Bentley University MA214 in R

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Contents

MA214 is an undergraduate statistics course at Bentley University that builds on the basic managerial statistics course taken by all students. The description from the course catalog can be found here.

It covers hypothesis tests, analysis of variance, multiple regression, and contingency tables.

The sequence of topics below is not necessarily the final version; this topic page is under construction.

- How to choose the sample size in a study

Content last modified on 06 September 2021.

How to choose the sample size in a study

Description

When designing a study, it is important to choose a sample size that is large enough to find a difference between groups but that is also economically feasible. If we are planning to conduct a study, how do we determine how large it should be in order to have a certain power?

Solution in R

Example: Let's say we're designing a study to assess the effectiveness of a new four-week exercise program for weight loss. Assume that weight loss in four-week exercise programs is normally distributed with a standard deviation of around 5 pounds. The goal is that the new exercise program will have a 4-pound higher weight loss than the average program.

We choose a value $0 \leq \alpha \leq 1$ as the probability of a Type I error (false positive, finding we should reject H_0 when it's actually true). Let's set α to be 0.05 here.

We choose a value $0 \leq \beta \leq 1$ as the probability of a Type II error (false negative, failing to reject H_0 when it's actually false). Let's set β to be 0.2 here. The test's power is $1 - \beta$, or in this case, 0.8.

What should the sample size be for each group?

```
# sd = standard deviation = 5 pounds
# delta = desired increase = 4 pounds
# sig.level = alpha = 0.05
# power = 1 - beta = 1 - 0.20 = 0.80
# n = NULL so R computes it for us
power.t.test(n = NULL, delta = 4, sd = 5, sig.level = 0.05, power = 0.80)
```

```
     Two-sample t test power calculation

              n = 25.52463
          delta = 4
             sd = 5
      sig.level = 0.05
          power = 0.8
    alternative = two.sided

NOTE: n is number in *each* group
```

Our sample size needs to be 26 participants in order for the power of the study to be 80% with our specified parameters.

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