STAT 350

Instructor: Womble

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HW 9

1 a) The data are independent because they are from two areas.

b) Paired : same cars different condition

c) Independent : two different random samples.

2. a) Matched pairs because employees from the same place are paired and distributed to two groups.

b) H_0: $\mu_D = 0$ H_a: $\mu_D \neq 0$

$(\mu_D = \mu_{\bar{x}_1} - \mu_{\bar{x}_2})$

$$t = \frac{\mu_D - 0}{S_D/\sqrt{n}} = \frac{0.5875}{0.9687/\sqrt{8}} = 1.7154$$

$DF = 8-1 = 7$ $\alpha = 0.01$ $t^* = 3.499 > 1.7154$

Hence we fail to reject the null hypothesis.

c) 99% CI: $(0.5875 \pm 3.499 \times \frac{0.9687}{\sqrt{8}})$

$= (-0.6109, 1.7858)$

We are 99% confident that the true mean difference of X_1 and X_2 is between -0.6109 and 1.7858.

d) It does not imply any difference because our CI include 0, also we can see $\bar{X}_1$ and $\bar{X}_2$ are really close even we have a small sample size

3. a) Two sample independent. The two assembly lines are totally independent.

b) H_0: $\mu_1 - \mu_2 = 0$ H_a: $\mu_1 - \mu_2 < 0$

$$S_p^2 = \frac{(n_1-1)S_1^2 + (n_2-1)S_2^2}{n_1+n_2-2} = \frac{15(0.3716^2 + 0.2586^2)}{30} = 0.10478$$

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{S_p^2(\frac{1}{n_1}+\frac{1}{n_2})}} = -2.2369$$

$\alpha = 0.01$

$$df = \frac{(\frac{S_1^2+S_2^2}{16})^2}{\frac{(S_1^2/n_1)^2}{15} + \frac{(S_2^2/n_2)^2}{15}} = 26.54 \approx 27$$

$t^* = -2.473$

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We fail to reject H_0 at $\alpha = 0.01$

c) $(-0.256 \pm 2.771 \times 0.114494)$

$= (-0.5731, 0.0611)$

We are 99% confident that the true mean difference of X_1 and X_2 is between -0.5731 and 0.0611

d) It does not imply the true mean for 2 is greater. In reality it might be the case, but we do not have significant evidence to support it.

4. a. $\sqrt{Var} = \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}} = 0.8198$

$Z = 2.576$

$\bar{X}_1 - \bar{X}_2 = 0.37$

99% CI: $(0.37 \pm 2.576 \times 0.8198)$

$= (-1.7418, 2.4818)$

We are 99% confident that the true mean difference is between -1.7418 and 2.4818

b. We fail to reject they are the same because 0 is in our 99% confident interval.