

# **Topic 3. COST VOLUME PROFIT APPROACH**

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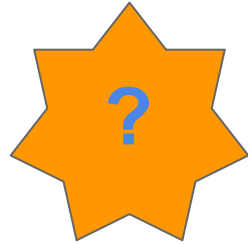


# CONTENT

- 3.1. Costs of an organization's inputs and output
- 3.2. Cost and revenue drivers; causality; cost hierarchies
- 3.3. Break-even point and safety margin
- 3.4. Cost structures and operating leverage
- 3.5. Cost management

# COST VOLUME PROFIT (CVP) ANALYSIS

- helpful to understand the relationship among variable costs, fixed costs and profit.
- looks at the relationship between selling prices, sales volumes, costs, and profits.



# COST VOLUME PROFIT ANALYSIS

Basic assumptions:

- – selling price is constant
- – costs are linear;
  - ▷ and can be divided into fixed and variable;
  - ▷ fixed element constant over the relevant range;
  - ▷ unit variable cost constant over relevant range
- – sales mix is constant
- – inventories stay at the same level

# Contribution Margin (CM)

- **Contribution Margin (CM)**
  - ▷ is the amount remaining from sales revenue
  - ▷ after variable expenses have been deducted
- CM goes to cover fixed expenses.
- After covering fixed costs,
  - ▷ any remaining CM contributes to income.

Sales

Less: Variable costs

Contribution margin

Less: Fixed costs

Operating income

Less: Provision for income taxes

Net income

## Contribution Margin ratio (CMR)

- CMR= CONTRIBUTION MARGIN RATIO
  - ▷ **CMR = CM / REVENUES** OR **cmu/p**
- VCR = VARIABLE COST RATIO
- **VCR= VC / REVENUES** OR **vcu/p**
- **CMR +VCR= 1**
  - ▷ **cmu - CM per unit, vcu - VC pre unit, p - price**
- EFFECT OF CHANGE IN FIXED COSTS?
- EFFECT OF CHANGE IN VARIABLE COSTS?
- EFFECT OF CHANGE IN SELLING PRICE?

### Contribution Margin

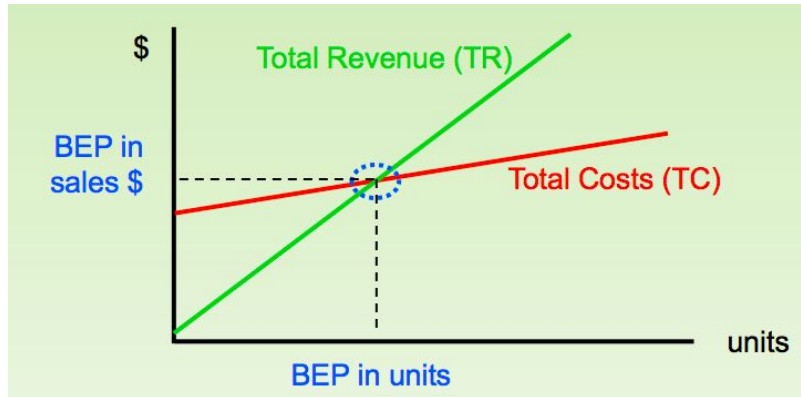
	\$	Per unit
Sales	\$750,000	\$3.00
Variable Costs	450,000	1.80
Contribution Margin	<u>300,000</u>	<u>\$1.20</u>

### Contribution Margin Ratio

$$\frac{\text{Contribution Margin}}{\text{Sales}} = \frac{\$300,000}{\$750,000} = 40\% \quad \frac{\$1.20}{\$3.00} = 40\%$$

# Break Even Point (BEP)

- **The breakeven point (BEP)** is where total revenue equal total costs.
- OR
- total contribution margin equals total fixed expenses.





## The Contribution Approach

For each additional unit Wind sells, \$200 more in contribution margin will help to cover fixed expenses and profit.

	Total	Per Unit
Sales (500 bikes)	\$ 250,000	\$ 500
Less: variable expenses	150,000	300
Contribution margin	\$ 100,000	\$ 200
Less: fixed expenses	80,000	
income	\$ 20,000	

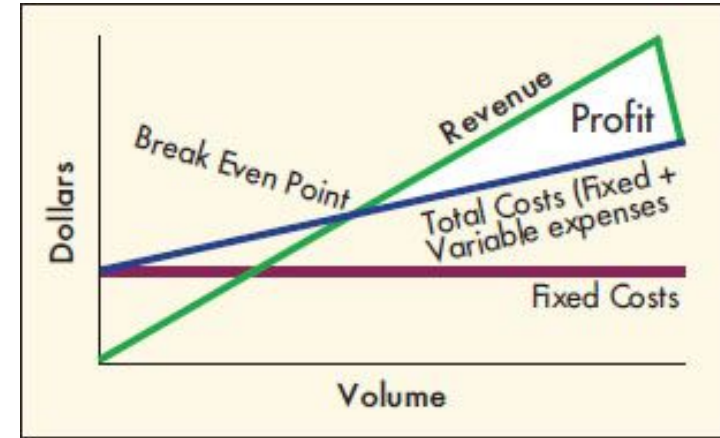
## The Contribution Approach

Each month Wind must generate at least **\$80,000** in total CM to break even.

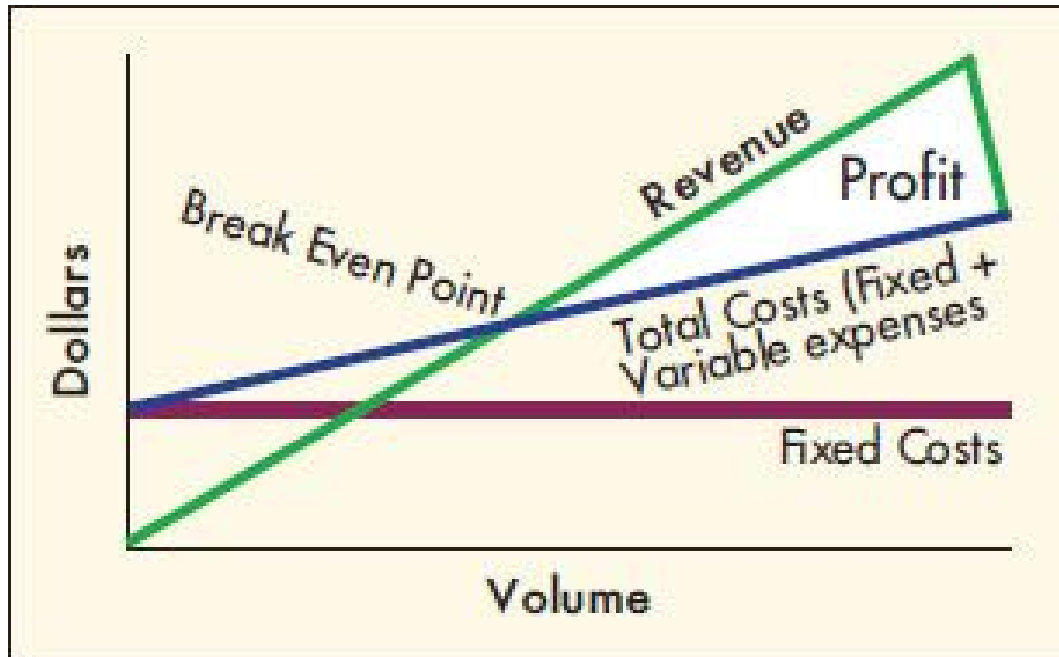
	<u>Total</u>	<u>Per Unit</u>
Sales (500 bikes)	\$250,000	\$ 500
Less: variable expenses	<u>150,000</u>	<u>300</u>
Contribution margin	\$100,000	\$ 200
Less: fixed expenses	<u>80,000</u>	
income	<u>\$ 20,000</u>	

# PROFIT ANALYSIS

- at breakeven profit = 0
  - before breakeven loss; after breakeven profit
  - CM covers fixed cost upto breakeven point
  - after breakeven point increase in CM will increase Operating Income
- 
- **CM = FC + Operating Income**



# COST VOLUME PROFIT ANALYSIS



Sales

Less: Variable costs

Contribution margin

Less: Fixed costs

Operating income

Less: Provision for income taxes

Net income

# Break-Even Analysis

Break-even analysis can be approached in two ways:

1. Equation method
2. Contribution margin method.

## Equation Method

Operating Income =

Revenues – (Variable expenses + Fixed expenses)

Revenues = Variable expenses + Fixed expenses + Operating Income

OR

*At the break-even point profits = 0.*

## DERIVATION OF EQUATIONS

- REVENUES= VARIABLE COSTS+FIXED COSTS + PROFIT
  - ▷  $p \cdot q = vcu \cdot q + FC + 0$  (*\*AT BREAK-EVEN PROFIT = 0*)
  - ▷  $q \cdot (p - vcu) = FC$
  - ▷  **$q = FC / (p - vcu)$  OR  $q = FC / cmu$**
- $CM = SALES - TOTAL\ VC$
- $VC = SALES - CM$  *\*INCLUDE VARIABLE PRODUCTION AND SELLING EXPENSES*
- $cmu = p - vcu$  OR  $cmu = CM/q$
- $vcu = VC/q$
- ***q - number of units, p - price, vcu - VC per unit, FC - total FC, cmu - CM per unit***

## Contribution Margin Method

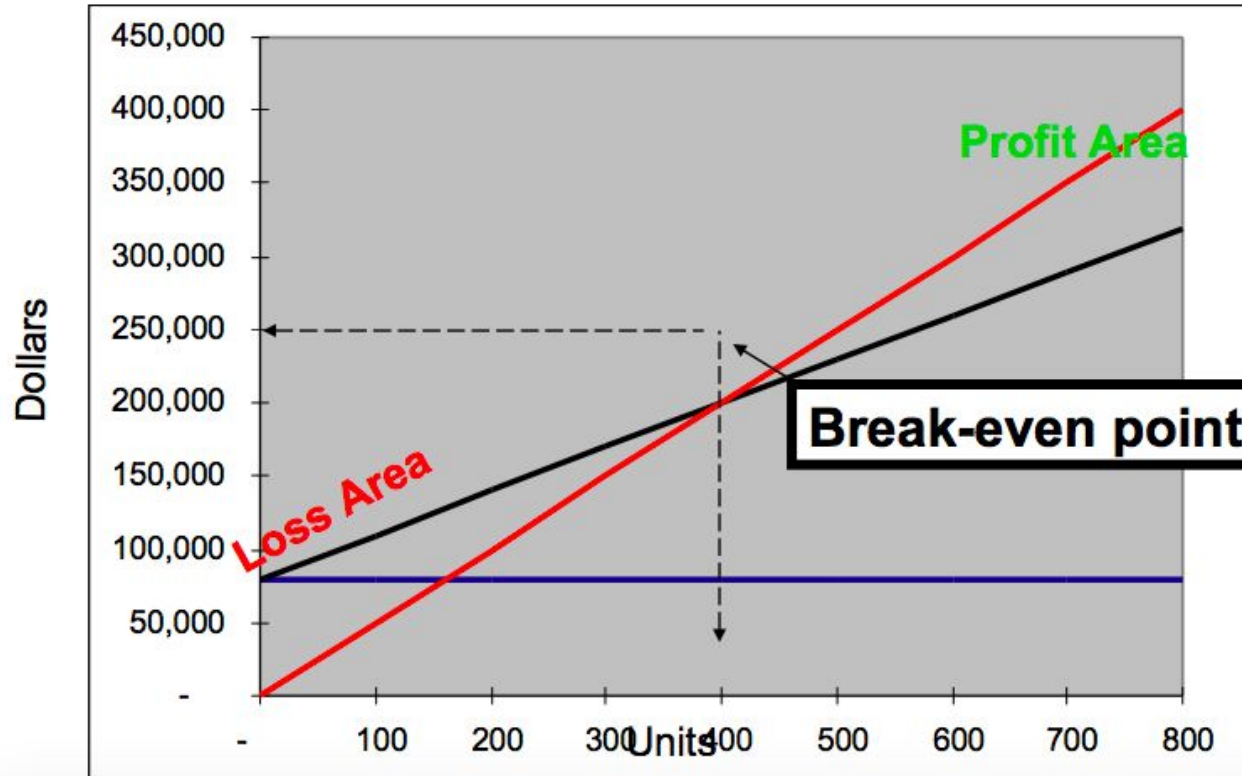
The contribution margin method is a variation of the equation method.

$$\text{Break-even point in units sold} = \frac{\text{Fixed expenses}}{\text{Unit contribution margin}}$$

$$\text{Break-even point in total sales dollars} = \frac{\text{Fixed expenses}}{\text{CM ratio}}$$



# CVP Graph



## Margin of Safety

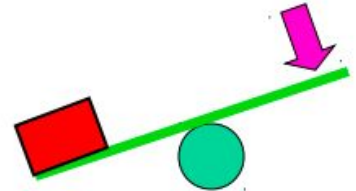
- The **Margin of Safety** is
  - ▷ an excess of budgeted (or actual) sales
  - ▷ over the break-even volume of sales.
- **Margin of safety = Total sales - Break-even sales**
- *The amount by which sales can drop before losses begin to be incurred.*

## Margin of Safety

- **MoS \$ = ACTUAL (OR BUDGETED) SALES \$ - BREAK-EVEN SALES \$**
- **MoS % = MoS \$ / ACTUAL (OR BUDGETED) SALES \$**
- 
- AT BREAK-EVEN REVENUES = VC\$ + FC\$
- $VCR = x\% \times \text{REVENUES}$  then  $1 - x\% = \text{CMR}$
- $\text{REVENUES} = x\% \times \text{SALES} + \text{FC}$
- $(1 - x\%) \times \text{SALES \$} = \text{FC}$  that is  $\text{CMR} \times \text{REVENUES} = \text{FC}$
- **REVENUES AT BREAK-EVEN = FC / CMR**
- **MoS - Margin of Safety, CMR - CM ratio, VC\$ - total VC**

# Operating Leverage

- **Operating Leverage** is a measure of
  - ▷ how sensitive Operating income is
  - ▷ to percentage changes in sales.
- With high leverage, a small percentage increase in sales can produce a much larger percentage increase in Operating income.
- **Degree of Operating Leverage = Contribution margin / Operating income**



## COST STRUCTURE AND PROFITABILITY

- high variable costs lead to lower CM and less unsafe in crisis time
- high fixed costs cause higher breakeven point;
- after the breakeven point profits increase faster than the high variable cost company
- degree of operating leverage:  $\text{contribution margin} / \text{net income}$
- for a given % change in sales, income will increase by  $(\% \text{ increase in sales} * \text{degree of operating leverage})$
- degree of operating leverage decreases as the sales move away from the breakeven point
- if variable costs are high degree of operating leverage low; and vice versa



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*Chapter 8. Cost-volume-profit  
relationships.*