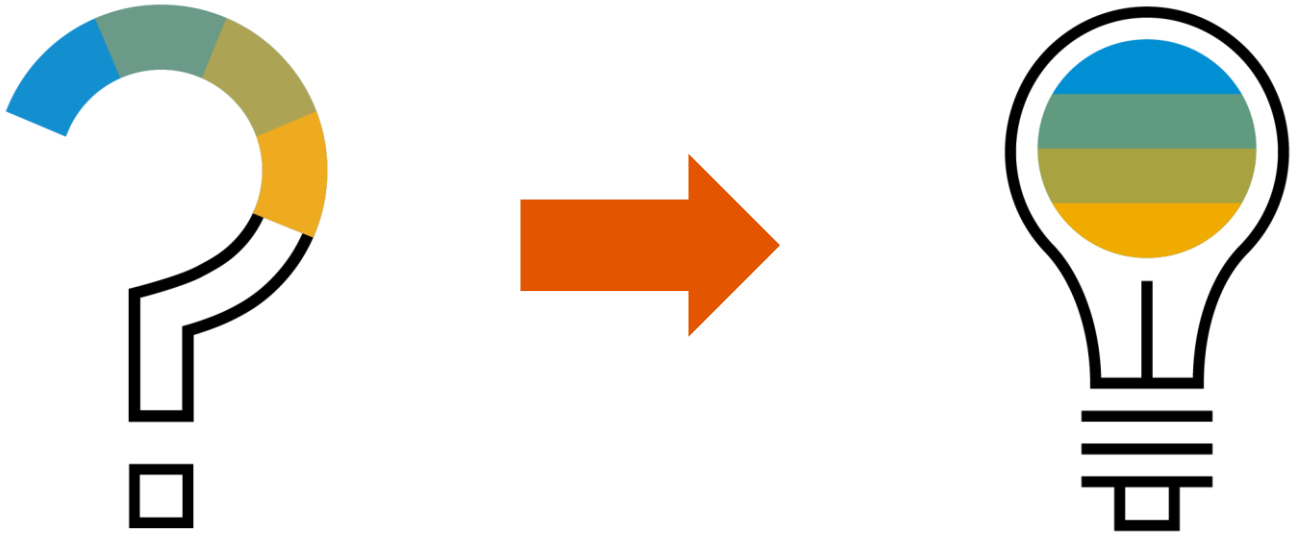
Week 5: Probability Distributions

Unit 5: Hypothesis Testing

Introduction

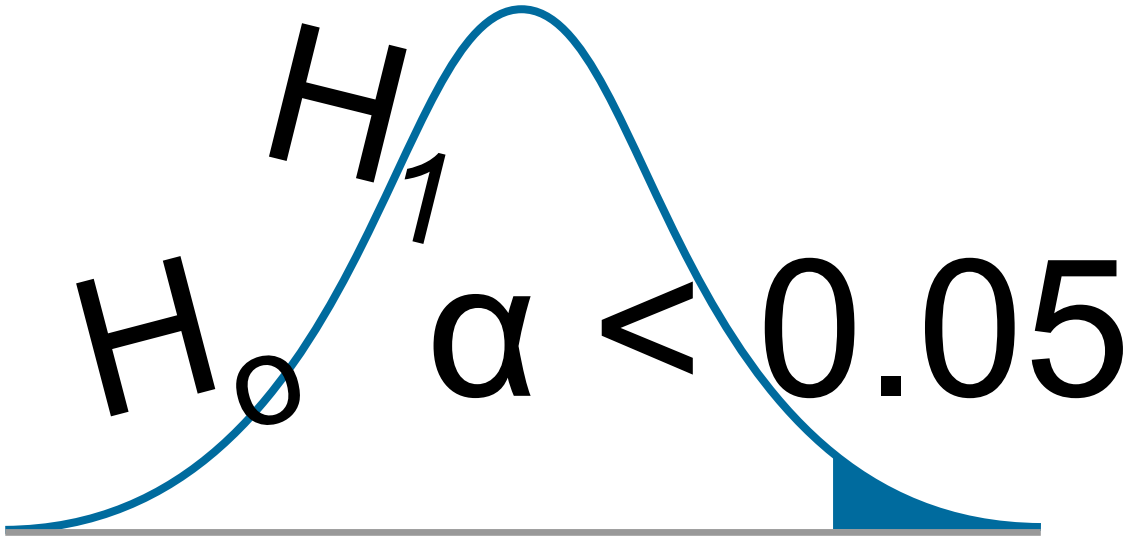


Null and alternative hypotheses

Determine whether a coin was fairly balanced:

- A null hypothesis H_0 might be that half the flips would result in Heads and half in Tails.
- The alternative hypothesis H_a might be that the number of Heads and Tails would be very different.

$$H_o: P = 0.5$$
$$H_1: P \neq 0.5$$



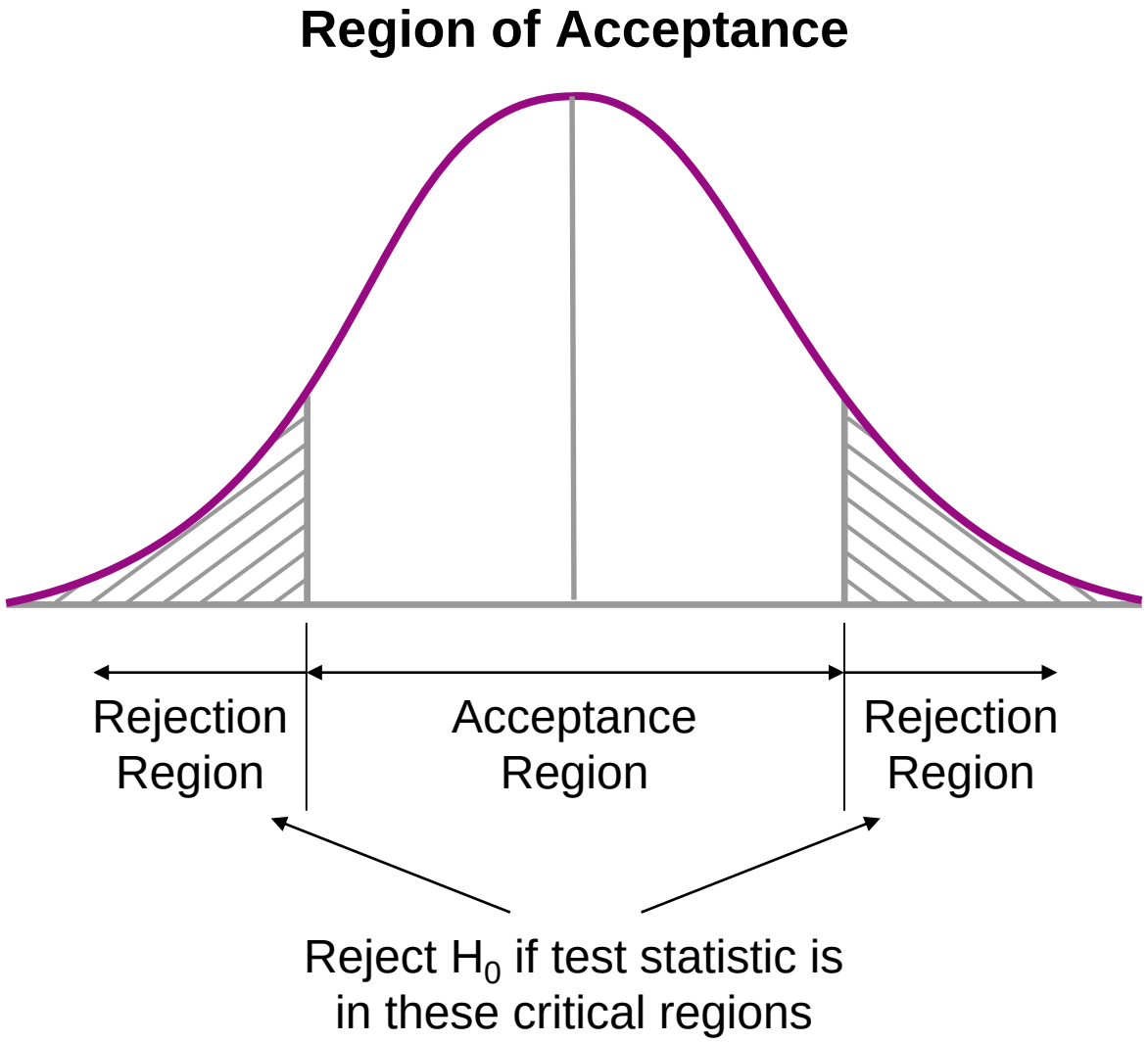
https://stattrek.com/hypothesis-test/hypothesis-testing.aspx

Testing

Hypothesis Testing

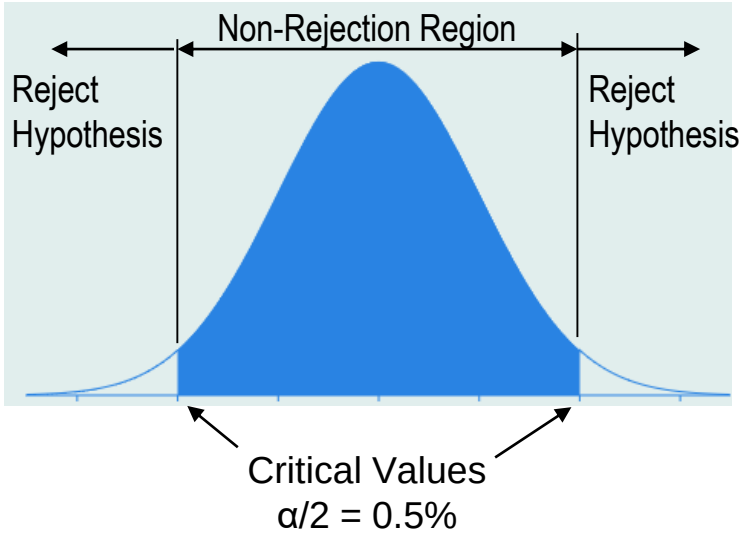
1. State the hypotheses
2. Formulate an analysis plan
3. Analyze sample data
4. Interpret results

Decision rules

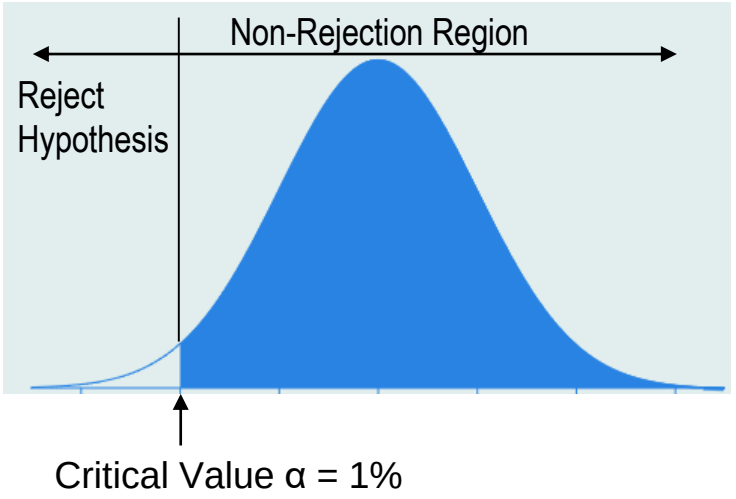


One-tailed and two-tailed tests

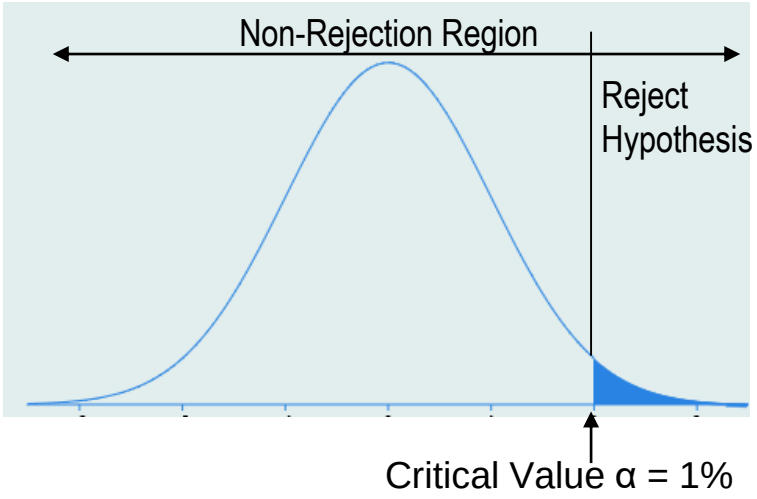
Two-Tailed Test



Left-Sided (One-Tailed) Test



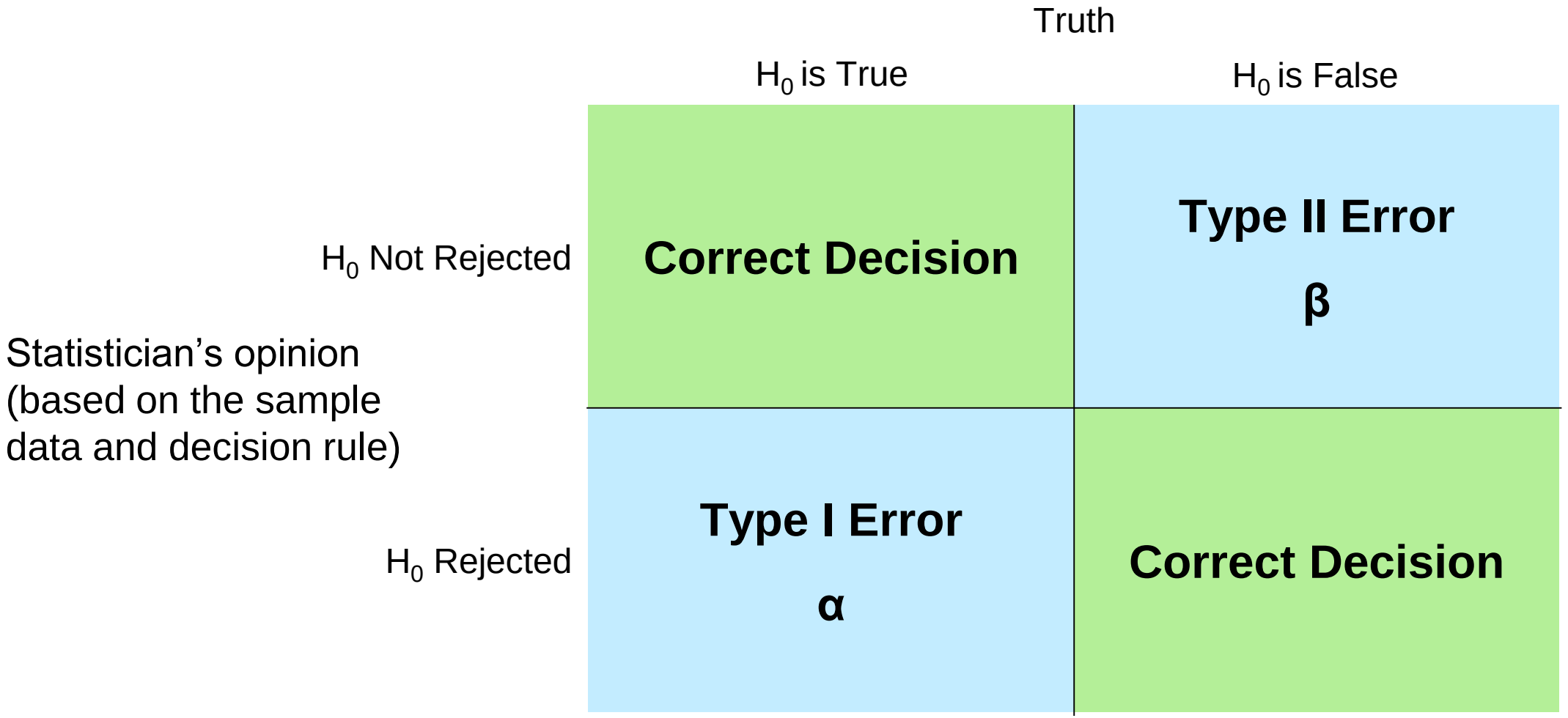
Right-Sided (One-Tailed) Test



http://www.stat.yale.edu/Courses/1997-98/101/sigtest.htm

https://blog.minitab.com/blog/adventures-in-statistics-2/understanding-hypothesis-tests-significance-levels-alpha-and-p-values-in-statistics

Decision errors



https://en.wikipedia.org/wiki/Power_(statistics)

Summary

- "**Hypothesis testing**" refers to the formal procedures used by statisticians to accept or reject statistical hypotheses.
- There are two types of statistical hypotheses:
  1. **Null hypothesis** (H_0) is usually the hypothesis that the sample observations result purely from chance.
  2. **Alternative hypothesis** (H_1 or H_a) is the hypothesis that the sample observations are influenced by some non-random cause.
- An analysis plan includes decision rules for rejecting the null hypothesis. Statisticians describe these decision rules in two ways – with reference to a P-value or with reference to a region of acceptance.
- Two types of errors can result from a hypothesis test.
  - A Type I error occurs when the researcher rejects a null hypothesis when it is true.
  - A Type II error occurs when the researcher fails to reject a null hypothesis that is false.

Thank you.

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