Chapter 13 Lecture - Leverage and Capital Structure

Give me a lever long enough and a place to stand and I will move the entire earth.
ARCHIMEDES (C. 287 –212 B.C.)

SYSTEMS

TOOLS

INFINITE NETWORKS

NETWORKS

TEAM

MENTOR

THE LEVER

THE MILLION – DOLLAR DREAM

THE POWER OF LEVERAGE!

FULCRUM
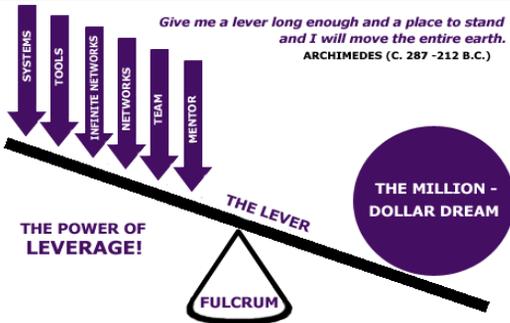
Capital Structure

- **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**

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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**

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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.**

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Business Risk

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

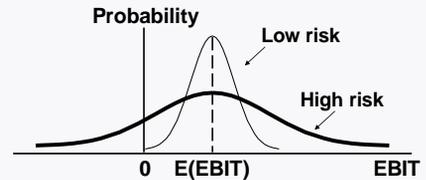EBIT → FIRM → EPS → Stock-holders

Affected by:

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

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

Probability

Low risk

High risk

0   E(EBIT)   EBIT

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

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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.**

EBIT → FIRM → EPS → Stock-holders

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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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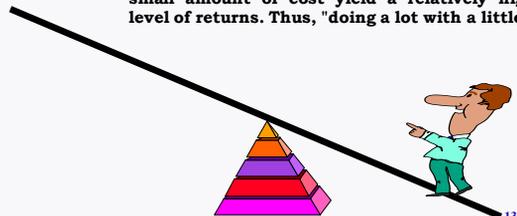
What is Leverage in Business?

- **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 <u>magnify</u> the potential return to a firm**

  - **Can produce beneficial results in favorable conditions**
  - **Can produce highly negative results in unfavorable conditions**

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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**

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Two Concepts that Enhance Understanding of Risk

1) **<u>Operating Leverage</u> - 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) **<u>Financial Leverage</u> - affects a firm's *financial risk.***

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

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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

$$EBIT = TR - TC = PQ - AVC(Q) - TFC$$
$$EBIT = (P - AVC)Q - TFC$$

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Break-Even (Quantity) Point

Breakeven occurs when EBIT = 0

$$\text{EBIT} = (P - AVC)\,Q - TFC = 0$$
$$(P - AVC)\,Q_{BE} - TFC = 0$$
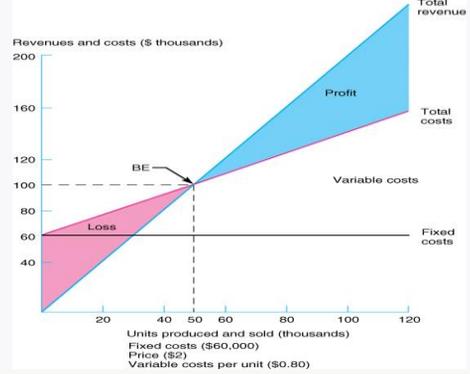$$(P - AVC)\,Q_{BE} = TFC$$
$$Q_{BE} = TFC / (P - AVC)$$

a.k.a. *Unit Contribution Margin*

- **A leveraged firm has a <u>high</u> BE point**
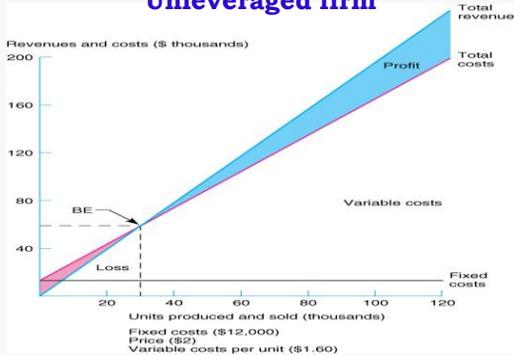- **A non-leveraged firm has a <u>low</u> BE point**

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Break-Even Chart: Leveraged firm

Revenues and costs ($ thousands)

Fixed costs ($60,000)
Price ($2)
Variable costs per unit ($0.80)

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Break-Even Chart: Conservative or Unleveraged firm

Revenues and costs ($ thousands)

Fixed costs ($12,000)
Price ($2)
Variable costs per unit ($1.60)

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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

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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

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Nonlinear Break-Even Analysis
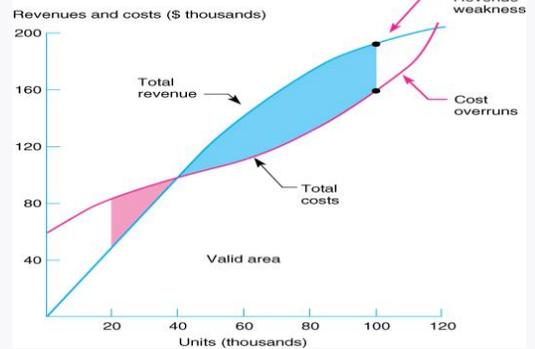
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Degree of Operating Leverage (DOL)

- 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.

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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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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

DOL (at Q = 40000) = Q(P-AVC) / (Q(P-AVC) – TFC)
= TR - TVC/(TR – TVC – TFC
= (80000 – 32000)/(80000 – 32000 - 60000) = 48000/-12000 = -4

DOL (at Q = 60000) = Q(P-AVC) / (Q(P-AVC) – TFC)
= TR - TVC/(TR – TVC – TFC
= (120000 – 48000)/(120000 – 480000 - 60000) = 72000/12000 = 6

DOL (at Q = 80000) = Q(P-AVC) / (Q(P-AVC) – TFC)
= TR - TVC/(TR – TVC – TFC
= (160000 – 64000)/(160000 – 640000 - 60000) = 96000/36000 = 2.67

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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

DOL (at Q = 40000) = Q(P-AVC) / (Q(P-AVC) – TFC)
= TR - TVC/(TR – TVC – TFC
= (80000 – 64000)/(80000 – 64000 - 12000) = 16000/4000 = 4

DOL (at Q = 60000) = Q(P-AVC) / (Q(P-AVC) – TFC)
= TR - TVC/(TR – TVC – TFC
= (120000 – 96000)/(120000 – 96000 - 12000) = 24000/12000 = 2

DOL (at Q = 80000) = Q(P-AVC) / (Q(P-AVC) – TFC)
= TR - TVC/(TR – TVC – TFC
= (160000 – 128000)/(160000 – 128000 - 60000) = 32000/20000 = 1.6

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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.

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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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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%

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Trans Am Corp
With and Without Debt

	Recession	Expected	Expansion
Current Capital Structure: No Debt			
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

	Recession	Expected	Expansion
Proposed Capital Structure: Debt = $4 million			
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

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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

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

$$\frac{EBIT}{400,000sh} = \frac{EBIT - \$4,000,000\ (interest)}{200,000sh}$$

$$EBIT = \left[\frac{400,000}{200,000}\right](EBIT - \$400,000)$$
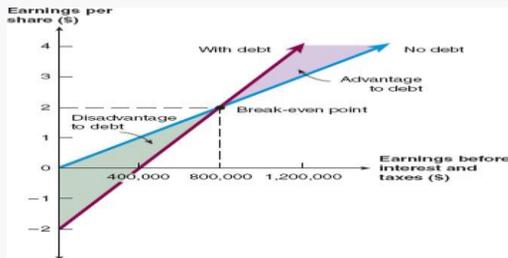
$$EBIT = 2 \times EBIT - \$800,000$$

$$EBIT = \$800,000$$

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

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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

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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

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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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