- **Course Title:** Engineering Cost Analysis & Economy (ENGR 222)
- **Session:** Fall 2024
- **Instructor:** Sudipta Chowdhury (chowdhurys@marshall.edu)
- **Class Time: TR 9.30 AM-10.45 AM**
- **Office hours: TR 11.00 AM-12.30 PM**

Breakeven Analysis

Cost-Revenue Model — One Project

Quantity, Q — An amount of the variable in question, e.g., units/year, hours/month

Breakeven value is Q_{BE}

Fixed cost, FC — Costs not directly dependent on the variable, e.g., buildings, fixed overhead, insurance, minimum workforce cost

Variable cost, VC — Costs that change with parameters such as production level and workforce size. These are labor, material and marketing costs. Variable cost per unit is *v*

Total cost, TC — Sum of fixed and variable costs, $\mathbf{TC = FC + VC}$

Cost-Revenue Model — One Project

Revenue, R — Amount is dependent on quantity sold

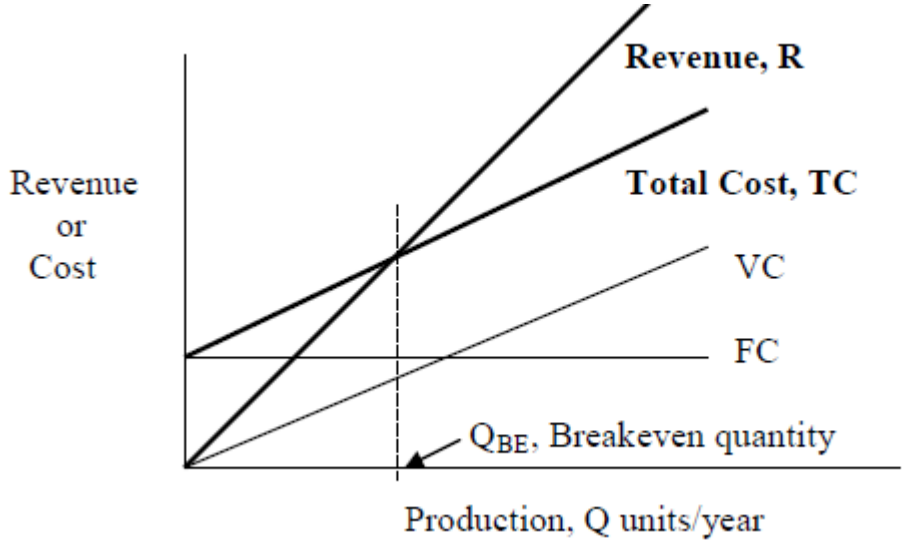
Revenue per unit is *r*

Profit, P — Amount of revenue remaining after costs

$$P = R - TC = R - (FC + VC)$$

At breakeven, there is no profit or loss, hence, revenue = total cost or, R = TC

Cost-Revenue Model — One Project



It can be seen that we have profit if the production level is above the breakeven quantity and loss if it is below.

Breakeven for linear R and TC

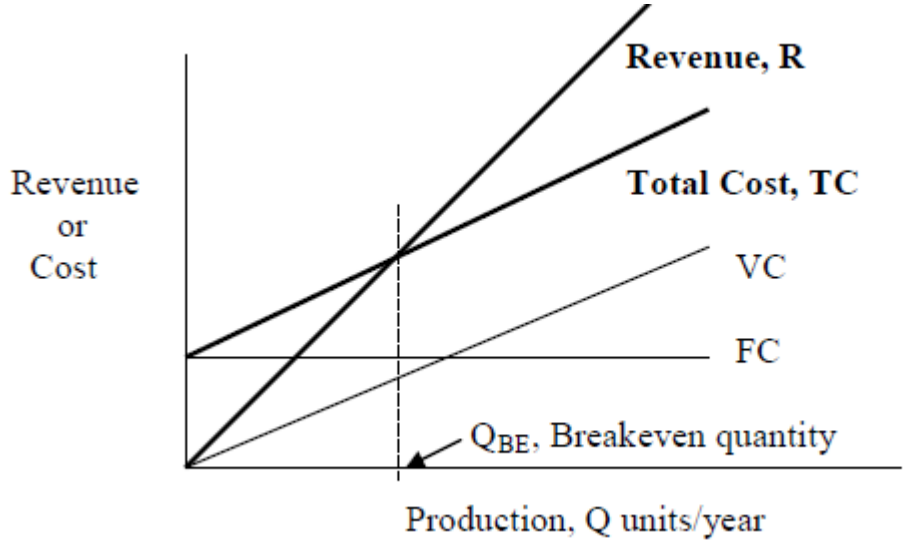
Set R = TC and solve for Q = Q_{BE}

$$R = TC$$

$$rQ = FC + vQ$$

$$\mathbf{Q_{BE}} = \frac{FC}{r - v}$$

When variable cost, v, is lowered, Q_{BE} decreases (moves to left)



r=revenue per unit
v=variable cost per unit

Example: One Project Breakeven Point

A plant produces 15,000 units/month. Find breakeven level if FC = $75,000 /month, revenue is $8/unit and variable cost is $2.50/unit. Determine expected monthly profit or loss.

Example 2: The fixed costs at Company X are $1 million annually. The main product has revenue of $8.90 per unit and $4.50 variable cost. (a) Determine the breakeven quantity per year, and (b) Annual profit if 200000 units are sold.

Example 3: A product currently sells for $12 per unit. The variable costs are $4 per unit, and 10,000 units are sold annually and a profit of $30,000 is realized per year. A new design will increase the variable costs by 20% and Fixed Costs by 10% but sales will increase to 12,000 units per year. (a) At what selling price do we break even, and (b) If the selling price is to be kept same ($12/unit) what will the annual profit be?

QUESTIONS?