Inventory Management
More Probabilistic Demand

Chris Caplice
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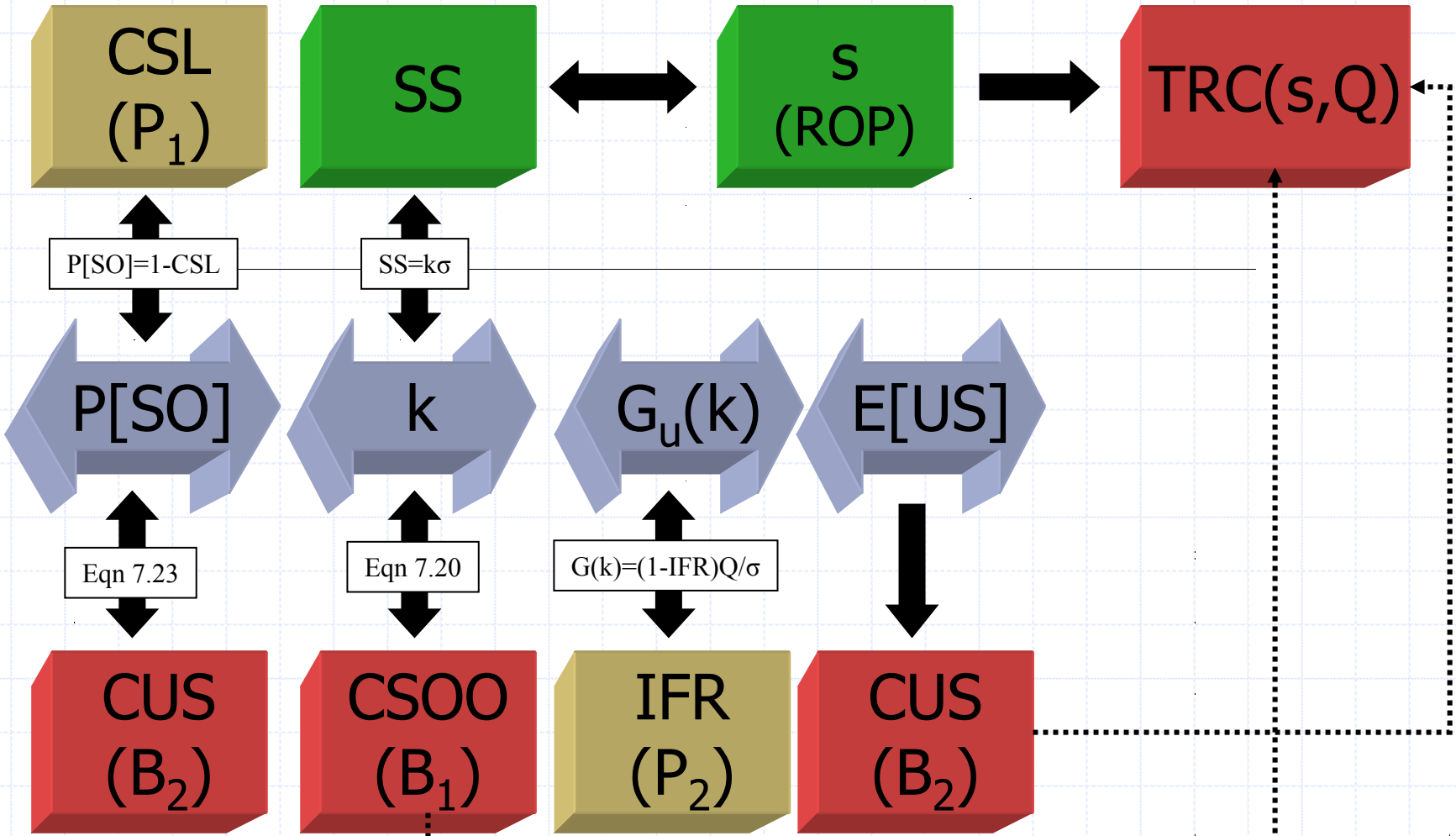
Safety Stock Logic (given x_L, σ_L, A,D, v, r, & Q)



Inputted versus Implied Objectives

- Any inputted objective implies all others
- Example
  - Average demand over time is considered constant
  - Forecast of demand is 13,000 units a year ~ iid Normal
  - Lead time is 2 weeks
  - RMSE of the forecast = 1,316 units per year
  - EOQ = 228 units (A=50 $/order, r=10%, v=250 $/item)
  - σ_L=258 units and μ_L=500 units
- If mgmt sets P_1= CSL=.95, what is the implied:
  - IFR (P2)?
  - Cost per Stockout Event (B1)?
  - Cost per Item Shorted (B2)?
  - What are my expected units short?

An Aside: Lost Sales vs Backorders

- So far, we have assumed 100% backorders.

$$TRSSC(Backorder) = vr\left(k\sigma_L\right) + C_{Backorder}\sigma_L G_u[k]\left(\frac{D}{Q}\right)$$

$$P[SO] = p_{u\geq}(k) = \frac{Qr}{DC_{Backorder}}$$

- If there are lost sales, then we need to order more each replenishment cycle.
- How much? . . . E[US]
- Changes $G_u[k]$ to $(Q/\sigma)((1\text{-}IFR)/IFR)$

$$TRSSC(LostSale) = vr\left(k\sigma_L + \sigma_L G_u[k]\right) + C_{LostSale}\sigma_L G_u[k]\left(\frac{D}{Q}\right)$$

$$P[SO] = p_{u\geq}(k) = \frac{Qr}{DC_{LostSales} + Qr}$$

Periodic vs Continuous Review

- Suppose that I now must review and order periodically.
  - What is my order cost?
  - How much should I order if I cannot find Q*?
- Convenient transformation of (s,Q) to (R,S)
  - (s,Q)= Continuous, order Q when IP≤s
  - (R,S)= Periodic, order up to S every R time periods
- Allows for the use of all previous decision rules

(s,Q)	(R,S)
s	S
Q	D*R
L	R+L

Periodic vs Continuous Review

- Same Example
  - Average demand over time is constant at 13,000 units a year
  - Lead time is 2 weeks
  - RMSE of the forecast = 1,316 units per year
  - EOQ = 228 units (A=50 $/order, r=10%, v=250 $/item)
  - σ_L=258 units and μ_L=500 units
- Find the (R,S) inventory policy and safety stock for P_2=IFR=.95
  - Review Period= 8 Weeks
- If this was an (s,Q) policy we would find $G_u[k]$

- Lets do the same thing with the recommended substitutions:
  - Q becomes D*R or (13000)(8/52) = 2000 units
  - x_L becomes x_{R+L}=(13000)/(52/10) = 2500 units
  - σ_L becomes σ_{R+L} = 1316/(√(52/10) = 577 units
  - So $G_\mu[k]$ = (1-.95)(2000/577) = 0.1733 giving k=0.58
  - $S = x_{R+L} + k\sigma_{R+L}$ = 2500 + (.58)(577) = 2835 units
- Policy becomes order up to 2835 units every 8 weeks.

Questions?
Comments?
Suggestions?