

Simulation of Exponential Distribution

Anthony Cato

April 4, 2017

Overview

In this project, I am investigating how the exponential distribution compares with the Central Limit Theorem. I will create 1000 simulations to observe this distribution and leverage the base plotting package to view this exponential distribution.

Simulation

```
# Default lambda value for investigation will be 0.2
lambda <- 0.2
# Number of exponentials used for each simulation
n <- 40
# Number of simulations
B <- 1000

# Setting the seed to make project reproducible
set.seed(7919)

# Generates 40000 random exponential values
exponentials <- rexp(n * B, lambda)

# Creates matrix of exponential values
simulations <- matrix(exponentials, nrow = B)

# Converts matrix to a data.table and computes the mean for each column
means <- data.table(apply(simulations, 1, mean))
```

Sample Mean versus Theoretical Mean

```
theoreticalMean <- 1 / lambda
sampleMean <- mean(means$V1)

print(c(theoreticalMean, sampleMean))
```

```
## [1] 5.000000 5.019161
```

Sample Variance versus Theoretical Variance

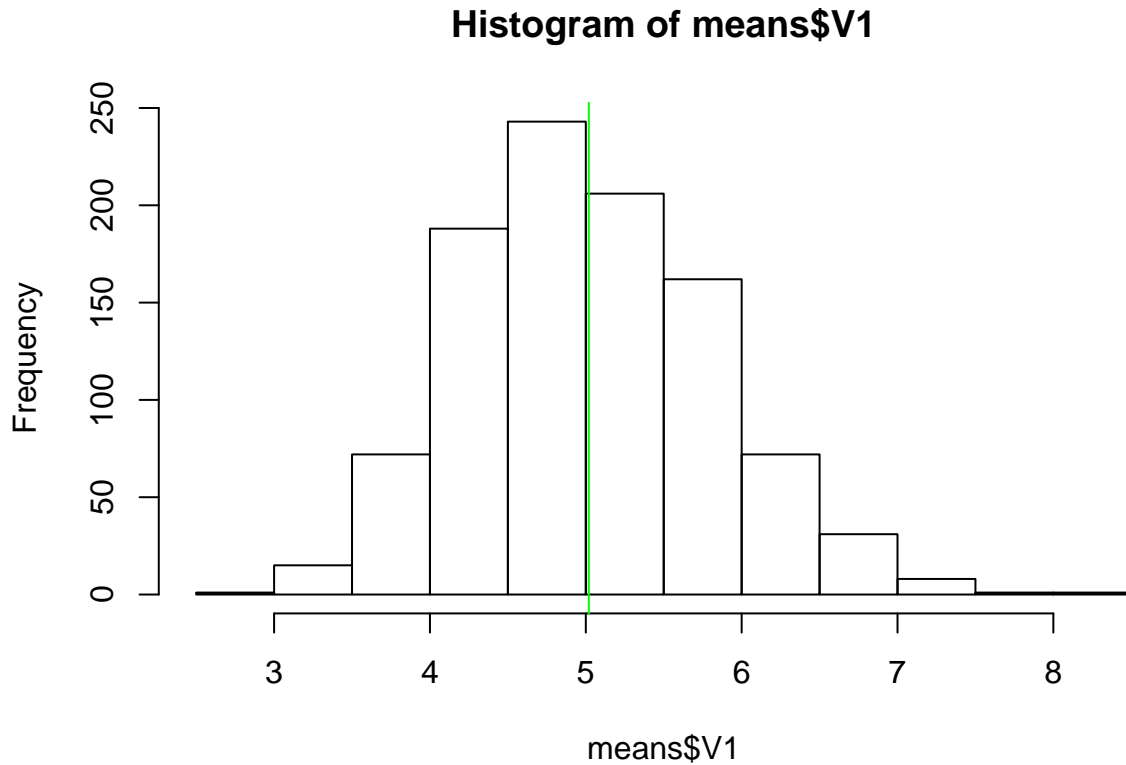
```
theoreticalVariance <- (1 / (lambda ^ 2)) / n
sampleVariance <- var(means$V1)

print(c(theoreticalVariance, sampleVariance))
```

```
## [1] 0.6250000 0.6390924
```

Distributions

```
# Plotting the distribution of the means  
hist(means$V1)  
# Drawing a line at x = sampleMean  
abline(v = sampleMean, col = "green")
```



Conclusion

A cursory look at the exponential distribution reveals that the average values are centered around the mean and resembles the normal distribution.