Math 220 : Elementary Statistics — Kane Nashimoto

Exam 3 Solutions

Fall 2007

1. Inference about proportion.

   $\hat{p} \pm z_{.01/2}\sqrt{\dfrac{\hat{p}(1-\hat{p})}{n}}$; $.104 \pm 2.576\sqrt{\dfrac{(.104)(1-.104)}{511}}$; $.104 \pm .035$; $(.069\,,\,.139)$

2. Inference about mean.

   $H_0\colon \mu = 84500$ vs. $H_a\colon \mu \neq 84500$

   $t^* = \dfrac{\bar{x}-\mu_0}{s/\sqrt{n}} = \dfrac{84800-84500}{1100/\sqrt{30}} = 1.494$

   $t_{.10,\,30-1} = 1.311 < |t^*| = 1.494 < t_{.05,\,30-1} = 1.699$

   $.10 < p\text{-value} < .20$

   Retain H_0 at $\alpha = .01$. ($\mu \approx 84500$)

3. Sample size for proportion.

   Use $\hat{p} = .5$.

   $n = \dfrac{\hat{p}(1-\hat{p})\,z_{.10/2}^2}{m^2} = \dfrac{.5(1-.5)(1.645)^2}{(.04)^2} = 422.82 \;\Rightarrow\; 423$

4. Sample size for mean.

   $n = \dfrac{4s^2}{m^2} = \dfrac{4(0.14)^2}{(0.03)^2} = 87.11 \;\Rightarrow\; 88$

5. Inference about mean.

   (a) $\bar{x} \pm t_{.05/2,\,61-1}\dfrac{s}{\sqrt{n}}$; $7.89 \pm 2.000\dfrac{0.62}{\sqrt{61}}$; 7.89 ± 0.159 ; $(7.731\,,\,8.049)$

   (b) The 95% confidence interval in (a) contains 8.00, indicating that 8.00 is a plausible value of μ. Therefore, the claim $\mu = 8.00$ cannot be refuted.

6. Sampling distribution of mean.

   (a) $\bar{X}$, mean income, is approximately normal by the central limit theorem with $\mu_{\bar{X}} = \mu = 42100$ and $\sigma_{\bar{X}} = \sigma/\sqrt{n} = 570/\sqrt{45}$.

   (b) $P(\bar{X} > 42000) = P\left(\dfrac{\bar{X}-\mu}{\sigma/\sqrt{n}} > \dfrac{42000-42100}{570/\sqrt{45}}\right) = P(Z > -1.18)$

   $= 1 - P(Z \leq -1.18) = 1 - .1190 = .8810$

7. Inference about proportion.

   $H_0\colon p = .85$ vs. $H_a\colon p < .85$

   $z^* = \dfrac{\hat{p}-p_0}{\sqrt{p_0(1-p_0)/n}} = \dfrac{.824-.85}{\sqrt{(.85)(1-.85)/863}} = -2.139$

   $p\text{-value} = P(Z \leq -2.14) = .0162$

   Reject H_0 at $\alpha = .10$. ($p < .85$)