IE375
Additional Slides for Chapter 4
April 2

Spring 2020

On-Line Material

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Resource Constrained Multi-Product Systems

Consider an inventory system of n items in which W is the total amount available to use from a resource and $w_1, w_2, \ldots, w_n$ are defined an items usage of this resource per unit. Then this imposes the following constraint on the system:

$$w_1 Q_1 + w_2 Q_2 + \ldots w_n Q_n \leq W$$

Interpretations:

W – Total Shelf space; w_i – space consumed by item i

W – Total Budget Available for acquisition; w_i – acquisition cost/item i

W – Average Budget Available for inventory (Working Capital); w_i – cost/item i for the average inventory – terms should be $w_i Q_i/2$

Resource Constrained Multi-Product Systems

$$\min \sum_{i=1}^{n} \left(K_i \lambda_i / Q_i + h_i Q_i / 2 \right)$$

$$subject\ to \quad \sum_{i=1}^{n} w_i Q_i \le W$$

Step1) Solve the problem without the constraint.

Check if $\sum_{i=1}^{n} w_i EOQ_i$ is less than W. If yes stop.

Step2) Then formulate Lagrangian function.

Solution: Take derivatives with respect to Q_i and Lagrange multiplier (θ) and equate derivatives to 0 and solve for n+1 unknowns.

$$Q_i^* = \sqrt{\frac{2K_i\lambda_i}{(h_i + 2\theta w_i)}} \text{ for all i} \qquad \sum_{i=1}^{n} w_i Q_i = W$$