Lecture 17: Paired Data and Difference of Two Means

Chapter 5.2, 5.1

Goals for Today

- Difference of means
- Note on Practical vs Statistical Significance
- Paired differences of means

6 Types of Questions

Here are the 6 broad types of questions about population parameters we'll be answering with statistical methods: confidence intervals and hypothesis tests

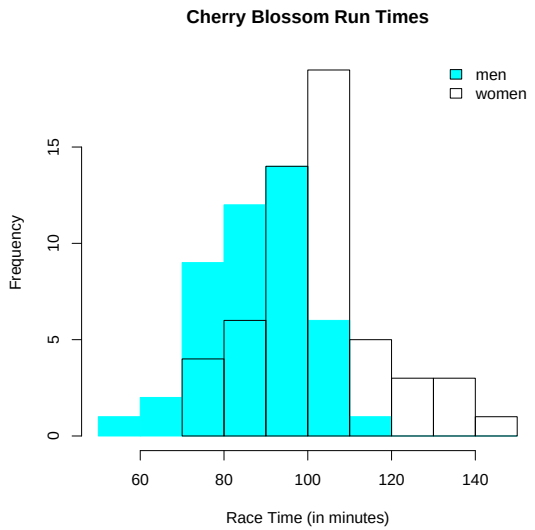
1. What is the mean value μ?
2. Are the means μ_1 and μ_2 of two groups different?
3. What is the mean paired difference μ_{diff}?
4. What is the proportion p of "successes"?
5. Are the proportions of "successes" p_1 and p_2 of two groups different?
6. Are the means $\mu_1, \ldots, \mu_k$ of k groups different?

Today we look at 3 and 2.

General Outline

Chapter 5.2: Are Two Means μ_1 & μ_2 Different?

We randomly sample 45 men (of 7192) and 55 women (of 9732) runners in the 2012 Cherry Blossom Run. Did men run faster than women?



	men	women
$\overline{x}$	87.65	102.13
s	12.5	15.2
n	45	55

Practical vs Statistical Significance

When rejecting H_0, we call this a statistically significant result. But statistically significant results aren't always practically significant.

Say for very large n_M & n_F we observe $\overline{x}_M = 87.65$ and $\overline{x}_F = 87.651$ and reject H_0.

The point estimate of the difference $\overline{x}_M - \overline{x}_F = 0.001$. Near negligible!

The 95% CI might be:

$$[0.0005, 0.0015]$$

Practical vs Statistical Significance

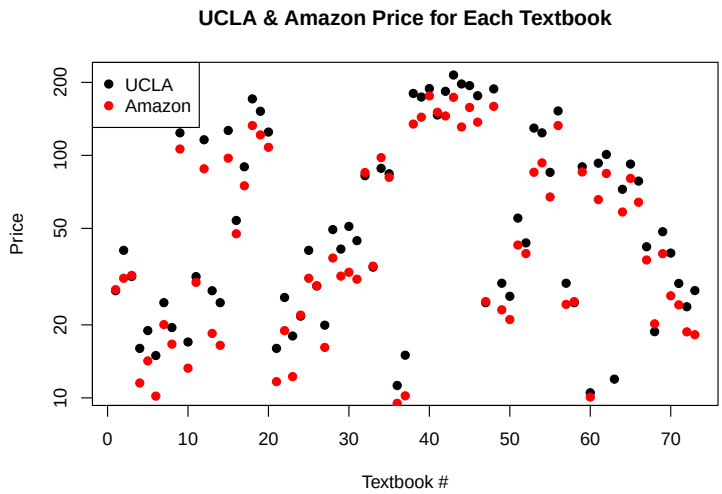
Chapter 5.1: Paired Data

Examples:

- Cholesterol levels before and after some intervention for the same person
- Disease rates amongst pairs of twins
- In the text: price of the same textbook at the UCLA bookstore vs Amazon

Paired Differences

The methodology for paired data remains the same, except our observations are the difference in pairs. Example, for the UCLA Bookstore vs Amazon book price example in the text



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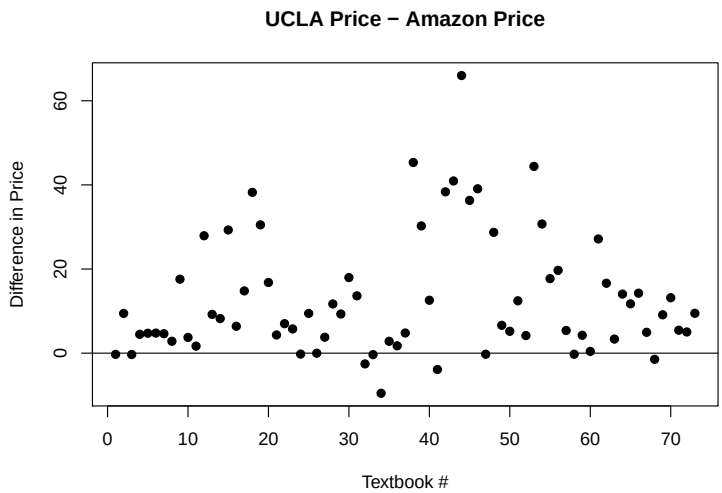

Paired Differences