IE221: Operations Research – Probabilistic Methods

Module I: Inventory Models

Lecture 2, Fall 2001

Lehigh University ♦ IMSE Department

Lecture 2 Outline

- Introduction to IM
- The EOQ Model
  - Basic Model, Assumptions
  - Derivation, Sensitivity Analysis
  - Example: Steinarts Pianos
- The News Vendor Problem

Probabilistic Inventory Models

- GOAL: to minimize costs associated with maintaining inventory and meeting customer demand.
- Q: When should an order be placed? How large should each order be?

- Ordering and setup costs
- Unit purchasing cost
- Holding or carrying cost
- Stockout or shortage cost

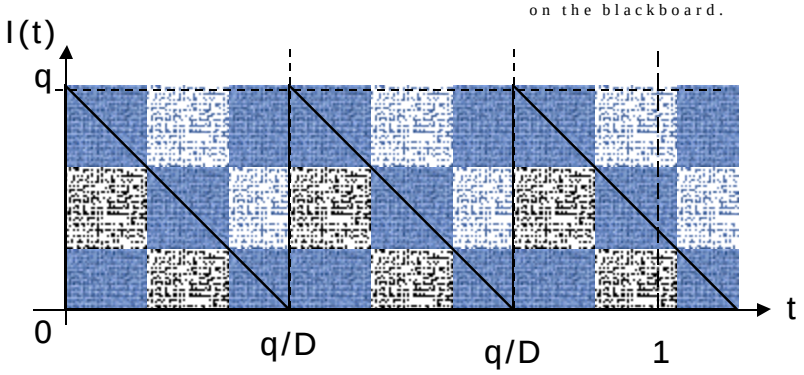
The EOQ Model

- Demand is uniform
- Repetitive ordering (not one-time)
- Continuous ordering (continuous review)
- Constant lead time

The Basic EOQ Model

- NO shortages allowed.

We will derive results and perform analyses on the blackboard.



Example: Steinarts Pianos

A leading piano manufacturer, Steinarts, uses 1800 piano key hammers each year. Each time an order for hammers is placed, an ordering cost of $9 is incurred. Each hammer costs $8. Due to special storage conditions, the holding cost is $1/hammer/year. Assume that demand occurs at a constant rate and shortages are not allowed.

Steinarts example continued ...

- What is the EOQ?
- How many orders will be placed each year?
- How much time will elapse between the placement of orders?
- If Steinarts needed 2178 hammers instead of 1800, what is the unnecessary cost we have incurred?

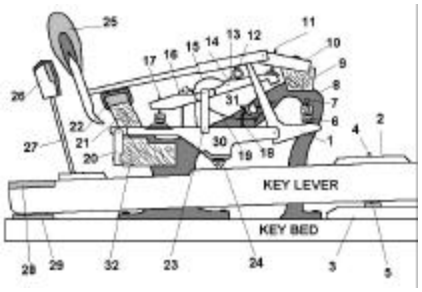
We will work through the solutions on the blackboard.

Steinarts example continued...

- If the holding cost was expressed as the opportunity cost of holding $1 in inventory for 1 year, this value being h_d=0.12/dollar/yr per year, what is q*?

Solutions will be given on the blackboard.

Steinarts example continued ...



Suppose that the lead time for orders is non-zero. What is the *reorder point*

- when L=1 month?
- when L=2 months?

Acknowledgements: pictures shown in lecture are from The Steinway website – http://www.steinway.com
And the Modern Piano Action Reference Pictures at http://www.dartmouthedu/~johnteti/engs9/pictures.html

Solutions will be worked out on the blackboard, and general results derived.

Classification of IMs

Inventory Models are CLASSIFIED by:

- whether the demand for a period is known (deterministic or probabilistic)
- the way inventory is reviewed (continuous or periodic)

How would you classify the EOQ model?

Preview: News Vendor Problem

- DECIDE: q, number of newspapers to order.
- Demand D is a random variable. D = d with probability P(d).
- Cost incurred is c(d,q). Excess newspapers are worthless. Profit lost if vendor is under-stocked.

Photo by Bruce Takeo Akizuki

What is the type of review and demand for NVPs?