



Assignment No:5

Optimal Transportation Plan

1. Assignment Description

As part of its sales activity the firm needs to transport its products from the production facility to the various regions. Transportation is performed by trucks that are hired based upon an annual contract. Any change in this contract generates a penalty. That is, the optimal policy is to set the number of truck for each line in quarter 1 (or 5) based upon the predicted demand for the whole year. However, demand is not constant and changes over the course of the quarters.

The purpose of this assignment is to design a transportation plan. The plan should take into consideration the quantities the firm intends to ship to each region in each quarter. The target of the plan is to minimize the cost of transportation for a given marketing plan.

2. Background Theory

The solution for this assignment should be based upon a framework of linear programming. This framework should be used in order to minimize the transportation costs. The problem can be described in the following mathematical formula:

$$\text{Min} \quad \sum_{j=1}^4 \sum_{i=1}^4 c_i q_i^j$$

s.t.

$$q_i^j \leq b_i$$

Where

i denotes region.

j denotes quarter.

c_i denotes the cost of conveying product to region i .

q_i^j denotes quantity of products transferred to region i in quarter j .

b_i the total quantity produced from the products in quarter j .



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3. Data Source

- Determine the marketing plan for the firm for quarters 1 through 8
- Build a linear programming model as described in section 2
- Set the parameters of the model according to the transportation cost terms as described in the user manual
- Calculate the optimal solution of the model
- Build a single firm with a selected technology that can produce the same quantities as in the planned model
- Run the simulation for eight quarters and record the transportation costs

4. Analysis Required

1. Compare the planned transportation cost with the actual costs in the simulation. Are there differences between the two solutions? Can you explain the differences?
2. What is the shadow price of adding an additional truck in the 4th quarter. How can this value be accounted for in the simulation?