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Math 312 Homework 5

8.2.11 -

a. $s_d^2 = \frac{\Sigma y_d^2 - (\Sigma y_d)^2/n}{n-1} = \frac{890 - 2,304/18}{17} = 44.82$

b. $H_0: \mu_d = 0$ or $\mu_T = \mu_C$
$H_1: \mu_d \neq 0$ or $\mu_T \neq \mu_C$

c. $t_{0.025,17} = 2.11$ $\quad \frac{2.67 - 0}{6.7/4.24} = 1.69 = t$

$1.69 < 2.11$, so we do not reject the null hypothesis. There isn't enough evidence to prove that there is any weight gain.

d. CI: $2.67 \pm 2.11 \cdot 1.58 = -0.66$ to 6.00
($\bar{x}$ ↑ $\quad t_{\alpha/2,n-1}$ $\quad s/\sqrt{n}$ ↑)

Since 0 is within that range we do not reject the null hypothesis

8.3.6 -

a. $H_0: \mu_c = \mu_w$ or $\mu_d = 0$
$H_1: \mu_c \neq \mu_w$ or $\mu_d \neq 0$

b. Assumptions: normality or at least symmetry and unimodality. σ_1^2 and σ_2^2 unknown. $\sigma_1^2 = \sigma_2^2$. n_1 or $n_2 < 30$

c. $s_p^2 = \frac{\Sigma(y_1 - \bar{y}_1)^2 + \Sigma(y_2 - \bar{y}_2)^2}{(n_1 - 1) + (n_2 - 1)} = \frac{0.3592 + 1.4347}{8 + 20}$

$= 0.064$

d. $\bar{y}_1 = 0.483 \quad \bar{y}_2 = 0.726 \quad \bar{y}_d = 0.2576$
$t_{0.025,28} = 2.048$

$t = \frac{0.2576}{\sqrt{\frac{0.064}{9} + \frac{0.064}{21}}} = 2.556 \geq 2.048$

So we reject the null hypothesis and accept the alternative that wind does have an effect

8.4.4 -

a. $\frac{s_1^2}{s_2^2} = \frac{4.6}{13.1} = 0.3511$

$F_{15,10} = 2.845$

$F_{10,15} = 2.544 \rightarrow 1/2.544 = 0.3931$

$0.3511 \leq 0.3931$

So $\sigma_1^2 \neq \sigma_2^2$ and we cannot use t test

t' must be used

b. $H_0: \mu_1 = \mu_2 \quad H_1: \mu_1 \neq \mu_2$

$$t' = \frac{(\bar{y}_1 - \bar{y}_2) - (\mu_1 - \mu_2)_0}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

$$v \cong \frac{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)^2}{\frac{\left(\frac{s_1^2}{n_1}\right)^2}{n_1 - 1} + \frac{\left(\frac{s_2^2}{n_2}\right)^2}{n_2 - 1}}$$

$$t' = \frac{6.5 - 8.9}{\sqrt{\frac{4.6}{16} + \frac{13.1}{11}}} = -1.974$$

$|t'| \geq t_{0.05,15}$

$$v \cong \frac{\left(\frac{4.6}{16} + \frac{13.1}{11}\right)^2}{\frac{\left(\frac{4.6}{16}\right)^2}{15} + \frac{\left(\frac{13.1}{11}\right)^2}{10}} = 14.835$$

$1.974 \geq 1.753$

we reject the null hypothesis

c. I would suggest picking voles over mice because the evidence suggests that the averages cannot be equal, so voles must be higher.

8.45 -

a. $s_1^2 = 440/8 = 55 \quad s_2^2 = 1860/15 = 124$

$F = 55/124 = 0.4435$

$\alpha = 0.02$ $F_{8,15} = 4.004 \quad F_{15,8} = 5.515 \rightarrow 0.1813$

$0.4435 \geq 0.1813$ So $\sigma_1^2 = \sigma_2^2$ (do not reject)

b. $CI: \frac{s_1^2}{s_2^2} \cdot \frac{1}{F_{v_1,v_2}} \leq \frac{\sigma_1^2}{\sigma_2^2} \leq \frac{s_1^2}{s_2^2} \cdot F_{v_2,v_1}$

CI: 0.1108 to 2.4459