**Homework #7-8**

**MSiA Program, Fall 2023**

**Optimization**

**Due: At the start of class on Tuesday 11/13/23**

1. Do the MacPherson Refrigeration Case. But, you need to do more than is in the case:
   1. Do the case as it is and answer the business questions
   2. No matter how you answer part (a), you also need to build and run this model in Python (or Excel). You should make sure the model is scalable and well-written
   3. Extend the analysis in the case to present some interesting results to the client. The interesting results should include you coming up with a unique way to use the model or a unique extension to the model that allows it to do some new things. This problem is intentionally vague. The real-world use case is that you have been given this problem by a client. You know that if you just answer the questions in the case, they will not be that impressed. And, you want to impress them.
2. Add a third time period to the natural gas model we covered in class. Formulate and solve it in Excel first and then create and solve a Python model. Test the model with the even split (33%), and then test it with a different mix of probabilities.
3. Purchasing Case Study. The spreadsheet “*Data for Homework 6 Purchasing Case Student*” is an extension of the vegetable distributor problem you saw in HW#1. In this problem, the data at the top shows the amount that the distributor sells the product for and the min and max of each product that can be sold. Assume that the distributor still has a constraint of 18,000 cubic feet. But, now, the distributor can purchase from 3 different suppliers. There are no constraints on the upper limit of what the distributor can buy from each supplier. However, there is a minimum constraint. The distributor must purchase at least $15,000 from a supplier if they purchase anything. That is, they don’t have to buy from a supplier, but if they do, they need to spend at least $15,000 with that supplier.
   1. Build a model that determines what they should buy from each distributor including the minimum requirement of $15,000. Provide a summary write-up of your approach to setting up the model (not the answer to this problem, but how you set up the optimization program)
   2. Include a write-up of the results of the model and why it appeared to make the decisions that it did. That is, why did it recommend the suppliers it picked and the quantities purchased from each supplier. As part of your write-up, you should at least note what happens when the minimum purchasing requirement is $0 and $12,000.