

## ANSWER KEY - PROBLEM SET 7

6.1.2, 6.1.5, 6.1.6, 6.1.12, 6.1.16,  
6.1.17, 6.1.19

6.1.2)  $n = 20$

a.)  $p = \frac{10}{20} = .5$

b.)  $10 - 4 = 6$   
 $p = \frac{6+10}{20} = \frac{16}{20} = .8$

6.1.5)  $\bar{y} = \frac{300 + 720 + 526 + 200 + 127}{5} = 374.6$

$$\bar{x} = \frac{300 + 520 + 526 + 200 + 157}{5} = 340.6$$

$$\bar{D} = \frac{0 + 200 + 0 + 0 + 30}{5} = 34$$

$$N = 5000$$

$$T = 1,761,300$$

①  $\bar{x} \cdot N = 340.6 \cdot 5000 = 1,703,000$

②  $T - N\bar{D} = 1,761,300 - (5000 \cdot 34) = 1,591,300$

③  $T \cdot \frac{\bar{x}}{\bar{y}} = 1,761,300 \cdot \left( \frac{340.6}{374.6} \right) = 1,601,438.3$

6.1.6) a.  $\hat{\mu} = \bar{x} = \frac{\sum \ln(X_i)}{n} = \frac{158.14}{31} = 5.1$

$$\sigma^2 = s^2 = \frac{1}{n-1} \sum (\ln X_i - \bar{x})^2$$
$$= \frac{1}{31-1} \sum (\ln X_i - 5.1)^2 = .25$$

b.  $E(X) = e^{\mu + \frac{1}{2}\sigma^2}$   
 $= e^{5.1 + \frac{1}{2}(.5)^2} = 185.9$

$$\frac{d(\text{Var})}{d\delta} = \frac{2\delta\sigma^2}{m} \cdot \frac{n}{n} + \frac{8(1-\delta)\sigma^2}{n} \cdot \frac{m}{m} = 0$$

$$\frac{2\delta\sigma^2 n + 8\sigma^2 - 8\delta\sigma^2 m}{mn} = 0$$

$$2\delta\sigma^2 n + 8\sigma^2 - 8\delta\sigma^2 m = 0$$

$$2\delta\sigma^2 n - 8\delta\sigma^2 m = -8\sigma^2$$

$$\frac{\delta(2\sigma^2 n - 8\sigma^2 m)}{2\sigma^2 n - 8\sigma^2 m} = \frac{-8\sigma^2}{2\sigma^2 n - 8\sigma^2 m}$$

$$\begin{aligned}\delta &= \frac{-8\sigma^2}{2\sigma^2 n - 8\sigma^2 m} \\ &= \frac{-8\sigma^2}{2\sigma^2(n - 4m)} \\ &= \frac{-4}{n - 4m}\end{aligned}$$

$$\begin{aligned}6.1.17) a - E(\hat{p}) &= \sum \frac{r-1}{x+r-1} \cdot \binom{x+r-1}{x} p^r (1-p)^x \\ &= p \sum \frac{(x+r-2)!}{x!(r-2)!} p^{r-1} (1-p)^x \\ &= p \sum \binom{x+r-2}{x} p^{r-1} (1-p)^x \\ &= p \sum \binom{x+r-2}{x} p^{r-1} (1-p)^x \\ &= p \sum \binom{x+r-2}{x} p^{r-1} (1-p)^x \\ &= p\end{aligned}$$

$$b. - \hat{p} = \frac{5-1}{5+5-1} = \frac{4}{9} = .44$$

$$\begin{aligned}6.1.19) a - \lambda &= \frac{5p + 15}{x - 15} \cdot \frac{15}{5} - 15 \\ p &= \frac{5p + 15}{x - 15} \cdot \frac{15}{5} - 15 \\ \hat{p} &= \frac{(20) - 15}{5} = 0.2\end{aligned}$$