

Project Analysis

Concepts to be Learned:

- Sensitivity Analysis
- Scenario Analysis
- Break-Even Analysis
 - Accounting Break-Even
 - NPV Break-Even
- Operating Leverage
 - Degree of Operating Leverage (DOL)

Sensitivity Analysis

Sensitivity Analysis:

The process of changing a single variable (such as sales volume, variable costs, fixed costs, etc.) from a set of variables and computing the resulting NPV. We do this to examine the NPV of certain alternatives:

- Best Case
 - Worst Case
 - Most Likely
-

Example 1:

How much could NPV be affected by a worst-case scenario of 15% reduction from the \$5 million in expected annual cash flows on a four year project with 10% cost of capital?

NPV = Sum of the present value of all project/investment cash flows

NPV = PV(All Cash Outflows) + PV(All Cash Inflows)

Scenario Analysis

Scenario Analysis:

The process of changing a several variables (such as sales volume, variable costs, fixed costs, etc.) from a set of variables and computing the resulting impact.

- This is a more realistic approach as compared to Sensitivity Analysis
-

Example 2:

Below is the current performance of XYZ Inc. What would be the effect on the profits of the company if revenues increase by 20% and variable costs increase to 50% of sales?

Revenues	20,000,000.00
Variable Costs	- 8,000,000.00
Fixed Costs	- 5,000,000.00
Before Tax Profit	7,000,000.00
Tax @ 35%	- 2,450,000.00
Profit	\$ 4,550,000.00

Accounting Break-Even

Accounting Break-Even Formula (from formula sheet)

$$= \frac{\text{Fixed Costs} + \text{Depreciation}}{\text{Additional Profit from each dollar of sales}}$$

Accounting Break-Even Formula (to remember)

$$= \frac{\text{Fixed Costs} + \text{Depreciation}}{(1 - \text{Variable Cost Ratio})}$$

Example 3:

What is the accounting break-even level of sales, assuming \$1 million in fixed costs, \$500,000 in depreciation expense and a variable cost-to-sales ratio of 60%?

Accounting Break-Even

Accounting Break-Even Formula (from formula sheet)

$$= \frac{\text{Fixed Costs} + \text{Depreciation}}{\text{Additional Profit from each dollar of sales}}$$

Accounting Break-Even Formula (to remember)

$$= \frac{\text{Fixed Costs} + \text{Depreciation}}{(1 - \text{Variable Cost Ratio})}$$

Example 4:

What is the accounting break-even level of sales for a company with \$10 million in sales, variable costs of \$4.5 million, fixed costs of \$1 million and depreciation expense of \$500,000?

NPV Break-Even

NPV break-even level of sales = The sales level at which NPV is zero

Example 5:

What is the NPV Break-even level in units for the following project.

Initial Investment: \$300,000

Sales Price Per Unit: \$200

Variable Cost Per Unit: \$150

Fixed Costs: \$80,000

Tax Rate: 30%

Discount Rate: 15%

10 year project

NPV = Sum of the present value of all project/investment cash flows

NPV =

$PV(\text{Initial Investment}) + PV(\text{Salvage}) + PV(\text{NWC Invested}) + PV(\text{NWC Recovered}) + PV(\text{Tax Shields}) + PV(\text{Operating Cash Flows})$

Operating Leverage

Is the degree to which a project's costs are fixed.

- When project costs are mostly fixed, it is said to have high operating leverage.
- High leverage means that profits are more sensitive to changes in sales.

Degree of Operating Leverage (DOL)

$$\mathbf{DOL} = \frac{\% \text{ Change in Profits}}{\% \text{ Change in Sales}} \quad \mathbf{DOL} = 1 + \frac{(\text{Fixed Costs} + \text{Depreciation})}{\text{Pre - Tax Profits}}$$

Example 6:

What is the DOL of a firm with \$800,000 fixed costs and \$200,000 depreciation if pre-tax profits are \$150,000?

Operating Leverage

Degree of Operating Leverage (DOL)

$$\mathbf{DOL} = \frac{\% \text{ Change in Profits}}{\% \text{ Change in Sales}} \quad \mathbf{DOL} = 1 + \frac{(\text{Fixed Costs} + \text{Depreciation})}{\text{Pre-Tax Profits}}$$

Example 7:

A firm has a DOL = 2.5. If sales decrease by 20%, then profit will _____.