

MATH/STAT 4850: Foundations of Statistics, Spring 2018

Homework 2

Due Wednesday, February 7.

This homework counts 30 points toward your total homework grade.

1. Estimate the sampling distribution of the following test statistics computed from the given random sample:

- (a) Ten random samples are taken from iid t random variables with 3 degrees of freedom, and the maximum is observed.
- (b) Twenty random samples are taken from a Poisson random variable with rate 5 and the mean is observed.
- (c) Fifteen random samples are taken from a normal random variable with mean 2 and standard deviation 4, and the sample standard deviation is observed.
- (d) Fifteen random samples are taken from a normal random variable with mean 2 and standard deviation 4, and the statistic

$$\frac{14}{16} * S^2$$

is observed, where S is the sample standard deviation. Compare your result to a chi-squared rv with 14 degrees of freedom.

2. Perform a goodness of fit test on `Phillies2009$Doubles` in the `resampled` package to determine whether the data is consistent with a Poisson distribution by comparing the test statistic to the relevant chi-squared distribution.

3. A random sample of size $n = 100$ is drawn from a distribution with pdf

$$f(x) = 3(1 - x)^2 \quad 0 \leq x \leq 1$$

(Note: this is a beta random variable.)

- (a) Use the CLT to approximate $P(\bar{X} \leq 0.27)$.
- (b) Use the CLT with skewness correction to approximate $P(\bar{X} \leq 0.27)$.
- (c) Use simulation to approximate $P(\bar{X} \leq 0.27)$.