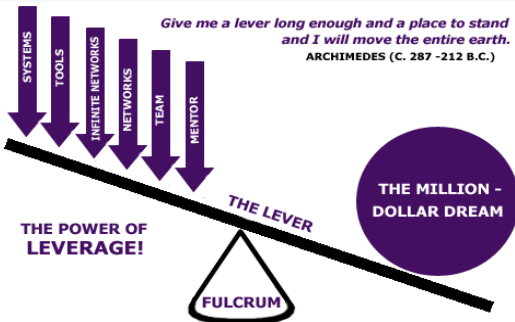


Chapter 13 Lecture - Leverage and Capital Structure

Chapter 13 Lecture - Leverage and Capital Structure



Capital Structure

- **Capital structure** = percent of debt and equity used to fund the firm's assets
 - “Leverage” = use of debt in capital structure
- **Capital restructuring** = changing the amount of leverage without changing the firm's assets
 - Increase leverage by issuing debt and repurchasing outstanding shares
 - Decrease leverage by issuing new shares and retiring outstanding debt

13-2

Capital Structure & Shareholder Wealth

- **The primary goal of financial managers:**
 - Maximize stockholder wealth
- **Maximizing shareholder wealth =**
 - Maximizing firm value
 - Minimizing WACC
- **Objective: Choose the capital structure that will minimize WACC and maximize stockholder wealth**

13-3

Business Risk versus Financial Risk

- **Business risk:**
 - Uncertainty in future EBIT.
 - 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 and preferred stock financing.

13-4

Chapter 13 Lecture - Leverage and Capital Structure

Business Risk

- The variability or uncertainty of a firm's operating income (EBIT).

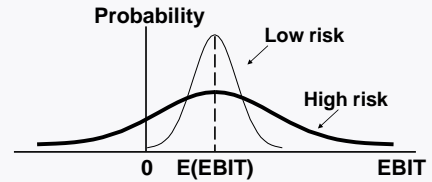


Affected by:

- Sales volume variability
- Competition
- Cost variability
- Product
- Diversification
- Product demand
- Operating Leverage

13-5

Business Risk: Uncertainty about Future Pre-tax Operating Income (EBIT)



Note that business risk focuses on operating income, so it ignores financing effects.

13-6

Financial Risk

- The variability or uncertainty of a firm's earnings per share (EPS) and the increased probability of insolvency that arises when a firm uses **financial leverage**.

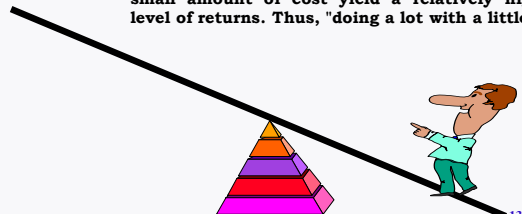


13-7

So What Exactly is Leverage?



Ability to influence a system, or an environment, in a way that multiplies the outcome of one's efforts without a corresponding increase in the consumption of resources. In other words, leverage is an advantageous-condition of having a relatively small amount of cost yield a relatively high level of returns. Thus, "doing a lot with a little."



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Chapter 13 Lecture - Leverage and Capital Structure

What is Leverage in Business?

- Remember it is the use of special forces and effects to magnify or produce more than the normal results from a given course of action
- Leverage involves using fixed costs to magnify the potential return to a firm
 - Can produce beneficial results in favorable conditions
 - Can produce highly negative results in unfavorable conditions

13-9

Leverage in a Business

- Determining type of fixed operational costs
 - Plant and equipment
 - Can reduce expensive labor in production of inventory
 - Expensive labor
 - Lessens opportunity for profit but reduces risk exposure
- Determining type of fixed financial costs
 - Debt financing
 - Can produce substantial profits, but failure to meet contractual obligations can result in bankruptcy
 - Selling equity
 - May reduce potential profits for existing shareholders, but reduces their risk exposure

13-10

Two Concepts that Enhance Understanding of Risk

1) Operating Leverage - affects a firm's *business risk*.

- The use of **fixed operating costs** as opposed to **variable operating costs**.
- A firm with relatively high **fixed operating costs** will experience more **variable operating income** if sales change.

2) Financial Leverage - affects a firm's *financial risk*.

- The use of **fixed-cost sources of financing** (debt, preferred stock) rather than **variable-cost sources** (common stock).

13-11

Operating Leverage and the Break-Even (Quantity) Point

Break-Even Point - The sales volume required so that total revenues and total costs are equal; may be in units or in sales dollars

How to find the quantity break-even point:

P = Price per unit **AVC** = Variable costs per unit
TFC = Fixed costs **Q** = Quantity (units) produced and sold

$$\text{EBIT} = \text{TR} - \text{TC} = \text{PQ} - \text{AVC}(\text{Q}) - \text{TFC}$$
$$\text{EBIT} = (\text{P} - \text{AVC})\text{Q} - \text{TFC}$$

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Break-Even (Quantity) Point

Breakeven occurs when $EBIT = 0$

$$EBIT = (P - AVC) Q - TFC = 0$$

$$(P - AVC) Q_{BE} - TFC = 0$$

$$(P - AVC) Q_{BE} = TFC$$

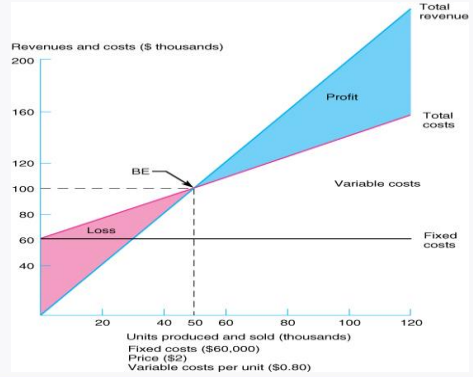
$$Q_{BE} = TFC / (P - AVC)$$

a.k.a. *Unit Contribution Margin*

- A leveraged firm has a high BE point
- A non-leveraged firm has a low BE point

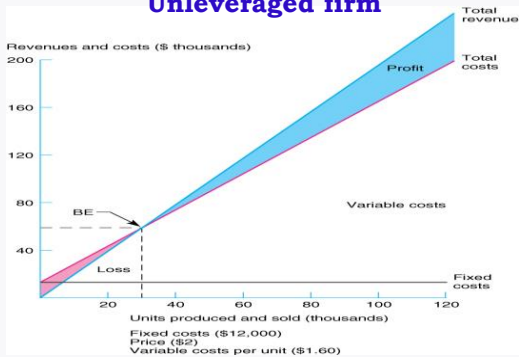
13-13

Break-Even Chart: Leveraged firm



13-14

Break-Even Chart: Conservative or Unleveraged firm



13-15

Volume-Cost-Profit Analysis: Leveraged Firm

| Units Sold | Total Variable Costs | Fixed Costs | Total Costs | Total Revenue | operating Income (loss) |
|------------|----------------------|-------------|-------------|---------------|-------------------------|
| 0 | 0 | \$60,000 | \$60,000 | 0 | \$(60,000) |
| 20,000 | \$16,000 | 60,000 | 76,000 | \$40,000 | (36,000) |
| 40,000 | 32,000 | 60,000 | 92,000 | 80,000 | (12,000) |
| 50,000 | 40,000 | 60,000 | 100,000 | 100,000 | 0 |
| 60,000 | 48,000 | 60,000 | 108,000 | 120,000 | 12,000 |
| 80,000 | 64,000 | 60,000 | 124,000 | 160,000 | 36,000 |
| 100,000 | 80,000 | 60,000 | 140,000 | 200,000 | 60,000 |

13-16

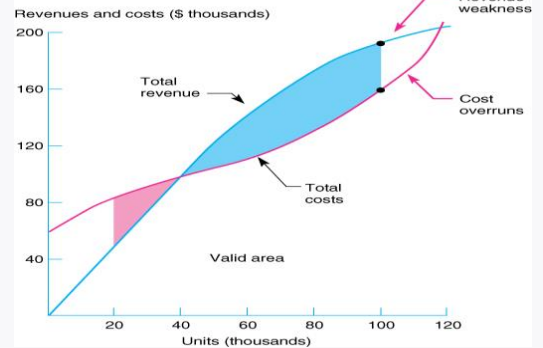
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Volume-Cost-Profit Analysis: Conservative or Unleveraged Firm

| Units Sold | Total Variable Costs | Fixed Costs | Total Costs | Total Revenue | Operating Income (loss) |
|------------|----------------------|-------------|-------------|---------------|-------------------------|
| 0 | 0 | \$12,000 | \$12,000 | 0 | \$(12,000) |
| 20,000 | \$32,000 | 12,000 | 44,000 | \$40,000 | (4,000) |
| 30,000 | 48,000 | 12,000 | 60,000 | 60,000 | 0 |
| 40,000 | 64,000 | 12,000 | 76,000 | 80,000 | 4,000 |
| 60,000 | 96,000 | 12,000 | 108,000 | 120,000 | 12,000 |
| 80,000 | 128,000 | 12,000 | 140,000 | 160,000 | 20,000 |
| 100,000 | 160,000 | 12,000 | 172,000 | 200,000 | 28,000 |

13-17

Nonlinear Break-Even Analysis



13-18

Degree of Operating Leverage (DOL)

- Measure of the amount of fixed operating costs used by a firm.
- Operating leverage amplifies changes in sales volume into larger changes in EBIT
- **Degree of Operating Leverage (DOL) = %Δ in EBIT (or Operating Income) / % Δ in Sales**

$$DOL = Q(P-AVC) / (Q(P-AVC) - TFC)$$

- Operating Leverage measures the sensitivity of a firm's operating income to a Δ in sales.

13-19

Operating Income or Loss

| Units | Leveraged Firm | Conservative Firm |
|---------|----------------|-------------------|
| 0 | \$(60,000) | \$(12,000) |
| 20,000 | (36,000) | (4,000) |
| 40,000 | (12,000) | 4,000 |
| 60,000 | 12,000 | 12,000 |
| 80,000 | 36,000 | 20,000 |
| 100,000 | 60,000 | 28,000 |

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Chapter 13 Lecture - Leverage and Capital Structure

Computing the DOL – Leveraged Firm

| Units Sold | Total Variable Costs | Fixed Costs | Total Costs | Total Revenue | operating Income (loss) |
|------------|----------------------|-------------|-------------|---------------|-------------------------|
| 0 | 0 | \$60,000 | \$ 60,000 | 0 | \$(60,000) |
| 20,000 | \$16,000 | 60,000 | 76,000 | \$ 40,000 | (36,000) |
| 40,000 | 32,000 | 60,000 | 92,000 | 80,000 | (12,000) |
| 50,000 | 40,000 | 60,000 | 100,000 | 100,000 | 0 |
| 60,000 | 48,000 | 60,000 | 108,000 | 120,000 | 12,000 |
| 80,000 | 64,000 | 60,000 | 124,000 | 160,000 | 36,000 |
| 100,000 | 80,000 | 60,000 | 140,000 | 200,000 | 60,000 |

| Unit Sales | Operating Income | % Change Sales | % Change in Operating Income | DOL |
|------------|------------------|----------------|------------------------------|----------|
| 40000 | -12000 | | | |
| 50000 | 0 | 0.25 | Infinite | Infinite |
| 60000 | 12000 | 0.2 | 2 | 10 |
| 80000 | 36000 | 0.333333333 | 0.666666667 | 2 |
| 100000 | 60000 | | | |

13-21

Computing the DOL – Conservative Firm

| Units Sold | Total Variable Costs | Fixed Costs | Total Costs | Total Revenue | operating Income (loss) |
|------------|----------------------|-------------|-------------|---------------|-------------------------|
| 0 | 0 | \$12,000 | \$ 12,000 | 0 | \$(12,000) |
| 20,000 | \$ 32,000 | 12,000 | 44,000 | \$ 40,000 | (4,000) |
| 30,000 | 48,000 | 12,000 | 60,000 | 60,000 | 0 |
| 40,000 | 64,000 | 12,000 | 76,000 | 80,000 | 4,000 |
| 60,000 | 96,000 | 12,000 | 108,000 | 120,000 | 12,000 |
| 80,000 | 128,000 | 12,000 | 140,000 | 160,000 | 20,000 |
| 100,000 | 160,000 | 12,000 | 172,000 | 200,000 | 28,000 |

| Unit Sales | Operating Income | % Change Sales | % Change in Operating Income | DOL |
|------------|------------------|----------------|------------------------------|------|
| 30000 | 0 | | | |
| 40000 | 4000 | 0.333333333 | 2 | 6 |
| 60000 | 12000 | 0.5 | 0.666666667 | 1.33 |
| 80000 | 20000 | 0.333333333 | 0.4 | 1.2 |
| 100000 | 28000 | | | |

13-22

Interpretation of the DOL

- DOL is a quantitative measure of the “sensitivity” of a firm’s operating profit to a change in the firm’s sales.
- The closer that a firm operates to its break-even point, the higher is the absolute value of its DOL.
- When comparing firms, the firm with the highest DOL is the firm that will be most “sensitive” to a change in sales.
- DOL is only **one component** of business risk and becomes “active” only in the presence of sales and production cost variability.
- DOL **magnifies** the variability of operating profits and, hence, business risk.

13-23

Financial Leverage

- “Financial leverage” = the use of debt
- Leverage amplifies the variation in both EPS and ROE
- We will ignore the effect of taxes at this stage
- We look at what happens to EPS and ROE when we issue debt and buy back shares of stock?
- The use of borrowed money incurs interest, which is like a fixed cost
- If returns are greater than the interest rate then financial leverage will improve a firm’s ROE and EPS
- However, if returns are lower than the interest rate then borrowing money will worsen EPS and ROE

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Chapter 13 Lecture - Leverage and Capital Structure

Trans Am Corporation Example

| | Current | Proposed |
|--------------------|-------------|-------------|
| Assets | \$8,000,000 | \$8,000,000 |
| Debt | \$0 | \$4,000,000 |
| Equity | \$8,000,000 | \$4,000,000 |
| Debt/Equity Ratio | 0.0 | 1.0 |
| Share Price | \$20 | \$20 |
| Shares Outstanding | 400,000 | 200,000 |
| Interest rate | 10% | 10% |

13-25

Trans Am Corp With and Without Debt

| | Current Capital Structure: No Debt | | |
|------------|------------------------------------|-------------|-------------|
| | Recession | Expected | Expansion |
| EBIT | \$500,000 | \$1,000,000 | \$1,500,000 |
| Interest | 0 | 0 | 0 |
| Net Income | \$500,000 | \$1,000,000 | \$1,500,000 |
| ROE | 6.25% | 12.50% | 18.75% |
| EPS | \$1.25 | \$2.50 | \$3.75 |

| | Proposed Capital Structure: Debt = \$4 million | | |
|------------|--|-------------|-------------|
| | Recession | Expected | Expansion |
| EBIT | \$500,000 | \$1,000,000 | \$1,500,000 |
| Interest | 400,000 | 400,000 | 400,000 |
| Net Income | \$100,000 | \$600,000 | \$1,100,000 |
| ROE | 2.50% | 15.00% | 27.50% |
| EPS | \$0.50 | \$3.00 | \$5.50 |

13-26

Leverage Effects

Variability in ROE

- **Current:** ROE ranges from 6.25% to 18.75%
- **Proposed:** ROE ranges from 2.50% to 27.50%

Variability in EPS

- **Current:** EPS ranges from \$1.25 to \$3.75
- **Proposed:** EPS ranges from \$0.50 to \$5.50

The variability in both ROE and EPS increases when financial leverage is increased

13-27

Example: Break-Even EBIT EPS are for both Capital Structures

$$\frac{\text{EBIT}}{400,000\text{sh}} = \frac{\text{EBIT} - \$400,000 \text{ (interest)}}{200,000\text{sh}}$$

$$\text{EBIT} = \left[\frac{400,000}{200,000} \right] (\text{EBIT} - \$400,000)$$

$$\text{EBIT} = 2 \times \text{EBIT} - \$800,000$$

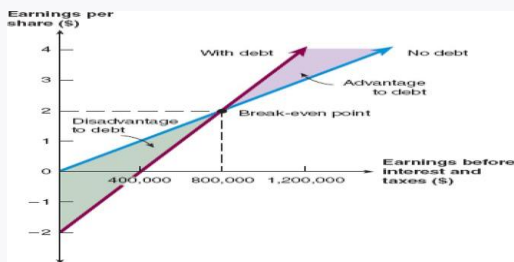
$$\text{EBIT} = \$800,000$$

$$\text{EPS} = \frac{800,000}{400,000} = \$2.00$$

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Chapter 13 Lecture - Leverage and Capital Structure

Break-Even EBIT



- If we expect EBIT to be *greater* than the break-even point, then leverage is *beneficial* to our stockholders
- If we expect EBIT to be *less* than the break-even point, then leverage is *detrimental* to our stockholders

13-29

Trans Am Corp Conclusions

1. The effect of leverage depends on EBIT
When EBIT is higher, leverage is **beneficial**
2. Under the “Expected” scenario, leverage increases ROE and EPS
3. Shareholders are exposed to more risk with more leverage
ROE and EPS more sensitive to changes in EBIT

13-30

Some Additional Information

- Asymmetric Information and Signaling

- Managers know the firm’s future prospects better than investors.
- Managers would not issue additional equity if they thought the current stock price was less than the true value of the stock (given their inside information).
- Hence, investors often perceive an additional issuance of stock as a negative signal, and the stock price falls.

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