Assignment 2 - Data 1204

## About the notebook

In this notebook we will test the following hypothesis:

The process followed to determine if the null hypothesis is true is described in the word document. As the sample size is less than 30, the t-distribution table is used to determine the p-value.

## Preparing the Environment and Loading Data

Install required packages.

# install.packages(c("lattice", "readr", "readxl"))

Loading the required libraries.

library(lattice)  
library(readxl)  
library(readr)  
  
options(digits=3)

Loading blood pressure data.

bp\_data <- read\_excel("BloodPressure.xls")  
bp\_data

## # A tibble: 25 x 3  
## Subject Before After  
## <dbl> <dbl> <dbl>  
## 1 1 135 127  
## 2 2 142 145  
## 3 3 137 131  
## 4 4 122 125  
## 5 5 147 132  
## 6 6 151 147  
## 7 7 131 119  
## 8 8 117 125  
## 9 9 154 132  
## 10 10 143 139  
## # … with 15 more rows

## Testing the Null Hypothesis (p-value calculation)

Calculating the absolute percentage change in blood pressure of the subjects before and after the 30-day experiment.

bp\_data$percent\_change <- abs((bp\_data$After - bp\_data$Before)/bp\_data$Before)  
bp\_data

## # A tibble: 25 x 4  
## Subject Before After percent\_change  
## <dbl> <dbl> <dbl> <dbl>  
## 1 1 135 127 0.0593  
## 2 2 142 145 0.0211  
## 3 3 137 131 0.0438  
## 4 4 122 125 0.0246  
## 5 5 147 132 0.102   
## 6 6 151 147 0.0265  
## 7 7 131 119 0.0916  
## 8 8 117 125 0.0684  
## 9 9 154 132 0.143   
## 10 10 143 139 0.0280  
## # … with 15 more rows

Calculating the mean, standard deviation and mean standard error of the sample provided. This will be used to calculate the t-value, which will further be used to calculate the p-value.

mean.percent\_change <- mean(bp\_data$percent\_change)  
sd.percent\_change <- sd(bp\_data$percent\_change)  
SE.percent\_change <- sd.percent\_change / sqrt(length(bp\_data$percent\_change))  
mean.percent\_change

## [1] 0.0677

sd.percent\_change

## [1] 0.0547

SE.percent\_change

## [1] 0.0109

## One-tail Test

Null hypothesis:

Alternate hypothesis:

Calculating the t-value.

# State the Ho value and calculate the z-score  
Ho <- 0  
t <- (mean.percent\_change - Ho) / SE.percent\_change  
t

## [1] 6.19

Calulating the p-value.

p\_value <- pt(-t, df=length(bp\_data$percent\_change)-1)  
p\_value

## [1] 1.06e-06

p\_value < 0.05 # Check if the p-value is less than 0.05 or 5%.

## [1] TRUE

## Short Conclusion

**As it can be seen above, the p-value is significant and the null hypothesis can be rejected.**