ISM 125/225, LECTURE #11 (2/9/10)

Agenda

1. Midterm
2. Project
3. Cycle Inventory
   - Tailored Aggregation (next lecture)
   - Discounting
4. Safety Inventory
5. Return HW #4 to class
MDTERM

For a particular company (SPC) you went through the following analyses:
- High level strategy
- Demand forecasting
- Inventory management

Take this learning & experience to your own team project & company

Project:

BEER Game:

Purpose:
- clear understanding of how the SC works
- understand coordination & lack of coordination in a SC $\Rightarrow$ bull-whip effect
- create a similar game very specific to your project
DISCOUNTING

\[
\text{Supplier} \rightarrow \begin{array}{c}
\uparrow \\
Q_L \\
\downarrow \\
\end{array} \quad \text{Manufacturer} \\
\]

\[(Q_L)(n) = 1\]

So far, we looked at inventory management from the viewpoint of the manufacturer. The manufacturer tries to determine the lowest inventory level, \(Q_L^*\), to minimize total costs.

The supplier, on the other hand, would like to increase the lot size, \(Q_L\), sold to the manufacturer.

One way to achieve this (increased selling) is by offering DISCOUNTS.
A simple case of discounting is the **Trade Discount:**

Supplier offers manufacturer a short term discount on each item purchased in order to achieve 2 objectives:

1. Reduce supplier inventory
2. Induce manufacturer to purchase larger quantities of the product

There are at least 2 scenarios:

1. Manufacturer does not pass the savings on to the customer (covered in the midterm)
2. Manufacturer passes some of the savings onto the customer
Analysis

Annual demand (items)

\[ \text{Demand, } D = D_0 - mp \rightarrow (1) \]

"Economics" demand curve

\[ p^*? \]

\[ D^*? \]

Average profit, \( P = D(p - c) \rightarrow (2) \)

\[ \text{cost per item} \]

\[ \text{price per item} \]

\[ P = (D_0 - mp)(p - c) \rightarrow (3) \]

\[ = f(p) \]

\[ \frac{dP}{dp} = 0 \Rightarrow \text{price, } p^* \text{ that maximizes profit, } P \rightarrow (4) \]

\[ \frac{dP}{dp} = D_0 - 2mp + mc = 0 \Rightarrow p^* = \frac{D_0 + mc}{2m} \rightarrow (5) \]
\[ D^* = \frac{D_0 - mc}{1,5} \rightarrow (6) \]

Conclusions
(1) In order to maximize profit, \( P \), price the product at \( p^* \) (eqn. 5)
(2) The corresponding demand \( D^* \) is given by eqn (6)
Safety Inventory:

Inventory management policy of

CONTINUOUS REVIEW:

(Idealized view)

$T$: replenishment cycle time
$L$: supplier lead-time: time it takes to receive a shipment once the order is placed

$ROP$: re-order point is the inventory level (# of items) when the order is placed with the supplier
ss \triangleq \text{Safety stock} = \text{nominal inventory level when a shipment arrives (from the supplier)}

From the geometry of the figure,

\[ ss = ROP - LD_w \]

where \( D_w \) is the weekly demand

& \( L \) is the lead time (weeks)

\[ ss \geq 0 \Rightarrow ROP \geq LD_w \]

Remark: The level of safety stock is determined by how available (to the customer) the manufacturer desires the product to be.