Leverage

Operating and Financial Leverage

Leverage

Operating Leverage ➔ Employment of an asset for which the firm pays a ***fixed*** cost

Financial Leverage ➔ Employment of funds which the firm pays a ***fixed*** return

Operating Leverage

Firm has fixed operating costs that do not vary with output

Rent, capital equipment, salaries

A change in output or sales produces a proportionally greater change in operating profits

Small ΔQ ➔ bigger ΔOperating Profits

Degree of Operating Leverage

An elasticity coefficient measuring the responsiveness of operating profits to a change in output or sales

$$OL = \frac{\%\Delta \text{Operating Profit}}{\%\Delta \text{Output or sales}} \geq 1$$

$$OL = \frac{dp}{p} \div \frac{dQ}{Q}$$

p = profit, Q = output

P = price per unit, TR = total revenue, TC = total cost

AVC = avg variable cost, VC = total variable cost

FC = fixed cost

$p = TR - TC$ $TR = P \cdot Q$ $TC = VC + FC$ $VC = AVC \cdot Q$

$p = P \cdot Q - AVC \cdot Q - FC$

if P, AVC and FC are constant, $dp = dQ(P - AVC)$

$$\therefore OL = \frac{Q(P - AVC)}{Q(P - AVC) - FC} \geq 1$$

Operating leverage example

$P = \$66/\text{unit}$ $AVC = \$27/\text{unit}$ $FC = \$195{,}000$

$$OL = \frac{Q(P - AVC)}{Q(P - AVC) - FC} = \frac{Q(66 - 27)}{Q(66 - 27) - 195{,}000}$$

if $Q = 6{,}000$ units, $OL = 6$

if $Q = 8{,}000$ units, $OL = 2.67$

if $Q = 20{,}000$ units, $OL = 1.33$

Leverage observations

- Operating leverage decreases as output increases
- Fixed costs are decreasing in relative importance and variable costs are increasing in relative importance as output rises
- Thus, the degree of operating leverage is declining

Fixed vs. variable operating costs

Fixed: Own your own fleet of trucks for which you make a fixed monthly payment to local Ford dealer **(high OL)**

Variable: Rent trucks on an as-needed basis from local U-Haul Center

What if: sales really take off?

What if: sales really plummet?

Magnified gains and losses with owning

Financial Leverage

How much of a firm's assets are financed by borrowed money (debt) vs. how much by stockholders' money (equity)

Two common ratios measure leverage:

- Debt to Asset Ratio
- Times Interest Earned Coverage Ratio

Debt to Asset Ratio

$$\text{debt ratio} = \frac{\text{total debt}}{\text{total assets}}$$

$$\text{equity ratio} = \frac{\text{total equity}}{\text{total assets}}$$

High debt ratio (firm = 70%, ind avg = 55%)

- chance for magnified gains and losses
- greater chance of bankruptcy and failure

Low debt ratio (firm = 30%, ind avg = 55%)

- sacrificing of profits
- tax-deductibility of interest payments

Times Interest Earned Ratio

$$TIE = \frac{\text{Operating Income (EBIT)}}{\text{Interest Charges}}$$

$$TIE = \frac{\text{ability to pay}}{\text{amount coming due}}$$

Primary determinant of a firm's bond ratings

high quality AAA, AA $TIE > 6$

medium quality A, BBB, BB $3 < TIE < 6$

speculative quality B, CCC, CC, C $TIE < 3$

Initial Position

Balance Sheet		*Income Statement*
Total Assets	1000	Assume ROA=10%
		Operating income=.10x1000=100
Debt	0	-interest charges - 0
Equity	1000	----------
----------		Net income = 100
Total Claims	1000	ROE = 100/1000=10%

Favorable leverage

Balance Sheet		*Income Statement*
Total Assets	1500	Assume ROA=10%
		Operating income=.10x1500=150
Debt (6%)	500	-interest char=.06x500=-30
Equity	1000	----------
----------		Net income = 120
Total Claims	1500	ROE = 120/1000=12%

Unfavorable leverage

Balance Sheet		*Income Statement*
Total Assets	1500	Assume ROA=10% on old but only 3% on new
Debt (6%)	500	Operating income = .10x1000+.03x500=115
Equity	1000	-interest char=.06x500=-30
Total Claims	1500	Net income = 85 ROE = 85/1000=8.5%

Degree of Financial Leverage

Elasticity coefficien t that measures the responsive ness of net income to changes in operating income

$$FL = \frac{\%\Delta \text{Net Income}}{\%\Delta \text{Operating Income}} \geq 1$$

$$FL = \frac{\text{EBIT}}{\text{EBIT -int charges}}$$

Degree of Total Leverage

Elasticity coefficien t that measures the responsive ness of net income to changes in output or sales

Borrowing money by issuing debt and using the funds to automate the plant or to buy a fleet of trucks and then having to make fixed monthly payments to Ford dealer

TL = OL x FL

$$TL = \frac{\%\Delta \text{Net Income}}{\%\Delta \text{Output or sales}} \geq 1$$