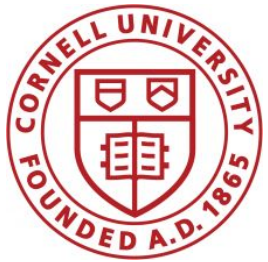


DSFA

Spring 2018

Lecture 21

Examples and Error Probabilities

Announcements

- Homework 5
  - due this Thursday
- Project 2 is out
  - work on project in section today
  - checkpoint due 9pm M 3/19;
  - due 9pm M 3/26

Testing a Hypothesis

Step 1: Select Two Hypotheses

- A test chooses between two views of how data were generated: *Null hypothesis* proposes that data were generated at random; *Alternative hypothesis* proposes some effect other than chance

Step 2: Choose a Test Statistic

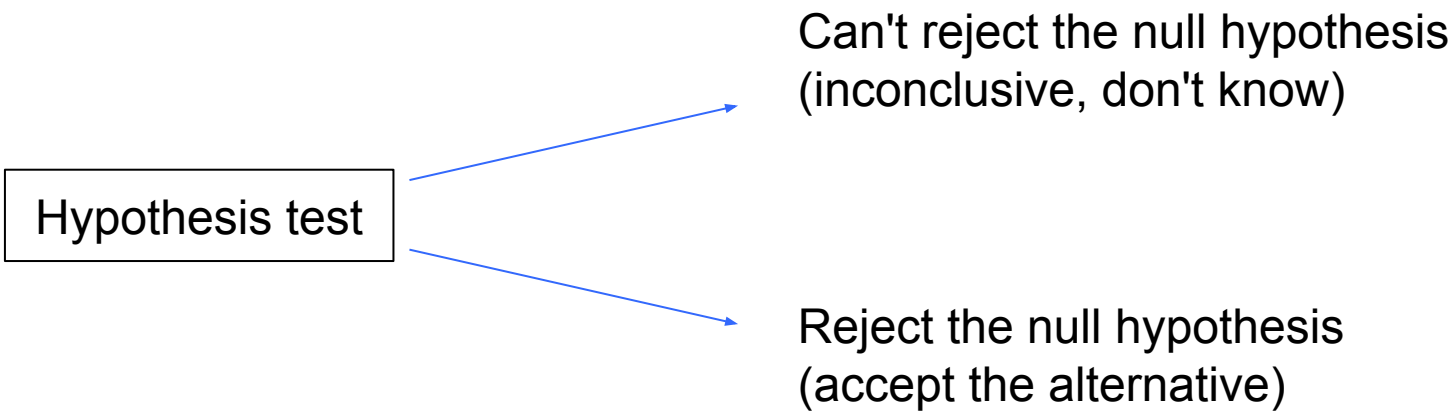
- A value that can be computed from the data

Step 3: Compute What The Null Hypothesis Predicts

- Compute the distribution of the test statistic: what the test statistic might be if the null hypothesis were true.

Step 4: Compare the Prediction to the Observed Data

Conclusions From a Test



Can the Conclusion be Wrong?

Yes.

	Null is true	Alternative is true
Test rejects the null	✗	✓
Test doesn't reject the null	✓	?

An Error Probability

- The cutoff for the P-value is an error probability.
- If:
  - your **cutoff is 5%**
  - and the **null hypothesis happens to be true**
  - (but you don't know that)
- then there is about a **5% chance** that **your test will reject the null hypothesis anyway**.

P-hacking

Demo: https://projects.fivethirtyeight.com/p-hacking/

Solution: replicate the experiment

How Much Risk To Accept?

- **First convention:**
  - Accept a 5% risk of wrongly rejecting the null.
  - The result is “statistically significant.”
- **Second convention:**
  - Accept a 1% risk of wrongly rejecting the null.
  - The result is “highly statistically significant.”

When is a large risk of wrongly rejecting the null acceptable? When not?

Assess this:

"Statistical significance is an objective, unambiguous, universally accepted standard of scientific proof.

— Letter to *Nature*, 1994

A. True
B. False

Deflategate

Deflategate

Tom Brady Then

Tom Brady Now

Boston Globe,
Sunday 10/9/16

Tom Brady on Deflategate: 'I've just moved on, man'

Adam Kurkjian Sunday, October 09, 2016

(Demo)