Math 300 Lesson 31 Notes

Interpreting Hypothesis Tests

Professor Bradley Warner

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Contents

Objectives

1. Correctly use terminology and notation of interpreting hypothesis tests.

Reading

Chapter 9.4

Lesson

Work through the learning checks LC 9.5 - LC 9.8.

- This section is conceptually difficult. We are setting up a contradiction but it is based on empirical data. Thus the language becomes somewhat confusing. The criminal trial analogy is a good reference to put the ideas into context. There is a large number of terms.
- The fail to reject idea is tricky since people want to "accept the null hypothesis". Remember there is a difference between "not guilty" and "innocent" in a trial.
- This framework helps:
  a - The defendant is truly either "innocent" or "guilty." Two possible outcomes of the test.
  b - The defendant is presumed "innocent until proven guilty." The null hypothesis.
  c - The defendant is found guilty only if there is strong evidence that the defendant is guilty. The phrase "beyond a reasonable doubt" is often used as a guideline for determining a cutoff for when enough evidence exists to find the defendant guilty. "Beyond a reasonable doubt" is the level of significance α.
  d - The defendant is found to be either "not guilty" or "guilty" in the ultimate verdict. This is "reject" or "fail to reject".

- Write conclusion in the context of the problem. For example "We found enough evidence in this data to suggest that there was gender discrimination at play in bank promotions."
- The names **Type I** and **Type II** are not informative. False positive and false negative make more sense in the context that a positive is rejecting the null hypothesis.

Libraries

```
library(tidyverse)
library(infer)
library(moderndive)
library(nycflights13)
library(ggplot2movies)
```

LC 9.5 (Objective 1)

(LC9.5) What is wrong about saying, "The defendant is innocent." based on the US system of criminal trials?

Solution:

LC 9.6 (Objective 1)

(LC9.6) What is the purpose of hypothesis testing?

Solution:

LC 9.7 (Objective 1)

(LC9.7) What are some flaws with hypothesis testing? How could we alleviate them?

Solution:

LC 9.8 (Objective 1)

(LC9.8) Consider two α significance levels of 0.1 and 0.01. Of the two, which would lead to a more *liberal* hypothesis testing procedure? In other words, one that will, all things being equal, lead to more rejections of the null hypothesis H_0.

Solution:

Documenting software

- File creation date: 2022-06-16
- R version 4.1.3 (2022-03-10)
- `tidyverse` package version: 1.3.1
- `moderndive` package version: 0.5.4
- `infer` package version: 1.0.0