



Transportation Models

P. K. Taneja




Vogel's Approximation Method: Another Way To Find An Initial Solution

- *Vogel's Approximation Method (VAM)* is not as simple as the northwest corner method, but it provides a very good initial solution, often one that is the *optimal* solution
- VAM tackles the problem of finding a good initial solution by taking into account the costs associated with each route alternative
- This is something that the northwest corner rule does not do
- To apply VAM, we first compute for each row and column the penalty faced if we should ship over the *second-best* route instead of the *least-cost* route



MODI Method

- The MODI (*modified distribution*) method allows us to compute improvement indices quickly for each unused square without drawing all of the closed paths
- Because of this, it can often provide considerable time savings over the stepping-stone method for solving transportation problems
- If there is a negative improvement index, then only one stepping-stone path must be found
- This is used in the same manner as before to obtain an improved solution



Unbalanced Transportation Problems



- In real-life problems, total demand is frequently not equal to total supply
- These *unbalanced problems* can be handled easily by introducing *dummy sources* or *dummy destinations*
- If total supply is greater than total demand, a dummy destination (warehouse), with demand exactly equal to the surplus, is created
- If total demand is greater than total supply, we introduce a dummy source (factory) with a supply equal to the excess of demand over supply

Unbalanced Transportation Problems



- In either case, shipping cost coefficients of zero are assigned to each dummy location or route as no goods will actually be shipped
- Any units assigned to a dummy destination represent excess capacity
- Any units assigned to a dummy source represent unmet demand

More Than One Optimal Solution



- It is possible for a transportation problem to have multiple optimal solutions
- This happens when one or more of the improvement indices zero in the optimal solution
- This means that it is possible to design alternative shipping routes with the same total shipping cost
- The alternate optimal solution can be found by shipping the most to this unused square using a stepping-stone path
- In the real world, alternate optimal solutions provide management with greater flexibility in selecting and using resources

Maximization Transportation Problems



- If the objective in a transportation problem is to maximize profit, a minor change is required in the transportation algorithm
- Now the optimal solution is reached when all the improvement indices are negative or zero
- The cell with the largest positive improvement index is selected to be filled using a stepping-stone path
- This new solution is evaluated and the process continues until there are no positive improvement indices

Unacceptable Or Prohibited Routes



- At times there are transportation problems in which one of the sources is unable to ship to one or more of the destinations
- When this occurs, the problem is said to have an *unacceptable* or *prohibited route*
- In a minimization problem, such a prohibited route is assigned a very high cost to prevent this route from ever being used in the optimal solution
- In a maximization problem, the very high cost used in minimization problems is given a negative sign, turning it into a very bad profit

Facility Location Analysis



- The transportation method is especially useful in helping a firm to decide where to locate a new factory or warehouse
- Each alternative location should be analyzed within the framework of one *overall* distribution system
- The new location that yields the minimum cost for the *entire system* is the one that should be chosen
