Statistical inference course project

Shawvin

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Part 1: Simulation exercise

Overview

This Simulation exercise investigate the exponential distribution and compare it with Central Limit Theorem.The exponential distribution can be simulated in R as rexp(n,lambda). The mean and standard devitaion for the exponential distribution will be 1/lambda.

Simulations

We will set lambda=0.2 for the simulation.The sample will be averages of 40 exponentials for 1000 simulation.

```
set.seed(1234)
lambda<-0.2
mns<-NULL

#1000 simulations are run, and each simulation will calculate the mean of 40 random exponential and gen
for(i in 1:1000)
  mns<-c(mns,mean(rexp(40,lambda)))

#Sample Mean will be the mean of these 1000 sample means
#Sample Variance will be the variance of these 1000 sample means
Sample_Mean<-mean(mns)
Sample_Var<-var(mns)

#Theoretical Mean and Theoretical Variance are 1/lambda and 1/(lambda^2*n) respectivly
Theoretical_Mean<-1/lambda
Theoretical_Var<-1/(lambda^2*40)
```
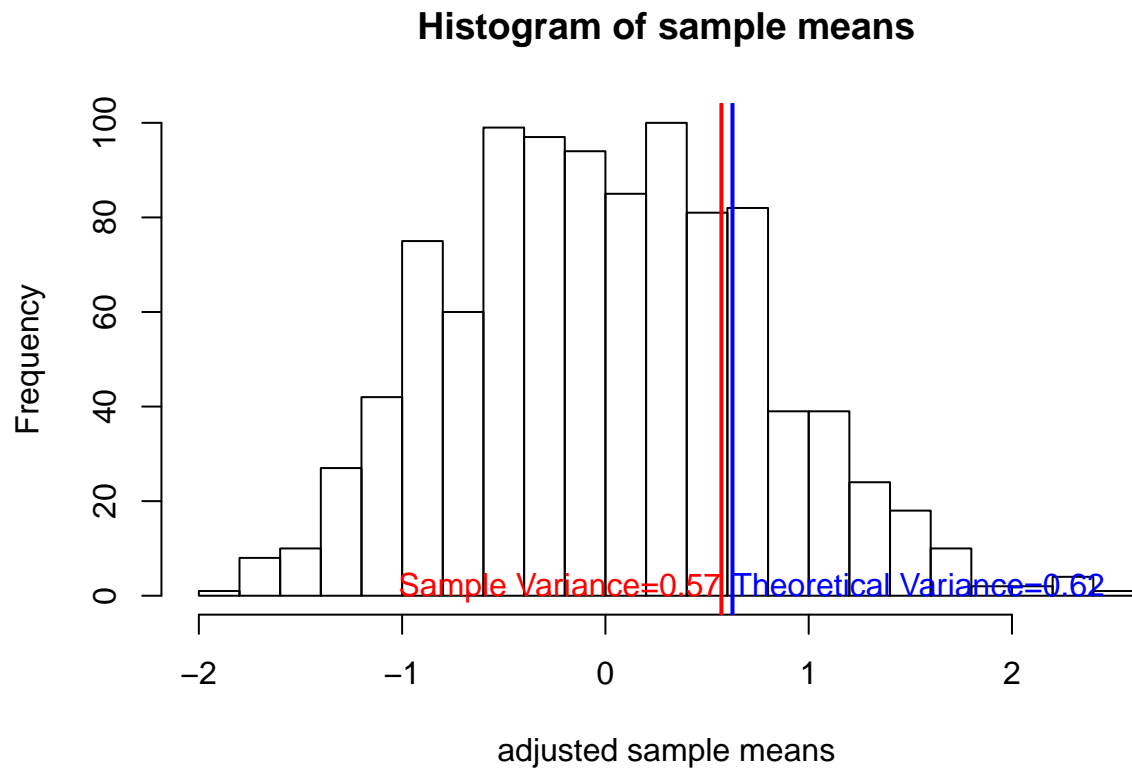
Histogram of sample means
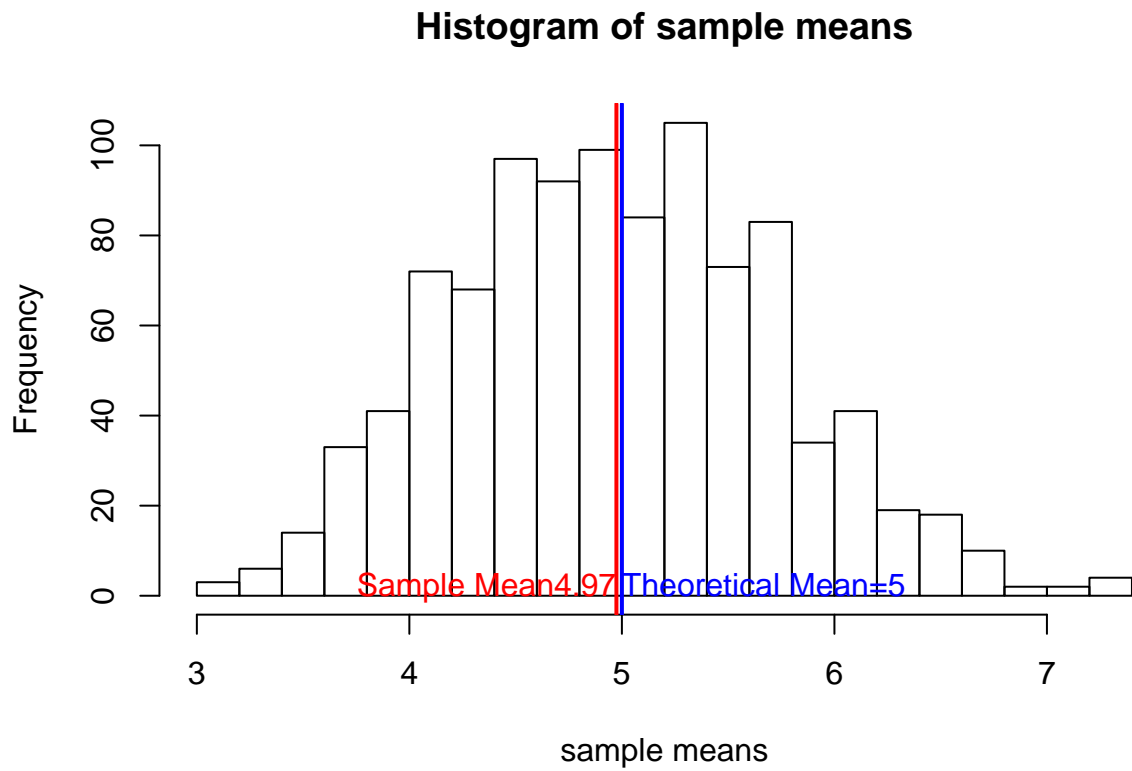
The histogram of 1000 sample means is plotted and the mean of these 1000 sample means is used as Sample Mean. In the plot, redline denotes the Sample Mean and the blue line denotes the Theoretical Mean. Their value are 4.9742388 and 5

Histogram of sample means

The histogram of 1000 sample means is plotted.Sample Variance is the variance of these 1000 sample means.For comparing the variance more esaily, the Sample Mean of these 1000 average is shifted to 0 by minusing Sample Mean from each sample mean.

In the plot, redline denotes the sample variance and the blue line denotes the theoretical variance. Their value are 0.5706551 and 0.625

Distribution

Histogram of normalized sample means
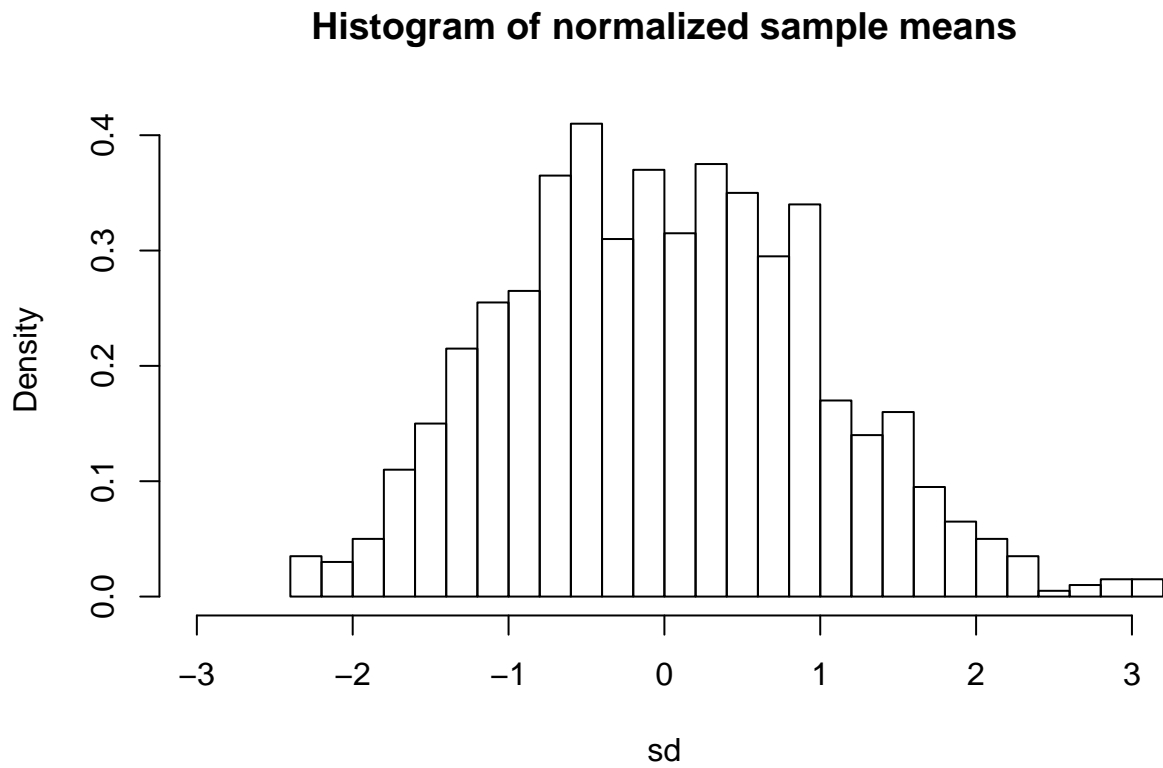

```
##    sd cum probability of Sample Mean distribution
## 1 -3                                        0.000
## 2 -2                                        0.013
## 3 -1                                        0.169
## 4  0                                        0.513
## 5  1                                        0.848
## 6  2                                        0.974
## 7  3                                        0.997
##   cum probability of normal distribution
## 1                             0.001349898
## 2                             0.022750132
## 3                             0.158655254
## 4                             0.500000000
## 5                             0.841344746
## 6                             0.977249868
## 7                             0.998650102
```

These 1000 sample means are normlized and plotted.The probabily is compared to normal distribution.