Sensitivity Analysis of Profit

By Dr. Istadi

Propose a Project?

- Whenever a project is proposed, market surveys, market price projections, market share, and revenues are estimated
- Capital cost and operating expenses are estimated
- Profitability of a project is calculated
- All these estimates are based on what is believed to be the best available data
- Errors inherent in all estimates, and the effect of these errors on profitability, will be considered

Objectives of Sensitivity Analysis?

- Sensitivity analysis is used to determine the effect of technical and economic parameters on the profitability of a project.
- The potential error of each parametric variable is examined, as well as its effect on the project

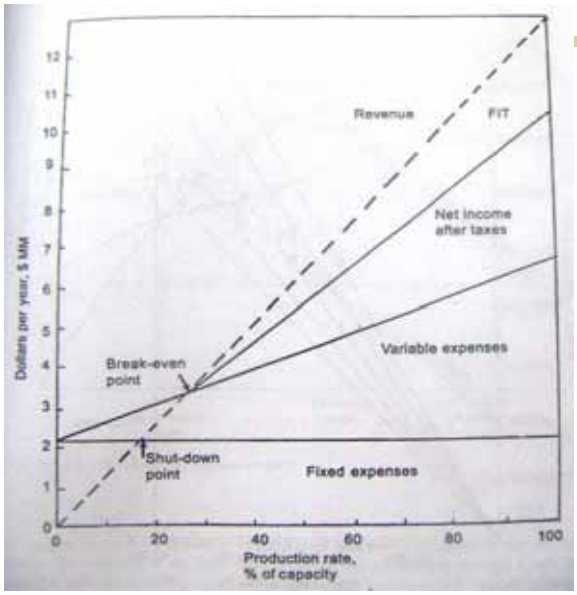
What is Sensitivity Analysis?

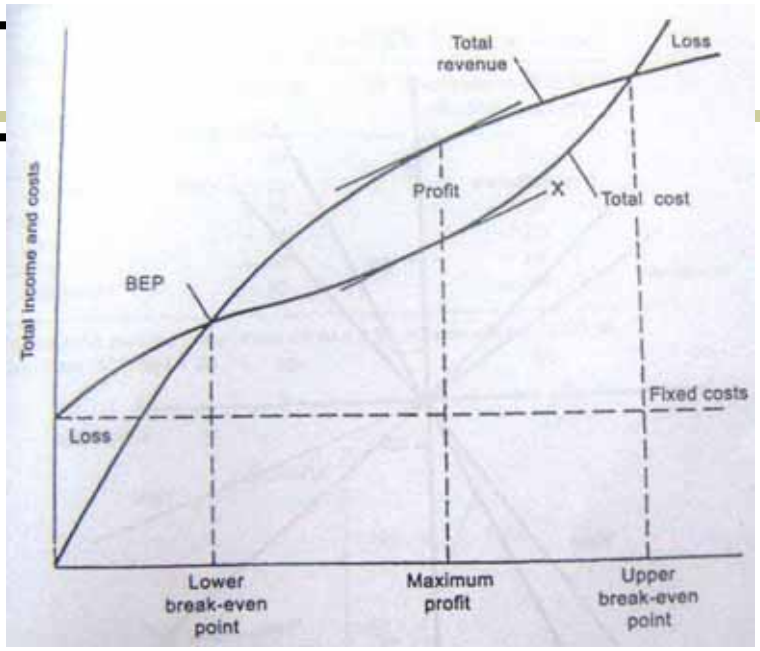
- Sensitivity Analysis is concerned with the extent of change in a cost analysis resulting from **variations in one or more elements** of a cost study.
- It shows the influence of possible changes of significant variables upon profitability.
- The ordinary practice is to make a number of computations of profitability, varying each significant cost element over the most likely range of values.

Break Even Analysis

- **BEP** is a simple form of sensitivity analysis, and is useful concept that can be of value to managers when a certain level of uncertainty exists.
- Break even refers to the point at which operations break even, where **income just equals expenses**.
- The **revenue or expenses are plotted as a function of the production rate or production capacity**

Typical Break-even Plot

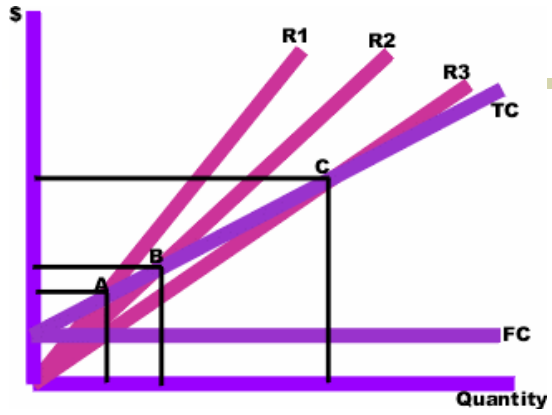




BEP Analysis …..

- **Break Even Point:** production capacity at which the revenue line (Sa) intersects the total expense line (Fa+Ra + Va)
- Management ➔ wants to do better than BEP ➔ profit planning tool
- **Shutdown Point:** the Revenue line (Sa) crosses the Fixed expense line (Fa)
- *If a company cannot make fixed expenses, it should shut down operations*
- For a short period of time a company may operate between the BEP and the Shutdown point to maintain customers.

- Break-even quantity = Total Fixed costs (Fa) / (Selling price (Sa) - average Variable costs (Va))
- Revenues = (selling price * quantity of product)
- Costs = (average variable costs * quantity) + total fixed costs
- Profit=(selling price*quantity)-(average variable costs*quantity + total fixed costs)



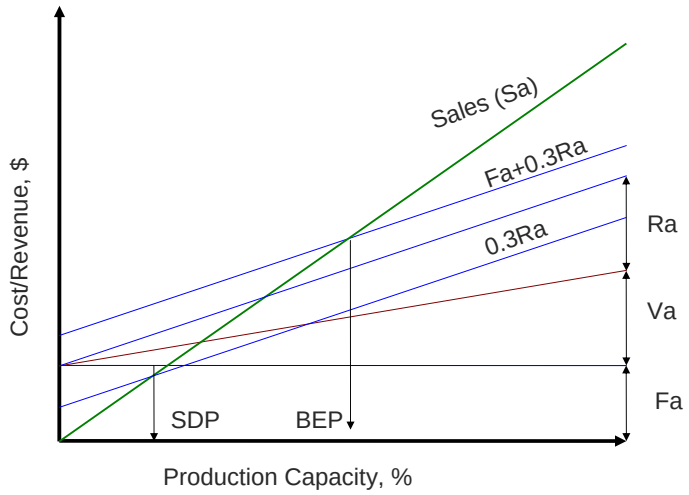
- The break even points (A,B,C) are the points of intersection between the total cost curve (TC) and a total revenue curve (R1, R2, or R3).

From Aries & Newton (1955)

$$BEP = \frac{Fa+0.3Ra}{Sa-Va-0,7Ra} \times 100\%$$

$$SDP = \frac{0.3Ra}{Sa-Va-0,7Ra} \times 100\%$$

Graphical Sensitivity Analysis (Aries & Newton, 1955)



Fa, Va, Ra ????

- **Fixed Cost (Fa)**: Depreciation, Property Taxes, Insurance
- **Variable Cost (Va)**: Raw material, Utilitas, Royalties & Patent, Packaging & Shipping
- **Regulated Cost (Ra)**: Labor, Payroll overhead, Supervision, Laboratorium, General Expense, Maintenance, Plant Supplies, Plant Overhead

Other Statements

- The firm will shut down if it cannot cover its variable costs. So long as it can cover the **variable costs**, it will continue to produce.
- This is an application of the opportunity cost principle. Just because fixed costs are fixed, they are not opportunity costs in the short run -- so they are not relevant to the decision to shut down.
- Even if the company shuts down, it must pay the fixed costs anyway. But the **variable costs are avoidable -- they are opportunity costs!** So the firm will shut down if it cannot meet the variable (short run opportunity) costs. But as long as it can pay the variable costs and still have something to apply toward the fixed costs, it is better off continuing to produce.

- It is important not to confuse shut-down with bankruptcy. They are two different things. If a company cannot pay its interest and debt payments (usually fixed costs), then it is **bankrupt**. But that doesn't mean it will shut down. Bankrupt firms are often reorganized under new ownership, and continue to produce -- just because they can cover their variable costs, and so the new owners do better to continue producing than to shut down.