Course 1 Project: Filling Demand while Optimizing Cost

Goal: For all orders on 12/31/2019, we need to decide which plant (warehouse) to produce and ship the product from in order to optimize cost. Note that all products on this day need to go to 'PORT_09'. See the description of files below.

Part 1 (20 points):

a) Create a new column in the 'orders' dataframe called 'allowed_plants'. To do this, you'll need to apply the defined get_plants function using a lambda function. (10)

b) Set the index of the 'orders' dataframe to be the 'Order ID'. Make sure you set the index in place. (10)

Part 2 (60 points):

a) Return the production cost for a given order_id and plant (wahrehouse) name. From the order id, you should first get the associated product id, which can be used to get the cost per unit. From here, multiply the cost per unit by the unit quantity to get the total production cost. (25)

b) Return the shipping cost for a given order_id and plant (warehouse) name. From the plant name, you should first get the associated port, which can be used to get the shipping cost per lb. From here, multiply the cost per lb by the weight to get the total shipping cost. (25)

c) Return the total cost for a given order_id and plant (warehouse) name. You should add the results of the two functions above. (10)

Part 3 (20 points):

a) Solve the linear programming problem and store its status in a variable called 'status'. (10)

b) Return the total cost for a given order_id and plant (warehouse) name. You should add the results of the two functions above. (10)

Description of Files:

1) *OrderList*: List of orders and required destination.

   - *Order ID*: Unique order ID.
   - *Order Date*: Date order was placed.
   - *Product ID*: Unique product ID.
   - *Destination Port*: Port location of final product destination.
   - *Unit Quantity*: Number of units ordered.
   - *Weight:* Total weight of product in order (lbs).

2) *FreightRates*: Shipping rates from various ports.

   - *orig_port_cd*: Port product is shipped from.
   - *dest_port_cd*: Port product arrives at.
   - *rate*: Shipping rate per lb.

3) *WhCapacities*: Production capacities per plant (warehouse).

   - *Plant ID*: Unique plant (warehouse) ID.
   - *Daily Capacity*: Max number of orders processed per day. Note that this capacity corresponds to number of orders, not units.

4) *ProductsPerPlant*: Production cost of each product per plant.

   - *Plant Code*: Unique plant (warehouse) ID.
   - *Product ID*: Unique product ID.
   - *Cost per unit*: Cost to produce 1 unit of product.

5) *PlantPorts:* Table linking plants (warehouses) to associated ports.

   - *Plant Code*: Unique plant (warehouse) ID.
   - *Port*: Unique Port ID