

Chapter 15: Debt Policy

1.
 - a. True.
 - b. False. As financial leverage increases, the expected rate of return on equity rises by just enough to compensate for its higher risk. The value of the firm and stockholders' wealth are unaffected.
 - c. False. The sensitivity of equity returns to business risk, and therefore the cost of equity, increases with leverage even without a change in the risk of financial distress.
 - d. True.

2. While the cost of debt and the cost of equity both increase, the weight applied to debt in the cost of capital formula also increases. Applying a higher weight to the lower-cost source of capital offsets the increase in the cost of debt and the cost of equity.

3. The interest tax shield is the reduction in corporate income taxes due to the fact that interest is treated as an expense that reduces taxable income. To the extent that the government collects less tax, there is a bigger pie of after-tax income available to the debt and equity holders.

Example: Assume operating income is \$100,000, the interest rate on debt is 10%, and the tax rate is 35%. Compare income for an unlevered firm versus a firm that borrows \$400,000:

	Zero-debt firm	\$400,000 of debt
Operating income	\$100,000	\$100,000
Interest on debt	0	40,000
Before-tax income	100,000	60,000
Tax at 35%	35,000	21,000
After-tax income	65,000	39,000
Sum of debt interest plus after-tax income	\$ 65,000	\$ 79,000

The combined debt interest plus equity income is higher for the levered firm. The difference equals \$14,000, which is also the difference in taxes paid by the two firms.

4.
$$\text{PV(Tax shield)} = \frac{0.35 \times (0.076 \times \$800)}{0.076} = 0.35 \times \$800 = \$280 \text{ million}$$

5. The tradeoff theory of capital structure holds that the optimal debt ratio is determined by striking a balance between the advantages and disadvantages of debt financing. The advantage of debt financing is the interest tax shield. The disadvantages are the various costs of financial distress. As leverage increases, the marginal tax shield from each dollar of additional borrowing falls. This is a consequence of the increasing probability that, with higher interest expense, the firm will not have positive taxable income and therefore will not pay taxes. At the same time, the expected costs of financial distress increase with leverage. As leverage increases, the marginal cost of financial distress eventually outweighs the interest tax shield. At the optimal debt ratio, the increase in the present value of tax savings from additional borrowing is exactly offset by increases in the present value of the costs of financial distress.

7. The pecking order theory states that firms prefer to raise funds through internal finance, and if external finance is required, that they prefer debt to equity issues. This preference – or pecking – order results from the fact that investors may interpret security issues – equity issues in particular – as a signal that managers think the firm is currently overvalued by the market; therefore, investors will reduce their valuation of the firm in response to news of a stock issue.

If the pecking order theory is correct, we would expect firms with the highest debt ratios to be those with low profits, because internal finance is less available to these firms.

8. Financial slack refers to a firm's access to cash, marketable securities, bank financing, or debt financing. Financial slack is valuable because it means financing will be quickly available to take advantage of positive-NPV investment opportunities.

Too much financial slack can be detrimental if it allows managers to take it easy, to empire build, or to use excess cash on their own perquisites.

15. a. Market value of firm is: $\$100 \times 10,000 = \$1,000,000$

With the low-debt plan, equity falls by \$200,000, so:

$$D/E = \$200,000/\$800,000 = 0.25$$

8,000 shares remain outstanding.

With the high-debt plan, equity falls by \$400,000, so:

$$D/E = \$400,000/\$600,000 = 0.67$$

6,000 shares remain outstanding.

b. Low-debt plan

EBIT	\$ 90,000	\$130,000
Interest	20,000	20,000
Equity Earnings	70,000	110,000
EPS [Earnings/8,000]	\$ 8.75	\$ 13.75

$$\text{Expected EPS} = (\$8.75 + \$13.75)/2 = \$11.25$$

High-debt plan

EBIT	\$ 90,000	\$130,000
Interest	40,000	40,000
Equity Earnings	50,000	90,000
EPS [Earnings/6000]	\$ 8.33	\$ 15.00

$$\text{Expected EPS} = (\$8.33 + \$15)/2 = \$11.67$$

Although the high-debt plan results in higher expected EPS, it is not necessarily preferable because it also entails greater risk. The higher risk shows up in the fact that EPS for the high-debt plan is lower than EPS for the low-debt plan when EBIT is low, but EPS for the high-debt plan is higher when EBIT is higher.

c.

	<u>Low-debt plan</u>	<u>High-debt plan</u>
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EBIT	\$100,000	\$100,000
Interest	20,000	40,000
Equity Earnings	80,000	60,000
EPS	\$ 10.00	\$ 10.00

EPS is the same for both plans because EBIT is 10% of assets which is equal to the rate the firm pays on its debt. When $r_{\text{assets}} = r_{\text{debt}}$, EPS is unaffected by leverage.

18. a. Under Proposition I, the cost of capital of the firm (r_{assets}) is not affected by the choice of capital structure. The reason the stated argument *seems* to be true is that it does not account for the changing *proportions* of the firm financed by debt and equity. As the debt-equity ratio increases, it is true that both the costs of equity and debt increase; but a larger portion of the firm is financed by debt. The overall effect is to leave the firm's cost of capital unchanged.
- b. Moderate borrowing does not significantly affect the probability of financial distress, but it does increase the variability (and also the market risk) borne by stockholders. *This* additional risk must be offset by a higher expected rate of return to stockholders.
- c. If the opportunity were the firm's *only* asset, this would be a good deal. Stockholders would put up no money and would therefore have nothing to lose. The trouble is, rational lenders will not advance 100 percent of the asset's value for an 8 percent promised return unless other assets are put up as collateral.

Sometimes firms find it convenient to borrow all the cash required for certain investments. But these investments don't support all of the additional debt; the lenders are protected by the firm's other assets too. In any case, if firm value is independent of leverage, then any asset's contribution to firm value must be independent of how it is financed. Note also that the statement ignores the effect on the stockholders of an increase in financial leverage.

- d. This is not an important reason for conservative debt levels. So long as MM's proposition holds, the company's overall cost of capital is unchanged despite increasing interest rates paid as the firm borrows more. (However, the increasing interest rates may signal an increasing probability of financial distress -- and that can be important.)

20. The ratio of debt to firm value is: $\frac{D}{D + E} = \frac{1}{1 + 2} = \frac{1}{3}$

$$r_{\text{assets}} = (1/3 \times 6\%) + (2/3 \times 12\%) = 10\%$$

If the firm reduces its debt-equity ratio to 1/3, then:

$$r_{\text{equity}} = r_{\text{assets}} + [D/E \times (r_{\text{assets}} - r_{\text{debt}})] = 10\% + \left[\frac{1}{3} \times (10\% - 6\%) \right] = 11.33\%$$

24. a.
$$\text{WACC} = \left[\frac{8}{27} \times 7\% \times (1 - 0.35) \right] + \left[\frac{19}{27} \times 14\% \right] = 11.20\%$$

- b. If the firm has no debt, the market value of the firm would decrease by the present value of the tax shield: $0.35 \times \$800 = \280

The value of the firm would be \$2,420. The long-term assets of the firm (which previously included the present value of the tax shield) will also decrease by \$280. The new market value balance sheet is therefore as follows:

Net working capital	\$ 550	Debt	\$ 0
Long-term assets	<u>1,870</u>	Equity	<u>2,420</u>
Value of firm	\$2,420	Total	\$2,420

27. a. If SOS runs into financial difficulties, the additional funds contributed by the equityholders to finance the new project will end up being available to pay the debtholders. To the extent that the financing for the new project increases the value of debt, it represents a transfer of wealth from stockholders to bondholders.

- b. If the new project is sufficiently risky, it may increase the expected payoff to equity holders. To see this, imagine the following extreme case:

The face value of SOS's debt is \$100 and the market value of its assets is \$90. The assets are risk free and therefore SOS is certain to default and the equity currently is valueless. But suppose the stockholders use \$10 of the firm's cash to invest in a very risky new project. The project will pay off \$100 with probability 0.09 and \$0 with probability 0.91. (Notice that the expected payoff from the project is \$9, which is less than its cost so that project NPV is negative.) If the project is successful, the value of the assets of the firm will be \$190, and the equity holders will have a claim worth \$90. Therefore, if they pursue the project, their expected payoff is: $0.09 \times \$90 = \8.10

The project is a long shot, but it is obviously preferable to the equityholders' current position in which they are guaranteed to receive nothing.

30. a.
$$V = \frac{\text{EBIT} \times (1 - T_c)}{r} = \frac{\$25,000 \times (1 - 0.35)}{0.10} = \$162,500$$

b. The value of the firm increases by the present value of the interest tax shield:

$$0.35 \times \$50,000 = \$17,500$$

c. The expected cost of bankruptcy is: $0.30 \times \$200,000 = \$60,000$

The present value of this cost is: $\$60,000 / (1.10)^3 = \$45,079$

Since this is greater than the present value of the potential tax shield, the firm should not issue the debt.