Probability + Statistics

Postclass Problems - Nov. 30

4.4

#5) $\bar{w} = 0.127$

$s_w = 0.2719$

$t = \frac{\bar{w} - 0}{s_w/\sqrt{n}} \Rightarrow \frac{0.127}{0.2719/\sqrt{10}} \Rightarrow 1.477$

$t_{0.05}(9) = 1.833$

critical region is thus $t \geq 1.833$

Since $t = 1.477 < 1.833$, fail to reject H_0

#7) critical region:

$\chi^2 \leq \chi^2_{1-\alpha}(r)$

$\chi^2 \leq \chi^2_{1-0.05}(19)$

$\chi^2 \leq 10.12$

Test Statistic:

$\chi^2 = \frac{(n-1)s^2}{\sigma_0^2}$

$= \frac{(20-1)(0.065)^2}{0.095^2}$

$= 0.845$

Since $0.845 \leq 10.12$, reject H_0. ∴ company was successful

#9 Using equations from Table 4.4-3 on page 186

a) 0.2902

b) 0.1010

11. Same as #9)

a) $\alpha = 0.1056$

b) $\beta = 0.3524$

4.5 #3) a) Test statistic:

$$t = \frac{\bar{x} - \bar{y}}{\sqrt{\frac{(n-1)s_x^2 + (m-1)s_y^2}{n+m-2}}\sqrt{\frac{1}{n} + \frac{1}{m}}}$$

Critical region

$t \leq -t_{0.05}(n+m-2)$

$t \leq -t_{0.05}(14+14-2)$

$t \leq -t_{0.05}(26)$

$t \leq -1.706$

b) $\bar{x} = 100.214$

$\bar{y} = 114.214$

$s_x = 24.586$

$s_y = 18.145$

$n = m = 14$

Plugging into yields

$t = -1.714$

Since $t \leq -1.706$, reject H_0

c) using table, $0.025 < P\text{-value} < 0.5$

e) Reject if $\frac{s_x^2}{s_y^2} \geq F_{\alpha/2}(n-1, m-1)$

$1.8359 \not\geq 3.28$

∴ fail to reject H_0: $\sigma_x = \sigma_y$

#5 a) $\frac{S_x^2}{S_y^2} = \frac{4.88}{5.81} = 0.84 < 2.53 = F_{0.01}(24, 28)$

$\frac{5.81}{4.88} = 1.19 < 2.91 = F_{0.01}(28, 24)$

fail to reject H_0

b) reject if

$$\bar{X} - \bar{Y} \geq t_\alpha (n+m-2) \sqrt{\frac{(n-1)S_x^2 + (m-1)S_y^2}{n+m-2}} \sqrt{\frac{1}{n} + \frac{1}{m}}$$

$$33.80 - 31.66 \geq t_{0.01}(25+29-2) \sqrt{\frac{(25-1)(4.88)+(29-1)(5.81)}{25+29-2}} \sqrt{\frac{1}{25} + \frac{1}{29}}$$

$2.14 \geq 2.326 \cdot 2.3196 \cdot 0.2729$

$2.14 \geq 1.472$ ∴ reject H_0

#7 CI: $\left[\hat{P}_1 - \hat{P}_2 - Z_{\alpha/2} \sqrt{\frac{\hat{P}_1(1-\hat{P}_1)}{n_1} + \frac{\hat{P}_2(1-\hat{P}_2)}{n_2}} \right.$

$\left. \hat{P}_1 - \hat{P}_2 + Z_{\alpha/2} \sqrt{\frac{\hat{P}_1(1-\hat{P}_1)}{n_1} + \frac{\hat{P}_2(1-\hat{P}_2)}{n_2}} \right]$

$P_1 = \frac{124}{894} = 0.139$

$P_2 = \frac{70}{700} = 0.100$

$Z_{\alpha/2} = 1.96$

$n_1 = 894$

$n_2 = 700$

[0.007, 0.071] this result agrees w/ hypothesis test (i.e. $|Z| \geq Z_{\alpha/2}$; reject H_0)