Module 09 – Fixed Charge Problem

Exploratory Data Analysis

*In this section, you should perform some data analysis on the data provided to you. Please format your findings in a visually pleasing way and please be sure to include these cuts:*

* *Make a visual graph of your data on a map (coordinates should be within US borders)*
  + <https://mymaps.google.com/>
  + Find a map with latitude/longitude and place them approximately
  + Any alternative that gives the same effect

A map of the united states

AI-generated content may be incorrect.

Red: Distribution Center

Blue: Warehouses

Model Formulation

*Write the formulation of the model into here prior to implementing it in your Excel model. Be explicit with the definition of the decision variables, objective function, and constraints.*

Min:

6.73\*X11 + 7.61\*X12 + 13.68\*X13 + 14.82\*X14 + 46.05\*X15 + 33.02\*X16+6.88\*X21 + 11.64\*X22 + 10.55\*X23 + 23.39\*X24 + 51.62\*X25 + 45.75\*X26+14.16\*X31 + 25.54\*X32 + 24.45\*X33 + 34.29\*X34 + 65.52\*X35 + 38.07\*X36

1:

2:

3:

4:

5:

6:

Linking Constraints:

Model Optimized for Min Costs to Supply DCs

*Implement your formulation into Excel and be sure to make it neat. This section should include:*

* *A screenshot of your optimized final model (formatted nicely, of course)*

*A screenshot of a graph

AI-generated content may be incorrect.*

* *A text explanation of what your model is recommending*
  + My model is recommending that the company should open 2 warehouses, warehouse 1 and warehouse 4. To minimize the cost, my model is suggesting that we do not send more materials than what is demanded. Warehouse 1 would receive the demand form distribution center 1, 2, 3, and 4. Warehouse 2 would receive the demand form distribution center’s 5 and 6.

Model with Stipulation

*Please copy the tab of your original model before continuing with the next part to avoid messing up your original solution.*

*Please perform 2 out of the 3 scenarios below with a short text description on what changed:*

1. *Instead of only being able to open 2 warehouses, what happens to our objective function when we only can open 1 warehouse?*
   * Originally, our costs would be $66,406.64. When we only allow one Warehouse to be opened the costs increase to $96,742.02. This could be because the distance from one warehouse to all the DCs is so much that it would be cheaper to open a second warehouse. 2 warehouses cuts down on transportation costs.
2. *Right now, we have $1 per unit shipped over the distance between the warehouse and the DC. What happens to our objective function when we increase this to $30? Does your DC assignment change at all?*
   * My objective function gets really high. It goes from $66,406.64 to ]$1,855,191.20. This is a huge increase. This happens because now the cost for the distance is $29 more than it used to be, which increases the transportation costs by a large margin.
3. *For distance between each location, we used Manhattan distance but what happens to our model if we use Euclidean distance instead? Did the change impact the model at all? Do you feel this is a better distance metric to use in this scenario?*

