

20/3/26

Inventory 2

Capacity Constraints : $x_t \leq C \quad \forall t$

$$\left. \begin{array}{l} x_1 \leq C \\ \text{Demande } I_1 + x_1 \geq d_1 \end{array} \right\} \Rightarrow d_1 \leq I_1 + x_1 \leq I_1 + C$$

$C \geq d_1 - I_1$

$$d_1 \leq I_1 + C \quad \text{average condition}$$

$$t=2 : \quad x_2 \leq C$$

$$I_2 + x_2 \geq d_2 \Rightarrow \underbrace{I_1 + x_1 - d_1 + x_2}_{I_2} \geq d_2 \Rightarrow$$

$$d_2 \leq I_1 + x_1 - d_1 + x_2 \Rightarrow d_1 + d_2 \leq I_1 + 2C \Rightarrow$$

$$\Rightarrow C \geq \frac{d_1 + d_2 - I_1}{2}$$

generally $tC \geq d_1 + d_2 + \dots + d_t - I_1$

$$\boxed{d_1 + \dots + d_t \leq I_1 + tC} \quad t=1, \dots, T$$

$\rightarrow$ average condition

Inv_3 : Production Smoothing ($I_1=0$)

Επίνακας : $x_t = \bar{d} = \frac{d_1 + \dots + d_T}{T}$

parameter

ελαστικοί ημίος.

constraints

$x_t - u_t + v_t = \bar{d}$

$t=1, \dots, T$

variables $\left\{ \begin{array}{l} u_t \geq 0 \\ v_t \geq 0 \end{array} \right.$

objective

$\min \sum c_t x_t + \sum h_t I_{t+} + p \sum u_t + q \sum v_t$

Parameters

p : penalty for over production
 q : " " under

Network - Capacitated Transshipment.

V = σύνολο κόμβων $(1, 2, \dots, m)$

E = " ακμών, $E \subseteq V \times V$ (νεροσυνα-τολίες)

c_{ij} = κόστος μεταφοράς συν ακμή (i, j)

v_{ij} = χωρητικότητα " " (i, j)

a_i = διαθ. ποσότητα στον κόμβο i

$a_i > 0$: απόθεμα

$a_i < 0$: ζήτηση

$\sum_{i \in V} a_i = 0$
balanced

$$\min \sum_{i,j} c_{ij} x_{ij}$$

(Capacity)

$$x_{ij} \leq v_{ij}$$

$$(i, j) \in E$$

(balance)

$$\sum_{(i,j) \in E} x_{ij} - \sum_{(k,i) \in E} x_{ki} = a_i, \quad i \in V$$

(balanced problem)

$$x_{ij} \geq 0$$

$M = \text{αρ. κόμβων (παράμετρος)}$

set nodes = range(1, M+1) [1, ..., M] ^{list}

set edges = [(1,2), (1,3), (2,3), ..., (6,7)] ^{python list}

supply : $\lambda \in \text{ζητά}$ με index nodes

supply = { 1: 50, 2: -30, ... }

capacity : $\lambda \in \text{ζητά}$ με index edges

capacity = { (1,2) : 70, (1,3) : 30, ... }