

TOPIC 8: STOCHASTIC DEMAND INVENTORY THEORY

Solutions to Practice Problems

1. Demand = 50/week
 EOQ = 200
 L = 1week
 $\sigma_L = 10$
 Service level = .95
 $Z_{.95} = 1.645$
 $SS = Z\sigma_L = 1.645(10) = 16.45$ or 17
 $R = 50 + 17 = 67$ cases

2. Annual Demand=12,000
 H=\$2.40
 S=\$25
 L=.5 months
 $\sigma = 200/\text{month}$
 S.L. = 90%

$$EOQ = \sqrt{\frac{2(12,000)(25)}{2.40}} = 500$$
 Demand per month = $12,000/12 = 1,000$
 $P(\text{in months}) = 500/1000 = .5$
 $P+L = 1$ month
 $\sigma_{P+L} = 200$
 $Z_{.9} = 1.28$
 $SS = Z\sigma_{P+L} = 1.28(200) = 256$
 $T = 1,000 + 256 = 1,256$

3. P = .5 months
 D = 6000/year
 $\sigma = 100/\text{month}$
 L = .5 months
 service level = 85%
 $P+L = 1$ month $\Rightarrow \sigma_{P+L} = 100$ and $D_{P+L} = 500$
 $Z_{.85} = 1.04$
 $SS = Z\sigma_{P+L} = 1.04(100) = 104$
 $T = 500 + 104 = 604$ units

4. A Continuous Review Problem.
 Demand during lead time = $1.6(15) = 24$
 $\sigma_L = .4\sqrt{15} = 1.55$
 $Z_{.98} = 2.055$
 $SS = Z\sigma_L = 2.055(1.55) = 3.185$ or 4
 $R = 24 + 4 = 28$ monitors

5. Daily demand = 3000
 σ per day = 600
 $L = 6$
 $Z_{.95} = 1.645$
 $\sigma_L = 600\sqrt{6} = 1469.69$
 $SS = 1.645(1469.69) = 2417.64$ or **2418**
 $R = 18,000 + 2418 = \mathbf{20,418}$
 If $SS = 2000$, $Z = 2000 / 1469.69 = 1.36$
 Service level = **91.309%**

6. Periodic review problem
 Demand = 200 per day
 $\sigma_t = 80$ per day
 $P = 30$ days
 $L = 4$ days
 $\sigma_{P+L} = 80\sqrt{30+4} = 466.48$
 $SS = 1.645(466.48) = 767.36$ or 768
 $T = 200(34) + 768 = 7568$
 $IP = 60$
 $Q = T - IP = 7568 - 60 = 7508$

7. A Periodic Review Problem.
 Demand = 18 per day
 $\sigma_t = 4$ per day
 $P = 30$ days
 $L = 2$ days
 $Z_{.98} = 2.055$
 $\sigma_{P+L} = 4\sqrt{30+2} = 22.63$
 $SS = 2.055(22.63) = 46.5$ or 47
 $T = 18(32) + 47 = 623$
 $IP = 25$
 $Q = 623 - 25 = 598$

8. Newsvendor Model with Normal Demand.
 $C_u = \$35 - \$15 = \$20$
 $C_o = \$15 - \$10 = \$5$
 $C_u / (C_o + C_u) = .8$
 $z_{.8} = .84$
 $Q^* = \mu + z\sigma = 2500 + .84(200) = 2668$

9. Newsvendor Model with Normal Demand.

$$\mu=500$$

$$\sigma=120$$

a. $C_u = \$7 - \$3.50 = \$3.50$

$$C_o = \$3.50$$

$$C_u / (C_o + C_u) = 50\%$$

$$Z_{.5} = 0$$

$$Q^* = 500 + 0(120) = 500 \text{ calendars}$$

b. $C_u = \$3.5$

$$C_o = \$3.5 - \$1.00 = \$2.50$$

$$C_u / (C_o + C_u) = 3.5 / (2.5 + 3.5) = .5833$$

$$Z_{.5833} = .21$$

$$Q^* = 500 + .21(120) = 525 \text{ calendars}$$

10. Newsvendor Model with Normal Demand.

$$\mu=150$$

$$\sigma=30$$

a. $C_u = \$1.65 - \$1.19 = \$0.46$

$$C_o = \$1.19 - \$1.00 = \$0.19$$

$$C_u / (C_o + C_u) = .46 / (.19 + .46) = .70769$$

$$Z_{.70769} = .545$$

$$Q^* = 150 + .545(30) = 166.35 \text{ or } 166$$

b. $P(D \geq Q) = 1 - F(Q)$

$$1 - C_u / (C_o + C_u) = .1 - .70769 = 29.231\%$$