MATH3202
OPERATIONS RESEARCH
TUTORIAL 3

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Sets.

I	oils
T	months {0,1,2,3,4,5}

Data.

H_i	hardness of oil $i \in I$
Cost_{it}	cost (\$/tonne) of oil $i \in I$ in month $t \in T$
IsVeg_i	is oil $i \in I$ vegetable?
MaxH	max hardness of blend
MinH	min hardness of blend
MaxVeg	max processing of vegetable oils (tonnes)
MaxNonVeg	max processing of non-veg oils (tonnes)
StoreCost	cost of storage (\$/tonne/month)
StoreMax	max storage (tonnes) for each oil
Initial	initial amount in storage of each oil
Sell	sell price (\$/tonne) of blend

Variables.

x_{it}	amount of oil $i \in I$ to process (tonnes) in month $t \in T$
y_{it}	amount of oil $i \in I$ to purchase (tonnes) in month $t \in T$
s_{it}	amount in storage of $i \in I$ (tonnes) at end of month $t \in T$

Objective.

$$\max\left(\text{profit} = \sum_{i\in I}\sum_{t\in T}\text{Sell}x_{it} - \sum_{i\in I}\sum_{t\in T}\text{Cost}_{it}y_{it} - \sum_{i\in I}\sum_{t\in T}\text{StoreCost}s_{it}\right)$$

Constraints.

$$\text{(1)} \qquad \sum_{\substack{i\in I \\ \text{IsVeg}_i}} x_{it} \leq \text{MaxVeg} \qquad \forall t \in T$$

$$\text{(2)} \qquad \sum_{\substack{i\in I \\ \text{NotIsVeg}_i}} x_{it} \leq \text{MaxNonVeg} \qquad \forall t \in T$$

$$\text{(3)} \qquad \sum_{i\in I}(H_i - \text{MinH})x_{it} \geq 0 \qquad \forall t \in T$$

$$\text{(4)} \qquad \sum_{i\in I}(H_i - \text{MaxH})x_{it} \leq 0 \qquad \forall t \in T$$

$$\text{(5)} \qquad s_{it} \leq \text{StoreMax} \qquad \forall t \in T$$

$$\text{(6)} \qquad s_{i0} = \text{Initial} - x_{i0} + y_{i0} \qquad \forall i \in I$$

$$\text{(7)} \qquad s_{it} = s_{i(t-1)} - x_{it} + y_{it} \qquad \forall i \in I, t \in T, t \neq 0$$

$$\text{(8)} \qquad x_{it}, y_{it}, s_{it} \geq 0 \qquad \forall i \in I, t \in T$$

Note. Constraints number (6) and (7) are called **inventory constraints**.

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