

## Concept Check #4: Uncertainty in Demand and Supply Concept Check

Instructions for this concept check:

- Submit the assignment as a quiz in bCourses; uploaded PDFs will not be graded unless the associated quiz has been completed.
  - To receive partial credit for incorrect answers, please upload a PDF of your work, which can be handwritten or typed. The GSI Team must be able to clearly follow and understand your work to award partial credit.
  - If you make any assumptions, state them clearly.
  - If you complete the assignment with a partner, use the first question in the bCourses quiz to list your partner. Only one partner should submit. If you and your partner are in different cohorts, you must submit by the earlier deadline.
  - Prior to the due date, discuss the assignment with no one other than your partner.
  - There is no time limit and you will have a single attempt to complete the “quiz,” so work through the entire assignment prior to submission.
  - Please use the Normal Probability Table we have been using in the course.
  - In your submission you will be asked to respond to the following question.
- “By typing my name below, I am declaring that, as per the course syllabus (p.5), I (and my partner, if I have one) have not used any AI tools or automated services for this assignment. This includes but is not limited to, AI-generated content, automated writing assistance, and machine learning-based solutions.”

### 1. Homeworld Hyperstores (30 points)

Homeworld Hyperstores (HH) supplies the US market from a warehouse located in California. It imports a single type of dishwasher in full container loads (FCL) from an appliance distributor located in South Korea. The demand mean and standard deviation are 2000 and 500 units per month, respectively. The mean and standard deviation of the leadtime are 25 and 10 days, respectively. The product cost is US\$500, and the cost of carrying inventory is 2% per month. HH must pay (by international bank transfer) the full cost of the order at the time it is placed. The estimated fixed costs of any order are US\$600. HH sets the order quantity by evaluating the EOQ from the classic formula but then rounding **up** to the nearest full container load (a container can carry 100 dishwashers). HH uses a safety factor of 2.0 for establishing the reorder point.

- Give **two** reasons why the fixed costs of an order (\$600) higher in South Korea than they would be if HH ordered from a US-based supplier? (6 points)
- What order quantity (Q) in units does HH use for these dishwashers? (5 points)
- What is the Reorder Point (R) in units? (6 points)
- If the average inventory in the system, including pipeline (in-transit) inventory, is given by  $R+Q/2$ , what is the monthly cost of carrying inventory? (5 points)

- (e) HH competes on cost and is contemplating switching to a cheaper distributor based in Thailand. However the leadtime mean and standard deviation are both 10% higher than that from the South Korean-based distributor. If HH switches, by what percentage will the expected monthly cost of carrying inventory increase: (i) <10%, (ii) 10%, or (iii) >10% [select one] (3 points)
- (f) HH switches its sourcing to the Thailand-based distributor, but subsequently finds out that the production and shipping frequency is only once per week. What would an appropriate response to this additional information be for HH? (5 points)

## Question 2. Orchestra (20 points)

You are the operations manager for a San Francisco orchestra about to tour Europe, performing five different concerts in five European cities over two weeks. Program guides, which you will print in Europe at a cost of €1.80 each, include information on California, the orchestra, and the specific program notes. In order to guarantee delivery for each concert night, the printer requires one week's notice of the size of the production run for each of the five program guides.

From previous tours demand for program guides (which sell for €4.80) is evenly (i.e., uniformly) distributed between 20% and 50% of the number ( $n_w$ ) of tickets sold one week prior to the concert. Under strict sustainability policies you must pay a recycling fee of €0.20 per unused program guide. Your CEO indicates she wants to maximize expected profits.

- (a) What is the “underage” cost in € ( $C_u$ , also known as “G”, the amount you **gain** if you stock the  $n^{\text{th}}$  item and it *is* needed)? (3 points)
- (b) What is the “overage” cost in € ( $C_o$ , also known as “L”, the amount you **lose** if you stock the  $n^{\text{th}}$  item and it is *not* needed)? (3 points)
- (c) What is the optimal number of packages to order for each concert, expressed as a percentage of  $n_w$ ? (6 points)
- (d) Describe **two** different improvement ideas to improve profitability by changing one of the “givens” (8 points)

Shortly after you finish this Concept Check, you should work through at least a subset of questions 6 to 10 in *Practice Problems Part II of the Course*, which is on bCourses. The exams will include questions that are more difficult than those in the keep-up-with-the-main-ideas Concept Checks. You should anticipate that at least some exam questions will be on par with the more challenging practice problems that are provided.