Homework #9

Ben Drucker

6.2

24

Part 1:

$$\frac{dp}{dl} = \frac{d}{dp} \ln \left[\begin{pmatrix} x+r-1 \\ x \end{pmatrix} p^r (1-p)^x \right] = 0$$

$$\frac{r}{p} - \frac{x}{1-p} = 0$$

$$\hat{p} = \frac{r}{r+x}$$

$$= \frac{3}{17+3} = \frac{3}{20}$$

Part 2:

$$Pr(X = x) = \begin{pmatrix} x+r \\ x \end{pmatrix} p^r (1-p)^x$$

$$l(p; x) = \ln \begin{pmatrix} x+r \\ x \end{pmatrix} + r \ln p + x \ln(1-p)$$

$$\frac{dl}{dp} = \frac{r}{p} - \frac{x}{1-p} = 0$$

The mle is the same.
Part 3: The mle is not the same in (17).

28

I don't even know how to start this.

6 - Supplementary Exercises

34

$MSE(KS^2) = Var(KS^2) + Bias(KS^2)$
$Bias(KS^2) = E(KS^2) - \sigma^2 = K\sigma^2 - \sigma^2$
$Var(KS^2) = K^2 Var(S^2) = K^2 * (E(S^2)^2) - (E(S^2))^2 = K^2 \left(\frac{\sigma^4 (n+1)}{n-1} - {\sigma^2}^2 \right)$
? ...

36

$\sum x = 555.86; \sum x^2 = 15490; s = \sqrt{2.16}$. Median of $x_i - \tilde{x} = \frac{.89+.91}{2} = .86$. The estimate is therefore $\frac{.86}{.6745} = 1.28$.

38

I wasn't able to solve this.

7.1

2

a)

$\overline{x} = \frac{114.4+115.6}{2} = 115$

b)

The smaller interval (114.4, 115,6) corresponds to the smaller confidence level (90%).

4

a)

$58.3 \pm \frac{1.96*3}{\sqrt{25}}$

b)

$58.3 \pm \frac{1.96*3}{\sqrt{100}}$

c)

$58.3 \pm \frac{2.58*3}{\sqrt{100}}$

d)

$z_{(1-.82)/2} = 1.34 \Rightarrow 58.3 \pm \frac{1.34*3}{\sqrt{100}}$

e)

$n = \left(\frac{2*2.58*3}{1}\right)^2 = 239.6 \rightarrow n = 240$

6

a)

$8439 \pm \frac{100*1.645}{\sqrt{25}}$

b)

$\alpha = (1 - .92)/2 = .04; z_{.04} = 1.75$
$8439 \pm \frac{100 * 1.75}{\sqrt{25}}$