

IE460 – Spring 2019

Homework III - Due date – April 5, 2019 – 17:00 pm

Information on Homework III

- **Homework III is 2%. Make sure that you review course material before you start. Cite sources used if any.**
- **Grading Policy:** The homework grades will not be only based on the correctness of the answers provided, but on the perceived degree of effort on the returned assignment. This means that even without obtaining the correct answers one can obtain full credit. The grade scale will be “2” (full effort, all questions); “1” (some effort or full effort, some questions); “0” (no effort or no submission). The submissions that exceed expectations may get a bonus – grade will be “3” (extra effort). Note that “2” corresponds to a grade out of 100% - 2% of the overall grade in this case. Late submissions will not be accepted.
- The grading scale for each question is 2 points (close to full effort), 1 point (some effort), and 0 (no effort or no submission). Total points that would lead to your overall HW grade are given below:

Total Points	HW Grade
6+	3
4-6	2
1-3	1
0	0

- **Academic Dishonesty (taken from IE460 Course Information):** For assignments: Discussion of the course material and working in groups are effective ways of learning. However, this does not mean that you can copy the assignment from one of your friends. You can discuss with your friends, but you should be alone, without any written solution in front of you, when you actually prepare your assignment. It is extremely important to understand the value of this exercise in the process of learning. Any violation of the above understanding will result measures outlined in the student rules and regulations.
- **Submission Information:** An assignment submission box is to be placed in front of office EA325 about two days before submission date and is to be removed at the time of the deadline. You need to put your assignment in the designated box before the deadline. **Submission via e-mail is NOT accepted.**

Suggestions: Before you start solving the problems:

- 1) Review and Read Chapter 12 of your text book in detail before solving your homework. The way things are described in the new text may be a bit different than your previous text-books.
- 2) Read Chapter 10 of your text book on information distortion issues.
- 3) For each question, each part: Outline what you need to do in steps before you actually solve. You can use a spread-sheet to solve your problem, as long as your outline is detailed enough to specify your parameters, decision variables and formulas to apply.

Homework Problems:

1. Consider a supply chain with a distributor and a retailer. The retailer uses an (s, S) policy to replenish its inventory, with $s = 3$ and $S = 10$. The following sequence of events takes place in each week:
 - i) weekly demand is observed at the retailer (any unsatisfied demand is backordered)
 - ii) if inventory position at the end of the week is less than or equal to $s (=3)$, the retailer places an order to the distributor to raise the inventory position to $S (=10)$.
 - iii) the order placed (if any) arrives immediately (before the beginning of the next week), i.e. lead-time is negligible.

You would like to understand if the bullwhip effect exists in the chain. The demand data (as observed at the retailer) for the past 15 weeks is as follows: (2,4,1,0,3,2,5,4,3,5,4,2,3,4,5). Suppose that at the beginning of Week 1 the inventory at the retailer is equal to 10 units.

- a) Is there a bullwhip effect observed at the system? Please, quantify it using the variance of orders generated divided by the variance of demand.
 - b) What would be the effect on the safety stock values kept if the variance computed were used to compute the SS of the above system rather than the variance computed for demand?
 - c) Specify and explain a different ordering policy for the retailer to decrease the bullwhip effect. Discuss qualitatively why it should decrease the bullwhip effect.
2. Problem 11, Chapter 12 (p. 362) of the text-book, Chopra and Meindl (2016).
3. Problem 19, Chapter 12 (p. 363) of the text-book, Chopra and Meindl (2016).

4. Problem 16, Chapter 13 (p. 404) of the text-book, Chopra and Meindl (2016). For part c) employ a mathematical formulation of the problem and compute its solution (Hint: You need to use a Lagrange formulation for the solution of the multi-item problem. Note that the formulation is actually stated in your text book – you may need to consult IE375 text book for its solution).