



Assignment No. 10

Build an Optimal Allocation Between Marketing Channels

1. Assignment Description

Each firm in the Green State has two marketing channels. One is direct sales to customers. These sales are performed in the stores of each of the firm in each region. The other option is sales via reseller. Resellers charge a fee which is a portion of the product price. The reseller's price is identical to the price in the firm's stores. The fee is what drives the reseller to market the firm's products. The higher this fee the stronger this driver. However, the higher this fee the smaller the income to the firm. Note also that resellers "do not like" the idea of reduction in the percentage of their fee. Thus, planning should be made under the assumption that over eight quarters fees should either be constant or increasing.

2. Background Theory

The problem of optimal allocation between marketing channels should be solved using a non-linear multi-target optimization framework. The target function is for maximum revenue from all areas (while each area has a different demand curve) plus revenue from diverse products being sold to resellers. Formal description of the problem is as follows:

$$\text{Max} \sum_{j=1}^8 \sum_{i=1}^4 [P_i^j * Q_i^j(P_i^j) + \alpha_i^j P_i^j * S_i^j]$$

Subset to $\alpha_j \leq \alpha_{j+1}$

Where

P is the price of the product at each region and each quarter

Q is the quantity sold by the firm in each region and each quarter

α is the reseller fee

S is the quantity soled by resellers

Note that i is index of regions and j is index of quarter



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3. Data Source

- Single firm with selected technology and automation
- Generate production of large number of products
- Estimate demand for each region and each quarter; run simulations
- Estimate the quantity sold by resellers as function of the fee

4. Analysis Required

- a. Run linear regression to estimate the demand for each region.
- b. Run linear regression to build the quantity of products sold by resellers based on the fee paid.
- c. Build and solve the optimization problem as described in Section 2.
- d. Define the optimal policy for reseller's fee.