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.

* Stars indicate warehouses
* Blue indicates DC’s

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: X1 + X2 + X3 + X4 + 2467Y1 + 2163Y2 + 2327Y3 + 2213Y4

X11 + X21 + X31 + X41 <= 973

X12 + X22 + X32 + X42 <= 805

X13 + X23 + X33 + X43 <= 521

X14 + X24 + X34 + X44 <= 550

X15 + X25 + X35 + X45 <= 707

X16 + X26 + X36 + X46 <= 959

X1 – 4515Y1 <= 0

X2 – 4515Y2 <= 0

X3 – 4515Y3 <= 0

X4 – 4515Y4 <= 0

All Y1 Must be binary

X1 >= 0, *i* = 1, 2, 3, 4

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 text explanation of what your model is recommending*

A screenshot of a computer

AI-generated content may be incorrect.

The model recommends we open warehouses 1 and 3. Warehouse 1 will supply DC’s 1,2,4, and 5, while warehouse 3 supplies DC’s 3 and 6. With this all demand is met in the most efficient way possible.

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?*

The total cost increases by $36,607.02, making it optimal to only open one warehouse.

A screenshot of a computer

AI-generated content may be incorrect.

1. *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?*

No, it does not, because the price increase was for all warehouses if they were the cheapest at $1, they continue to be the cheapest at $30

*A screenshot of a computer

AI-generated content may be incorrect.*

1. *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?*

