

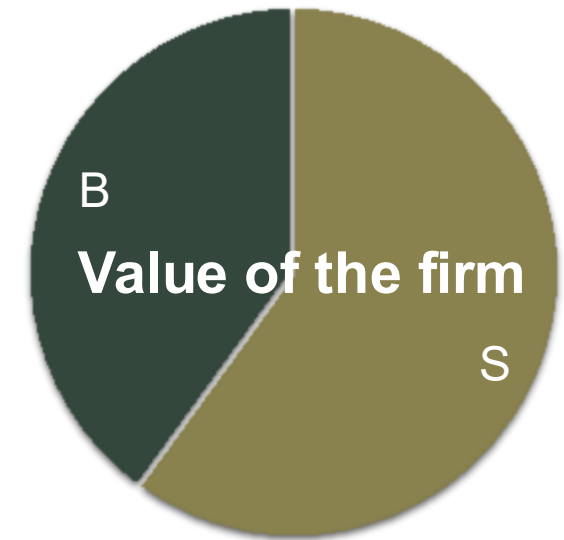
Capital Structure

- Business Vs. Financial Risk
- Operating Leverage ✓
- Optimal Capital Structure
- Capital Structure Theory



Capital Structure

- **Definition:** Capital Structure is the mix of financial securities used to finance the firm.
- The value of a firm is defined to be the sum of the value of the **firm's debt** and the **firm's equity**.
- $V = B + S$
- If the goal of the management of the firm is to make the firm as valuable as possible, then the firm should pick the debt-equity ratio that makes the pie as big as possible.





The Capital- Structure Question

There are really two important questions:

1. Why should the stockholders care about maximizing ***firm*** value? Perhaps they should be interested in strategies that maximize ***shareholder*** value.
2. What is the ratio of debt-to-equity that maximizes the shareholder's value?

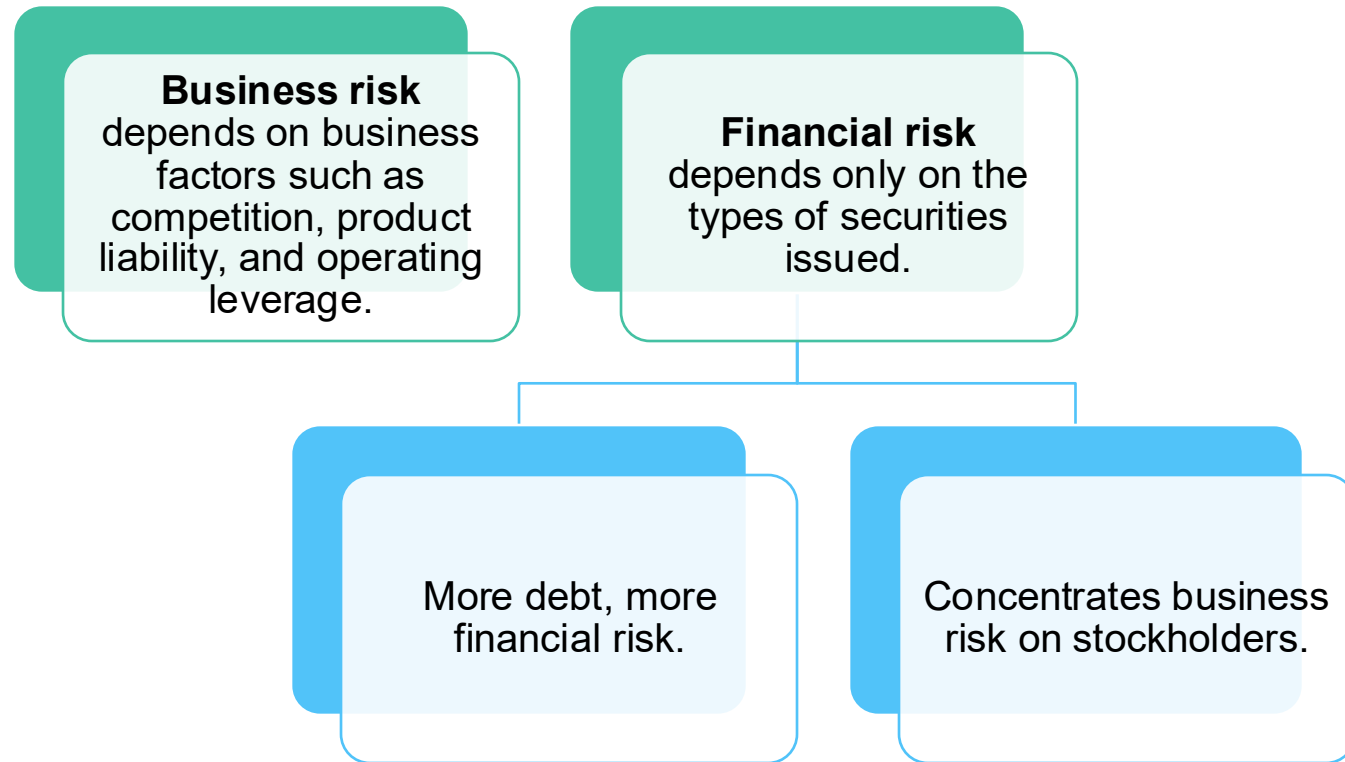
As it turns out, changes in capital structure benefit the stockholders *if and only if* the value of the firm increases.

Note: When we talk about a change in capital structure, we usually hold other things constant. Thus, an increase in debt financing implies that equity will be repurchased (and vice versa) so that overall assets remain unchanged.

Risk analysis

1. **Financial Risk:** risks that occur from capital structure change
 - Expenses
 - Interest
 - Taxes
2. **Business risk:** risks that occur from operating activities
 - Prices
 - Fixed cost and variable cost

Business risk vs. Financial risk

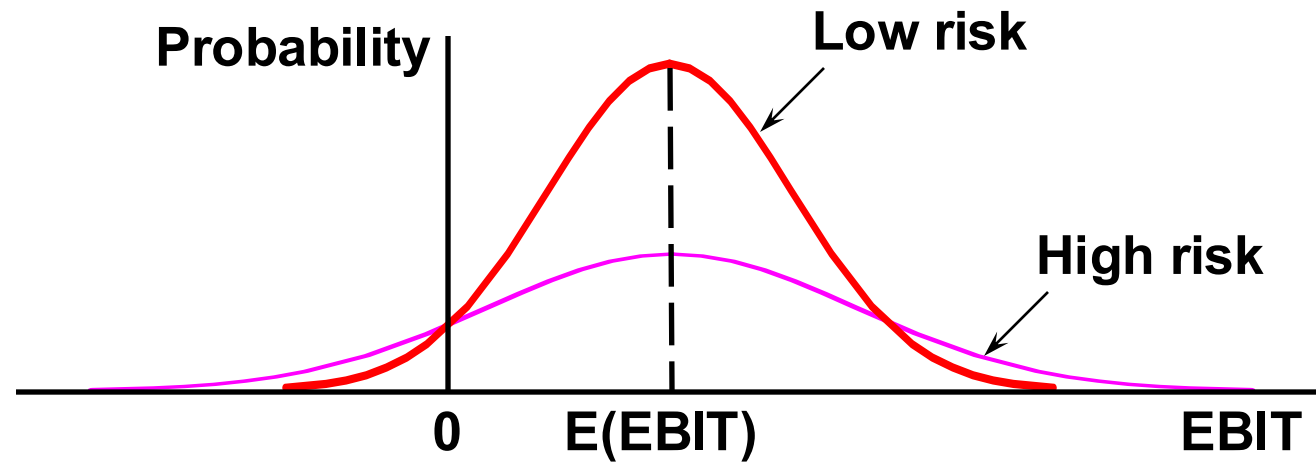


ABC Company Income Statement

	USD	
Revenue	10,000	}
Cost of good sold	<u>7,000</u>	
Gross profit	3,000	
Other expenses	<u>2,000</u>	
EBIT	1,000	Business Risk
Interest	<u>100</u>	}
EBT	900	
Tax	<u>360</u>	
Net Income	540	
Outstanding stocks	100	}
Earning per share	4.8	
		Financial Risk

What is Business Risk?

- Uncertainty about future operating income (EBIT), i.e., how well can we predict operating income?



- Note that business risk does not include financing effects.

What Determines Business Risk?



Uncertainty about demand (sales)



Uncertainty about output prices



Uncertainty about costs



Product, other types of liability

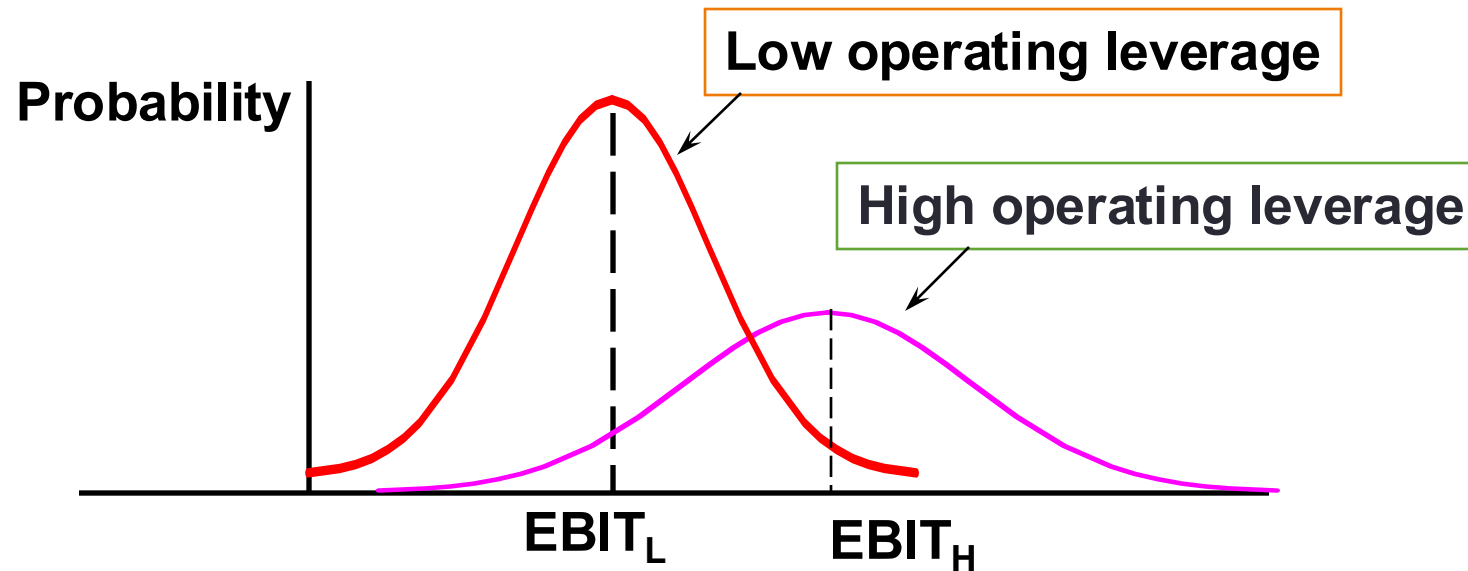


Operating leverage

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.
- A high degree of operating leverage, other factors held constant, implies that a relatively small change in sales results in a large change in ROE (Return on Equity)

Using operating leverage



- Typical situation: Can use operating leverage to get higher $E(EBIT)$, but risk also increases.

Measuring operating leverage

- Break-even point

$$Q = \frac{FC}{p-v}$$

Where:

Q = volume

FC = Fixed cost

p = Price per unit

v = Variable cost per unit

- Degree of Operating Leverage (DOL)

$$DOL = \frac{EBIT}{Q} \quad (\text{Times})$$

What is financial leverage? Financial risk?

- **Financial leverage** is the degree to which a business is utilizing borrowed money. Companies that are highly leveraged may be at risk of bankruptcy if they are unable to make payments on their debt. However, it can increase the shareholders' return on investment and often there are tax advantages associated with borrowing.
- **Financial risk** is the additional risk concentrated on common stockholders as a result of financial leverage.

Example -1

ABC company has capital structure as follow:

Equity

Common share (10,000) \$10 per share =	\$100,000
Retained earning	<u>\$20,000</u>
Total equity	<u>\$120,000</u>

The ABC need to raise \$30,000 by borrowing long-term loan with 15% interest. How this capital structure affect ROE and EPS? If earning is...

1. \$10,000
2. \$15,000
3. \$5,000

Comparing the effect of capital structure: Practice #1

	Before arrange capital structure	Case 1	Case 2	Case 3
EBIT	\$10,000	\$10,000	\$15,000	\$5,000
Interest (15%)	-			
EBT	\$10,000			
Tax (40%)	\$4,000			
Net Income	\$6,000			
No. of Shares	10,000			
EPS*	\$0.6			
ROE**	5%			

Note: *EPS Formular = Net income / No. of shares

**ROE Formular = Net income / Total Equity



Practice Activity #1

20 minutes

Comparing the effect of capital structure

	Before arrange capital structure	Case 1	Case 2	Case 3
EBIT	\$10,000	\$10,000	\$15,000	\$5,000
Interest (15%)	-	(\$30,000*15%) \$4,500	4,500	4,500
EBT	\$10,000	(\$10,000-\$4,500) \$5,500	10,500	500
Tax (40%)	\$4,000	(\$5,500*40%) \$2,200	4,200	200
Net Income	\$6,000	(\$5,500-\$2,200) \$3,300	6,300	300
No. of Shares	10,000	10,000	10,000	10,000
EPS	\$0.6	(\$3,300/10,000) \$0.33	\$0.63	\$0.03
ROE	5%	(\$3,300/\$120,000) 2.75%	5.25%	0.25%

Note: EPS Formular = Net income / No. of shares
 ROE Formular = Net income / Total Equity

Conclusion

- Before borrowing money, ABC has EPS \$0.6
- Case 1: After borrowing money (with same EBIT) EPS will decrease to \$0.33
- Case 2: EBIT increase to \$15,000, EPS increase to \$0.63
- Case 3: EBIT reduce to \$5,000, EPS reduce to only \$0.03

Therefore, ABC needs to increase its earning to reduce risk that incur by capital structure. This type of risk will affect EPS.

WACC and Capital Structure Changes

- Manager should choose the capital structure that **minimizes WACC** (weight average cost of capital) because it is usually easier to predict how a capital structure change will affect the WACC.
- The formula is

$$\begin{aligned}\text{WACC} &= w_d(k_d)(1-T) + w_c(k_s), & \text{or} \\ &= (D/A)(k_d)(1-T) + (E/A)(k_s)\end{aligned}$$

Note: D/A represent Debt/Assets
E/A represent Debt/Equity,
and they sum to 1.0

Example-2

- Suppose ABC company has a target capital structure calling for 45% debt and 55% common equity. Before tax cost of debt (K_d) is 10%. Its marginal tax rate is 40%. Assume that a stock has risk free rate is 8%, rate of return on the market is 13% and beta is 0.7. Find WACC

- **First Step**, find $W_d = 0.45$ (debt 45% = 0.45)
 $W_c = 0.55$ (equity 55% = 0.55)

$$WACC = W_d(k_d)(1-T) + W_c(k_s)$$

**45% and 55% is called “optimal capital structure”. It is a percentage of debt and equity that will maximize the firm’s stock price.

- **Second Step**, find $(k_d)(1-T)$ or after-tax cost of debt

$$WACC = w_d(k_d)(1-T) + w_c(k_s)$$

Since $k_d = 10\%$ or 0.1

Thus, after tax cost of debt is = $0.1(1-0.4) = 0.06$ or 6%

$$WACC = 0.45 (6\%) + 0.55 (k_s)$$

- **Third Step**, find K_s or cost of retained earnings (the rate of return required by stockholders on a firm's common stock)

$$\text{CAPM} = K_s = K_{RF} + (K_M - K_{RF}) b_i$$

- Thus, K_s
 - = $8\% + (13\% - 8\%) (0.7)$
 - = $8\% + (5\%) (0.7)$
 - = $8\% + 3.5\%$
 - = **11.5%**

$$\text{WACC} = 0.45 (6\%) + 0.55 (11.5\%)$$

Calculate WACC

$$\begin{aligned}\text{WACC} &= w_d(k_d)(1-T) + w_c(k_s) \\ &= 0.45 (6\%) + 0.55 (11.5\%) \\ &= 2.7\% + 6.325\% \\ &= \mathbf{9.025\%}\end{aligned}$$

Therefore, ABC should keep its capital structure on target (WACC = 9.025%). Indeed, WACC will not remain constant but will increase as the firm raises more and more capital.

ALTERNATIVE OF NEW CAPITAL	K_D	B_I
0	0	1.0
250,000	8	1.09
500,000	9	1.20
750,000	11.5	1.36
1,000,000	14	1.60

Example - 3

XYZ company has total assets of \$2,000,000. The company need to borrow some money in order to invest. Suppose the risk-free rate is 6%, as is the market risk premium. Tax rate is 40%. The 5 alternatives are as follow.

Amount of new capital (\$000)	D/A (W _d)	E/A (W _c)	K _s	K _d (1-T)	WACC
\$0	0.00%	100.00%	12.00%	0.00%	12.00%
\$250	12.50%	87.50%			
\$500	25.00%	75.00%			
\$700	37.50%	62.50%			
\$1,000	50.00%	50.00%			

**Table for calculating WACC and determining the minimum WACC:
Practice #2**