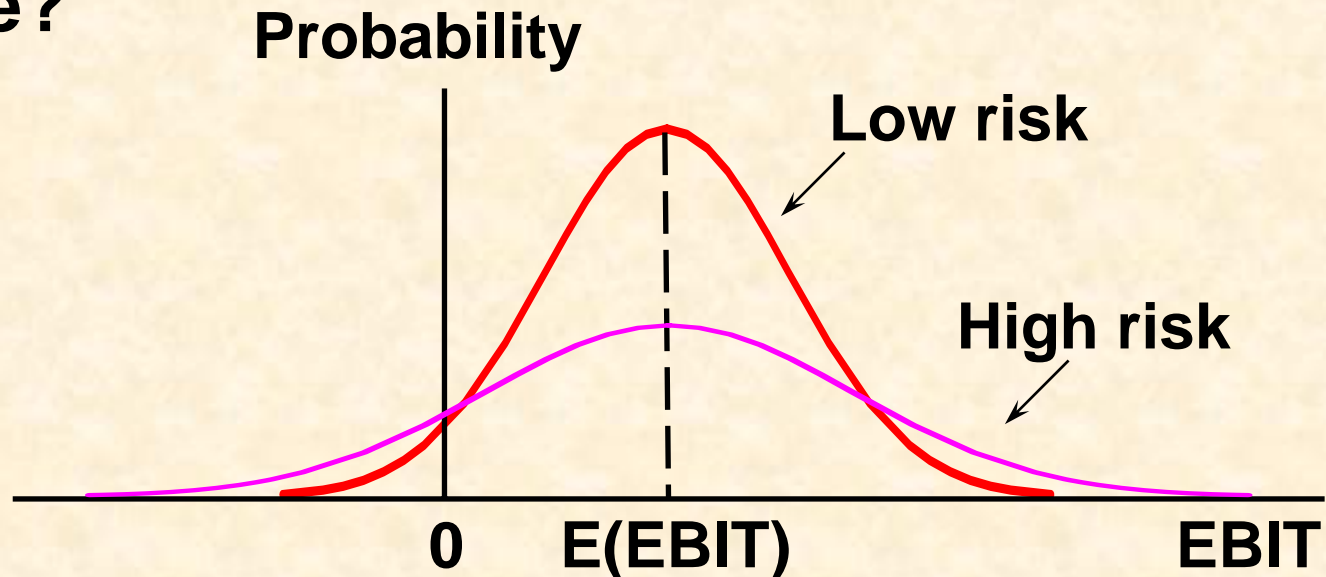


Capital Structure and Leverage

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

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.

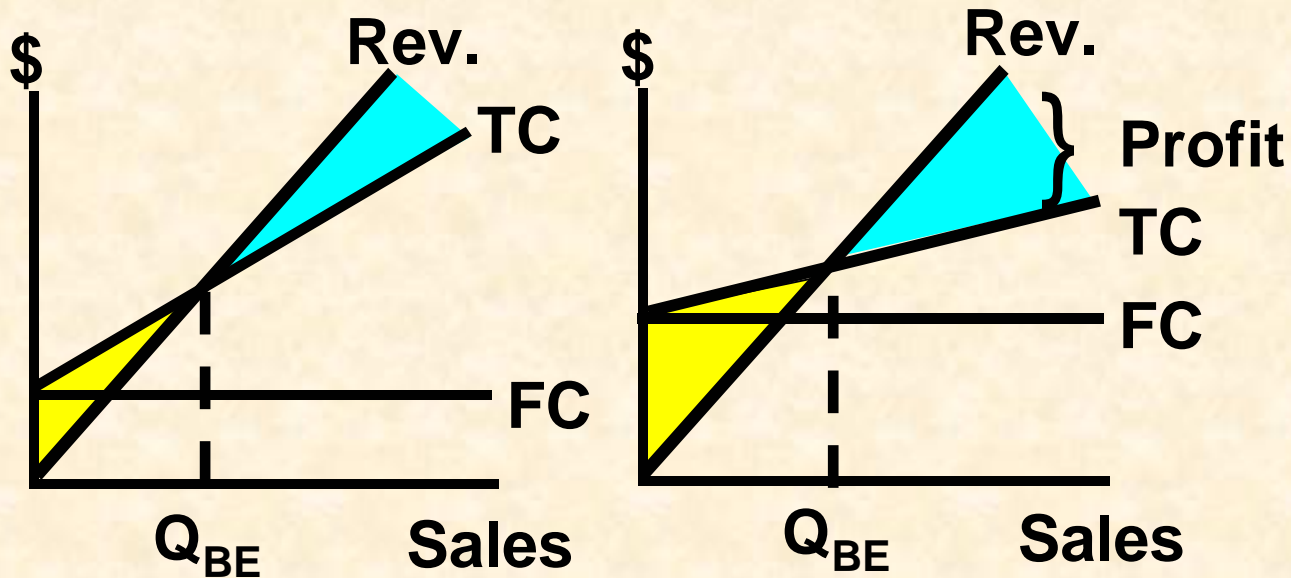
Business risk is affected primarily by:

- Uncertainty about **demand (sales)**.
- Uncertainty about **output prices**.
- Uncertainty about **costs**.
- Product, other types of **liability**.
- **Operating leverage**.

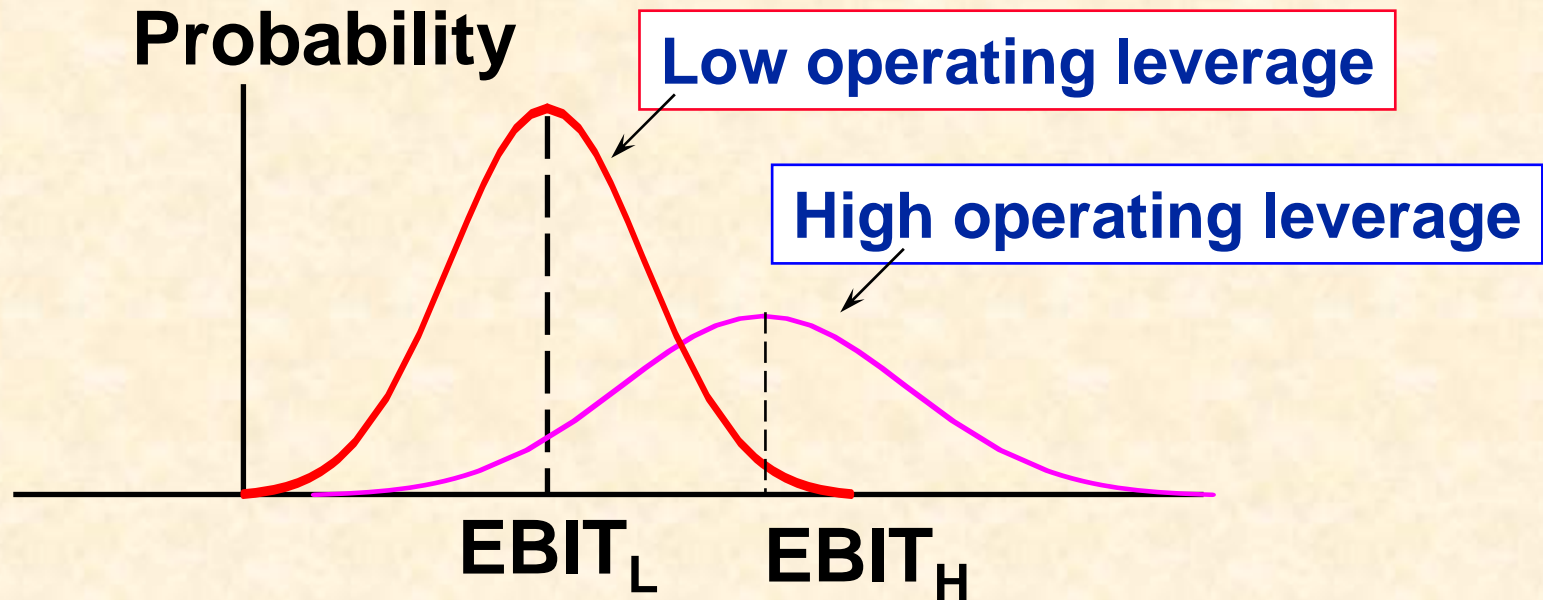
What is operating leverage, and how does it affect a firm's business risk?

- **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**.

- More operating leverage leads to more business risk, for then a small sales decline causes a big profit decline.



- What happens if variable costs change?



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

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.

Business Risk vs. Financial Risk

- **Business risk** depends on business factors such as competition, product liability, and operating leverage.
- **Financial risk** depends **only** on the types of securities issued: More debt, more financial risk. Concentrates business risk on stockholders.

Consider 2 Hypothetical Firms

Firm U

No debt

\$20,000 in assets

40% tax rate

Firm L

\$10,000 of 12% debt

\$20,000 in assets

40% tax rate

Both firms have same operating leverage, business risk, and probability distribution of EBIT. **Differ only with respect to use of debt (capital structure).**

Firm U: Unleveraged

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

Firm L: Leveraged

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

*Same as for Firm U.

| Firm U | Bad | Avg. | Good |
|---------------|--------------|--------------|--------------|
| BEP* | 10.0% | 15.0% | 20.0% |
| ROE | 6.0% | 9.0% | 12.0% |
| TIE | ∞ | ∞ | ∞ |

| Firm L | Bad | Avg. | Good |
|---------------|--------------|--------------|--------------|
| BEP* | 10.0% | 15.0% | 20.0% |
| ROE | 4.8% | 10.8% | 16.8% |
| TIE | 1.67x | 2.5x | 3.3x |

***BEP same for Firms U and L.**

Expected Values:

| | U | L |
|---------------|----------------------------|--------------|
| E(BEP) | 15.0% | 15.0% |
| E(ROE) | 9.0% | 10.8% |
| E(TIE) | ∞ | 2.5x |

Risk Measures:

| | | |
|----------------------------------|--------------|--------------|
| σ_{ROE} | 2.12% | 4.24% |
| CV_{ROE} | 0.24 | 0.39 |

- For leverage to raise expected ROE, must have **BEP** > k_d .
- **Why?** If $k_d > \text{BEP}$, then the interest expense will be higher than the operating income produced by debt-financed assets, so leverage will depress income.

Conclusions

- **Basic earning power = BEP = EBIT/Total assets is unaffected by financial leverage.**
- **L has higher expected ROE because $BEP > k_d$.**
- **L has much wider ROE (and EPS) swings because of fixed interest charges. Its higher expected return is accompanied by higher risk.**

If debt increases, TIE falls.

$$\text{TIE} = \frac{\text{EBIT}}{\text{Int}}$$

EBIT is constant (unaffected by use of debt), and since $\text{Int} = k_d D$, as D increases, TIE must fall.

Optimal Capital Structure

- That capital structure (mix of debt, preferred, and common equity) at which P_0 is maximized. Trades off higher $E(\text{ROE})$ and EPS against higher risk. The tax-related benefits of leverage are exactly offset by the debt's risk-related costs.
- The target capital structure is the mix of debt, preferred stock, and common equity with which the firm intends to raise capital.

Describe the sequence of events in a recapitalization.

- Campus Deli *announces* the recapitalization.
- New debt is *issued*.
- Proceeds are used to *repurchase* stock.

$$\text{Shares bought} = \frac{\text{Debt issued}}{\text{Price per share}}$$

Cost of Debt at Different Debt Levels after Recapitalization

| Amount borrowed | D/A ratio | D/E ratio | Bond rating | k_d |
|----------------------------|----------------------|----------------------|------------------------|-------------------------|
| \$ 0 | 0 | 0 | -- | -- |
| 250 | 0.125 | 0.1429 | AA | 8% |
| 500 | 0.250 | 0.3333 | A | 9% |
| 750 | 0.375 | 0.6000 | BBB | 11.5% |
| 1,000 | 0.500 | 1.0000 | BB | 14% |

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

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

What would the earnings per share be if Campus Deli recapitalized and used these amounts of debt: \$0, \$250,000, \$500,000, \$750,000? Assume EBIT = \$400,000, $T = 40\%$, and shares can be repurchased at $P_0 = \$25$.

D = 0:

$$\begin{aligned} \text{EPS}_0 &= \frac{(\text{EBIT} - k_d D)(1 - T)}{\text{Shares outstanding}} \\ &= \frac{(\$400,000)(0.6)}{80,000} = \$3.00. \end{aligned}$$

$$D = \$250, k_d = 8\%.$$

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

$$\begin{aligned} \text{EPS}_1 &= \frac{[\$400 - 0.08(\$250)](0.6)}{80 - 10} \\ &= \$3.26. \end{aligned}$$

$$\text{TIE} = \frac{\text{EBIT}}{I} = \frac{\$400}{\$20} = 20\times.$$

Stock Price (Zero Growth)

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

If payout = 100%, then EPS = DPS and $E(g) = 0$.

We just calculated $\text{EPS} = \text{DPS}$. To find the expected stock price (P_0), we must find the appropriate k_s at each of the debt levels discussed.

What effect would 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 .

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.**

Conclusions on Capital Structure

- 1. Need to make calculations as we did, but should also recognize inputs are “guesstimates.”**
- 2. As a result of imprecise numbers, capital structure decisions have a large judgmental content.**
- 3. We end up with capital structures varying widely among firms, even similar ones in same industry.**