Test 2

Thursday, Nov. 15th: 10:10 - 11:40 AM (1 1/2 hrs)

- Class work + HW
- Chaps 13, 15, and part of Chap 14 (Models 1, 2)
- Closed book & closed notes
- Equations, if appropriate, will be included in the test
- Both quantitative & qualitative questions
- Pencils, eraser, and a (functional) calculator

HW 7 posted, due: Nov. 15th in class
hint: \( \frac{TC}{FL} \) \( \geq \) \( \frac{TC}{LFL(\text{limited})} \)

Use excel to evaluate production cost, inventory carrying cost, and backorder cost.

\( \sum = \text{Total cost} \)

Any other graphs, plots, diagrams that seem appropriate for the project.
(a) \[ \frac{Q}{d} = \frac{51,639.778}{5000} = 10.3 \text{ days} \]

(b) Max inventory = \((p-d)\left(\frac{Q}{d}\right)\)

\[ = (10000 - 5000)(51,639.778/10000) \]

\[ = 25,819.89 \text{ barrels} \]

Model III - EOQ with qty discounts

It is not unusual for suppliers to offer lower unit prices when larger quantities are ordered. This practice is called quantity discounting.
ex. 8

<table>
<thead>
<tr>
<th>$Q$</th>
<th>Per unit cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>$Q &lt; 500$</td>
<td>$1.00$</td>
</tr>
<tr>
<td>$500 \leq Q &lt; 1000$</td>
<td>$0.90$</td>
</tr>
<tr>
<td>$1000 \leq Q$</td>
<td>$0.85$</td>
</tr>
</tbody>
</table>

Model 3 example

(a) $EOQ_1 = \sqrt{\frac{2DS}{c_1}} = \sqrt{\frac{2(50000)(200)}{(0.3)(41.60)}}$

$= 1265.92 \Rightarrow$ infeasible

(b) $EOQ_2 = \sqrt{\frac{2DS}{c_2}} = \sqrt{\frac{2(50000)(200)}{(0.3)(40.95)}}$

$= 1275.93 \Rightarrow$ feasible

(c) $EOQ_3 = \sqrt{\frac{2DS}{c_3}} = \sqrt{\frac{2(50000)(200)}{(0.3)(40.92)}}$

$= 1276.40 \Rightarrow$ infeasible
\[ TMC = \left( \frac{\theta}{2} \right) C + \left( \frac{\partial}{\partial x} \right) S + (D)(ae) \]
\[ TMC = \left( \frac{1275.93}{2} \right) (0.3) (40.95) + \frac{50000}{1275.93} (200) + 50000 (40.95) \]
\[ = 7837.41 + 7837.41 + 2,047,500 \]
\[ = 2,163,144.82 \]
\[ TMC_{2000} = \left( \frac{2000}{2} \right) (0.3) (40.92) \]
\[ + \left( \frac{50000}{2000} \right) (200) \]
\[ + \left( \frac{50000}{2000} \right) (40.92) \]
\[ = \$2,063,276 \]

\[ \Rightarrow TMC_{1275.93} < TMC_{2000} \]
\[ \Rightarrow \text{order phy} \]
\[ \Rightarrow \text{The DQ (EOQ) = 1276 units/order} \]

\[ TBO = \left( \frac{\text{Days per year}}{9/D} \right) \]
\[ = 365 \left( \frac{1276}{50000} \right) \]
\[ = 9.3 \text{ days} \]
Order point determination

Two factors contribute to the variation in demand during lead time (DDL T):

1. The LT required to receive an order is subject to variation.
2. The daily demand for the product is subject to variation.

The safety demand during LT (DDL T) is an important measure to consider.

A stockout can occur if the stock arrives late or if the actual demand for the item is greater than the expected DDL T.

One way to solve this problem is to carry a safety stock (SS).

Too much SS ⇒ carrying cost incurred can be too high.

Too little SS ⇒ excessive stockouts can occur.

Thus, the desired SS is really a trade off between the two factors, and is dependent upon the probability of a stockout, determined by the input.
Order point (OP) = EDDLT + SS

Service Level
It is the probability that a stockout will not occur during LT.

ex: SL = 90%

The probability that all customer orders can be immediately filled out of inventory is 90%.

<table>
<thead>
<tr>
<th>Actual DDLT</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>80 - 99</td>
<td>2/33 = 0.0606</td>
</tr>
<tr>
<td>100 - 119</td>
<td>3/33 = 0.0909</td>
</tr>
<tr>
<td>120 - 139</td>
<td>5/33 = 0.1515</td>
</tr>
<tr>
<td>140 - 159</td>
<td>6/33 = 0.1818</td>
</tr>
<tr>
<td>160 - 179</td>
<td>7/33 = 0.2121</td>
</tr>
<tr>
<td>180 - 199</td>
<td>6/33 = 0.1818</td>
</tr>
<tr>
<td>200 - 219</td>
<td>4/33 = 0.1212</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Service Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0606</td>
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<tr>
<td>0.1515</td>
</tr>
<tr>
<td>0.3030</td>
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<tr>
<td>0.4848</td>
</tr>
<tr>
<td>0.6969</td>
</tr>
<tr>
<td>0.8787</td>
</tr>
<tr>
<td>1.000</td>
</tr>
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