

Questions

- (9-1) Define each of the following terms:
- Weighted average cost of capital, WACC; after-tax cost of debt, $r_d(1 - T)$
 - Cost of preferred stock, r_{ps} ; cost of common equity (or cost of common stock), r_s
 - Target capital structure
 - Flotation cost, F ; cost of new external common equity, r_e
- (9-2) How can the WACC be both an average cost and a marginal cost?
- (9-3) How would each of the factors in the following table affect a firm's cost of debt, $r_d(1 - T)$; its cost of equity, r_s ; and its weighted average cost of capital, WACC? Indicate by a plus (+), a minus (-), or a zero (0) if the factor would raise, lower, or have an indeterminate effect on the item in question. Assume that all other factors are held constant. Be prepared to justify your answer, but recognize that several of the parts probably have no single correct answer; these questions are designed to stimulate thought and discussion.

	EFFECT ON:		
	$r_d(1 - T)$	r_s	WACC
a. The corporate tax rate is lowered.	_____	_____	_____
b. The Federal Reserve tightens credit.	_____	_____	_____
c. The firm uses more debt.	_____	_____	_____
d. The firm doubles the amount of capital it raises during the year.	_____	_____	_____
e. The firm expands into a risky new area.	_____	_____	_____
f. Investors become more risk averse.	_____	_____	_____

- (9-4) Distinguish between beta (or market) risk, within-firm (or corporate) risk, and stand-alone risk for a potential project. Of the three measures, which is theoretically the most relevant, and why?
- (9-5) Suppose a firm estimates its overall cost of capital for the coming year to be 10%. What might be reasonable costs of capital for average-risk, high-risk, and low-risk projects?

Self-Test Problem

Solution Appears in Appendix A

- (ST-1) Longstreet Communications Inc. (LCI) has the following capital structure, which it considers to be optimal: debt = 25%, preferred stock = 15%, and common stock = 60%. LCI's tax rate is 40%, and investors expect earnings and dividends to grow at a constant rate of 6% in the future. LCI paid a dividend of \$3.70 per share last year (D_0), and its stock currently sells at a price of \$60 per share. Ten-year Treasury bonds yield 6%, the market risk premium is 5%, and LCI's beta is 1.3. The following terms would apply to new security offerings.

Preferred: New preferred could be sold to the public at a price of \$100 per share, with a dividend of \$9. Flotation costs of \$5 per share would be incurred.

Debt: Debt could be sold at an interest rate of 9%.

Common: New common equity will be raised only by retaining earnings.

- Find the component costs of debt, preferred stock, and common stock.
- What is the WACC?

Problems

Answers Appear in Appendix B

EASY PROBLEMS 1–8

- (9–1) Calculate the after-tax cost of debt under each of the following conditions:
After-Tax Cost of Debt
- Interest rate of 13%, tax rate of 0%
 - Interest rate of 13%, tax rate of 20%
 - Interest rate of 13%, tax rate of 35%
- (9–2) LL Incorporated's currently outstanding 11% coupon bonds have a yield to maturity of 8%. LL believes it could issue new bonds at par that would provide a similar yield to maturity. If its marginal tax rate is 35%, what is LL's after-tax cost of debt?
After-Tax Cost of Debt
- (9–3) Duggins Veterinary Supplies can issue perpetual preferred stock at a price of \$50 a share with an annual dividend of \$4.50 a share. Ignoring flotation costs, what is the company's cost of preferred stock, r_{ps} ?
Cost of Preferred Stock
- (9–4) Burnwood Tech plans to issue some \$60 par preferred stock with a 6% dividend. A similar stock is selling on the market for \$70. Burnwood must pay flotation costs of 5% of the issue price. What is the cost of the preferred stock?
Cost of Preferred Stock with Flotation Costs
- (9–5) Summerdahl Resort's common stock is currently trading at \$36 a share. The stock is expected to pay a dividend of \$3.00 a share at the end of the year ($D_1 = \$3.00$), and the dividend is expected to grow at a constant rate of 5% a year. What is its cost of common equity?
Cost of Equity: DCF
- (9–6) Booher Book Stores has a beta of 0.8. The yield on a 3-month T-bill is 4% and the yield on a 10-year T-bond is 6%. The market risk premium is 5.5%, and the return on an average stock in the market last year was 15%. What is the estimated cost of common equity using the CAPM?
Cost of Equity: CAPM
- (9–7) Shi Importer's balance sheet shows \$300 million in debt, \$50 million in preferred stock, and \$250 million in total common equity. Shi's tax rate is 40%, $r_d = 6%$, $r_{ps} = 5.8%$, and $r_s = 12%$. If Shi has a target capital structure of 30% debt, 5% preferred stock, and 65% common stock, what is its WACC?
WACC
- (9–8) David Ortiz Motors has a target capital structure of 40% debt and 60% equity. The yield to maturity on the company's outstanding bonds is 9%, and the company's tax rate is 40%. Ortiz's CFO has calculated the company's WACC as 9.96%. What is the company's cost of equity capital?
WACC

INTERMEDIATE
PROBLEMS 9–14

- (9–9) A company's 6% coupon rate, semiannual payment, \$1,000 par value bond that matures in 30 years sells at a price of \$515.16. The company's federal-plus-state tax rate is 40%. What is the firm's after-tax component cost of debt for purposes of calculating the WACC? (*Hint*: Base your answer on the *nominal* rate.)
Bond Yield and After-Tax Cost of Debt
- (9–10) The earnings, dividends, and stock price of Shelby Inc. are expected to grow at 7% per year in the future. Shelby's common stock sells for \$23 per share, its last dividend was \$2.00, and the company will pay a dividend of \$2.14 at the end of the current year.
Cost of Equity

- Using the discounted cash flow approach, what is its cost of equity?
- If the firm's beta is 1.6, the risk-free rate is 9%, and the expected return on the market is 13%, then what would be the firm's cost of equity based on the CAPM approach?
- If the firm's bonds earn a return of 12%, then what would be your estimate of r_s using the over-own-bond-yield-plus-judgmental-risk-premium approach? (*Hint: Use the midpoint of the risk premium range.*)
- On the basis of the results of parts a through c, what would be your estimate of Shelby's cost of equity?

(9-11)
Cost of Equity

Radon Homes' current EPS is \$6.50. It was \$4.42 five years ago. The company pays out 40% of its earnings as dividends, and the stock sells for \$36.

- Calculate the historical growth rate in earnings. (*Hint: This is a 5-year growth period.*)
- Calculate the *next* expected dividend per share, D_1 . (*Hint: $D_0 = 0.4(\$6.50) = \2.60 .*) Assume that the past growth rate will continue.
- What is Radon Homes' cost of equity, r_s ?

(9-12)
Calculation of g and
EPS

Spencer Supplies' stock is currently selling for \$60 a share. The firm is expected to earn \$5.40 per share this year and to pay a year-end dividend of \$3.60.

- If investors require a 9% return, what rate of growth must be expected for Spencer?
- If Spencer reinvests earnings in projects with average returns equal to the stock's expected rate of return, then what will be next year's EPS? (*Hint: $g = \text{ROE} \times \text{Retention ratio}$.*)

(9-13)
The Cost of Equity and
Flotation Costs

Messman Manufacturing will issue common stock to the public for \$30. The expected dividend and the growth in dividends are \$3.00 per share and 5%, respectively. If the flotation cost is 10% of the issue's gross proceeds, what is the cost of external equity, r_e ?

(9-14)
The Cost of Debt and
Flotation Costs

Suppose a company will issue new 20-year debt with a par value of \$1,000 and a coupon rate of 9%, paid annually. The tax rate is 40%. If the flotation cost is 2% of the issue proceeds, then what is the after-tax cost of debt? Disregard the tax shield from the amortization of flotation costs.

CHALLENGING
PROBLEMS 15-17

(9-15)
WACC Estimation

On January 1, the total market value of the Tysseland Company was \$60 million. During the year, the company plans to raise and invest \$30 million in new projects. The firm's present market value capital structure, shown below, is considered to be optimal. There is no short-term debt.

Debt	\$30,000,000
Common equity	<u>30,000,000</u>
Total capital	<u>\$60,000,000</u>

New bonds will have an 8% coupon rate, and they will be sold at par. Common stock is currently selling at \$30 a share. The stockholders' required rate of return is estimated to be 12%, consisting of a dividend yield of 4% and an expected constant growth rate of 8%. (The next expected dividend is \$1.20, so the dividend yield is $\$1.20/\$30 = 4\%$.) The marginal tax rate is 40%.

- In order to maintain the present capital structure, how much of the new investment must be financed by common equity?
- Assuming there is sufficient cash flow for Tysseland to maintain its target capital structure without issuing additional shares of equity, what is its WACC?
- Suppose now that there is not enough internal cash flow and the firm must issue new shares of stock. Qualitatively speaking, what will happen to the WACC? No numbers are required to answer this question.

(9-16)

Market Value Capital Structure

Suppose the Schoof Company has this *book value* balance sheet:

Current assets	\$30,000,000	Current liabilities	\$10,000,000
Fixed assets	50,000,000	Long-term debt	30,000,000
		Common equity	
		Common stock	
		(1 million shares)	1,000,000
		Retained earnings	<u>39,000,000</u>
Total assets	<u>\$80,000,000</u>	Total claims	<u>\$80,000,000</u>

The current liabilities consist entirely of notes payable to banks, and the interest rate on this debt is 10%, the same as the rate on new bank loans. These bank loans are not used for seasonal financing but instead are part of the company's permanent capital structure. The long-term debt consists of 30,000 bonds, each with a par value of \$1,000, an annual coupon interest rate of 6%, and a 20-year maturity. The going rate of interest on new long-term debt, r_d , is 10%, and this is the present yield to maturity on the bonds. The common stock sells at a price of \$60 per share. Calculate the firm's *market value* capital structure.

(9-17)

WACC Estimation

The table below gives the balance sheet for Travellers Inn Inc. (TII), a company that was formed by merging a number of regional motel chains.

Travellers Inn: December 31, 2009 (Millions of Dollars)

Cash	\$ 10	Accounts payable	\$ 10
Accounts receivable	20	Accruals	10
Inventories	<u>20</u>	Short-term debt	<u>5</u>
Current assets	\$ 50	Current liabilities	\$ 25
Net fixed assets	50	Long-term debt	30
		Preferred stock	5
		Common equity	
		Common stock	\$ 10
		Retained earnings	<u>30</u>
		Total common equity	<u>\$ 40</u>
Total assets	<u>\$100</u>	Total liabilities and equity	<u>\$100</u>

The following facts also apply to TII.

- Short-term debt consists of bank loans that currently cost 10%, with interest payable quarterly. These loans are used to finance receivables and inventories on a seasonal basis, so bank loans are zero in the off-season.

- (2) The long-term debt consists of 20-year, semiannual payment mortgage bonds with a coupon rate of 8%. Currently, these bonds provide a yield to investors of $r_d = 12\%$. If new bonds were sold, they would have a 12% yield to maturity.
- (3) TII's perpetual preferred stock has a \$100 par value, pays a quarterly dividend of \$2, and has a yield to investors of 11%. New perpetual preferred would have to provide the same yield to investors, and the company would incur a 5% flotation cost to sell it.
- (4) The company has 4 million shares of common stock outstanding. $P_0 = \$20$, but the stock has recently traded in the price range from \$17 to \$23. $D_0 = \$1$ and $EPS_0 = \$2$. ROE based on average equity was 24% in 2008, but management expects to increase this return on equity to 30%; however, security analysts and investors generally are not aware of management's optimism in this regard.
- (5) Betas, as reported by security analysts, range from 1.3 to 1.7; the T-bond rate is 10%; and RP_M is estimated by various brokerage houses to be in the range from 4.5% to 5.5%. Some brokerage house analysts report forecasted growth dividend growth rates in the range of 10% to 15% over the foreseeable future.
- (6) TII's financial vice president recently polled some pension fund investment managers who hold TII's securities regarding what minimum rate of return on TII's common would make them willing to buy the common rather than TII bonds, given that the bonds yielded 12%. The responses suggested a risk premium over TII bonds of 4 to 6 percentage points.
- (7) TII is in the 40% federal-plus-state tax bracket.
- (8) TII's principal investment banker predicts a decline in interest rates, with r_d falling to 10% and the T-bond rate to 8%, although the bank acknowledges that an increase in the expected inflation rate could lead to an increase rather than a decrease in interest rates.

Assume that you were recently hired by TII as a financial analyst and that your boss, the treasurer, has asked you to estimate the company's WACC under the assumption that no new equity will be issued. Your cost of capital should be appropriate for use in evaluating projects that are in the same risk class as the assets TII now operates.

SPREADSHEET PROBLEM

(9-18)

Build a Model: WACC



Start with the partial model in the file *Cb09 P18 Build a Model.xls* on the textbook's Web site. The stock of Gao Computing sells for \$50, and last year's dividend was \$2.10. A flotation cost of 10% would be required to issue new common stock. Gao's preferred stock pays a dividend of \$3.30 per share, and new preferred could be sold at a price to net the company \$30 per share. Security analysts are projecting that the common dividend will grow at a rate of 7% a year. The firm can issue additional long-term debt at an interest rate (or a before-tax cost) of 10%, and its marginal tax rate is 35%. The market risk premium is 6%, the risk-free rate is 6.5%, and Gao's beta is 0.83. In its cost-of-capital calculations, Gao uses a target capital structure with 45% debt, 5% preferred stock, and 50% common equity.

- a. Calculate the cost of each capital component—in other words, the after-tax cost of debt, the cost of preferred stock (including flotation costs), and the cost of equity (ignoring flotation costs). Use both the DCF method and the CAPM method to find the cost of equity.
- b. Calculate the cost of new stock using the DCF model.

- c. What is the cost of new common stock based on the CAPM? (*Hint*: Find the difference between r_e and r_s as determined by the DCF method and then add that difference to the CAPM value for r_s .)
- d. Assuming that Gao will not issue new equity and will continue to use the same target capital structure, what is the company's WACC?
- e. Suppose Gao is evaluating three projects with the following characteristics.
 - (1) Each project has a cost of \$1 million. They will all be financed using the target mix of long-term debt, preferred stock, and common equity. The cost of the common equity for each project should be based on the beta estimated for the project. All equity will come from reinvested earnings.
 - (2) Equity invested in Project A would have a beta of 0.5 and an expected return of 9.0%.
 - (3) Equity invested in Project B would have a beta of 1.0 and an expected return of 10.0%.
 - (4) Equity invested in Project C would have a beta of 2.0 and an expected return of 11.0%.
- f. Analyze the company's situation and explain why each project should be accepted or rejected.

THOMSON ONE | Business School Edition Problem

Use the Thomson ONE—Business School Edition online database to work this chapter's questions.

CALCULATING 3M'S COST OF CAPITAL

In this chapter we described how to estimate a company's WACC, which is the weighted average of its costs of debt, preferred stock, and common equity. Most of the data we need to do this can be found in Thomson ONE. Here, we walk through the steps used to calculate Minnesota Mining & Manufacturing's (MMM) WACC.

Thomson ONE—BSE Discussion Questions

1. As a first step we need to estimate what percentage of MMM's capital comes from long-term debt, preferred stock, and common equity. If we click on FINANCIALS, we can see immediately from the balance sheet the amount of MMM's long-term debt and common equity (as of mid-2008, MMM had no preferred stock). Alternatively, you can click on FUNDAMENTAL RATIOS in the next row of tabs below and then select WORLDSCOPE'S BALANCE SHEET RATIOS. Here, you will also find a recent measure of long-term debt as a percentage of total capital.

Recall that the weights used in the WACC are based on the company's target capital structure. If we assume the company wants to maintain the same mix of capital that it currently has on its balance sheet, then what weights should you use to estimate the WACC for MMM? (In Chapter 15, we will see that we might arrive at different estimates for these weights if we assume that MMM bases its target capital structure on the market values, rather than the book values, of debt and equity.)

2. Once again, we can use the CAPM to estimate MMM's cost of equity. Thomson ONE provides various estimates of beta; select the measure that you believe is best and combine this with your estimates of the risk-free rate and the market risk premium to obtain an estimate of its cost of equity. (See the Thomson ONE exercise in Chapter 6 for more details.) What is your estimate for the cost of equity? Why might it not make much sense to use the DCF approach to estimate MMM's cost of equity?
3. Next, we need to calculate MMM's cost of debt. Unfortunately, Thomson ONE doesn't provide a direct measure of the cost of debt. However, we can use different approaches to estimate it. One approach is to take the company's long-term interest expense and divide it by the amount of long-term debt. This approach works only if the historical cost of debt equals the yield to maturity in today's market (that is, only if MMM's outstanding bonds are trading at close to par). This approach may produce misleading estimates in the years during which MMM issues a significant amount of new debt.

For example, if a company issues a lot of debt at the end of the year, then the full amount of debt will appear on the year-end balance sheet, yet we still may not see a sharp increase in interest expense on the annual income statement because the debt was outstanding for only a small portion of the entire year. When this situation occurs, the estimated cost of debt will likely understate the true cost of debt.

Another approach is to try to find this number in the notes to the company's annual report by accessing the company's home page and its Investor Relations section. Remember that you need the after-tax cost of debt to calculate a firm's WACC, so you will need MMM's average tax rate (which has been about 37% in recent years). What is your estimate of MMM's after-tax cost of debt?

4. Putting all this information together, what is your estimate of MMM's WACC? How confident are you in this estimate? Explain your answer.

Mini Case

During the last few years, Harry Davis Industries has been too constrained by the high cost of capital to make many capital investments. Recently, though, capital costs have been declining, and the company has decided to look seriously at a major expansion program proposed by the marketing department. Assume that you are an assistant to Leigh Jones, the financial vice president. Your first task is to estimate Harry Davis's cost of capital. Jones has provided you with the following data, which she believes may be relevant to your task:

- (1) The firm's tax rate is 40%.
- (2) The current price of Harry Davis's 12% coupon, semiannual payment, noncallable bonds with 15 years remaining to maturity is \$1,153.72. Harry Davis does not use short-term interest-bearing debt on a permanent basis. New bonds would be privately placed with no flotation cost.
- (3) The current price of the firm's 10%, \$100 par value, quarterly dividend, perpetual preferred stock is \$116.95. Harry Davis would incur flotation costs equal to 5% of the proceeds on a new issue.
- (4) Harry Davis's common stock is currently selling at \$50 per share. Its last dividend (D_0) was \$3.12, and dividends are expected to grow at a constant rate of 5.8% in the foreseeable future. Harry Davis's beta is 1.2, the yield on T-bonds is 5.6%, and the market risk premium is estimated to be 6%. For the over-own-bond-yield-plus-judgmental-risk-premium approach, the firm uses a 3.2% risk premium.