AN ALTERNATIVE METHOD TO NORTH-WEST CORNER METHOD FOR SOLVING TRANSPORTATION PROBLEM

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Abstract — **In Linear Programming, the transportation problem is a special class of model. It deals with the situation in which a commodity from several sources is shipped to different destinations with the main objective to minimize the total shipping cost. In this paper, we present an alternative method to North West Corner method by using Statistical tool called Coefficient of Range. Numerical examples are explained to justify the results.**

Keywords— Alternate method, Coefficient of Range, Initial Basic Feasible Solution, Linear Programming, Operation Research, Transportation Problem.

I. INTRODUCTION

Transportation problems have been widely studied in Computer Science and Operations Research. It is one of the fundamental problems of network flow problem which is usually use to minimize the transportation cost for industries with number of sources and number of destination while satisfying the supply limit and demand requirement. Transportation models serve as a key tool in logistics and supply-chain management for minimizing cost and better services. Some previous studies have devised solution procedure for the transportation problem with precise supply and demand parameters. Efficient algorithms have been developed for solving the transportation problem when the cost coefficients and the supply and demand quantities are known exactly. It was first studied by F. L. Hitchcock in 1941[1], then separately by T. C. Koopmans in 1947, and finally placed in the framework of linear programming and solved by simplex method by G. B. Dantzig in 1951[2]. The first step of the simplex method for the transportation problem is to determine an initial basic feasible solution. The simplest procedure for finding an initial basic feasible solution was proposed by Dantzig (1951) and was termed the Northwest Corner rule by Charnes and Cooper (1954)[3].

Beginning from the northwest corner cell of the transportation table, allocate the maximum possible value to the variable. By doing so will result in either exhausting the supply at origin 1 or satisfying the demand at destination 1. If the former occurs, continue by proceeding to row 2; if the latter occurs, continue in row 1 by allocating as much as possible to the cell, which will either exhaust the supply at origin 1 or completely satisfy the demand of destination 2. This process is continued until all demands are met and all supplies are exhausted. It is possible that at some step, other than the last, a supply is quenched and a demand is fulfilled simultaneously. For such cases, assign a zero arbitrarily to the next variable in either the same row or the same column, and then proceed as described above.

Since the Northwest Corner rule does not take into account costs when allocating to the variables, it may yield an initial

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solution that gives an objective function value far from the optimum.

Many researchers have provided alternate methods to find the initial basic feasible solution(IBFS) as well as optimal solution. In 2012, authors S. I. Ansari and A. P. Bhadane proposed a statistical techniques based approach to find IBFS[4].

In our paper, we propose an alternative method to the North-West Corner method by using a statistical tool called Coefficient of Range which provides a better option than NWCR to find the initial basic feasible solution.

II. PROPOSED METHODOLOGY

In Statistics, measures of Dispersion play a vital role in explaining the nature of the distribution. One of such measure is Range, which is difference between the largest and smallest data value.

The Coefficient of Range (CoR) is the ratio of Largest Value minus Smallest Value & Largest Value plus Smallest Value

Step 1- Find the CoR for each Row as well as Column and find the one with maximum value.

Step 2. Identify the Row or Column having maximum CoR and also identify the boxes with minimum transportation cost in the corresponding Row or Column.

Step 3. Make maximum allotment to the box having minimum cost of transportation in that row (or column)

Step 4. Delete the row (or column) whose supply (or demand) is fulfilled

Step5. Calculate fresh CoR for the remaining sub-matrix as in step 1 and allocate following the procedure of previous step. Continue the process until all rows and columns are satisfied.

Step 6. Compute total transportation cost for the feasible cost for the feasible allocations using the original balanced transportation cost matrix.

III. NUMERICAL EXAMPLES & FINDINGS

1) Consider the transportation problem in Table 1

	D1	D2	D3	D4	Supply
S1	19	30	50	10	7
S2	70	30	40	60	9
S3	40	8	70	20	18
Demand	5	8	7	14	34

Method	**NWCR**	LCM	VAM	**CoR**
Allocations	x11=5, x12=2, x22=6, x23=3, x33=4, x34=14	x14=7, x21=2, x23=7, x31=3, x32=8, x34=7	x11=5, x14=2, x23=7, x24=2, x32=8, x34=10	x14=7, x21=2, x23=7, x31=3, x32=8, x34=7
Total Cost	**1015**	814	779	**814**

2) Consider the transportation problem in Table 2

	D1	D2	D3	D4	Supply
S1	2	3	11	7	6
S2	1	0	6	1	1
S3	5	8	15	9	10
Demand	7	5	3	2	17

Method	**NWCR**	LCM	VAM	**CoR**
Allocations	x11=6, x21=1, x32=5, x33=3, x34=2	x11=6, x22=1, x31=1, x32=4, x33=3, x34= 2	x11=6, x12=5, x24=1, x31=6, x33=6, x34=1	x11=6, x24=1, x31=1, x32=5, x33=3, x34= 1
Nature of Solution	**Degen-erate**	Non-Degen-erate	Non-Degen-erate	**Non-Degenerate**
Total Cost	**116**	112	102	**112**

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ISSN : 2494-9150 Vol-01, Issue 12, MAR 2016.

IV. CONCLUSION

In this paper, we have presented an alternate method to the North-West Corner rule for solving the Transportation method. From the numerical examples, we observed that the total transportation cost by using the Coefficient of Range(CoR) is optimal as compared to the North- West Corner method. Also the transportation cost obtained by CoR method is same as LCM method. The solution by NWCR is Degenerate(Ex.3.2) but by CoR method it is Non-Degenerate. It was also observed that the initial basic feasible solution is obtained in comparatively very less number of iterations.

So, We can conclude that the Coefficient of Range(CoR) can be used for finding the IBFS . Further developments can be done for unbalanced transportation problems.

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