Simulation Exercise : Statistical Inference

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August 30, 2017

Overview

In this project we will investigate the exponential distribution in R and compare it with the Central Limit Theorem. The mean of exponential distribution is 1/lambda and the standard deviation is also 1/lambda. We will use lambda = 0.2 for all of the simulations. We will investigate the distribution of averages of 40 exponentials and that we will need to do a thousand simulations.

Simulations

```
set.seed(12345)
lambda<-0.2
simulations<-1000
n<-40
sampledata<-NULL
for(i in 1:1000){
  sampledata<-c(sampledata,mean(rexp(n,lambda)))
}
```

Sample Mean versus Theoretical Mean

```
sampleMean<-mean(sampledata)

TheorMean<-1/lambda

table(sampleMean,TheorMean)
```

```
##                   TheorMean
## sampleMean         5
##   4.97197196424051 1
```

Sample Variance versus Theoretical Variance

```
sampleVariance<-var(sampledata)

TheorVar<-1/(lambda*sqrt(n))^2

table(sampleVariance,TheorVar)
```

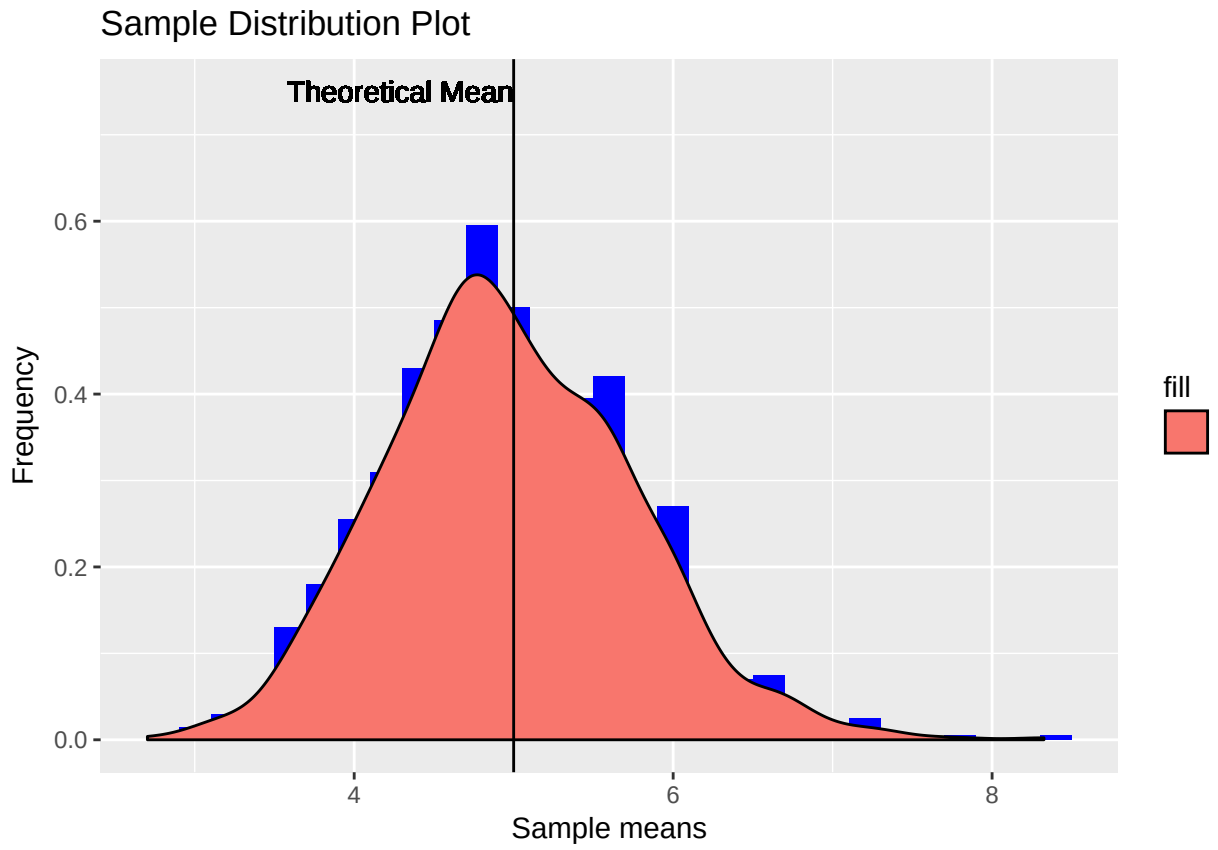
```
##                    TheorVar
## sampleVariance      0.625
##   0.595436904765261     1
```

Distribution

```
library(ggplot2)
sampledata<-as.data.frame(sampledata)

ggplot(sampledata,aes(x=sampledata,y=..density..))+geom_histogram(binwidth = lambda, fill="blue") + geo
labs(title="Sample Distribution Plot",x="Sample means",y="Frequency")+
geom_vline(xintercept=TheorMean)+
geom_text(aes(x=TheorMean,y=.75),label="Theoretical Mean",hjust=1)
```

```
## Warning: Ignoring unknown parameters: method
```



Conclusion

On plotting the simulated means along with theoretical mean, we can easily figure out that the simulated mean is very close to theoretical mean. The distribution takes the shape as of a bell around the sample mean and hence that of a normal distribution.