STAT100 Elementary Statistics and Probability Summer II 2014

Quiz 11, Tuesday, August 19, 2014 Name: Jeff

Show all work clearly and in order, and circle your final answers. Justify your answers algebraically whenever possible. You are allowed to calculator for basic calculation in this quiz. You have 20 minutes to take this 10 point quiz.

1. *(6 points)* Several samples have been taken from 2 populations:

Sample from population one:	1	3	2	5	3	4	X
Sample from population two:	2	5	6	3	4		Y

Does the data substantiate that the two populations have different mean? Test with $\alpha = .1$.

$n_1 = 6$, $\bar{X} = \frac{1+3+2+5+3+4}{6} = 3$, $S_1^2 = \frac{(-2)^2+0^2+(-1)^2+2^2+0^2+1^2}{6-1} = 2$, $S_1 = \sqrt{2} \approx 1.414$

$n_2 = 5$, $\bar{Y} = \frac{2+5+6+3+4}{5} = 4$, $S_2^2 = \frac{(-2)^2+1^2+2^2+(-1)^2+0^2}{5-1} = 2.5$, $S_2 \approx 1.581$

As $\frac{S_1}{S_2} = .894 \in [\frac{1}{2}, 2]$, we pool the data to get standard error.

$$S.E. = S_{pooled}\sqrt{\frac{1}{n_1}+\frac{1}{n_2}} = \sqrt{\frac{S_1^2(n_1-1)+S_2^2(n_2-1)}{n_1+n_2-2}}\cdot\sqrt{\frac{1}{n_1}+\frac{1}{n_2}} = \sqrt{\frac{20}{9}}\sqrt{\frac{1}{6}+\frac{1}{5}} \approx .903$$

We form hypotheses: $H_0: \mu_1-\mu_2=0$, $H_1: \mu_1-\mu_2 \neq 0$.

The test statistic $T = \frac{\bar{X}-\bar{Y}-0}{S.E.}$ is valued $T = \frac{-1-0}{.903} = -1.107$

We reject H_0 if $|T| \geq t_{\alpha/2}$ with $d.f. = n_1+n_2-2 = 9 \Rightarrow t_{\alpha/2} = 1.833$. Hence, we retain H_0. The data does not substantiate that the means are different.

2. *(5 points)* A study on two new drugs provides the following result: 120 patients were treated with drug A and 50 are cured. 150 patients were treated with drug B and 88 were cured. Estabilish a 95% confidence interval on the difference of the cured percentage between the two drugs.

From the data, $\hat{p}_1 = \frac{50}{120}$, $\hat{p}_2 = \frac{88}{150}$, $\hat{p} = \frac{50+88}{120+150} = \frac{138}{270}$.

The estimator for p_1-p_2 is $\hat{p}_1-\hat{p}_2 = \frac{50}{120}-\frac{88}{150} = -.17$

The standard error $S.E. = \hat{p}\hat{q}\sqrt{\frac{1}{n_1}+\frac{1}{n_2}} = \frac{138}{270}\cdot\frac{132}{270}\cdot\sqrt{\frac{1}{120}+\frac{1}{150}} = .0306$

95% confidence interval is $\hat{p}_1-\hat{p}_2 \pm z_{\alpha/2}\,S.E.$ where $z_{\alpha/2} = z_{.025} = 1.96$

$$\Rightarrow \left[-.17-1.96\times.0306, -.17+1.96\times.0306\right] = [-.2302, -.1098].$$