ISyE 6203  Transportation and Supply Chain Systems

Spring 2013

Homework 1

Issued: January 10, 2013

Due: January 17, 2013

50 points.
This assignment is based on the Supply Chain Game we played in class.

1. Each team member prepares a spreadsheet with data on the following for each time period of each of the three versions of the game:
   (a) initial inventory (positive for items in inventory, negative for items backordered),
   (b) number of items received from supplier,
   (c) number of items ordered by customer,
   (d) number of items sent to customer,
   (e) final inventory,
   (f) number of items ordered from supplier,
   (g) total cost for the time period.

2. Combine the spreadsheets prepared by the members of your team. Make sure that the numbers match up—for example, make sure that the orders submitted by the retailer in each time period were exactly equal to the orders received by the wholesaler in the next time period, that the wholesaler sent the correct amount to the retailer, that the wholesaler’s inventory and backlog were updated correctly, and similarly for the other members of the team. If the numbers do not match up, you need to get together with the other members of your team and sort out the discrepancies.

3. Check the costs incurred by each team member for each time period. Inventory holding cost = $0.50 per unit per time period. Backlog cost = $4.00 per unit per time period. Order change cost = $2.00 per unit change for versions 2 and 3 of the game.

4. Plot graphs of the order quantities in each time period versus time. This includes graphs for the customer demands at the retailer, retailer orders sent to the wholesaler, wholesaler orders sent to the distributor, distributor orders sent to the manufacturer, and manufacturer orders for raw materials. To make comparison easier, you may plot them on the same graph. Interpret the results.

5. Plot a graph of the inventory levels in each time period versus time. A backlog is considered a negative inventory level. This includes the inventory levels at the retailer, wholesaler, distributor, and manufacturer. To make comparison easier, you may plot them on the same graph. Interpret the results.
6. Plot a graph of the costs in each time period versus time. This includes the costs of the retailer, wholesaler, distributor, and manufacturer. To make comparison easier, you may plot them on the same graph. Interpret the results.

7. Compute statistics for the order quantities. This includes the averages and standard deviations of the customer demands at the retailer, retailer orders sent to the wholesaler, etc. Compute separate statistics for the 3 versions of the game. Interpret the results.

8. Compute statistics for the inventory levels. This includes the averages and standard deviations of the inventory levels at the retailer, wholesaler, distributor, and manufacturer. Compute separate statistics for the 3 versions of the game. Interpret the results.

9. Compute statistics for the costs. This includes the averages and standard deviations of the costs of the retailer, wholesaler, distributor, and manufacturer. Compute separate statistics for the 3 versions of the game. Interpret the results.

10. Compare the results for the 3 stages of the game.
   
   (a) Did the order change penalty improve behavior?
   (b) Did sharing information improve behavior?

11. (a) Evaluate your decisions, and the decisions of your team mates.
    (b) Describe what you think went wrong.
    (c) How could better decisions have been made? How could the available information have been used better, without team members having to share information?
    (d) What types of decision tools and techniques do you think managers need to manage supply chains?