M&IS 34060—Operations Management
Excel Exercises—Inventory

Introduction

For these exercises, you are to use a template spreadsheet to answer some basic inventory questions. You will find a template spreadsheet link on the class website under the "Inventory1" file link or at http://www.personal.kent.edu/~vberardi/34060/inventory1.xlsm .

Make sure when you save the file, it has the file extension ".xlsm". If not, make it so by specifying it to be such manually as you save the file calling it "inventory1.xlsm".

NOTE—This is a macro-enabled file. You may need to "enable" the content if a "Security Warning" appears by clicking on the "Options" box that appears. After doing this, a "runtime error" may appear. Ignore it by clicking the button.

This template is adapted from an Active Module spreadsheet from the Heizer/Render text CD. Notice that there are two sheets, one for EOQ and one for POQ. Start with the EOQ and note that initial data corresponds to Examples 3 – 5 in chapter 12 of the text, from editions 5 and 6.

PART ONE

The first series of questions relates to the EOQ spreadsheet. They are designed for you to consider the impact of changes or errors on the decisions. Write answers on this sheet for easy reference.

1) Review the spreadsheet to ensure understanding. Play with the numbers and sliders to get a feel for changes.
   Reset data before proceeding.

2) Given the initial data in the spreadsheet, what is the EOQ?

3) What happens to EOQ if demand rate quadruples to 4000 units?
   Reset data.

4) How does the total cost change (use percentage change) if…
   a. You were actually ordering 150 units instead of an EOQ of 200?
   b. You were actually ordering 250 units instead of an EOQ of 200?
      i. Which is more costly?
      ii. Notice that the quantities ordered were off by 25 % from the EOQ of 200. Yet the total cost change in (a) and (b) was much less. What does this say about the robustness of the EOQ model?

5) Reset data.

(continued on next page)

6) Consider a Just in Time (JIT) scenario. JIT challenges organizations to produce goods and services only *when* they are needed, not in advance where they are inventoried *until* needed. In this environment, operations must meet the demand rate of customers (e.g., 1000 units) and they often have little to no control over holding costs.
   a. Given the above, what does operations have to do to drive the EOQ to as small a quantity as possible?
      i. Initially, can you get EOQ = 63.25 units? What did you change to make this happen?
         1. From an operations standpoint, what does this change truly represent? Hint…it may look like dollars on the spreadsheet but for operations this cost is not dollars but …???
      ii. Ultimately, can you get EOQ = 1 unit? What does an EOQ = 1 represent?

PART TWO

This series of questions relates to the POQ spreadsheet. They are designed for you to consider the impact of changes or errors on the decisions. Write answers on this sheet for easy reference.

1) Review the spreadsheet to ensure understanding. Play with the numbers and sliders to get a feel for changes. Notice, I have copied the EOQ results for comparison. Reset data before proceeding.

2) Given the initial data in the spreadsheet, what is the optimal production order quantity, POQ?
   a. How does POQ compare to EOQ?
      i. What about the total costs of each?
      ii. Why do you think POQ has a higher order quantity but a lower cost?
   b. How does the maximum inventory for the POQ compare to the EOQ maximum inventory?
      i. Why do you think this is?
   c. Reset the data. Can you change one value in the green shaded cells of the spreadsheet to get the POQ model results to look similar to the EOQ model?
      i. What value did you change and how?

PART THREE

For this section, see if you can create spreadsheets to accomplish the tasks listed below. I recommend that you close the Inventory spreadsheet you were using above and create a new one.

1)   Develop a spreadsheet to answer problem 12.28 in the text. This is a probabilistic reorder point question.
   a. Solve this by hand to ensure you know the correct answers.
   b. Create a spreadsheet to solve probabilistic ROP problems.
      i. Hint—You will need to use an Excel function that calculates the Z-value related to a Normal distribution cumulative probability. If you do not know the correct one, try searching the statistical functions in Excel. If you still cannot find it, I will help.
         1. Once you know the correct function, be sure you understand how it works when you enter information. In other words, do some "what if" scenarios to verify correctness.

2)   Us the spreadsheet created above to answer problem 12.27 in the text.
   a. Note: Both 12.27 and 12.28 have solved answers available so you can check your work.

12.27   Barbara Flynn is in charge of maintaining hospital supplies at General Hospital. During the past year, the mean lead time demand for bandage BX-5 was 60 (and was normally distributed). Furthermore, the standard deviation for BX-5 was 7. Ms. Flynn would like to maintain a 90% service level.
   a) What safety stock level do you recommend for BX-5?
   b) What is the appropriate reorder point?

12.28   Based on available information, lead time demand for CD-ROM drives averages 50 units (normally distributed), with a standard deviation of 5 drives. Management wants a 97% service level.
   a) What value of Z should be applied?
   b) How many drives should be carried as safety stock?
   c) What is the appropriate reorder point?

PART FOUR
A CHALLENGE…BUT NOT SOMETHING I WOULD ASK ON AN EXAM…

Can you use the built-in Excel functions to create your own z-table in a spreadsheet? Use absolute and relative addressing here and use an actual z-table to check your answers.

PART FIVE
Consider the Zhou Bicycle Company case from the textbook, which is copied below for convenience. If using the EOQ model and finding the ROP under uncertainty, what is the order quantity (Q*), reorder point (ROP), and total cost (total holding + total ordering). Hint: The total holding cost must now include the safety stock required to achieve the service level desired.

Note—this case is in the textbook beginning with the sixth edition. Depending upon your edition, the years in the table may be different than shown below. For convenience and consistency, we will discuss the previous year as being 2006 regardless of what it might show in your edition.

CASE STUDY

Zhou Bicycle Company

Zhou Bicycle Company (ZBC), located in Seattle, is a wholesale distributor of bicycles and bicycle parts. Formed in 1981 by University of Washington Professor Yong-Pin Zhou, the firm's primary retail outlets are located within a 400-mile radius of the distribution center. These retail outlets receive the order from ZBC within 2 days after notifying the distribution center, provided that the stock is available. However, if an order is not fulfilled by the company, no backorder is placed; the retailers arrange to get their shipment from other distributors, and ZBC loses that amount of business.

The company distributes a wide variety of bicycles. The most popular model, and the major source of revenue to the company, is the AirWing. ZBC receives all the models from a single manufacturer in China, and shipment takes as long as 4 weeks from the time an order is placed. With the cost of communication, paperwork, and customs clearance included, ZBC estimates that each time an order is placed, it incurs a cost of $65. The purchase price paid by ZBC, per bicycle, is roughly 60% of the suggested retail price for all the styles available, and the inventory carrying cost is 1% per month (12% per year) of the purchase price paid by ZBC. The retail price (paid by the customers) for the AirWing is $170 per bicycle.

ZBC is interested in making an inventory plan for 2006. The firm wants to maintain a 95% service level with its customers to minimize the losses on the lost orders. The data collected for the past 2 years are summarized in the following table. A forecast for AirWing model sales in 2006 has been developed and will be used to make an inventory plan for ZBC.

	DEMANDS FOR AIRWING MODEL		
MONTH	2004	2005	FORECAST FOR 2006
January	6	7	8
February	12	14	15
March	24	27	31
April	46	53	59
May	75	86	97
June	47	54	60
July	30	34	39
August	18	21	24
September	13	15	16
October	12	13	15
November	22	25	28
December	38	42	47
Total	343	391	439

Discussion Questions

1. Develop an inventory plan to help ZBC.
2. Discuss ROPs and total costs.
3. How can you address demand that is not at the level of the planning horizon?

Source: Professor Kala Chand Seal, Loyola Marymount University.

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<p style="text-align:center">**EXCEL EXERCISES—INVENTORY SOLUTION VIDEO LINKS**</p>

Below are links for the solution videos to the EE—Inventory assignments. The files are large, up to 40mb and may take time to download and start once clicked.

To save the SWF files for playback later, use the Firefox browser at www.firefox.com if your browser will not save them.
In Firefox, once the video has loaded, choose File/SaveAs and save your file. It will probably save to your Downloads folder by default.

Solution Videos

http://www.personal.kent.edu/~vberardi/34060/content/34060--EE--Inventory--part-1.swf

http://www.personal.kent.edu/~vberardi/34060/content/34060--EE--Inventory--part-2.swf

http://www.personal.kent.edu/~vberardi/34060/content/34060--EE--Inventory--part-3.swf

http://www.personal.kent.edu/~vberardi/34060/content/34060--EE--Inventory--part-4.swf

http://www.personal.kent.edu/~vberardi/34060/content/34060--EE--Inventory--part-5.swf