Competitive Markets

Features

(*) (i) Large number of buyers and sellers. (No buyer / seller has mkt power)
(Firms are price takers in the competitive mkt)

(ii) All firms selling homogeneous product

(iii) Freedom of entry and exit. (No restriction).

Note: A competitive equilibrium is Pareto optimal.

Suppose there are 'n' homogeneous firms in the market. then Let $q_i(P)$ denote the supply of the ith firm at mkt price P. Then total mkt supply at the given price P:

$$Q(P) = q_1(P) + q_2(P) + \dots + q_n(P) \quad \text{[Horizontal summation]}$$

mkt supply curve

$$= \sum_{i=1}^{n} q_i(P) \quad [q_i(P) \text{ is determined by } \pi\text{-max of } i\text{th firm}]$$

since, firms are homogeneous, $q_1(P) = q_2(P) = \dots = q_n(P) = q(P)$

$$\therefore \boxed{Q(P) = n\, q(P)} \Rightarrow n = \text{no. of firms in the mkt}$$

$Q(P)$ → mkt supply.

$q(P)$ → representative firm's supply

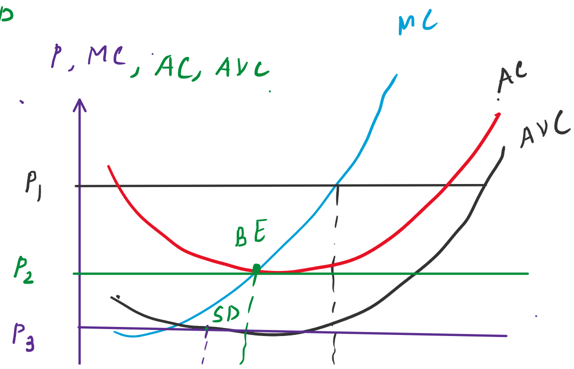
Firm in a Competitive Market

Firms are price takers in the mkt: $P = \bar{P}$

Let $c(q)$ denote the cost fn of the firm.

$$\pi = R - C = \bar{P}.q - c(q)$$

Obj: Determine q that max π.



$$\frac{\partial \pi}{\partial q} = 0 \Rightarrow \bar{P} - \frac{\partial C}{\partial q} = 0 \Rightarrow (P = MC)$$

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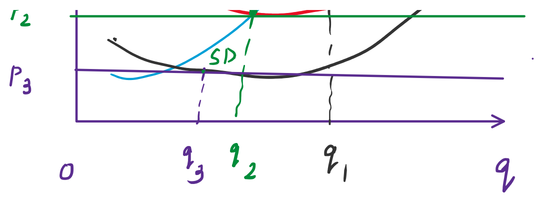

(i) Break Even Point : pt where $\pi = 0 \Rightarrow \bar{P} \cdot q - C(q) = 0.$

(ii) Shut Down Point : $\Rightarrow \bar{P} = \frac{C(q)}{q} \Rightarrow \boxed{P = AC}$

The pt where the firm goes out of business, i.e it does not produce anything $(q = 0)$

$\boxed{P = AVC}$

Break-even point: $P = \min AC$.

Shut-down point $P = \min AVC$.

Now, firm's supply curve, $s(P) = \begin{cases} q(P), & P \geq \min AVC \\ 0, & P < \min AVC \end{cases}$

Market supply curve $S(P) = \begin{cases} Q(P), & P \geq \min AVC. \\ 0, & P < \min AVC. \end{cases}$

Q. The cost fn of the ith firm in a competitive market is given by:

$C_i(q_i) = 0.1\, q_i^3 - 2q_i^2 + 15q_i + 10, \quad i = 1, 2, \dots, n$

(a) Find the supply curve of the firm.

(b) If there are 100 firms in the mkt, find the mkt supply curve.

$C_i(q_i) = 0.1\, q_i^3 - 2q_i^2 + 15q_i + 10.$

$VC_i = 0.1\, q_i^3 - 2q_i^2 + 15q_i$

$AVC_i = 0.1\, q_i^2 - 2q_i + 15$

For min $\frac{d\,AVC_i}{dq_i} = 0 \Rightarrow 0.2\,q_i - 2 = 0 \Rightarrow q_i = \frac{2}{0.2} = 10.$

$\min AVC_i = 0.1(10)^2 - 2(10) + 15 = 5$

Firm will supply if $P \geq 5$

For supply $\pi_i = \bar{P} \cdot q_i - (0.1 q_i^3 - 2q_i^2 + 15 q_i + 10)$.

For π-max: $\frac{d\pi_i}{dq_i} = 0 \Rightarrow \bar{P} - 0.3 q_i^2 + 4q_i - 15 = 0$.

$0.3 q_i^2 - 4q_i + (15 - \bar{P}) = 0$ ... [solve for q_i]

[Quadratic in q_i]

Quad: $ax^2 + bx + c = 0$.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$q_i = \frac{4 \pm \sqrt{16 - 4(0.3)(15 - \bar{P})}}{2 \times 0.3}.$$

$$q_i = \frac{4 \pm \sqrt{16 - 1.2(15 - \bar{P})}}{0.6}.$$

$$q_i = \frac{4 \pm \sqrt{16 - 18 + 1.2P}}{0.6}.$$

$$q_i = \frac{4 \pm \sqrt{1.2P - 2}}{0.6}.$$

$\cancel{12}^{6} \times \cancel{15}^{3}$, $\cancel{10}$, 2

$$\therefore \boxed{q_i = \frac{4 + \sqrt{1.2P - 2}}{0.6}}$$

$\therefore$ Firm's supply curve. $s(p) = \begin{cases} \frac{4 + \sqrt{1.2P - 2}}{0.6}, & P \geq 5 \\ 0, & P < 5 \end{cases}$