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= Y1+y2+Y3+Y4

Where DC =1,2,3,4 and DC=1,2,3,4,5,6

Binary = 0,1

DC1= x1​+x2​+x3​+x4​=760

DC2= x12​+x22​+x32​+x42​=824

DC3= x13​+x23​+x33​+x43​=790

DC4=x14​+x24​+x34​+x44​=543

DC5=x15​+x25​+x35​+x45​=704

DC6= x16​+x26​+x36​+x46​=766

WH1,2,3,4<=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:*

* *A screenshot of your optimized final model (formatted nicely, of course)*
* *A text explanation of what your model is recommending*

A screenshot of a spreadsheet

AI-generated content may be incorrect.

My model is recommending to use warehouse 3 and 4 to ship out of to meet demand DC 1-6. Warehouses 1 and 2 are not used.

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?*
   1. The objective function decreases when you change from 1 to 2 warehouses being open.
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?*
   1. When we change the shipping cost to $30 the objective function per unit increases from $1 to $30. Growing the total shipping cost 30 times. Shipping cost was previously small compared to the $30. Focusing on minimizing shipping distances rather than fewer warehouses, depending mostly on total distance.
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?*
   1. Euclidean distances are always shorter, therefore the shipping costs will decrease if we were to switch leading to the total cost in the objective function drops. The change impacted the model a little but not a lot. If the distances change a lot, different warehouses might be selected because some would be “closer” under Euclidean. I think that in this case, Manhatten is more realistic.

