simulation

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Introduction

The purpose of this data analysis is to investigate the exponential distribution and compare it to the Central Limit Theorem. For this analysis, the lambda will be set to 0.2 for all of the simulations. This investigation will compare the distribution of averages of 40 exponentials over 1000 simulations.

Load library

```
library(tinytex)
```

```
## Warning: package 'tinytex' was built under R version 4.0.3
```

```
library(ggplot2)
```

```
## Warning: package 'ggplot2' was built under R version 4.0.3
```

Simulations

Set the simulation variables lambda, exponentials, and seed.

```
library(ggplot2)

set.seed(28) ##to ensure reproducibility, I am setting seed arbitrary on 28.

lambda <- 0.2
```

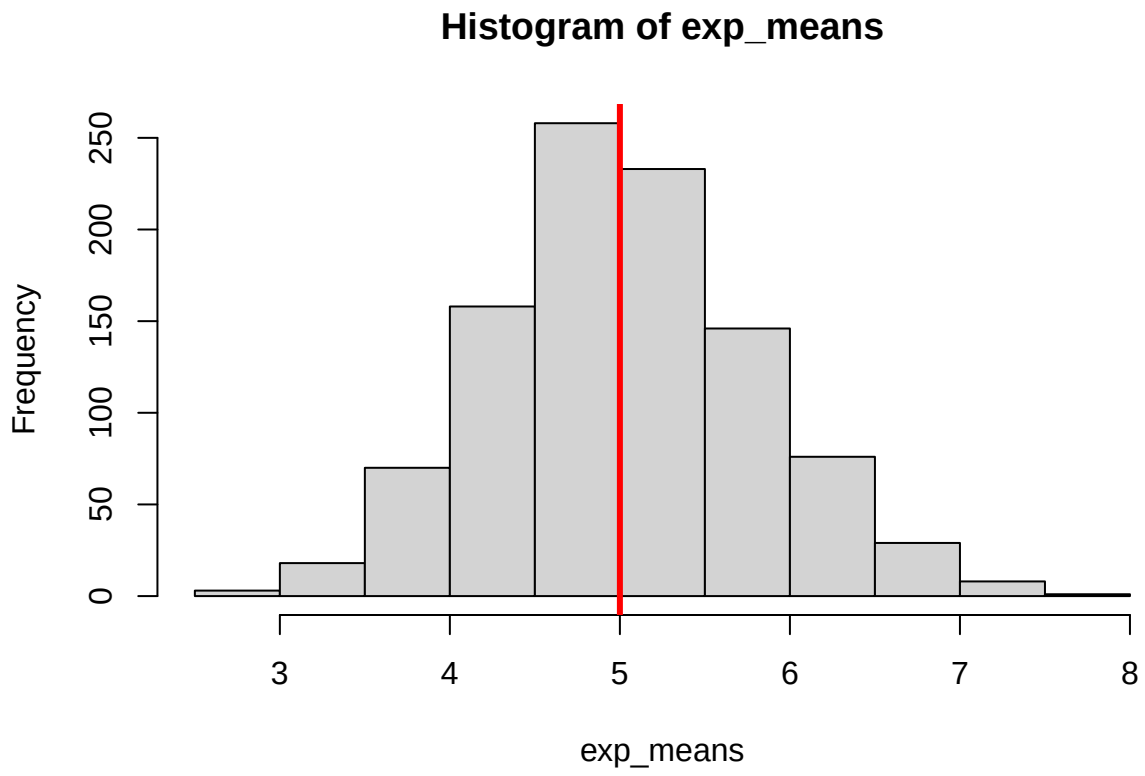
Run Simulations with variables

```
exp_means =NULL
for (i in 1 : 1000)
  exp_means = c(exp_means , mean(rexp(40, 0.2)))
```

Drowing histogram to show simple mean

Sample Mean Calculating the mean from the simulations with give the sample mean.

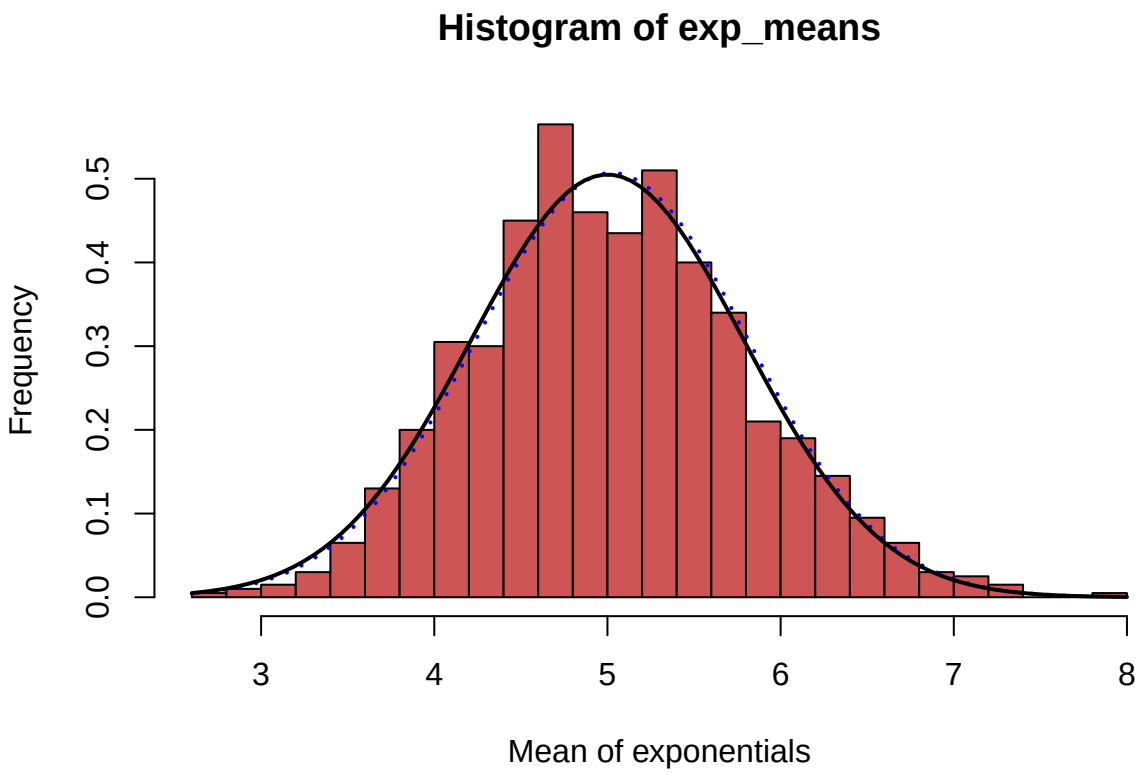
```r
hist(exp_means)

simMeanMean <- mean(exp_means)
# theoretical exponential mean
theMean <- 1/lambda

abline(v=theMean, col="red", lwd=3)
```



Gaussian distribution

Gaussian distribution compare with a normal distribution.

```r
hist(exp_means, breaks=20, prob=TRUE, xlab="Mean of exponentials", ylab="Frequency",
     col="IndianRed3")
curve(dnorm(x, mean=mean(exp_means), sd=sd(exp_means)), col="blue", lwd=2,
      lty = "dotted", add=TRUE, yaxt="n")
curve(dnorm(x, mean=5, sd=0.79), col="black", lwd=2, add=TRUE, yaxt="n")
```


Histogram of exp_means
Frequency
0.0
0.1
0.2
0.3
0.4
0.5
3
4
5
6
7
8
Mean of exponentials