



Lowest Even Cost Method (OR) an Alter Method to Least Cost Method for the Transportation Problem

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ABSTRACT

In transportation problem the main objective is to obtain an Initial Basic Feasible Solution for the transportation problem. The aim of the transportation problem is to minimize the cost. In this paper, a new procedure (i.e.) Lowest Even Cost Method (LECM) which is proposed to find an initial basic feasible solution for the transportation problem. This method is ex with numerical examples.

Keywords--- Transportation Problem, Transportation Cost, Initial Basic Feasible Solution, Optimal Solution

maximize the profit. The Hitchcock-Koopmans's transportation problem is expressed as a linear transportation model as follows:

$$\text{Minimize } Z = \sum_{i=1}^n \sum_{j=1}^m c_{ij} \alpha_{ij}$$

$$\text{Subject to, } \sum_{j=1}^m \alpha_{ij} \leq X_i, i=1,2,\dots,n \text{ (supply)}$$

$$\sum_{i=1}^n \alpha_{ij} \leq Y_j, j=1,2,\dots,m \text{ (demand)}$$

$$\alpha_{ij} \geq 0, \text{ for all } i \text{ and } j.$$

Where,

α_{ij} - the quantity of goods moved from origin i to destination j .

C_{ij} - per unit cost in transporting goods from origin i to destination j .

X_i - the amount available at each origin i .

Y_j - the demand available at each destination j .

m - total number of origins(source)

n - total number of destinations(sinks)

I. INTRODUCTION

Special type of linear programming problem is known as transportation problem (TP). These kind of problems gives us to decide the minimum cost of transporting goods from one place to another. It plays a vital role in logistics. There are many methods for finding an initial basic feasible solution like North West Corner Rule (NWCR), Least Cost Method (LCM), Vogel's Approximation Method (VAM) and to find the optimality we are using the method MODI. In this paper we are introducing a new method for finding an Initial Basic Feasible Solution. Two numerical examples are provided to prove the claim with stepwise procedure of this new method.

II. MATHEMATICAL REPRESENTATION

The transportation problem was developed and proposed by F.L. Hitchcock since 1941. This method main aim is to minimize the total transportation cost and

III. ALGORITHM

STEP 1:

Determine whether the problem is balanced, if not make them balanced.

STEP 2:

Select the lowest even cost (LEC) from all the cost cell (i,j) and allocate the minimum of supply and demand to the selected cell and cross out the corresponding row/column.

STEP3:

If we have odd number to be less than the even number then add 1 to all unit cost cell.

STEP4:

Form a new table which is to be known as allocation table (AT) by keeping the LEC in the respective cost cell and subtract LEC from all of the cells except the LEC value of TT. Now reduced value is known as allocation cell value (ACV).

STEP5:

Now identify the minimum ACV and allocate the minimum of supply and demand to cell and cross out the corresponding row/column.

STEP6:

In case if we have more than one minimum ACV's select the one which has minimum the sum of supply and demand.

STEP7:

Repeat step5 until the demand and supply are exhausted.

STEP8:

Now transfer the allocation to the original table.

STEP9:

Finally calculate the total transportation cost of the TT. This calculation is the sum of the product of cost and corresponding allocated value of TT.

IV. NUMERICAL EXAMPLES

EXAMPLE 1:

7	5	9	11	30
4	3	8	6	25
3	8	10	5	20
2	6	7	3	15
30	30	20	10	

SOLUTION:

Here we have $\sum a_i = \sum b_j = 90$.

The given transportation problem is balanced.

In this TT we have 2 as the lowest even number.

So, let us allocate the minimum value of supply or demand to the corresponding cell then cross out the corresponding row or column.

7	5	9	11	30
4	3	8	6	25
3	8	10	5	20
2	6	7	3	15
30	30	20	10	

Now let us subtract 2 (LEC) from all the cells of TT except the allocated one.

After subtracting, choose the minimum cost and start allocating until the supply and demand get exhausted.

5	3	5	7	9	5	30
2	1	25	6	4		25
1	15	6	8	3	5	20
2	15	4	5	1		15
30	30	20	10			

Now let us transfer the allocation to the original TT and calculate the transportation cost.

7	5	5	9	20	11	5
4	3	25	8		6	
3	15	8	10		5	5
2	15	6	7		3	

Here we have allocation as $m+n-1=4+4-1=7$

The initial transportation cost =

$$5 \times 5 + 9 \times 20 + 11 \times 5 + 3 \times 25 + 3 \times 15 + 5 \times 5 + 2 \times 15 = 435/-$$

EXAMPLE 2:

3	3	4	1	100
4	2	4	2	125
1	5	3	2	75
120	80	75	25	

SOLUTION:

Here we have $\sum a_i = \sum b_j = 300$.

The given transportation problem is balanced.

In this problem we have the LEC is 2 but, we have an odd number 1 which is less than the LEC so, let us add 1 to each unit cost cell and then identify the LEC. After adding 1 to every cell we have 2 to be the lowest even number, then start allocating.

4	4	5	2	25	100
5	3	5	3		125
2	6	4	3		75
120	80	75	25		

Subtract 2 from all the unit cost cell and start allocating

2	45	2	30	3	30	2	25	100
3		1	80	3	45	1		125
0	75	4		2		1		75
120	80	75	25					

Now let us transfer these allocations to the original

3	45	3		4	30	1	25
4		2	80	4	45	2	
1	75	5		3		2	

Here we have the allocations as $m+n-1=3+4-1=6$.

The initial transportation cost

$$= 3 \times 45 + 4 \times 30 + 1 \times 25 + 2 \times 80 + 4 \times 45 + 1 \times 75.$$

$$= 695/-$$

V. COMPARATIVE STUDY OF THE RESULTS

After proving the results for an IBFS by this proposed method, the obtained result is compared with solution proved by other existing methods.

PROBLEMS	NWCR	LCM	VAM	LECM
EXAMPLE 1	540	435	470	435
EXAMPLE 2	840	695	695	695

VI. CONCLUSION

In this paper we found a new algorithm named Lowest Even Cost Method (LECM) which is very in complex to calculate than other algorithms. This method gives us a better feasible solution than others and sometimes it is equal to the optimal solution. But it is not always sure that LECM provides least feasible solution but sometimes it gives greater or better approach too.

REFERENCES

[1] Abdul Sattar Soomro, Muhammad Junaid, & Gurudeo Anand Tularam. (2015). Modified vogel's approximation method for solving transportation problem, *International Institute for Science, Technology and Education*, 5(4), 32-42.

[2] Amaravathy.A, Thiagarajan K, Vimala S. (2016) MDMA method-an optimal solution for transportation problem. *Middle East Journal of Scientific Research*, 24 (12), 3706-3710.

[3] Ashraful Babu. Md, Abu Helal. Md, Mohammad Sazzad Hussain, & Utpal Kanti Das. (2014). Implied cost method(ICM): An alternative approach to find the feasible solution of transportation. *Global Journal of Science Frontier Research: F Mathematics and Decision Sciences*, 14(1), 1-11.

[4] Neetu M. Sharma & Ashok P. Bhadane. (2015). An alternative method to north west corner method for solving transportation problem. *International Journal of Research in Engineering Application and Management*, 1(12), 1-3.

[5] A. Seethalakhmy & N. Srinivasan. (2018). A heuristic approach to obtain an optimal solution for transportation problem using assignment. *TAGA Journal*, 14, 1862-1870.

[6] V.J.Sudhakar, N.Arunnsankar, & T.Karpagam. (2012). A new approach for find an optimal solution for transportation problems. *European Journal of Scientific Research*, 68(2), 254-257.

[7] Sushma Duraphe, Geetha Modi & Sarala Raigar. (2017). A new method for the optimum solution of a transportation problem. *International Journal of Mathematics and its Applications*, 5(3-c), 309-312.