CHAPTER 12
Capital Structure and Leverage

- Business vs. financial risk
- Optimal capital structure
- Operating leverage
- Capital structure theory

12-1

Business & Financial Risk

- Business Risk – The volatility of a firm's returns given the firm carries no debt
  - Affected by general business conditions, economic factors, competition, and catastrophy
- Financial Risk – The increase in risk to stockholders, over and above the firm's business risk, resulting from the use of financial leverage (Debt)

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What determines business risk?

- Uncertainty about demand (sales).
- Uncertainty about output prices.
- Uncertainty about costs.
- Product, other types of liability.
- Operating leverage – the extent to which fixed costs are used in a firm's operations

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What is operating leverage, and how does it affect a firm's business risk?

- Operating leverage is the use of fixed costs rather than variable costs.
- If most costs are fixed, hence do not decline when demand falls, then the firm has high operating leverage.
- Greater operating leverage means a firm has to hit higher sales targets before making money. It also mean lower variable costs per unit, so once this B/E hurdle is met, greater returns result

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What is financial leverage? Financial risk?

- Financial leverage is the use of debt and preferred stock.
- Financial risk is the additional risk concentrated on common stockholders as a result of financial leverage.

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An example: Illustrating effects of financial leverage

- Two firms with the same operating leverage, business risk, and probability distribution of EBIT.
- Only differ with respect to their use of debt (capital structure).

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Firm U	Firm L
No debt	$10,000 of 12% debt
$20,000 in assets	$20,000 in assets
40% tax rate	40% tax rate

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Firm U: Unleveraged

	Economy		
	Bad	Avg.	Good
Prob.	0.25	0.50	0.25
EBIT	$2,000	$3,000	$4,000
Interest	0	0	0
EBT	$2,000	$3,000	$4,000
Taxes (40%)	800	1,200	1,600
NI	$1,200	$1,800	$2,400

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Firm L: Leveraged

	Economy		
	Bad	Avg.	Good
Prob.*	0.25	0.50	0.25
EBIT*	$2,000	$3,000	$4,000
Interest	1,200	1,200	1,200
EBT	$ 800	$1,800	$2,800
Taxes (40%)	320	720	1,120
NI	$ 480	$1,080	$1,680

*Same as for Firm U.

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Ratio comparison between leveraged and unleveraged firms

FIRM U	Bad	Avg	Good
BEP [EBIT/TA]	10.0%	15.0%	20.0%
ROE [NI/EQTY]	6.0%	9.0%	12.0%
TIE [EBIT/INT CHG]			

FIRM L	Bad	Avg	Good
BEP	10.0%	15.0%	20.0%
ROE	4.8%	10.8%	16.8%
TIE	1.67x	2.50x	3.30x

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Optimal Capital Structure

That capital structure (mix of debt, preferred, and common equity) at which P_0 is maximized.

The target capital structure is the mix of debt, preferred stock, and common equity with which the firm intends to raise capital.

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Describe the sequence of events in a recapitalization.

Campus Deli announces the recapitalization.

New debt is issued.

Proceeds are used to repurchase stock.

The number of shares repurchased is equal to the amount of debt issued divided by price per share.

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Cost of debt at different levels of debt, after the proposed recapitalization

Amount borrowed	D/A ratio	D/E ratio	Bond rating	k_d
$ 0	0	0	--	--
250	0.125	0.1429	AA	8.0%
500	0.250	0.3333	A	9.0%
750	0.375	0.6000	BBB	11.5%
1,000	0.500	1.0000	BB	14.0%

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Why do the bond rating and cost of debt depend upon the amount borrowed?

- As the firm borrows more money, the firm increases its financial risk causing the firm's bond rating to decrease, and its cost of debt to increase.

Analyze the proposed recapitalization at various levels of debt. Determine the EPS and TIE at each level of debt.

D = $0

$$EPS = \frac{(EBIT - k_d D)(1 - T)}{\text{Shares outstanding}} = \frac{(\$400{,}000)(0.6)}{80{,}000} = \$3.00$$

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Determining EPS and TIE at different levels of debt. (D = $250,000 and k_d = 8%)

$$\text{Shares repurchased} = \frac{\$250{,}000}{\$25} = 10{,}000$$

$$EPS = \frac{(EBIT - k_d D)(1 - T)}{\text{Shares outstanding}} = \frac{(\$400{,}000 - 0.08(\$250{,}000))(0.6)}{80{,}000 - 10{,}000} = \$3.26$$

$$TIE = \frac{EBIT}{\text{Int Exp}} = \frac{\$400{,}000}{\$20{,}000} = 20x$$

Determining EPS and TIE at different levels of debt. (D = $500,000 and k_d = 9%)

$$\text{Shares repurchased} = \frac{\$500{,}000}{\$25} = 20{,}000$$

$$EPS = \frac{(EBIT - k_d D)(1 - T)}{\text{Shares outstanding}} = \frac{(\$400{,}000 - 0.09(\$500{,}000))(0.6)}{80{,}000 - 20{,}000} = \$3.55$$

$$TIE = \frac{EBIT}{\text{Int Exp}} = \frac{\$400{,}000}{\$45{,}000} = 8.9x$$

Determining EPS and TIE at different levels of debt. (D = $750,000 and k_d = 11.5%)

$$\text{Shares repurchased} = \frac{\$750{,}000}{\$25} = 30{,}000$$

$$EPS = \frac{(EBIT - k_d D)(1 - T)}{\text{Shares outstanding}} = \frac{(\$400{,}000 - 0.115(\$750{,}000))(0.6)}{80{,}000 - 30{,}000} = \$3.77$$

$$TIE = \frac{EBIT}{\text{Int Exp}} = \frac{\$400{,}000}{\$86{,}250} = 4.6x$$

Determining EPS and TIE at different levels of debt. (D = $1,000,000 and k_d = 14%)

$$\text{Shares repurchased} = \frac{\$1{,}000{,}000}{\$25} = 40{,}000$$

$$EPS = \frac{(EBIT - k_d D)(1 - T)}{\text{Shares outstanding}} = \frac{(\$400{,}000 - 0.14(\$1{,}000{,}000))(0.6)}{80{,}000 - 40{,}000} = \$3.90$$

$$TIE = \frac{EBIT}{\text{Int Exp}} = \frac{\$400{,}000}{\$140{,}000} = 2.9x$$

Stock Price, with zero growth

$$P_0 = \frac{D_1}{k_s - g} = \frac{EPS}{k_s} = \frac{DPS}{k_s}$$

- If all earnings are paid out as dividends, E(g) = 0.
- EPS = DPS
- To find the expected stock price (P_0), we must find the appropriate k_s at each of the debt levels discussed.

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What effect does increasing debt have on the cost of equity for the firm?

- If the level of debt increases, the riskiness of the firm increases.
- We have already observed the increase in the cost of debt.
- However, the riskiness of the firm's equity also increases, resulting in a higher k_s.

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The Hamada Equation

P 480

- Because the increased use of debt causes both the costs of debt and equity to increase, we need to estimate the new cost of equity.
- The Hamada equation attempts to quantify the increased cost of equity due to financial leverage.
- Uses the unlevered beta of a firm, which represents the business risk of a firm as if it had no debt.

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The Hamada Equation

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$$\beta_L = \beta_U[\ 1 + (1 - T)\ (D/E)]$$

- Suppose, the risk-free rate is 6%, as is the market risk premium. The unlevered beta of the firm is 1.0. We were previously told that total assets were $2,000,000.

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Calculating levered betas and costs of equity

If D = $250,

$\beta_L = \beta_U[\ 1 + (1 - T)\ (D/E)]$

$\beta_L = 1.0\ [\ 1 + (0.6)(\$250/\$1,750)\ ]$

$\beta_L = 1.0857$

$k_s = k_{RF} + (k_M - k_{RF})\ \beta_L$

$k_s = 6.0\% + (6.0\%)\ 1.0857$

$k_s = 12.51\%$

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Table for calculating levered betas and costs of equity

Amount borrowed	D/A ratio	D/E ratio	Levered Beta	k_s	k_d
$ 0	0.00%	0.00%	1.00	12.00%	0.0%
250	12.50	14.29	1.09	12.51	8.0
500	25.00	33.33	1.20	13.20	9.0
750	37.50	60.00	1.36	14.16	11.5
1,000	50.00	100.00	1.60	15.60	14.0

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Finding Optimal Capital Structure

- The firm's optimal capital structure can be determined two ways:
  - Minimizes WACC.
  - Maximizes stock price.
- Both methods yield the same results.

Table for calculating WACC and determining the minimum WACC

Amount borrowed	D/A ratio	E/A ratio	k_s	$k_d(1-T)$	WACC
$ 0	0.00%	100.00%	12.00%	0.00%	12.00%
250	12.50	87.50	12.51	4.80	11.55
500	25.00	75.00	13.20	5.40	11.25
750	37.50	62.50	14.16	6.90	11.44
1,000	50.00	50.00	15.60	8.40	12.00

* Amount borrowed expressed in terms of thousands of dollars

Table for determining the stock price maximizing capital structure

Amount Borrowed	DPS	k_s	P_0
$ 0	$3.00	12.00%	$25.00
250,000	3.26	12.51	26.03
500,000	3.55	13.20	26.89
750,000	3.77	14.16	26.59
1,000,000	3.90	15.60	25.00

$$P_0 = \frac{D_1}{k_s - g} = \frac{EPS}{k_s} = \frac{DPS}{k_s}$$

What debt ratio maximizes EPS?

- Maximum EPS = $3.90 at D = $1,000,000, and D/A = 50%. (Remember DPS = EPS because payout = 100%.)
- Risk is too high at D/A = 50%.

What is Campus Deli's optimal capital structure?

- P_0 is maximized ($26.89) at D/A = $500,000/$2,000,000 = 25%, so optimal D/A = 25%.
- EPS is maximized at 50%, but primary interest is stock price, not E(EPS).
- The example shows that we can push up E(EPS) by using more debt, but the risk resulting from increased leverage more than offsets the benefit of higher E(EPS).

Other factors to consider when establishing the firm's target capital structure

1. Industry average debt ratio
2. TIE ratios under different scenarios
3. Lender/rating agency attitudes
4. Reserve borrowing capacity
5. Effects of financing on control
6. Asset structure
7. Expected tax rate