Week 6: Hypothesis Testing

3. Compute p-value with R

Stat 140 - 04

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Slides posted at *http://sshanshans.github.io/stat140*

- The randomization distribution shows what types of statistics would be observed, just by random chance, if the null hypothesis were true
- A p-value is the chance of getting a statistic as extreme as that observed, if H_0 is true
- A p-value can be calculated via
  - percentile method
  - CLT method
  - by R
- The smaller the p-value, the stronger the evidence against H_0

The significance level, α, is the threshold below which the p-value is deemed small enough to reject the null hypothesis

Often $\alpha = 0.05$ by default, unless otherwise specified

In short

If p-value $< \alpha \rightarrow$ statistically significant $\rightarrow$ reject H_0.
If p-value $\geq \alpha$, fail to reject H_0.

Poll question

Which of the following p-values gives the strongest evidence against H_0?

a. 0.005
b. 0.1
c. 0.32
d. 0.56
e. 0.94

Poll question

Two different studies obtain two different p-values.
Study A obtained a p-value of 0.002 and Study B obtained a p-value of 0.2.
Which study obtained stronger evidence against the null hypothesis?

a. Study A
b. Study B

Fix a significance level α

- If the p-value is less than α
  - **Reject** H_0
  - the sample would be extreme if H_0 were true
  - the results are statistically significant
  - we have evidence for H_A
- If the p-value is greater than α
  - **Do not reject** H_0
  - the sample would not be too extreme if H_0 were true
  - the results are not statistically significant
  - the test is inconclusive; either H_0 or H_A may be true