



## SCENARIO ANALYSIS

### *Scenario 1: Quarterly demand volumes shifts*

This scenario investigates how production volume would be influenced if demand should change. To illustrate the principle the total demand over the four quarters will not change, only the demand will be shifted over periods. A change in demand would be indicated by the demand and inventory constraints. Assume that demand for quarter 2 and quarter 4 increases as indicated in the table below:

Period (t)	Demand $d_t$	Change	Inventory $i_t$
0	0	0	10
1	50	+10	$10 + x - 40$
2	55	-5	$i_{t-1} + x - 65$
3	65	-10	$i_{t-1} + x - 75$
4	30	+5	$i_{t-1} + x - 45$

### *Results:*

Optimal solution: \$ 78 800.00

Production schedule:

Quarter	Production volume	Regular time	Overtime	Extra overtime
1	50	40	10	0
2	50	40	10	10
3	60	40	10	10
4	30	30	0	0

To accommodate the shift in demand quarterly production volumes are adjusted. Five less sailboats should be manufactured during quarter 2. These five ships have to be manufactured during quarter 4 in order to meet demands. The total production cost decreases by \$ 900.00. This is due to the fact that less overtime labor is utilized in this scenario.

**Scenario 2: The quarterly holding cost associated with excess inventory increases**

This scenario investigates the repercussion when the cost of holding inventory increases. A change in the holding cost will be indicated in the objective function. Assume that the cost of holding a sailboat in inventory increases to \$50 per sailboat. The new objective function is given below:

$$[Z] \text{ MIN} = 0*(z_{11} + z_{21} + z_{31} + z_{41}) + 16000*(z_{12} + z_{22} + z_{32} + z_{42}) + 21500*(z_{13} + z_{23} + z_{33} + z_{43}) + 27500*(z_{14} + z_{24} + z_{34} + z_{44}) + 20*(i_1 + i_2 + i_3 + i_4);$$

*Results:*

Optimal solution: \$ 80 750.00

Production schedule:

Quarter	Production volume	Regular time	Overtime	Extra overtime
1	45	40	5	0
2	60	40	10	10
3	60	40	10	10
4	25	25	0	0

The cost of having excess inventory increases for this scenario. This means that it might be more profitable to rather utilize overtime labor than manufacture sailboats in advance. In this case, fewer sailboats are manufactured during quarter 1. These sailboats are rather manufactured during quarter 2, when they are required.