Simple Monte Carlo

Patrick Wilson

4/17/2019

# Simple Example

We start off with a very simple test. Behold the t-test! You have probably heard of it[[1]](#footnote-22).

Here we will power a simple hypothesis test utilizing the Design, Simulate, and Record framework.

## Design Your Model

You will likely build a function for this which can facilitate multiple scenarios let’s keep it simple.

n <- 25 # sample size  
mu <- 7.5 # true mean  
sigma <- 15 # true SD  
mu0 <- 0 # mean under the null hypothesis  
  
reps <- 10000 # number of simulations  
  
## p-value approach:  
  
pvalues <- numeric(reps)

## Simulate Your Model and Record Your Result

set.seed(04192019)  
  
for (i in 1:reps) {  
 x <- rnorm(n, mu, sigma)  
 #Run your test for each repetition and record your p-value   
 pvalues[i] <- t.test(x, mu = mu0)$p.value  
}

The proportion of statistically significant effects is your *power*

mean(pvalues < 0.05)

## [1] 0.6623

1. As an aside I am simulating a normal model and testing with a t-test. We generally want to match the design with the analyses but sometimes this is not possible or desirable. A good example would be a cox model, with any design choice you would need to simulate a baseline hazard but you may still want the robustness of a cox model. For a sample size of 25 there won’t be a big differences between the t and normal. With larger samples sizes the difference wouldn’t be noticeable [↑](#footnote-ref-22)