Stocks:

Modelo básico sin agotamiento

$n = \frac{D}{q} = \frac{T}{t} \qquad q_o = \sqrt{\frac{2KD}{TC_1}}$

$t_o = \sqrt{\frac{2KT}{DC_1}} = q_o \frac{T}{D} \qquad S_r = Lt * d \ \ [si\ Lt < t]$

$CTE = \frac{KD}{q} + \frac{1}{2} C_1 qT + bD$

$CTE_o = \sqrt{2KDC_1T} + bD$

Modelo con stock de protección

$n = \frac{D}{q} = \frac{T}{t} \qquad q_o = \sqrt{\frac{2KD}{TC_1}}$

$t_o = \sqrt{\frac{2KT}{DC_1}} = q_o \frac{T}{D} \qquad S_r = Lt * d + S_p \ [si\ Lt < t]$

$CTE = \frac{KD}{q} + \frac{1}{2} C_1 qT + C_1 S_p T + bD$

$CTE_o = \sqrt{2KDC_1T} + C_1 S_p T + bD$

Modelo con agotamiento

$n = \frac{D}{q} = \frac{T}{t} \qquad S_r = Lt * d - (q_0 - S_0) \ [si\ Lt < t]$

$q_o = \sqrt{\frac{2KD}{TC_1}} \sqrt{\frac{C_2 + C_1}{C_2}} \qquad t_o = \sqrt{\frac{2KT}{DC_1}} \sqrt{\frac{C_2 + C_1}{C_2}} = q_o \frac{T}{D}$

$S_o = \sqrt{\frac{2KD}{TC_1}} \sqrt{\frac{C_2}{C_2 + C_1}} = q_o \frac{C_2}{C_2 + C_1}$

$t_1 = \frac{S}{q} t \qquad t_2 = \frac{q - S}{q} t$

$CTE = \frac{KD}{q} + \frac{1}{2} \frac{S^2}{q} C_1 T + \frac{1}{2} \frac{(q-S)^2}{q} C_2 T + bD$

$CTE_o = \sqrt{2KDC_1T} \sqrt{\frac{C_2}{C_2 + C_1}} + bD$

Modelo con reposición gradual

$n = \frac{D}{q} = \frac{T}{t} \qquad S = q(1 - \frac{d}{p})$

$q_o = \sqrt{\frac{2KD}{TC_1(1 - \frac{d}{p})}} \qquad t = q\frac{T}{D} \qquad t_1 = \frac{q}{p}$

Para $Lt \le (t - t_1)$: $S_r = Lt * d \ [si\ Lt < t]$

Para $Lt \ge (t - t_1)$: $S_r = (t - Lt) * (p - d)$

$CTE = \frac{KD}{q} + \frac{1}{2} C_1 q (1 - \frac{d}{p}) T + bD$

$CTE_o = \sqrt{2KDC_1T(1 - \frac{d}{p})} + bD$

Filas:

M/M/1/∞/∞: Cola ∞: 1 canal de atención

$P_0 = 1 - \rho \qquad P_n = \rho^n P_0 \qquad P_{n \ge x} = \rho^x \qquad L = \frac{\rho}{1-\rho} \qquad L_c = \frac{\rho^2}{1-\rho} \qquad W = \frac{1}{\mu - \lambda} \qquad W_c = \frac{\rho}{\mu - \lambda}$

M/M/K/∞/∞: Cola ∞: K canales de atención

$\frac{1}{P_0} = \frac{\rho^K K}{K!(K-\rho)} + \sum_{n=0}^{K-1} \frac{\rho^n}{n!} \qquad W_c = P_0 \frac{\mu \rho^K}{(K-1)!(K\mu - \lambda)^2} \qquad H = \rho$

Para $n \le K$: $P_n = \frac{\rho^n}{n!} P_0 \qquad P_{(n \ge K)} = \frac{\rho^K}{K!} P_0 \frac{K}{K - \rho}$

$W_c = L_c / \lambda \qquad W = W_c + t_s \qquad L = H + L_c$

Para $n \ge K$: $P_n = \frac{\rho^n}{K^{n-K} K!} P_0$

M/M/1/N/∞: Cola Limitada: 1 canal de atención

$P_0 = \frac{1-\rho}{1-\rho^{N+1}} \qquad P_n = \rho^n P_0 \qquad L = \rho \frac{1 - (N+1)\rho^N + N\rho^{N+1}}{(1-\rho)(1-\rho^{N+1})} \qquad L_c = L - 1 + P_0 \qquad \lambda_{ef} = (1 - P_N)\lambda \qquad W = \frac{L}{\lambda_{ef}} \qquad W_c = \frac{L_c}{\lambda_{ef}}$

M/M/1/N/N: Población N: 1 canal de atención

$\frac{1}{P_0} = \sum_{n=0}^{N} \frac{N!}{(N-n)!} \rho^n \qquad P_n = \frac{N!}{(N-n)!} \rho^n P_0 \qquad L_c = N - \frac{\lambda + \mu}{\lambda}(1 - P_0) \qquad L = L_c + 1 - P_0 \qquad W_c = \frac{L_c}{(N-L)\lambda}$