

Transportation Method

Transportation Method of Planning

- ◆ Each row in transportation table represents a production period
- ◆ Each column in the table represents a demand period
- ◆ Each cell in the table represents cost of production and inventory holding cost.

	Demand Period 1	Demand Period 2	Demand Period 3	Capacity/ Supply
Production Period 1	C_{11}	C_{12}	C_{13}	P_1
Production Period 2	**	C_{22}	C_{23}	P_2
Production Period 3	**	**	C_{33}	P_3
Demand→	D_1	D_2	D_3	

Transportation Method of Planning

- Suppose we have three month planning problem: { Jan , Feb , Mar }
 Demands for Jan, Feb and Mar are : { 40,50,50}
 Production capacity for Jan, Feb and Mar are : { 50,50,40}
 Production cost = \$10/unit. Inventory holding cost = \$2/unit/period
 $c_{11} = c_{22} = c_{33} = \10 , $c_{12} = 10 + 2 = \$12$, $c_{13} = 10 + 2 + 2 = \$14$
 $c_{23} = 10 + 2 = \$12$.

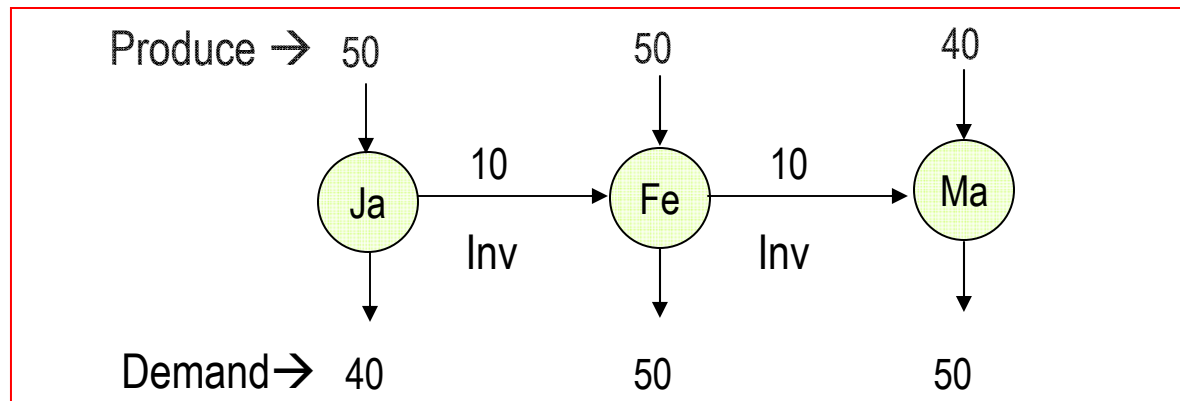
Entering the data; Transportation Table will look like as follows:

	Demand Jan	Demand Feb	Demand Mar	Capacity/ Supply
Produce in Jan	10	12	14	70
Produce in Feb	**	10	12	70
Produce in Mar	**	**	10	70
Demand →	30	50	40	

Transportation Method of Planning

◆ Least cost solution;

	Demand Jan	Demand Feb	Demand Mar	Capacity/ Supply
Produce in Jan	40 10	10 12	14	50
Produce in Feb	**	40 10	10 12	50
Produce in Mar	**	**	40 10	40
Demand→	40	50	50	



**Production
Plan**

Multiple Production Source Problem

- ◆ Solve three month planning problem: { Mar, Apr, May }

Demands for Mar, Apr and May are : { 800, 1000, 750 }

Production is to be carried out in Mar, Apr and May.

There are three sources of Production in each month.

Regular Time, Overtime and Subcontract

Capacity for each source in each month is :

Regular time = 700 units

Overtime = 50 units

Subcontract = 150 units

Production cost in each month:

Regular Time = \$40/unit. Overtime = \$ 50/unit

Subcontract = \$70/unit

Inventory holding cost = \$2/unit/period

There are 100 units in inventory at the beginning of Mar.

Use Transportation Problem and develop a Production Plan.

Transportation Table

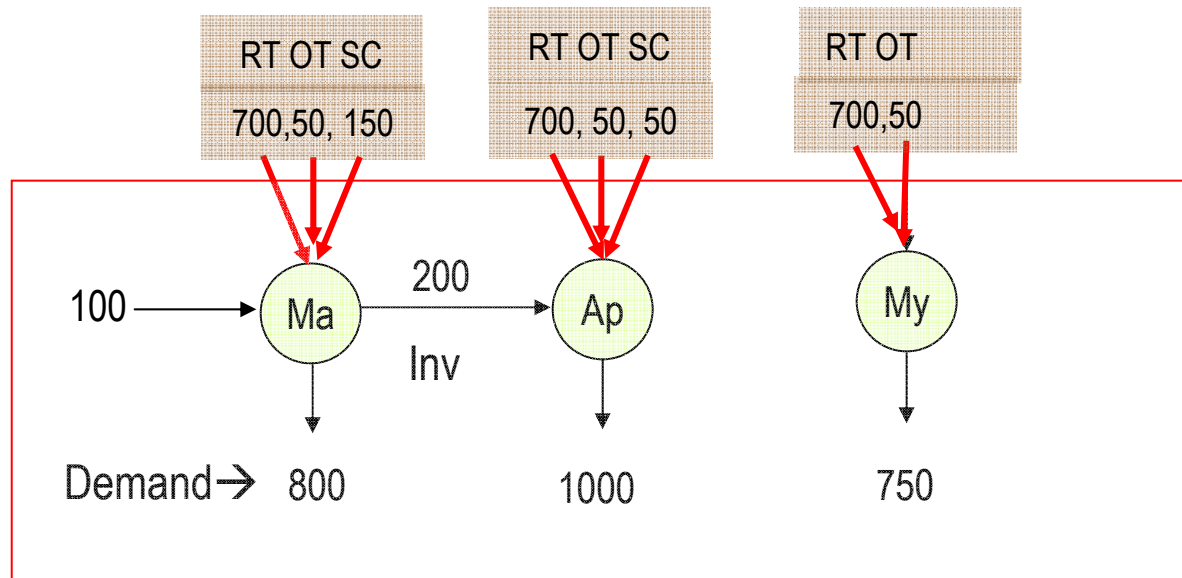
	Period 1 (Mar)	Period 2 (Apr)	Period 3 (May)	Unused Capacity (Dummy)	Total Capacity Available (Supply)	
Period 1	Beginning Inventory	0 100	2	4	0	100
	Regular	40 700	42	44	0	700
	Overtime	50	52 50	54	0	50
Period 2	Subcontract	70	72 150	74	0	150
	Regular	X	40 700	42	0	700
	Overtime	X	50 50	52	0	50
Period 3	Subcontract	X	70 50	72	0 100	150
	Regular	X	X	40 700	0	700
	Overtime	X	X	50 50	0	50
	Subcontract	X	x	70	0 150	150
	Total Demand	800	1000	750	250	2800

Transportation Table

	Period 1 (Mar)	Period 2 (Apr)	Period 3 (May)	Unused Capacity (Dummy)	Total Capacity Available (Supply)
Beginning Inventory	0	2	4	0	100
	100				
Regular	40	42	44	0	700
	700				
Overtime	50	52	54	0	50
		50			
Subcontract	70	72	74	0	150
		150			
Period 2 Regular	X	40	42	0	700
		700			
Overtime	X	50	52	0	50
		50			
Subcontract	X	70	72	0	150
		50		100	
Period 3 Regular	X	X	40	0	700
			700		
Overtime	X	X	50	0	50
			50		
Subcontract	X	x	70	0	150
				150	
Total Demand	800	1000	750	250	2800

Cost of solution:

$$700 \cdot 40 + 52 \cdot 50 + 150 \cdot 72 + 700 \cdot 40 + 50 \cdot 50 + 70 \cdot 50 + 40 \cdot 700 + 50 \cdot 50 = \$105,900$$



Solution by Transportation Model

Comparison of Three Major Aggregate Planning Methods

Techniques	Approaches	Aspects
Charting/graphical methods	Trial and error	Simple to understand, easy to use. Many solutions; one chosen may not be optimal
Transportation method	Optimization	LP software available; permits sensitivity analysis and constraints. Linear function may not be realistic
Management coefficient model	Heuristic	Simple, easy to implement; tries to mimic manager's decision process; uses regression