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.

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: 2516Y1-2441Y2-1056Y3-1495Y4

ST:

31.37X1+47.47X2+17.66X3+56.96X4 <= 917

4.85X1+20.95X2+25.56X3+30.44X4<=949

7.37X1+25.61X2+23.04X3+32.96X4<=605

22.26X1+38.36X2+8.15X3+47.85X4<=854

46.3X1+62.4X2+15.89X3+71.89X4<=556

15.98X1+32.08X2+19.17X3+41.57X4<=724

Xi>=0, i= 1,2,3,4

X1-1Y1<=0

X2-1Y2<=0

X3-1Y3<=0

X4-1Y4<=0

Model Optimized for Min Costs to Supply DCs

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

The optimized model to minimize costs is showing Funfetti Fields and Honeysuckle Hollow are ideal for fulfilling the demand. The overall cost is $56,192.18.

A screenshot of a spreadsheet

AI-generated content may be incorrect.

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 objective function increases from $59,000 to $85,000. This occurs due to setting a new constraint that there are only 1 warehouse available working to meet the same demand as before.

*A screenshot of a spreadsheet

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?*

If the units shipped over increased cost to $30, the objective function would drastically increase. The overall minimize cost would be greater as it costs more per unit to be shipped. The DC assignments will most likely change as the $1 cost per unit shipped had a low to none impact on cost, which could have supported the lower-cost routes even if it was longer. With the $30 cost per unit, the model will prioritize shorter routes to avoid the higher shipping costs.

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?*

