CHAPTER 11

Cost of Capital

LEARNING OBJECTIVES

- **LO1** Explain that the cost of capital represents the overall cost of financing to the firm.
- **LO2** Define the cost of capital as the discount rate normally used to analyze an investment. It is an evaluation tool.
- **LO3** Construct the cost of capital based on the various valuation techniques from Chapter 10 as applied to bonds, preferred stocks, and common shares.
- **LO4** Examine how a firm attempts to find a minimum cost of capital by varying the mix of its sources of financing.
- **LO5** Apply the marginal cost of capital concept.

Determining an appropriate discount rate to value future cash flows is one of the most important considerations in finance and in business. The analysis process will directly affect decisions and the future strategic direction of firms and individuals.

Suppose a young doctor is rendered incapable of practising medicine due to an auto accident in the last year of her residency. In a subsequent legal action, the court determines that the best approximation of her future earning potential before the accident was $100,000 a year for the next 30 years. If her lawyer argues for a 5 percent discount rate, the settlement value becomes $1,537,300, while the insurance company's argument for a 12 percent rate becomes $805,500. The difference is not trivial.

For a firm to decide whether expected future inflows justify a current investment, we evaluate with an appropriately selected discount rate. This evaluation yardstick determines whether an investment proposal is acceptable or not acceptable in maximizing shareholders' wealth. This chapter sets out the concepts, methods, and procedures for making that determination.

The minimal acceptable return for capital invested today, to receive benefits in the future, should be what it costs us to acquire the funds for investment. If the firm's cost of funds is 12 percent, projects of the same risk as the average of the firm's existing assets must be tested to make sure they earn at least 12 percent. By using this as the discount rate, we can decide whether we can reasonably expect to earn the financial cost of doing business. The 12 percent discount rate would not be appropriate for considering projects that exhibit different risks than the average of the existing assets of the firm.

THE OVERALL CONCEPT

LO1 Decisions made by the financial manager are aimed at increasing shareholder value and should be judged against a cost of capital standard. A firm's cost of capital is

- A composite of the various costs of the borrowed or assembled financings
- Determined by the components of its capital structure (debt and equity)
- Based on the costs (or yields) currently demanded by investors in the financial markets

Funds (capital) will be invested in the firm's assets to produce future cash flows. The present value (benefit) of these cash flows should be compared in value against the cost of acquiring the assets. This comparison requires a discount rate or a cost of capital. The cost of capital is the tool used to evaluate (discount) future cash flows and assign a value to them. It is the standard that will satisfy shareholders.

To illustrate this concept, examine two projects of equal risk:

- A plant superintendent wishes to purchase a conveyor system (8 percent rate of return (ROR))
  - borrowing funds at 6 percent (aftertax cost)
- A division manager suggests the development of a new digital component for one of the company's products (14 percent ROR)
  - selling common shares at an effective cost of 15 percent

Judging each investment against the specific means of financing used to fund it runs the risk of making investment selection decisions arbitrary and inconsistent. If projects and financing are matched in this way, the project with the lower return would be accepted and the project with the higher return would be rejected.

If stock and debt are sold in equal proportions, the average cost of financing would be

$$0.5 \times 0.06 = 0.03$$
$$0.5 \times 0.15 = \underline{0.075}$$
$$\text{Overall} = 0.105 = 10.5\%$$

We would now reject the 8 percent conveyor system and accept the 14 percent component project. This would be a rational and consistent decision.

Though an investment financed by low-cost debt might appear acceptable at first glance, the use of debt might increase the overall risk to the firm (as discussed in Chapter 5), eventually making all forms of financing more expensive. Therefore, the general conclusion has been that each project must be measured against the overall cost of funds to the firm.

LO2 The use of the cost of capital to analyze investment projects, as determined with the Baker Corporation example below, rests on two important assumptions:

- The capital structure of the firm will be the same as that currently in place.
- Investment proposals analyzed are of the same risk as the firm's current investments.

If the financial leverage (capital structure) of the firm is altered, the risks to the investors from holding debt or equity will change. Investors will then require different rates of return and, as these required rates of return are the firm's costs of financing, the firm's cost of capital must be revised.

If new proposals are riskier than the current investments of the firm, investors, through their debt or equity holdings, will expect and demand higher returns from their investments, and the cost of capital calculation must be revised upward accordingly. Otherwise, projects might be accepted that do not satisfy the risk and return preferences of investors, thus causing the firm value to drop.

The determination of cost of capital can best be understood by examining the capital structure of a hypothetical firm, the Baker Corporation, in Table 11–1. Note that the aftertax costs of the individual sources of financing are determined, weights are then assigned to each, and finally, a weighted average cost is determined. The relevant costs are those related to new funds that might be raised in future financings rather than the costs of funds raised to fund investments in the past. The remainder of the chapter examines each of these procedural steps.

		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
Weighted average cost of capital	K_a			10.26%

Table 11–1 Cost of capital—Baker Corporation

Each element in the capital structure (on the right side of the balance sheet) has an explicit or opportunity cost associated with it, herein referred to by the symbol ***K***. Although all liabilities have some cost associated with them, we usually only determine the cost of longer-term liabilities for simplicity in a cost of capital calculation. Nevertheless, current liabilities can sometimes be significant in the capital structure of a firm.

FINANCE IN ACTION

Capital Availability for Small Business

The options for raising capital in a small business are limited because the full scope of the capital market is not available to the smaller firm. Investors and the investment dealers that put together financing packages in the capital markets shy away from the small business because of the risks perceived in a small business and because the amount of capital required is limited. Capital markets operate as wholesale markets, and require financing deals of a sufficient size to achieve economies of scale. Small business risks may relate only to a lack of understanding of the business by the capital markets, but nevertheless, the small business owner will likely have to raise capital elsewhere.

Debt financing is generally limited to bank operating loans that are used to support liquid current assets and term loans secured by capital assets. The cost of these loans is often several percentage points above the prime rate, unless special government or bank programs are available.

As for equity, options are personal savings, love money (from family and good friends), government assistance, and venture capital funding. The sale of shares (equity) in the capital markets is pretty well impossible in the startup phase of the business. Money from "angels" or venture capital firms is also difficult to access in the firm, on the expectations of rates of return of between 25 to 40 percent annually. Family and friends may have similar expectations.

Canada's Venture Capital and Private Equity Association (CVCA) is a significant source of information on the venture capital business in Canada.

Considering the higher debt costs and the high expectations for equity returns by investors, the cost of capital in the small business will be substantial. This places a significant demand on the returns that need to be achieved by the business. Cost of capital is used to evaluate the desirability of capital investment projects by the firm.

Q1 What are the financing options available to the small firm from Small Business BC?

Q2 Can you describe two recent venture capital deals with the amounts involved?

smallbusinessbc.ca/growing-a-business
cvca.ca

FINANCE IN ACTION

Double Double with that Capital!

In 2006, Tim Hortons wanted to raise additional capital for its operations by going to the public financial markets. Capital can be raised through securities issued as bonds, preferreds, or common equity. In this instance, common shares were sold to the public at $27 per share to raise approximately $775 million.

To raise capital successfully in the public capital markets, the services of investment firms (as underwriters), lawyers, accountants, and others are required. The firm pays these experts for raising, or floating, the capital on their behalf. This reduces the proceeds received by the firm from the amount paid by the public. These flotation costs increase the cost of raising capital.

Out of the approximately $775 million worth of common equity sold to the public, the investment firms received fees of approximately $47 million. Other expenses incurred by the issue amounted to $12.25 million.

Therefore, the flotation costs of this issue were approximately 7.6 percent (59.25/775) of the price paid by the public. As the public based their expectation of a return on the price they paid, the flotation expenses increased Tim Hortons cost of the issue.

By the end of 2014 Tim Hortons had merged with Burger King and was bought by Restaurant Brands International (QSP on TSX).

Q1 What are the current yields on 10-year bonds in the above countries?

Q2 What are the flotation costs of Freshii's subordinated voting share issue of early 2017?

sedar.com

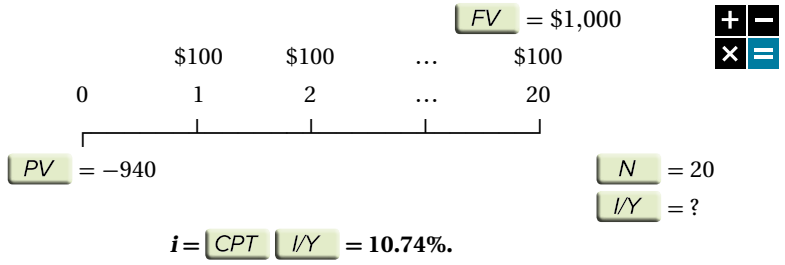
This cost is directly related to the valuation concepts developed in the previous chapter. The cost of a security is a function of how the security is valued in the marketplace by investors. Once we decide on the proper method for valuing a particular security, the mathematics involved are relatively simple. In Chapter 10, we examined the valuation techniques for financial assets. Let us now examine how the various components of the capital structure might be calculated by a firm's financial analyst.

COST OF DEBT

LO3 The cost of debt is measured by the interest rate, or yield, that would have to be paid to bondholders to persuade them to buy bonds. The present market-determined yield that we have seen in the term structure of interest rates is a reflection of future interest rate expectations. This is an appropriate yield to use, because the investment proposals to be evaluated will be successful or not successful in the future as well. A simple case might involve our being able to sell $1,000 bonds, paying $100 in annual interest for $1,000. Our cost of debt would, thus, be 10 percent. Of course, the computation becomes a little more difficult if our $1,000 bonds sell for an amount more or less than $1,000. If this is the case, we could use the yield-to-maturity techniques discussed in Chapter 10.

For example, assume Baker Corporation is preparing to issue new debt. To determine the likely cost of the new debt in the marketplace, the firm computes the yield on its currently outstanding debt. This is not the rate at which the old debt was issued; it is the

rate that investors are demanding today. Assume the debt issue pays $100 per year in interest, has a 20-year life, and is currently selling for $940.



$$i = \boxed{CPT}\ \boxed{I/Y} = 10.74\%.$$

Spreadsheet: Yield to maturity calculation

	A	B	C	D	E	F	G	H
1	nper	N	20		"= +RATE(C1,C2,C3,C4,)			
2	pmt	PMT	$100		"= rate(nper,(pmt),(pv),fv,[type], [guess])			
3	pv	PV	-$940		10.74%			
4	fv	FV	$1,000					
5					"= +RATE(20,100,-940,1000)			
6					"= rate(nper,(pmt),(pv),fv,[type], [guess])			
7					10.74%			

In many cases, we do not have to compute the yield to maturity. It is available from other sources, such as the financial pages of various daily and weekly newspapers, from one of the larger investment dealers that deal in bond trading, or from several websites. The type of information available on a sample of outstanding bonds is presented in Table 11–2.

Issuer	Interest Payable	Maturity	Price	Yield	Rating (AAA = lowest risk)
Canada	1.50%	June 2026	98.91	1.63	AAA
	5.00	June.2037	144.05	2.27	AAA
TD Bank	4.859	Mar. 2026	112.64	3.22	AA
Hydro One	4.39	Sept. 2041	110.17	3.75	A (high)
Suncor	5.39	Mar. 2037	115.00	4.26	A (low)
TELUS	4.40	Oct. 2042	96.83	4.61	BBB (high)
Greece		10 years		7.11	CCC

Note: Pricing for June 2014. Greece's 10-year bond suggested yield in Feb. 2012 was 36%.
Source: CBID Perimeter Financial, pfin.ca/canadianfixedincome/Default.aspx; S&P, standardandpoors.com; DBRS, dbrs.com.

Table 11–2 Sample bond information

If the firm involved were TD Bank, for example, the financial manager could observe that debt maturing in 2026 would have a yield to maturity of 3.22 percent. This is true even though the debt was originally issued at a yield close to 4.859 percent, the established coupon rate. The financial manager should also observe that lower-rated bonds typically offer the investing public a higher rate of return. TELUS, with an BBB (high) rating, had a yield of 4.61 percent, whereas Hydro One, with a similar maturity and an A (high) rating, offered the yield of 3.75 percent.

Hydro One
hydroone.com

Adjustments With the bond's yield to maturity determined by calculation or by going to the current published market yields (or it is given) we must adjust the yield for

- Tax considerations (interest payments are a tax-deductible expense)
- Flotation costs (costs incurred to sell new debt)

The yield to maturity indicates how much the corporation has to pay on a before-tax basis and does not consider the costs the firm will incur to sell new debt.

Since interest is tax deductible, the true cost of the bond is less than the interest paid because the government is picking up part of the cost by allowing the firm to reduce taxes. The aftertax cost of debt (with a simplifying assumption) is the yield to maturity times one minus the tax rate. This is presented as formula 11–1*a*.

$$K_d = Y(1 - T) \quad \text{(11–1a)}$$

Where

K_d = Cost of debt
Y = Yield (or yield to maturity)
T = Tax rate

Earlier, we determined that current yield on existing debt for Baker Corporation was 10.74 percent. Assuming that new debt can be issued at the same going market rate and that the firm is in a 39 percent tax bracket, the aftertax cost of debt would be 6.55 percent.[1]

$$\begin{aligned} K_d &= Y(1 - T) \\ &= 10.74\%(1 - .39) \\ &= 10.74\%(.61) \\ &= 6.55\% \end{aligned}$$

Observe in Table 11–1, column 1, that the aftertax cost of debt for Baker Corporation is the 6.55 percent that we have just computed.

The aftertax cost of debt to the firm should also consider all selling and distribution costs, known as flotation costs. These costs are usually quite small, and they are often bypassed in some types of loans. To explicitly include flotation costs we would have[2]

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

Where

F = Flotation, or selling, cost (after tax)

The flotation cost (F) in this formula is expressed as a percentage of the funds raised. Therefore, $1 - F$ will also be a percentage, equal to net proceeds (P_n) received by the firm as a percentage of gross proceeds raised from the public. The difference is absorbed by investment dealers, accountants, lawyers, and others. With flotation costs typically in the 2 to 10 percent range for a bond issue, the firm will net over 90 percent of the funds invested by the bondholders. The bondholder's expected yield will be based on the amount they have invested and not on what the firm has received. Thus, flotation costs increase the cost of the debt to the firm.

[1]More accurately, we could use a time–line development to compute the aftertax yield with a present value calculation. We would adjust the initial proceeds by the flotation costs and by the present value of the tax savings resulting from the flotation costs over the first five years of the bond's life. The annual interest payments would be included at one minus the tax rate. The final payment on the debt would be included in the calculation as a future value. This would have only a minor impact on the final cost of debt. For example, a 20–year bond K_d = 6.83% (PV = –970, PMT = 65.51, FV = 1,000, N = 20, compute I/Y = 6.83).

[2]Actually, the rate might be slightly higher to reflect that generally yields are lower for bonds trading at a discount from par ($940 in this case) because of potential tax advantages and higher leverage potential. This is not really a major issue in this case.

Expressed alternatively, a bond issue (with a $1,000 face value) with net aftertax proceeds to the firm of $970 can be said to have net proceeds ($\mathbf{1 - F}$) of 97 percent ($970/$1,000), or flotation costs of 3 percent ($30/$1,000).

If flotation costs had been 3 percent of proceeds or, in other words, if the firm netted $970 on a $1,000 bond with the seller of the bonds, known as the investment dealer or underwriter, receiving $30, then the following adjustment would be made:

$$K_d = \frac{Y(1-T)}{1-F} = \frac{10.74\%(1-0.39)}{1-0.03} = \frac{6.55\%}{0.97} = 6.75\%$$

We will continue our example with 6.55%, without the flotation cost adjustment.

FINANCE IN ACTION

Debt Costs Around the Globe

A corporation needing long-term debt financing usually looks first in its own backyard; that is, in the country where it will invest the capital. However, multinational corporations will carefully investigate global interest rates to find those that are the most cost effective. A risk of borrowing in a foreign country is the likelihood that exchange rates will change before the debt is paid back. This may make the debt cost far greater than anticipated.

In April 2017, the following long-term interest rates were demanded in capital markets for government securities with 10 years to maturity. Top-rated corporations would expect to pay 1 to 2 percent above these rates.

Canada	1.60%
Australia	2.70
Brazil	10.20
Germany	0.40
Greece	7.11
Japan	0.05
Britain	1.16
U.S.	2.37

Notice the low rate in Japan compared to the other countries. The Japanese economy has stagnated for a considerable time with deflationary pressures; low rates are an attempt to stimulate economic activity. Also examine the rate of borrowing in Brazil, a country with a tendency toward high inflation and economic troubles. Greek rates, down considerably from recent history, were high due to high debt loads and a shaky economy.

Of course, the key from a Canadian perspective would be how exchange rates moved as debt borrowed abroad was paid back.

Q1 What are the current yields on 10-year bonds in the above countries?

Q2 What are the current interest rates as reported in OECD countries?

bloomberg.com/markets/rates-bonds

oecd.org

COST OF PREFERRED STOCK

The cost of preferred stock is similar to the cost of debt in that a constant annual payment is made, but it is dissimilar in that there is no maturity date on which a principal payment must be made. Thus, the determination of the yield on preferred stock is simpler than determining the yield on debt. However, one must examine the actual preferreds quite closely for the attached bells and whistles, as they may actually have maturity dates that make their valuation similar to bonds. Yield is determined by dividing the annual dividend by the current price (this process was discussed in Chapter 10).

$$K_p = \frac{D_P}{P_P} \quad \text{(10–3)}$$

The rate of return to preferred shareholders is also the annual cost to the corporation for a preferred stock issue, with a slight alteration to account for flotation costs. There is no downward tax adjustment ($1 - T$) because a preferred stock dividend, unlike debt interest payments, is not a tax-deductible expense. The formula is, however, adjusted as we did with debt by dividing the preferred yield by $1 - F$, which is effectively the net proceeds of a new issue expressed as a percentage of gross proceeds. The cost of preferred stock is expressed as[3]

$$K_p = \frac{D_P/P_P}{(1 - F)} \quad \text{(11–2a)}$$

Where

K_p = Cost of preferred stock
D_p = Annual dividend on preferred stock
P_p = Price of preferred stock
F = Flotation, or selling, costs

For Baker Corporation, the annual dividend is $10.50, the preferred stock price is $100, and the flotation, or selling, costs are estimated at $4. The flotation costs of $4 received by the underwriter are 4 percent ($4/$100) of the price paid investors ($100). The firm nets $96 or 96 percent ($96/$100).

The calculation of preferred cost becomes

$$K_P = \frac{D_P/P_P}{1 - F} = \frac{\$10.50/\$100}{1 - 0.04} = \frac{0.1050}{0.96} = 0.1094 = 10.94\%$$

The same result will be obtained by dividing the dividend payment by the price or proceeds received by the firm after flotation costs ($P_n = P_p - F$), because the valuation formula is a perpetuity. A new share of preferred stock with a selling cost (flotation cost) produces proceeds to the firm equal to the selling price in the market minus the flotation cost ($96). Therefore, the cost of preferred stock can also be presented as

$$K_p = \frac{D_p}{P_p - F} \quad \text{(11–2b)}$$

The effective cost of preferred shares becomes

$$K_p = \frac{D_p}{P - F} = \frac{\$10.50}{\$100 - \$4} = \frac{\$10.50}{\$96} = 0.1094 = 10.94\%$$

Carefully examine the similarity of these two formulas before referring back to Table 11–1, column 1, where we find that 10.94 percent is the cost of preferred stock in the Baker Corporation example.

[3]Note that in Chapter 10, K_p was presented with no adjustment for flotation charges. Some may wish to formally change the formula with an additional subscript to indicate the flotation cost adjustment, K_{pn}.

COST OF COMMON EQUITY

Determining the cost of common equity in the capital structure is a more involved task than for debt or preferred shares. Those instruments are simpler because a stated coupon or dividend rate is in evidence. The required yields of investors in common equity are not as clear. Dividends may be paid but investors also have a claim on residual earnings (after expenses, debt costs, taxes, and preferred dividends). This may result in increased dividend payments and/or increases in share prices, which lead to capital gains.

Common stock costs cannot simply be based on the out-of-pocket cost cash dividend. This is the dividend yield, which is the current year's dividend divided by the market price.

$$\textbf{Dividend yield} = \frac{\textbf{Current dividend}}{\textbf{Market price}}$$

The "Dividend Yields" Finance in Action box shows common dividend yields of about 3 to 6 percent for better dividend-paying stocks and generally less than the preferred yields. If new common stock were thought to be so cheap, firms would have no need to issue other securities and could profitably finance projects that earned these meager returns. On the other hand, who would invest in a corporation with such inadequate yields?

Furthermore, though new financing capital raised by debt and preferreds will always come from the markets and, thus, incur flotation costs, this may not happen with common equity. This is because common equity comes from two sources. Internally generated funds are produced from the residual claim on earnings of common shares (recorded as retained earnings), and externally generated funds come from the issue of new shares (recorded as common shares). New shares issues will incur flotation expenses, raising the cost of common equity.

FINANCE IN ACTION

Dividend Yields

Dividend yields are often a focus of investor sentiment after the market has had gone through a period of upheaval. Cash flow by way of regular quarterly dividend payments—in other words, "A bird in the hand ..."—is somewhat reassuring to investors.

At the beginning of the past millennium, and again into early 2008, investors focused on the speculative potential of firms hoping for capital gains as share prices soared. Then they fell. With low interest rates at the banks and caution toward speculative investments, high-dividend-paying stocks increasingly become popular if backed by solid earnings power. Of course, to attract investors' monies, firms are required to offer healthy dividend yields. Preferreds generally have a higher dividend yield as, unlike common, they do not have a claim on future earnings growth. In April 2017 the following dividend yields were available to investors:

	Common Shares		Preferred Shares	
	Symbol	**Yield**	**Symbol**	**Yield**
BMO	BMO	3.55%	BMO.PR.Z	4.88%
BCE Inc	BCE	4.87	BCE.PR.A	5.06
TransAlta	TA	2.16	TA.PR.F	6.60

These yields can be found daily on the pages of *The Globe and Mail* or the *National Post*. They can also be found at the TSX website (tmx.com).

Q1 What are the current dividend yields required by the market for these companies?

Q2 Do any dividend yields on common shares exceed the preferred?

The determination of the yield required by investors for common share investments (becoming the cost of equity financing, with some adjustments) is difficult in practice because the future payments to shareholders have greater uncertainty than with bonds or preferreds. Two valuation models have been developed to determine the return required by common equity investors:

- ***Dividend model***, which is based on dividends to be paid and their growth over time
- ***Capital asset pricing model (CAPM)***, which is based on a relationship between risk and return

It is unlikely that both models, in practice, will provide the same result because of the many assumptions and variables that must be determined. Nevertheless, they should produce similar results, and using two models can improve the accuracy in estimating the expected returns from common equity as each model acts as a check on the other.

In determining the cost of common equity we consider the following:

- Will internal or external funds be required (with a possible adjustment for flotation costs)?
- Will the dividend valuation model, CAPM, or an average of both be used to determine the yield and, thus, cost to the firm?

Valuation Approach (Dividend Model)

The cost of common stock is a function of the pricing and performance demands of current and future shareholders. An appropriate approach is to develop a model for valuing common stock that is dependent on the required return demanded from it. Investors receive their return from dividends and the increase in share price. Our dividend valuation model (or dividend capitalization model) uses both components to derive a cost of equity capital.

In Chapter 10, the constant dividend growth model yielded the following relationship between stock price and demanded return:

$$P_0 = \frac{D_1}{K_e - g} \quad \textbf{(10–8)}$$

Where

P_0 = Price of the stock today
D_1 = Dividend at the end of the first year (or period)
K_e = Required rate of return/cost of equity
g = Constant growth rate in dividends

We then found we could rearrange the terms in the to solve for ***formula*** K_e instead of P_0. This was presented in formula 10–9 and, once again, here as formula 11–3.

$$K_e = \frac{D_1}{P_0} + g \quad \textbf{(11–3)}$$

The required rate of return (K_e) is equal to the dividend at the end of the first year (D_1), divided by the price of the stock today (P_0), plus a constant growth rate (g). Although the growth rate applies directly to dividends, it must also apply to earnings over the long term. The formula's assumption that there is a constant relationship between earnings per share and dividends per share (i.e., a constant payout ratio) ensures the ability to sustain the growth in dividend payments.

In the Baker Corporation example, the expected dividend for this year is $2, the current stock price is $40, and the dividends have been and are expected to continue to grow at a rate of 7 percent. Given that information, we would calculate K_e to be equal to 12 percent.

$$K_e = \frac{D_1}{P_0} + g = \frac{\$2}{\$40} + 7\% = 5\% + 7\% = 12\%$$

This result assumes shareholders expect to receive a 5 percent return on their investment by way of dividends and a 7 percent return by way of an increase in the price of their shares. Thus, they are investing in this stock on the basis that they demand and expect to receive a 12 percent return on their investment.

Cost of Retained Earnings

Up to this point, we have discussed the cost (required return) of common stock equity capital in a general sense. These funds can be supplied by

- Purchasers of new shares of common stock (external)
- Income kept in the firm as retained earnings (internal)

In 2016, Statistics Canada reported Canadian nonfinancial corporations as having $1 trillion of their historical equity financing as retained earnings and $1.7 trillion as common share issues.[4] Retained earnings form an important source of ownership or equity capital investment funds.

Statistics Canada
statcan.ca

Retained earnings represent

- Past and present earnings of the firm (reinvested)
- Minus previously distributed dividends

Retained earnings, by law, belong to common shareholders. They represent a source of equity capital supplied by the current shareholders. But just because the firm did not have to go to the market to raise new funds does not mean these internally generated funds are free.

There is an opportunity cost involved as the funds could be paid out as dividends to the current shareholders, who could then redeploy them by buying other stocks, bonds, real estate, and so forth. The expected rate of return on these alternative investments becomes the opportunity cost of not having paid out the earnings in dividends. It seems reasonable to assume shareholders could earn a return equivalent to that provided by their present investment in the firm (on an equal-risk basis).[5] This is represented by $\boldsymbol{D_1/P_0 + g}$.

Computing the cost of retained earnings takes us back to where we began our discussion of the cost of common stock. The cost of retained earnings is equivalent to the rate of return on the firm's common stock. This is the opportunity cost. Thus, we say the cost of common equity in the form of retained earnings is equal to the required rate of return on the firm's stock.[6]

$$K_e = \frac{D_1}{P_0} + g \quad \textbf{(11–3)}$$

Thus, $\boldsymbol{K_e}$ represents not only the required return on common stock as previously defined, but also the cost of equity in the form of retained earnings. It is a symbol with double significance.

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[4]This represents the most recent published data. Statistics Canada, *Quarterly Financial Statistics for Enterprises*, Catalogue No. 61-008.

[5]Chapter 14, in dealing with the concept of efficient markets, provides more insight as to why this assumption is reasonable.

[6]One could make the seemingly logical suggestion that this is not a perfectly equivalent relationship. For example, if shareholders receive a distribution of retained earnings in the form of dividends, they may have to pay taxes on the dividends before they can reinvest them in equivalent yield investments. Additionally, the shareholder may incur brokerage costs in the process. For these reasons, one might suggest that the opportunity cost of retained earnings is less than the rate of return on the firm's common stock. The current majority view, however, is that the appropriate cost for retained earnings is equal to the rate of return on the firm's common stock. The strongest argument for this equality position is that for a publicly traded company, a firm always has the option of buying back some of its shares in the market. Given that this is so, it is assured a return of $\boldsymbol{K_e}$. Thus, the firm should never make an alternative investment that has an expected equity return of less than $\boldsymbol{K_e}$. Nevertheless, students may wish to look into the minority view as well. In the event a tax adjustment is made, the cost of retained earnings can be represented as $\boldsymbol{K_r = K_e(1 - t_r)}$, where $\boldsymbol{K_r}$ is the cost of retained earnings, $\boldsymbol{K_e}$ is the required return on common stock, and $\boldsymbol{t_r}$ is the average shareholder marginal tax rate on dividend income.

The cost of common equity in the form of retained earnings for Baker Corporation is equal to 12 percent, the previously calculated required rate of return of shareholders. Please refer back to Table 11–1 and observe in column 1 that 12 percent is the value we have used for common equity.

Cost of New Common Stock

Let's now consider the other source of equity capital, new common stock. If we are issuing ***new*** common stock, we must pay a slightly higher return than K_e, which represents the required rate of return of ***present*** shareholders. The higher return is needed to cover the distribution costs of the new securities. If the required return for current shareholders was 12 percent and shares were quoted to the public at $40, a new distribution of securities would need to earn slightly more than 12 percent to compensate for sales commissions and other expenses. The corporation does not receive the full $40 because of these costs. The formula for K_e is restated as K_n (the cost of new common stock) to reflect this requirement.

Common stock

$$K_e = \frac{D_1}{P_0} + g$$

New common stock

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

The only new term is P_n (net proceeds received on a new share issue after flotation costs and any underpricing of the share price).

If net proceeds are expressed as a percentage we can divide K_e by the net proceeds to get K_n.

Assume

$$D_1 = \$2 \qquad P_n = P_0 - F$$
$$P_0 = \$40 \qquad = \$40 - \$4$$
$$F = \$4 \qquad = \$36$$
$$g = 7\%$$

Then

$$K_n = \left(\frac{\$2}{\$40} + 7\%\right)\left(\frac{\$40}{\$36}\right)$$
$$= (5\% + 7\%)(1.111) = 13.33\%$$

The cost of new common stock to the Baker Corporation is 13.3 percent. This value is used more extensively later in the chapter. New common stock was not included in the original assumed capital structure for the Baker Corporation presented in Table 11–1.

The flotation costs in this example are 10 percent of proceeds, as the firm will net $36 on a $40 common share with the seller of the shares, the underwriter, receiving $4 ($4/$40 = .10 = 10%). The calculation would then be

$$K_n = \frac{\frac{D_1}{P_0} + g}{1 - F} = \frac{\frac{\$2}{\$10} + .07}{1 - .10} = \frac{.12}{.90} = 0.1333 = 13.33\%$$

The flotation cost adjustment applies to the complete formula for K_n. It is the required return of investors, which is increased to determine the cost to the firm when flotation costs are considered and investors base their expectations on what they pay, not what the firm receives.

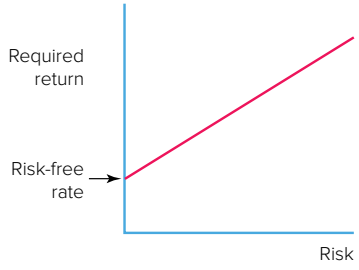
CAPM for the Required Return on Common Stock

An alternative model for calculating the required return on common stock is represented by the capital asset pricing model (CAPM). The attributes of this model are covered in Appendix 11A, so we consider it only briefly at this point. Some proclaim the capital asset pricing model as an important advance in our attempts at common stock valuation, but others suggest that it is not a valid description of how the real world operates.

The model is based on a risk-return relationship for determining the required rate of return for common equity or, indeed, any capital asset. The model follows from the discussion in Chapter 10 on yield to maturity, in which an expected return is developed as follows:

Required return = Risk-free rate + Risk premium

This can be presented graphically as a linear relationship between the required rate of return (K_j) and a measure of risk (β) for the firm's business. Greater risk in a firm's business operations requires a greater rate of return for common shareholders.



The CAPM develops the risk premium from the relationship between a share's returns and the returns of the stock market as a whole. Under CAPM, the required return for common stock (or other investments) expressed as a cost to the firm can be described by the following formula:

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

Where

K_j = Required return on common stock or the cost of equity.
R_f = Risk-free rate of return; often taken as equivalent to the current rate on short-term Government of Canada Treasury bills.
β_j = Beta coefficient. The beta measures the historical volatility (risk) of an individual stock's (j) return relative to a stock market index. A beta greater than one indicates greater volatility (as measured by price movements) than the market; the reverse would be true for a beta less than one.
R_m = Return in the market as measured by an appropriate index.

A flotation cost adjustment can be achieved, for new equity, by adjusting the formula by

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

Where

K_{jn} = Cost of new equity (CAPM)
P_0 = Current price
P_n = Net proceeds received on a new share issue after flotation costs (and any underpricing of the share price)

FINANCE IN ACTION

Canadian Utilities, Return on Common Equity, and Cost of Capital

Canadian Utilities (CU) is primarily a holding company for power generation, utilities management, and energy services. By 2017, it had assets exceeding $18 billion and revenues of about $3.3 billion. Although nonregulated subsidiaries have played an increasing role in the sector, and deregulation has occurred in the energy business, Canadian Utilities continues to face the demands of government regulation. Its subsidiary companies must appear before the Alberta Utilities Commission (AUC) to determine the cost of service rates. These rates become the charges customers pay for their gas.

To determine the cost of service rates, each utility prepares for an intensive hearing to establish the cost of financing the utility's operation. Often, there are divergent views on the costs of the various components of the firm's capital structure, a fair rate of return, and indeed, the nature of the capital structure itself. These costs and structure are debated in an attempt to reach consensus on the firm's cost of capital. In early 2017, Canadian Utilities had the following.

Capital Structure	Book Value
Accounts payable	5%
Other liabilities	18
Long-term debt	44
Preferreds	8
Common equity	25

Its profits are restrained by AUC decisions, which established CU's return on equity for 2017 at 8.50 percent. Furthermore, the common equity ratio within the capital structure was under review, as debt was taking on a more significant role.

Regulatory matters are discussed in the management discussion and analysis of the financial statements.

Q1 Have recent AUB decisions impacted CU's return on common equity?

Q2 What is the rating on CU's commercial paper, debentures, and preferred shares?

canadianutilities.com
Symbol: CU

dbrs.com

standardandpoors.com

In the Baker Corporation example, the following values might apply:

$$R_f = 9\%$$
$$R_m = 11\%$$
$$\beta_j = 1.5$$

Based on formula 11–4, K_j would then equal

$$K_j = 9\% + 1.5(11\% - 9\%) = 9\% + 1.5(2\%)$$
$$= 9\% + 3\% = 12\%$$

In this case, we have structured the data so that K_j (the required return under the CAPM) would equal K_e (the required return under the dividend valuation model). In both cases, the computations lead to a 12 percent estimate as the cost of common equity. In real life, the two models rarely give exactly the same estimate. Nevertheless, both models are attempting to determine the same thing—the expected, or required, return of investors.

For now, we use the dividend valuation model; that is, $K_e = D_1/P_0 + g$. Those who wish to study the capital asset pricing model further are referred to Appendix 11A.

With flotation costs ($P_0 = \$40$, $F = \$4$)

$$K_{jn} = K_j\left(\frac{P_0}{P_n}\right) = 12\%\left(\frac{\$40}{\$36}\right) = 13.33\%$$

Or

$$K_{jn} = \frac{K_j}{1 - F} = \frac{12\%}{1 - 0.10} = 13.33\%$$

Overview of Common Stock Costs

For those of you who are suffering from an overexposure to *K*'s in the computation of cost of common stock, let us recap. We have to consider which model to use to establish the investor's required return on common equity and then determine whether or not flotation costs will be required.

Dividend valuation or dividend capitalization model:

Internally generated (retained earnings)

$$K_e = \frac{D_1}{P_0} + g$$

Externally generated (new common stock)

$$K_n = \frac{\frac{D_1}{P_0} + g}{1 - F} \quad \text{or} \quad K_n = \left(\frac{D_1}{P_0} + g\right)\frac{P_0}{P_n}$$

Capital asset pricing model (CAPM):

Internally generated (retained earnings)

$$K_j = R_f + \beta_j\left(R_m - R_f\right)$$

Externally generated (new common stock)

$$K_{jn} = \left(\frac{K_j}{1 - F}\right) \quad \text{or} \quad K_{jn} = K_j\left(\frac{P_0}{P_n}\right)$$

OPTIMAL CAPITAL STRUCTURE—WEIGHTING COSTS

LO4

Having established the techniques for computing the cost of the various elements in the capital structure, we must now discuss methods of assigning weights to these costs to determine our weighted average cost of capital. We attempt to weight capital components in accordance with our desire to achieve a minimum overall cost of capital. That will be the optimum capital structure because at that point the value of shareholders' wealth is maximized. For purposes of this discussion, Table 11–1 (cost of capital for the Baker Corporation) is reproduced here.

		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
Weighted average cost of capital	K_a			10.26%

By formula the weighted average cost of capital (WACC) is

$$K_a = \left(\frac{V_d}{V_a}\right)K_d + \left(\frac{V_p}{V_a}\right)K_p + \left(\frac{V_e}{V_a}\right)K_e \quad \text{(11–7)}$$

V = Value of components (subscripts) of capital structure (expressed as market value)

How does the firm decide on the appropriate weights for debt, preferred stock, and common stock financing? In other words, why not use all debt for future financing since the preceding chart indicates that it is substantially cheaper than the alternatives? The use of debt beyond a reasonable point will probably greatly increase the firm's financial risk and thereby drive up the costs of all sources of financing. For a more complete discussion of the theory related to this point, please see Appendix 11B.

One way for us to explore this critical point is to assume that you plan to start your own company and are considering the following three different capital structures. For ease of presentation, only debt and equity (common stock) are being considered. As it happens, the costs of the components in the capital structure change each time you vary the proposed debt-equity mix (weights).

Financial Plan A:	Cost (after tax)	Weights	Weighted Cost
Debt	6.5%	20%	1.3%
Equity	12.0	80	9.6
			10.9%
Financial Plan B:			
Debt	7.0%	40%	2.8%
Equity	12.5	60	7.5
			10.3%
Financial Plan C:			
Debt	9.0%	60%	5.4%
Equity	15.0	40	6.0
			11.4%

We see that the firm can reduce the cost of capital by including more debt financing as we consider plan B versus plan A. Beyond a point, however, the continued use of debt becomes unattractive, causing increases in the costs of the various sources of financing that more than offset the benefit of substituting cheaper debt for more expensive equity. In our example, that point seems to occur somewhere around the debt-equity mix represented by plan B. Traditional financial theory maintains that there is a U-shaped cost of capital curve relative to debt-equity mixes for the firm, as illustrated in Figure 11–1. In this illustration, the optimum capital structure occurs at a 40 percent debt-to-equity ratio.

Most firms are able to use 40 to 70 percent total debt (total debt/total assets) in their capital structure without exceeding norms acceptable to creditors and investors. Distinctions should be made, however, between firms that carry high or low business risks. As discussed in Chapter 5, a growth firm in a reasonably stable industry can afford to absorb more debt than its counterparts in cyclical industries. Examples of debt used by companies in various industries are presented in Table 11–3.

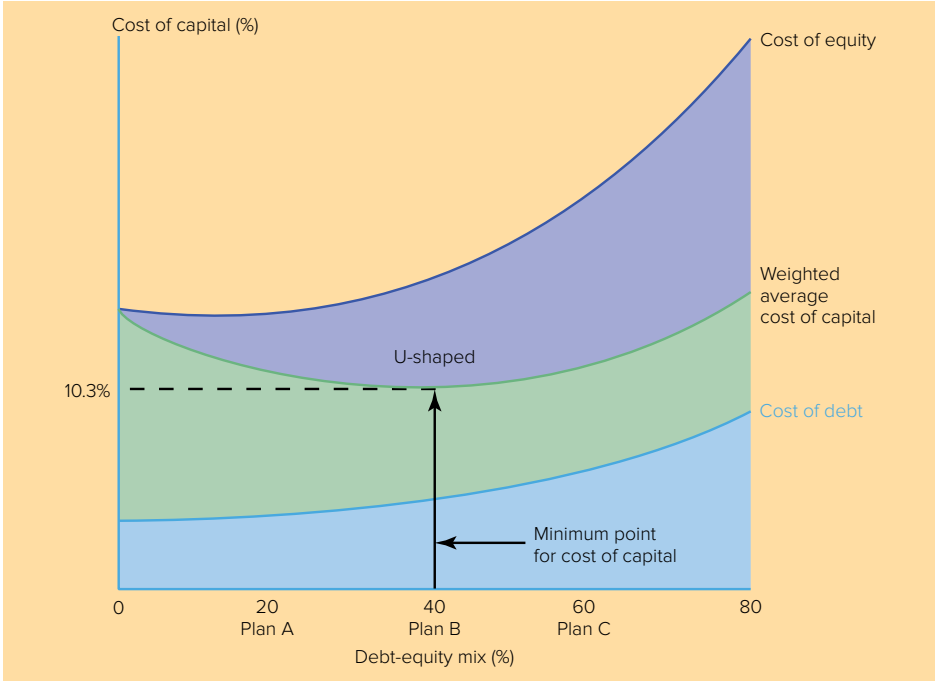


Figure 11–1 Cost of capital curve

Selected Companies with Industry Designation	Symbol	Debt/Assets Percent
Air Canada (airlines)	AC.A	92
Bank of Montreal (financials)	BMO	93
Canadian Tire (consumer retail)	CTC	68
Descartes (software)	DSG	14
Encana (energy)	ECA	58
Melcor (real estate)	MRD	47
Potash (fertilizers)	POT	52
Loblaw (consumer staples)	L	62
BlackBerry (communications)	BB	42
Teck (mining)	TECK.B	51
West Fraser (forest products)	WFT	38

Table 11–3 Debt (total) to total assets, early 2017

In determining the appropriate capital mix, the firm generally begins with its present capital structure and ascertains whether that structure is optimal. If it is not, subsequent financing should carry the firm toward a financing mix deemed more desirable. Note that only the costs of new or incremental financing should be considered. The historical costs of financing to the firm are not relevant except to the extent that they provide clues as to what future financing costs are likely to be.

Market Value Weightings

To calculate the cost of capital, we weight each component of the capital structure based on how the corporation will raise funds in the future (presumably its optimal capital

structure) and it is with that capital structure mix that new investments must find their success. If the firm is to be successful, the new investments must achieve a rate of return equal to the overall cost of the financing used. Past costs are not relevant. Unless the corporation has calculated its optimal capital structure, we presume that the present structure will be maintained and is appropriate for cost of capital calculations.

These ratios were calculated as follows: 1 − (equity/total assets) from the latest balance sheet available at each company's website. Company sites can be accessed through the TSX site under listed companies. Please note that these are based on book values not market values.

Toronto Stock Exchange
tmx.com

1. What are the latest debt ratios for the above companies?
2. Compare the book value of equity of these companies with their market capitalization.

However, the present capital structure should be based on the market value of debt and equity. It should not be based on book values from the financial statements. Why? Remember that the cost of funding for each component in the capital structure is based on the expectations of investors for the returns they require from the corporation. In Chapter 6, we discovered that expectations about the future are part of today's interest rates (the expectations hypothesis) and that the returns expected by investors from their investment are based on what they have at stake—the market value of their investment.

Suppose an investor purchased shares in a corporation several years ago for $1,000 and those shares are now worth $10,000. (Book value = $1,000, market value = $10,000). If that investor expected the investment to generate a 12 percent return over the next year, by way of dividends or a capital gain from an increasing share price, $1,200 would be expected based on the market value, and not $120 based on the book value. Therefore, investors have the market value of their investment at stake at any time and this is what determines their required rates of return and the costs of financing to the firm.

If there is an active market for the securities of the corporation, such as the Toronto Stock Exchange, it is easy to identify their market value. The market value will be available in the newspaper or by calling an investment dealer. Without an active market for a firm's securities we must use the present value models from Chapter 10 to determine market value.

Present value models are employed to revalue the debt, preferreds, and common equity of the firm's financial statements from their book value to market value. The historically based book values and the financial footnotes should disclose information for each of these components of the capital structure to identify the cash flows (future values, payments, time periods) needed for the present value models.

Furthermore, to calculate the current market values of each component of the capital structure we will need discount rates. We will use the current yields (interest rates) from the market. Current yields on securities of similar risk are found in newspapers, on many websites, and from investment dealers. Table 11–2 illustrates how these yields are found.

Calculating Market Value Weightings

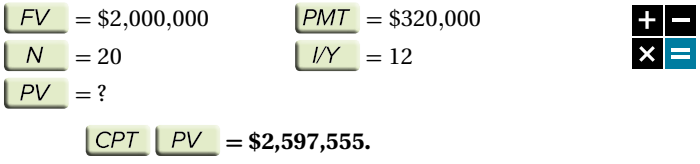
From the financial statements (often historically based) with the accompanying notes, the following is determined:

- Debt: 20 years to maturity, annual coupon rate of 16 percent, current yield 12 percent
- Preferreds: Dividend rate of 7 percent, current yield 10 percent
- Common shares: 1 million shares outstanding, currently trading at $8 per share in the market

The capital structure is as follows:

	Book Value	Book Value Weightings	Market Value	Market Value Weightings
Debt	$2,000,000	0.29	$ 2,597,555	0.23
Preferreds	1,000,000	0.14	700,000	0.06
Common stock	1,000,000	0.14	8,000,000	0.71
Retained earnings	3,000,000	0.43		
	$7,000,000	1.00	$11,297,555	1.00

The debt's market value was calculated using the maturity value, or future value, of $2 million; annual payments of $320,000 (16% of $2,000,000); and a period of 20 years, all identified from the financial statements. The discount rate applied to determine the present value of the debt was 12 percent, which is the current yield on debt. Interest payments, by contract, are based on the maturity value.



The preferreds' market value was calculated by using the formula

$$P_p = \frac{D_p}{K_p} \quad (10\text{–}3)$$

With

D_p = $70,000 (7% of $1,000,000)
K_p = 10%, the current yield on the preferreds

Notice that for the market value of equity, the accounting categories of common stock and retained earnings are combined into equity. The investors' market value of shares at $8 represents both equity accounts. Therefore, the value of equity is $8 times the 1 million shares outstanding, or $8 million.

The market value weightings would now be combined with the costs of the various components, as in Table 11–1, to derive the cost of capital. Today, when the capital markets are highly dynamic and often unforgiving, it is essential that the financial manager base decision making on the market value of assets and evaluate those assets with the current yields or costs of the various components of the capital structure. Nowhere is this more important than in making capital investment decisions based on a discount rate derived from a cost of capital calculation.

CAPITAL ACQUISITION AND INVESTMENT DECISION MAKING

So far, the various costs of financial capital and the optimum capital structure have been discussed. Financial capital consists of bonds, preferred stock, and common equity. These forms of financial capital appear on the corporate balance sheet under liabilities and equity. The money raised by selling these securities, along with the earnings retained in the firm, is invested in the real capital of the firm, the long-term productive assets of plant and equipment.

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.

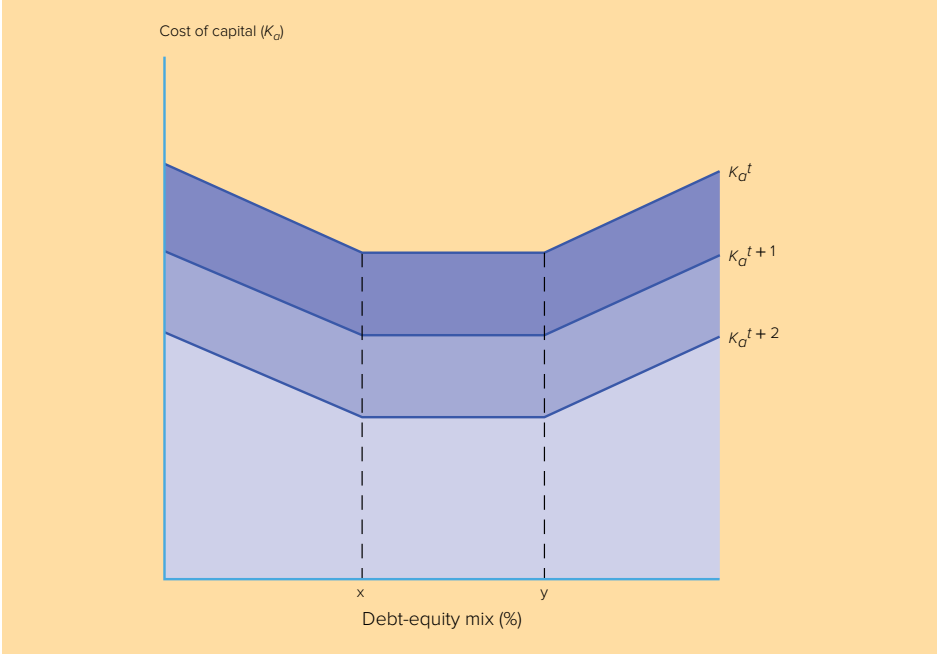


Figure 11–2 Cost of capital over time

[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

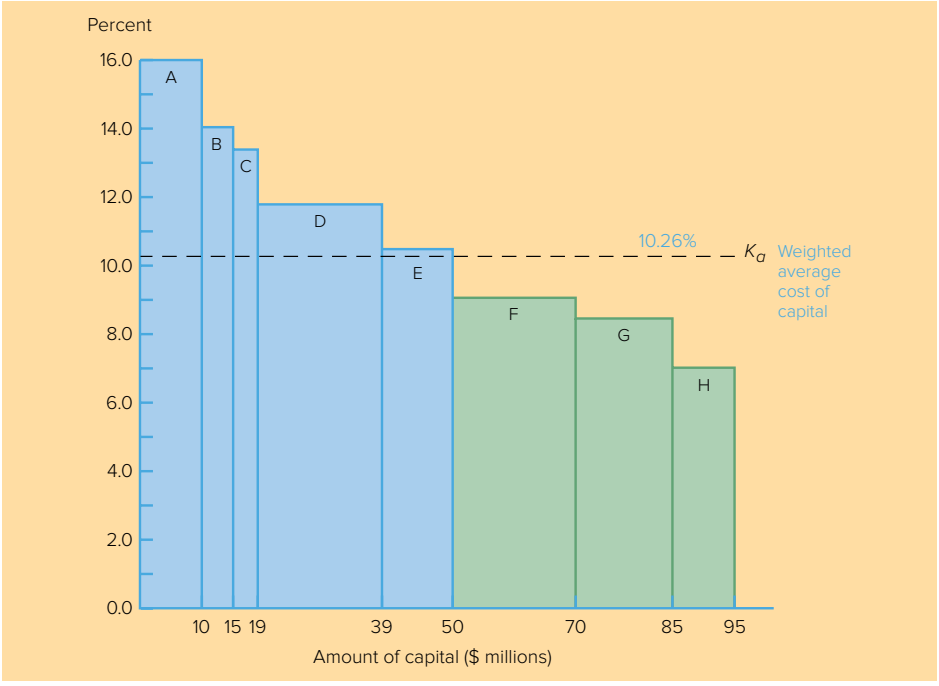


Figure 11–3 Cost of capital and investment projects for the Baker Corporation

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.

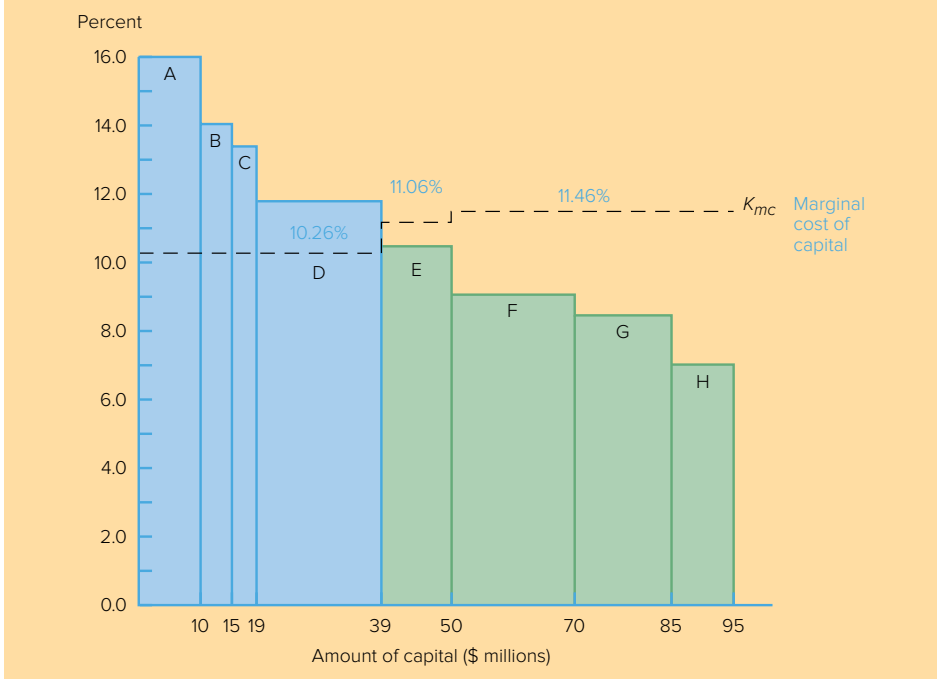


Figure 11–4 Marginal cost of capital and Baker Corporation investment alternatives

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 = 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:

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

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

CAPM:

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

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

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

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

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

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 ($\boldsymbol{K_e}$)? (LO3)
8. Why is the cost of new common stock ($\boldsymbol{K_n}$) higher than the cost of retained earnings ($\boldsymbol{K_e}$)? (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)

INTERNET RESOURCES AND QUESTIONS

Two Canadian sites rate and grade debt. The ratings determine the spread corporations pay above Government of Canada securities:
standardandpoors.com
dbrs.com

Sites that identify current yields on bond issues:
financialpost.com
pfin.ca/canadianfixedincome/Default.aspx

The TSX and the *Financial Post* identify current pricing on preferreds and common stock, including P/E ratios and dividend yields:
tmx.com
financialpost.com/markets/index.html

Betas and other useful share information are available on many Canadian companies at NASDAQ Canada and Thomson Reuters: reuters.com

1. Calculate the cost of capital for a corporation listed on one of the major exchanges in Canada. Use current pricing on debt and equity from the sites identified above, and use the latest filed financial statement of the selected company. The financial statements will be available at sedar.com.
2. Update the information included in Table 11–2. Have any of the ratings changed? Can you suggest why the ratings have changed?
3. Find the betas, P/E ratios, and dividend yields for the companies listed in Table 11–2. What do they tell you about the relative risk of the companies?

PROBLEMS

1. Recently, Hertz Pain Relievers bought a massage machine that provided a return of 8 percent. It was financed by debt costing 7 percent. In August, Mr. Hertz came up with a heating compound that had a return of 14 percent. The chief financial officer, Mr. R. Ental, told him it was impractical because it would require the issuance of common stock at a cost of 16 percent to finance the purchase. Is the company following an appropriate approach to using its cost of capital?
2. Royal Petroleum Co. can buy a piece of equipment that is anticipated to provide a 9 percent return and can be financed at 6 percent with debt. Later in the year, the firm turns down an opportunity to buy a new machine that would yield a 16 percent return but would cost 18 percent to finance through common equity. Assume debt and common equity each represent 50 percent of the firm's capital structure at 6 percent cost of debt and 18 percent cost of equity.
   a. Compute the weighted average cost of capital.
   b. Which project(s) should be accepted?
3. Pogo Stick Co can issue debt yielding 9 percent. The company is paying at a 25 percent tax rate. What is the aftertax cost of debt?
4. A brilliant young scientist is killed in a plane crash. It is anticipated that he could have earned $240,000 a year for the next 50 years. The attorney for the plaintiff's estate argues that the lost income should be discounted back to the present at 4 percent. The lawyer for the defendant's insurance company argues for a discount rate of 8 percent. What is the difference between the present value of the settlement at 4 percent and 8 percent? Compute each one separately.

5. Calculate the aftertax cost of debt under each of the following conditions.

	Yield	Corporate Tax Rate
a	8.0%	22%
b	14.0%	36%
c	11.5%	42%

6. Calculate the aftertax cost of debt under each of the following conditions.

	Yield	Corporate Tax Rate
a	8.0%	18%
b	12.0%	34%
c	10.6%	15%

7. Calculate the aftertax cost of debt on a bond issue yielding 10 percent. The issuing company pays tax at a rate of 34 percent and will incur distribution costs of 1 percent on this bond issue.

8. The Goodsmith Charitable Foundation, which is tax-exempt, issued debt last year at 9 percent to help finance a new playground facility in Vancouver. This year the cost of debt is 25 percent higher; that is, firms that paid 11 percent for debt last year will be paying 13.75 percent this year.
   a. If the Goodsmith Charitable Foundation borrowed money this year, what would be the aftertax cost of debt, based on its cost last year and the 25 percent increase?
   b. If the receipts of the foundation were found to be taxable by CRA (at a rate of 30 percent because of involvement in political activities), what would be the aftertax cost of debt?

9. Waste Disposal Systems has an aftertax cost of debt of 6 percent. With a tax rate of 33 percent, what can you assume the yield is on the debt?

10. Octopus Transit has a $1,000 par value bond outstanding with 10 years to maturity. The bond carries an annual interest payment of $75, payable semiannually, and is currently selling for $1,092. Octopus is in a 35 percent tax bracket. The firm wishes to know what the aftertax cost of a new bond issue is likely to be. The yield to maturity on the new issue will be the same as the yield to maturity on the old issue because the risk and maturity date will be similar.
    a. Compute the yield to maturity on the old issue and use this as the yield for the new issue.
    b. Make the appropriate tax adjustment to determine the aftertax cost of debt.

11. Russell Container Company has a $1,000 par value bond outstanding with 20 years to maturity. The bond carries an annual interest payment of $95, and is currently selling for $920. Russell is in a 25 percent tax bracket. The firm wishes to know what the aftertax cost of a new bond issue is likely to be. The yield to maturity on the new issue will be the same as the yield to maturity on the old issue because the risk and maturity date will be similar.
    a. Compute the yield to maturity on the old issue and use this as the yield for the new issue.
    b. Make the appropriate tax adjustment to determine the aftertax cost of debt.

12. For Russell Container Company, described in the previous problem, assume the yield on the bonds goes up by one percentage point and that the tax rate is now 34 percent.
    a. What is the new aftertax cost of debt?
    b. Has the aftertax cost of debt gone up or down from the previous problem? Explain why.

13. Terrier Company is in a 40 percent tax bracket and has a bond outstanding that yields 10 percent to maturity.
    a. What is Terrier's aftertax cost of debt?
    b. Assume that the yield on the bond goes down by 1 percentage point, and due to tax reform, the corporate tax rate falls to 25 percent. What is Terrier's new aftertax cost of debt?
    c. Has the aftertax cost of debt gone up or down from part ***a*** to part ***b***? Explain why.

14. Suncor is planning to issue debt that will mature in the year 2037. In many respects the issue is similar to currently outstanding debt of the corporation. Using Table 11–2 in the chapter, identify
    a. The yield to maturity on similarly outstanding debt for the firm, in terms of maturity.
    b. Assume that because the new debt will be issued at par, the required yield to maturity will be 0.15 percent higher than the value determined in part ***a***. Add this factor to the answer in ***a***. (New issues at par sometimes require a slightly higher yield than old issues that are trading below par. There is less leverage and fewer tax advantages.)
    c. If the firm is in a 30 percent tax bracket, what is the aftertax cost of debt?

15. Schuss Inc. can sell preferred shares for $60 with an estimated flotation cost of $3.00. The preferred stock is anticipated to pay $7 per share in dividends.
    a. Compute the cost of preferred stock for Schuss Inc.
    b. Do we need to make a tax adjustment for the issuing firm?

16. The Meredith Company issued $100 par value preferred shares 10 years ago. The shares provided an 8 percent yield at the time of issue. Each preferred share is now selling for $75. What is the current yield or cost of preferred stock? (Disregard flotation costs.)

17. Radio Gaga can issue preferred shares at $25 with an annual dividend of $1.50. Flotation expenses of a new issue will be 5 percent. What is the cost of a preferred share issue?

18. The treasurer of Sutton Security Systems is asked to compute the cost of fixed income securities for her corporation. Even before making the calculations, she assumes the aftertax cost of debt is at least 2 percent less than that for preferred stock. Based on the following facts, is she correct?

    Debt can be issued at a yield of 10.5 percent, and the corporate tax rate is 34 percent. Preferred shares will be priced at $50 and pay a dividend of $4.40. The flotation cost on the preferred stock is $2.00.

19. Ellington Electronics wants you to calculate its cost of common stock. During the next 12 months, the company expects to pay dividends (D_1) of $1.50 per share, and the current price of its common stock is $30 per share. The expected growth rate is 8 percent.
    a. Compute the cost of retained earnings (K_e).
    b. If a $2 flotation cost is involved, compute the cost of new common stock (K_n).

20. Compute K_e and K_n under the following circumstances:
    a. $D_1 = \$4.60$; $P_0 = \$60$; $g = 6\%$; $F = \$4.00$.
    b. $D_1 = \$0.25$; $P_0 = \$20$; $g = 10\%$; $F = \$1.50$.
    c. E_1 (earnings at the end of period one) = $6; payout ratio equals 30 percent; $P_0 = \$25$; $g = 4.5\%$; $F = \$2$.
    d. D_0 (dividend at the beginning of the first period) = $3; growth rate for dividends and earnings (g) = 7%; $P_0 = \$42$; $F = \$3.00$.

21. Sam's Fine Garments sells jackets and sports coats in suburban malls throughout the country. Business has been good, as indicated by the six-year growth in earnings per share. The earnings have grown from $1.00 to $1.87.
    a. Determine the compound annual rate of growth in earnings ($n = 6$).
    b. Based on the growth rate determined in part ***a***, project earnings for next year (E_1). Round to two places to the right of the decimal point.
    c. Assume the dividend payout ratio is 40 percent. Compute D_1. Round to two places to the right of the decimal point.
    d. The current price of the stock is $15. Using the growth rate (g) from part ***a*** and D_1 from part ***c***, compute K_e.
    e. If the flotation cost is $1.75, compute the cost of new common stock (K_n).

22. The Tyler Oil Company's capital structure is as follows:

Debt	35%
Preferred stock	15
Common equity	50

    The aftertax cost of debt is 7 percent; the cost of preferred stock is 10 percent; and the cost of common equity (in the form of retained earnings) is 13 percent.

    Calculate Tyler Oil Company's weighted average cost of capital in a manner similar to Table 11–1.

23. As an alternative to the capital structure shown in the previous problem for Tyler Oil Company, an outside consultant has suggested the following modifications.

Debt	60%
Preferred stock	5
Common equity	35

    Under this new and more debt-oriented arrangement, the aftertax cost of debt is 8.8 percent, the cost of preferred stock is 10.5 percent, and the cost of common equity (in the form of retained earnings) is 15.5 percent.

    Recalculate Tyler's weighted average cost of capital. Which plan is optimal in terms of minimizing the weighted average cost of capital?

24. Given the following information, calculate the weighted average cost of capital for Genex Corporation. Line up the calculations in the order shown in Table 11–1.

Percent of Capital Structure:	
Debt	35%
Preferred stock	10
Common equity	55
Additional Information:	
Bond coupon rate	13%
Bond yield	11%
Dividend, expected common	$3.00
Dividend, preferred	$10.00
Price, common	$50.00
Price, preferred	$98.00
Flotation cost, preferred	$5.50
Corporate growth rate	8%
Corporate tax rate	30%

25. Given the following information, calculate the weighted average cost of capital for Hadley Corporation. Line up the calculations in the order shown in Table 11–1.

Percent of Capital Structure:	
Debt	30%
Preferred stock	10
Common equity	60
Additional Information:	
Corporate tax rate	34%
Dividend, preferred	$9.00
Dividend, expected common	$3.50
Price, preferred	$102.00
Corporate growth rate	6%
Bond yield	7%
Flotation cost, preferred	$3.20
Price, common	$70.00

26. Given the following information, calculate the weighted average cost of capital for Puppet Corporation.

Percent of Capital Structure:	
Debt	55%
Preferred stock	5
Common equity	40
Additional Information:	
Bond coupon rate	8.5%
Bond yield	7%
Bond flotation cost	2%
Dividend, expected common	$1.50
Price, common	$30.00
Dividend, preferred	5%
Flotation cost, preferred	3%
Flotation cost, common	4%
Corporate growth rate	6%
Corporate tax rate	35%

a. Calculate the cost of capital assuming use of internally generated funds.

b. Calculate the cost of capital assuming use of externally generated funds.

c. Why is there a difference? Why does only common equity change?

27. Valvano Publishing Company is trying to calculate its cost of capital for use in a capital budgeting decision. Mr. Washburn, the vice-president of finance, has given you the following information and asked you to compute the weighted average cost of capital.

The company currently has outstanding a bond with an 11 percent coupon rate and a convertible bond with a 7.1 percent rate. The firm has been informed by its investment dealer, Dean, Smith, and Company, that bonds of equal risk and credit rating are now selling to yield 13 percent. The common stock has a price of $45 and an expected dividend ($\boldsymbol{D}_1$) of $2.52 per share. The firm's historical growth rate of earnings and dividends per share has been 14.5 percent, but security analysts on Bay Street expect this growth to slow to 11 percent in the future. The preferred stock is selling at $50 per share and carries a dividend of $5.50 per share. The corporate tax rate is 34 percent. The flotation costs are 3 percent of the selling price for preferred stock.

The optimum capital structure for the firm seems to be 35 percent debt, 10 percent preferred stock, and 55 percent common equity in the form of retained earnings.

Compute the cost of capital for the individual components in the capital structure, and then calculate the weighted average cost of capital.

28. McNabb Construction Company is trying to calculate its cost of capital for use in making a capital budgeting decision. Mr. Reid, the vice-president of finance, has given you the following information and has asked you to compute the weighted average cost of capital.

The company currently has an outstanding bond with a 9.5 percent coupon rate and another bond with a 7.8 percent rate. The firm has been informed by its investment dealer that bonds of equal risk and credit ratings are now selling to yield 10.5 percent. The common stock has a price of $98.44 and an expected dividend ($\boldsymbol{D}_1$) of $3.15 per share. The historical growth pattern ($\boldsymbol{g}$) for dividends is as follows:

$2.00
2.24
2.51
2.81

a. Compute the historical growth rate, round it to the nearest whole number, and use it for $\boldsymbol{g}$.

The preferred stock is selling at $90 per share and pays a dividend of $8.50 per share. The corporate tax rate is 30 percent. The flotation cost is 2 percent of the selling price for preferred stock. The optimum capital structure for the firm is 30 percent debt, 10 percent preferred stock, and 60 percent common equity in the form of retained earnings.

b. Compute the cost of capital for the individual components in the capital structure, and then calculate the weighted average cost of capital.

29. Western Electric Utility Company faces increasing needs for capital. Fortunately it has an A (low) credit rating. The corporate tax rate is 30 percent. Western's treasurer is trying to determine the corporation's current weighted average cost of capital to assess the profitability of capital budgeting projects. Historically, the corporation's earnings and dividends per share have increased at about a 6 percent annual rate.

Western Electric's common stock is selling at $60 per share, and the company will pay a $4.50 per share dividend ($\boldsymbol{D_1}$). The company's $100 preferred stock has been yielding 9 percent in the current market. Flotation costs for the company have been estimated by its investment dealer to be $1.50 for preferred stock. The company's optimum capital structure is 40 percent debt, 10 percent preferred stock, and 50 percent common equity in the form of retained earnings. Refer to the table below on bond issues for comparative yields on bonds of equal risks to Western Electric, maturing in 2038. Compute the values for parts ***a***, ***b***, ***c***, and ***d*** from the information given.

Data on Bond Issues

Issue	Rating	Price	Yield to Maturity
Utilities:			
Bell Canada 6.10%, 2035 . . .	BBB (high)	122.16	4.32
TransCanada 8.05%, 2039 . .	A (low)	154.69	4.20
Hydro One 4.89%, 2037	A (high)	117.30	3.66
Industrials:			
Loblaw 5.90%, 2036	BBB	120.38	4.31
Suncor 5.39, 2037	A(low)	115.08	4.26

a. Cost of debt, $\boldsymbol{K_d}$

b. Cost of preferred stock, $\boldsymbol{K_p}$

c. Cost of common equity in the form of retained earnings, $\boldsymbol{K_e}$

d. Weighted average cost of capital

30. Eaton International Corporation has the following capital structure:

	Cost (after tax)	Weightings	Weighted Cost
Debt	7.1%	25%	1.78%
Preferred stock (K_p)	8.6	10	.86
Common equity (K_e) (retained earnings)	14.1	65	9.17
Total: Weighted average cost of capital (K_a)			11.81%

a. If the firm has $19.5 million in retained earnings, at what size capital structure will the firm run out of retained earnings?

b. The 7.1 percent cost of debt referred to above applied only to the first $14 million of debt. After that the cost of debt will go up. At what size capital structure will there be a change in the cost of debt?

31. The Nolan Corporation finds that it is necessary to determine its marginal cost of capital. Nolan's current capital structure calls for 45 percent debt, 15 percent preferred stock, and 40 percent common equity. Initially common equity will be in the form of retained earnings ($\boldsymbol{K_e}$) and then new common stock ($\boldsymbol{K_n}$). The costs of the various sources of financing are as follows: debt, 5.6 percent; preferred stock, 9.0 percent; retained earnings, 12.0 percent; and new common stock, 13.2 percent.

a. What is the initial weighted average cost of capital? (Include debt, preferred stock, and common equity in the form of retained earnings, K_e.)

b. If the firm has $12 million in retained earnings, at what size of investment will the firm run out of retained earnings?

c. What will the marginal cost of capital be immediately after that point? (Equity will remain at 40 percent of the capital structure, but it will all be in the form of new common stock, K_n.)

d. The 5.6 percent cost of debt referred to above applies only to the first $18 million of debt. After that the cost of debt will be 7.2 percent. At what size of investment will there be a change in the cost of debt?

e. What will the marginal cost of capital be immediately after that point? (Consider the facts in both parts ***c*** and ***d***.)

32. The Evans Corporation finds that it is necessary to determine its marginal cost of capital. Evans' current capital structure calls for 30 percent debt, 10 percent preferred stock, and 60 percent common equity. Initially, common equity will be in the form of retained earnings (K_e) and then new common stock (K_n). The costs of the various sources of financing are as follows: debt, 6.2 percent; preferred stock, 9.4 percent; retained earnings, 12 percent; and new common stock, 13.4 percent.

a. What is the initial weighted average cost of capital? (Include debt, preferred stock, and common equity in the form of retained earnings, K_e.)

b. If the firm has $20 million in retained earnings, at what size of investment will the firm run out of retained earnings?

c. What will the marginal cost of capital be immediately after that point? (Equity will remain at 60 percent of the capital structure, but it will all be in the form of new common stock, K_n.)

d. The 6.2 percent cost of debt referred to above applies only to the first $36 million of debt. After that, the cost of debt will be 7.8 percent. At what size of investment will there be a change in the cost of debt?

e. What will the marginal cost of capital be immediately after that point? (Consider the facts in both parts ***c*** and ***d***.)

33. Eaton Electronic Company's treasurer uses both the capital asset pricing model and the dividend valuation model to compute the cost of common equity (also referred to as the required rate of return for common equity).

Assume the following:

$R_f = 7\%$, $K_m = 10\%$, $\beta_j = 1.6$, $D_1 = \$0.70$, $P_0 = \$19$, $g = 8\%$

a. Compute K_j (required rate of return on common equity based on the capital asset pricing model).

b. Compute K_e (required rate of return on common equity based on the dividend valuation model).

COMPREHENSIVE PROBLEMS

34. Medical Research Corporation is expanding its research and production capacity to introduce a new line of products. Current plans call for the expenditure of $100 million on four projects of equal size ($25 million) but with different returns. Project A is in blood clotting proteins and has an expected return of 18 percent. Project B relates to a hepatitis vaccine and carries a potential return of 14 percent. Project C, dealing with a cardiovascular compound, is expected to earn

11.8 percent, and Project D, an investment in orthopedic implants, is expected to show a 10.9 percent return.

The firm has $15 million in retained earnings. After a capital structure with $15 million in retained earnings is reached (in which retained earnings represent 60 percent of the financing), all additional equity financing must come in the form of new common stock.

Common stock is selling for $25.00 per share, and underwriting costs are estimated at $3.00 if new shares are issued. Dividends for the next year will be $0.90 per share (D1), and earnings and dividends have grown consistently at 11 percent per year.

The yield on comparative bonds has been hovering at 11 percent. The investment dealer believes the first $20 million of bonds could be sold to yield 11 percent, while additional debt might require a 2 percent premium and be marketed to yield 13 percent. The corporate tax rate is 30 percent. Debt represents 40 percent of the capital structure.

a. Based on the two sources of financing, what is the initial weighted average cost of capital? (Use K_d and K_e.)
b. At what size capital structure will the firm run out of retained earnings?
c. What will the marginal cost of capital be immediately after that point?
d. At what size capital structure will there be a change in the cost of debt?
e. What will the marginal cost of capital be immediately after that point?
f. Based on the information about potential returns on investments in the first paragraph and information on marginal cost of capital (in parts ***a***, ***c***, and ***e***), how large a capital investment budget should the firm use?
g. Graph the answer determined in part ***f***.

35. Masco Oil and Gas Company is a very large company with common stock listed on the Toronto Stock Exchange and bonds traded over the counter. As of the current balance sheet, it has three bond issues outstanding:

$150 million of 10% series	2027
$ 50 million of 7% series	2021
$ 75 million of 5% series	2016

The vice-president of finance is planning to sell $75 million of bonds next year to replace the debt due to expire. Present market yields on similar BB-rated bonds are 12.1 percent. Masco also has $90 million of 7.5 percent, non-callable preferred stock outstanding, and it has no intentions of selling any more preferred stock in the future. The preferred stock is currently priced at $80.00 per share, and its dividend per share is $7.80.

The company has had very volatile earnings, but its dividends per share have had a very stable growth rate of 8 percent, and this will continue. The expected dividend (D1) is $1.90 per share, and the common stock is selling for $40.00 per share. The company's investment dealer has quoted the following flotation costs to Masco: $2.50 per share for preferred stock and $2.20 per share for common stock.

On the advice of its investment dealer, Masco has kept its debt at 50 percent of assets and its equity at 50 percent. Masco sees no need to sell either common or preferred stock in the foreseeable future as it generates enough internal funds for its investment needs when these funds are combined with debt financing. Masco's corporate tax rate is 40 percent.

Compute the cost of capital for the following:

a. Bond (debt) (K_d)
b. Preferred stock (K_p)
c. Common equity in the form of retained earnings (K_e)
d. New common stock (K_n)
e. Weighted average cost of capital

36. A Dozen Monkeys Ltd. has the following right-hand side of its balance sheet:

Debt: 8% coupon, 12 years to maturity	$ 8,000,000
Preferred shares: 5% dividend	1,000,000
Common shares: 750,000 outstanding	1,500,000
Retained earnings	4,500,000
	$15,000,000

New debt could be issued to yield 10 percent, with flotation costs netting the firm $970 on each $1,000 bond. Preferred shares would require a current yield of 8 percent, with aftertax flotation costs of 4 percent. Common shares currently trade at $15.00, but new shares would be discounted to $14.25 to encourage sales. Aftertax flotation costs on new common shares would be 5 percent. The anticipated dividend growth rate is 6 percent. The expected dividend is $1.50. A Dozen Monkeys Ltd. has a 40 percent tax rate and would require new share capital to fund new investments.

a. Based on market value weightings, calculate Monkey's weighted average cost of capital.

37. Island Capital has the following capital structure:

Bonds	$20,000,000
Perpetuals (preferred shares)	4,000,000
Common shares	20,000,000
Retained earnings	19,500,000
	$63,500,000

The existing bonds have a coupon rate of 8 percent with 18 years left to maturity, but current yields on these bonds are 11 percent. Flotation costs of $25.00 per $1,000 bond would be expected on a new issue.

The existing perpetuals have a $25.00 par value and an annual dividend rate of 9 percent. New perpetuals could be issued at a $50.00 par value with an 8 percent yield. Flotation costs would be 3 percent.

There are four million common shares outstanding that currently trade at $18.00 per share and expect to pay a dividend next year of $1.75 that will continue to grow at 7 percent per annum for the foreseeable future. New shares could be issued at $17.50 and would require flotation expenses of 5 percent of proceeds.

Island's tax rate is 39 percent, and it is expected that internally generated funds will be sufficient to fund capital projects in the near future.

a. Compute Island Capital's current cost of capital with market value weightings.
b. How would the cost of capital calculation change if new shares are required to fund the equity component of the capital structure?

38. Trois-Rivières Manufacturing has 10,000 bonds (face value of $1,000 each) with a 10 percent coupon maturing in 8 years. Its preferreds (100,000 shares) have a face value of $25 and pay a 7.5 percent dividend, and it has 600,000 common shares outstanding. Retained earnings are reported at $4,500,000.

    During the last five years, Trois-Rivières Manufacturing has enjoyed steady growth, with common stock dividends growing from $0.80 to $1.23 (just recently paid). The common share price currently trades at $15.00. If new shares were issued at $15.00, they would require flotation expenses of 7 percent of proceeds.

    The preferred shares currently trade at $26.50, and any new issue would require flotation expenses of 5 percent of price to investors.

    The bonds currently pay interest semiannually and are trading at a price that yields a nominal 12 percent annual rate (12.36 effective annual rate). Flotation costs of new debt would be 4 percent of proceeds.

    Trois-Rivières' tax rate is 38 percent, and equity financing would require a new share issue.

    a. Calculate the weighted average cost of capital of Trois-Rivières Manufacturing.

39. Murchie's is considering diversification by way of acquisition to reduce its reliance on its volatile core business. Mad Max, the CEO, has asked for your calculation of a discount rate to be used to analyze the potential acquisition targets. The following information has been assembled.

Long-term bonds	$10,000,000
Subordinated perpetual bonds	2,000,000
Common shares	2,062,500
Retained earnings	937,500
	$15,000,000

    The yield on 98-day Treasury bills is 7.38 percent. Long-term debt has 15 years to maturity and has a coupon rate of 12 percent paid semiannually. Currently the bonds are trading at a premium of 15 percent to face value. A new debt issue would incur flotation costs of 3 percent of the issue price.

    The perpetual bonds were issued at a yield of 9 percent but currently are trading to yield 12 percent. The flotation costs of a new issue would be 4 percent.

    There are 750,000 common shares outstanding, currently priced at $4.50. Murchie's, with a beta of 1.7, is planning a dividend of $0.10. Future growth is suggested at a compound annualized rate of 15 percent. A new issue of common shares would net the firm $4.10 per share. Murchie's tax rate is 43 percent. Internally generated funds will not be sufficient to fund future expansion plans.

    a. Calculate Murchie's weighted average cost of capital.
    b. Calculate Murchie's weighted average cost of capital if it has negative income for tax purposes.
    c. Comment on the appropriateness of Murchie's present capital structure.
    d. Comment on the use of the weighted average cost of capital as calculated to analyze the suggested acquisitions.

APPENDIX 11A

Cost of Capital and the Capital Asset Pricing Model

The work of Harry Markowitz, examined in Chapter 13, highlights the importance of thinking of investments, their returns, and their risks in a portfolio context. The risk of an investment is not so much its individual risk but the risk it adds to a portfolio, or collection of assets. Individual, or unique, risks tend to disappear (they cancel each other out) within a portfolio. However, some risk still remains, and it is this risk that is of interest as it will shape the value that investors or shareholders place on assets. William Sharpe and others developed a model that focused on the risk that cannot be diversified away, which suggests that the nondiversifiable risk will determine the pricing of assets in an efficient market. Efficient markets are examined in Chapter 14.

The Capital Asset Pricing Model

The capital asset pricing model (CAPM) relates the risk-return tradeoffs of individual assets to market returns. It suggests the expected return of an asset based on the asset's risk that cannot be diversified away. Common stock returns over time have generally been used to test this model, since stock prices are widely available and efficiently priced, as are market indexes of stock performance. In theory, the CAPM encompasses all assets, but in practice it is difficult to measure returns on all types of assets or to find an all-encompassing market index. For our purposes, we use common stock returns to explain the model, and occasionally we generalize to other assets.

The basic form of the CAPM is a linear relationship between returns on individual stocks and stock market returns over time. By using least squares regression analysis, the return on an individual stock, K_j, is expressed in formula 11A–1.

$$K_j = \alpha + \beta_j R_m + e \quad \textbf{(11A–1)}$$

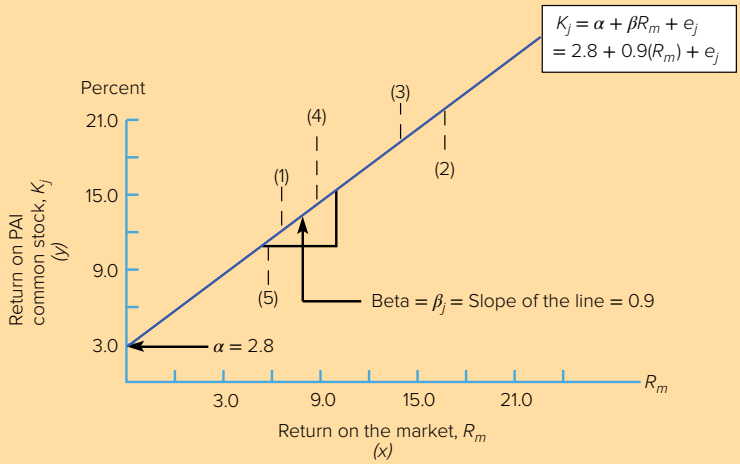
Where

K_j = Return on individual common stock of a company
α = Alpha, the intercept on the y-axis
β_j = Beta, the coefficient of stock (j)
R_m = Return on the stock market (an index of stock returns is used, usually the S&P/TSX Composite Index)
e = Error term of the regression formula

As indicated in Table 11A–1 and Figure 11A–1, this formula uses historical data to generate the alpha coefficient (α) and the beta coefficient (β_j), a measurement of the return performance of a given stock versus the return performance of the market. Assume we want to calculate a beta for Parts Associates Inc. (PAI), and we have the performance data for that company and the market shown in the table. The relationship between PAI and the market appears graphically in the figure.

Year	Rate of Return on Stock	
	PAI	Market
1	12.0%	10.0%
2	16.0	18.0
3	20.0	16.0
4	16.0	10.0
5	6.0	8.0
Mean return	**14.0%**	**12.4%**
Standard deviation	**4.73%**	**3.87%**

Table 11A–1 Performance of PAI and the market



Year	K_j	R_m	$\Sigma K_j R_m$ 936	$\Sigma K_j \Sigma R_m$ 4,340	ΣR_m^2 844	$(\Sigma R_m)^2$ 3,844
1	12%	10%	$\beta_j = \frac{n\Sigma K_j R_m - \Sigma K_j \Sigma R_m}{n\Sigma R_m^2 - (\Sigma R_m)^2} = \frac{5(936) - 4{,}340}{5(844) - 3{,}844} = 0.9$			
2	16	18	$\alpha = \frac{\Sigma K_j - \beta \Sigma R_m}{n} = \frac{70 - 0.9(62)}{5} = 2.8$			
3	20	16				
4	16	10				
5	6	8				
	70%	62%				

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Input [2nd] {DATA}				
X01 = 10 [Enter] [↓]	Y01 12 [Enter]			
[↓] X02 = 18 [Enter] [↓]	Y02 16 [Enter]			
[↓] X02 = 16 [Enter] [↓]	Y02 20 [Enter]			
[↓] X02 = 10 [Enter] [↓]	Y02 16 [Enter]			
[↓] X02 = 8 [Enter] [↓]	Y02 6 [Enter]			
[2nd] [STAT] [↓] Repeat				
SHARP	[Mode]		[1] [1]	Stat
Input 10	[(x, y)]	12	[Data]	Note that the values for the x axis (R_m are input first.)
18	[(x, y)]	16	{Data}	
16	[(x, y)]	20	{Data}	
10	[(x, y)]	16	{Data}	
8	[(x, y)]	6	{Data}	
[RCL]	{a} gives	2.79		This is the alpha coefficient.
[RCL]	{b} gives	.90		This is the beta coefficient.
[RCL]	{r} gives	.74		This is the correlation coefficient, a measure of how well the formula describes the relationship. The closer to 1.00, the better the fit.

Figure 11A–1 Linear regression of returns between PAI and the market

The alpha term in Figure 11A–1 of 2.8 percent is the ***y***-intercept of the linear regression. It is the expected return on PAI stock if returns on the market are zero. However, if the returns on the market are expected to approximate the historical rate of 12.4 percent, the expected return on PAI would be $K_j = 2.8 + 0.9(12.4) = 14.0$ percent. This maintains the historical relationship. If the returns on the market are expected to rise to 18 percent next year, expected return on PAI would be $K_j = 2.8 + 0.9(18.0) = 19$ percent.

The error term (***e***) is useful in determining the degree of confidence we would have in estimates of returns based on the regression line. From the historical data, it is evident that not all observations lie on the regression line, and yet we propose to use the relationship that it suggests to predict return expectations in the future. On the basis of the historical observations that do not fit on the line, the error terms, we can express the likelihood that our predicted returns are within an acceptable range of the prediction. Statistically, this involves calculating the standard error of the estimate.

As the CAPM is developed, our focus will be on the beta term. If we plot only excess returns—that is, asset and market returns above the risk-free rate of return—it is found that alpha is not significantly different from zero. In addition, our expectation for the error term is also zero. In a diversified portfolio, the error terms tend to offset each other.

Notice that we are talking in terms of expectations. The CAPM is an expectational (ex ante) model, and there is no guarantee that historical data will reoccur. One area of empirical testing involves the stability and predictability of the beta coefficient based on historical data. Research has indicated that betas are more useful in a portfolio context (for groupings of stocks) because the betas of individual stocks are less stable from period to period than portfolio betas. In addition, research indicates betas of individual common stocks have a tendency to approach 1.0 over time.

The Security Market Line

The capital asset pricing model evolved from formula 11A–1 into a risk premium model where the basic assumption is that investors expected to take more risk must be compensated by larger expected returns. Investors should also not accept returns that are less than they can get from a riskless asset. For CAPM purposes, it is assumed that short-term government Treasury bills may be considered a riskless asset.[9] When viewed in this context, an investor must achieve an extra return above that obtainable from a Treasury bill to induce the assumption of more risk. This brings us to the more common and theoretically useful model:

$$K_j = R_f + \beta_j\left(R_m - R_f\right) \quad \textbf{(11A–2)}$$

Where

R_f = Risk-free rate of return
β_j = Beta coefficient from formula 11A–1
R_m = Return on the market index
$R_m - R_f$ = Premium or excess return of the market versus the risk-free rate (since the market is riskier than R_f, the assumption is that the expected R_m will be greater than R_f)
$\beta_j(R_m - R_f)$ = Expected return above the risk-free rate for the stock of company ***j***, given the level of risk

The model centres on beta, the coefficient of the premium demanded by an investor to invest in an individual stock. For each individual security, beta measures the sensitivity (volatility) of the security's return to the market. By definition, the market has a beta of 1.0, so if an individual company's beta is 1.0, it can expect to have returns as volatile as the market and total returns equal to the market. A company with a beta of 2.0 would be

[9]A number of studies have also indicated that longer–term government securities may appropriately represent R_f (the risk–free rate).

twice as volatile as the market and would be expected to generate more returns, whereas a company with a beta of 0.5 would be half as volatile as the market.

The term $(R_m - R_f)$ indicates common stock is expected to generate a rate of return higher than the return on a Treasury bill. This makes sense, since common stock has more risk. In fact, research by Roger Ibbotson shows that this risk premium over the last 83 years is close to 6.5 percent on average, but exhibits a wide standard deviation.[10] In the actual application of the CAPM to cost of capital, companies often use this historical risk premium in their calculations. In our example, we use 6.5 percent to represent the expected $(R_m - R_f)$.

Ibbotson SBBI Classic Yearbook
corporate.morningstar.com/

For example, assuming the risk-free rate is 5.5 percent and the market risk premium $(R_m - R_f)$ is 6.5 percent, the following returns would occur with betas of 2.0, 1.0, and 0.5:

$$K_2 = 5.5\% + 2.0(6.5\%) = 5.5\% + 13.0\% = 18.5\%$$
$$K_1 = 5.5\% + 1.0(6.5\%) = 5.5\% + \ \ 6.5\% = 12.0\%$$
$$K_{.5} = 5.5\% + 0.5(6.5\%) = 5.5\% + 3.25\% = 8.75\%$$

FINANCE IN ACTION

Risks and Returns

In early 2017 the following betas were reported for three companies listed on the Toronto Stock Exchange (TSX).

BCE (BCE)	0.38
Telus (T)	0.94
Encana (ECA)	1.87

These betas give us a sense of the performance we should expect from each of the companies. We measure performance based on changes in the company's market share price. BCE would be least sensitive to market movements, whereas Encana, a world leader in energy producer, would be most sensitive to market movements. In an up market, Encana's share price would be expected to outperform the two other companies. This would, however, be appropriate, given that with a higher beta Encana would be riskier. In a down market, Encana would be expected to underperform the other companies.

A portfolio with equal value weightings of the three stocks would have a beta of 1.06 (0.38 × 0.33 + 0.94 × 0.33 + 1.87 × 0.33). This portfolio, with virtually the same beta, would be expected to perform similarly to the market, which has a beta of 1. A portfolio beta would be a more reliable estimate of performance because, through the benefits of diversification, the individual risks of each company would be reduced. Although beta measures risk in relation to the market fairly well, it does not capture the individual risk of a company's performance (the error term in formula 11A–1).

In constructing an individual's portfolio of investments, betas can be used (and are by investment managers) to assemble a collection of stocks. Betas would be used to construct a portfolio based on an investor's attitude toward risk and expected returns. Higher-beta portfolios would expect greater returns, but with greater risks.

Q1 What are the current betas of these companies?

Q2 Can you find any Canadian companies with higher betas?

reuters.com/finance/stocks

[10] Ibbotson, *SBBI Classic Yearbook, Stocks, Bonds, Bills and Inflation*: 2013 (Chicago, IL: Morningstar, 2013).

The beta term measures the riskiness of an investment relative to the market. To outperform the market, one would have to assume more risk by selecting assets with betas greater than 1.0. Another way of looking at the risk-return tradeoff would be that if less risk than the market is desired, an investor would choose assets with a beta of less than 1.0. Beta is a good measure of a stock's risk when the stock is combined into a portfolio, and therefore, it has some bearing on the assets a company acquires for its portfolio of real capital.

In Figure 11A–1, individual stock returns were compared to market returns, and the beta from formula 11A–1 was shown. From formula 11A–2, the risk premium model, a generalized risk-return graph called the security market line (SML) can be constructed that identifies the risk-return tradeoff of any common stock (asset) relative to the company's beta. This is shown in Figure 11A–2.

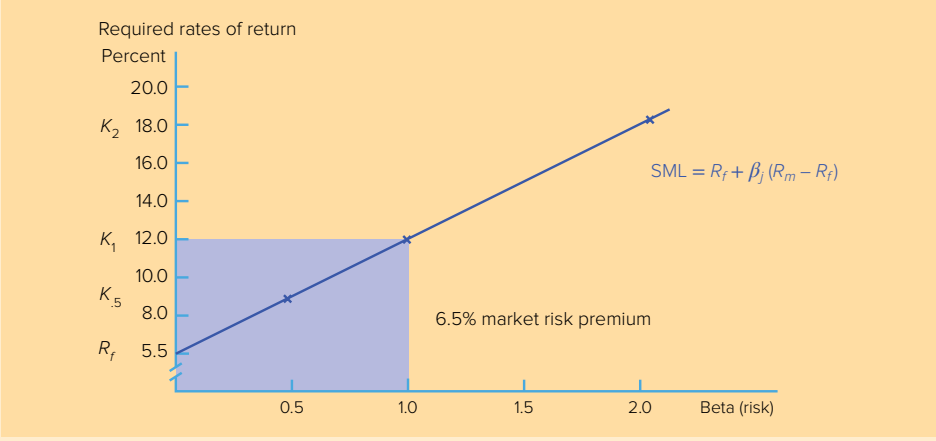


Figure 11A–2 The security market line (SML)

The required return for all securities can be expressed as the risk-free rate plus a premium for risk. Thus, we see that a stock with a beta of 1.0 would have a risk premium of 6.5 percent added to the risk-free rate of interest, 5.5 percent, to provide a required return of 12 percent. Since a beta of 1.0 implies risk equal to the stock market, the return is also at the overall market rate. If the beta is 2.0, twice the market risk premium of 6.5 percent must be earned, and we add 13 percent to the risk-free rate of 5.5 percent to determine the required return of 18.5 percent. For a beta of 0.5, the required return is 8.75 percent.

Cost of Capital Considerations

When calculating the cost of capital for common stock, remember that K_e is equal to the expected total return from the dividend yield and capital gains.

$$K_e = \frac{D_1}{P_0} + g$$

K_e is the return required by investors based on expectations of future dividends and growth. The SML provides the same information, but in a market-related risk-return model. As required returns rise, prices must fall to adjust to the new equilibrium return level, and as required returns fall, prices rise. Stock markets are generally efficient, and when stock prices are in equilibrium, the K_e derived from the dividend model is equal to K_j derived from the SML. However, just as with the dividend valuation model we had to allow for flotation costs on a new share issue, we must do the same for the CAPM. We adjust K_j by multiplying by P_0/P_n.

The SML helps us to identify several circumstances that can cause the cost of capital to change. Figure 11–2 examined required rates of returns over time with changing interest rates and stock prices. Figure 11A–3 does basically the same thing, only through the SML format.

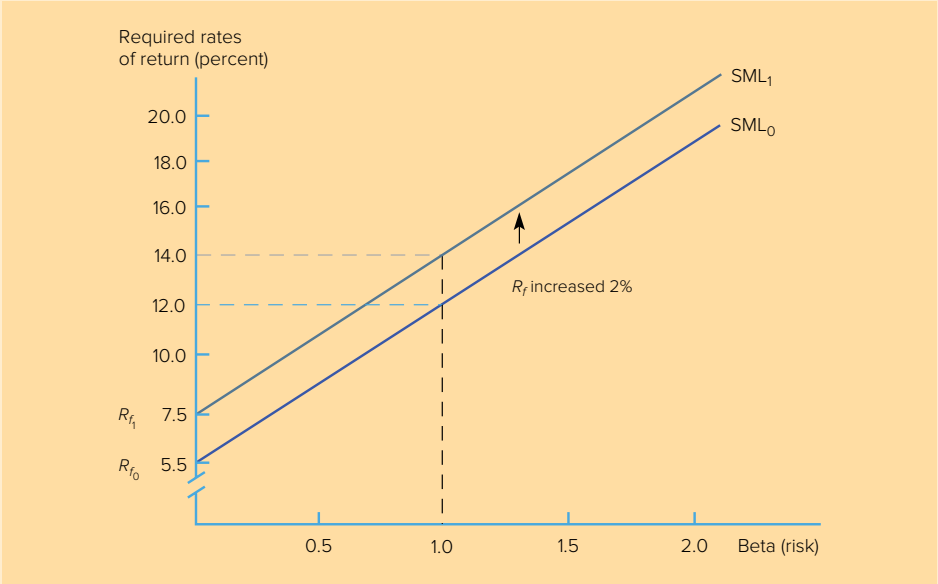


Figure 11A–3 The SML and changing interest rates

When interest rates increase from the initial period (R_{f1} versus R_{f0}), the security market line in the next period is parallel to SML_0, but higher. This means that required rates of return have risen for every level of risk, as investors desire to maintain their risk premium over the risk-free rate.

One very important variable influencing interest rates is the rate of inflation. As inflation increases, lenders try to maintain their real dollar purchasing power, so they increase the required interest rates to offset inflation. The risk-free rate can be thought of as

$$R_f = RR + IP$$

Where

RR = The real rate of return on a riskless government security when inflation is zero
IP = An inflation premium that compensates lenders (investors) for loss of purchasing power

An upward shift in the SML indicates that the prices of all assets shift downward as interest rates move up. In Chapter 10, this was demonstrated in the discussion showing that when market interest rates went up, bond prices adjusted downward to make up for the lower coupon rate (interest payment) on the old bonds.

Another factor affecting the cost of capital is a change in risk preferences by investors. As investors become more pessimistic about the economy, they require larger premiums for assuming risks. Even though the historical average market risk premium may be close to 6.5 percent, this is not stable, and investors' changing attitudes can have a big impact on the market risk premium. A more risk-averse attitude shows up in higher required stock returns and lower stock prices. For example, if investors raise their market risk premium to 8 percent, the rates of return from the original formulas increase as follows:

$$K_2 = 5.5\% + 2.0\ (8.0\%) = 5.5\% + 16.0\% = 21.5\%$$
$$K_1 = 5.5\% + 1.0\ (8.0\%) = 5.5\% + 8.0\% = 13.5\%$$
$$K_{.5} = 5.5\% + 0.5\ (8.0\%) = 5.5\% + 4.0\% = 9.5\%$$

The change in the market risk premium causes the required market return (beta = 1.00) to be 13.5 percent instead of the 12 percent, from Figure 11A–2. Any asset riskier than the market would have a larger increase in the required return. For example, a stock with a beta of 2.0 would need to generate a 21.5 percent return, instead of the 18.5 percent in the figure. The overall shape of the new security market line (SML_1) is shown in Figure 11A–4. Note the higher slope for SML_1, in comparison to SML_0.

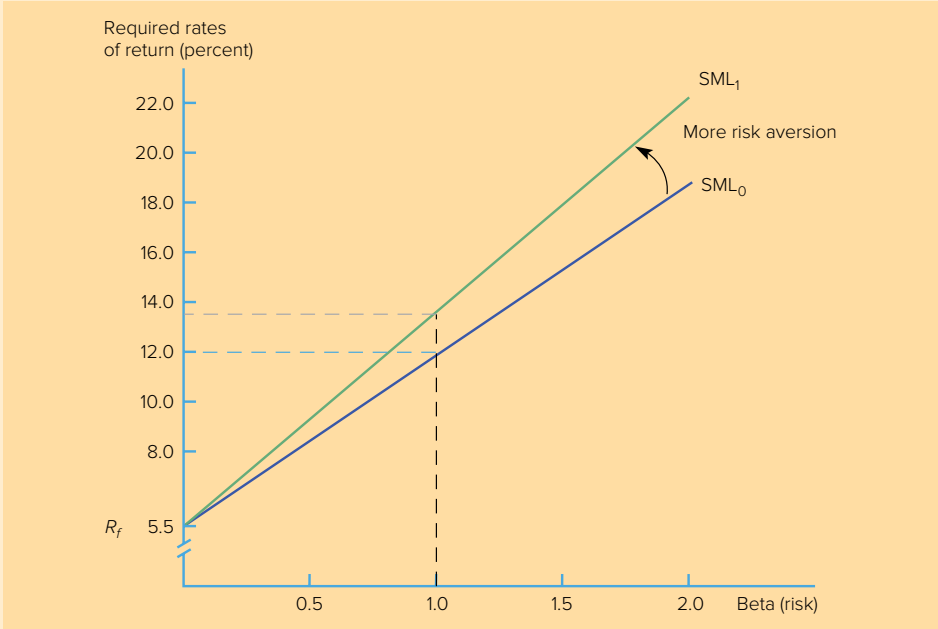


Figure 11A–4 The SML and changing investor expectations

In many instances, rising interest rates and pessimistic investors go hand in hand, so the SML may change its slope and intercept at the same time. This combined effect would cause both severe drops in the prices of risky assets and much larger required rates of return for such assets.

The capital asset pricing model and the SML have been presented to further your understanding of market-related events that affect the firm's cost of capital, such as market returns and risk, changing interest rates, and changing risk preferences.

Although the capital asset pricing model has received criticism because of the difficulties of dealing with the betas of individual securities and because of the problems involved in consistently constructing the appropriate slope of the SML to represent reality, it provides some interesting insights into risk-return measurement.

REVIEW OF FORMULAS

1. $$K_j = \alpha + \beta_j R_m + e \qquad \textbf{(11A–1)}$$

2. $$K_j = R_f + \beta_j \left(R_m - R_f\right) \qquad \textbf{(11A–2)}$$

DISCUSSION QUESTIONS

11A–1. How does the capital asset pricing model help explain changing costs of capital? (LO2)

11A–2. Why does K_e approximate K_j, or why does $D_1/(P_0 - g)$ approximate $R_f + \beta_j(R_m - R_f)$? (LO3)

11A–3. How does the SML react to changes in the rate of interest, changes in the rate of inflation, and changing investor expectations? (LO1, LO3)

11A–4. If an individual stock lay above the SML, what would be an appropriate investment strategy? Why? (LO2)

11A–5. Why would an efficient market be an important assumption for the development of the CAPM? (LO1)

11A–6. Why do you think the CAPM is or is not useful to the financial manager? (LO2)

INTERNET RESOURCES AND QUESTIONS

Betas and other useful share information are available on many Canadian companies at Thomson Reuters:
reuters.com/finance/stocks

BigCharts provides historical quotes on stocks and the S&P/TSX Composite Index (CA:$ISPTX) going back several years:
canada.bigcharts.com

Perimeter CBID identifies yields on Government of Canada bonds that can represent the risk-free rate:
pfin.ca

The Bank of Canada provides some current and historical yields on securities:
bankofcanada.ca

11A–1. Calculate the expected yield for the following securities using current information and the framework of the CAPM: BlackBerry (BB), Teck (TECK.B), CNR (CNR), Potash (POT), and the S&P/TSX Composite Index. The TSX (tmx.com) has betas as well, although different than Reuters. For the market portfolio, determine the average annual return on the S&P/TSX Composite Index over the last five years. Do your results seem reasonable in today's market?

PROBLEMS

1. Assume $R_f = 4$ percent and $R_m = 8$ percent. Compute K_j for the following betas, using formula 11A–2.
   a. 0.7
   b. 1.4
   c. 1.7

2. For the preceding problem, assume an increase in interest rates changes R_f to 7.0 percent; also assume that the market premium ($R_m - R_f$) changes to 6.5 percent.
   a. Compute K_j for the three betas of 0.7, 1.4, and 1.7.

3. The risk-free interest rate on one-year debt is 7 percent and the return on the market is expected to be 13 percent. A stock with a beta of 1.2 pays no dividends over the next year. If it is currently priced at $15.00, what will its price be at the end of the year?

4. Currently, Treasury bills yield 4.75 percent and the market prices risk at 6.90 percent. You have invested in a stock efficiently priced by the CAPM with a beta of 1.15 that will pay an expected dividend of $1.80 in one year. If the stock expects no capital appreciation in value over the next year, compute its current price.

5. You have invested in a stock with some systematic risk. It has a beta of 1.05. The current anticipated market portfolio return for the upcoming year is 16 percent, and the anticipated market risk premium is 7 percent. Calculate the expected yield on this stock based on the CAPM.

6. The risk-free rate is projected to be 5 percent for the upcoming year. Investor expectations concerning the market portfolio reveal expected excess returns of 8 percent during the same period. You have been closely following Y Ltd.'s stock with a beta of 1.2.
   a. What would be Y's anticipated return based on the SML?
   b. If your analysis reveals an expected return of 16 percent, what investment strategy would you suggest? Justify and fully explain your position.

   And now for some WACC (weighted average cost of capital) calculations using the CAPM for the cost of equity.

7. Austen Sensibles Ltd. has the following capital structure, which it expects to maintain into the foreseeable future:

Debt	35%
Preferreds	10%
Common stock	35%
Retained earnings	20%

   Current yields on similar risk bonds are 11 percent. Flotation costs would be negligible and can be ignored for calculation purposes.

   New preferred shares are currently being considered and are expected to be offered at $100.00 with a dividend of 8 percent. Flotation costs would be 5 percent.

   Austen has a beta of 0.9. Currently, Treasury bills are yielding 8.5 percent for one year, and the market portfolio (the S&P/TSX Composite Index) is expected to yield 16 percent over the next year.

   Austen has a tax rate of 44 percent and expects internally generated funds to be sufficient to fund new investments.
   a. Calculate the cost of capital of Austen Sensibles Ltd.

8. Huron Ltd. has the following capital structure:

16% Debentures, due in 14 years	$30,000,000
Preferreds (8% dividend, 40,000 shares)	3,000,000
Common shares: 3,600,000 outstanding	7,200,000
Retained earnings	5,600,000
Foreign currency translation	2,200,000
	$48,000,000

   In today's capital markets, a company with risk characteristics similar to Huron's would be subject to the following yields:
   - Bank prime rate is 7 percent.
   - The average yield on 91 day T-bills is 5 percent.

- Debentures would require a yield of 9.5 percent. Flotation costs aftertax would be 4 percent.
- Preferreds would require a yield of 6.5 percent. Flotation costs aftertax would be 5 percent.
- The market portfolio is anticipated to yield 13 percent over the next year.
- Huron's historical beta is 1.25.

Huron's shares currently trade at $15.50. A new issue would net $15.00, including aftertax flotation costs. Internally generated funds will be sufficient to fund Huron's upcoming enterprises. Huron's tax rate is 40 percent.

a. Calculate Huron Ltd.'s cost of capital.

b. A major new investor in Huron is concerned with the possible rejection of viable business proposals based on the calculations just performed. The shareholder suggests that Huron can borrow at prime plus 1 percent and that should be good enough as a discount rate. Prepare a reply to the shareholder. (A "Yes, sir" or "No, ma'am" is not a correct answer.)

9. Orbit Corp. has the following balance sheet:

Cash	$ 500,000	Demand loans at prime + 1%	$ 3,000,000
A/R	2,500,000	Subordinated debentures	
Inventory	4,000,000	8% coupon, 12 years to maturity	12,000,000
Land	15,000,000	Preferred issue 6%	7,000,000
Equipment	20,000,000	Common stock: 5,000,000 shares outstanding	5,000,000
		Retained earnings	15,000,000
	$42,000,000		$42,000,000

Today's market is subject to different supply and demand factors and underlying economic events than when Orbit's capital structure was put in place. This has been translated into the following current yields, which are demanded by the marketplace for a company exhibiting the same risk characteristics as Orbit Corp.:

- The bank's prime rate is now 9.5 percent. The average yield on 91-day T-bills is now 8.5 percent.
- Subordinated debentures would now demand 12 percent; the underwriter would float them for 5 percent of par.
- Preferreds would now call for a stated yield of 11 percent. The underwriters would take 6 percent of issue price for their fee.
- Orbit's stock currently trades on the market at $25. Flotation costs would be 8 percent of the current market price.

This high-growth stock, 12 percent per year, pays no dividends but it has been determined to have a beta of 1.7. A well-diversified market portfolio of stocks would yield excess returns of 9 percent above the risk-free rate of interest in the foreseeable future.

Retained earnings will be insufficient to contribute the equity portion of funding of new investments. Orbit's tax rate is 23 percent.

a. Calculate Orbit's cost of capital.

b. Would you suggest that Orbit consider paying a small dividend?

c. Explain how Orbit might improve its capital structure. Justify your position.

APPENDIX 11B

Capital Structure Theory and Modigliani and Miller

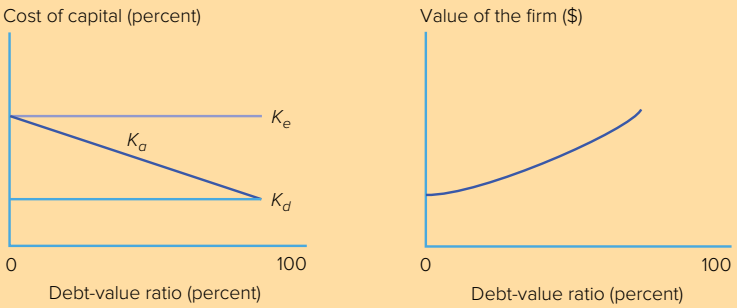
The foundation supporting cost of capital theories was primarily developed by Professors Modigliani and Miller in the late 1950s and mid-1960s.[11] They actually went through an evolutionary process in which they proposed many different theories and conclusions about cost of capital.

However, before we discuss Modigliani and Miller, we briefly touch on the work of David Durand in the early 1950s, which was the first written attempt to describe the effect of financial leverage on cost of capital and valuation. Professor Durand described three different theories of cost of capital: the net income approach, the net operating income (NOI) approach, and the traditional approach.[12]

Nobel Prize
nobelprize.org

Net Income Approach

Under the net income (NI) approach, it is assumed that the firm can raise all the funds it desires at a constant cost of equity and debt. Since debt tends to have a lower cost than equity, the more debt utilized, the lower the overall cost of capital and the higher the evaluation of the firm, as indicated in Figure 11B–1.



K_e = Cost of equity; K_d = Cost of debt; K_a = Cost of capital.

Value is the market value of the firm.

Figure 11B–1 Net income (NI) approach

Under this approach, the firm would be foolish not to use 100 percent debt to minimize cost of capital and maximize valuation. However, the assumption of constant cost of all forms of financing regardless of the level of utilization has been severely challenged by practitioners.

Net Operating Income Approach

A second approach covered by Professor Durand was the net operating income (NOI) approach. Under this proposition, the low cost of debt is assumed to remain constant

[11]Franco Modigliani and Merton H. Miller, "The Cost of Capital, Corporation Finance and the Theory of Investment," *American Economic Review*, June 1958, and "Taxes and the Cost of Capital: A Correction," *American Economic Review*, June 1963, pp. 433–43.

[12]See David Durand, "Costs of Debt and Equity Funds for Business: Trends and Problems of Measurement," *Conference on Research in Business Finance*, National Bureau of Economic Research, New York, 1952.

with greater debt utilization, but the cost of equity increases to such an extent that the cost of capital remains unchanged. Essentially, only operating income matters, and how you finance it makes no difference in terms of cost of capital or valuation. In Figure 11B–2 we see the effects of the NOI approach.

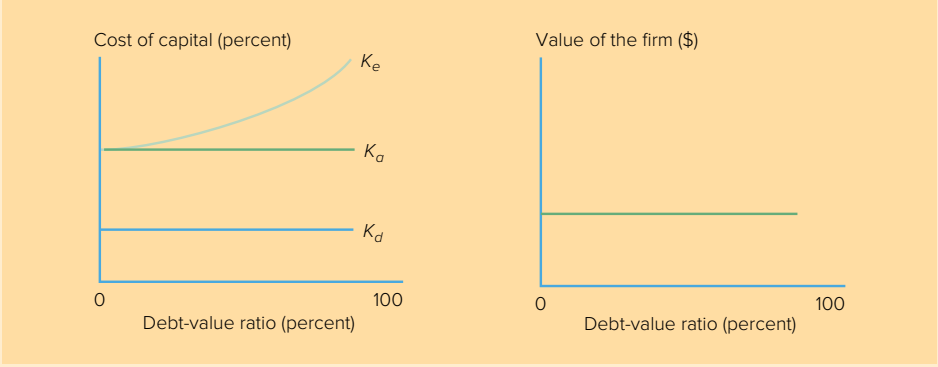


Figure 11B–2 Net operating income (NOI) approach

Finally, Professor Durand described the traditional approach to cost of capital, which lies somewhere between the net income approach and the net operating income approach. In the traditional approach, there are benefits from increased debt utilization, but only up to a point. After that point, the cost of capital begins to turn up and the valuation of the firm begins to turn down. A graphical representation of the traditional approach is seen in Figure 11B–3.

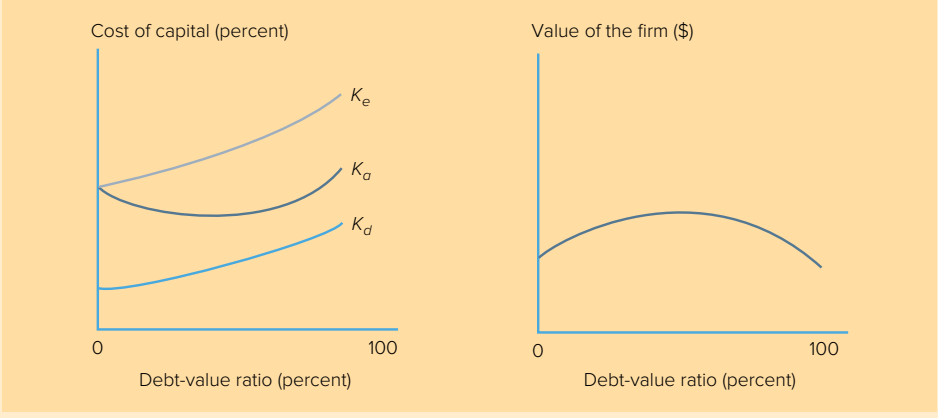


Figure 11B–3 Traditional approach as described by Durand

The student will perhaps realize that the traditional approach described by Durand in 1952 is similar to what is accepted today (as described in the main body of the chapter), but the many theories of Modigliani and Miller had a major impact as we went from 1952 to the currently existing theory.

Modigliani and Miller's Initial Approach

The approaches described by Durand were largely unsupported by theories and mathematical proofs. The major contribution by Modigliani and Miller (M&M) was to add economic and financial theories to naive assumptions. Although it is beyond the

scope of this text to go through all the various mathematical proofs of M&M, their basic positions are presented.

Under the initial M& M approach, it is assumed that the value of the firm and its cost of capital are independent of the means of financing that occurs. This is similar to the NOI approach described by Durand, but the rationale or mechanism for arriving at this conclusion is different.

M&M stipulate that the value of the firm equals the following:

$$V = \frac{\text{EBIT}}{K_a} \quad \text{(11B–1)}$$

Where

$\boldsymbol{V}$ = Value
$\boldsymbol{EBIT}$ = Earnings before interest and taxes
$\boldsymbol{K_a}$ = Cost of capital

They further stipulate that

$$K_a = K_{eu} \quad \text{(11B–2)}$$

Where $\boldsymbol{K_{eu}}$ represents the cost of equity for an unlevered firm (one with no debt).

But what if a firm decides to include debt in its capital structure? Then the cost of equity for this leveraged firm increases by a risk premium to compensate for the additional risk associated with the debt.

$$K_{eL} = K_{eu} + \text{Risk premium}$$
$$K_{eL} = K_{eu} + (K_{eu} - I)(D/S) \quad \text{(11B–3)}$$

$\boldsymbol{K_{eL}}$ represents the cost of equity to the leveraged firm, $\boldsymbol{I}$ is the interest rate on the debt, $\boldsymbol{D}$ is the amount of debt financing, $\boldsymbol{S}$ is the amount of stock (equity) financing. The actual symbols aren't important for our purposes. The important point to observe in formula 11B–3 is that a risk premium is associated with the cost of equity financing ($\boldsymbol{K_e}$) when leverage is involved.

M&M thus say a firm cannot reduce the cost of capital or increase the valuation of the firm, because any benefits from cheaper debt are offset by the increased cost of equity financing. That is,

$$K_{eL} = K_{eu} + \text{Risk premium}$$

M&M then go on to demonstrate that if a leveraged firm could increase its value over another firm not using leverage (when all else is equal in terms of operating performance), then investors would simply sell the overpriced leverage firm and use homemade leverage (borrow on their own) to buy the underpriced, unleveraged firm's stock. Since both firms are equal in operating performance, investors would simply arbitrage between the values of the two to bring them into equilibrium (sell the overpriced firm and buy the underpriced one using their own personally borrowed funds as part of the process).

In summary, under the initial M&M hypothesis, the value of a firm and its cost of capital are unaffected by the firm's capital structure.

Modigliani and Miller with the Introduction of Corporate Taxes

As is true of many economic models, M&M made a number of assumptions in their initial theory of cost of capital that tended to simplify the analysis. The most critical simplifying assumption was to ignore the impact of corporate taxes on the cost of capital to the firm. (Durand made similar simplifying assumptions.) Once M&M began to consider the effect of taxes, their whole outlook changed. Because interest on debt is a tax-deductible expense, the tax effect greatly reduces the cost of debt and the associated cost of capital. Furthermore, with a reduced cost of capital, there is an increased valuation for the firm.

A key adjustment to a basic valuation formula is that

$$V_L = V_U + TD \quad \text{(11B–4)}$$

Formula 11B–4 says the value of a leveraged firm (V_L) is equal to the value of an unleveraged firm (V_U), plus an amount equal to the corporate tax rate (T) times the amount of debt (D) the firm has. If an unleveraged firm has a value of $1,000,000 ($V_U$), then a leveraged firm with $400,000 in debt and a tax rate of 34 percent will have a value of $1,136,000.

$$\begin{aligned} V_L &= V_U + TD \\ &= \$1{,}000{,}000 + 0.34\ (\$400{,}000) \\ &= \$1{,}000{,}000 + \$136{,}000 \\ &= \$1{,}136{,}000 \end{aligned}$$

A firm with $600,000 in debt has a value of $1,204,000, and so on.

$$\begin{aligned} V_L &= V_U + TD \\ &= \$1{,}000{,}000 + 0.34\ (\$600{,}000) \\ &= \$1{,}000{,}000 + \$204{,}000 \\ &= \$1{,}204{,}000 \end{aligned}$$

Graphically, we are led to the positions presented in Figure 11B–4.

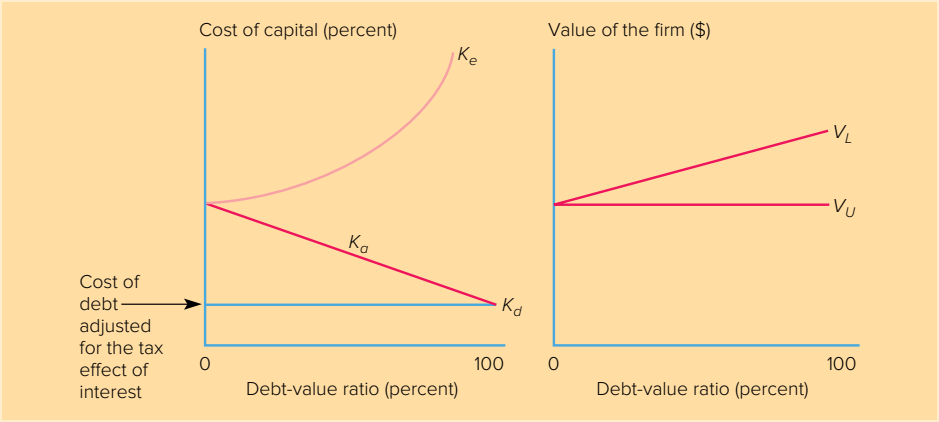


Figure 11B–4 Modigliani and Miller with corporate taxes

As can be seen in the figure, once corporate taxes are introduced, it is assumed that every increment of debt reduces the cost of capital, eventually down to the cost of debt itself. Furthermore, the more debt a firm has, the higher its valuation.[13]

Under the second version of M&M, every firm should be 100 percent (perhaps 99.9%) financed by debt to lower its cost of capital and increase its valuation. With corporate taxes our cost of equity capital becomes

$$K_{eL} = K_{eu} + (K_{eu} - 1)(D/S)(1 - T) \quad \text{(11B–5)}$$

Modigliani and Miller with Bankruptcy Considerations

Since no firm or investor in the real world operates on the basis of the just-described M&M hypothesis, there must be some missing variables. One of the disadvantages of heavy borrowing is that the firm may eventually go bankrupt (a topic discussed in Appendix 16A). A firm that does not borrow has ***no*** such threat. Other things being equal, the threat of bankruptcy increases as the amount of borrowing increases.

[13]The only constraint to this proposition is that the amount of debt cannot exceed the amount of assets.

When bankruptcy occurs, the firm may be forced to sell assets at a fraction of their value. Furthermore, there are likely to be substantial legal fees, court costs, and administrative expenses. Even if a firm does not go bankrupt but is on the verge of bankruptcy, customers may hesitate to do business with the firm. Suppliers may demand advanced payments, and so on.

Also, as a firm increases the amount of debt it has, there are likely to be restrictive covenants or provisions in debt agreements that hinder the normal operations of the firm (the current ratio must be at a given level or no new projects can be undertaken without lender approval).

All of these bankruptcy-related considerations have an implicit cost. If the potential cost of bankruptcy were $10 million, then the probability of that bankruptcy must also be considered. Of course, if the firm has no debt, then the probability of bankruptcy is zero and the obvious cost is zero. If the firm has 50 percent debt, there may be a 10 percent probability of bankruptcy and the expected cost is $1 million ($10,000,000 × 10%). Finally, with 90 percent debt, there may be a 25 percent probability of bankruptcy and the expected cost is $2.5 million ($10,000,000 × 25%). Once these expected costs of bankruptcy are present valued, they must be deducted from the current, unadjusted value of the firm to determine true value. Similarly, the expected value of the threat of future bankruptcy also tends to increase the cost of capital to the firm as progressively more debt is utilized.

In Figure 11B–5, we combine the effect of the corporate tax advantage (M&M II) with the effect of the bankruptcy threat (M&M III) to show the impact of financial leverage on the cost of capital and valuation of the firm.

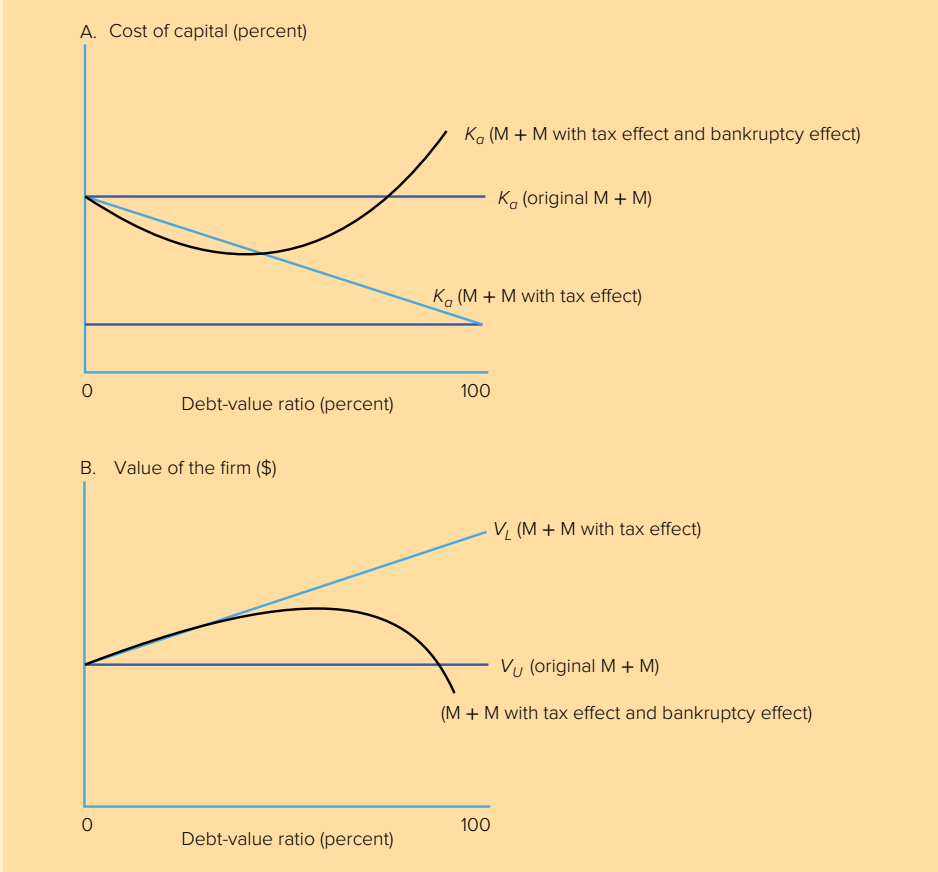


Figure 11B–5 Combined impact of the corporate tax effect and bankruptcy effect on valuation and cost of capital

As you can see in panel A of the figure, the black line, which combines the tax effect with the bankruptcy effect, takes us all the way back to the proposition first discussed in the main body of the chapter, which is that cost of capital tends to be U-shaped in nature. We have simply added some additional theory to support this proposition. In panel B, we also see from the black line that the combined effect of taxation and bankruptcy allows the firm to maximize valuation at a given debt level and then the valuation begins to diminish.

The Miller Model

As if to temporarily confuse an already settled issue, Professor Miller announced at the annual meeting of the American Finance Association in 1976 that he was rejecting his own latest version of the M&M hypothesis (M&M III, as indicated by the black lines in Figure 11B–5).[14] His new premise was that he had considered corporate taxes but not personal taxes in the earlier M&M models. He suggested that, when one began considering personal taxes in the process, share ownership had substantial advantages over debt ownership. Why? Because, at the time, gains from share ownership were potentially taxed at a much lower rate than interest income, due to the capital gains component that was part of the anticipated return to shareholders. Long-term capital gains have traditionally been taxed at a rate lower than other income. Miller said that once you factored all tax considerations (corporate and personal) into the analysis, there was not an overall advantage to debt utilization to the firm, and therefore, the cost of capital was unaffected by the capital structure of the firm.

Subsequent research has partially taken issue with Professor Miller. We can somewhat safely return to the U-shaped approach generally described in the chapter and in this appendix.

REVIEW OF FORMULAS

1. $$V = \frac{\text{EBIT}}{K_a} \quad \text{(11B–1)}$$

2. $$K_a = K_{eu} \quad \text{(11B–2)}$$

3. $$K_{eL} = K_{eu} + (K_{eu} - I)(D/S) \quad \text{(11B–3)}$$

4. $$V_L = V_U + TD \quad \text{(11B–4)}$$

5. $$K_{eL} = K_{eu} + (K_{eu} - 1)(D/S)(1 - T) \quad \text{(11B–5)}$$

DISCUSSION QUESTIONS

11B–1. What is the difference between the net income (NI) approach, the net operating income (NOI) approach, and the traditional approach?

11B–2. Under the initial M&M approach, does the use of debt affect the cost of capital? Explain.

11B–3. How do corporate taxes and bankruptcy considerations change the initial M&M approach? What is the net effect?

[14]Merton H. Miller, "Debt and Taxes," *Journal of Finance*, May 1977, pp. 261–75.