Primer on Inventory Management

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Excercises

Continuous Review Inventory Model

Exercise 1: Harvey's Specialty Shop

Harvey's Specialty Shop is a popular spot that specializes in international gourmet foods. One of the items that Harvey sells is a popular mustard that he purchases from an English company. The mustard costs Harvey 10 EUR a jar and requires six-month lead time for replenishment of stock. Harvey uses a 20 percent annual interest rate to compute holding costs and estimates that if a customer requests the mustard when he is out of stock, the loss-of-goodwill cost is 25 EUR a jar. Book keeping expenses for placing an order amount to about 50 EUR. During the six-month lead time, Harvey estimates that he sells an average of 100 jars, but there is substantial variation from one six-month period to the next. He estimates that the standard deviation of demand during each six-month period is 25. Assume that demand is described by a normal distribution.

i. Compute the optimal re-order point and optimal order quantity. Use the iterative solution approach that I present in the video until there the order quantity and the re-order point do not change by more than 0.1% from one iteration to the next. You might want to use Excel or some other program for the iterations.

ii. What is the expected cost of the solution?

iii. A practitioner suggests to use the EOQ formula for $x^\star$, to compute the optimal re-order point for this order quantity. He argues that this is a much easier approach and that this approach is reasonably accurate. Compute the cost of this approach for the data of this exercise.

Exercise 2: Assumptions of the Model

In the solution to the continuous review model, I used a number of assumptions and approximations to keep the model simple.

i. I used the approximation sign ($\approx$) in the cost function $Z(x, r)$. Why is the expression of the cost function an approximation? In which situation would you expect this approximation to be reasonably accurate?

ii. Under the α-service-level constraint, I used the EOQ formula to compute the optimal order quantity. Is this an approximation or is this the optimal solution? To answer this question, write down the mathematical program. Use the objective function with $p = 0$, because we do not have penalty cost in the objective function under a service level constraint. Then, write down the service level constraint. Analyze the mathematical model formulation to answer the question.

iii. Under the β-service-level constraint, I used the EOQ formula to compute the order quantity. Why is this an approximation? In which situation would you expect this approximation to be reasonably accurate?