Chapter -3-

Cost – Volume - Profit Analysis

(CVP)

Cost – volume – Profit (CVP) analysis studies the behavior and relationship among (revenues, total cost, and income) as changes occur in the units sold, selling price, variable cost per unit, fixed cost of a product.

(CVP) Assumptions:

The following are some assumptions underlying (CVP) analysis:

1- Changes in the levels of revenues and costs arise only because of changes in the number of product (or service) units sold. The number of units sold is the only revenue driver and the only cost driver. Just as a cost driver is any factor that affects costs, a revenue driver is a variable, such as volume, that causally affects revenues.

2- Total costs can be separated into two components: a fixed component that does not vary with units sold and a variable component that changes with respect to units sold.

3- When represented graphically, the behaviors of total revenues and total costs are linear (meaning they can be represented as a straight line) in relation to units sold within a relevant range (and time period).

4- Selling price, variable cost per unit, and total fixed costs (within a relevant range and time period) are known and constant.

Expressing (CVP) Relationships:

There are three methods to think more deeply about (CVP) relationships:

1- The equation method:

Net Income = Revenues – Total costs

Net Income = (Selling price * Quantity sold) – [(Variable cost per unit * Quantity) + Fixed cost]

Net Income = (SP*Q) – [(V.C*Q) + F.C]

At Breakeven point net Income = Zero

Revenue = Total Cost

S.P*Q = (V.C*Q) + F.C

2- Contribution Margin Method:

$$\text{A: Breakeven point (units)} = \frac{Fixed\ costs}{Contribution\ Margin\ per\ unit}$$

$$= \frac{F.C}{S.P - V.C}$$

$$\text{B: Breakeven point (\$)} = \frac{Fixed\ Costs}{Contribution\ margin\ percentage}$$

$$= \frac{F.C}{C.M\ \%}$$

*C.M% →
- 100% - V.C%
- $\frac{S.P - V.C}{S.P}$
- $\frac{Total\ Revenue - Total\ variable\ costs}{Total\ Revenue}$

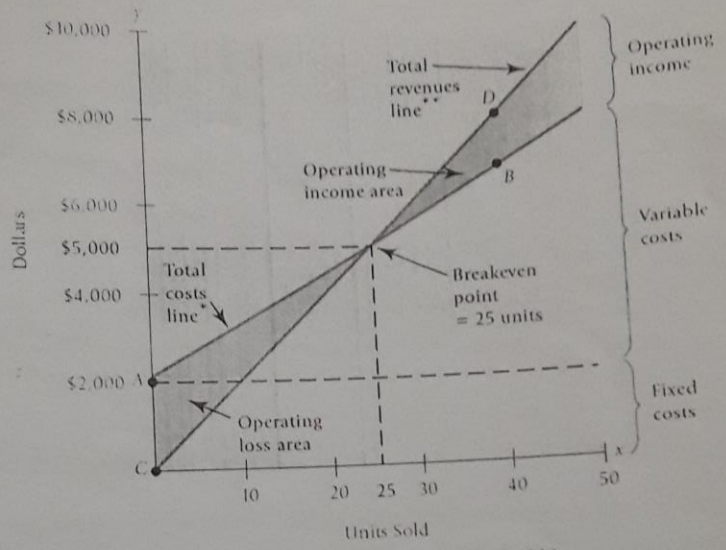
3- Graph Method:

Example: The following data have been collected:-

Selling price per unit $200, Variable cost per unit $120, Fixed cost $2000

Required: Find breakeven point graphically.

Solution:



* Slope of the total costs line is the variable cost per unit = $120

** Slope of the total revenues line is the selling price = $200

Contribution Margin and Margin of safety:

Contribution Margin = Selling Price – Variable cost

Margin of Safety (units) = Actual (Budgeted) sales (units) – Breakeven Point (units)

Or Margin of safety ($) = Actual (Budgeted) sales ($) - Breakeven Point ($)

$$\text{Margin of safety percentage} = \frac{Margin\ of\ safety}{\text{Actual (Budgeted) sales}}$$

Target Net Income and Income Taxes:

A- Without Income tax

The quantity of units must Sell to earn net income $= \frac{Fixed\ Cost + Profit}{Contribution\ Margin} = \frac{F.C+R}{S.P-V.C}$

Total Revenue ($) $= \frac{F.C+R}{C.M\ \%}$

B- With Income tax

Total quantity of units Must sell to earn net income after tax $= \frac{Fixed\ Cost + \frac{Profit}{1-tax\ rate\ \%}}{C.M} = \frac{F.C+\frac{R}{1-tax\%}}{S.P-V.C}$

Total Revenue ($) $= \frac{Fixed\ cost + \frac{Profit}{1-tax\ rate}}{Contribution\ Margin\%} = \frac{F.C+\frac{R}{1-tax\%}}{C.M\%}$

Sensitivity Analysis and (CVP)

Sensitivity analysis is a " what-if " technique that managers use to examine how an outcome will change if the original predicted data are not achieved or if an underlying assumption changes.

In (CVP) analysis, sensitivity analysis answers questions such as:

* What will operating income be if the quantity of unit sold decrease?
* What will operating income be if variable cost increase?
* What will operating income be if fixed cost increase?

Operating Leverage and CVP:

Operating Leverage describe the effects that fixed costs have on changes in operating income as changes occur in units sold and contribution Margin

Degree of Operating Leverage = $\frac{Contribution\ Margin}{Net\ Income}$

Or Degree of Operating Leverage = $\frac{1}{Margin\ of\ safety\%}$

Data	High Leverage	Low Leverage
Variable Cost	Low	High
Fixed Costs	High	Low
Breakeven point	High	Low
Risk	High	Low
Profit	High	Low

(CVP) Analysis and Sales Mix:

Breakeven point in bundles = $\frac{Fixed\ Cost}{Contribution\ Margin\ per\ bundle}$

$= \frac{Fixed\ Costs}{\frac{Total\ Contribution\ Margin}{Total\ quantity\ sold}}$

Breakeven point for each product (units):

Breakeven point for product A (units) =

Breakeven point in bundles * $\frac{Quantity\ sold\ (A)}{Total\ quantity\ sold}$

Breakeven point for product A (units) =

Breakeven point in bundles * $\frac{Quantity\ sold\ (B)}{Total\ quantity\ sold}$

Breakeven Point (revenues) = $\frac{Fixed\ Costs}{Contribution\ margin\ \%\ for\ the\ bundle}$

Breakeven point for each product ($)

Breakeven point for each product **A** ($) =

$$\text{Breakeven Point (revenues)} * \frac{Revenue(A)}{Total\ Revenue}$$

Breakeven point for each product **B** ($) =

$$\text{Breakeven Point (revenues)} * \frac{Revenue(B)}{Total\ Revenue}$$