’s stockholders. Thus, if the management of a firm is firmly entrenched and steadfast in its opposition to debt, an underlevered firm will stay that way over time. In an environment where stockholders have more power, there will eventually be pressure on this firm to increase its leverage toward its optimal level.

**Illustration 12.8 Cost of Capital: Disney**

Recapping the inputs we used to estimate the cost of capital in Disney, we will make the following assumptions:

- The beta for the first five years will be the bottom-up beta of 0.9011 that we estimated in Illustration 4.7. In conjunction with a risk-free rate of 3.5 percent and market risk premium of 6%, this yields a cost of equity of 8.91 percent.

\[
\text{Cost of Equity} = \text{Risk-Free Rate} + \beta \times \text{Risk Premium} = 3.5\% + 0.9011 \times 6\% = 8.91\%
\]

- The cost of debt for Disney for the first five years, based on its rating of A, is 6%. Using Disney’s tax rate of 38 percent gives an after-tax cost of debt of 3.29 percent:

\[
\text{After-Tax Cost of Debt} = 6\% \times (1 - 0.38) = 3.72\%
\]

- The current market debt ratio of 26.7% debt will be used as the debt ratio for the first five years of the valuation. Keep in mind that this debt ratio is computed using the market value of debt (inclusive of operating leases) of $16,682 million and a market value of equity of $46,045 million.

The cost of capital for Disney, at least for the first five years of the valuation, is 7.52%.

\[
\text{Cost of Capital} = \text{Cost of Equity} \times \left( \frac{E}{D + E} \right) + \text{After-Tax Cost of Debt} \times \left( \frac{D}{D + E} \right)
\]

\[
= 8.91\% \times (0.763) + 3.72\% \times (0.267) = 7.52\%
\]
A standard critique of the use of cost of capital in firm valuation is that it assumes that leverage stays stable over time (through the weights in the cost of capital). Is this true?

a. Yes
b. No

wacc.xls: There is a data set online that summarizes the costs of capital for firms in the United States by industry group.

c. Estimating Terminal Value

The approach most consistent with a discounted cash flow model assumes that cash flows beyond the terminal year will grow at a constant rate forever, in which case the terminal value can be estimated as follows:

\[
\text{Terminal Value}_n = \frac{\text{Free Cash Flow to Firm}_{n+1}}{(\text{Cost of Capital}_{n+1} - g_n)}
\]

where the cost of capital and the growth rate in the model are sustainable forever. We can use the relationship between growth and reinvestment rates that we noted earlier to estimate the reinvestment rate in stable growth:

\[
\text{Reinvestment Rate in Stable Growth} = \frac{\text{Stable Growth Rate}}{\text{ROC}_n}
\]

where the \( \text{ROC}_n \) is the return on capital that the firm can sustain in stable growth. This reinvestment rate can then be used to generate the FCFF in the first year of stable growth:

\[
\text{Terminal Value} = \frac{\text{EBIT}_{n+1}(1 - t) \left( 1 - \frac{g_n}{\text{ROC}_n} \right)}{(\text{Cost of Capital}_n - g_n)}
\]

In the special case where \( \text{ROC} \) is equal to the cost of capital, this estimate simplifies to become the following:

\[
\text{Terminal Value}_{\text{ROC=WACC}} = \frac{\text{EBIT}_{n+1}(1 - t)}{\text{Cost of Capital}_n}
\]

Thus, in every discounted cash flow valuation, there are two critical assumptions we need to make on stable growth. The first relates to when the firm we are valuing will become a stable-growth firm, if it is not one already. The second relates to what the characteristics of the firm will be in stable growth, in terms of return on capital and cost of capital. We
examined the first question earlier in this chapter when we looked at the dividend discount model. Let us consider the second question now.

As firms move from high growth to stable growth, we need to give them the characteristics of stable-growth firms. A firm in stable growth will be different from that same firm in high growth on a number of dimensions. For instance,

- As we noted with equity valuation models, high-growth firms tend to be more exposed to market risk (and have higher betas) than stable-growth firms. Thus, although it might be reasonable to assume a beta of 1.8 in high growth, it is important that the beta be lowered, if not to one at least toward one in stable growth.\(^{21}\)
- High-growth firms tend to have high returns on capital and earn excess returns. In stable growth, it becomes more difficult to sustain excess returns. There are some who believe that the only assumption sustainable in stable growth is a zero excess return assumption; the return on capital is set equal to the cost of capital. Although we agree in principle, with this view it is difficult in practice to assume that all investments, including those in existing assets, will suddenly lose the capacity to earn excess returns. Because it is possible for entire industries to earn excess returns over long periods, we believe that assuming a firm’s return on capital will move toward its industry average sometimes yields more reasonable estimates of value.
- Finally, high-growth firms tend to use less debt than stable-growth firms. As firms mature, their debt capacity increases. The question of whether the debt ratio for a firm should be moved toward its optimal cannot be answered without looking at the incumbent managers’ power relative to their stockholders and their views about debt. If managers are willing to change their debt ratios and stockholders retain some power, it is reasonable to assume that the debt ratio will move to the optimal level in stable growth; if not, it is safer to leave the debt ratio at existing levels.

12.9. Net Capital Expenditures, FCFE, and Stable Growth

Assume that you are valuing a high-growth firm with high risk (beta) and large reinvestment needs (high reinvestment rate). You assume the firm will be in stable
growth after five years, but you leave the risk and reinvestment rate at high-growth levels. Will you undervalue or overvalue this firm?

a. Undervalue the firm
b. Overvalue the firm

Illustration 12.9 Stable Growth Inputs and Transition Period: Disney

We will assume that Disney will be in stable growth after year ten. In its stable growth phase, we will assume the following:

- The beta for the stock will drop to one, reflecting Disney’s status as a mature company. This will lower the cost of equity for the firm to 9.50 percent.
  
  Cost of Equity = Risk-Free Rate + Beta * Risk Premium = 3.5% + 6% = 9.50%

- The debt ratio for Disney will stay at 30 percent. This is at the lower end of the optimal we computed for Disney in Chapter 8. Because we assume that the cost of debt remains unchanged at 6%, this will result in a cost of capital of 7.95 percent
  
  Cost of Capital = 9.5%(0.7327) + 6%(1 – 0.38)(0.2673) = 7.95%

- The return on capital for Disney will drop from its high-growth period level of 9.91 percent to a stable growth level of 9 percent. This is still higher than the cost of capital of 7.91%, but Disney’s competitive advantages are unlikely to dissipate completely by the end of the tenth year.

- The expected growth rate in stable growth will be 3 percent. In conjunction with the return on capital of 9%, this yields a stable period reinvestment rate of 33.33%:
  
  Reinvestment Rate = Growth Rate/Return on Capital = 3%/9% = 33.33%

The values of all of these inputs adjust gradually during the transition period, from years six to ten, from high-growth levels to stable-growth values.

a. From Operating Asset Value to Firm Value

The operating income is the income from operating assets, and the cost of capital measures the cost of financing these assets. When the operating cash flows are discounted to the present, we value the operating assets of the firm. Firms, however, often have

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21As a rule of thumb, betas above 1.2 or below 0.8 are inconsistent with stable-growth firms. Two-thirds of all U.S. firms have betas that fall within this range.
significant amounts of cash and marketable securities on their books. The value of these assets should be added to the value of the operating assets to arrive at firm value.

Cash and marketable securities can easily be incorporated into firm value, whereas other non-operating assets are more difficult to value. Consider, for instance, minority holdings in other firms and subsidiaries, where income statements are not consolidated.\(^{22}\) If we consider only the reported income from these holdings, we will miss a significant portion of the value of the holdings.\(^{23}\) The most accurate way to incorporate these holdings into firm value is to value each subsidiary or firm in which there are holdings and assign a proportional share of this value to the firm. If a firm owns more than 50 percent of a subsidiary, accounting standards in the United States require that the firm fully consolidate the income and assets of the subsidiary into its own. The portion of the equity that does not belong to the firm is shown as minority interest on the balance sheet and should be subtracted out to get to the value of the equity in the firm.\(^{24}\)

There is one final asset to consider. Firms with defined pension liabilities sometimes accumulate pension fund assets in excess of these liabilities. Although the excess does belong to the owners of the firm, they face a tax liability if they claim it. The conservative rule would be to assume that the social and tax costs of reclaiming the excess pension funds are so large that few firms would ever even attempt to do so.

**Illustration 12.10 Value of Non-operating Assets at Disney**

At the end of 2008, Disney reported holding $3,795 million in cash and marketable securities. In addition, Disney reported a book value of $1.763 billion for minority investments in other companies, primarily in foreign Disney theme parks.\(^{25}\) In the absence of detailed financial statements for these investments, we will assume that the

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\(^{22}\)When income statements are consolidated, the entire operating income of the subsidiary is shown in the income statement of the parent firm. Firms do not have to consolidate financial statements if they hold minority stakes in firms and take a passive role in their management.

\(^{23}\)When firms hold minority, passive interests in other firms, they report only the portion of the dividends they receive from these investments. With minority, active holdings, they report the portion of the net income that is attributable to them, but not as part of operating income.

\(^{24}\)Optimally, we would like to subtract out the market value of the minority interests rather than the book value, which is reported in the balance sheet.

\(^{25}\)Disney owns 39 percent of Euro Disney and 43 percent of the Hong Kong Disney park. It also owns 37.5 percent of the A&E network and 39.6 percent of E! Television.
book value is roughly equal to the market value. Note that we consider the rest of the assets on Disney’s balance sheet including the $5.4 billion it shows in capitalized TV and film costs and $22.2 billion it shows in goodwill and intangibles to be operating assets that we have already captured in the cash flows.\textsuperscript{26}

Finally, Disney consolidates its holdings in a few subsidiaries in which it owns less than 100 percent. The portion of the equity in these subsidiaries that does not belong to Disney is shown on the balance sheet as a liability (minority interests) of $1,344 million. As with its holdings in other companies, we assume that this is also the estimated market value and subtract it from firm value to arrive at the value of equity in Disney.

\textbf{\textit{cash.xls}}: There is a data set online that summarizes the value of cash and marketable securities by industry group in the United States for the most recent quarter.

\textbf{b. From Firm Value to Equity Value}

The general rule that you should use is 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 convert operating leases to debt 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 (if it is not) and deduct it from firm value to get to the value of common equity.\textsuperscript{27}

There may be other claims on the firm that do not show up in debt for purposes of computing cost of capital but should be subtracted out from firm value to get to the value of equity.

\begin{itemize}
  \item \textit{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 percent chance that
\end{itemize}

\textsuperscript{26}Adding these on to the present value of the cash flows would represent double counting.

\textsuperscript{27}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

\begin{equation*}
\text{Cost of preferred stock} = \frac{\text{Preferred Dividend}}{\text{Cost of Preferred Stock}}
\end{equation*}

The cost of preferred stock should be higher than the pretax cost of debt, because debt has a prior claim on the cash flows and assets of the firm.
you could lose a case that you are defending and the expected damage award is $1 billion, you would reduce the value of the equity in the firm by $100 million (Probability * Expected Damages). If the expected liability is not expected to occur 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. Although 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 strategies that reduce their taxes in the current year while increasing their taxes in future years. Of the three items listed here, this one is the least clearly defined, because it is not clear when or even whether the obligation will come due. Ignoring it, though, may be foolhardy, because 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 ten years, you would discount the deferred tax liability back ten years and deduct this amount from the firm value to get to equity value.

* * *  

**e. From Equity Value to Equity Value per Share**

Once the value of the firm, inclusive of nonoperating assets, has been estimated, we generally subtract the value of the outstanding debt to arrive at the value of equity and then divide the value of equity by the number of shares outstanding to estimate the value per share. This approach works only when common stock is the only equity outstanding. When there are warrants and employee options outstanding, the estimated value of these options has to be subtracted from the value of the equity before we divide by the number of shares outstanding. The same procedure applies when the firm has convertible bonds outstanding, because these conversion options represent claims on equity as well.

For those unwilling to use option pricing models, there are two shortcuts available. One is to divide the value of equity by the fully diluted number of shares
outstanding rather than by the actual number.\textsuperscript{28} This approach will underestimate the value of the equity because it fails to consider the cash proceeds from option exercise. The other shortcut, which is called the \textit{treasury stock approach}, adds the expected proceeds from the exercise of the options (exercise price multiplied by the number of options outstanding) to the numerator before dividing by the number of shares outstanding. Although this approach will yield a more reasonable estimate than the first one, it does not include the time premium of the options outstanding. Thus, it tends to overstate the value of the common stock.

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

\textit{Illustration 12.11 Value of Equity Options}

Disney has granted considerable numbers of options to its managers. At the end of 2008, there were 171 million options outstanding, with a weighted average exercise price of $28.37 and weighted average life of six years. Using the current stock price of $24.34, an estimated standard deviation of 29 percent,\textsuperscript{29} a dividend yield of 1.54\%, and an option pricing model, we estimate the value of these equity options to $851 million.\textsuperscript{30} The value we have estimated for the options above are probably too high, because we assume that all the options are exercisable. In fact, a significant proportion of these options (about 30\%) are not vested yet,\textsuperscript{31} and this fact will reduce their estimated value. We will also assume that these options, when exercised, will generate a tax benefit to the firm equal to 38\% of their value:

\[ \text{After-Tax Value of Equity Options} = 851(1 – 0.38) = $528 \text{ million} \]

To get to the value of equity in common stock, we will reduce the overall value of equity by the after-tax value of options granted by the firm. Dividing the value of equity in

\textsuperscript{28}We assume that all options will be exercised and compute the number of shares that will be outstanding in that event.

\textsuperscript{29}We used the historical standard deviation in Disney’s stock price to estimate this number.

\textsuperscript{30}The option pricing model used is the Black-Scholes model, adjusted for potential dilution. It is explained in appendix 4.

\textsuperscript{31}When options are not vested, they cannot be exercised. When providing options to their employees, firms often require that they continue as employees for a set period (vesting period) before they can exercise these options.
common stock by the actual number of shares outstanding should yield a value of equity value per share.

Reconciling Equity and Firm Valuations

This model, unlike the dividend discount model or the FCFE model, values the firm rather than equity. The value of equity, however, can be extracted from the value of the firm by subtracting out the market value of outstanding debt. Because this model can be viewed as an alternative way of valuing equity, two questions arise: Why value the firm rather than equity? Will the values for equity obtained from the firm valuation approach be consistent with the values obtained from the equity valuation approaches described in the previous section?

The advantage of using the firm valuation approach is that cash flows relating to debt do not have to be considered explicitly, because the FCFF is a pre-debt cash flow, whereas they do have to be taken into account in estimating FCFE. In cases where the leverage is expected to change significantly over time, this is a significant saving, because estimating new debt issues and debt repayments when leverage is changing can become increasingly messy the further into the future you go. The firm valuation approach does, however, require information about debt ratios and interest rates to estimate the WACC.

The value for equity obtained from the firm valuation and equity valuation approaches will be the same if you make consistent assumptions about financial leverage. Getting them to converge in practice is much more difficult. Let us begin with the simplest case—a no-growth, perpetual firm. Assume that the firm has $166.67 million in EBIT and a tax rate of 40 percent. Assume that the firm has equity with a market value of $600 million, with a cost of equity of 13.87 percent, and debt of $400 million, with a pretax cost of debt of 7 percent. The firm’s cost of capital can be estimated:

\[
\text{Cost of Capital} = (13.87\% \times \frac{600}{1000}) + (7\% \times (1 - 0.4) \times \frac{400}{1000}) = 10\%
\]

\[
\text{Value of the Firm} = \frac{\text{EBIT}(1 - t)}{\text{Cost of capital}} = \frac{166.67(1 - 0.4)}{0.10} = $1,000
\]

Note that the firm has no reinvestment and no growth. We can value equity in this firm by subtracting out the value of debt.

\[
\text{Value of Equity} = \text{Value of Firm} - \text{Value of Debt} = $1,000 - $400 = $600 \text{ million}
\]
Now let us value the equity directly by estimating the net income:

\[
\text{Net Income} = (\text{EBIT} - \text{Pretax Cost of Debt} \times \text{Debt})(1 - t) = (166.67 - 0.07 \times 400)(1 - 0.4) = 83.202 \text{ million}
\]

The value of equity can be obtained by discounting this net income at the cost of equity:

\[
\text{Value of Equity} = \frac{\text{Net Income}}{\text{Cost of equity}} = \frac{83.202}{0.1387} = 600 \text{ million}
\]

Even this simple example works because of the following assumptions that we made implicitly or explicitly during the valuation.

1. The values for debt and equity used to compute the cost of capital were equal to the values that we obtained in the valuation. Notwithstanding the circularity in reasoning—you need the cost of capital to obtain the values in the first place—it indicates that a cost of capital based on market value weights will not yield the same value for equity as an equity valuation model if the firm is not fairly priced in the first place.

2. There are no extraordinary or nonoperating items that affect net income but not operating income. Thus, to get from operating to net income, all we do is subtract out interest expenses and taxes.

3. The interest expenses are equal to the pretax cost of debt multiplied by the market value of debt. If a firm has old debt on its books, with interest expenses that are different from this value, the two approaches will diverge.

If there is expected growth, the potential for inconsistency multiplies. You have to ensure that you borrow enough money to fund new investments to keep your debt ratio at a level consistent with what you are assuming when you compute the cost of capital.

Illustration 12.12 FCFF Valuation: Disney

To value Disney, we will consider all of the numbers that we have estimated already in this section. Recapping those estimates:

- The operating income in 2008, before taxes and adjusted for operating leases, is $7,030 million. Based upon the capital invested at the start of 2008, we estimate a return on capital is 9.91%.
- For years one through five, we will assume that Disney will maintain its return on capital on new investments at 9.91% and that the reinvestment rate will be 53.72% (see Illustration 12.7). This will result in an expected growth rate of 5.32% a year.
- For years one through five, we will assume that Disney will maintain its existing debt ratio of 26.73% and its current cost of capital of 7.51% (see Illustration 12.8).
- The assumptions for stable growth (after year ten) and for the transition period are listed in Illustration 12.9.

In Table 12.7, we estimate the after-tax operating income, reinvestment, and free cash flow to the firm each year for the next ten years.

**Table 12.7 Estimated FCFF, Disney**

<table>
<thead>
<tr>
<th>Year</th>
<th>Expected growth rate</th>
<th>EBIT (1-t)</th>
<th>Reinvestment rate</th>
<th>Reinvestment</th>
<th>FCFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>5.32%</td>
<td>$4,591</td>
<td>53.72%</td>
<td>$2,466</td>
<td>$2,125</td>
</tr>
<tr>
<td>2010</td>
<td>5.32%</td>
<td>$4,835</td>
<td>53.72%</td>
<td>$2,598</td>
<td>$2,238</td>
</tr>
<tr>
<td>2011</td>
<td>5.32%</td>
<td>$5,093</td>
<td>53.72%</td>
<td>$2,736</td>
<td>$2,357</td>
</tr>
<tr>
<td>2012</td>
<td>5.32%</td>
<td>$5,364</td>
<td>53.72%</td>
<td>$2,882</td>
<td>$2,482</td>
</tr>
<tr>
<td>2013</td>
<td>5.32%</td>
<td>$5,650</td>
<td>53.72%</td>
<td>$3,035</td>
<td>$2,615</td>
</tr>
<tr>
<td>2014</td>
<td>4.86%</td>
<td>$5,924</td>
<td>49.64%</td>
<td>$2,941</td>
<td>$2,983</td>
</tr>
<tr>
<td>2015</td>
<td>4.39%</td>
<td>$6,185</td>
<td>45.57%</td>
<td>$2,818</td>
<td>$3,366</td>
</tr>
<tr>
<td>2016</td>
<td>3.93%</td>
<td>$6,428</td>
<td>41.49%</td>
<td>$2,667</td>
<td>$3,761</td>
</tr>
<tr>
<td>2017</td>
<td>3.46%</td>
<td>$6,650</td>
<td>37.41%</td>
<td>$2,488</td>
<td>$4,162</td>
</tr>
<tr>
<td>2018</td>
<td>3.00%</td>
<td>$6,850</td>
<td>33.33%</td>
<td>$2,283</td>
<td>$4,567</td>
</tr>
</tbody>
</table>

In Table 12.8, we estimate the present value of the FCFF using the cost of capital. Because the beta and debt ratio change each year from year six to ten, the cost of capital also changes each year.

**Table 12.8 Present Value of Free Cash Flows to Firm, Disney**

<table>
<thead>
<tr>
<th>Year</th>
<th>FCFF</th>
<th>Cost of capital</th>
<th>Cumulated Cost of capital</th>
<th>PV of cash flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>$2,125</td>
<td>7.52%</td>
<td>1.0752</td>
<td>$1,976</td>
</tr>
<tr>
<td>2010</td>
<td>$2,238</td>
<td>7.52%</td>
<td>1.1561</td>
<td>$1,936</td>
</tr>
<tr>
<td>2011</td>
<td>$2,357</td>
<td>7.52%</td>
<td>1.2430</td>
<td>$1,896</td>
</tr>
<tr>
<td>2012</td>
<td>$2,482</td>
<td>7.52%</td>
<td>1.3365</td>
<td>$1,857</td>
</tr>
<tr>
<td>2013</td>
<td>$2,615</td>
<td>7.52%</td>
<td>1.4370</td>
<td>$1,819</td>
</tr>
<tr>
<td>2014</td>
<td>$2,983</td>
<td>7.61%</td>
<td>1.5463</td>
<td>$1,929</td>
</tr>
</tbody>
</table>
To compute the present value of the cash flows in years six through ten, we have to use the compounded cost of capital over the previous years. To illustrate, the present value of $3,761 million in cash flows in 2016 is:

\[
PV \text{ of Cash Flow in 2009} = \frac{3,761}{(1.0752)(1.0761)(1.0769)(1.0778)} = \$2,095 \text{ million}
\]

The final piece of the valuation is the terminal value. To estimate the terminal value, at the end of year ten, we estimate the free cash flow to the firm in year 11, using the reinvestment rate of 33.33% that we estimated in illustration 12.9:

\[
FCFF_{11} = \text{EBIT}_{10}(1 - t)(1 + g_{\text{nw}})(1 - \text{Reinvestment Rate}_{\text{Stable Growth}})
\]

\[
= 6,850(1.03)(1 - 0.333) = \$4,704 \text{ million}
\]

\[
\text{Terminal Value} = \frac{FCFF_{11}}{(\text{Cost of Capital}_{\text{Stable Growth}} - g)}
\]

\[
= \frac{4704}{(0.0795 - 0.03)} = \$94,928 \text{ million}
\]

The value of the firm is the sum of the present values of the cash flows during the high-growth period, the present value of the terminal value, and the value of the nonoperating assets that we estimated in Illustration 12.10.

\[
\text{PV of cash flows during the high growth phase} = \$19,865 \text{ million}
\]

\[
\text{PV of Terminal Value} = \frac{94,928}{(1.0752)^5(1.0761)(1.0769)(1.0778)(1.0787)(1.0795)} = \$45,419
\]

\[+ \text{Cash and Marketable Securities} = \$3,795\]

\[+ \text{Nonoperating Assets (Holdings in Other Companies)} = \$1,763\]

\[\text{Value of the Firm} = \$70,842\]

Subtracting out the market value of debt (including operating leases) of $16,682 million the value of minority interests ($1,344 million) and the value of the equity options (estimated to be worth $528 million in Illustration 12.11) yields the value of the common stock:

\[\text{Value of Equity in Common Stock} = \text{Value of Firm} - \text{Debt} - \text{Minority interests} - \text{Equity Options}\]
= $70,842 - $16,682 - $1,344 - $528 = $52,288

Dividing by the number of shares outstanding (1856.75 million), we arrive at a value per share of $28.16, about 17% above the market price of $24.34 at the time of this valuation. Figure 12.4 summarizes the valuation:

**Figure 12.4: Valuation Summary**

Disney - Status Quo in 2009

Current Cashflow to Firm
- EBIT(1-t) = 7030(1-0.38) = 4,359
- Net CapX = 2,101
- Chg WC = 541
- FCFF = 2,017
- Reinvestment Rate = 2342/4359 = 53.72%

Return on Capital = 9.91%

Reinvestment Rate
- Expected Growth in EBIT (1-t) = 53.72%

Stable Growth
- Expected Growth = 3% (Beta = 1.00; Cost of capital = 7.95%)
- ROI = 9%
- Reinvestment Rate = 33.33%

Terminal Value = 4704/(0.0795 - 0.03) = 94,928

Cost of Capital (WACC) = 8.91% (0.73) + 3.72% (0.27) = 7.52%

Op. Assets = 65,284
- Cash = 3,795
- Non op inv = 1,763
- Debt = 16,682
- Minority int = 1,344
- Equity = 52,816
- Options = 528

Value/Share = $28.16

10

12.10. Net Capital Expenditures and Value

In the valuation above, we assumed that the reinvestment rate would be 33.33 percent in perpetuity to sustain the 3% stable growth rate. What would the terminal value have been if instead we had assumed that the reinvestment rate was zero while continuing to use a stable growth rate of 3%?

a. Higher than $94.9 billion (estimated in illustration 12.12)

b. Lower than $94.9 billion

**In Practice: Adjusted Present Value**

In Chapter 8, we presented the adjusted present value (APV) approach to estimate the optimal debt ratio for a firm. In that approach, we begin with the value of the firm
without debt. As we add debt to the firm, we consider the net effect on value by considering both the benefits and the costs of borrowing. To do this, we assume that the primary advantage of borrowing is a tax benefit and the most significant cost is the added risk of bankruptcy.

The first step in this approach is the estimation of the value of the unlevered firm. This can be accomplished by valuing the firm as if it had no debt, that is, by discounting the expected FCFF at the unlevered cost of equity. In the special case where cash flows grow at a constant rate in perpetuity, the value of the firm is easily computed.

$$\text{Value of Unlevered Firm} = \frac{\text{FCFF}_u (1 + g)}{\rho_u - g}$$

where FCFF$_u$ is the current after-tax operating cash flow to the firm, $\rho_u$ is the unlevered cost of equity, and $g$ is the expected growth rate. In the more general case, you can value the firm using any set of growth assumptions you believe are reasonable for the firm.

The second step is the calculation of the expected tax benefit from a given level of debt. This tax benefit is a function of the tax rate of the firm and is discounted at the cost of debt to reflect the riskiness of this cash flow. If the tax savings are viewed as a perpetuity,

$$\text{Value of Tax Benefits} = \left( \text{Tax Rate} \right) \left( \text{Cost of Debt} \right) \left( \text{Debt} \right)$$

$$= (t_c \times D)$$

The tax rate used here is the firm’s marginal tax rate, and it is assumed to stay constant over time. If we anticipate the tax rate changing over time, we can still compute the present value of tax benefits over time, but we cannot use the perpetual growth equation.

The third step is to evaluate the effect of the given level of debt on the default risk of the firm and on expected bankruptcy costs. In theory at least, this requires the estimation of the probability of default with the additional debt and the direct and indirect cost of bankruptcy. If $\pi_a$ is the probability of default after the additional debt and $BC$ is the present value of the bankruptcy cost, the present value of expected bankruptcy cost can be estimated.

$$\text{PV of Expected Bankruptcy Cost} = \left( \text{Probability of Bankruptcy} \right) \left( \text{PV of Bankruptcy Cost} \right)$$

$$= \pi_a BC$$
This step of the APV approach poses the most significant estimation problems, because neither the probability of bankruptcy nor the bankruptcy cost can be estimated directly.

In theory, both the APV and the cost of capital approach will yield the same values for a firm if consistent assumptions are made about financial leverage. The difficulties associated with estimating the expected bankruptcy cost, though, often lead many to use an abbreviated version of the APV model, where the tax benefits are added to the unlevered firm value and bankruptcy costs are ignored. This approach will overvalue firms.

**Valuing Private Businesses**

All of the principles that we have developed for valuation apply to private companies as well. In other words, the value of a private company is the present value of the expected cash flows that you would expect that company to generate over time, discounted back at a rate that reflects the riskiness of the cash flows. The differences that exist are primarily in the estimation of the cash flows and the discount rates:

- When estimating cash flows, keep in mind that although accounting standards may not be adhered to consistently in publicly traded firms, they can diverge dramatically in private firms. In small, private businesses, we should reconstruct financial statements rather than trust the earnings numbers that are reported. There are also two common problems that arise in private firm accounting that we have to correct for. The first is the failure on the part of many owners to attach a cost to the time that they spend running their businesses. Thus the owner of a store who spends most of every day stocking the store shelves, staffing the cash register, and completing the accounting will often not show a salary associated with these activities in his or her income statement, resulting in overstated earnings. The second is the intermingling of personal and business expenses that is endemic in many private businesses. When reestimating earnings, we have to strip the personal expenses out of the analysis.

- When estimating discount rates for publicly traded firms, we hewed to two basic principles. With equity, we argued that the only risk that matters is the risk that cannot be diversified away by marginal investors, who we assumed were well diversified. With debt, the cost of debt was based on a bond rating and the default spread associated with that rating. With private firms, both these assumptions will
come under assault. First, the owner of a private business is almost never diversified and often has his or her entire wealth tied up in the firm’s assets. That is why we developed the concept of a total beta for private firms in Chapter 4, where we scaled the beta of the firm up to reflect all risk and not just nondiversifiable risk. Second, private businesses usually have to borrow from the local bank and do not have the luxury of accessing the bond market. Consequently, they may well find themselves facing a higher cost of debt than otherwise similar publicly traded firms.

The final issue relates back to terminal value. With publicly traded firms, we assume that firms have infinite lives and use this assumption, in conjunction with stable growth, to estimate a terminal value. Private businesses, especially smaller ones, often have finite lives since they are much more dependent on the owner/founder for their existence.

With more conservative estimates of cash flows, higher discount rates to reflect the exposure to total risk and finite life assumptions, it should come as no surprise that the values we attach to private firms are lower than those that we would attach to otherwise similar publicly traded firms. This also suggests that private firms that have the option of becoming publicly traded will generally opt to do so even though the owners might not like the oversight and loss of control that comes with this transition.

Illustration 12.13 Valuing a Private Business: Bookscape

To value Bookscape, we will use the pre-tax operating income of $3 million that the firm had in its most recent year as a starting point. Adjusting for the operating lease commitments that the firm has, we arrive at an adjusted pre-tax operating income of $3,575 million.\(^{32}\) To estimate the cost of capital, we draw on the estimates of total beta and the assumption that the firm’s debt to capital ratio would resemble the industry average of 34.84% that we made in Chapter 4:

\[
\text{Cost of Capital} = \text{Cost of Equity}(D/[D + E]) + \text{After-Tax Cost of Debt}(D/[D + E])
\]

\[
= 20.94\%(0.6516) + 6\%(1 - 0.4)(0.3484) = 0.149 \text{ or } 14.9\%
\]

\(^{32}\)In Illustration 4.15, we estimated the present value of the operating lease commitments at Bookscape to be $9.588 million. To adjust the operating income, we add back the imputed interest expense on this debt, obtained by multiplying the pretax cost of borrowing by the present value of the operating leases (6% of $9.588 million).
The total beta for Bookscape is 2.91, and we will continue to use the 40 percent tax rate for the firm, as long as the firm has taxable income.

In Chapter 6, we estimated a return on capital for Bookscape of 13.76% and we will assume that the firm will continue to generate this return on capital for the foreseeable future, while growing its earnings at 2 percent a year. The resulting reinvestment rate is 14.53 percent:

\[ \text{Reinvestment Rate} = \frac{\text{Growth Rate}}{\text{Return on Capital}} = \frac{2\%}{13.76\%} = 14.53\% \]

The present value of the cash flows, assuming perpetual growth, can be computed as follows:

\[ \text{Value of Operating Assets} = \frac{\text{EBIT}(1-t)(1-\text{Reinvestment Rate})(1+g)}{(\text{Cost of capital} - g)} \]

\[ = \frac{3.575(1-.4)(1-.1453)(1.02)}{(.149 - .02)} = $14.497 \text{ mil} \]

To get to the value of equity, we add back the cash holdings ($500,000) and subtract out the debt ($9.588 million).

\[ \text{Value of Equity} = \text{Value of Operating Assets} + \text{Cash} - \text{Debt} \]

\[ = 14.497 + 0.5 - 9.588 = $5.409 \text{ million} \]

Note that this valuation of equity is conditioned on two assumptions, that the firm will continue operating in perpetuity and that the buyer is an undiversified individual.

To see the effect on value of altering the assumption of perpetual life, we assumed instead that the business would continue for only as long as the lease (25 years), with cash flows growing at 2% a year for that period, and that there is no residual value at the end of 25 years. With this assumption, the value of the business drops to $13.576 million and the value of equity to $4.67 million:

\[ \text{Value of Operating Assets} = \frac{1 - (1+g)^n}{(1+r)^n} \]

\[ = 3.575 (1-.4)(1-.1453) \frac{1 - (1.02)^n}{(1.149)^n} = 13.576 \text{ mil} \]

\[ \text{Value of Equity} = \text{Value of Operating Assets} + \text{Cash} - \text{Debt} \]

\[ = 13.576 + 0.5 - 9.588 = $ 4.67 \text{ million} \]
Finally, we also consider the value of the firm to a diversified investor or a publicly traded company by reverting back to a perpetual life and using the cost of capital of 8.81% that we estimated for Bookscape, using a market beta (see illustration 4.18):

\[
\text{Value of Operating Assets} = \frac{\text{EBIT(1-}t)(1-\text{Reinvestment Rate})(1+g)}{(\text{Cost of capital} - g)} = \frac{3.575(1-.4)(1-0.1453)(1.02)}{(0.0881 - .02)} = $27.442 \text{ mil}
\]

\[
\text{Value of Equity} = \text{Value of Operating Assets} + \text{Cash} - \text{Debt} = 27.4442 +0.5 - 9.588 = $ 18.35 \text{ million}
\]

The gap between the value of equity to a private buyer ($ 5.4 million) and to a public buyer ($18.35 million) yields some interesting implications:

a. **Diversification discount**: The only reason for the difference in values lies in the fact that the private owner is not diversified and thus sees more risk (and demands a higher return to compensate) than a public buyer, looking at the same business.

b. **A rationale for acquisitions**: The different perspectives on risk and value on the part of private and public buyers also offers a rationale for acquisitions of private businesses by publicly traded companies, where both sides see themselves as winners. Thus, if a public company (say, Barnes and Noble) offers $ 8 million for the equity in Bookscape, the owner of the company is being offered more than what he thinks the business is worth ($5.4 million) and the public company gets a bargain (since the equity is worth $18.35 million to them).

c. **Intermediate Solutions**: Venture capital and private equity investors fall between the two extremes, since they are more diversified than the private owner but less so than public investors. Consequently, they will arrive at values between $5.4 million and $18.35 million and derive their payoff from nurturing the business for an initial public offering or sale or public company.

The fact that some public companies go private is often viewed as inconsistent with our analyses here. After all, why would investors in a firm accept a huge drop in value by taking a company off the market? Note that when private equity investors such as KKR or Blackstone take a company private, their intent is not to keep them private, but to fix what they see as potential problems and take the company back public sooner rather than
later. Since the endgame remains the public market, they continue to run these businesses as if they were publicly held.

**In Practice: Illiquidity Discounts in Private Firm Valuation**

If you buy stock in a publicly traded firm and then change your mind and decide to sell, you face modest transaction costs. If you buy a private business and change your mind, it is far more difficult to reverse your decision. As a consequence, many analysts valuing private businesses apply an illiquidity discount that ranges from 20 to 40 percent of the value to arrive at a final value. Although the size of the discount is large, there is surprisingly little thought that goes into the magnitude of the discount. In fact, it is almost entirely based on studies of restricted stock issued by publicly traded firms. These stock are placed with investors who are restricted from trading on the stock for two years after the issue, and the price on the issue can be compared to the market price of the traded shares of the company to get a sense of the discount that investors demand for the enforced illiquidity. Because there are relatively few restricted stock issues, the sample sizes tend to be small and involve companies that may have other problems raising new funds.

Although we concede the necessity of illiquidity discounts in the valuation of private businesses, the discount should be adjusted to reflect the characteristics of the firm in question. Other things remaining equal, we would expect smaller firms with less liquid assets and in poorer financial health to have much larger illiquidity discounts attached to their values. One way to make this adjustment is to take a deeper look at the restricted stock issues for which we have data and look at reasons for the differences in discounts across stocks.33 Another way is to view the bid-ask spread as the illiquidity discount on publicly traded companies and extend an analysis of the determinants of these spreads to come up with a reasonable measure of it or illiquidity discount of a private business.34

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33Silber did this in a 1989 study, where he found that the discount tended to be larger for companies with smaller revenues and negative earnings. See Silber, W.L., 1991, Discounts on Restricted Stock: The Impact of Illiquidity on Stock Prices, Financial Analysts Journal, 60-64.

Value Enhancement

In a discounted cash flow valuation, the value of a firm is the function of four key inputs—the cash flows from existing investments, the expected growth rate in these cash flows for the high-growth period, the length of time before the company becomes a stable-growth company, and the cost of capital. Put simply, to enhance the value of a firm, we have to change one or more of these inputs:

a. *Increase cash flows from existing assets:* There are a number of ways we can increase cash flows from assets. First, we can use assets more efficiently, cutting costs and improving productivity. If we succeed, we should see higher operating margins and profits. Second, we can, within the bounds of the law, reduce the taxes we pay on operating income through good tax planning. Third, we can reduce maintenance capital expenditures and investments in working capital—inventory and accounts receivable—thus increasing the cash left over after these outflows.

b. *Increase the growth rate during the high-growth period:* Within the structure that we used in the last section, there are only two ways of increasing growth. We can reinvest more in internal investments and acquisitions, or we can try to earn higher returns on the capital that we invest in new investments. To the extent that we can do both, we can increase the expected growth rate. One point to keep in mind, though, is that increasing the reinvestment rate will almost always increase the growth rate, but it will not increase value if the return on capital on new investments lags the cost of capital.

c. *Increase the length of the high-growth period:* It is not growth per se that creates value but excess returns. Because excess returns and the capacity to continue earning them comes from the competitive advantages possessed by a firm, a firm has to either create new competitive advantages—brand name, economies of scale, and legal restrictions on competition all come to mind—or augment existing ones.

d. *Reduce the cost of capital:* In Chapter 8, we considered how changing the mix of debt and equity may reduce the cost of capital, and in Chapter 9, we considered how matching your debt to your assets can reduce your default risk and reduce your overall cost of financing. Holding all else constant, reducing the cost of capital will increase firm value.
Figure 12.5 summarizes the ways in which value can be enhanced at a public company.

**Figure 12.5: Ways of Enhancing Value**

- **Cashflows from existing assets**: Cashflows before debt payments, but after taxes and reinvestment to maintain existing assets.
- **Expected Growth during high growth period**: Growth created by making new investments; function of amount and quality of investments.
- **Efficiency Growth**: Growth generated by using existing assets better.
- **Stable growth firm, with no or very limited excess returns**: Length of the high growth period.
  - Since value creating growth requires excess returns, this is a function of:
    - Magnitude of competitive advantages
    - Sustainability of competitive advantages

Which one of these four approaches you choose will depend on where the firm you are analyzing or advising is in its growth cycle. For large mature firms, with little or no growth potential, cash flows from existing assets and the cost of capital offer the most promise for value enhancement. For smaller, risky, high-growth firms, it is likely to be changing the growth rate and the growth period that generate the biggest increases in value.

**Illustration 12.14 Value Enhancement at Disney**

In Illustration 12.12, we valued Disney at $28.16 a share. In the process, though, we assumed that there would be no significant improvement in the return on capital that Disney earns on its existing assets, which at 9.91% is still well below the return on capital that Disney earned until 1996 and that the debt ratio would remain unchanged at the existing level of 27%. To examine how much the value per share could be enhanced at Disney if it were run differently, we made the following changes:

- We assumed that there is little scope left for operating efficiencies on existing investments and that the return on capital on these investments will remain at its existing level of 9.91%.
We assumed that the return on capital on new investments would increase to 12%, higher than the 9.91% that we used in the status quo valuation. This is closer to the return that Disney used to make prior to its acquisition of Capital Cities. We kept the reinvestment rate unchanged at 53.72 percent. The resulting growth rate in operating income (for the first five years) is 7.98 percent a year.

We assumed that the firm would increase its debt ratio immediately to 40 percent, which is its current optimal debt ratio (from Chapter 8). Though the beta will increase to 1.04 as a consequence, the cost of capital will drop to 7.33 percent. Keeping this debt ratio in stable growth, assuming that the beta moves to 1, results in a cost of capital in stable growth of 7.19%.

Keeping the assumptions about stable growth unchanged, we estimate significantly higher cash flows for the firm for the high-growth period in Table 12.9.

<table>
<thead>
<tr>
<th>Year</th>
<th>Expected growth rate</th>
<th>EBIT (1-t)</th>
<th>Reinvestment rate</th>
<th>Reinvestment</th>
<th>FCFF</th>
<th>Cost of capital</th>
<th>Cumulated Cost of capital</th>
<th>PV</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>6.45%</td>
<td>$4,640</td>
<td>53.72%</td>
<td>$2,492</td>
<td>$2,147</td>
<td>7.33%</td>
<td>1.0733</td>
<td>$2,001</td>
</tr>
<tr>
<td>2010</td>
<td>6.45%</td>
<td>$4,939</td>
<td>53.72%</td>
<td>$2,653</td>
<td>$2,286</td>
<td>7.33%</td>
<td>1.1520</td>
<td>$1,984</td>
</tr>
<tr>
<td>2011</td>
<td>6.45%</td>
<td>$5,257</td>
<td>53.72%</td>
<td>$2,824</td>
<td>$2,433</td>
<td>7.33%</td>
<td>1.2365</td>
<td>$1,968</td>
</tr>
<tr>
<td>2012</td>
<td>6.45%</td>
<td>$5,596</td>
<td>53.72%</td>
<td>$3,006</td>
<td>$2,590</td>
<td>7.33%</td>
<td>1.3271</td>
<td>$1,951</td>
</tr>
<tr>
<td>2013</td>
<td>6.45%</td>
<td>$5,957</td>
<td>53.72%</td>
<td>$3,200</td>
<td>$2,757</td>
<td>7.33%</td>
<td>1.4244</td>
<td>$1,935</td>
</tr>
<tr>
<td>2014</td>
<td>5.76%</td>
<td>$6,300</td>
<td>49.64%</td>
<td>$3,127</td>
<td>$3,172</td>
<td>7.30%</td>
<td>1.5285</td>
<td>$2,076</td>
</tr>
<tr>
<td>2015</td>
<td>5.07%</td>
<td>$6,619</td>
<td>45.57%</td>
<td>$3,016</td>
<td>$3,603</td>
<td>7.27%</td>
<td>1.6397</td>
<td>$2,197</td>
</tr>
<tr>
<td>2016</td>
<td>4.38%</td>
<td>$6,909</td>
<td>41.49%</td>
<td>$2,866</td>
<td>$4,043</td>
<td>7.25%</td>
<td>1.7585</td>
<td>$2,299</td>
</tr>
<tr>
<td>2017</td>
<td>3.69%</td>
<td>$7,164</td>
<td>37.41%</td>
<td>$2,680</td>
<td>$4,484</td>
<td>7.22%</td>
<td>1.8854</td>
<td>$2,378</td>
</tr>
<tr>
<td>2018</td>
<td>3.00%</td>
<td>$7,379</td>
<td>33.33%</td>
<td>$2,460</td>
<td>$4,919</td>
<td>7.19%</td>
<td>2.0209</td>
<td>$2,434</td>
</tr>
</tbody>
</table>

The terminal value is also pushed up, as a result of the higher growth in the high-growth period:
Terminal Value = FCFF\text{t}_1/(\text{Cost of Capital} – g) = 4,919 (1.03)/(0.0719 – 0.03) = 
$120,982\text{ mil}$

The value of the firm and the value per share can now be estimated:

Present Value of FCFF in High-Growth Phase = $21,233
+ Present Value of Terminal Value of Firm = $59,866
+ Value of Cash & Marketable Securities = $3,795
+ Value of Minority Holdings in other companies = $1,763
Value of Firm = $86,647
– Market Value of Outstanding Debt = $16,682
- Minority Interests = $1,344
– Value of Equity in Options = $528
Value of Equity in Common Stock = $68,093
Market Value of Equity/Share = $36.67

Disney’s value per share increases from $28.16 per share in Illustration 12.12 to $36.67 a share when we make the changes to the way it is managed.\textsuperscript{35} Figure 12.6 presents the restructured valuation:

\textsuperscript{35}You may wonder why the dollar debt does not change even though the firm is moving to a 30 percent debt ratio. In reality, it will increase, but the number of shares will decrease when Disney recapitalizes. The net effect is that the value per share will be close to our estimated value.
**In Practice: The Value of Control**

The notion that control is worth 15 percent or 20 percent or some fixed percent of every firm’s value is deeply embedded in valuation practice, and it is not true. The value of control is the difference between two values—the value of the firm run by its existing management (status quo) and the value of the same firm run optimally.

Value of Control = Optimal Value for Firm – Status Quo Value

Thus, a firm that takes poor investments and funds them with a suboptimal mix of debt and equity will be worth more if it takes better investments and funds them with the right mix of debt and equity. In general, the worse managed a firm is the greater the value of control. This view of the world has wide ramifications in corporate finance and valuation:

- In a hostile acquisition, which is usually motivated by the desire to change the way that a firm is run, you should be willing to pay a premium that at best is equal to the value of control. You would prefer to pay less to preserve some of the benefits for yourself (rather than give them to target company stockholders).

- In companies with voting and nonvoting shares, the difference in value between the two classes should be a function of the value of control. If the value of control is high,
and there is a high likelihood of control changing, the value of the voting shares will increase relative to nonvoting shares.

In the Disney valuation, the value of control can be estimated by comparing the value of Disney run optimally with the status quo valuation done earlier in the chapter.

Value of Control_{Disney} = \text{Optimal Value} - \text{Status Quo Value} = \$36.67 - \$28.16 = \$8.51

Since the stock trades at $24.34, we could pay a premium of up to $12.33 to acquire the firm.

**Relative Valuation**

In discounted cash flow valuation, the objective is to find the value of assets, given their cash flow, growth, and risk characteristics. In relative valuation, the objective is to value assets, based on how similar assets are currently priced in the market. In this section, we consider why and how asset prices have to be standardized before being compared to similar assets, and how to control for differences across comparable firms.

**Standardized Values and Multiples**

To compare the values of similar assets in the market, we need to standardize the values in some way. They can be standardized relative to the earnings they generate, to the book value or replacement value of the assets themselves, or to the revenues that they generate. We discuss each method next.

1. **Earnings Multiples**

One of the more intuitive ways to think of the value of any asset is as a multiple of the earnings it generates. When buying a stock, it is common to look at the price paid as a multiple of the earnings per share generated by the company. This *price/earnings ratio* can be estimated using earnings per share over the last four quarters, which is called a *trailing PE*, or an expected earnings per share in the next financial year, called a *forward PE*. When buying a business, as opposed to just the equity in the business, it is common to examine the value of the firm, usually net of cash (enterprise value), as a multiple of the operating income or the earnings before interest, taxes, depreciation, and amortization (EBITDA). To a buyer of the equity or the firm, a lower multiple is better
than a higher one, but these multiples will be affected by the growth potential and risk of the business being acquired.

2. Book Value or Replacement Value Multiples

Although markets provide one estimate of the value of a business, accountants often provide a very different estimate. The accounting estimate of book value is determined by accounting rules and is heavily influenced by the original price paid for the asset and any accounting adjustments (such as depreciation) made since that time. Investors often look at the relationship between the market’s assessment of the value of equity and the book value of equity (or net worth) as a measure of how over- or undervalued a stock is; the price/book value ratio that emerges can vary widely across industries, depending again on the growth potential and the quality of the investments in each. When valuing businesses, we estimate this ratio using the value of the firm and the book value of all capital (rather than just the equity). For those who believe that book value is not a good measure of the true value of the assets, an alternative is to use the replacement cost of the assets; the ratio of the value of the firm to replacement cost is called the Q Ratio.

3. Revenue Multiples

Both earnings and book value are accounting measures and are determined by accounting rules and principles. An alternative, which is far less affected by these factors, is to use the ratio of the value of an asset to the revenues it generates. For equity investors, this ratio is the price/sales ratio (PS), where the market value of equity is divided by the revenues generated by the firm. For firm value, this ratio can be modified as the value/sales ratio (VS), where the numerator becomes the value of the firm. This ratio again varies widely across sectors, largely as a function of the profit margins in each. The advantage of using revenue multiples, however, is that it becomes far easier to compare firms in different markets, with different accounting systems at work, than it is to compare earnings or book value multiples.

Determinants of Multiples

One reason commonly given for the use of these multiples to value equity and firms is that they require far fewer assumptions than discounted cash flow valuation does.
We believe this is a misconception. The difference between discounted cash flow valuation and relative valuation is that the assumptions we make are explicit in the former and remain implicit in the latter. It is important that we know what the variables are that cause multiples to change, because these are the variables we have to control for when comparing these multiples across firms.

To look under the hood, so to speak, of equity and firm value multiples, we will go back to fairly simple discounted cash flow models for equity and firm value and use them to derive our multiples. Thus, the simplest discounted cash flow model for equity, which is a stable growth dividend discount model, would suggest that the value of equity is:

\[
\text{Value of Equity} = P_0 = \frac{DPS_1}{k_e - g_n}
\]

where \(DPS_1\) is the expected dividend in the next year, \(k_e\) is the cost of equity, and \(g_n\) is the expected stable growth rate. Dividing both sides by the earnings, we obtain the discounted cash flow equation specifying the PE ratio for a stable growth firm:

\[
\frac{P_0}{EPS_0} = \text{PE} = \frac{\text{Payout Ratio} \times (1 + g_n)}{k_e - g_n}
\]

Dividing both sides by the book value of equity, we can estimate the price/book value ratio for a stable-growth firm:

\[
\frac{P_0}{BV_0} = \text{PBV} = \frac{\text{ROE} \times \text{Payout Ratio} \times (1 + g_n)}{k_e - g_n}
\]

Dividing by the sales per share, the price/sales ratio for a stable-growth firm can be estimated as a function of its profit margin, payout ratio, profit margin, and expected growth.

\[
\frac{P_0}{Sales_0} = \text{PS} = \frac{\text{Net Profit Margin} \times \text{Payout Ratio} \times (1 + g_n)}{k_e - g_n}
\]
We can do a similar analysis from the perspective of firm valuation. The value of a firm in stable growth can be written as:

\[
\text{Value of Firm} = V_0 = \frac{FCFF_1}{k_c - g_n}
\]

where \( k_c \) is the cost of capital. Dividing both sides by the expected FCFF yields the value/FCFF multiple for a stable growth firm:

\[
\frac{V_0}{FCFF_1} = \frac{1}{k_c - g_n}
\]

Because the FCFF is the after-tax operating income netted against the net capital expenditures and working capital needs of the firm, the multiples of EBIT, after-tax EBIT, and EBITDA can also be estimated similarly. The value/EBITDA multiple, for instance, can be written as follows:

\[
\frac{\text{Value}}{\text{EBITDA}} = \frac{(1 - t)}{k_c - g} + \frac{\text{Depr} (t)/\text{EBITDA}}{k_c - g} - \frac{\text{CEx/EBITDA}}{k_c - g} - \frac{\Delta \text{Working Capital/EBITDA}}{k_c - g}
\]

The point of this analysis is not to suggest that we go back to using discounted cash flow valuation but to understand the variables that may cause these multiples to vary across firms in the same sector. If we ignore these variables, we might conclude that a stock with a PE of 8 is cheaper than one with a PE of 12, when the true reason may be that the latter has higher expected growth or we might decide that a stock with a P/BV ratio of 0.7 is cheaper than one with a P/BV ratio of 1.5, when the true reason may be that the latter has a much higher return on equity. Table 12.10 lists the multiples that are widely used and the variables that determine each; the variable that (in our view) is the most significant determinant is highlighted for each multiple. This variable is what we would call the \textit{companion variable} for this multiple, that is, the one variable we need to know to use this multiple to find under or over valued assets.

---

\(^{36}\)In practice, cash and marketable securities are subtracted from firm value to arrive at what is called enterprise value. All the multiples in the following section can be written in terms of enterprise value, and the determinants remain unchanged.
Table 12.10 Multiples and Companion Variables (in Italics)

<table>
<thead>
<tr>
<th>Multiple</th>
<th>Determining Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price/earnings ratio</td>
<td>Growth, payout, risk</td>
</tr>
<tr>
<td>Price/book value ratio</td>
<td>Growth, payout, risk, ROE</td>
</tr>
<tr>
<td>Price/sales ratio</td>
<td>Growth, payout, risk, net margin</td>
</tr>
<tr>
<td>Value/EBIT</td>
<td>Growth, reinvestment needs, leverage, risk</td>
</tr>
<tr>
<td>Value/EBIT (1 – t)</td>
<td></td>
</tr>
<tr>
<td>Value/EBITDA</td>
<td></td>
</tr>
<tr>
<td>Value/sales</td>
<td>Growth, reinvestment needs, leverage, risk, operating margin</td>
</tr>
<tr>
<td>Value/book capital</td>
<td>Growth, leverage, risk, ROC</td>
</tr>
</tbody>
</table>

eqmlult.xls: This spreadsheet allows you to estimate the equity multiples for a firm, given its fundamentals.

firmmult.xls: This spreadsheet allows you to estimate the firm value multiples for a firm, given its fundamentals.

The Use of Comparable Firms

When we use multiples, we tend to use them in conjunction with comparable firms to determine the value of a firm or its equity. This analysis begins with two choices—the multiple that will be used in the analysis and the group of firms that will make up the comparable firms. The multiple is computed for each of the comparable firms, and the average is computed. To evaluate an individual firm, we then compare its multiple to the average computed; if it is significantly different, we make a subjective judgment about whether the firm’s individual characteristics (growth, risk, or cash flows) may explain the difference. Thus, a firm may have a PE ratio of 22 in a sector where the average PE is only 15, but the analyst may conclude that this difference can be justified because the firm has higher growth potential than the average firm in the industry. In the analysts’ judgment, if the difference on the multiple cannot be explained by the variables listed in Table 12.10, the firm will be viewed as overvalued (if its multiple is higher than the average) or undervalued (if its multiple is lower than the average). Choosing
comparable firms and adequately controlling for differences across these comparable firms, then become critical steps in this process. In this section, we consider both decisions.

1. Choosing Comparables

The first step in relative valuation is usually the selection of comparable firms. A comparable firm is one with cash flows, growth potential, and risk similar to the firm being valued. It would be ideal if we could value a firm by looking at how an exactly identical firm—in terms of risk, growth, and cash flows—is priced. In most analyses, however, analysts define comparable firms to be other firms in the same business or businesses. If there are enough firms in the industry to allow for it, this list is pruned further using other criteria; for instance, only firms of similar size may be considered. The implicit assumption being made here is that firms in the same sector have similar risk, growth, and cash flow profiles and therefore can be compared with much more legitimacy.

This approach becomes more difficult to apply when there are relatively few firms in a sector. In most markets outside the United States, the number of publicly traded firms in a particular sector is small, especially if it is defined narrowly. It is also difficult to find comparable firms if differences in risk, growth, and cash flow profiles across firms within a sector are large. Thus, there may be hundreds of computer software companies listed in the United States, but the differences across these firms are also large. The trade-off is therefore simple. Defining a industry more broadly increases the number of comparable firms, but it also results in a more diverse group.

2. Controlling for Differences across Firms

In Table 12.10, we listed the variables that determined each multiple. Because it is impossible to find firms identical to the one being valued, we have to find ways of controlling for differences across firms on these variables. The process of controlling for the variables can range from very simple approaches, which modify the multiples to take into account differences on one key variable, to more complex approaches that allow for differences on more than one variable.
a. Simple Adjustments

Let’s start with the simple approaches. In this case, we modify the multiple to take into account the most important variable determining it. Thus, the PE ratio is divided by the expected growth rate in earnings per share (EPS) for a company to determine a growth-adjusted PE ratio or the PEG ratio. Similarly, the PBV ratio is divided by the ROE to find a value ratio. These modified ratios are then compared across companies in a sector. The implicit assumption we make is that these firms are comparable on all the other measures of value, besides the one being controlled for.

Illustration 12.15 Comparing PE Ratios and Growth Rates across Firms: Entertainment Companies

To value Disney, we look at the PE ratios and expected growth rates in EPS over the next five years, based on consensus estimates from analysts, for all entertainment companies where data is available on PE ratios and analyst estimates of expected growth in earnings over the next five years. Table 12.11 lists the firms and PE ratios.

Table 12.11 Entertainment Firm PE Ratios and Growth Rates, 2009

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Current PE</th>
<th>Trailing PE</th>
<th>Forward PE</th>
<th>Expected Growth in EPS: next 5 years</th>
<th>PEG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belo Corp. 'A'</td>
<td>1.56</td>
<td>2.60</td>
<td>1.88</td>
<td>1.50%</td>
<td>1.04</td>
</tr>
<tr>
<td>CBS Corp. 'B'</td>
<td>3.76</td>
<td>4.23</td>
<td>5.93</td>
<td>4.50%</td>
<td>0.84</td>
</tr>
<tr>
<td>Central European Media Enterps</td>
<td>9.10</td>
<td>5.69</td>
<td>5.58</td>
<td>9.78%</td>
<td>0.93</td>
</tr>
<tr>
<td>CTC Media Inc</td>
<td>5.26</td>
<td>4.18</td>
<td>4.44</td>
<td>6.55%</td>
<td>0.80</td>
</tr>
<tr>
<td>Cumulus Media Inc</td>
<td>20.41</td>
<td>4.89</td>
<td>5.53</td>
<td>12.00%</td>
<td>1.70</td>
</tr>
<tr>
<td>Disney (Walt)</td>
<td>10.24</td>
<td>9.40</td>
<td>9.45</td>
<td>14.50%</td>
<td>0.71</td>
</tr>
<tr>
<td>DreamWorks Animation</td>
<td>9.37</td>
<td>10.17</td>
<td>12.26</td>
<td>14.50%</td>
<td>0.65</td>
</tr>
<tr>
<td>Global Traffic Network Inc</td>
<td>62.00</td>
<td>39.04</td>
<td>32.44</td>
<td>21.40%</td>
<td>2.90</td>
</tr>
<tr>
<td>Lin TV Corp.</td>
<td>4.22</td>
<td>1.43</td>
<td></td>
<td>8.00%</td>
<td>0.53</td>
</tr>
<tr>
<td>News Corp.</td>
<td>6.74</td>
<td>7.12</td>
<td>11.98</td>
<td>14.00%</td>
<td>0.48</td>
</tr>
<tr>
<td>Playboy Enterprises 'B'</td>
<td>15.81</td>
<td>30.86</td>
<td></td>
<td>42.50%</td>
<td>0.37</td>
</tr>
<tr>
<td>RC2 Corp</td>
<td>7.23</td>
<td>22.00</td>
<td>6.93</td>
<td>10.50%</td>
<td>0.69</td>
</tr>
<tr>
<td>Regal Entertainment Group</td>
<td>13.87</td>
<td>11.74</td>
<td></td>
<td>8.00%</td>
<td>1.73</td>
</tr>
<tr>
<td>Rentrak Corp.</td>
<td>25.35</td>
<td>29.15</td>
<td>35.73</td>
<td>50.00%</td>
<td>0.51</td>
</tr>
<tr>
<td>Saga Communic. 'A'</td>
<td>2.21</td>
<td>2.29</td>
<td>2.76</td>
<td>8.00%</td>
<td>0.28</td>
</tr>
<tr>
<td>Sinclair Broadcast</td>
<td>12.36</td>
<td>4.84</td>
<td>9.39</td>
<td>15.00%</td>
<td>0.82</td>
</tr>
<tr>
<td>Time Warner</td>
<td>8.42</td>
<td>9.35</td>
<td>8.98</td>
<td>6.00%</td>
<td>1.40</td>
</tr>
<tr>
<td>Viacom Inc. 'B'</td>
<td>6.69</td>
<td>6.69</td>
<td>7.72</td>
<td>12.00%</td>
<td>0.56</td>
</tr>
<tr>
<td>World Wrestling Ent.</td>
<td>14.39</td>
<td>14.06</td>
<td>12.18</td>
<td>15.00%</td>
<td>0.96</td>
</tr>
</tbody>
</table>
At 9.4 times forward earnings and 9.45 times current earnings, Disney looks overvalued relative to the median values for the sector. It is true that it looks reasonably priced, using the averages for the two values, but those numbers are skewed by a few outliers.

In this valuation, we assume that Disney has a growth rate similar to the average for the sector. One way of bringing growth into the comparison is to compute the PEG ratio, which is reported in the last column. On this measure, Disney looks more under valued, with a PEG ratio of 0.71, below both the median (0.8) and the average (0.94) for the sector. Although this may seem like an easy adjustment to resolve the problem of differences across firms, the conclusion holds only if these firms are of equivalent risk. Implicitly, this approach assumes a linear relationship between growth rates and PE.37

12.11. Underlying Assumptions in Comparable Valuation

Assume that you are reading an equity research report where a buy recommendation for a company is being based on the fact that its PE ratio is lower than the average for the industry. Implicitly, what is the underlying assumption or assumptions being made by this analyst?

a. The sector itself is, on average, fairly priced.
b. The earnings of the firms in the group are being measured consistently.
c. The firms in the group are all of equivalent risk.
d. The firms in the group are all at the same stage in the growth cycle.
e. The firms in the group have similar cash flow patterns.

All of the above.

pe.xls: There is a data set online that summarizes PE ratios and PEG ratios by industry group in the United States for the most recent quarter.

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37Put another way, we are assuming that as growth doubles, the PE ratio will also double.
b. Adjusting for More than One Variable

When firms differ on more than one variable, it becomes difficult to modify the multiples to account for the differences across firms. We can run regressions of the multiples against the variables and then use these regressions to find predicted values for each firm. This approach works reasonably well when the number of comparable firms is large and the relationship between the multiple and the variables is stable. When these conditions do not hold, a few outliers can cause the coefficients to change dramatically and make the predictions much less reliable.

Illustration 12.16 Price to Book Value Ratios and Return on Equity: European Banks

Table 12.12 lists the price/book value ratios of European banks and reports on their returns on equity and risk levels (measured using the stock beta over the previous five years).

<table>
<thead>
<tr>
<th>Company Name</th>
<th>P/Book Equity</th>
<th>Beta</th>
<th>ROE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Royal Bank of Scotland Group plc</td>
<td>0.24</td>
<td>1.77</td>
<td>-15.37%</td>
</tr>
<tr>
<td>Deutsche Bank AG</td>
<td>0.41</td>
<td>1.61</td>
<td>5.48%</td>
</tr>
<tr>
<td>UniCredito Italiano S.p.A. (CM:UCG)</td>
<td>0.44</td>
<td>1.38</td>
<td>7.15%</td>
</tr>
<tr>
<td>Credit Agricole SA (ENXTPA:ACA)</td>
<td>0.44</td>
<td>1.16</td>
<td>1.13%</td>
</tr>
<tr>
<td>Barclays plc (LSE:BARC)</td>
<td>0.49</td>
<td>1.32</td>
<td>15.71%</td>
</tr>
<tr>
<td>Lloyds TSB Group plc (LSE:LLOY)</td>
<td>0.52</td>
<td>1.02</td>
<td>21.53%</td>
</tr>
<tr>
<td>KBC Group NV (ENXTBR:KBC)</td>
<td>0.54</td>
<td>1.53</td>
<td>5.96%</td>
</tr>
<tr>
<td>Banca Monte dei Paschi di Siena SpA (CM:BMPS)</td>
<td>0.58</td>
<td>1.37</td>
<td>9.59%</td>
</tr>
<tr>
<td>Bank Name</td>
<td>PB</td>
<td>BV</td>
<td>ROE</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>-----</td>
<td>-----</td>
<td>------</td>
</tr>
<tr>
<td>Unione di Banche Italiane Scpa (CM:UBI)</td>
<td>0.62</td>
<td>1.12</td>
<td>8.54%</td>
</tr>
<tr>
<td>Intesa Sanpaolo SpA (CM:ISP)</td>
<td>0.67</td>
<td>0.99</td>
<td>8.43%</td>
</tr>
<tr>
<td>Nordea Bank AB (OM:NDA SEK)</td>
<td>0.81</td>
<td>1.17</td>
<td>16.25%</td>
</tr>
<tr>
<td>Credit Suisse Group (VIRTX:CSGN)</td>
<td>0.84</td>
<td>1.07</td>
<td>14.24%</td>
</tr>
<tr>
<td>HSBC Holdings plc (LSE:HSBA)</td>
<td>0.90</td>
<td>0.56</td>
<td>12.14%</td>
</tr>
<tr>
<td>UBS AG (VIRTX:UBSN)</td>
<td>0.99</td>
<td>1.31</td>
<td>12.93%</td>
</tr>
<tr>
<td>Svenska Handelsbanken AB (OM:SHB A)</td>
<td>1.02</td>
<td>0.72</td>
<td>19.58%</td>
</tr>
<tr>
<td>National Bank of Greece SA (ATSE:ETE)</td>
<td>1.02</td>
<td>1.09</td>
<td>21.62%</td>
</tr>
<tr>
<td>Banco Santander, S.A. (CATS:SAN)</td>
<td>1.03</td>
<td>1.23</td>
<td>17.52%</td>
</tr>
<tr>
<td>Banco Popular Espanol SA (CATS:POP)</td>
<td>1.14</td>
<td>0.50</td>
<td>19.26%</td>
</tr>
<tr>
<td>Banco Bilbao Vizcaya Argentaria (CATS:BBVA)</td>
<td>1.24</td>
<td>0.85</td>
<td>22.30%</td>
</tr>
<tr>
<td>Standard Chartered PLC (LSE:STAN)</td>
<td>1.31</td>
<td>0.85</td>
<td>16.18%</td>
</tr>
</tbody>
</table>

**Median**                                        **0.74**  **1.14**  **0.13585**

**Average**                                       **0.7625** **1.131** **0.120085**

*Source:* Capital IQ.

Trading at 0.41 times book equity, Deutsche looks cheap, relative to the rest of the sector. However, part of the reason for this may be its low return on equity in 2008 (5.48%) and high beta (1.61). Because these firms differ on both risk and return on equity, we run a regression of PBV ratios on both variables:
Firms with higher return on equity and lower standard deviations trade at much higher price to book ratios. The numbers in parentheses are $t$-statistics and suggest that the relationships between PBV ratios and both variables in the regression are statistically significant. The $R^2$ indicates the percentage of the differences in PBV ratios that is explained by the independent variables. Finally, the regression itself can be used to get predicted PBV ratios for the companies in the list. Thus, the predicted PBV ratio for Deutsche Bank, based on its return on equity of 5.48 percent and its beta of 1.61, would be 0.47.

$$\text{Predicted PBV}_{\text{Deutsche Bank}} = 1.03 + 1.54 (0.0548) - 0.40 (1.61) = 0.47$$

Because the actual PBV ratio for Deutsche Bank at the time of the analysis was 0.41, this would suggest that the stock is trading close to its fundamentals.

3. Expanding the Range of Comparable Firms

Searching for comparable firms within the sector in which a firm operates is fairly restrictive, especially when there are relatively few firms in the sector or when a firm operates in more than one sector. Because the definition of a comparable firm is not one that is in the same business but one that has the same growth, risk, and cash flow characteristics as the firm being analyzed, we need not restrict our choice of comparable firms to those in the same industry. A software firm should be comparable to an automobile firm if we can control for differences in the fundamentals.

The regression introduced in the previous section allows us to control for differences on those variables that we believe cause multiples to vary across firms. Based
on the variables listed in Table 12.10, we should be able to regress multiples against the variables that should affect them. It is, however, possible that the proxies that we use for risk (beta), growth (expected growth rate), and cash flow (payout) are imperfect and that the relationship may not be linear. To deal with these limitations, we can add more variables to the regression—for example, the size of the firm may operate as a good proxy for risk—and use transformations of the variables to allow for nonlinear relationships.

We ran these regressions for multiples across publicly listed firms in the United States in January 2009 against analyst estimates of expected growth in earnings per share and other financial indicators from the most recent year. The sample, which had about 7,000 firms in it, yielded the regressions reported in Table 12.13:


<table>
<thead>
<tr>
<th>Multiple</th>
<th>Regression</th>
<th>$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>PE</td>
<td>$7.62 + 77.98 , g_{EPS} + 7.67 , \text{Payout} - 5.37 , \text{Beta}$</td>
<td>28.6%</td>
</tr>
<tr>
<td></td>
<td>(8.77) , (26.71) , (13.09) , (7.21)</td>
<td></td>
</tr>
<tr>
<td>PBV</td>
<td>$1.28 + 6.72 , g_{EPS} + 0.33 , \text{Payout} - 1.65 , \text{Beta} + 8.67 , \text{ROE}$</td>
<td>68.3%</td>
</tr>
<tr>
<td></td>
<td>(10.09) , (15.85) , (4.95) , (11.70) , (38.48)</td>
<td></td>
</tr>
<tr>
<td>PS</td>
<td>$0.29 + 4.32 , g_{EPS} + 0.31 , \text{Payout} - 0.86 , \text{Beta} + 11.42 , \text{Net Margin}$</td>
<td>62.3%</td>
</tr>
<tr>
<td></td>
<td>(2.48) , (9.52) , (4.58) , (8.60) , (35.72)</td>
<td></td>
</tr>
<tr>
<td>EV/Invested Capital</td>
<td>$1.10 + 3.99 , g + 5.06 , \text{ROIC} - 1.35 , (\text{Debt/Capital})$</td>
<td>50.1%</td>
</tr>
<tr>
<td></td>
<td>(10.23) , (6.60) , (20.59) , (10.1)</td>
<td></td>
</tr>
<tr>
<td>EV/Sales</td>
<td>$1.72 + 1.94 , g + 5.58 , \text{Operating Margin} - 4.87 , \text{Tax Rate}$</td>
<td>50.3%</td>
</tr>
<tr>
<td></td>
<td>(16.46) , (3.32) , (29.00) , (18.80)</td>
<td></td>
</tr>
<tr>
<td>EV/EBITDA</td>
<td>$6.68 + 25.34 , g - 7.99 , \text{Tax rate} - 1.59 , (\text{Debt/Capital}) - 1.837 , \text{RIR}$</td>
<td>19.3%</td>
</tr>
<tr>
<td></td>
<td>(18.58) , (12.35) , (9.78) , (3.84) , (1.94)</td>
<td></td>
</tr>
</tbody>
</table>

$g_{EPS}$ = Expected growth rate in EPS for next 5 years (analyst estimates)
$g$ = Expected growth rate in revenues for next 5 years (if not available, use $g_{EPS}$)
Payout = Dividends/Earnings
ROIC = Return on capital = EBIT (1- tax rate)/ Invested Capital
Invested Capital = Book value of equity + Book value of debt - Cash
ROE = Net Income/ Book value of Equity
Tax Rate = Effective tax rate
Debt/Capital = Debt/ (Market value of Equity + Debt)

---

38Both approaches described assume that the relationship between a multiple and the variables driving value are linear. Because this is not always true, we might have to run nonlinear versions of these regressions.

39We ran the regression both with intercepts and without intercepts. If the intercept is negative, we report the regression without the intercept.
RIR = Reinvestment Rate = (Cap Ex – Depreciation + Chg in WC)/ EBIT (1-t)

The first advantage of this approach over the “subjective” comparison across firms in the same sector is that it does quantify, based on actual market data, the degree to which higher growth or risk should affect the multiples. It is true that these estimates can have error in them, but the error is a reflection of the reality that many analysts choose not to face when they make subjective judgments. Second, by looking at all firms in the market, this approach allows us to make more meaningful comparisons of firms that operate in industries with relatively few firms. Third, it allows us to examine whether all firms in an industry are under- or overvalued by estimating their values relative to other firms in the market.

Illustration 12.17 Applying Market Regression to Estimate Multiples: Disney

We will use the results of the market regression just summarized to estimate the appropriate value for Disney. Consider the regression for the PE ratio:

\[ PE = 7.62 + 77.98 \, g_{\text{EPS}} + 7.67 \, \text{Payout} - 5.37 \, \text{Beta} \]

The corresponding values for Disney are as follows:

- Expected Growth Rate = 14.5% (analyst consensus estimate for EPS growth)
- Payout Ratio = 15.35%
- Beta = 0.9011

The estimated price earnings ratio for Disney is:

\[ PE = 7.62 + 77.98 \times 0.145 + 7.67 \times 0.1535 - 5.37 \times 0.90 = 15.27 \]

Because Disney trades at an actual PE ratio of 9.45, it looks significantly undervalued (by almost 40%), relative to the market.

Equity as an Option

In most publicly traded firms, equity has two features. The first is that the equity investors run the firm and can choose to liquidate its assets and pay off other claim holders at any time. The second is that the liability of equity investors in some private
firms and almost all publicly traded firms is restricted to their equity investments in these firms. This combination of the option to liquidate and limited liability allows equity to have the features of a call option. In firms with substantial debt and a significant potential for bankruptcy, the option value of equity may be in excess of the discounted cash flow value of equity.

*The Payoff on Equity as an Option*

The equity in a firm is a residual claim, that is, equity holders lay claim to all cash flows left after other financial claimholders (debt, preferred stock, etc.) have been satisfied. If a firm is liquidated, the same principle applies; equity investors receive the cash that is left in the firm after all outstanding debt and other financial claims have been paid off. With limited liability, if the value of the firm is less than the value of the outstanding debt, equity investors cannot lose more than their investment in the firm. The payoff to equity investors on liquidation can therefore be written as:

\[
\text{Payoff to equity on liquidation} = \begin{cases} 
V - D & \text{if } V > D \\
0 & \text{if } V \leq D
\end{cases}
\]

where

\[
V = \text{Liquidation Value of the firm}
\]

\[
D = \text{Face Value of the outstanding debt and other external claims}
\]

Equity can thus be viewed as a call option on the firm, where exercising the option requires that the firm be liquidated and the face value of the debt (which corresponds to the exercise price) be paid off. The firm is the underlying asset and the option expires when the debt comes due. The payoffs are shown in Figure 12.7.
Illustration 12.18: Valuing Equity as an Option

Assume that we are valuing the equity in a firm whose assets are currently valued at $100 million; the standard deviation in this asset value is 40%. The face value of debt is $80 million (it is zero coupon debt with 10 years left to maturity). The 10-year treasury bond rate is 10%. We can value equity as a call option on the firm, using the following inputs for the option pricing model.

Value of the underlying asset = \( S = \) Value of the firm = $100 million
Exercise price = \( K = \) Face Value of outstanding debt = $80 million
Life of the option = \( t = \) Life of zero-coupon debt = 10 years
Variance in the value of the underlying asset = \( \sigma^2 = \) Variance in firm value = 0.16
Riskless rate = \( r = \) Treasury bond rate corresponding to option life = 10%

Based upon these inputs, the Black-Scholes model provides the following value for the call.

\[ d_1 = 1.5994 \quad N(d_1) = 0.9451 \]
\[ d_2 = 0.3345 \quad N(d_2) = 0.6310 \]

Value of the call = \( 100 \cdot 0.9451 - 80 \cdot e^{-0.10 \cdot 10} \cdot 0.6310 = 75.94 \) million

Since the call value represents the value of equity and the firm value is $100 million, the estimated value of the outstanding debt can be calculated.
Value of the outstanding debt = $100 - $75.94 = $24.06 million

Since the debt is a 10-year zero coupon bond, the market interest rate on the bond can be calculated.

Interest rate on debt = \( \left( \frac{80}{24.06} \right)^{\frac{1}{10}} - 1 = 12.77\% \)

Thus, the default spread on this bond should be 2.77%.

Implications of viewing Equity as an Option

When the equity in a firm takes on the characteristics of a call option, we have to change the way we think about its value and what determines its value. In this section, we will consider a number of potential implications for equity investors and bondholders in the firm.

When will equity be worthless?

In discounted cash flow valuation, we argue that equity is worthless if what we own (the value of the firm) is less than what we owe. The first implication of viewing equity as a call option is that equity will have value, even if the value of the firm falls well below the face value of the outstanding debt. While the firm will be viewed as troubled by investors, accountants and analysts, its equity is not worthless. In fact, just as deep out-of-the-money traded call options command value because of the possibility that the value of the underlying asset may increase above the strike price in the remaining lifetime of the option, equity commands value because of the time premium on the option (the time until the bonds mature and come due) and the possibility that the value of the assets may increase above the face value of the bonds before they come due.

Illustration 12.19: Firm Value and Equity Value

Revisiting the preceding example, assume that the value of the firm drops to $50 million, below the face value of the outstanding debt ($80 million). Assume that all the other inputs remain unchanged. The parameters of equity as a call option are as follows:

Value of the underlying asset = \( S = \) Value of the firm = $ 50 million
Exercise price = \( K = \) Face Value of outstanding debt = $ 80 million
Life of the option = \( t = \) Life of zero-coupon debt = 10 years
Variance in the value of the underlying asset = \( \sigma^2 = \) Variance in firm value = 0.16
Riskless rate = \( r = \) Treasury bond rate corresponding to option life = 10%
Based upon these inputs, the Black-Scholes model provides the following value for the call.

\[
\begin{align*}
d_1 &= 1.0515 & \text{N}(d_1) &= 0.8534 \\
d_2 &= -0.2135 & \text{N}(d_2) &= 0.4155
\end{align*}
\]

Value of the call (equity) = 50 \times (0.8534) - 80 \exp(-0.10)(10) \times (0.4155) = $30.44 million

Value of the bond = $50 - $30.44 = $19.56 million

As we can see, the equity in this firm retains value, because of the option characteristics of equity. In fact, equity continues to have value in this example even if the firm value drops to $10 million or below.

*Increasing Risk can increase Equity Value*

In traditional discounted cash flow valuation, higher risk almost always translates into lower value for equity investors. When equity takes on the characteristics of a call option, we should not expect this relationship to continue to hold. Risk can become our ally, when we are equity investors in a troubled firm. In essence, we have little to lose and much to gain from swings in firm value.

*Illustration 12.20: Equity Value and Volatility*

Let us revisit the valuation in Illustration 12.8. The value of the equity is a function of the variance in firm value, which we assumed to be 40%. If we change this variance, holding all else constant, the value of the equity will change as evidenced in Figure 12.8.
Note that the value of equity increases, if we hold firm value constant, as the standard deviation increases. The interest rate on debt also increases as the standard deviation increases.

**Probability of Default and Default Spreads**

One of the more interesting pieces of output from the option pricing model is the risk-neutral probability of default that we can obtain for the firm. In the Black-Scholes model, we can estimate this value from $N(d_2)$, which is the risk-neutral probability that $S>K$, which in this model is the probability that the value of the firm’s asset will exceed the face value of the debt.

Risk-neutral probability of default = $1 – N(d_2)$

In addition, the interest rate from the debt allows us to estimate the appropriate default spread to charge on bonds.

You can see the potential in applying this model to bank loan portfolios to extract both the probability of default and to measure whether you are charging an interest rate that is high enough on the debt. In fact, there are commercial services that use fairly sophisticated option-pricing models to estimate both values for firms.
Illustration 12.21: Probabilities of default and Default Spreads

We return to Illustration 12.8 and estimate the probability of default as $N(d_2)$ and the default spread, measured as the difference between the interest rate on a firm’s debt and the riskfree rate, as a function of the variance. These values are graphed in Figure 12.9.

![Figure 12.9: Risk Neutral Probability of default and Default spreads](image)

Note that the probability of default climbs very quickly as the standard deviation in firm value increases and the default spread follows it along.

Estimating the Value of Equity as an Option

The examples we have used thus far to illustrate the application of option pricing to value equity have included some simplifying assumptions. Among them are the following.

1. There are only two claimholders in the firm - debt and equity.
2. There is only one issue of debt outstanding and it can be retired at face value.
3. The debt has a zero coupon and no special features (convertibility, put clauses, etc.)
4. The value of the firm and the variance in that value can be estimated.

Each of these assumptions is made for a reason. First, by restricting the claimholders to just debt and equity, we make the problem more tractable; introducing other claimholders
such as preferred stock makes it more difficult to arrive at a result, albeit not impossible. Second, by assuming only one zero-coupon debt issue that can be retired at face value any time prior to maturity, we align the features of the debt more closely to the features of the strike price on a standard option. Third, if the debt is coupon debt, or more than one debt issue is outstanding, the equity investors can be forced to exercise (liquidate the firm) at these earlier coupon dates if they do not have the cash flows to meet their coupon obligations.

Finally, knowing the value of the firm and the variance in that value makes the option pricing possible, but it also raises an interesting question about the usefulness of option pricing in equity valuation. If the bonds of the firm are publicly traded, the market value of the debt can be subtracted from the value of the firm to obtain the value of equity much more directly. The option pricing approach does have its advantages, however. Specifically, when the debt of a firm is not publicly traded, option pricing theory can provide an estimate of value for the equity in the firm. Even when the debt is publicly traded, the bonds may not be correctly valued and the option pricing framework can be useful in evaluating the values of debt and equity. Finally, relating the values of debt and equity to the variance in firm value provides some insight into the redistributive effects of actions taken by the firm.

**Inputs for Valuing Equity as an Option**

Since most firms do not fall into the neat framework developed above (such as having only one zero-coupon bond outstanding), we have to make some compromises to use this model in valuation.

**Value of the Firm**

We can obtain the value of the firm in one of four ways. In the first, we cumulate the market values of outstanding debt and equity, assuming that all debt and equity are traded, to obtain firm value. The option pricing model then reallocates the firm value between debt and equity. This approach, while simple, is internally inconsistent. We start with one set of market values for debt and equity and, using the option pricing model, end up with entirely different values for each.

In the second, we estimate the market values of the assets of the firm by discounting expected cash flows at the cost of capital. The one consideration that we need
to keep in mind is that the value of the firm in an option pricing model should be the value obtained on liquidation. This may be less than the total firm value, which includes expected future investments and it may also be reduced to reflect the cost of liquidation. If we estimate the firm value using a discounted cash flow model, then this would suggest that only existing investments\(^40\) should be considered while estimating firm value. The biggest problem with this approach is that financial distress can affect operating income and thus the value that we obtain by using current operating income may be too low.

In the third approach, we estimate a multiple of revenues by looking at healthy firms in the same business and apply this multiple to the revenues of the firm we are valuing. Implicitly, we are assuming that a potential buyer, in the event of liquidation, will pay this value.

We can use the fourth approach for firms that have separable assets that are individually traded. Here, we cumulate the value of the market values of the assets to arrive at firm value. For example, we can value a troubled real estate firm that owns five properties by valuing each property separately and then aggregating the values.

**Variance in Firm value**

We can obtain the variance in firm value directly if both stocks and bonds in the firm are traded. Defining \(\sigma_e^2\) as the variance in the stock price and \(\sigma_d^2\) as the variance in the bond price, \(w_e\) as the market-value weight of equity and \(w_d\) as the market-value weight of debt, we can write the variance in firm value as:\(^41\)

\[
\sigma_{firm}^2 = w_e^2 \sigma_e^2 + w_d^2 \sigma_d^2 + 2w_e w_d \rho_{ed} \sigma_e \sigma_d
\]

where \(\rho_{ed}\) is the correlation between the stock and the bond prices. When the bonds of the firm are not traded, we can use the variance of similarly rated bonds as the estimate of \(\sigma_d^2\) and the correlation between similarly rated bonds and the firm's stock as the estimate of \(\rho_{ed}\).

When companies get into financial trouble, this approach can yield misleading results as both its stock prices and its bond prices become more volatile. An alternative that often yields more reliable estimates is to use the average variance in firm value for

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\(^40\) Technically, this can be done by putting the firm into stable growth and valuing it as a stable growth firm, where reinvestments are used to either preserve or augment existing assets.
other firms in the sector. Thus, the value of equity in a deeply troubled steel company can be estimated using the average variance in firm value of all traded steel companies.

*Maturity of the Debt*

Most firms have more than one debt issue on their books and much of the debt comes with coupons. Since the option pricing model allows for only one input for the time to expiration, we have to convert these multiple bonds issues and coupon payments into one equivalent zero-coupon bond.

- One solution, which takes into account both the coupon payments and the maturity of the bonds, is to estimate the duration of each debt issue and calculate a face-value-weighted average of the durations of the different issues. This value-weighted duration is then used as a measure of the time to expiration of the option.
- An approximation is to use the face-value weighted maturity of the debt converted to the maturity of the zero-coupon bond in the option pricing model.

*Face Value of Debt*

When a distressed firm has multiple debt issues outstanding, we have three choices when it comes to what we use as the face value of debt:

- We could add up the principal due on all of the debt of the firm and consider it to be the face value of the hypothetical zero coupon bond that we assume that the firm has issued. The limitation of this approach is that it will understate what the firm will truly have to pay out over the life of the debt, since there will be coupon payments and interest payments during the period.
- At the other extreme, we could add the expected interest and coupon payments that will come due on the debt to the principal payments to come up with a cumulated face value of debt. Since the interest payments occur in the near years and the principal payments are due only when the debt comes due, we are mixing cash flows up at different points in time when we do this. This is, however, the simplest approach of dealing with intermediate interest payments coming due.
- We can consider only the principal due on the debt as the face value of the debt and the interest payments each year, specified as a percent of firm value, can take

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41 This is an extension of the variance formula for a two-asset portfolio.
the place of the dividend yield in the option pricing model. In effect, each year that the firm remains in existence, we would expect to see the value of the firm decline by the expected payments on the debt.

*Illustration 12.22: Valuing Equity as an option – Aracruz in 2009*

For Aracruz, 2008 was a very bad year, with losses from derivatives in the billions leading the firm to the brink of disaster. In June 2009, the firm owed in excess of 9.8 billion $R in debt and had operating income of only 574 million $R. Even if we assume that the firm reverts back to its average profitability between 2003 and 2007, the firm will generate pre-tax operating income of only 1.007 billion $R (see chapter 8). Assuming a perpetual growth rate of 7% growth rate (in nominal $R), a return on capital of 15% and using the cost of capital of 18.37% (also in nominal $R, estimated in chapter 4) allows us to estimate the value of the operating assets:

\[
\text{Value of Operating Assets} = \frac{\text{EBIT}(1-t)(1-\frac{g}{\text{ROC}})(1+g)}{(\text{Cost of capital} - g)}
\]

\[
= \frac{1007(1-.34)(1-.07)}{(1.07)(.15)} = $R \ 5,807 \text{ million}
\]

Since this is well below the face value of the debt, it would be difficult to justify the value of equity, using an intrinsic valuation model.

We can try to estimate the value of Aracruz, as an equity option, assuming that the debt has a weighted average duration of 3 years and the industry average standard deviation of 34% as the standard deviation in firm value.\(^{42}\) In summary, the inputs to the option pricing model are as follows:

- Value of the underlying asset = \( S = \) Value of the firm = $R \ 5,807 \text{ million}
- Exercise price = \( K = \) Face Value of outstanding debt = $R \ 9,835 \text{ million}
- Life of the option = \( t = \) Weighted average duration of debt = 3 years
- Variance in the value of the underlying asset = \( \sigma^2 = \) Variance in firm value = \((0.34)^2=0.115\)
- Riskless rate = \( r = \) Riskfree corresponding to option life = 6.5%
Based upon these inputs, we estimate the following value for the call:
\[ d_1 = -0.2691 \quad N(d_1) = 0.3939 \]
\[ d_2 = -0.8580 \quad N(d_2) = 0.1954 \]

Value of the call = 5,807(0.3939) – 9,358.5e\([-0.065(3)\cdot0.1954]\) = \$706 million

If we treat this as the value of equity, it yields a value per share of R$1.20 a share, which is much lower than the stock price of R$ 15.14 per share.

The option pricing framework, in addition to yielding a value for Aracruz equity, yields some valuable insight into the drivers of value for this equity. While it is certainly important that the firm try to bring costs under control and increase operating margins, the two most critical variables determining equity value are the duration of the debt and the variance in firm value. Any action that increases (decreases) the debt duration will have a positive (negative) effect on equity value. Thus, the results of debt renegotiation talks that were ongoing at the time of this analysis could have a significant effect on value.

**Reconciling Different Valuations**

The standard approaches to valuation—discounted cash flow valuation and relative valuation—yield different values for Disney.\(^43\) In fact, Disney is under valued using a discounted cash flow model but is closer to being fairly valued using relative valuation models. Even within relative valuation, we arrive at different estimates of value, depending on which multiple we use and the firms on which we based the relative valuation.

The differences in value between discounted cash flow valuation and relative valuation come from different views of market efficiency or, put more precisely, market inefficiency. In discounted cash flow valuation, we assume that markets make mistakes, they correct these mistakes over time, and these mistakes can often occur across entire sectors or even the entire market. In relative valuation, we assume that although markets

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\(^{42}\) This is the industry average for firm value variances of paper and pulp companies.

make mistakes on individual stocks, they are correct on average. In other words, when we value Disney relative to other entertainment companies, we are assuming that the market has priced these companies correctly, on average, even though it might have made mistakes in the pricing of each of them individually. Thus, a stock may be overvalued on a discounted cash flow basis but undervalued on a relative basis, if the firms used in the relative valuation are all overpriced by the market. The reverse would occur, if an entire sector or market were underpriced.

To conclude, we suggest the following broad guidelines on gauging value using different approaches:

• The discounted cash flow models are built on the implicit assumption of long time horizons, giving markets time to correct their errors.
• When using relative valuation, it is dangerous to base valuations on multiples where the differences across firms cannot be explained well using financial fundamentals—growth, risk, and cash flow patterns. One of the advantages of using the regression approach described in the later part of this chapter is that the $R^2$ and t-statistics from the regressions yield a tangible estimate of the strength (or weakness) of this relationship.

### 12.12. Valuing an IPO

If you were an investment banker pricing an IPO, would you primarily use discounted cash flow valuation, relative valuation, or a combination of the two?

- a. Relative valuation, because the buyers of the IPO will look at comparables
- b. Discounted cash flow valuation, because it reflects intrinsic value
- c. The higher of the two values, because it is my job to get the highest price I can for my client
- d. None of the above

Explain.

**Conclusion**

There are three basic approaches to valuation. The first is discounted cash flow valuation, in which the value of any asset is estimated by computing the present value of
the expected cash flows on it. The actual process of estimation, in either case, generally requires four inputs:

- the length of the period for which a firm or asset can be expected to generate growth greater than the stable growth rate (which is constrained to be close to the growth rate of the economy in which the firm operates),
- the cash flows during the high-growth period,
- the terminal value at the end of the high growth period, and
- a discount rate.

The expected growth potential will vary across firms, with some firms already growing at a stable growth rate and others for which the expectation, at least, is that high growth will last for some period into the future. We can value the operating assets of a firm by discounting cash flows before debt payments but after reinvestment at the cost of capital. Adding the value of cash and nonoperating assets give us firm value, and subtracting out debt yields the value of equity. We can also value equity directly by discounting cash flows after debt payments and reinvestment needs at the cost of equity.

The second approach to valuation is relative valuation, where the value of any asset is estimated by looking at how similar assets are priced in the market. The key steps in this approach are defining comparable firms or assets and choosing a standardized measure of value (usually value as a multiple of earnings, cash flows, or book value) to compare the firms. To compare multiples across companies, we have to control for differences in growth, risk, and cash flows, just as we would have in discounted cash flow valuation.

In the final approach to valuation, we assume that equity investors own the option to liquidate the firm’s assets and claim the difference between asset value and debt outstanding for themselves. This approach works for highly levered and distressed firms and is the only one where equity value increases as risk increases.
Live Case Study

Valuation

**Objective** To value your firm, based on its existing management, and your expectations for the future.

**Key Questions**
- What type of cash flow (dividends, FCFE, or FCFF) would you choose to discount for this firm?
- What growth pattern would you pick for this firm? How long will high growth and excess returns last?
- When will your firm be in stable growth and what will your firm look like when it reaches stable growth?
- What is your estimate of value of equity in this firm? How does this compare to the market value?

**Framework for Analysis**

1. **Cash Flow Estimation**
   - What is this firm’s accounting operating income? Would you adjust it for your valuation?
   - What is your firm’s effective tax rate? What is its marginal tax rate? Which would you use in your valuation?
   - How much did your firm reinvest last year in internal investments, acquisitions, R&D, and working capital?

2. **Growth Pattern Choice**
   - How fast have this company’s earnings grown historically?
   - How quickly do analysts expect this company’s earnings to grow in the future?
   - What do the fundamentals suggest about earnings growth at this company? (How much is being reinvested and at what rate of return?)
   - If there is anticipated high growth with excess returns, what are the barriers to entry that will allow these excess returns to continue? For how long?
3. **Valuation**

- What is the value of the operating assets of the firm, based on a discounted cash flow model?
- Does the firm have cash and nonoperating assets, and what are their values?
- Are there equity options outstanding (management options, convertible bonds) and how much are they worth?
- What is the value of equity per share?

4. **Relative Valuation**

- What multiple would you use to value the firm or its equity?
- What industry does the firm belong to, and what are the comparable firms?
- How does your firm’s valuation (in multiple terms) compare to those of the other firms in the industry?
- What value would you assign your firm (or its equity), given how comparable firms are valued?

**Getting Information for valuation**

Most of the information that you need for valuation come from your current or past financial statements. You will also need a beta (see risk and return section) and a debt ratio (see risk and return section) to estimate the FCFE. You can get analyst estimates of growth in several sources including Zacks and I/B/E/S.

**Online sources of information**

[www.stern.nyu.edu/~adamodar/cfin2E/project/data.htm](http://www.stern.nyu.edu/~adamodar/cfin2E/project/data.htm).
Problems and Questions

In the problems below, you can use a risk premium of 5.5 percent and a tax rate of 40 percent if none is specified.

1. Vernon Enterprises has current after-tax operating income of $100 million and a cost of capital of 10 percent. The firm earns a return on capital equal to its cost of capital.
   a. Assume that the firm is in stable growth, growing 5 percent a year forever; estimate the firm’s reinvestment rate.
   b. Given this reinvestment rate, estimate the value of the firm.
   c. What is the value of the firm, if you assume a zero reinvestment rate and no growth?

2. Assume in the previous question with Vernon Enterprises that the firm will earn a return on capital of 15 percent in perpetuity.
   a. Assume that the firm is in stable growth, growing 5 percent a year forever; estimate the firm’s reinvestment rate.
   b. Given this reinvestment rate, estimate the value of the firm.

3. Cello is a manufacturer of pianos. It earned an after-tax return on capital of 10 percent last year and expects to maintain this next year. If the current year’s after-tax operating income is $100 million and the firm reinvests 50 percent of this income back, estimate the FCFF next year. (After-Tax Operating Income = EBIT (1 – t)).

4. Cell Phone is a cellular firm that reported net income of $50 million in the most recent financial year. The firm had $1 billion in debt, on which it reported interest expenses of $100 million in the most recent financial year. The firm had depreciation of $100 million for the year, and capital expenditures were 200 percent of depreciation. The firm has a cost of capital of 11 percent. Assuming that there is no working capital requirement, and a constant growth rate of 4 percent in perpetuity, estimate the value of the firm.

5. Netsoft is a company that manufactures networking software. In the current year, the firm reported operating earnings before interest and taxes of $200 million (operating earnings does not include interest income), and these earnings are expected to grow 4
percent a year in perpetuity. In addition, the firm has a cash balance of $250 million on which it earned interest income of $20 million. The unlevered beta for other networking software firm is 1.20, and these firms have on average cash balances of 10 percent of firm value. If Netsoft has a debt ratio of 15 percent, a tax rate of 40 percent, a return on capital of 10 percent on operating assets, and a cost of debt of 10 percent, estimate the value of the firm. (The risk-free rate is 6 percent, and you can assume a market risk premium of 5.5 percent.)

6. Gemco Jewelers earned $5 million in after-tax operating income in the most recent year. The firm also had capital expenditures of $4 million and depreciation of $2 million during the year, and the noncash working capital at the end of the year was $10 million.
   a. Assuming that the firm’s operating income will grow 20 percent next year, and that all other items (capital expenditures, depreciation, and noncash working capital) will grow at the same rate, estimate the FCFF next year.
   b. If the firm can grow at 20 percent for the next five years, estimate the present value of the FCFF over that period. You can assume a cost of capital of 12 percent.
   c. After year five, the firm’s capital expenditures will decline to 125 percent of revenues, and the growth rate will drop to 5 percent (in both operating income and noncash working capital). In addition, the cost of capital will decline to 10 percent. Estimate the terminal value of the firm at the end of year five.
   d. Estimate the total value of the operating assets of the firm.

7. Now assume that Gemco Jewelers has $10 million in cash and nonoperating assets and that the firm has $15 million in outstanding debt.
   a. Estimate the value of equity in the firm.
   b. If the firm has 5 million shares outstanding, estimate the value of equity per share.
   c. How would your answer to b change if you learn that the firm has 1 million options outstanding, with an exercise price of $5 and five years to maturity? (The estimated value per option is $7.)

8. Union Pacific Railroad reported net income of $770 million after interest expenses of $320 million in a recent financial year. (The corporate tax rate was 36 percent.) It
reported depreciation of $960 million in that year, and capital spending was $1.2 billion. The firm also had $4 billion in debt outstanding on the books, was rated AA (carrying a yield to maturity of 8 percent), and was trading at par (up from $3.8 billion at the end of the previous year). The beta of the stock is 1.05, and there were 200 million shares outstanding (trading at $60 per share), with a book value of $5 billion. Union Pacific paid 40 percent of its earnings as dividends and working capital requirements are negligible. (The Treasury bond rate is 7 percent.)

a. Estimate the FCFF for the most recent financial year.

b. Estimate the value of the firm now.

c. Estimate the value of equity and the value per share now.

9. Lockheed, one of the largest defense contractors in the United States, reported EBITDA of $1,290 million in a recent financial year, prior to interest expenses of $215 million and depreciation charges of $400 million. Capital expenditures amounted to $450 million during the year, and working capital was 7 percent of revenues (which were $13,500 million). The firm had debt outstanding of $3.068 billion (in book value terms), trading at a market value of $3.2 billion, and yielding a pretax interest rate of 8 percent. There were 62 million shares outstanding, trading at $64 per share, and the most recent beta is 1.10. The tax rate for the firm is 40 percent. (The Treasury bond rate is 7 percent.) The firm expects revenues, earnings, capital expenditures, and depreciation to grow at 9.5 percent a year for the next 5 years, after which the growth rate is expected to drop to 4 percent. (Even though this is unrealistic, you can assume that capital spending will offset depreciation in the stable-growth period.) The company also plans to lower its debt/equity ratio to 50 percent for the steady state (which will result in the pretax interest rate dropping to 7.5 percent).

a. Estimate the value of the firm.

b. Estimate the value of the equity in the firm and the value per share.

10. In the face of disappointing earnings results and increasingly assertive institutional stockholders, Eastman Kodak was considering the sale of its health division, which earned $560 million in EBIT in the most recent year on revenues of $5.285 billion. The expected growth in earnings was expected to moderate to 6 percent for the next 5 years,
and to 4 percent after that. Capital expenditures in the health division amounted to $420 million in the most recent year, whereas depreciation was $350 million. Both are expected to grow 4 percent a year in the long run. Working capital requirements are negligible.

The average beta of firms competing with Eastman Kodak’s health division is 1.15. Although Eastman Kodak has a debt ratio (D/[D + E]) of 50 percent, the health division can sustain a debt ratio (D/[D + E]) of only 20 percent, which is similar to the average debt ratio of firms competing in the health sector. At this level of debt, the health division can expect to pay 7.5 percent on its debt, before taxes. (The tax rate is 40 percent, and the Treasury bond rate is 7 percent.)

a. Estimate the cost of capital for the division.
b. Estimate the value of the division.

11. You have been asked to value Alcoa and have come up with the following inputs.

- The stock has a beta of 0.90, estimated over the last five years. During this period, the firm had an average debt/equity ratio of 20 percent and an average cash balance of 15 percent.
- The firm’s current market value of equity is 1.6 billion and its current market value of debt is $800 million. The current cash balance is $500 million.
- The firm earned earnings before interest and taxes of $450 million, which includes the interest income on the current cash balance of $50 million. The firm’s tax rate is 40 percent.
- The firm is in stable growth, and its earnings from operations are expected to grow 5 percent a year. The net capital expenditures next year are expected to be $90 million.

Estimate the value of the noncash assets of the firm, its total value, and the value of its equity.

12. You are analyzing a valuation done on a stable firm by a well-known analyst. Based on the expected FCFF next year of $30 million, and an expected growth rate of 5 percent, the analyst has estimated a value of $750 million. However, he has made the mistake of using the book values of debt and equity in his calculation. Although you do not know the book value weights he used, you know that the firm has a cost of equity of 12 percent.
and an after-tax cost of debt of 6 percent. You also know that the market value of equity is three times the book value of equity, and the market value of debt is equal to the book value of debt. Estimate the correct value for the firm.

13. You have been asked to value Office Help, a private firm providing office support services in the New York area.
   - The firm reported pretax operating income of $10 million in its most recent financial year on revenues of $100 million. In the most recent financial year, you note that the owners of the business did not pay themselves a salary. You believe that a fair salary for their services would be $1.5 million a year.
   - The cost of capital for comparable firms that are publicly traded is 9 percent. (You can assume that this firm will have similar leverage and cost of capital.)
   - The firm is in stable growth and expects to grow 5 percent a year in perpetuity. The tax rate is 40 percent.

The average illiquidity discount applied to private firms is 30 percent, but you have run a regression and arrived at the following estimate for the discount:

   \[ \text{Illiquidity Discount} = 0.30 - 0.04 \ln(\text{Revenues in millions}) \]

Estimate the value of Office Help for sale in a private transaction (to an individual).

14. National City, a bank holding company, reported earnings per share of $2.40 and paid dividends per share of $1.06. The earnings had grown 7.5 percent a year over the prior five years, and were expected to grow 6 percent a year in the long run. The stock had a beta of 1.05 and traded for ten times earnings. The Treasury bond rate was 7 percent.
   a. Estimate the P/E ratio for National City.
   b. What long-term growth rate is implied in the firm’s current PE ratio?

15. The following were the P/E ratios of firms in the aerospace/defense industry at the with additional data on expected growth and risk:

<table>
<thead>
<tr>
<th>Company</th>
<th>P/E Ratio</th>
<th>Expected Growth</th>
<th>Beta</th>
<th>Payout</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boeing</td>
<td>17.3</td>
<td>3.5%</td>
<td>1.10</td>
<td>28%</td>
</tr>
<tr>
<td>General Dynamics</td>
<td>15.5</td>
<td>11.5%</td>
<td>1.25</td>
<td>40%</td>
</tr>
<tr>
<td>General Motors—Hughes</td>
<td>16.5</td>
<td>13.0%</td>
<td>0.85</td>
<td>41%</td>
</tr>
<tr>
<td>Company</td>
<td>P/E</td>
<td>Growth Rate</td>
<td>Payout</td>
<td>ROE</td>
</tr>
<tr>
<td>-----------------</td>
<td>------</td>
<td>-------------</td>
<td>--------</td>
<td>------</td>
</tr>
<tr>
<td>Grumman</td>
<td>11.4</td>
<td>10.5%</td>
<td>0.80</td>
<td>37%</td>
</tr>
<tr>
<td>Lockheed</td>
<td>10.2</td>
<td>9.5%</td>
<td>0.85</td>
<td>37%</td>
</tr>
<tr>
<td>Logicon</td>
<td>12.4</td>
<td>14.0%</td>
<td>0.85</td>
<td>11%</td>
</tr>
<tr>
<td>Loral</td>
<td>13.3</td>
<td>16.5%</td>
<td>0.75</td>
<td>23%</td>
</tr>
<tr>
<td>Martin Marietta</td>
<td>11.0</td>
<td>8.0%</td>
<td>0.85</td>
<td>22%</td>
</tr>
<tr>
<td>McDonnell Douglas</td>
<td>22.6</td>
<td>13.0%</td>
<td>1.15</td>
<td>37%</td>
</tr>
<tr>
<td>Northrop</td>
<td>9.5</td>
<td>9.0%</td>
<td>1.05</td>
<td>47%</td>
</tr>
<tr>
<td>Raytheon</td>
<td>12.1</td>
<td>9.5%</td>
<td>0.75</td>
<td>28%</td>
</tr>
<tr>
<td>Rockwell</td>
<td>13.9</td>
<td>11.5%</td>
<td>1.00</td>
<td>38%</td>
</tr>
<tr>
<td>Thiokol</td>
<td>8.7</td>
<td>5.5%</td>
<td>0.95</td>
<td>15%</td>
</tr>
<tr>
<td>United Industrial</td>
<td>10.4</td>
<td>4.5%</td>
<td>0.70</td>
<td>50%</td>
</tr>
</tbody>
</table>

a. Estimate the average and median P/E ratios. What, if anything, would these averages tell you?
b. An analyst concludes that Thiokol is undervalued because its P/E ratio is lower than the industry average. Under what conditions is this statement true? Would you agree with it here?
c. Using the PEG ratio, assess whether Thiokol is undervalued. What are you assuming about the relationship between value and growth when you use PEG ratios?
d. Using a regression, control for differences across firms on risk, growth, and payout. Specify how you would use this regression to spot under- and overvalued stocks. What are the limitations of this approach?

16. NCH, which markets cleaning chemicals, insecticides, and other products, paid dividends of $2.00 per share on earnings of $4.00 per share. The book value of equity per share was $40.00, and earnings are expected to grow 5 percent a year in the long term. The stock has a beta of 0.85, and sells for $60 per share. The Treasury bond rate is 7 percent.

a. Based on these inputs, estimate the price/book value ratio for NCH.
b. How much would the return on equity have to increase to justify the price/book value ratio at which NCH sells for currently?
17. You are trying to estimate a price per share on an IPO of a company involved in environmental waste disposal. The company has a book value per share of $20 and earned $3.50 per share in the most recent time period. Although it does not pay dividends, the capital expenditures per share were $2.50 higher than depreciation per share in the most recent period, and the firm uses no debt financing. Analysts project that earnings for the company will grow 25 percent a year for the next five years. You have data on other companies in the environment waste disposal business:

<table>
<thead>
<tr>
<th>Company</th>
<th>Price</th>
<th>BV/Share</th>
<th>EPS</th>
<th>DPS</th>
<th>Beta</th>
<th>Exp. Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air &amp; Water</td>
<td>$9.60</td>
<td>$8.48</td>
<td>$0.40</td>
<td>$0.00</td>
<td>1.65</td>
<td>10.5%</td>
</tr>
<tr>
<td>Allwaste</td>
<td>$5.40</td>
<td>$3.10</td>
<td>$0.25</td>
<td>$0.00</td>
<td>1.10</td>
<td>18.5%</td>
</tr>
<tr>
<td>Browning Ferris</td>
<td>$29.00</td>
<td>$11.50</td>
<td>$1.45</td>
<td>$0.68</td>
<td>1.25</td>
<td>11.0%</td>
</tr>
<tr>
<td>Chemical Waste</td>
<td>$9.40</td>
<td>$3.75</td>
<td>$0.45</td>
<td>$0.15</td>
<td>1.15</td>
<td>2.5%</td>
</tr>
<tr>
<td>Groundwater</td>
<td>$15.00</td>
<td>$14.45</td>
<td>$0.65</td>
<td>$0.00</td>
<td>1.00</td>
<td>3.0%</td>
</tr>
<tr>
<td>Intn'l Tech.</td>
<td>$3.30</td>
<td>$3.35</td>
<td>$0.16</td>
<td>$0.00</td>
<td>1.10</td>
<td>11.0%</td>
</tr>
<tr>
<td>Ionics</td>
<td>$48.00</td>
<td>$31.00</td>
<td>$2.20</td>
<td>$0.00</td>
<td>1.00</td>
<td>14.5%</td>
</tr>
<tr>
<td>Laidlaw</td>
<td>$6.30</td>
<td>$5.85</td>
<td>$0.40</td>
<td>$0.12</td>
<td>1.15</td>
<td>8.5%</td>
</tr>
<tr>
<td>OHM</td>
<td>$16.00</td>
<td>$5.65</td>
<td>$0.60</td>
<td>$0.00</td>
<td>1.15</td>
<td>9.50%</td>
</tr>
<tr>
<td>Rollins</td>
<td>$5.10</td>
<td>$3.65</td>
<td>$0.05</td>
<td>$0.00</td>
<td>1.30</td>
<td>1.0%</td>
</tr>
<tr>
<td>Safety-Kleen</td>
<td>$14.00</td>
<td>$9.25</td>
<td>$0.80</td>
<td>$0.36</td>
<td>1.15</td>
<td>6.50%</td>
</tr>
</tbody>
</table>

The average debt/equity ratio of these firms is 20 percent, and the tax rate is 40 percent.

a. Estimate the average price/book value ratio for these comparable firms. Would you use this average P/BV ratio to price the IPO?

b. What subjective adjustments would you make to the price/book value ratio for this firm and why?

18. Longs Drug, a large U.S. drugstore chain operating primarily in northern California, had sales per share of $122 on which it reported earnings per share of $2.45 and paid a dividend per share of $1.12. The company is expected to grow 6 percent in the long run, and has a beta of 0.90. The current Treasury bond rate is 7 percent.

a. Estimate the appropriate price/sales multiple for Longs Drug.
b. The stock is currently trading for $34 per share. Assuming the growth rate is estimated correctly, what would the profit margin need to be to justify this price per share?

19. You have been asked to assess whether Walgreen, a drugstore chain, is correctly priced relative to its competitors in the drugstore industry. The following are the price/sales ratios, profit margins, and other relative details of the firms in the drugstore industry.

<table>
<thead>
<tr>
<th>Company</th>
<th>P/S Ratio</th>
<th>Profit Margin</th>
<th>Payout</th>
<th>Expected Growth</th>
<th>Beta</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arbor Drugs</td>
<td>0.42</td>
<td>3.40%</td>
<td>18%</td>
<td>14.0%</td>
<td>1.05</td>
</tr>
<tr>
<td>Big B</td>
<td>0.30</td>
<td>1.90%</td>
<td>14%</td>
<td>23.5%</td>
<td>0.70</td>
</tr>
<tr>
<td>Drug Emporium</td>
<td>0.10</td>
<td>0.60%</td>
<td>0%</td>
<td>27.5%</td>
<td>0.90</td>
</tr>
<tr>
<td>Fay’s</td>
<td>0.15</td>
<td>1.30%</td>
<td>37%</td>
<td>11.5%</td>
<td>0.90</td>
</tr>
<tr>
<td>Genovese</td>
<td>0.18</td>
<td>1.70%</td>
<td>26%</td>
<td>10.5%</td>
<td>0.80</td>
</tr>
<tr>
<td>Longs Drug</td>
<td>0.30</td>
<td>2.00%</td>
<td>46%</td>
<td>6.0%</td>
<td>0.90</td>
</tr>
<tr>
<td>Perry Drugs</td>
<td>0.12</td>
<td>1.30%</td>
<td>0%</td>
<td>12.5%</td>
<td>1.10</td>
</tr>
<tr>
<td>Rite-Aid</td>
<td>0.33</td>
<td>3.20%</td>
<td>37%</td>
<td>10.5%</td>
<td>0.90</td>
</tr>
<tr>
<td><strong>Walgreen</strong></td>
<td><strong>0.60</strong></td>
<td><strong>2.70%</strong></td>
<td><strong>31%</strong></td>
<td><strong>13.5%</strong></td>
<td><strong>1.15</strong></td>
</tr>
</tbody>
</table>

Based entirely on a subjective analysis, do you think that Walgreen is overpriced because its price/sales ratio is the highest in the industry? If it is not, how would you rationalize its value?

20. Time Warner is considering a sale of its publishing division. The division had earnings EBITDA of $550 million in the most recent year (depreciation was $150 million), growing at an estimated 5 percent a year (you can assume that depreciation grows at the same rate). The return on capital in the division is 15 percent, and the corporate tax rate is 40 percent. If the cost of capital for the division is 9 percent, estimate the following:

a. Value/FCFF multiple.
b. Value/EBIT multiple.
c. Value/EBITDA multiple.