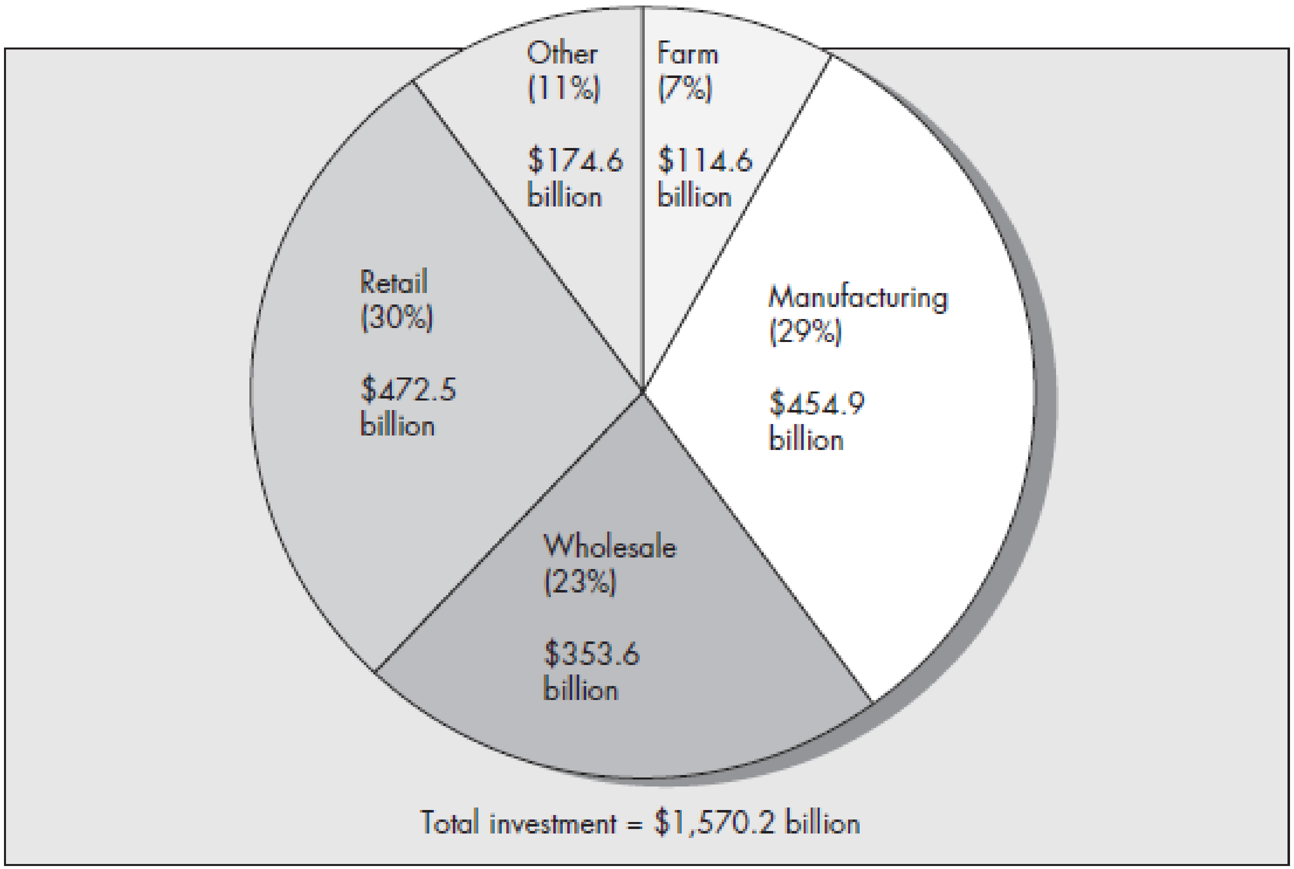
Chapter 4

Inventory Control Subject to Deterministic Demand

IE375 Fall 2020
Nesim K. Erkip

Breakdown of the Total Investment in Inventories in the U.S. Economy (2007)



[1] *Survey of Current Business* (July 2007).

Classification of Inventories

- *Raw materials*. These are resources required for production or processing – (Product as described at the Push/Pull Boundary and/or final product)
- *Components*. These could be raw materials or subassemblies that will later be included (into product as described at the Push/Pull Boundary and/or final product)
- *Work-in-process (WIP).* These are inventories that are in the plant waiting for processing
- *Finished goods*. These are items that have completed the production process and are waiting to be shipped out.

Reasons for Holding Inventories

- Economies of scale in Production
  - Duration in Production – manufacturing lead time
- Economies of scale in Transportation
  - Duration of transportation – transportation lead time
- Uncertainties
- Speculation - Changing Costs Over Time
- Smoothing
- Logistics
- Control costs

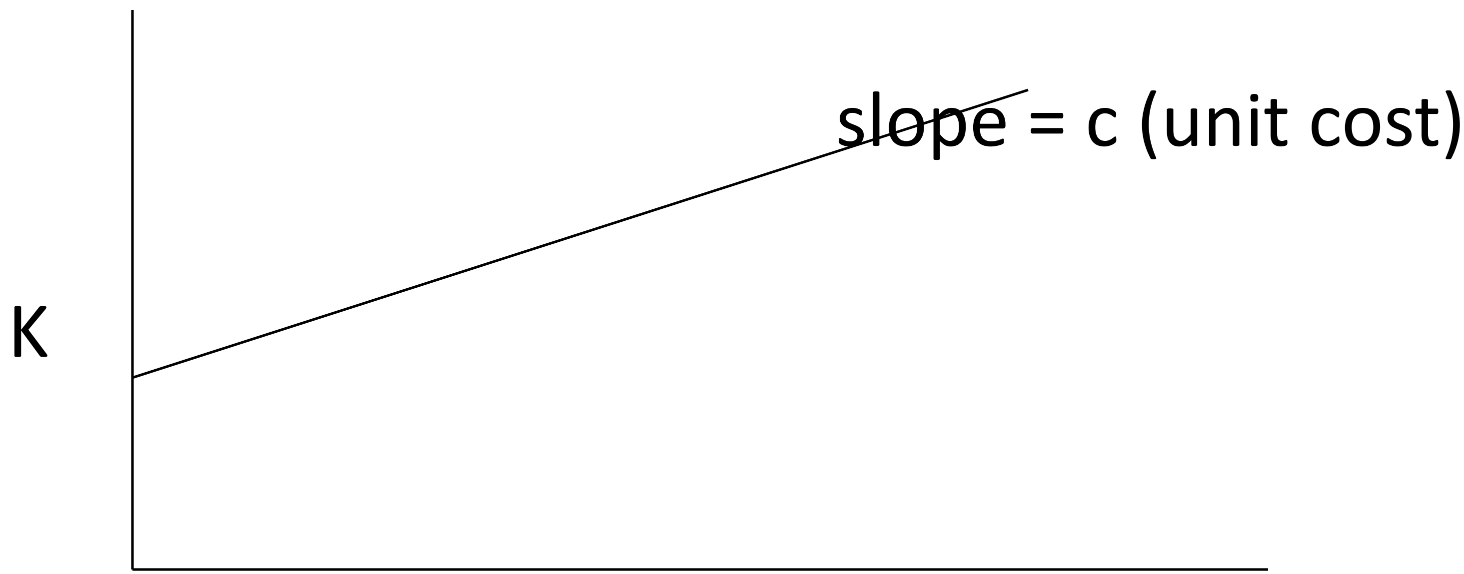
Characteristics of Inventory Systems

- Demand
  - *May Be Known or Uncertain*
  - *May be Changing or Unchanging in Time*
- Lead Times - Can assume known or unknown.
- Review Time. Is system reviewed periodically or is system state known at all times?
- Treatment of Excess Demand (Backlogs)
    - *Backorder all Excess Demand (Backorders)*
    - *Lose all excess demand (lost sales)*
    - *Backorder some and lose some*
- Inventory that changes value over time
    - *perishability*
    - *obsolescence*

Relevant Costs

- Ordering Cost (or Production Cost)

  Includes both fixed (setup cost) and variable (unit) components.



$C(x) = K + cx$ for $x > 0$ and $=0$ for $x = 0$

Relevant Costs (continued)

- Holding Costs - Costs proportional to the quantity of inventory held
- Includes:

  a) Physical cost of space

  b) Taxes and insurance

  c) Breakage spoilage and deterioration

  d) Opportunity cost of alternative investment

➢ The last is often the most significant

h per unit per unit time

➢ Most cases: $h \approx I\,c$

Relevant Costs (continued)

- Backlog cost (penalty cost is frequently used, as well) includes administrative costs, as well costs regarding reputation loss (we call it goodwill cost)
  - Backorder – customer is willing to wait with or without some additional discount, favors
    - charge for backorders:
      - per unit per unit time
      - OR per unit
  - Lost sales – profit loss
    - per unit