FIT3158 Business Decision Modelling

Tutorial 8

Stochastic Inventory Modelling

Topics covered:

- **Single-period Inventory Decision - Newsvendor Problem**
- **Continuous Probability Distribution for Demand**
- **Optimal Inventory Policy with Backordering**

1. ***Single-period Order quantity Model (Refer to Lecture 8 Slide 19 – 24)***
   A weekly sports magazine publishes a special edition for the World Series. The sales forecast is for the number of copies to be normally distributed with mean 800,000 copies and standard deviation 60,000 copies. It costs $.35 to print a copy, and the newsstand price is $1.95. Unsold copies will be scrapped. How many copies should be printed?

2. The Fitness Shop is considering ordering a special model exercise machine. Each unit will cost the shop $410 and it will sell for $750. Any units not sold at the regular price will be sold at the year-end model clearance for $340. Assume that demand follows a normal probability distribution with $\mu = 20$ and $\sigma = 6$.
   a. What is the recommended order quantity?
   b. What is the probability that Fitness Shop will sell all units it orders (at the normal price)?

3. ***Reorder Point quantity Model (Refer to Lecture 8 Slide 31 – 40)***
   Daily demand for packages of five videotapes at a warehouse store is found to be normally distributed with mean 50 and standard deviation 5. When the store orders more tapes, the ordering cost is $42 and the orders take 4 days to arrive. Each pack of tapes costs $7.20 and there is a 24% annual holding cost for inventory. Assume the store is open 360 days a year.
   a. What is the EOQ?
   b. If the store wants the probability of stocking out to be no more than 5%, and demand each day is independent of the day before, what reorder point should be set?
   c. How much of your reorder point in part b) is safety stock?

4. ***Periodic Review Order quantity Model (Refer to Lecture 8 Slide 41 – 46)***
   A gourmet food store uses a one-week periodic review system for its supply of coffee beans. There is a five-day lead time for orders, and the store will allow two stock-outs per year.
   a. What is the probability of a stock-out associated with each replenishment decision?
   b. What is the replenishment level if demand during the review and lead-time periods is normally distributed with mean 120 pounds and standard deviation 8 pounds?
   c. How many pounds of beans should be ordered if there are 42 pounds of beans on hand?

5. Chez Paul Restaurant orders special styrofoam "doggy bags" for its customers once a month and lead time is one week. Weekly demand for doggy bags is approximately normally distributed with an average of 120 bags and a standard deviation of 25. Chez Paul wants at most a 3% chance of running out of doggy bags during the replenishment period. If he has 150 bags in stock when he places an order, how many additional bags should he order? What is the safety stock in this case?