

Transportation Cost Minimization: Max Min Penalty Approach

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Abstract: In this paper, a transportation problem is applied to determine the reduction in Transportation cost (TC) of tools which appeared to be an important component of the total cost of production . The algorithm determines the Initial Basic Feasible (IBFS) Solution of Transportation Problem (TP) to minimize the cost. The result with an elaborate illustration demonstrates that the method presented here is effective in minimizing the transportation cost.

Keywords: Transportation ,Minimization cost, maxmin penalty cost,VAM ,sources,destination

I. INTRODUCTION

Transportation model has an increasingly great impact on the management of transport. It is one of the subclass of linear programming problem, it aims to transport various quantities of a single homogeneous commodity, that are initially stored at various source to different destination in such that the transportation cost, transportation distance or time is minimum. There are two main responsible for the development of transportation model which involve a number of shipping sources and number of destinations[2]. It deal with the minimum cost plan to transport a commodity from a number of sources to destinations using initial feasible solution max min penalty approach .Methods are available to determine the IBFS. The well-known methods are: Vogel’s Approximation Method (VAM) [1], Balakrishnan’s version of VAM [6],H.H.shore version of VAM[7]. In this paper we present a method which gives same minimization cost as Vogel approximation method .

II. ALGORITHM OF THE MAX MIN PENALTY APPROACH:

- Step 1 :Examine whether the total supply equals total demand .If not introduce dummy row/column
- Step 2 :T he first brackets, which are the difference of the greatest element and smallest element of each row and column of the TT.
- Step 3: Identify the largest distribution . Choose the smallest entry along the largest distribution . If there are two or more smallest elements, choose any one of them arbitrarily.
- Step 4 : Allocate $x_{ij} = \min (a_i , b_j)$ on the left top of the smallest entry in the cell (i , j) of the TT.
- Step 5: Recomputed the column and row difference for the reduce transportation table and go to step 4 .Repeat the procedure until all the rim satisfied.

III. ILLUSTRATION

	A	B	C	D	Supply
P	21	16	25	13	11
Q	17	18	14	23	13
R	32	27	18	41	19
Demand	6	10	12	15	

Solution :

Using VAM method,

Since $\sum a_i = \sum b_j = 43$, the given transportation problem is balanced . \therefore There exists a basic feasible solution to this problem.

By Vogel’s approximation method, the initial solution is as shown in the following table

21	16	25	13	11
17	18	14	23	4
32	27	18	41	
	6	3	7	12

(1)
(3)	(3)	(3)	(4)
(9)	(9)	(9)	(9)

(4)	(2)	(4)	(10)
(15)	(9)	(4)	(18)
(15)	(9)	(4)
.....	(9)	(4)

That is

21	16	25	13
			11
17	18	14	23
6	3		4
32	27	18	41
	7	12	

From this table, we see that the number of non-negative independent allocations is $(m+n-1)=(3+4-1)=6$. Hence the solution is non-degenerate basic feasible .

∴ The initial transportation cost
 = Rs. $13 \times 11 + 17 \times 6 + 18 \times 3 + 23 \times 4 + 27 \times 7 + 18 \times 12$
 =Rs.796/-

IV. ILLUSTRATION

Using **max min penalty Approach** ,the initial basic feasible solution as follows:

- Step 1 : Examine whether the total supply equals total demand is 43.
- Step 2 :The first brackets, which are the difference of the greatest element and smallest element of each row and column of the TT.
- Step 3 :Identify the largest distribution(28) in a column . Choose the smallest entry along the largest distribution is 13 . If there are two or more smallest elements, choose any one of them arbitrarily.
- Step 4: Allocate $x_{14} = \min (11 , 15) =11$ on the left top of the smallest entry in the cell (1,4) of the TT.
- Step 5:Recomputed the column and row difference for the reduce transportation table and go to step 4 .Repeat the procedure until all the rim satisfied.

	A	B	C	D	supply	Row penalty indicators			
P	21	16	25	13	11	(12)	-	-	-
Q	17	18	14	23	13	(9)	(9)	(6)	(1)
R	32	27	18	41	19	(23)	(23)	(14)	(5)
demand	6	10	12	15					
Column penalty indicators	(15)	(11)	(11)	(28)					
	(15)	(9)	(4)	(18)					
	(15)	(9)	-	(18)					
	(15)	(9)	-	-					

21	16	25	13
			11
17	18	14	23
6	3		4
32	27	18	41
	7	12	

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Optimal test:

To find the optimal test for IBFS max min penalty approach
 Since all $d_{ij} > 0$ the solution under the test is optimal

21	7	16	8	25	-1	13
	14		8		26	11
17		18		14	9	23
6		3			5	4
32	26	27		18		41
	6	7		12		32
						9

V. CONCLUSION

The max min penalty approach are quite simple from the computational point of view and also, easy to understand and apply. The method presented and discussed above gives us an initial basic feasible solution of the transportation problem with equal constraints, in minimization cost and an alternative method of VAM . The method developed here ensures a solution which is very closer to the optimal solution.

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