

# HW3

## Problem 1.

n=9. The sample standard deviation was s=2.81

a)

Calculate 99% CI for  $\sigma^2$  and for  $\sigma$ .

The CI for  $\sigma^2$  is:

99% CI  $\rightarrow \alpha=0.01$

$$X_{0.01/2,9-1}^2 = 21.955 \quad X_{1-0.01/2,9-1}^2 = 1.344$$

$$\left[ \frac{(n-1)S^2}{X_{\alpha/2,n-1}^2}, \frac{(n-1)S^2}{X_{1-\alpha/2,n-1}^2} \right]$$

$$\left[ \frac{(9-1)2.81^2}{X_{0.01/2,9-1}^2}, \frac{(9-1)2.81^2}{X_{1-0.01/2,9-1}^2} \right] = \left[ \frac{63.1688}{21.955}, \frac{63.1688}{1.344} \right] = [2.877, 47.001]$$

99% CI for  $\sigma^2$  is: [2.877, 47.001]

The CI for  $\sigma$  is:

$$[\sqrt{2.877}, \sqrt{47.001}] = [1.696, 6.856]$$

99% CI for  $\sigma$  is: [1.696, 6.856]

b)

Calculate 95% upper confidence bound for  $\sigma^2$

$$X_{1-0.05,9-1}^2 = 2.733$$

$$\frac{(n-1)S^2}{X_{1-\alpha,n-1}^2} = \frac{(9-1)2.81^2}{X_{1-0.05,9-1}^2} = \frac{63.1688}{2.733} = 23.113$$

95% Upper confidence bound for  $\sigma^2$  is: 23.113

## Problem 2.

We have two samples:

1  $\rightarrow$  m=10 |  $\bar{x}$ =15.3 |  $s_1$ =2.43

2  $\rightarrow$  n=15 |  $\bar{y}$ =14.8 |  $s_2$ =3.17

Unknown  $\mu_1$   $\mu_2$  and  $\sigma^2$

Give 99% CI for  $\mu_1 - \mu_2$

$$t_{\alpha/2, m+n-2} = t_{0.01/2, 10+15-2} = 2.807336$$

CI:

$$\bar{x} - \bar{y} \pm t_{\alpha/2, m+n-2} Sp \sqrt{\frac{1}{m} + \frac{1}{n}}$$

$$\bar{x} - \bar{y} \pm t_{\alpha/2, m+n-2} Sp \sqrt{\frac{1}{m} + \frac{1}{n}} = 15.3 - 14.8 \pm 2.807336 * \sqrt{\frac{2.43^2 + 3.17^2}{10 + 15 - 2}} \sqrt{\frac{1}{10} + \frac{1}{15}}$$

$$0.5 \pm 2.807336 * \sqrt{\frac{2.43^2 + 3.17^2}{10 + 15 - 2}} \sqrt{\frac{1}{10} + \frac{1}{15}}$$

$$[-0.4545, 1.4545]$$

99% CI for  $\mu_1 - \mu_2$  is: [-0.4545, 1.4545]

### Problem 3.

Problem solve on document: 'HW3\_Alex\_Parra\_Garcia\_Code.pdf' or  
'HW3\_Alex\_Parra\_Garcia\_Code.Rmd'