

PSYC 2317: Statistical Methods for Psychology

Tarleton State University

Unit 10 Homework

For each of the hypothesis testing problems below, you need to do the following: (1) explicitly define your null hypothesis \mathcal{H}_0 and alternative hypothesis \mathcal{H}_1 ; (2) calculate and report the observed t -score; (3) calculate and report the resulting Bayes factor; and (4) calculate and report the posterior probability of the “winning” model (i.e., the model which receives more support from the data).

1. A random sample of $N = 35$ individuals is selected from a population with a mean of 60, and a treatment is administered to each individual in the sample. After treatment, the sample mean is found to be $\bar{X} = 60.2$ with $SS = 296$. Based on the sample data, can we conclude that the treatment results in a meaningful score change?
2. To evaluate the effect of a treatment, a sample is obtained from a population with a mean of 20 and the treatment is administered to the individuals in the sample. After treatment, the sample mean is found to be $\bar{X} = 17.7$ with a standard deviation of $\hat{\sigma} = 3$.
 - (a) If the sample consists of $N = 16$ individuals, are the data sufficient to conclude that the treatment decreases scores?
 - (b) If the sample consists of $N = 36$ individuals, are the data sufficient to conclude that the treatment decreases scores?
 - (c) Comparing your answers for parts (a) and (b), how does the size of the sample influence the size of the obtained Bayes factor?
3. A sample of $N = 9$ individuals participates in a repeated measures study that produces a sample mean difference of $\bar{X} = 4.25$ with $SS = 128$ for the difference scores. Is this mean difference large enough to be considered a real positive effect?
4. Two separate samples receive two different treatments. The first treatment group ($N = 15$) has a mean of 50 with $SS = 210$. The second treatment group ($N = 9$) has a mean of 56 with $SS = 190$. Does the second treatment result in larger scores than the first treatment?