Statistics & Inferencing Homework #04

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P 9.3) (a) $H_0: \mu = 25$ $H_a: \mu \neq 25$

$\bar{x} = 28.1$, $n = 57$ $\sigma = 8.46$ $\alpha = 0.1$

$\therefore z = (28.1 - 25)/(8.46/\sqrt{57}) = 2.77$

$\alpha = 0.1 \Rightarrow \alpha/2 = 0.05$ $z_{\alpha/2} = 2.5758$

$z > z_{\alpha/2}$ hence we reject H_0.

(b) p-value $= P[z > 2.77] \times 2$

$= [1 - P[z < 2.77]] \times 2$

$= 2 \times [1 - 0.9972] = 0.0056$

Since p-value $< \alpha/2$, we reject H_0.

(c) $\pm z_c = (\bar{x}_c - \mu)/(6/\sqrt{n})$

$\pm 2.5758 = (\bar{x}_c - 25)/(8.46/\sqrt{57})$

$\bar{x}_c = 25 \pm 2.5758 (8.46/\sqrt{57})$

Upper $\bar{x}_c = 27.886$, Lower $\bar{x}_c = 22.114$

P 9.5) (a) $H_0: \mu = 1200$ $H_a: \mu > 1200$

$\bar{x} = 1215$, $n = 113$ $\sigma = 100$ $\alpha = 0.10$

$\therefore z = (1215 - 1200)/(100/\sqrt{113}) = 1.59$ $z_\alpha = 1.2816$

$z > z_\alpha$, reject H_0.

(b) p-value $= P[z > 1.59]$

$= 1 - P[z < 1.59] = 1 - 0.9441 = 0.0559$

$p < \alpha$, reject H_0.

(c) $z_c = (\bar{x}_c - \mu)/(6/\sqrt{n})$ $\Rightarrow 1.2816 = (\bar{x}_c - 1200)/(100/\sqrt{113})$

$\bar{x}_c = 1212.06$

P 9.15) $n = 11$ $\alpha = 0.05$ $H_0: \mu = 1160$ $H_1: \mu > 11.60$.

$t_{0.05, 10} = 1.8125$ $t = (\bar{x} - \mu)/(s/\sqrt{n})$ $\bar{x} = 1236.364$

$s = 103.812$

$t = (1236.364 - 1160)/(103.812/\sqrt{11}) = 2.44$

$t_x > t$, hence reject H_0.

P 9.17) $n = 12$ $\alpha = 0.10$ $H_0: \mu = 1.84$ $H_a = \mu \neq 1.84 \rightarrow$ Two-Tailed

$\bar{x} = 1.851$ $s = 0.0235$

$t = (1.851 - 1.84)/(0.0235/\sqrt{12}) = 1.6$

p-val $= 2 \times P(t > 1.6) = 2 \times P(1.6, 11) = 0.14$

$p > \alpha$, fail to reject H_0.

P9.25) $H_0: p \geq 0.63$ $H_a: p < 0.63$ $n = 100$

$x = 55$ → characteristic of interest. $\alpha = 0.01$

$z_\alpha = 2.3263$ $\hat{p} = 0.55$ $\hat{q} = 0.45$ $z = (\hat{p} - p)/(\sqrt{pq/n})$

$z = (0.55 - 0.63)/\sqrt{0.55(0.45)/100} = -1.61$

$z < z_\alpha$ → we fail to reject.

P9.27) $n = 380$ → purchased policy, always reread: 164

$\alpha = 0.01$ 48% reread: $p = 0.48$

$H_0: \mu_p = 0.48$ $H_1: \mu_p \neq 0.48$

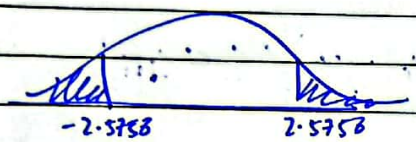
$\hat{p} = 164/380 = 0.431$ $\alpha/2 = 0.005$ $z_{\alpha/2} = 2.5758$

$z = (0.431 - 0.48)/\sqrt{0.48(0.52)/380}$

$z = -1.911$

$z > z_{\alpha/2}$

↳ Fail to reject H_0.

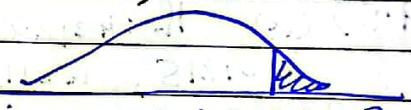


P9.33) (a) $H_0: \sigma^2 \geq 20$ $H_a: \sigma^2 < 20$ $\alpha = 0.05$, $n = 15$ $s^2 = 32$

$\chi^2_{\alpha,14} = 23.6848$ $\chi^2 = (n-1)s^2/\sigma^2$

$\chi^2 = (14)(32)/20 = 22.4$

$\chi^2 < \chi^2_{\alpha,14}$ → fail to reject H_0.



(b) $H_0: \sigma^2 = 8.5$ $H_a: \sigma^2 \neq 8.5$ $\alpha = 0.1$ $n = 22$, $s^2 = 17$

$\alpha/2 = 0.05$ $\chi^2_{\alpha/2,21} = 32.6706$

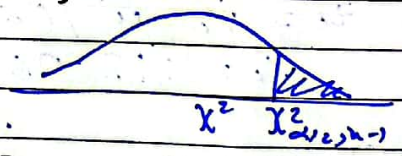
$\chi^2 = (21)(17)/8.5 = 42$ $\chi^2 > \chi^2_{\alpha/2,n-1}$ → reject H_0.

(c) $H_0: \sigma^2 = 45$ $H_a: \sigma^2 < 45$ $\alpha = 0.01$, $n = 8$, $s = 4.12$

$s^2 = 16.9744$ $\chi^2_{\alpha,7} = 2.18.4753$

$\chi^2 = (7)(16.9744)/45 = 2.64$

$\chi^2 < \chi^2_{\alpha/2,n-1}$ → fail to reject H_0.



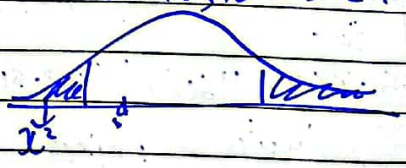
(d) $H_0: \sigma^2 \geq 5$ $H_a: \sigma^2 \neq 5$ $\alpha = 0.05$, $n = 11$. $s^2 = 1.2$

$\alpha/2 = 0.025$ $\chi^2_{\alpha/2,10} = 20.4832$ $\chi^2_{1-\alpha/2,10} = 3.2470$

$\chi^2 = (10)(1.2)/5 = 2.4$

$\chi^2 < \chi^2_{1-\alpha/2,10}$

↳ reject H_0.



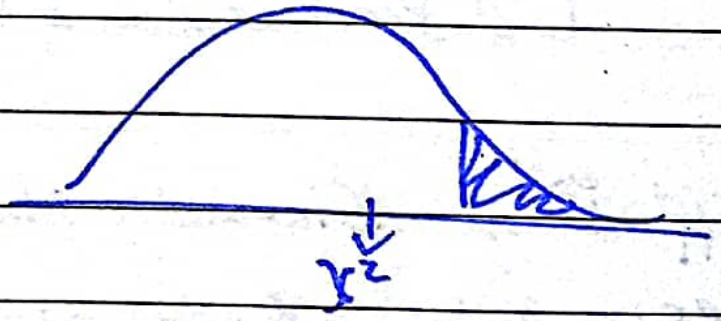
P9.35) $n = 16$ $\alpha = 0.001$ $H_0: \sigma^2 = 0.001$ $H_a: \sigma^2 > 0.001$

$\chi^2_{\alpha,15} = 30.5779$ $\bar{s} = 0.038035$

$\bar{s}^2 = 0.001447$

$\chi^2 = (15)(0.001447)/0.001 =$

$\chi^2 = 21.6999$



$\chi^2 < \chi^2_{\alpha,n-1}$ → Fail to reject H_0