



3. **ROE and Leverage** Suppose the company in Problem 1 has a market-to-book ratio of 1.0.
1. Calculate return on equity, ROE, under each of the three economic scenarios before any debt is issued. Also calculate the percentage changes in ROE for economic expansion and recession, assuming no taxes.
 2. Repeat part (a) assuming the firm goes through with the proposed recapitalization.
 3. Repeat parts (a) and (b) of this problem assuming the firm has a tax rate of 35 percent.
4. **Break-Even EBIT** Rolston Corporation is comparing two different capital structures, an all-equity plan (Plan I) and a levered plan (Plan II). Under Plan I, Rolston would have 240,000 shares of stock outstanding. Under Plan II, there would be 160,000 shares of stock outstanding and \$3.1 million in debt outstanding. The interest rate on the debt is 10 percent and there are no taxes.
1. If EBIT is \$750,000, which plan will result in the higher EPS?
 2. If EBIT is \$1,500,000, which plan will result in the higher EPS?
 3. What is the break-even EBIT?
5. **MM and Stock Value** In Problem 4, use MM Proposition I to find the price per share of equity under each of the two proposed plans. What is the value of the firm?



6. **Break-Even EBIT and Leverage** Kolby Corp. is comparing two different capital structures. Plan I would result in 1,500 shares of stock and \$20,000 in debt. Plan II would result in 1,100 shares of stock and \$30,000 in debt. The interest rate on the debt is 10 percent.
1. Ignoring taxes, compare both of these plans to an all-equity plan assuming that EBIT will be \$12,000. The all-equity plan would result in 2,300 shares of stock outstanding. Which of the three plans has the highest EPS? The lowest?
 2. In part (a) what are the break-even levels of EBIT for each plan as compared to that for an all-equity plan? Is one higher than the other? Why?
 3. Ignoring taxes, when will EPS be identical for Plans I and II?
 4. Repeat parts (a), (b), and (c) assuming that the corporate tax rate is 40 percent. Are the break-even levels of EBIT different from before? Why or why not?
7. **Leverage and Stock Value** Ignoring taxes in Problem 6, what is the price per share of equity under Plan I? Plan II? What principle is illustrated by your answers?
8. **Homemade Leverage** Star, Inc., a prominent consumer products firm, is debating whether or not to convert its all-equity capital structure to one that is 40 percent debt. Currently there are 5,000 shares outstanding and the price per share is \$65. EBIT is expected to remain at \$37,500 per year forever. The interest rate on new debt is 8 percent, and there are no taxes.
1. Ms. Brown, a shareholder of the firm, owns 100 shares of stock. What is her cash flow under the current capital structure, assuming the firm has a dividend payout rate of 100 percent?
 2. What will Ms. Brown's cash flow be under the proposed capital structure of the firm? Assume that she keeps all 100 of her shares.
 3. Suppose Star does convert, but Ms. Brown prefers the current all-equity capital structure.

Show how she could unlever her shares of stock to recreate the original capital structure.

4. Using your answer to part (c), explain why Star's choice of capital structure is irrelevant.
9. **Homemade Leverage and WACC** ABC Co. and XYZ Co. are identical firms in all respects except for their capital structure. ABC is all equity financed with \$800,000 in stock. XYZ uses both stock and perpetual debt; its stock is worth \$400,000 and the interest rate on its debt is 10 percent. Both firms expect EBIT to be \$95,000. Ignore taxes.
 1. Richard owns \$30,000 worth of XYZ's stock. What rate of return is he expecting?
 2. Show how Richard could generate exactly the same cash flows and rate of return by investing in ABC and using homemade leverage.
 3. What is the cost of equity for ABC? What is it for XYZ?
 4. What is the WACC for ABC? For XYZ? What principle have you illustrated?
10. **MM** Nina Corp. uses no debt. The weighted average cost of capital is 11 percent. If the current market value of the equity is \$43 million and there are no taxes, what is EBIT?
11. **MM and Taxes** In the previous question, suppose the corporate tax rate is 35 percent. What is EBIT in this case? What is the WACC? Explain.



12. **Calculating WACC** Weston Industries has a debt-equity ratio of 1.5. Its WACC is 12 percent, and its cost of debt is 9 percent. The corporate tax rate is 35 percent.
 1. What is Weston's cost of equity capital?
 2. What is Weston's unlevered cost of equity capital?
 3. What would the cost of equity be if the debt-equity ratio were 2? What if it were 1.0? What if it were zero?
13. **Calculating WACC** Shadow Corp. has no debt but can borrow at 7 percent. The firm's WACC is currently 11 percent, and the tax rate is 35 percent.
 1. What is Shadow's cost of equity?
 2. If the firm converts to 25 percent debt, what will its cost of equity be?
 3. If the firm converts to 50 percent debt, what will its cost of equity be?
 4. What is Shadow's WACC in part (b)? In part (c)?
14. **MM and Taxes** Bruce & Co. expects its EBIT to be \$140,000 every year forever. The firm can borrow at 9 percent. Bruce currently has no debt, and its cost of equity is 17 percent. If the tax rate is 35 percent, what is the value of the firm? What will the value be if Bruce borrows \$135,000 and uses the proceeds to repurchase shares?
15. **MM and Taxes** In Problem 14, what is the cost of equity after recapitalization? What is the WACC? What are the implications for the firm's capital structure decision?



16. **MM Proposition I** Levered, Inc., and Unlevered, Inc., are identical in every way except their capital structures. Each company expects to earn \$65 million before interest per year in perpetuity, with each company distributing all its earnings as dividends. Levered's perpetual debt has a market

value of \$185 million and costs 8 percent per year. Levered has 3.4 million shares outstanding, currently worth \$100 per share. Unlevered has no debt and 7 million shares outstanding, currently worth \$80 per share. Neither firm pays taxes. Is Levered's stock a better buy than Unlevered's stock?

INTERMEDIATE (Questions 17–25)

17. **MM** Tool Manufacturing has an expected EBIT of \$42,000 in perpetuity and a tax rate of 35 percent. The firm has \$70,000 in outstanding debt at an interest rate of 8 percent, and its unlevered cost of capital is 15 percent. What is the value of the firm according to MM Proposition I with taxes? Should Tool change its debt–equity ratio if the goal is to maximize the value of the firm? Explain.
18. **Firm Value** Old School Corporation expects an EBIT of \$15,000 every year forever. Old School currently has no debt, and its cost of equity is 17 percent. The firm can borrow at 10 percent. If the corporate tax rate is 35 percent, what is the value of the firm? What will the value be if Old School converts to 50 percent debt? To 100 percent debt?
19. **MM Proposition I with Taxes** The Maxwell Company is financed entirely with equity. The company is considering a loan of \$1.4 million. The loan will be repaid in equal installments over the next two years, and it has an 8 percent interest rate. The company's tax rate is 35 percent. According to MM Proposition I with taxes, what would be the increase in the value of the company after the loan?
20. **MM Proposition I without Taxes** Alpha Corporation and Beta Corporation are identical in every way except their capital structures. Alpha Corporation, an all-equity firm, has 10,000 shares of stock outstanding, currently worth \$20 per share. Beta Corporation uses leverage in its capital structure. The market value of Beta's debt is \$50,000, and its cost of debt is 12 percent. Each firm is expected to have earnings before interest of \$55,000 in perpetuity. Neither firm pays taxes. Assume that every investor can borrow at 12 percent per year.
 1. What is the value of Alpha Corporation?
 2. What is the value of Beta Corporation?
 3. What is the market value of Beta Corporation's equity?
 4. How much will it cost to purchase 20 percent of each firm's equity?
 5. Assuming each firm meets its earnings estimates, what will be the dollar return to each position in part (d) over the next year?
 6. Construct an investment strategy in which an investor purchases 20 percent of Alpha's equity and replicates both the cost and dollar return of purchasing 20 percent of Beta's equity.
 7. Is Alpha's equity more or less risky than Beta's equity? Explain.
21. **Cost of Capital** Acetate, Inc., has equity with a market value of \$35 million and debt with a market value of \$14 million. Treasury bills that mature in one year yield 6 percent per year, and the expected return on the market portfolio is 13 percent. The beta of Acetate's equity is 1.15. The firm pays no taxes.
 1. What is Acetate's debt–equity ratio?
 2. What is the firm's weighted average cost of capital?
 3. What is the cost of capital for an otherwise identical all-equity firm?
22. **Homemade Leverage** The Veblen Company and the Knight Company are identical in every respect except that Veblen is not levered. The market value of Knight Company's 6 percent bonds is \$1.2 million. Financial information for the two firms appears here. All earnings streams are

perpetuities. Neither firm pays taxes. Both firms distribute all earnings available to common stockholders immediately.

	Veblen	Knight
Projected operating income	\$ 400,000	\$ 400,000
Year-end interest on debt	—	72,000
Market value of stock	3,600,000	2,532,000
Market value of debt	—	1,200,000

1. An investor who can borrow at 6 percent per year wishes to purchase 5 percent of Knight's equity. Can he increase his dollar return by purchasing 5 percent of Veblen's equity if he borrows so that the initial net costs of the two strategies are the same?
 2. Given the two investment strategies in (a), which will investors choose? When will this process cease?
23. **MM Propositions** Locomotive Corporation is planning to repurchase part of its common stock by issuing corporate debt. As a result, the firm's debt-equity ratio is expected to rise from 40 percent to 50 percent. The firm currently has \$4.3 million worth of debt outstanding. The cost of this debt is 10 percent per year. Locomotive expects to have an EBIT of \$1.68 million per year in perpetuity. Locomotive pays no taxes.
1. What is the market value of Locomotive Corporation before and after the repurchase announcement?
 2. What is the expected return on the firm's equity before the announcement of the stock repurchase plan?
 3. What is the expected return on the equity of an otherwise identical all-equity firm?
 4. What is the expected return on the firm's equity after the announcement of the stock repurchase plan?
24. **Stock Value and Leverage** Green Manufacturing, Inc., plans to announce that it will issue \$3 million of perpetual debt and use the proceeds to repurchase common stock. The bonds will sell at par with a 6 percent annual coupon rate. Green is currently an all-equity firm worth \$9.5 million with 600,000 shares of common stock outstanding. After the sale of the bonds, Green will maintain the new capital structure indefinitely. Green currently generates annual pretax earnings of \$1.8 million. This level of earnings is expected to remain constant in perpetuity. Green is subject to a corporate tax rate of 40 percent.
1. What is the expected return on Green's equity before the announcement of the debt issue?
 2. Construct Green's market value balance sheet before the announcement of the debt issue. What is the price per share of the firm's equity?
 3. Construct Green's market value balance sheet immediately after the announcement of the debt issue.
 4. What is Green's stock price per share immediately after the repurchase announcement?
 5. How many shares will Green repurchase as a result of the debt issue? How many shares of common stock will remain after the repurchase?
 6. Construct the market value balance sheet after the restructuring.
 7. What is the required return on Green's equity after the restructuring?

25. **MM with Taxes** Williamson, Inc., has a debt–equity ratio of 2.5. The firm’s weighted average cost of capital is 15 percent, and its pretax cost of debt is 10 percent. Williamson is subject to a corporate tax rate of 35 percent.
1. What is Williamson’s cost of equity capital?
 2. What is Williamson’s unlevered cost of equity capital?
 3. What would Williamson’s weighted average cost of capital be if the firm’s debt–equity ratio were .75? What if it were 1.5?

CHALLENGE (Questions 26–30)

26. **Weighted Average Cost of Capital** In a world of corporate taxes only, show that the R_{WACC} can be written as $R_{WACC} = R_0 \times [1 - t_c(B/V)]$.
27. **Cost of Equity and Leverage** Assuming a world of corporate taxes only, show that the cost of equity, R_S , is as given in the chapter by MM Proposition II with corporate taxes.
28. **Business and Financial Risk** Assume a firm’s debt is risk-free, so that the cost of debt equals the risk-free rate, R_f . Define β_A as the firm’s asset beta—that is, the systematic risk of the firm’s assets. Define β_S to be the beta of the firm’s equity. Use the capital asset pricing model, CAPM, along with MM Proposition II to show that $\beta_S = \beta_A \times (1 + B/S)$, where B/S is the debt–equity ratio. Assume the tax rate is zero.
29. **Stockholder Risk** Suppose a firm’s business operations mirror movements in the economy as a whole very closely—that is, the firm’s asset beta is 1.0. Use the result of previous problem to find the equity beta for this firm for debt–equity ratios of 0, 1, 5, and 20. What does this tell you about the relationship between capital structure and shareholder risk? How is the shareholders’ required return on equity affected? Explain.
30. **Unlevered Cost of Equity** Beginning with the cost of capital equation—that is:

$$R_{WACC} = \frac{S}{B + S}R_S + \frac{B}{B + S}R_B$$

show that the cost of equity capital for a levered firm can be written as follows:

$$R_S = R_0 + \frac{B}{S}(R_0 - R_B)$$

S&P PROBLEMS



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1. Locate the annual balance sheets for General Motors (GM), Merck (MRK), and Kellogg (K). For each company calculate the long-term debt–equity ratio for the prior two years. Why would these companies use such different capital structures?
2. Look up a company and download the annual income statements. For the most recent year, calculate the average tax rate and EBIT, and find the total interest expense. From the annual balance sheets calculate the total long-term debt (including the portion due within one year). Using the interest expense and total long-term debt, calculate the average cost of debt. Next, find the estimated beta for the company on the S&P Stock Report. Use this reported beta, a current T-bill rate, and the historical average market risk premium found in a previous chapter to calculate the