Long-term funds are usually invested in long-term assets, with several asset-financing mixes possible over the business cycle. Obviously, a firm wants to provide all of the necessary financing at the lowest possible cost. This generally leads the financial manager to attempt to sell common stock when prices are relatively high, to minimize the cost of equity.[7] The financial manager also wants to sell debt at low interest rates. Since there is short-term and long-term debt, the manager needs to know how interest rates move over the business cycle and when to use short-term versus long-term debt.

Thus, the task is for the firm to find a balance between debt and equity that achieves its minimum cost of capital. Although we discussed minimizing the overall cost of capital K_a at a single debt-to-equity ratio, firms seem, in reality, to operate within a relevant range of debt to equity before they become penalized with a higher overall cost because of increased risk.

Figure 11–2 shows a theoretical cost of capital curve at three different points. As we move from time period t to time period $t + 2$, falling interest rates and rising stock prices cause a downward shift in K_a. This graph illuminates two basic points: (1) the firm wants to keep its debt-to-equity ratio between x and y at all times, and (2) the firm would rather finance its long-term needs at K_{at+2} than at K_{at}. Corporations do have some leeway in the money and capital markets such that it is not uncommon for the debt-to-equity ratio to fluctuate between x and y over a business cycle. Note, however, that the firm at point y has lost the flexibility of increasing its debt-to-equity ratio without incurring the penalty of higher capital costs.

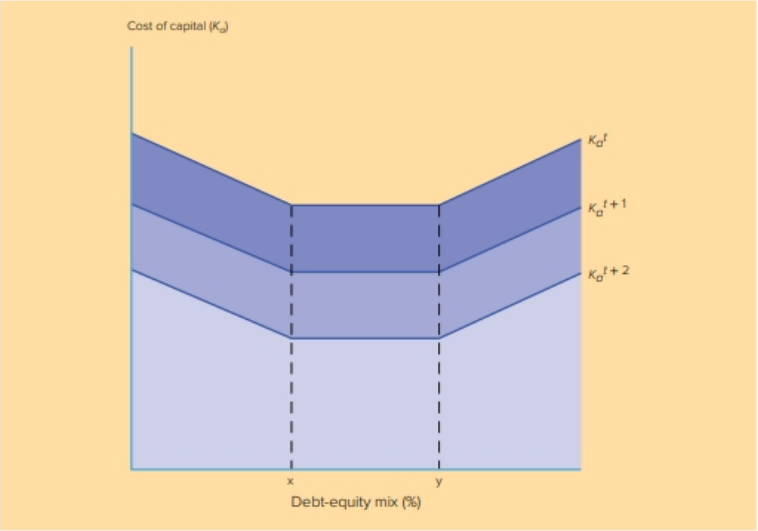

Figure 11–2 Cost of capital over time

[7] In Chapter 14 we discuss the rationality of such market timing in more detail.

FINANCE IN ACTION

EVA, the Music of Shareholder Value

EVA stands for *economic value added* and is a concept for financial decision making that was developed by Stern Stewart & Co., a New York City consulting firm, over two decades ago. Worldwide, Stern Stewart & Co. has over 300 EVA clients, who claim great success. The concept reduces to the following formula:

EVA = Net operating profit after taxes (NOPAT)
(NOPAT) − (capital × the cost of capital)

EVA stresses that decisions should be made or projects accepted only if this formula's results are positive. Simply put, it maintains that you should make an investment decision only if the return exceeds the cost. So what's the big deal? The "big deal" is that it is one thing for managers of corporations to understand the concept, but it is quite another for them to implement it. Often companies do not properly measure the cost of capital or are incorrectly focused on growth rather than shareholder wealth. Joel M. Stern and G. Bennett Stewart III, as developers of the EVA concept, maintain that they can teach corporate managers a program that ensures the return on capital exceeds the cost. In the process, shareholder wealth is maximized.

The value of the EVA technique is that it focuses the organization on creating value for the shareholders and it is an extension of the cost of capital concept examined in the chapter.

Q1 What does the Stern Stewart Institute provide today?

sternstewartinstitute.com

Cost of Capital in the Capital Budgeting Decision

The current cost of capital for each source of funds is always important when making a capital budgeting decision. Historical costs for past funding may have little to do with current costs against which future potential returns must be measured. When raising new financial capital, a company taps the various sources of financing over a reasonable time period. Regardless of the particular source of funds the company is using for the purchase of an asset, the required rate of return, or discount rate, is the weighted average cost of capital (WACC). As long as the company earns its cost of capital, the common share value of the firm is maintained, since shareholders' expectations are being met. For example, assume the Baker Corporation was considering making an investment in eight projects with the returns and costs shown in Table 11–4. These projects could be viewed graphically and merged with the WACC to make a capital budgeting decision, as indicated in Figure 11–3.

Projects	Expected Returns	Cost ($ millions)
A	16.00%	$10
B	14.00	5
C	13.50	4
D	11.80	20
E	10.40	11
F	9.50	20
G	8.60	15
H	7.00	10
		$95

Table 11–4 Investment projects available to the Baker Corporation

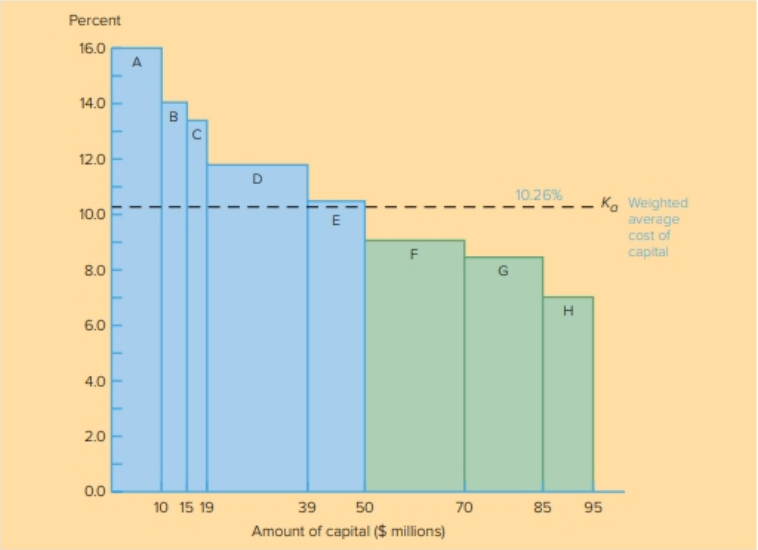

Figure 11–3 Cost of capital and investment projects for the Baker Corporation

Notice that the Baker Corporation is contemplating $95 million in projects. Given that the WACC is 10.26 percent, however, it should choose only projects A through E, or $50 million in new assets. Selecting assets F, G, and H would probably reduce the market value of the common stock because these projects do not provide a return equal to the overall costs of raising funds. We cannot forget that using the WACC assumes that the Baker Corporation is in its optimum capital structure range and will employ that structure in the future. Furthermore, when using the cost of capital to evaluate capital projects, we are assuming those projects will not adjust the risk complexion of the corporation. If they do, investors will change their required rates of return, and the cost of capital as calculated will be inappropriate.

THE MARGINAL COST OF CAPITAL

LO5 Nothing guarantees the Baker Corporation that its component cost of capital will stay constant for as much money as it wants to raise, even if a given capital structure is maintained. If a large amount of financing is desired, the market may demand a higher cost of capital for each extra increment of funds desired. The point is analogous to the fact that you may be able to go to your relatives and best friends and raise funds for an investment at 10 percent. After exhausting the lending or investing power of those closest to you, and you have to look to other sources, your marginal cost of capital will probably go up. (As background for this discussion, the cost of capital table for the Baker Corporation is reproduced again.)

		Cost (after tax)	Weights	Weighted Cost
Debt	K_d	6.55%	30%	1.97%
Preferred stock	K_p	10.94	10	1.09
Common equity (retained earnings)	K_e	12.00	60	7.20
WACC	K_a			10.26%

We need to review the nature of the firm's capital structure to explain the concept of marginal cost of capital as it applies to the firm. Note that 60 percent of the firm's capital is in the form of common equity. This equity (ownership) capital is represented initially by share capital and subsequently by share capital and retained earnings. Management has learned through experience that 60 percent is the amount of equity capital the firm must maintain to keep a balance acceptable to security holders, between fixed income securities and ownership interest. However, depending on how quickly the firm's capital needs expand, the growth in internally generated funds that are recorded as retained earnings may not be enough to support the investment needs of the firm and maintain a balanced capital structure.

For example, if the Baker Corporation generates $23.4 million in earnings, it will be recorded as retained earnings and will be deployed with other capital in the investments of the firm.[8] Since management has determined that equity should represent 60 percent of the capital structure, these internally generated funds recorded as retained earnings will be adequate to support investments of $39 million. More formally, we say that

$$X = \frac{\text{Retained earnings}}{\text{Percent of equity in the capital structure}} \quad (11\text{–}8)$$

(Where X represents the size of the investments that retained earnings will support.)

$$X = \frac{\$23.4 \text{ million}}{0.60} = \$39 \text{ million}$$

Once $39 million of investments are made, internally generated funds, recorded as retained earnings, are no longer adequate to keep the equity portion of the capital structure above 60 percent. Lenders and investors become concerned if common equity (ownership) capital falls below 60 percent. Because of this, ***new*** common stock is needed to supplement retained earnings to provide the 60 percent common equity component for the firm. That is, after $39 million of investments are made, additional common equity capital will be in the form of new common stock rather than retained earnings.

In the upper portion of Table 11–5, we see the original cost of capital that we have been discussing throughout the chapter. This applies up to a total capital amount of $39 million. After $39 million, the concept of marginal cost of capital becomes important and, as shown on the lower portion of the table, the cost of capital goes up.

		Cost (after tax)	Weights	Weighted Cost
First $39 million:				
Debt	K_d	6.55%	.30	1.97%
Preferred	K_p	10.94	.10	1.09
Common equity*	K_e	12.00	.60	7.20
				$K_a = 10.26\%$
Next $11 million:				
Debt	K_d	6.55%	.30	1.97%
Preferred	K_p	10.94	.10	1.09
Common equity*	K_n	13.33	.60	8.00
				$K_{mc} = 11.06\%$

*Retained earnings
*New common equity

Table 11–5 Cost of capital for different amounts of financing

[8] This basic concept, known as *sustainable growth rate*, is an important one for the student or practitioner of finance to grasp. Too often, managers have assumed that as long as their firms were profitable, they could continue to grow as quickly as possible. Rude awakenings sometimes followed when banks refused to advance any more loans to the cash–strapped firms. The formula for determining the internally sustainable growth rate of the firm is discussed in Chapter 4. Assuming the firm's debt ratio is optimal, the rest of the balance sheet can grow no faster than the equity portion.

In the lower portion of the table, K_{mc} represents the ***marginal*** cost of capital, which becomes 11.06 percent after $39 million. The cost of capital increases for capital above $39 million because the invested common equity is now in the form of new common stock rather than retained earnings. The overall cost becomes slightly more for the additional funding because of flotation costs (F). The cost of new common stock was shown earlier in the chapter as formula 11–6. In this circumstance, it is calculated

$$K_n = \left(\frac{D_1}{P_0} + g\right)\left(\frac{P_0}{P_n}\right) = \left(\frac{\$2}{\$40} + 7\%\right)\left(\frac{\$40}{\$36}\right)$$
$$= 13.33\%$$

The flotation cost (F) of $4.00 reduces the net share proceeds (P_n) to $36 and makes the cost of new common stock 13.33 percent. This is higher than the 12 percent cost of retained earnings we have been using and, therefore, causes the increase in the marginal cost of capital.

To carry the example a bit further, let us assume the cost of debt of 6.55 percent applies to the first $15 million of debt the firm raises. After that, the aftertax cost of debt rises to 7.9 percent because of the need to tap more expensive sources. Since debt represents 30 percent of the capital structure for the Baker Corporation, the cheaper form of debt is available to support the capital structure up to $50 million. We derive the $50 million by using this formula

$$Z = \frac{\text{Amount of lower} - \text{Cost debt}}{\text{Percent of debt in the capital structure}} \quad (11\text{–}9)$$

(Where Z represents the size of the investments in which lower-cost debt can be utilized.)

$$Z = \frac{\$15 \text{ million}}{0.30}$$
$$= \$50 \text{ million}$$

After the first $50 million of capital is raised, lower-cost debt is no longer available to make up 30 percent of the capital structure. After $50 million in total financing, the aftertax cost of debt goes up to the previously specified 7.9 percent. The marginal cost of capital for over $50 million in financing is shown in Table 11–6.

		Cost (after tax)	Weights	Weighted Cost
Over $50 million:				
Debt (higher cost)	K_d	7.90%	.30	2.37%
Preferred	K_p	10.94	.10	1.09
Common equity (new common stock)	K_n	13.33	.60	8.00
				$K_{mc} = 11.46\%$

Table 11–6 Cost of capital for increasing amounts of financing

This increase in the cost of debt causes another rise in the marginal cost of capital (K_{mc}) to 11.46 percent after $50 million of financing. Observe that the capital structure with over $50 million of financing reflects both the increase in the cost of debt and the continued exclusive use of new common stock to represent additional common equity capital.

We could carry on this process by next considering at what point an increase in the cost of preferred stock would be demanded by investors, or at what points the costs of debt or new common stock increase as more and more capital is required. For now,

however, it is important that you merely understand the basic process and can think it through when the details of an actual situation are at hand.

To summarize then, we have calculated that the Baker Corporation has a basic weighted average cost of capital of 10.26 percent. This chapter was devoted to demonstrating the development of that value. Table 11–1 presented it originally. We found, however, that as the firm's investment plans required it to substantially expand its capital structure, the weighted average cost of capital increased. This process demonstrated the concept of marginal cost of capital. The first increase, or break point, occurred at $39 million. At that point, the marginal cost of capital went up to 11.06 percent as a result of having to raise new common stock (in other words, we passed the firm's sustainable growth rate). The second increase in the cost of capital occurred when the total required capital structure passed $50 million. Beyond there, the marginal cost of capital increased to 11.46 percent as a result of the need to utilize more expensive sources of debt. These marginal changes are summarized as

Amount of Financing	Marginal Cost of Capital
0–$39 million	10.26%
$39–50 million	11.06
Over $50 million	11.46

Remember that this discussion of marginal cost of capital is highly dependent on the investment opportunities available to the firm and, in turn, has a great effect on them. Figure 11–3 showed the estimated returns from investment for projects A through H. Figure 11–4 reproduces the returns originally shown in Figure 11–3 and includes the concept of marginal cost of capital. Observe that the marginal cost of capital (dotted lines) increases even as the marginal returns (straight lines) decrease.

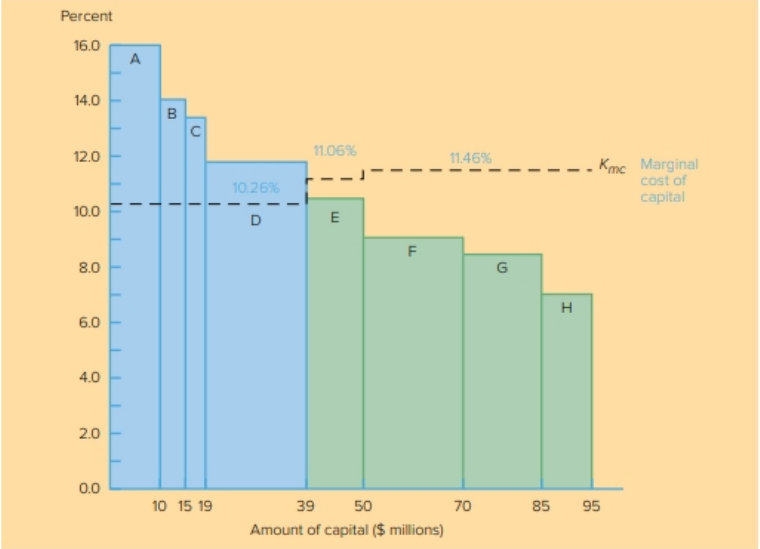

Figure 11–4 Marginal cost of capital and Baker Corporation investment alternatives

In the earlier, Figure 11–3, presentation, the Baker Corporation seemed justified in choosing projects A through E, representing capital expenditures of $50 million. Figure 11–4 represents a more sophisticated consideration of the investment alternatives and, as such, tells a slightly different story. Because of the increasing marginal cost of capital, the returns exceed the cost of capital for only the first $39 million of projects. This means that only projects A through D are deemed acceptable.

For most of our discussion of capital budgeting decisions in the next chapter, we assume we are operating at the original marginal cost of capital before substantially increasing the capital structure. This means that most of our decisions are made based on the initial weighted average cost of capital. Such an approach is generally acceptable, but it is up to the astute financial analyst to realize when this will not be the case. If there seem to be very real financing consequences involved with taking on marginal projects, he or she must consider them.

SUMMARY

1. The cost of capital is determined by computing the costs from the various sources of financings and weighting them in proportion to their expected representation in future financings. As such, it is the overall cost of financing of the firm at the present time based on expectations of the future.

2. The cost of capital is a critical component in the valuation of a firm and its future prospects. An investment is expected to generate cash flows in the future. To evaluate the worth of these cash flows, we want to discount them to the present and compare their value with the investment cost. By using the cost of capital as the discount rate, we suggest that the cash flows are valued on the basis of the financing required to make the investment that will produce those cash flows. The cost of capital is used under the assumption that the investment evaluated is of the same risk as the average investment of the firm. It is important to realize that the cost of capital is a concept used as an evaluation tool to analyze investment proposals.

3. A cost of capital calculation requires the determination of the appropriate weightings of the components of the firm's capital structure and the current costs of those components. We saw how to determine the weightings based on the market value of the existing capital structure. The cost of each component in the capital structure is closely associated with the valuation of that source. For debt and preferred stock, the cost is directly related to the current yield determined by investors, with the cost of debt reduced downward to reflect the tax-deductibility of interest costs.

   For common stock, the cost of retained earnings (K_e) is the current dividend yield on the security plus the anticipated future rate of growth in dividends. Minor adjustments must be made to the formula to determine the cost of new common stock issues. A summary of the Baker Corporation's capital costs, as developed throughout the chapter, is presented in Table 11–7.

1. Cost of debt	$K_d = \text{Yield}\,(1 - T) = 6.55\%$	Yield = 10.74% T = Corporate tax rate, 39.0%
2. Cost of preferred stock	$K_p = \frac{D_p}{P_p - F} = 10.94\%$	D_p = Preferred dividend, \$10.50 P_p = Price of preferred stock, \$100 F = Flotation costs, \$4.00
3. Cost of common equity (retained earnings)	$K_e = \frac{D_1}{P_0} + g = 12.0\%$	D_1 = First–year common dividend, \$2.00 P_0 = Price of common stock, \$40.00 g = Growth rate, 7.0%
4. Cost of new common stock	$K_n = \left(\frac{D_1}{P_0} + g\right)\left(\frac{P_0}{P_n}\right) = 13.33\%$	Same as above, with F = Flotation costs of \$4, P_n = \$36

Table 11–7 Cost of components in the capital structure

4. The weights for each of the elements in the capital structure should be chosen with a view to minimizing the overall cost of capital. Although debt is usually the cheapest form of financing, excessive use of debt may increase the financial risk of the firm and drive up the costs of all sources of financing. The wise financial manager attempts to ascertain which level of debt will result in the lowest overall

cost of capital. That level of debt defines the optimum capital structure. Once the optimum capital structure has been established, the weighted average cost of capital is used as the discount rate in converting future cash flows to their present value. The major decision rule, then, is to determine if an investment proposal will earn at least the cost of the firm's financing. Investments that earn more than that cost increase the value of the firm or create value.

5. The marginal cost of capital is important in considering what happens to a firm's cost of capital as it tries to finance large requirements for funds. At first the company uses up its access to retained earnings, with the cost of financing rising as higher-cost, new common stock is substituted for retained earnings. Common stock is needed to maintain the optimum capital structure (i.e., the appropriate debt-to-equity ratio). Needs for larger amounts of financial capital can also cause the costs of the individual means of financing to rise by raising the interest rates the firm must pay or by depressing the price of the stock because more is offered for sale than the market wants to absorb at the old price. The marginal cost of capital is the cost of the next dollar of financing required based on the presumption that the next dollar comes from a weighted mix of the optimal financing sources.

REVIEW OF FORMULAS

Subscripts: ***d*** = debt, ***p*** = preferred, ***e*** = common equity (dividend model), ***j*** = common equity (CAPM).

K = Cost of, or required return from, the various sources of capital
V = Value of components (subscripts) of capital structure (expressed as market value)
Y = Yield (expected investor yields form basis for various costs of capital, aftertax and flotation adjustments)
T = Corporate tax rate
F = Flotation costs (as a percentage of gross proceeds: may be actual dollar cost)
P = Market price of share or stock
n = Subscript added to: ***K*** to indicate net cost after flotation costs ***P*** to indicate net price after flotation costs and price discounts (new issue)
D = Annual dividend
D_1 = Dividend at the end of a period (usually one year)
g = Dividend growth rate (infinite)
R_f = Risk-free rate
β_j = Beta coefficient (measure of risk)
R_m = Return in the market as measured by an appropriate index

1. Cost of debt

$$K_d = Y(1-T) \tag{11–1a}$$

$$K_d = \frac{Y(1-T)}{1-F} \tag{11–1b}$$

2. Cost of preferred stock

$$K_p = \frac{D_p/P_p}{1-F} \tag{11–2a}$$

$$K_p = \frac{D_p}{P_p - F}\left(F \text{ as cost}\right) \tag{11–2b}$$

3. Cost of common equity
Dividend model:

$$K_e = \frac{D_1}{P_0} + g\left(\text{retained earnings}\right) \tag{11–3}$$

$$K_n = \frac{\frac{D_1}{P_0} + g}{1 - F} \text{ or } K_n = \left(\frac{D_1}{P_0} + g\right)\frac{P_0}{P_n} \quad \text{(new common equity)} \qquad (11\text{–}4)$$

CAPM:

$$K_j = R_f + \beta_j(R_m - R_f) \quad \text{(retained earnings)} \qquad (11\text{–}5)$$

$$K_{jn} = \frac{K_j}{1 - F} \text{ or } K_{jn} = K_j\left(\frac{P_0}{P_n}\right) \quad \text{(new common equity)} \qquad (11\text{–}6)$$

$$K_a = \left(\frac{V_d}{V_a}\right)K_d + \left(\frac{V_p}{V_a}\right)K_p + \left(\frac{V_c}{V_a}\right)K_c \quad \text{(weighted average cost of capital)} \qquad (11\text{–}7)$$

4. $$X\left(\begin{array}{c}\text{Size of the investments that}\\ \text{retained earnings will support}\end{array}\right) = \frac{\text{Retained earnings}}{\text{\% of equity in the capital structure}} \qquad (11\text{–}8)$$

5. $$Z\left(\begin{array}{c}\text{Size of the investments that}\\ \text{lower} - \text{cost debt will support}\end{array}\right) = \frac{\text{Amount of lower} - \text{cost debt}}{\text{\% of debt in the capital structure}} \qquad (11\text{–}9)$$

DISCUSSION QUESTIONS

1. Why do we use the overall cost of capital for investment decisions even when an investment will be funded by only one source of capital (e.g., debt)? (LO1)
2. How does the cost of a source of capital relate to the valuation concepts presented in Chapter 10? (LO2)
3. In computing the cost of capital, do we use the historical costs of existing debt and equity or the current costs as determined in the market? Why? (LO3)
4. Why is the cost of debt less than the cost of preferred stock if both securities are priced to yield 10 percent in the market? (LO3)
5. What are the two sources of equity (ownership) capital for the firm? (LO3)
6. Explain why retained earnings has an opportunity cost associated with it. (LO3)
7. Why is the cost of retained earnings the equivalent of the firm's own required rate of return on common stock (K_e)? (LO3)
8. Why is the cost of new common stock (K_n) higher than the cost of retained earnings (K_e)? (LO3)
9. How are the weights determined to arrive at the optimal weighted average cost of capital? (LO4)
10. Explain the traditional, U-shaped approach to the cost of capital. (LO4)
11. Identify other variables (ratios) besides the debt-to-equity ratio that influence a company's cost of capital. You may wish to refer to Chapter 3 for possibilities. (LO4)
12. It has often been said that if the company can't earn a rate of return greater than the cost of capital, it should not make investments. Explain. (LO2)
13. What effect would inflation have on a company's cost of capital? (***Hint:*** Think about how inflation influences interest rates, stock prices, corporate profits, and growth.) (LO3)
14. What is the concept of marginal cost of capital? (LO5)
15. What limitations are there in using the dividend valuation model to determine the cost of equity capital? (LO3)
16. What is the justification for using market value weightings rather than book value weightings? (LO4)