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.

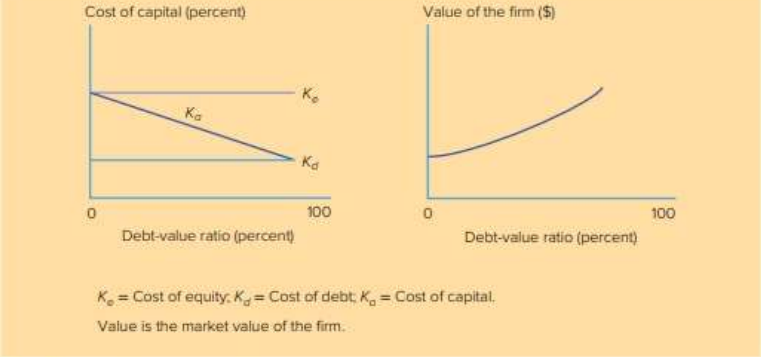

Figure 11B–1 Net income (NI) approach

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.

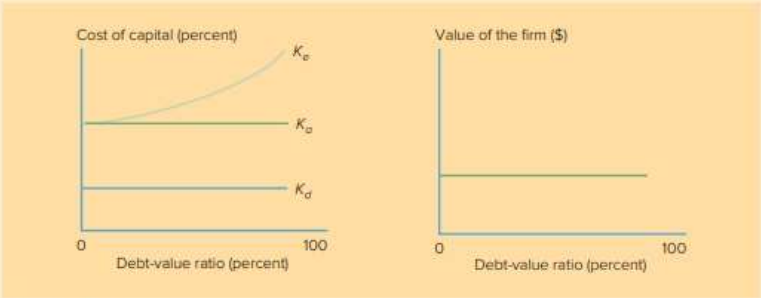

Figure 11B–2 Net operating income (NOI) approach

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.

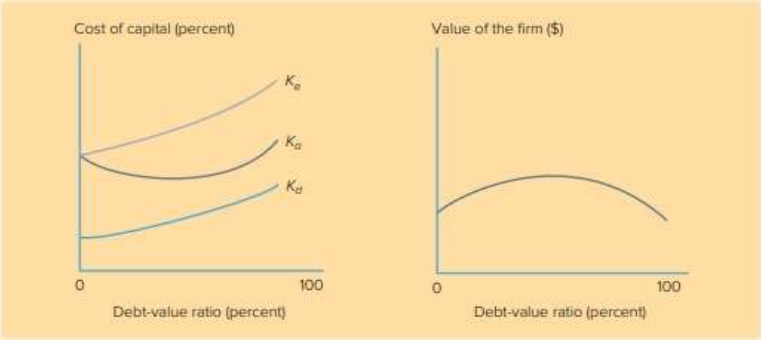

Figure 11B–3 Traditional approach as described by Durand

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:

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

Where

V = Value
$EBIT$ = Earnings before interest and taxes
K_a = Cost of capital

They further stipulate that

$$K_a = K_{eu} \quad (11B\text{–}2)$$

Where 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.

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

K_{eL} represents the cost of equity to the leveraged firm, I is the interest rate on the debt, D is the amount of debt financing, 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 (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.

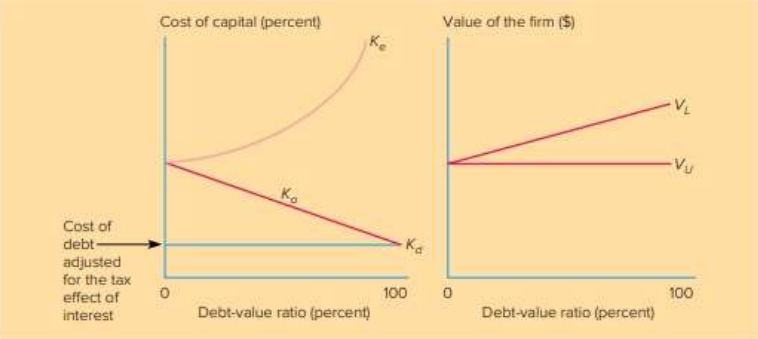

Figure 11B–4 Modigliani and Miller with corporate taxes

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.

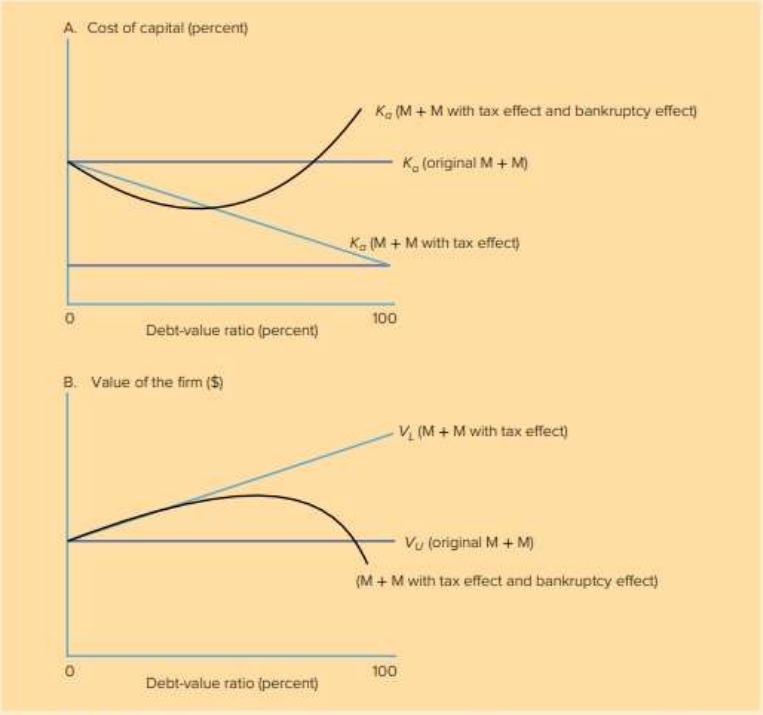

Figure 11B–5 Combined impact of the corporate tax effect and bankruptcy effect on valuation and cost of capital

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.