FN 201 : Lecture Note 9
Capital Structure Decision

Dr. Winai Homsombat

Bachelor of Economics, International Program

Thammasat University

Outline

- Overview and preview of capital structure effects
- Business versus financial risk and the impact of debt on returns
- Choosing the optimal structure

Overview of
Capital Structure Effects

Goal of the Firm ?

- Maximize shareholder Wealth
- Maximize Profits
- Maximize ROIC
- Maximize Firm Value
- Minimize WACC

$$V = \sum_{t=1}^{\infty} \frac{FCF_t}{(1+WACC)^t}$$

The impact of capital structure on value depends upon the effect of debt on:

=> WACC and FCF

Basic notation:

- V = value of firm
- FCF = free cash flow
- WACC = weighted average cost of capital

Business versus financial risk and the impact of debt on returns

Business Risk: Uncertainty in EBIT, NOPAT, and ROIC

- Uncertainty about **demand** (unit sales)
- Uncertainty about **output prices**
- Uncertainty about **input costs**
- Product and other types of liability
- Degree of operating leverage (DOL)

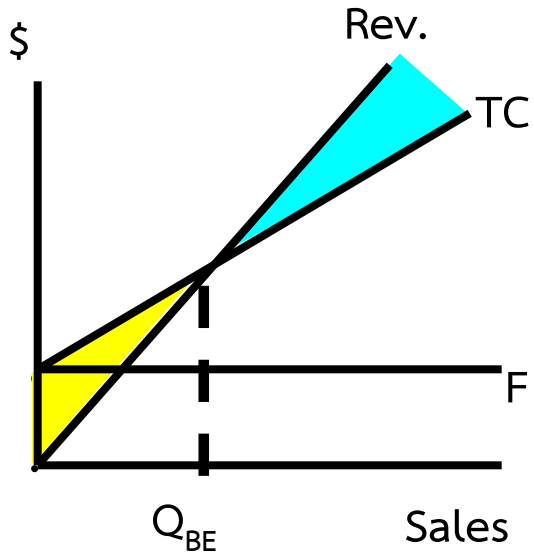
What is operating leverage, and how does it affect a firm's business risk?

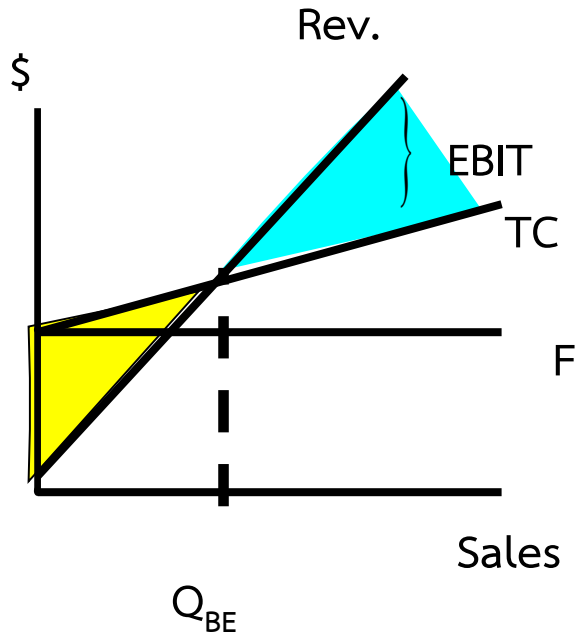
- **Operating leverage**

  = the change in EBIT caused by a change in quantity sold

- The **higher the proportion of <u>fixed costs</u>** relative to **variable costs**,

  => the greater the operating leverage





Higher operating leverage leads to more business risk:

= small sales decline causes a larger EBIT decline.

Operating Breakeven or Breakeven Quantity (Q_{BE})

- Operating breakeven = Q_{BE}
- Q_{BE} =

Q = quantity sold P = price per unit

F = fixed cost V = variable cost

TC = total cost, and

Example: Shapland Inc. has fixed operating costs of $500,000 and variable costs of $50 per unit. If it sells the product for $75 per unit, what is the break-even quantity?

Business Risk versus Financial Risk

- **Business risk:**
  - Uncertainty in future **EBIT, NOPAT, and ROIC**.
  - Depends on business factors such as competition, operating leverage, etc.
- **Financial risk:**
  - Additional business risk concentrated on **common stockholders** when financial leverage is used.
  - Depends on **the amount of debt financing**.

Recall that:

1. NOPAD
2. ROIC
3. ROE

Consider Two Hypothetical Firms Identical Except for Debt

	Firm U	Firm L
Capital	$20,000	$20,000
Debt	$0	$10,000 (12% rate)
Equity	$20,000	$10,000
Tax rate	40%	40%
EBIT	$3,000	$3,000
NOPAT	$1,800	$1,800
ROIC	9%	9%

Impact of Leverage on Returns

	Firm U	Firm L
EBIT	$3,000	$3,000
Interest	0	1,200
EBT	$3,000	$1,800
Taxes (40%)	1,200	720
NI	$1,800	$1,080
ROIC = NOPAT/Capital	9.0%	9.0%
ROE = NI/Equity	9.0%	10.8%

Why does leveraging increase return?

- **More cash goes to investors** of Firm L.
  - **Total dollars** paid to investors:

    U:

    L:
  - **Taxes paid**:

    U:

    L:
- In Firm L, **fewer dollars are tied up in equity**.

Impact of Leverage on Returns if EBIT Falls

= Leverage magnifies risk and return!

	Firm U	Firm L
EBIT	$2,000	$2,000
Interest	0	1,200
EBT	$2,000	$800
Taxes (40%)	800	320
NI	$1,200	$480
ROIC	6.0%	6.0%
ROE	6.0%	4.8%

Impact of Leverage on Returns if EBIT Increases

= Leverage magnifies risk and return!

	Firm U	Firm L
EBIT	$4,000	$4,000
Interest	0	1,200
EBT	$4,000	$2,800
Taxes (40%)	1,600	1,120
NI	$2,400	$1,680
ROIC	12.0%	12.0%
ROE	12.0%	16.8%

Leverage magnifies risk and return!

- Financial risk is from an uncertainty in **EBIT and thus NOPAT**

1. NOPAD = EBIT (1 – T)
2. ROIC = NOPAD / Capital
3. ROE = NI / Equity

Key Performance Measures	Worst		Expected		Best	
	U	L	U	L	U	L
EBIT	$2,000	$2,000	$3,000	$3,000	$4,000	$4,000
NOPAT (tax = 40%)	$1,200	$1,200	$1,800	$1,800	1,600	1,600
ROIC	6.0%	6.0%	9.0%	9.0%	12.0%	12.0%
ROE	**6.0%**	**4.8%**	**9.0%**	**10.8%**	**12.0%**	**16.8%**

Financial Leverage

Choosing the Optimal Capital structure theory

Choosing the Optimal Capital Structure: Example

Example:

b = 1.0 R_F = 6% R_M = 6%

T = 40% Debt = 0

Expected FCF = $30 million (expects zero growth)

Solution

Cost of equity using CAPM:

Currently has no debt: w_d = 0%.

Current Value of Operations

V_{op}

Other Data for Valuation Analysis

- Company has no ST investments.
- Company has no preferred stock.
- 10 mil shares outstanding

Current Valuation Analysis

V_{op}	$250
+ ST Inv.	0
V_{Total}	$250
– Debt	0
S	$250
÷ n	10
P	$25.00

Investment bankers provided estimates of R_D for different capital structures.

w_d	0%	20%	30%	40%	50%
r_d	0.0%	8.0%	8.5%	10.0%	12.0%

If company recapitalizes, it will use proceeds from debt issuance to repurchase stock.

Hamada's Formula:

The Cost of Equity at Different Levels of Debt

= MM theory implies that **beta changes with leverage**.

b_U is the beta of a firm when it has no debt (the unlevered beta)

The Cost of Equity for w_d = 20%

- Use Hamada's equation to find beta:

$b = b_U [1 + (1 - T)(w_d/w_s)]$

$=$

$=$

- Use CAPM to find the cost of equity:

$r_s = r_{RF} + b_L (RPM)$

$=$

- Calculate for new WACC:

$WACC = w_d (1-T) r_d + w_{ce} r_s$

$=$

$=$

Beta, r_s, and WACC

w_d	0%	20%	30%	40%	50%
r_d	0.0%	8.0%	8.5%	10.0%	12.0%
w_s	100%	80%	70%	60%	50%
b	1.000	1.150	1.257	1.400	1.600
r_s	12.00%	12.90%	13.54%	14.40%	15.60%
WACC	12.00%	11.28%	11.01%	11.04%	11.40%

Corporate Value for w_d = 20%

- V_{op} = [FCF(1+g)]/(WACC – g)

  =

- Debt = D_{New} = w_d V_{op}

  =

- Equity = S = w_s V_{op}

  =

Value of Operations, Debt, and Equity

w_d	0%	20%	30%	40%	50%
r_d	0.0%	8.0%	8.5%	10.0%	12.0%
w_s	100%	80%	70%	60%	50%
b	1.000	1.150	1.257	1.400	1.600
r_s	12.00%	12.90%	13.54%	14.40%	15.60%
WACC	12.00%	11.28%	11.01%	11.04%	11.40%
V_{op}	$250.00	$265.96	$272.48	$271.74	$263.16
D	$0.00	$53.19	$81.74	$108.70	$131.58
S	$250.00	$212.77	$190.74	$163.04	$131.58

Example 1:

Elliott Athletics is trying to determine its optimal capital structure, which now consists of only debt and common equity. The firm does not currently use preferred stock in its capital structure, and it does not plan to do so in the future. To estimate how much its debt would cost at different debt levels, the company's treasury staff has consulted with investment bankers and, on the basis of those discussions, has created the following table:

Market Debt-to-Value Ratio (w_d)	Market Equity-to-Value Ratio (w_s)	Market Debt-to-Equity Ratio (D/S)	Bond Rating	Before-Tax Cost of Debt (r_d)
0.0	1.0	0.00	A	7.0%
0.2	0.8	0.25	BBB	8.0
0.4	0.6	0.67	BB	10.0
0.6	0.4	1.50	C	12.0
0.8	0.2	4.00	D	15.0

Elliott uses the CAPM to estimate its cost of common equity, r_s. The company estimates that the risk-free rate is 5%; the market risk premium is 6%, and the company's tax rate is 40%. Elliott estimates that if it had no debt, its "unlevered" beta, b_U, would be 1.2. Based on this information, what is the firm's optimal capital structure, and what would be the weighted average cost of capital at the optimal capital structure?

Example 2:

Beckman Engineering and Associates (BEA) is considering a change in its capital structure. BEA currently has $20 million in debt carrying a rate of 8%, and its stock price is $40 per share with 2 million shares outstanding. BEA is a zero-growth firm and pays out all of its earnings as dividends. The firm's EBIT is $14.933 million, and it faces a 40% federal-plus-state tax rate. The market risk premium is 4%, and the risk-free rate is 6%. BEA is considering increasing its debt level to a capital structure with 40% debt, based on market values, and repurchasing shares with the extra money that it borrows. BEA will have to retire the old debt in order to issue new debt, and the rate on the new debt will be 9%. BEA has a beta of 1.0.

a. What is BEA's unlevered beta? Use market value D/S when unlevering.
b. What are BEA's new beta and cost of equity if it has 40% debt?
c. What are BEA's WACC and total value of the firm with 40% debt?

Question?