Lesson 13. Multiperiod Models, Revisited

Example 1. Priceler manufactures sedans and wagons. The demand for each type of vehicle in the next three months is:

	Month 1	Month 2	Month 3
Sedans	1100	1500	1200
Wagons	600	700	500

Assume that the demand for both vehicles must be met exactly each month. Each sedan costs $2000 to produce, and each wagon costs $1500 to produce. Vehicles not sold in a given month can be held in inventory. To hold a vehicle in inventory from one month to the next costs $150 per sedan and $200 per wagon. During each month, at most 1500 vehicles can be produced. At the beginning of month 1, 200 sedans and 100 wagons are available. Write a linear program using symbolic input parameters that can be used to minimize Priceler's costs during the next three months.

Example 2. During the next three months, the Bellman Company must meet the following demands for their line of advanced GPS navigation systems:

Month 1	Month 2	Month 3
1200	1400	2200

It takes 1 hour of labor to produce 1 GPS system. During each of the next three months, the following number of regular-time labor hours are available:

Month 1	Month 2	Month 3
1200	1300	1000

Each month, the company can require workers to put in up to 500 hours of overtime. Workers are only paid for the hours they work. A worker receives $10 per hour for regular-time work and $15 per hour for overtime work. GPS systems produced in a given month can be used to meet demand in that month, or put into a warehouse. Holding a GPS system in the warehouse from one month to the next costs $2 per GPS system. Write a linear program using symbolic input parameters that minimizes the total labor and inventory cost incurred in meeting the demands of the next three months.

Input parameters.

T = set of months

d_t = demand for GPS systems in month t for $t \in T$

r_t = regular-time labor hours available in month t for $t \in T$

o = overtime labor hours available in each month

h = cost of holding 1 GPS system in inventory from one month to the next

c_r = cost of 1 hour of regular-time labor

c_o = cost of 1 hour of overtime labor

Decision variables.

x_{rt} = number of GPS systems produced in month t with regular-time labor for $t \in T$

x_{ot} = number of GPS systems produced in month t with overtime labor for $t \in T$

I_t = number of GPS systems held in inventory at the end of month t for $t \in T$

Objective function and constraints.