T-Tests and Related Procedures

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Reading: Chapter 5 VR; CB:

Setup

Independent Samples from Two Populations:

$$\begin{aligned} Y_i &\overset{iid}{\sim} f(y) \quad \text{for } i = 1, \ldots n \\ X_j &\overset{iid}{\sim} g(x) \quad \text{for } i = 1, \ldots m \end{aligned}$$

Questions: Are the distributions equal? Do the distributions have the same expected value (mean)? Same median?

Some Procedures for Comparing 2 Populations

Independent iid Samples from each popluation

- Two-Sample t-test `t.test(Y, X, var.equal=T)`
- Welch t-test `t.test(Y, X, var.equal=F)`
- Rank-Sum (Wilcoxon or Mann-Whitney test) `wilcox.test(Y,X)`
- Permutation tests
- Bootstrap

Paired Samples

Sample $i = 1, \ldots n$ units and on each unit observe Y_i and X_i. Assumption of independent samples no longer valid.
Questions of interest: mean difference 0, median 0

- Paired t-test `t.test(D)`
- Sign test
- Wilcoxon Signed-Rank Test`wilcox.test(X,Y, paired=T)`
- Permutation tests