

Stochastic Methods in Industry I (WS 07/08)

Problem Set 13

Problem 1

Two inventory policies have been suggested by the purchasing department of a company:

Policy 1: Order 150 units. The reorder point is 50 units and the time between placing and receiving an order is 10 days.

Policy 2: Order 200 units. The reorder point is 75 units and the time between placing and receiving an order is 15 days.

The setup cost per order is 20 Euro, and the holding cost per unit per day is 2 cents.

(a) Which of the two policies should the company adopt?

(b) Answer (a) if there is a lead time of 22 days.

Problem 2

Consider the inventory situation in which the stock is replenished uniformly at the rate a . Consumption rate is D ($a > D$, why?). The setup cost is K per order, and the holding cost is h per unit per unit time. Shortages are allowed at a penalty cost of p per unit per unit time. If y is the order size and w the maximum shortage during a cycle, show that the economic order quantity y^* and the maximal shortage w^* with

$$y^* = \sqrt{\frac{2KD(p+h)}{ph(1-D/a)}}$$

and

$$w^* = \sqrt{\frac{2K Dh(1-D/a)}{p(p+h)}}$$

lead to minimum total cost per unit time.

Problem 3

An item is consumed at the rate of 30 items per day. The holding cost per unit per day is 5 cents, and the setup cost is 100 Euro. No shortage is allowed. The purchasing cost per unit is 10 Euro for any quantity not exceeding 500 units and 8 Euro otherwise. The lead time is 21 days. Determine the optimal inventory policy.

Problem 4

In a model with three different items 1,2,3 competing for a limited storage space A , where no shortage shall be allowed and instantaneous replenishment is available, let D_i denote the demand rate for item i , K_i the setup cost, h_i the unit holding cost per unit time and a_i the storage area requirement per unit of item i . Assume $A = 30m^2$ and the following data in the table and find the corresponding optimal order quantity (y_1, y_2, y_3) to minimize the total cost per unit time.

item i	K_i (Euro)	D_i (units per day)	h_i (Euro)	a_i (m^2)
1	10	2	0.3	1
2	5	4	0.1	1
3	15	4	0.2	1

Due date Friday, February 8th 2008, 14:00 o'clock. Sheets can be turned in right before class. Please put your **name** and **student id number** on each sheet you turn in and staple the sheets.