Inventory management
Part I

Economic Order Quantity Model

Types of Inventory

- Four types of inventory
  - Raw Material
  - Semi-finished goods or Work-in-progress
  - Finished goods
  - Stores and spares

Need for inventory

- Production is a continuous activity
- Smooth production process

- Transaction motive
- Precautionary motive
- Speculative motive

Inventory Management Model
Economic Order Quantity

- **There are two basic questions**
  - What should be the size of the order?
  - At what level should the order be placed?

Cost of managing inventory

Ordering costs

(i) Cost of requisitioning the item(s)

(ii) Cost of preparation of purchase order (*i.e. drafting, typing, dispatch and postage)*

(iii) Cost of sending reminders to get the dispatch of item(s) expedited

(iv) Cost of transportation of goods

(v) Cost of receiving goods

(vi) Cost of unloading of goods

Carrying costs

(i) Capital cost (*i.e. interest on funds locked up in inventories)*

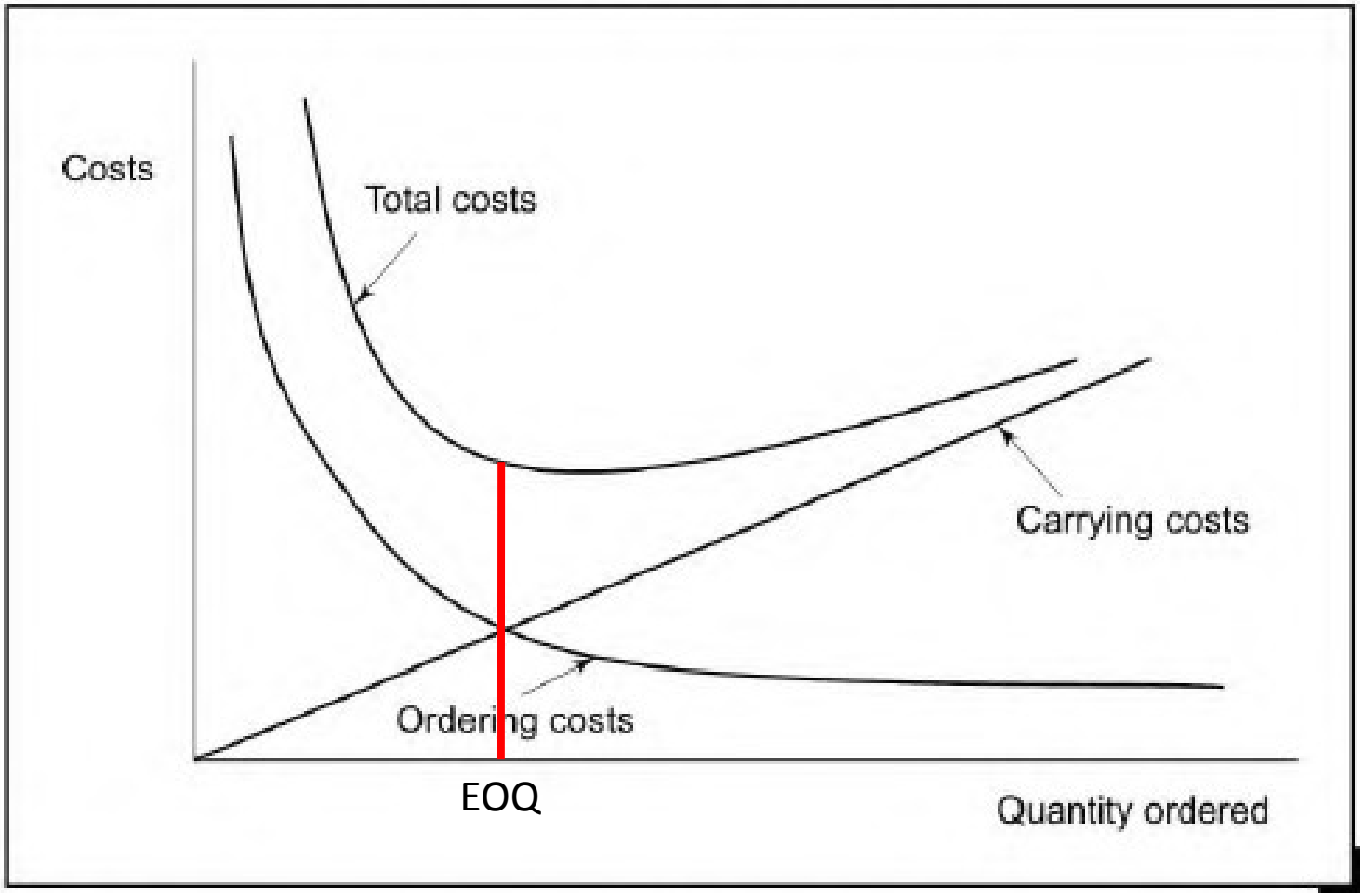
(ii) Storage cost

(iii) Cost of insurance (fire and theft insurance of stocks)

(iv) Obsolescence cost

(v) Taxes

Behaviour of Costs



Assumptions of the EOQ Model

- **The basic EOQ model is based on the following assumptions:**
- The usage/demand of material for a given period, usually one year, is known.
- The consumption of raw material is distributed evenly throughout the period.
- Inventory orders can be replenished immediately (There is no delay in placing and receiving orders).
- There are two distinguishable costs associated with inventories: costs of ordering and costs of carrying'.
- The cost per order is constant regardless of the size of order.
- The cost of carrying is a fixed percentage of the average value of inventory.

For determining the EOQ formula we shall use the following symbols:

- A = annual usage/demand
- Q = quantity ordered
- B = cost per order
- C = carrying cost per unit
- P = price per unit
- TC = total costs of ordering and carrying

Total cost of managing inventory

Ordering cost

$$= \frac{A}{Q} \times B$$

Carrying cost

$$= \frac{Q}{2} \times C$$

$$Total\ \cos t = \frac{A}{Q} \times B + \frac{Q}{2} \times C$$

Economic Order Quantity Model

- The order level at which the total cost of managing inventory is minimum is known as EOQ.
- This can be derived by applying minima rule of differentiation.
- If you take first differential and make it equal to zero, you will get the final formula:

$$EOQ = \sqrt{\frac{2AB}{C}}$$

EOQ

$$\frac{dTC}{dQ} = -\frac{AB}{Q^2} + \frac{C}{2} = 0$$

$$= -2AB + CQ^2 = 0$$

$$= CQ^2 = 2AB$$

$$= Q^2 = \frac{2AB}{C}$$

$$Q = \sqrt{\frac{2AB}{C}}$$

An illustration

- The annual sales of ABC LTD. is estimated at 1,800 units. The ordering cost, per order, is (fixed) 60, and the inventory carrying cost per unit is 2.

Quantity Ordered Q	1,800	900	600	450	360	300	225	200	180	150
Average Inventory Q/2	900	450	300	225	180	150	112.5	100	90	75
No. of orders A/Q	1	2	3	4	5	6	8	9	10	12
Annual carrying cost C*(Q/2)	1,800	900	600	450	360	300	225	200	180	150
Annual Ordering cost B*(A/Q)	60	120	180	240	300	360	480	540	600	720
Total Annual Cost (C+B)	1,860	1,020	780	690	660	660	705	740	780	870

EOQ: Answer of given example

$$EOQ = \sqrt{\frac{2 \times 1800 \times 60}{2}} = 328.63$$

We may say 329 Units.
No. of orders = 1800/329 = 5.47

Either 5 or 6 orders. In both cases either we place 5 or 6 order the total cost will be 660.

- **Average inventory** = EOQ/2

= 329/2 = 164.5 Units

- **No. of Orders** = Annual Demand / EOQ

= 1800/329 = 5.47

No. of days per order = 360/No. of orders = 360/5.47 = 65.81 days

(We have assumed 360 working days in a year)

average per day consumption = EOQ/No. of days per order = 329/65.81 = 4.999 Units or 5 Units per day

- Annual sales of App. Eco. Limited is 50,000 units. The ordering cost per order is 5,00. Purchase price per unit is 20. Inventory carrying cost is 25 per cent of the inventory value. Calculate EOQ and other information.