Universität zu Köln

Seminar für Allgemeine Betriebswirtschaftslehre, Supply Chain Management und Management Science

Primer on Inventory Management

Economic Order Quantity Model

Economic order quantity (EOQ) model

Assumptions
- Demand is deterministic and constant
- All demand must be met from inventory
- Orders arrive instantaneously after ordering

Parameters

μ Demand rate (20 units/week)

K Fixed order cost (20 €/order)

c Variable order cost (400 €/unit)
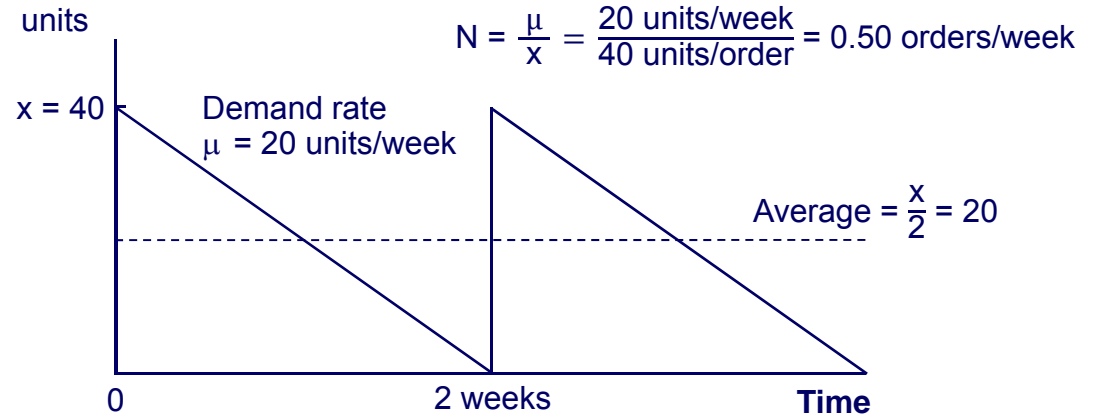
h Inventory holding cost (2 €/unit/week)

Decision variable

x Order quantity (x = 40 units/order)

Other variables

N Number of orders

Inventory level

units

$$N = \frac{\mu}{x} = \frac{20 \text{ units/week}}{40 \text{ units/order}} = 0.50 \text{ orders/week}$$

x = 40

Demand rate
μ = 20 units/week

$$\text{Average} = \frac{x}{2} = 20$$

0   2 weeks   **Time**

Total cost = Inventory holding cost + Fixed order cost + Variable order cost

$$Z(x) = \quad h\frac{x}{2} \quad + \quad K\frac{\mu}{x} \quad + \quad c\mu$$

$$\frac{d}{dx}Z(x) = \quad h\frac{1}{2} \quad\quad -K\frac{\mu}{x^2}$$

EOQ Formula

$$\frac{d}{dx}Z(x) \overset{!}{=} 0 \Rightarrow x^* = \sqrt{\frac{2K\mu}{h}} = \sqrt{\frac{2 \cdot 20 \cdot 20}{2}} = 20 \text{ units}$$

$$Z(x^*) = c\mu + \sqrt{2K\mu h} = 400 \cdot 20 + \sqrt{2 \cdot 20 \cdot 20 \cdot 2} = 8{,}040 \text{ €/week}$$