

# Two-Sample Hypotheses

Lecture 11

## Objectives

- ▶ Define terms.
- ▶ Select and execute the correct test for a given situation.
- ▶ Know the assumptions of each test and understand the consequences of violating the different assumptions.
- ▶ Be able to determine an adequate sample size.

## Overview

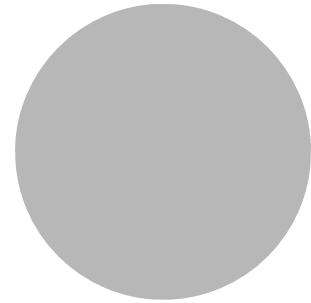
- ▶ One of the most common statistical procedures is the comparison of two samples to infer whether differences exist between the two populations sampled.

## Testing for difference between two sample variances

- ▶ If we have two samples, we might ask if the variances of the two populations are equal -- F-test.

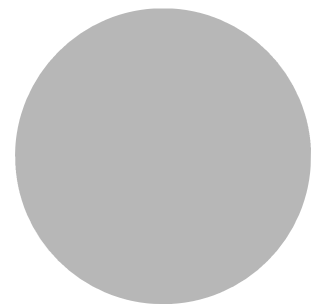
## Assumptions of F-test

- ▶ Random samples.
- ▶ Independent samples.
- ▶ Normal distributed populations.



## Example

- ▶ Example 12



## Testing for difference between two sample means

- ▶ We take random samples from two different populations and we want to determine if the two sampled population's means differ significantly from one another.
- ▶ There are several tests for comparing sample means, but the most basic and the classic test is the t-test.

## Assumptions of t-test

- ▶ Random samples.
- ▶ Independent samples.
- ▶ Normally distributed populations.
- ▶ Equal variances.

## Violation of assumptions and minimization

- ▶ The t-test is fairly robust to violations of assumptions
- ▶ Always better to have equal sample sizes
- ▶ Better if the test is run as a two-tailed test.
- ▶ Larger sample sizes reduce the problems associated with violations.

## Example

- ▶ Example 12

## Determining sample size

- ▶ This is an iterative process
- ▶ Sample size is influenced by several variables
  - ▶ If we wish to detect a very small difference,  $\delta$ , then we will need a larger sample
  - ▶ If the variation in the populations is large ( $\sigma^2$ ), then we will need a larger sample size.

## Determining sample size

- ▶ If we want a very low significance level ( $\alpha$ ), then we will need a larger sample size.
- ▶ If we want high power (be able to detect a difference when one actually exists),  $1-\beta$ , then we will need a larger sample size.

# Example

▶ Example 13

