

AGGREGATE PLANNING LAB EXERCISE

A firm faces a firm schedule of delivery commitments for a product over the next six months. The production cost varies by month due to anticipated changes in material costs. The company's production capacity is 100 units per month on regular time and an additional 15 units per month on overtime.

The following table contains delivery requirements and production costs by month.

	1	2	3	4	5	6
Delivery commitment (units)	95	85	110	115	90	105
Cost per unit in regular time	30	30	32	32	31	32
Cost per unit in overtime	35	35	37	37	36	37

The cost of carrying an unsold unit in stock is \$2 per month. The problem for the company is to determine the number of units to produce in regular time and overtime each month to meet requirements at minimum cost. The firm has no units on hand at the beginning of month 1 and wishes to have no units on hand at the end of month 6.

Questions:

1. What are the decision variables?
2. What is the objective function?
3. What are the constraints?

To ensure delivery commitments are met we have:

Sources of units = uses of units, or

Opening inventory + regular time production + overtime production =
Delivery commitments + ending inventory

Rearranging terms we have:

$\text{Beg. Inv} + \text{RT pdtn} + \text{OT pdtn} - \text{End Inv} = \text{Delivery commitments}$
--

Assignment:

Set up and solve as an optimization problem.

(Solution = \$18,810 Total Cost.)

Spreadsheet Implementation:

	A	B	C	D	E	F	G	H	I	
1		COSTS								
2		January	February	March	April	May	June			
3	Regular time cost	30	30	32	32	31	32			
4	Overtime cost	35	35	37	37	36	37			
5	Inventory cost	2	2	2	2	2	2			
6		DECISION VARIABLES								
7		January	February	March	April	May	June	Total		
8	Regular time pdtn							cost		
9	Overtime pdtn							0		
10	Ending inventory									
11		PRODUCTION/INVENTORY /SHIPMENTS CONSTRAINTS								
12	Beginning inventory	0								
13	(Plus) amount produced									
14	(Less) ending inventory									
15	Available for shipment									
16	Shipping requirements	95	85	110	115	90	105			

Solver parameters:

Target cell: I9 (minimize)

Changing cells: B8:G10

Constraints:

B8:G8 \leq 100 Regular time limit

B9:G9 \leq 15 Overtime limit

B15:G15=B16:G16 Shipments =beginning inventory +
production - ending inventory

G10=0 No June inventory

B8:G10 \geq 0 Non-negativity constraint

Source: Bonini, Hausman & Bierman, Quantitative Analysis for Management.