

Frisbee Square Formulation

Input Data Model

Indices

- I - Collection of products.
- T - Collection of periods $[1, 2, \dots]$.

Parameters

- d_{it} : Demand (units) of product i in period t .
- oi_i : Opening inventory (units) of product i .
- pr_i : Production rate (units/hour) of product i .
- hc_t : Holding cost (dollars/unit) in period t .
- pu_t : Production capacity (hours) at period t .
- pc_i : Production cost (dollars/unit) of product i .

Decision Variables

- x_{it} : Number of units produced of product i in period t .
- y_{it} : Number of units held in inventory of product i from period t to $t + 1$.

Constraints

- C1) Flow balance:

$$y_{it} = oi_i + x_{it} - d_{it}, \quad \forall i, t = 1$$

$$y_{it} = y_{it-1} + x_{it} - d_{it}, \quad \forall i, t \geq 2$$

By defining y_{it} as non-negative, we already ensure that demand d_{it} is met for every i and t .

- C2) Production capacity:

$$\sum_i \frac{x_{it}}{pr_i} \leq pu_t, \quad \forall t$$

Objective

The objective is to minimize total cost, which is composed by production and holding costs:

- $\text{production_cost}_{it} := pc_i \cdot x_{it}$
- $\text{holding_cost}_{it} := hc_t \cdot y_{it}$

$$\min \sum_{it} \text{production_cost}_{it} + \text{holding_cost}_{it}$$