Operation Research – Formulation

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Sets:

d_c :Set of distribution centers
s_m :Set of supermarkets
s_c :Set of scenarios

Data:

$cost_{dc\ sm}$:Cost to supply to supermarket *sm* ∈ s_m from distribution center *dc* ∈ d_c
$dc\_capacity_{dc}$:Capacity of distribution center *dc* ∈ d_c
$sm\_demand_{sc\ sm}$:Demand of each supermarket *sm* ∈ s_m in each scenario *sc* ∈ s_c
d_capacity_max :Maximum available capacity in DC_0 and DC_1

Variables:

$X_{dc\ sm}$: Proportion of contribution from distribution center *dc* ∈ d_c for the supermarket *sm*

Objective Function:

$$\boldsymbol{min} \sum_{\boldsymbol{sm} \in \boldsymbol{s\_m}} \sum_{\boldsymbol{dc} \in \boldsymbol{d\_c}} \boldsymbol{X_{dc\ sm}} * \boldsymbol{cost_{dc\ sm}}$$

Constraints:

1. The sum of the contribution proportion from all distribution center for each supermarket should not be greater than 1. For all the scenarios, this constrain will be constant because we are using proportions.

$$\sum_{dc \in d\_c} X_{dc\ sm} == 1 \qquad \forall sm \in s\_m$$

2. The total quantity sent out from each distribution center for all supermarkets in each scenario is less than distribution center capacity.

$$\sum_{sm \in s_m} X_{dc\ sm} * sm_{demand_{sc\ sm}} \leq . dc_{capacity_{dc}}$$
$$\forall sc \in s\_c \qquad \forall cd \in d\_c$$

3. The total quantity sent out from distribution centres DC0 and DC1 for all supermarkets in each scenario is less than 100 which is the labour capacity.

$$\sum_{dc \in \{DC_0, DC_1\}} \sum_{sm \in s\_m} X_{dc\ sc} * sm_{demand_{sc\ sm}} \leq d\_capacity\_\max \qquad \forall sc \in s\_c$$