

Stochastic Methods in Industry I (WS 07/08)

Problem Set 14

Problem 1

In a 5-period problem with no setup costs the demand for a product over the next five periods may be filled from regular production, overtime production, or subcontracting (so each period has 3 production levels). Subcontracting may be used only if the overtime capacity has been used. The following table gives the supply, demand, and cost data of the situation.

Period	Regular time (units)	Over time (units)	Subcontracting (units)	Demand (units)
1	100	50	30	153
2	40	60	80	200
3	90	80	70	150
4	60	50	20	200
5	70	50	100	203

The unit production cost for the three levels in each period are 4, 6, and 7 Euro, respectively. The unit holding cost per period is 50 cents. Determine the optimal solution.

Problem 2

The following table provides the data for a 3-period inventory situation with setup costs.

Period	Demand D_i (units)	Setup cost K_i (Euro)	Holding cost h_i (Euro/unit)
1	3	3	1
2	2	7	3
3	4	6	2

The demand occurs in discrete units, and the starting inventory is $x_1 = 2$ units. The unit production cost is 10 Euro for the first three units and 20 Euro for each additional unit. Determine the optimal inventory policy.

Problem 3

In a probabilistic single period model (random demand) without setup costs, the unit holding cost in a single period inventory situation is 1 Euro. If the order quantity is 4 units, find the permissible range of the unit penalty cost implied by the optimal conditions. Assume here that the random demand D occurs instantaneously at the start of the period and the demand pdf f is discrete with values given in the following table.

D	0	1	2	3	4	5	6	7	8
f(D)	.05	.1	.1	.2	.25	.15	.05	.05	.05

Problem 4

The random daily demand D for an item during a single period occurs instantaneously at the start of the period. The pdf of demand is uniform between 0 and 10 units. The unit holding cost of the item is 50 cents, and the unit penalty cost for running out of stock is 4.5 Euro. A fixed cost of 5 Euro is incurred each time an order is placed. Determine the optimal inventory policy. Also do the above problem when the pdf of demand is exponential with mean 5 units.

No correction of this problem set. There will be class next Friday.