STAT 305 D Homework 10

Due Apr 18, 2013 at 12:40 PM in class

Show all 6 steps in your hypothesis tests.

1.

Are male college students more easily bored than their female counterparts? This question was examined in the article "Boredom in Young Adults—Gender and Cultural Comparisons" (*J. of Cross-Cultural Psych.*, 1991: 209–223). The authors administered a scale called the Boredom Proneness Scale to 97 male and 148 female U.S. college students. Does the accompanying data support the research hypothesis that the mean Boredom Proneness Rating is higher for men than for women? Test the appropriate hypotheses using a .05 significance level.

Gender	Sample Size	Sample Mean	Sample SD
Males	97	10.40	4.83
Females	148	9.26	4.68

Parameter of interest: $\mu_1 - \mu_2 =$ the true difference of means for males and females on the Boredom Proneness Rating. Let $\mu_1 =$ men's average and $\mu_2 =$ women's average.

H_0: $\mu_1 - \mu_2 = 0$

H_a: $\mu_1 - \mu_2 > 0$

$$z = \frac{(\bar{x} - \bar{y}) - \Delta_o}{\sqrt{\frac{s_1^2}{m} + \frac{s_2^2}{n}}} = \frac{(\bar{x} - \bar{y}) - 0}{\sqrt{\frac{s_1^2}{m} + \frac{s_2^2}{n}}}$$

RR: $z \geq 1.645$

$$z = \frac{(10.40 - 9.26) - 0}{\sqrt{\frac{4.83^2}{97} + \frac{4.68^2}{148}}} = 1.83$$

Reject H_0. The data indicates the average Boredom Proneness Rating is higher for males than for females.

2.

Let μ_1 and μ_2 denote true average tread lives for two competing brands of size P205/65R15 radial tires. Test H_0: $\mu_1 - \mu_2 = 0$ versus H_a: $\mu_1 - \mu_2 \neq 0$ at level .05 using the following data: $m = 45$, $\bar{x} = 42{,}500$, $s_1 = 2200$, $n = 45$, $\bar{y} = 40{,}400$, and $s_2 = 1900$.

The test statistic value is $z = \dfrac{\bar{x} - \bar{y}}{\sqrt{\frac{s_1^2}{m} + \frac{s_2^2}{n}}}$, and H_0 will be rejected if either $z \geq 1.96$ or $z \leq -1.96$. We compute $z = \dfrac{42{,}500 - 40{,}400}{\sqrt{\frac{2200^2}{45} + \frac{1900^2}{45}}} = \dfrac{2100}{433.33} = 4.85$. Since 4.85 > 1.96, reject H_0 and conclude that the two brands differ with respect to true average tread lives.

3.

Fusible interlinings are being used with increasing frequency to support outer fabrics and improve the shape and drape of various pieces of clothing. The article "Compatibility of Outer and Fusible Interlining Fabrics in Tailored Garments" (*Textile Res. J.*, 1997: 137–142) gave the accompanying data on extensibility (%) at 100 gm/cm for both high-quality fabric (H) and poor-quality fabric (P) specimens.

H	1.2	.9	.7	1.0	1.7	1.7	1.1	.9	1.7
	1.9	1.3	2.1	1.6	1.8	1.4	1.3	1.9	1.6
	.8	2.0	1.7	1.6	2.3	2.0			
P	1.6	1.5	1.1	2.1	1.5	1.3	1.0	2.6	

The sample mean and standard deviation for the high-quality sample are 1.508 and .444, respectively, and those for the poor-quality sample are 1.588 and .530. Use the two-sample t test to decide whether true average extensibility differs for the two types of fabric.

We test $H_0 : \mu_1 - \mu_2 = 0$ vs. $H_a : \mu_1 - \mu_2 \neq 0$. With degrees of freedom $\nu = \frac{(.0433265)^2}{.00017906} = 10.5$, which we round down to 10, and using significance level .05 (not specified in the problem), we reject H0 if $|t| \geq t_{.025,10} = 2.228$. The test statistic is $t = \frac{-.08}{\sqrt{(.0433265)}} = -.38$, which is not ≥ 2.228 in absolute value, so we cannot reject H0.

There is insufficient evidence to claim that the true average extensibility differs for the two types of fabrics.

4.

As the population ages, there is increasing concern about accident-related injuries to the elderly. The article "Age and Gender Differences in Single-Step Recovery from a Forward Fall" (*J. of Gerontology,* 1999: M44–M50) reported on an experiment in which the maximum lean angle—the furthest a subject is able to lean and still recover in one step—was determined for both a sample of younger females (21–29 years) and a sample of older females (67–81 years). The following observations are consistent with summary data given in the article:

YF: 29, 34, 33, 27, 28, 32, 31, 34, 32, 27

OF: 18, 15, 23, 13, 12

Does the data suggest that true average maximum lean angle for older females is more than 10 degrees smaller than it is for younger females? State and test the relevant hypotheses at significance level .10 by obtaining a *P*-value.

We will test the hypotheses: $H_0 : \mu_1 - \mu_2 = 10$ vs. $H_a : \mu_1 - \mu_2 > 10$. The test statistic is $t = \dfrac{(\bar{x} - \bar{y}) - 10}{\sqrt{\left(\frac{2.75^2}{10} + \frac{4.44^2}{5}\right)}} = \dfrac{4.5}{2.17} = 2.08$ The degrees of freedom

$\nu = \dfrac{\left(\frac{2.75^2}{10} + \frac{4.44^2}{5}\right)^2}{\frac{\left(\frac{2.75^2}{10}\right)^2}{9} + \frac{\left(\frac{4.44^2}{5}\right)^2}{4}} = \dfrac{22.08}{3.95} = 5.59 \approx 5$, and the p-value from table A.8 is approx .045, which is < .10 so we reject H_0 and conclude that the true average lean angle for older females is more than 10 degrees smaller than that of younger females.

5. Weekly feedback. You get full credit as long as you write something.

   a. Is there any aspect of the subject matter that you currently struggle with? If so, what specifically do you find difficult or confusing? The more detailed you are, the better I can help you.
   You got full credit as long as you wrote something.

   b. Do you have any questions or concerns about the material, class logistics, or anything else? If so, fire away. You got full credit as long as you wrote something.