CHAPTER 9

CAPITAL STRUCTURE: THE FINANCING DETAILS

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

[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.[2] 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

[2]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

= Cost of Equity[Equity/(Debt+ Equity)] + Cost of Debt[Debt/(Debt + Equity)]

= 12.23% [15,406/(15,406+657)] + 7.70% (1 – 0.435) [657/(15,406 + 657)]

= 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

Debt Ratio	*Beta*	*Cost of Equity*	*Interest Coverage Ratio*	*Bond Rating*	*Interest Rate*	*Cost of Debt*	*Cost of Capital*	*Firm Value (in millions)*	*Stock Price*
0.00%	0.93	12.10%	∞	AAA	7.30%	4.12%	12.10%	$15,507	$96.41
10.00%	0.99	12.42%	10.73	AAA	7.30%	4.12%	11.59%	$17,007	$106.15
20.00%	1.06	12.82%	4.75	A	8.25%	4.66%	11.19%	$18,399	$115.19

30.00%	1.15	13.34%	2.90	BBB	9.00%	5.09%	10.86%	$19,708	$123.69
40.00%	1.28	14.02%	1.78	B	11.00%	6.22%	10.90%	$19,546	$122.63
50.00%	1.45	14.99%	1.21	CCC	13.00%	7.35%	11.17%	$18,496	$115.81
60.00%	1.71	16.43%	1.00	CCC	13.00%	7.35%	10.98%	$19,228	$120.57
70.00%	2.37	20.01%	0.77	CC	14.50%	9.63%	12.74%	$13,939	$86.23
80.00%	3.65	27.08%	0.61	C	16.00%	11.74%	14.81%	$10,449	$63.58
90.00%	7.30	47.16%	0.54	C	16.00%	12.21%	15.71%	$9,391	$56.71

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.

Debt-for-Equity Swaps: A voluntary exchange of outstanding equity for 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 formet 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]

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

[4]An 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;[5] 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

[5]The 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:

Expected Price Appreciation = Cost of Equity – 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:

$$\text{Expected Price Appreciation}_{\text{Disney}} = 7.51\% - (\$0.35/\$24.34) = 6.07\%$$

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.

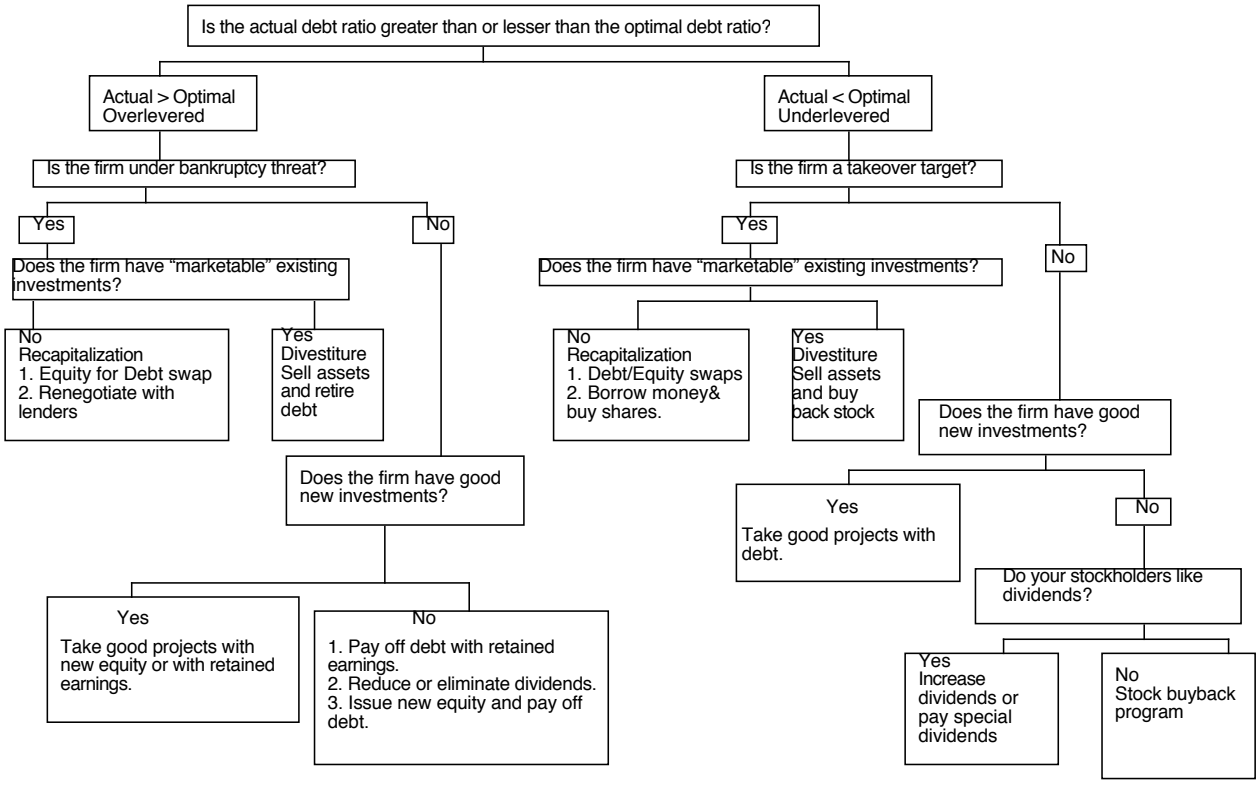
We summarize our conclusions about the right route to follow to the optimal, based on all these determinants, in Table 9.2.

Table 9.2 Optimal Route to Financing Mix

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

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.

FIGURE 9.1: A FRAMEWORK FOR CHANGING DEBT RATIOS



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).[6] This would require approximately $29.5 million in new debt, which can be used to buy back stock.[7]



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 t to adjust quickly to the cash-flow demands of a highly levered firm. While the

[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 *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

Debt Ratio	Cost of capital	Firm Value (G)
0%	7.90%	$58,499.82
10%	7.68%	$60,373.92
20%	7.45%	$62,371.16
30%	7.32%	$63,595.96
40%	7.32%	$63,650.81
50%	7.33%	$63,556.35
60%	7.40%	$62,873.20
70%	9.49%	$47,883.80
80%	10.46%	$43,090.17
90%	11.34%	$39,497.05

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.[8] 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.[9] 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%.

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

[9]The 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.[10] 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)

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

[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.

Growth Rate		5.00%	5.00%	5.00%	5.00%	5.00%
Dividend Payout Ratio	15.36%	15.36%	15.36%	15.36%	15.36%	15.36%

[a]Net Income$_t$ = Net Income$_{t-1}$ (1 + g) - Interest Rate (1 – t) * (Debt$_t$ – Debt$_{t-1}$).

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 31.01% at the end of the fifth year.

Table 9.5 Estimated Debt Ratio with Higher Dividend Payout Ratio (Notice that cash outflows are shown as positive and cash inflows as negative)

	Current Year	1	2	3	4	5
Equity	$45,193	$45,813	$46,356	$46,810	$47,164	$47,404
Debt	$16,682	$17,475	$18,316	$19,206	$20,149	$21,148
Debt/(Debt+Equity)	26.96%	27.61%	28.32%	29.09%	29.93%	30.85%
Revenues	$36,990	$38,840	$40,781	$42,821	$44,962	$47,210
Capital Expenditures	$3,389	$3,559	$3,737	$3,924	$4,120	$4,326
+ Chg in Work. Cap	$40	$42	$44	$47	$49	$51
- Depreciation	$1,593	$1,673	$1,756	$1,844	$1,936	$2,033
- Net Income	$4,324	$4,540	$4,738	$4,943	$5,157	$5,380
+ Dividends	$664	$3,405	$3,553	$3,707	$3,868	$4,035
= Debt issued (repaid)	($1,823)	$793	$840	$890	$943	$999
Beta	0.90	0.91	0.91	0.92	0.93	0.94
Cost of Equity	8.91%	8.94%	8.98%	9.02%	9.07%	9.12%
Growth Rate		5.00%	5.00%	5.00%	5.00%	5.00%
Dividend Payout Ratio	15.36%	75.00%	75.00%	75.00%	75.00%	75.00%

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.[11]

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

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

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$_{t-1}$ (1+Cost of Equity)$_{t-1}$-Dividends$_t$) (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

	Current Year	1	2	3	4	5
Equity	$45,193	$48,521	$52,111	$55,985	$60,166	$64,681
Debt	$16,682	$18,326	$20,125	$22,092	$24,244	$26,597
Debt/(Debt+Equity)	26.96%	27.42%	27.86%	28.30%	28.72%	29.14%
Revenues	$36,990	$38,840	$40,781	$42,821	$44,962	$47,210
Capital Expenditures	$3,389	$7,118	$7,474	$7,847	$8,240	$8,652
+ Chg in Work. Cap	$40	$42	$44	$47	$49	$51
- Depreciation	$1,593	$1,673	$1,756	$1,844	$1,936	$2,033
- Net Income	$4,324	$4,540	$4,706	$4,874	$5,045	$5,217
+ Dividends	$664	$697	$743	$792	$844	$900
+ Stock Buybacks		$0	$0	$0	$0	$0
= Debt issued (repaid)	($1,823)	$1,644	$1,799	$1,967	$2,152	$2,353
Beta	0.90	0.91	0.91	0.91	0.92	0.92
Cost of Equity	8.91%	8.93%	8.95%	8.98%	9.00%	9.02%
Growth Rate		5.00%	5.00%	5.00%	5.00%	5.00%
Dividend Payout Ratio	15.36%	15.36%	15.36%	15.36%	15.36%	15.36%

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. t. 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

	Current Year	1	2	3	4	5
Equity	Rs52,160	Rs59,187	Rs67,129	Rs75,832	Rs85,364	Rs95,794
Debt	Rs26,892	Rs24,324	Rs21,381	Rs18,008	Rs14,143	Rs9,714
Debt/(Debt+Equity)	34.02%	29.13%	24.16%	19.19%	14.21%	9.21%
Revenues	Rs59,757	Rs64,538	Rs69,701	Rs75,277	Rs81,299	Rs87,803
Capital Expenditures	Rs2,162	Rs2,335	Rs2,522	Rs2,723	Rs2,941	$3,177
+ Chg in Work. Cap	Rs742	$802	Rs866	Rs935	Rs1,010	Rs1,091
- Depreciation	Rs1,582	Rs1,709	Rs1,845	Rs1,993	Rs2,152	Rs2,324
- Net Income	Rs3,700	Rs3,996	Rs4,485	Rs5,039	Rs5,664	Rs6,373
+ Dividends	Rs664	Rs0	Rs0	Rs0	Rs0	Rs0
= Debt issued (repaid)	(Rs1,714)	(Rs2,568)	(Rs2,943)	(Rs3,373)	(Rs3,865)	(Rs4,429)
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%
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.

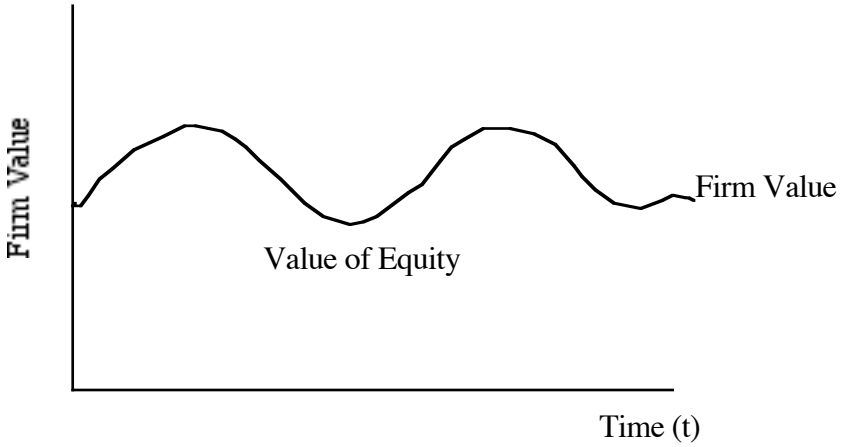
I. Matching Financing Cash Flows with Asset Cash Flows

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 macro economic variables.

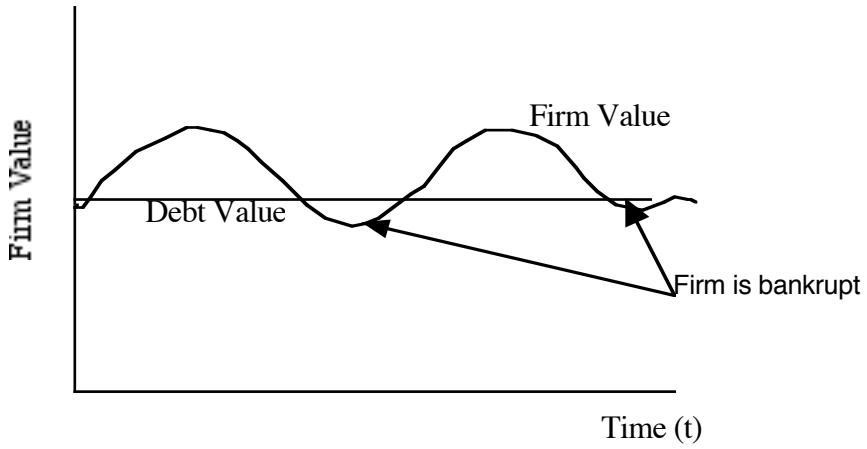
Figure 9.2: Firm Value over time with Short Term Debtt



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.

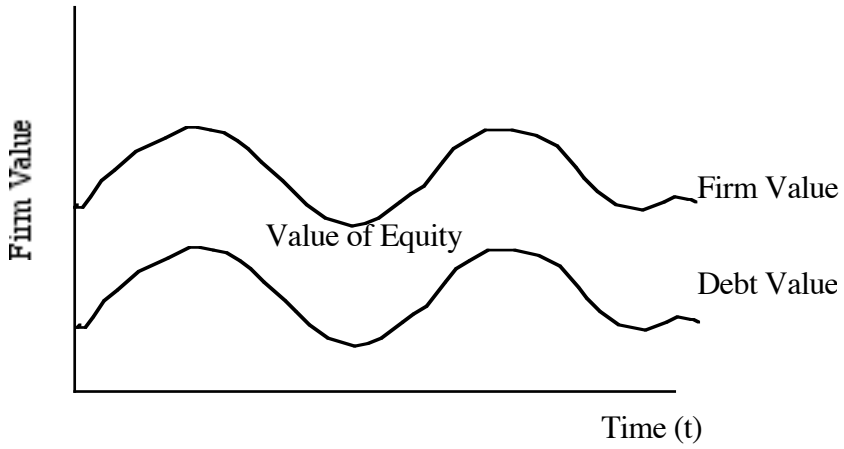
Figure 9.3: Firm Value over time with Long Term Debtt



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 Debtt



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:[12]

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

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:

[12]This 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.

$$\text{Duration of 30 - year Bond} = \frac{dP/dr}{(1+r)} = \frac{\left[\sum_{t=1}^{t=30} \frac{t * \$\,70}{(1.08)^t} + \frac{30 * \$1000}{(1.08)^{30}}\right]}{\left[\sum_{t=1}^{t=30} \frac{\$\,70}{(1.08)^t} + \frac{\$1000}{(1.08)^N}\right]} = 12.41$$

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.[13] For zero-coupon bonds, the duration is equal to the maturity.

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:

$$\text{Duration of Project/Asset} = dPV/dr = \frac{\left[\sum_{t=1}^{t=N} \frac{t * CF_t}{(1+r)^t} + \frac{N * \text{Terminal Value}}{(1+r)^N}\right]}{\left[\sum_{t=1}^{t=N} \frac{CF_t}{(1+r)^t} + \frac{\text{Terminal Value}}{(1+r)^N}\right]}$$

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

[13]For instance, making the coupon rate floating, rather than fixed, will reduce the duration of a bond. Similarly, adding a call feature to a bond will decrease duration, whereas making bonds extendible will increase duration.

(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 9.5 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

Year (t)	Annual Cashflow	Terminal Value	Present Value @ 8.62%	Present value *t
0	-$2,000		-$2,000	$0
1	-$1,000		-$921	-$921
2	-$860		-$729	-$1,457
3	-$270		-$211	-$632
4	$332		$239	$956
5	$453		$300	$1,500
6	$502		$305	$1,833
7	$538		$302	$2,112
8	$596		$307	$2,460
9	$660		$313	$2,821
10	$692	$10,669	$4,970	$49,704
			$2,877	$58,375

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

Floating Rate Debt: The interest rate on floating rate debt varies from period to period and is linked to a specified short-term rate; for instance, many floating rate bonds have coupon rates that are tied to the London Interbank Borrowing Rate (LIBOR).

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,[14] 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 be 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

[14]The 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

[15]As 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.

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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 b 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 fell that their stock is over priced and less equity when they feel it is over priced. There is also evidencd 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 fo 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 asset 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

[16]Ratings 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,[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.[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

[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.

[18]In recent years, insurance companies have issued billions of dollars of surplus notes in the private placement market.

financed are long-term assets.[19] Flannery (1986) and Kale and Noe (1990) note that although both short-tem and long-term debt will be mispriced in the presence of asymmetric information, long-term debt will be mispriced more.[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.[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.

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[19]S. C. Myers, 1977, "Determinants of Corporate Borrowing," *Journal of Financial Economics*, 5(2), 147–175.

[20]M. J. Flannery, 1986, "Asymmetric Information and Risky Debt Maturity Choice," *Journal of Finance*, 41(1), 19–38; J. R. Kale and T. H. Noe, "Risky Debt Maturity Choice in a Sequential Game Equilibrium," *Journal of Financial Research*, 8, 155–165.

[21]G. Goswami, T. Noe, and M. Rebello, 1995, "Debt Financing under Asymmetric Information," *Journal of Finance*, 50(2), 633–659.

- 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.

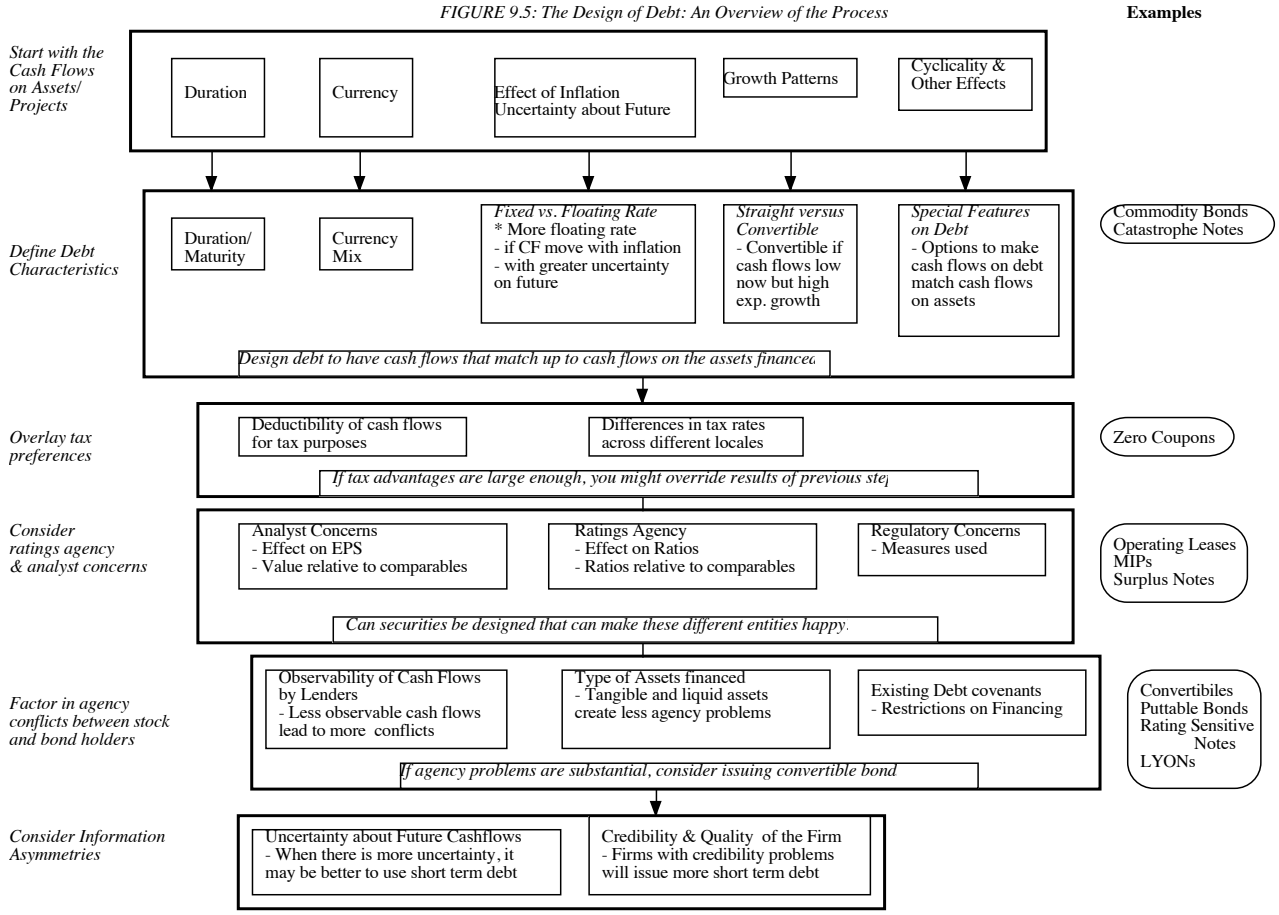
Barclay and Smith (1996) examined debt issues by U.S. companies between 1981 and 1993 and concluded that high-growth firms are more likely to issue short-term debt with higher priority.[22] This finding is consistent with both the information asymmetry argument and the agency cost argument, because lenders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

[22]M. J. Barclay and C. W. Smith, 1996, "On Financial Architecture: Leverage, Maturity and Priority," *Journal of Applied Corporate Finance*, 8(4), 4–17.

FIGURE 9.5: The Design of Debt: An Overview of the Process



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 9.6 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

Business	*Project Cash Flow Characteristics*	*Type of Financing*
Studio entertainment	Movie projects are likely to 1. Be short-term 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) 3. Have net cash flows that are heavily driven by whether the movie is a hit, which is often difficult to predict	Debt should be 1. Short-term 2. Primarily dollar debt 3. If possible, tied to the success of movies (*Lion King* or *Mulan* bonds)
Media networks	Projects are likely to be 1. Short-term 2. Primarily in dollars, though foreign component is growing 3. Driven by advertising revenues and show success (Nielsen ratings)	Debt should be 1. Short-term 2. Primarily dollar debt 3. If possible, linked to network ratings
Park resorts	Projects are likely to be 1. Very long-term 2. Primarily in dollars, but a significant proportion of revenues come from foreign tourists, who are likely to stay away if the dollar strengthens 3. Affected by success of studio entertainment and media networks divisions	Debt should be 1. Long-term 2. Mix of currencies, based on tourist makeup
Consumer products	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	Debt should be a. Medium-term b. Dollar debt

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

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

1990	$1,287	$12,643	16.01%	-24.90%	0.12%	0.65%	0.43%	-8.00%
1989	$1,109	$16,834	40.64%	-2.64%	-1.11%	2.66%	0.51%	2.04%
1988	$789	$17,290	11.65%	65.50%	0.26%	3.66%	0.60%	1.05%
1987	$707	$10,447	53.02%	85.24%	1.53%	4.49%	2.54%	-12.01%
1986	$462	$5,640	25.15%	61.24%	-1.61%	2.83%	-2.33%	-15.26%
1985	$369	$3,498	157.99%	24.37%	-2.27%	4.19%	3.89%	-13.51%

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]

$$\text{Change in Firm Value} = 0.1949 + 2.9439\ (\text{Change in Interest Rates})$$
$$(2.89) \quad (0.50)$$

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:

$$\text{Change in Firm Value} = -0.0826 + 8.89\ (\text{GDP Growth})$$
$$(0.65) \quad (2.36^{a})$$

[23]To 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:

  Change in Operating Income = 0.1958 - 6.5439 (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:

  Change in Operating Income = 0.04 + 6.06 (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:

  Change in Operating Income = 0.19 – 1.57 (Change in Dollar)

  (2.42) (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:

  Change in Operating Income = 0.22 + 8.79 (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:[24]

Business	Interest rates		GDP Growth	Inflation	Currency	Weights
Studio entertainment	-3.70	0.56	1.41	-1.23	9.88%	
Media networks	-4.50	0.70	-3.05	-1.58	58.92%	
Park resorts	-	0.22	-	-3.21	29.88%	

[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.

	6.47		1.45		
Consumer products	-4.88	0.13	-5.51	-3.01	1.32%
Disney	*-5.01*	*0.54*	*-2.16*	*-2.05*	

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 9.7 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

- Fixed rate debt, since the company is unlikely to have much pricing power in this business.
- 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 it 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 the projects?

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:

Year	*Market Value of Equity (in millions $)*	*Debt (in millions $)*
1985	1,824.9	436
1986	2,260.6	632
1987	2,389.6	795
1988	1,960.8	655
1989	2,226	836
1990	1,875.9	755
1991	2,009.7	795
1992	2,589.3	833
1993	3,210	649
1994	3,962.7	1,053

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.

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

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:

Year	*Operating Income (in $ thousands)*
1985	463.05
1986	411.696
1987	483.252
1988	544.633
1989	550.65
1990	454.875
1991	341.481
1992	413.983
1993	567.729
1994	810.968

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 consider 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

Change in Firm Value = 0.20% – 6.33 (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:

Change in Firm Value = $a + b$(Change in Long-Term Interest Rates)

Company	Intercept (a)	Slope Coefficient (b)
LA Gear	–0.07	–4.74
Nike	0.05	–11.03
Stride Rite	0.01	–8.08
Timberland	0.06	–22.50
Reebok	0.04	–4.79
Wolverine	0.06	–2.42

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?