

Homework #8
Supply Chain Models: Manufacturing & Warehousing (ISyE 3104) – Spring 2002
Due March 14, 2002

Reading assignment: Sections 5.1, 5.2, 5.3 and Appendix 5A.
Show all your steps to get partial or full credit. Total 55 points.

Question 1

(The following question is completely fictitious and any similarity to real names and “thing”s is nothing but a coincidence.)

Dean Keman, an ISyE sophomore at Georgia Tech, has invented a single-wheel scooter. He thinks his invention, Sageway, is the first enhancement to personal travel that fully integrates the user in the pedestrian world. It uses powerful motors and high-speed computer processors to mimic human equilibrium.

Total cost of producing one unit is \$1250. Dean thinks that he can charge customers \$2000 per unit. The motor and the wheels of unsold scooters can be returned to the suppliers for \$300, and the other parts of the final product are worthless.

He believes that this is the next big thing, but his financial advisor friend, a freshman at DuPree College of Management is not so optimistic about the sales. She convinced her to investigate how much of these Sageways he would be able to sell before investing in production.

In order to have an idea of how much he should produce, Dean asked 20 of his friends for help in conducting surveys and obtained the following results.

40, 20, 30, 30, 40, 20, 30, 30, 40, 10, 60, 10, 40, 30, 50, 30, 40, 30, 50, 30

- a) (5 points) Assume that all these results are coming from the same distribution. Estimate the mean and variance of the demand for Sageways based on the results obtained.
- b) (10 points) Assume that the demand is normally distributed. Use your mean and variance estimates from part (a) to find the optimal number of Sageways to produce.
- c) (5 points) Based on the observed 20 values construct an empirical (discrete) probability distribution of the demand. Use this distribution to find the optimal number to produce.
- d) (5 points) Use your results from parts (b) and (c) and comment on whether normal distribution provides an adequate approximation.

Question 2

A retailer uses an EOQ model with backlogs for ordering from its supplier. Annual demand is d units, annual holding cost is $\$h$ per unit, and ordering cost is $\$K$ per order. There are two types of costs associated with backlogs: $\$b$ is the penalty per unit short per year (similar to holding cost), and $\$b'$ is the penalty per unit short.

- (a) (10 points) Write the average annual total cost expression for the retailer. Note that you need to compute the average shortage to incorporate b in the total cost, and you need the maximum shortage to incorporate b' .
- (b) (10 points) Find the optimal order quantity and the maximum shortage.

Now, instead of a retailer, consider a manufacturer who uses a similar EOQ policy with backorders for production. The manufacturer's annual production rate is p . (Assume $p > d$.)

- (c) (10 points) Write the average annual total cost expression for the manufacturer.