TRANSPORTATION PROBLEM: COMPARATIVE STUDY ON SOUTH-EAST CORNER RULE AND SOUTH WEST CORNER RULE

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***ABSTRACT* :** The South-East Corner Method (SECM), The South-West Corner Method (SWCM) are adopted to compute the initial Basic Feasible Solution (IBFS) of the Transportation problem(TR). In this paper, we should compare south east corner method and south west corner method with suitable transportation problems.

***KEY WORDS* :** TR, SECM, SWCM, IBFS

INTRODUCTION :

Operations research is a statistical tool. Operation research was developed during the World War II by the military management of the United Kingdom. A large group of scientists were called from various countries to give a research plan to analyse the situation and develop a strategy to meet the requirements of the war. After the World War II, these techniques were applied to all the fields. Operations research was developed as a science. Nowadays in world these techniques are applied in each and every field to meet the requirements to solve a problem.

TRANSPORTATION PROBLEM :

Transportation problem is famous in operation research and its applications widely used in real life. The transportation problem is one of the sub-classes of linear programming problems (LPP). The objective of Transportation Problem (TP) is to transport various amounts of a single homogeneous commodity that are initially stored in various origins and from there to different to minimize the total transportation cost. The transportation problem received this name because many of its applications involved in determining how to optimally transport goods. Transportation problem is a logistical problem for organizations specifically for manufacturing and transport companies. The basic transportation problem was originally developed by Hitchcock in the year 1941. Efficient methods for finding solution were primarily developed by Dantzig in 1951 and then by Charnes, Cooper and Henderson in 1953.

Basically, the solution procedure for the transportation problem consists of the following phases:

Phase 1: Mathematical formulation of the transportation problem.

Phase 2: Finding an initial basic feasible solution (IBFS).

Phase 3: Optimizing the initial basic feasible solution which is obtained in Phase 2

In this paper, we comparing the South East Corner Method and South west Corner Methods used to obtain an initial basic feasible solution for the transportation problems

MATHEMATICAL FORMULATION OF THE TRANSPORTATION PROBLEM

Generally the transportation model is represented by the network in Figure 1. There are m sources and n destinations, each represented by a node. The arcs represent the routes linking the sources and destinations. Arc(i,j) joining source *I* to destination j carries two pieces of information. The transportation cost per unit, C_{ij} and the amount shipped, X_{ij}. The amount of supply at source *i* is S_i , and the amount of demand at destination j is D_j. The objective of the model is to determine the unknowns X_{ij} that will minimize the total transportation cost while satisfying the supply and demand restrictions.

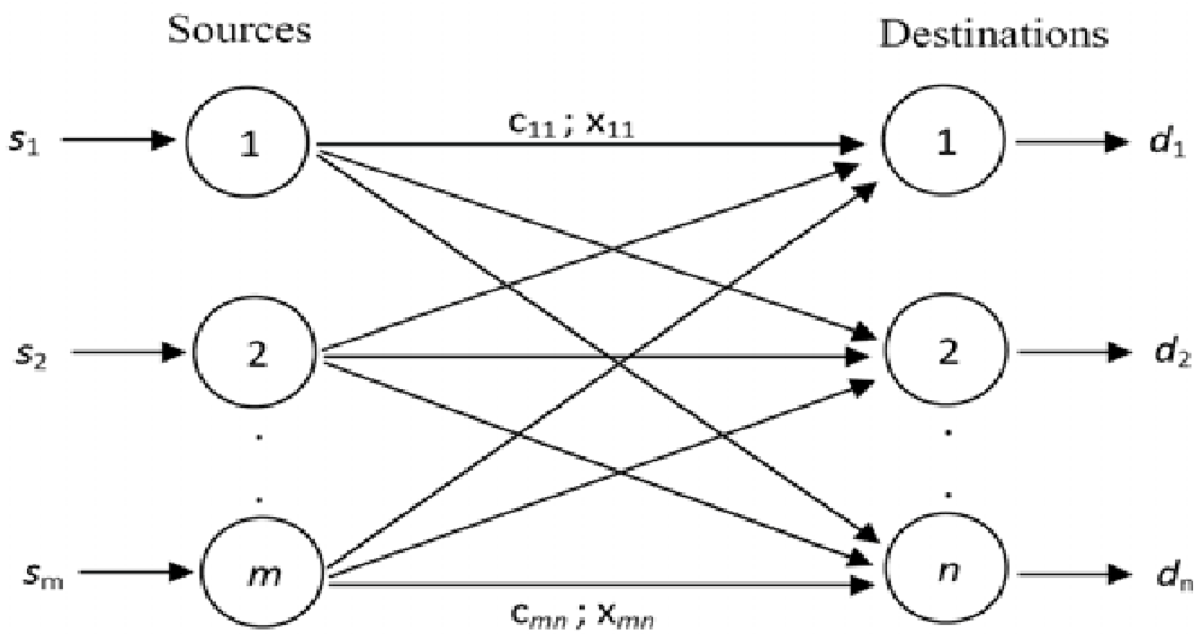

Figure .1 Network representation of the transportation problem

In developing the Linear Programming model of a transportation problem the following notations are used Transportation Problem

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

Subject to constraints,

$$\sum_{j=1}^{n} x_{ij} = a_i \qquad i = 1,2,\ldots..m \text{ (supply constraints)}$$

$$\sum_{i=1}^{n} x_{ij} = b_j \qquad j = 1,2,\ldots..m \text{ (demand constraints)}$$

and $x_{ij} \geq 0$ for all $i = 1,2,\ldots..m$ and,

$j = 1,2,\ldots..m$

The objective function minimizes the total cost of transportation Z between various sources and destinations. The constraint i in the first set of constraints ensures that the total units transported from the source I is less than or equal to its supply. The constraint j in the second set of constraints ensures that the total units transported to the destination j is greater than or equal to its demand.

Feasible solution:

A set of non-negative values x_{ij}, i = 1, 2,… n and j = 1,2, …, m that satisfies the constraints is called a feasible solution to the transportation problem.

***Optimal solution*:**

A feasible solution is said to be optimal if it minimizes the total transportation cost.

Non degenerate basic feasible solution:

A basic feasible solution to a (m × n) transportation problem that contains exactly m + n – 1 allocations in independent positions.

SOUTH WEST CORNER METHOD (SWCM):

The steps involved in solving the transportation problem using south west corner method is given below.

Step 1: construct the transportation table for the given transportation problem and verify that the problem is balanced.

Step 2: Select the south west corner cell (left hand corner) of the transportation table.

Step 3: Allocate as much as possible units to the selected cell i.e. minimum (supply, demand) at this cell and adjust the supply and demand by subtracting the allocated amount.

Step 4: a) If the supply for the last row is exhausted then move up in the first column and go to step 3

b) If the demand for the first column is satisfied then move horizontally to the next cell in the same row and go to step 3.

Step 5: If both row and column tend to zero simultaneously then arbitrarily cross out only one row or column and leave the other column or row.

Step 6: Repeat the steps 3 to 5 until all the allocations are made i.e. until the supply meets demand.

Step 7: check for m+n-1 occupied cells and calculate the transportation cost.

SOUTH EAST CORNER RULE (SECM)

The steps involved in the south east corner rule are stated as follows
Step 1: Construct the transportation table for the given transportation problem and verify that the problem is balanced.

Step 2: Select the south east corner cell (right hand corner) of the transportation table.
Step 3: Allocate as much as possible units to the selected cell i.e. minimum (supply, demand) at this cell and adjust the associated amounts of supply and demand by subtracting the allocated amount.
Step 4: a) If the supply for the last row is exhausted then move up in the first column and go to step 3

b) If the demand for the first column is satisfied then move horizontally to the next cell in the same row and go to step 3.

Step 5: If both row and column tend to zero simultaneously then arbitrarily cross out only one row or column and leave the other column or row. If exactly one row or column is left uncrossed out, stop. Otherwise, move to the cell to the right if a column has just been crossed out.

Step 6: Repeat the steps 3 to 5 until all the allocations are made i.e. until the supply meets demand.

Step 7: check for m+n-1 occupied cells and calculate the transportation cost.

Table 1.1 Table illustrating four sources and five Destinations

	D1	D2	D3	D4	D5	Supply
S1	13	5	12	4	7	14
S2	4	9	5	10	3	13
S3	14	4	6	7	9	22
S4	11	6	8	5	7	16
Demand	15	10	15	10	15	

In this problem there are five destinations D1, D2, D3, D4 and D5 and four sources S1, S2, S3 and S4. The total demand at each destination is given in the last row and the total commodities can be supplied by each source is given in the last column. The cost for transporting a commodity from a source to destination is given in the cells. The total supply by all the four sources is 65 and that of total demand is also 65. The total supply is equal to the total demand and the above problem is treated as a balanced transportation problem.

SOUTH WEST CORNER METHOD

	D1	D2	D3	D4	D5	Supply
S1	13	5	12	4	14 (7)	14
S2	4	9	2 (5)	10 (10)	1 (3)	13
S3	14	9 (4)	13 (6)	7	9	22
S4	15 (11)	6	8	5	7	16
Demand	15	10	15	10	15	

Table 1.2 Table illustrating four sources and five Destinations Balanced problem

Total cost = 11*15 + 4*9 + 6*13 + 5*2 + 10*10 + 3*1 + 7*14 = 496

SOUTH EAST CORNER METHOD

	D1	D2	D3	D4	D5	Supply
S1	14 (13)	5	12	4	7	14
S2	1 (4)	10 (9)	2 (5)	10	3	13
S3	14	4	6 (13)	9 (7)	9	22
S4	11	6	8	1 (5)	7 (15)	16
Demand	15	10	15	10	15	

Table 1.3 Table illustrating four sources and five Destinations Balanced problem

Total cost = 14*13 + 1*4 + 10*9 + 2*5 + 6*13 + 9*7 + 1*5 + 7*15 = 537

RESULT ANALYSIS

Methods	Total Transportation Cost
South East Corner Method (SECM)	537
South West Corner Method (SWCM)	496

CONCLUSION:

In this Paper, Compared with South East Corner Method and South West Corner methods for suitable Transportation of Goods from one place to another place. From the above calculations concluding that the Transportation cost of South West corner method is near to the optimal solution.

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