ECEN321 : Engineering Statistics
Assignment 8 Submission

Daniel Eisen : 300447549

June 2, 2020

Confidence Intervals

1. (Navidi 5.2.2), $n = 100 \;\; x = 73$

   (a) $\tilde{p} = \frac{x+2}{n+4} = 0.721153846154$
   $z_{\alpha/2} = 1.96$
   $\tilde{p} \pm z_{\alpha/2} \cdot \sqrt{\frac{\tilde{p}(1-\tilde{p})}{n+4}}$
   $\tilde{p} \pm 0.086185795204 \Rightarrow (0.63496805095, 0.807339641358)$

   2

   (b) $\tilde{p} = \frac{x+2}{n+4} = 0.721153846154$
   $z_{\alpha/2} = 2.575$
   $\tilde{p} \pm z_{\alpha/2} \cdot \sqrt{\frac{\tilde{p}(1-\tilde{p})}{n+4}}$
   $\tilde{p} \pm 0.113228787066 \Rightarrow (0.607925059087, 0.83438263322)$

   2

   (c) $n = \left(\frac{1.96\sqrt{\tilde{p}(1-\tilde{p})}}{0.05}\right)^2 - 4 \approx 305$

   2

   note as $\tilde{p}$ is relative to previous n, the actual required n is lower, but 305 will still bring the E below 0.05.

   (d) $n = \left(\frac{2.575\sqrt{\tilde{p}(1-\tilde{p})}}{0.05}\right)^2 - 4 \approx 530$

   2

   note as $\tilde{p}$ is relative to previous n, the actual required n is lower, but 530 will still bring the E below 0.05.

   (e) $p = 0.7, n = 100, \tilde{p} = 0.72115$
   $z = \frac{p-\tilde{p}}{\sqrt{\frac{\tilde{p}(1-\tilde{p})}{n+4}}} = -0.48$
   $P(Z > -0.48) = .6844 = 68.44\%$

   3

   Y is approximately normal with mean= 200*.95 and varinace= sqrt(.95(1-0.95)*200)

   (f) $n = 200, p = 0.95, k = 193...200$
   $P(X = k) = \frac{n!}{k!(n-k)!} \cdot p^k \cdot (1-p)^{n-k}$
   $P(X > 192) = \sum_{k=193}^{200} \frac{n!}{k!\cdot(n-k)!} \cdot p^k \cdot (1-p)^{n-k} = 0.2133$
   I used wolfram to compute the sum, due to the large factorial.

   3:

   (Y > 192) = (Y> 192 +0.5) use the continuity correction
   = 1 − (192.5 − (200 × 0.95)/√200 × 0.95(1 − 0.95)
   = 1 − (0.81)
   = 1 − ((0.81))
   (> 192) = 0.2090

2. (Navidi 5.3.8) $\bar{X} = 3410.14,\; s = 1.018,\; n = 8,\; df = 7,\; CI = \bar{X} \pm t_{\alpha/2} \cdot \frac{s}{\sqrt{n}}$

   (a) $t_{\alpha/2} = 2.356$
   $CI = 3410.14 \pm 2.356 \cdot \frac{1.018}{\sqrt{8}} \Rightarrow (3409.29, 3410.99)$

   2

   (b) $t_{\alpha/2} = 2.998$
   $CI = 3410.14 \pm 2.998 \cdot \frac{1.018}{\sqrt{8}} \Rightarrow (3409.06, 3411.22)$

   2

   (c) No, because to able to use the student t CI's and calculations the samples must come from a population that is approximately normal, as seen by the outlier (3412.66) this sample cannot be said to come from a normal population so the above CI's cannot be used.

3. (Navidi 5.6.13)

$$X = (207.4,\; 233.1,\; 215.9,\; 235.1,\; 225.6,\; 244.4,\; 245.3)$$

$$\bar{X} = 229.54,\; s_X = 14.17,\; n_X = 7$$

$$Y = (84.3,\; 53.2,\; 127.3,\; 201.3,\; 174.2,\; 246.2,\; 149.4,\; 156.4,\; 103.3)$$

$$\bar{Y} = 143.96,\; s_Y = 59.76,\; n_Y = 9$$

2

2

$$CI = \bar{X} - \bar{Y} \pm z_{\alpha/2} \cdot \sqrt{\frac{s_X^2}{n_X} + \frac{s_Y^2}{n_Y}}, \quad z_{\alpha/2} = 1.96$$

$$85.58 \pm 1.96 \cdot \sqrt{\frac{14.17^2}{7} + \frac{59.76^2}{9}} \approx 85.58 \pm 40.43$$

$$CI = (45.15,\; 126.01)$$