Chapter 12

Capital Structure

Answers to Concept Review Questions

1. Long-term interest rates have declined dramatically over the past two decades. What impact do you think this has had on the incentive for corporations to employ financial leverage?

The decline in interest rates has lowered the overall cost of capital for companies, but in theory (assuming away the impact of corporate taxes) this decline has not affected the corporate incentive to use debt financing. The cost of equity will still increase linearly as debt is added to the capital structure. The ability to use very low-cost debt financing will increase the expected return to the shareholders of a profitable firm by increasing earnings per share even more for a given level of EBIT, but this will not affect firm value since WACC remains unchanged. The net effect of the decline in rates, given that most corporations do pay income taxes, is also ambiguous. The pre-tax cost of debt financing has declined, but so has the tax shield. All in all, the net impact of the decline in interest rates has had little impact on the incentive to use debt versus equity financing, though this has increased the incentive to make capital investments by reducing the weighted average cost of capital.

2. Comment on the following statement: “The Fundamental Principle of Corporate Leverage is incorrect, because shareholders are risk-averse and they prefer a lower dispersion of earnings per share.”

Public shareholders can diversify away firm-specific risk, and will only care about the systematic risk of owning common stock. When a firm uses financial leverage, it increases the beta of the company’s stock since this concentrates the risk that attaches to the firm’s assets on the shareholders, and does so in a linear fashion.

3. Explain how Propositions I and II are different, as well as what they have in common.

Propositions I and II both support the conclusion that capital structure doesn’t matter. Proposition I states that firm value stays the same at every level of capital structure. Proposition II supports I by allowing a new cost of equity to be calculated as debt is added to the capital structure. Using this cost of equity to discount cash flows to equity holders, and using the cost of debt to discount cash flows (interest) to debt holders provides a firm value identical to the no-leverage firm value. Proposition II states that as firms switch from equity, which has a relatively high required return, to debt, which has a relatively low required return, the required return on equity increases just enough to offset the cost savings of switching from equity to debt. The cost of capital does not change as capital structure changes. Intuitively this makes sense as long as changes in capital structure do not result in changes in the firm’s investment projects.
4. What is the difference between levered and unlevered equity? If you believe that Intel Corp., a widely followed company with very little debt, should include more debt in its capital structure, what actions could you take in an M&M world that would have a similar impact?

Levered equity means equity in a company that also uses debt financing. Unlevered equity is equity financing for an all-equity firm. If you thought that Intel should be more levered, you could buy shares in Intel partially using your own cash and borrow the amount of money representing the amount of leverage you believe Intel should have for the percentage of the company that you own to buy additional shares in Intel. You will have used leverage to create a riskier portfolio than owning Intel alone.

5. The after-corporate-tax valuation formula assumes that investors still require a 10 percent pre-tax return on corporate assets, despite the fact that this profit will then be subjected to corporate taxes and will be 6.5 percent after a 35 percent corporate income tax is levied. If investors instead required the same after-tax return (10%) as in the no-tax model, what impact would this have on the incentive to use debt.

If the investors are in a no-tax world there will be no incentive to use debt (M&M Irrelevance). If corporate income is subject to tax then the company would increase the value of the firm (by being able to deduct interest payments from taxable income) and be inclined to issue debt. If investor’s after-tax required return increases from 6.5% to 10% then this would imply an increase in the required (pre-tax) return on the firm’s projects/businesses. To calculate what the pre-tax return must be to yield an after-tax return of 10% on investment, we must “gross up” the 10% after tax return by dividing by (1-tax rate); yields yield a pre-tax required return of 15.38% [0.1538 = 0.10 ÷ (0.65)]. This is the required return that an unlevered firm must earn to yield an after-tax 10% return to investors, when income is taxed only at the corporate level. Issuing tax-deductible debt allows the firm to substitute tax-favored debt capital for equity dollar for dollar. The firm should issue as much debt as possible, up to almost 100% debt, even though this would have to carry an interest rate of 10% to reflect the fact that creditors are assuming all of the firm’s business risk. In this case, tax-deductible interest payments would almost equal the firm’s net operating income (and would exceed NOI in poor earnings periods), and so taxable profit would be reduced almost to zero. In this limiting case of nearly 100% debt finance, the required return on the firm’s investments would again fall to almost 10%, and all of the return on investment would be funneled to the firm’s private creditors (bondholders) as interest payments. The government would receive almost no corporate income tax payments from the firm.

6. M&M suggested that “real-world considerations,” primarily institutional constraints on high leverage, would prevent firms from approaching 100 percent debt levels. Do you find this convincing? Why or why not?

There are institutional constraints. Lenders are reluctant to lend too much – their investment in the company becomes riskier as debt is added. Managers might also be reluctant to take on too much debt. It constrains their future financing capability – if they are highly levered and a good investment opportunity appears, they might be unable to raise the necessary financing for the opportunity.
7. Over time, an increasing percentage of common stock has been held by institutional investors, especially pension funds, which are effectively untaxed on their investment income. What do you think this trend implies for corporate leverage?

If institutional investors pay no tax on their investment income, regardless of whether it comes in the form of dividends, capital gains, or interest, then we have a special case of Equation 12.6 where $T_{ps} = T_{pd} = 0$. In this case, the only tax effect on capital structure is the tax advantage that arises from interest deductibility at the corporate level. The implication of this trend for corporate leverage depends on the values of $T_{ps}$ and $T_{pd}$ for individual investors. For instance, if individual level tax rates are such that interest income is taxed more heavily than dividends and capital gains, then personal tax effects can partially or fully offset the corporate tax advantage of debt. In that case, as stock ownership gradually shifts from individual investors to institutional investors, the personal tax disadvantage of debt becomes less and less important, so debt ratios should rise.

8. In 1964, Britain adopted a corporation taxation system with separate company-level taxation of corporate operating income and personal taxation of distributed profits (dividends). After 1964, debt levels increased in Britain. Offer an explanation of this phenomenon.

Britain effectively increased the corporate tax rate. Corporate income was fully taxed, and then dividends were additionally taxed at the personal level. Increasing the corporate tax rate increases the value of the tax shield of debt, giving companies more incentive to reduce taxable income and therefore taxes by taking on more debt.

9. In most countries, firms in high-tech industries are almost all intangible-asset-rich rather than fixed-asset-rich. What impact do you think the continued growth of these industries will have on average leverage ratios in the future?

High tech companies are young, risky and high growth. These are the types of companies that will finance with more equity and less debt. Lenders are unwilling to risk large amounts of capital to an industry where there is nothing tangible to repossess in case of financial distress. With a more high tech and service oriented global economy, debt financing would be expected to decrease.

10. If Congress decided to increase the tax rate on retained corporate earnings, what impact do you think this would have on observed corporate leverage over time? Why?

If Congress increased the tax on retained corporate earnings, a source of equity financing, then debt financing would be more attractive. More debt financing would mean more interest expense, lower net income and fewer earnings to retain. If personal taxes on dividend and interest income were reduced, then the impact of those changes on capital structure would depend on the relative magnitudes of the new tax rates. It is theoretically possible that the interaction between personal and corporate taxes applied to debt and equity could generate a tax advantage for either type of security.

11. As late as the nineteenth century, people who could not (or would not) pay their debts would be sent to debtors’ prison, often for many years. What do you think was the
primary rationale for the laws mandating such punishment, and what effect do you think this had on personal borrowing?

The rationale was to punish those who violated the law, and not to provide for rehabilitation. In debtors’ prison, the debtors had no opportunity to earn money to pay back their debts, and may, in fact, have incurred further debts. There was a religious bias against lending money at that time, and such laws would strongly discourage personal borrowing. Class distinctions also came into play – a lower class debtor was more likely to be harshly treated than an upper class debtor was. In general, harsh penalties and pressures of other types discouraged borrowing.

12. Suppose that an individual borrows from a bank to buy a new car. A few months later, the borrower realizes that he will have to default on this loan in a few months and the bank will repossess the car. What kind of underinvestment problem might occur here?

The car owner has no incentive to invest in preventive maintenance if he/she expects the bank to repossess the car soon – no oil and filter changes, new tires, high-grade gasoline, etc. The owner has no incentive to spend any money on the car, other than low-grade gasoline as needed.

13. Suppose that a commercial bank experiences losses on some of its loans and as a result approaches the brink of insolvency. What kinds of asset substitution problems might arise? How might bank regulators try to prevent these problems?

This problem did occur with savings and loans during the real estate crisis in the late 1980s. Banks, needing to increase their returns partially because of losses on loans, had the incentive to invest in even riskier loans – loans that had a low probability of payoff, but a high payoff if they did succeed. Bank regulators could try to control these problems through more frequent checks of the quality of the commercial bank’s loan portfolio or setting standards for loans that creditors must meet before the loans could be made. Regulators can also impose risk-based capital requirements, meaning that bank must have more equity on its balance sheet if it chooses to make riskier loans.

14. Think of some rather gaudy corporate perks given to managers, such as a plush office, a company jet, or luxury box seats at professional sporting events. How might managers justify these as value-maximizing corporate expenditures that benefit the shareholders?

Managers could justify perks on the grounds that the perks make them more productive. For example, the CEO’s time is very valuable. It might be better spent on a private company jet than standing on long security lines at public airports, waiting for commercial flights. A plush office might impress potential customers and make them more likely to do business with the firm. Sports arena luxury boxes may be used to attract and retain key clients who provide more in new business than the cost of the box.

15. Over-investment is another type of agency problem in which managers invest in negative-NPV projects to increase the size of the firm (as measured by sales or assets). Explain how debt constrains this behavior.

Debt constrains over-investment because there is a limit to how much a firm can borrow and stay solvent. A high debt company will have to give first priority to meeting interest
Can you think of a retailing analogy of the “bait-and-switch” investment strategy described in this section? Why are these admittedly effective techniques not used more frequently? (Hint: Consider the importance of reputation.)

*A retailing bait and switch would be when a retailer advertises product of a high quality and substitutes product with a lower quality. A customer may be fooled once, but is less likely to return to the establishment because of dissatisfaction with the product.*

What other explanation might there be for the most profitable firms having the lowest leverage, other than that offered by the pecking order theory?

*Profitable firms could have low leverage because they are high growth firms, or because they have more intangible assets (research and development, patents, brand name value) than tangible assets. A firm that has high-risk operations may choose to finance itself conservatively, with less debt in the capital structure.*

Do you think that allowing firms to make a rights issue—sell stock only to their existing shareholders, perhaps at a below-market price—would negate the importance of the informational asymmetry problem described by Myers and Majluf?

*Even if a firm sells only to existing shareholders, in a large, publicly traded company with many shareholders, the information asymmetry problem will still exist. Shareholders will still expect management to know more than they do about the firm and may be unsure if the price, even a discounted price, represents a fair value. However, the problem of potentially transferring wealth from old shareholders to new shareholders, as described by Myers and Majluf, goes away. If the firm really does have a positive NPV project (and not a potentially value decreasing over-investment), then the informational asymmetry problem is reduced.*

How do you think the pecking order theory might rationalize the existence of financial intermediaries such as commercial banks?

*Financial intermediaries like commercial banks bring together investors with a need for additional funds with savers, or lenders. The investing firms may not have access to savers without the services of a financial intermediary. The intermediary consolidates funds from small investors. This reduces transaction costs for investors and makes debt financing more attractive to firms.*

**Answers to Self-Test Problems**

**ST12-1.** As Chief Financial Officer of the Uptown Service Corporation (USC), you are considering a recapitalization plan that would convert USC from its current all-equity capital structure to one including substantial financial leverage. USC now has 150,000 shares of common stock outstanding, which are selling for $80.00 each, and the recapitalization proposal is to issue $6,000,000 worth of long-term debt at an interest rate of 7.0 percent and use the proceeds to repurchase 75,000 shares of common stock worth
$6,000,000. USC’s earnings next year will depend on the state of the economy. If there is normal growth, EBIT will be $1,200,000. EBIT will be $600,000 if there is a recession and EBIT will be $1,800,000 if there is an economic boom. You believe that each economic outcome is equally likely. Assume there are no market frictions such as corporate or personal income taxes.

a. Calculate the number of shares outstanding, the per-share price and the debt-to-equity ratio for USC if the proposed recapitalization is adopted.

b. Calculate the earnings per share (EPS) and return on equity for USC shareholders under all three economic outcomes (recession, normal growth and boom), for both the current all-equity capitalization and the proposed mixed debt/equity capital structure.

c. Calculate the break-even level of EBIT where earnings per share for USC stockholders are the same under the current and proposed capital structures.

d. At what level of EBIT will USC shareholders earn zero EPS under the current and the proposed capital structures?

\[ \text{Interest (7.0%)} \]  
\[ \text{Net Income} \]  
\[ \text{Shares outstanding} \]  
\[ \text{Earnings per share} \]  
\[ \% \text{ Return on shares} \ (P_0 = \$80.00/\text{share}) \]  

\[ \text{Recession} \text{ Normal Growth} \text{ Boom} \]  
\[ \text{EBIT} \$600,000 \$1,200,000 \$1,800,000 \]  
\[ \text{All Equity Financing} \text{ 50\% Debt: 50\% Equity} \text{ All Equity Financing} \text{ 50\% Debt: 50\% Equity} \text{ All Equity Financing} \text{ 50\% Debt: 50\% Equity} \]  
\[ \text{Interest (7.0\%)} \$0 \$420,000 \$0 \$420,000 \$0 \$420,000 \]  
\[ \text{Net Income} \$600,000 \$180,000 \$1,200,000 \$780,000 \$1,800,000 \$1,380,000 \]  
\[ \text{Shares outstanding} \ 150,000 \ 75,000 \ 150,000 \ 75,000 \ 150,000 \ 75,000 \]  
\[ \text{Earnings per share} \$4.00 \$2.40 \$8.00 \$10.40 \$12.00 \$18.40 \]  
\[ \% \text{ Return on shares} \ (P_0 = \$80.00/\text{share}) \ 5.0\% \ 3.0\% \ 10.0\% \ 13.00\% \ 15.0\% \ 23.0\% \]  

b. The break-even point is EBIT equal to twice the interest payment, or $840,000 (2 x $420,000 interest). At that level of EBIT, earnings per share will be $5.60 per share under both the current all-equity capitalization ($840,000 EBIT ÷ 150,000 shares O/S) and under the 50\% debt, 50\% equity capital structure [(($840,000 EBIT - $420,000 Interest) ÷ 75,000 shares O/S)].
d. Under the current all-equity capitalization, shareholders will earn positive EPS for any EBIT above zero, so EBIT = $0 is where EPS = $0. Under the proposed capital structure, EPS = $0 where EBIT = Interest payments = $420,000.

ST12-2. An unlevered company operates in perfect markets and has net operating income (EBIT) of $2,000,000. Assume that the required return on assets for firms in this industry is 8 percent and that the firm issues $10 million worth of debt with a required return of 6.5 percent and uses the proceeds to repurchase outstanding stock. There are no corporate or personal taxes.

a. What is the market value and required return of this firm’s stock before the repurchase transaction, according to M&M Proposition I?
b. What is the market value and required return of this firm’s remaining stock after the repurchase transaction according to M&M Proposition II?

a. Before the stock repurchase, the value of the firm is EBIT/r = $2,000,000/0.08 = $25,000,000. The required return on the stock (all-equity financing) is 8.0%.

b. After the repurchase, the firm has $10,000,000 debt and $15,000,000 equity, so the debt-to-equity ratio is 0.6667 and the new required return on equity is 
\[ r_l = r + (r - r_d)D/E = 0.08 + (0.08 - 0.065) \times 0.6667 = 0.08 + 0.01 = 0.09 \] or 9%.

ST12-3. Westside Manufacturing has EBIT of $10 million; there is $60 million of debt outstanding with a required rate of return of 6.5 percent; the required rate of return on the industry is 10 percent; and the corporate tax rate is 30 percent. Assume there are corporate taxes but no personal taxes.

a. Determine the present value of the interest tax shield of Westside Manufacturing, as well as the total value of the firm.
b. Determine the gain from leverage if personal taxes of 10 percent on stock income and 35 percent on debt income exist.

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<thead>
<tr>
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<th>Levered</th>
<th>Unlevered</th>
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<tbody>
<tr>
<td>EBIT</td>
<td>$10,000,000</td>
<td>$10,000,000</td>
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<tr>
<td>- Interest paid</td>
<td>(3,900,000)</td>
<td>0</td>
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<tr>
<td>= Taxable income</td>
<td>6,100,000</td>
<td>10,000,000</td>
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<tr>
<td>- Taxes (T_C = 0.30)</td>
<td>(1,830,000)</td>
<td>(3,000,000)</td>
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<tr>
<td>= Net income</td>
<td>4,270,000</td>
<td>7,000,000</td>
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<tr>
<td>+ Interest paid</td>
<td>3,900,000</td>
<td>0</td>
</tr>
<tr>
<td>= Total income available to investors</td>
<td>$8,170,000</td>
<td>$7,000,000</td>
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a. Present value of tax shield = Debt x T_C = $60,000,000 x 0.30 = $18,000,000
Value unlevered firm = Net income÷capitalization rate = $7,000,000÷0.10 = $70,000,000
Value of levered firm = Value unlevered firm + PV tax shields = $70,000,000 + $18,000,000 = $88,000,000.
b.  

\[ G_L = 1 - \frac{1 - T_c}{1 - T_{ps}} \]

\[ D = \left\{ 1 - \left[ (1 - 0.3)(1 - 0.1) \right] \div (1 - 0.35) \right\} \times 60,000,000 \]

\[ = \left\{ 1 - \left[ (0.7)(0.0) \right] \div 0.65 \right\} \times 60,000,000 \]

\[ = 0.0308 \times 60,000,000 = 1,846,153.85 \]

ST12-4. You are the manager of a financially distressed corporation with $10 million in debt outstanding that will mature in one month. Your firm currently has $7 million cash on hand. Assume that you are offered the opportunity to invest in either of the two projects described below.

**Project 1**: the opportunity to invest $7 million in risk-free Treasury bills, with a 4 percent annual interest rate (or a 0.333% per month interest rate)

**Project 2**: a high-risk gamble, which will pay off $12 million in one month if successful (probability = 0.25), but will only pay $4,000,000 if unsuccessful (probability = 0.75)

a. Compute the expected payoff for each project, and state which one you would adopt if you were operating the firm in the shareholders’ best interests? Why?

b. Which project would you accept if the firm was unlevered? Why?

c. Which project would you accept if the company was organized as a partnership rather than a corporation? Why?

a. Payoff for Project 1: $7,000,000 x 1.00333 = $7,023,333

Payoff for Project 2: 0.25 x $12,000,000 + 0.75 x $4,000,000 = $6,000,000

If you were operating in the shareholders’ interests, project 2 would be accepted. It gives a higher potential payoff to shareholders if the project does well. Project 1 has a sure, but lower return, but its payoff will accrue to bondholders, rather than shareholders. This is spite of the fact that project 2 clearly has a negative NPV – it pays off only $6,000,000 and requires a $7 million investment. Note that these are future payoffs – they need to be discounted at the appropriate cost of capital to determine NPV.

b. If the firm were unlevered, the firm would prefer project 1. The payoff for project is 1 is higher than the payoff for project 2. If the firm is unlevered all of the return will accrue to shareholders, since there are no bondholders. An unlevered firm would reject project 2.

c. If the company were organized as a partnership rather than a corporation, then it would accept Project 1. In partnerships, the owners do not have the option to default on the firm’s debt (i.e., they don’t have limited liability), leaving the firm’s assets in the hands of creditors. Therefore, without the option to default, partners have no incentive to under-invest. They will accept Project 1 because doing so reduces their expected losses when the firm goes bankrupt.
ST12-5. Run-and-Hide Detective Company currently has no debt and expects to earn $5 million in EBIT each year for the foreseeable future. The required return on assets for detective companies of this type is 10.0 percent, and the corporate tax rate is 35 percent. There are no taxes on dividends or interest at the personal level. Run-and-Hide calculates that there is a 5 percent chance that the firm will fall into bankruptcy in any given year, and if bankruptcy does occur, it will impose direct and indirect costs totaling $8 million. If necessary, use the industry required return for discounting bankruptcy costs.

a. Compute the present value of bankruptcy costs for Run-and-Hide.

b. Compute the overall value of the firm.

c. Re-calculate the value of the company, assuming that the firm’s shareholders face a 15 percent personal tax rate on equity income.

a. For any given year, the expected value of bankruptcy costs will be equal to the probability of bankruptcy \((p = 0.05)\) times the cost to the firm if bankruptcy occurs \((8,000,000)\), or $400,000 per year. Since direct bankruptcy \((B/R)\) costs are usually only incurred by unprofitable firms—that are not currently paying corporate income taxes—and since indirect B/R costs are things such as opportunity costs such as lost sales, loss of reputational capital and loss of key personnel, we will assume that all B/R costs are after-tax costs. The present value of bankruptcy costs, \(PV_{BR}\), will then be equal to the sum of the stream of discounted expected annual bankruptcy costs, where the discount rate will be the industry required return \((r = .10)\). Since this stream is a perpetuity, \(PV_{BR}\) will simply be the expected annual B/R costs divided by the discount rate:

\[
PV_{BR} = \frac{400,000}{0.10} = 4,000,000
\]

b. The overall value of the firm is computed using equation 12.7, where \(V_U\) is the value of an unlevered firm (computed using equation 12.3), \(V_L\) is the value of a levered firm, and \(PV_{TS}\) equals the present value of debt tax shields. Since there are, at present, no debt tax shields, we will simply compute firm value, \(V\):

\[
V_L = V = V_U + PV_{TS} - PV_{BR} \quad \text{(Eq 12.7)}
\]

\[
V_U = \frac{EBIT(1 - T_c)}{r} = \frac{5,000,000,000 (0.65)}{0.10} = \frac{3,250,000}{0.10} = 32,500,000
\]

\[
V = V_U - PV_{BR} = 32,500,000 - 4,000,000 = 28,500,000
\]

c. Incorporating a personal tax rate on equity income into the valuation model of an unlevered firm presented in equation 12.3 yields:

\[
V_U = \frac{EBIT(1 - T_c)(1 - T_{ps})}{r} = \frac{5,000,000,000 (0.65) (0.85)}{0.10} = \frac{2,762,500}{0.10} = 27,625,000
\]

And the new value of the firm, \(V\), taking account of bankruptcy costs as well, becomes:

\[
V = V_U - PV_{BR} = 27,625,000 - 4,000,000 = 26,400,000
\]