$\text{capacity} = \dfrac{1}{\text{cycle time}}$ $\text{utilization} = \dfrac{\text{flow rate}}{\text{capacity}}$ flow rate = minimum (demand, capacity) avg. inventory = avg. flow rate $\times$ avg. flow time

$$\text{avg. time in queue } T_q = \left(\frac{\text{service time}}{m}\right) \times \left(\frac{\text{utilization}^{\sqrt{2(m+1)}-1}}{1-\text{utilization}}\right) \times \left(\frac{CV_a^2 + CV_p^2}{2}\right)$$

avg. inventory in queue $I_q = T_q / a$ avg. flow time $T = T_q + p$

where m = number of servers

a = avg. interarrival time

flow rate = avg. arrival rate = $1/a$

$CV_a =$ coefficient of variation of interarrival time $= \dfrac{\text{standard deviation of interarrival time}}{\text{avg. interarrival time}}$

p = avg. service time

capacity per server = avg. service rate = $1/p$

capacity for m-server system = m/p

$CV_p =$ coefficient of variation of service time $= \dfrac{\text{standard deviation of service time}}{\text{avg. service time}}$

$$\text{utilization} = \frac{\text{flow rate}}{\text{capacity}} = \frac{p}{m \times a} = \frac{\text{time busy}}{\text{time available}}$$

$$\text{economic order quantity} = \sqrt{\frac{2 \times S \times D}{h}}$$

where D = demand / unit time

S = setup (fixed) cost incurred per order

h = holding cost / unit time

c = per-unit purchase cost

Q = order quantity

$$\text{total cost over time unit} = \underbrace{c \times D}_{\text{variable cost over time unit}} + \underbrace{\frac{h \times Q}{2}}_{\text{inventory cost over time unit}} + \underbrace{\frac{S \times D}{Q}}_{\text{setup cost over time unit}}$$

average inventory = $Q/2$ number of orders over time unit = D/Q

critical fractile = $\dfrac{G}{G+L}$ where G is gain L and is loss, the actual values of G and L are context specific, but we looked at examples where G = price − cost and L = cost − salvage value, or where G = high fare − low fare and L = low fare

quantity = mean + z $\times$ standard deviation $z = \dfrac{\text{quantity} - \text{mean}}{\text{standard deviation}}$

protection level = mean + z $\times$ standard deviation booking limit = capacity − protection level

standard deviation = $\sqrt{\text{variance}}$ coefficient of variation = $\dfrac{\text{standard deviation}}{\text{mean}}$ $\sigma_x = \sqrt{E[L]\,\text{var}[D] + \left(E[D]\right)^2 \text{var}[L]}$

Suppose $D_1, D_2, \ldots, D_N$ are independent normal random variables where D_i has mean = mean_i and variance = variance_i; then $D_1 + D_2 + \ldots + D_N$ is a normal random variable with mean = $\text{mean}_1 + \text{mean}_2 + \ldots + \text{mean}_N$ and variance = $\text{variance}_1 + \text{variance}_2 + \ldots + \text{variance}_N$