Peer-graded Assignment: Statistical Inference Course ProjectPart 1

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Peer-graded Assignment: Statistical Inference Course Project

The project consists of two parts:

1. A simulation exercise.
2. Basic inferential data analysis.

Part 1: Simulation Excercise :

In this project you will investigate the exponential distribution in R and compare it with the Central Limit Theorem. The exponential distribution can be simulated in R with rexp(n, lambda) where lambda is the rate parameter. The mean of exponential distribution is 1/lambda and the standard deviation is also 1/lambda. Set lambda = 0.2 for all of the simulations. You will investigate the distribution of averages of 40 exponentials. Note that you will need to do a thousand simulations.

Show the sample mean and compare it to the theoretical mean of the distribution.

Theoretical Mean of distribution is 1/ lambda if lmabda is 0.2, the theoretical mean is 5

```
set.seed(150)
lambda = 0.2
n = 40 #number of exponentials
n_simulations =1000

exp_mean = NULL
for(i in 1:n_simulations){
  exp_mean = c(exp_mean,mean(rexp(n,lambda)))
}
mean(exp_mean)

## [1] 5.00215
```

Result indicate that the mean of 40 exponentials for 10000 simulations is close to the theoretical mean of 5.

Show how variable the sample is (via variance) and compare it to the theoretical variance of the distribution.

The theoretical standart deviation is 1/lambda/sqrt(n) if, lamda is 0.2, the standart deviations is 5 and theoretical variance is 0.79

```
theo_variance <- (1/lambda/sqrt(n))^2
variance_exp <- var(exp_mean)
variance_exp

## [1] 0.6498806

theo_variance

## [1] 0.625
```

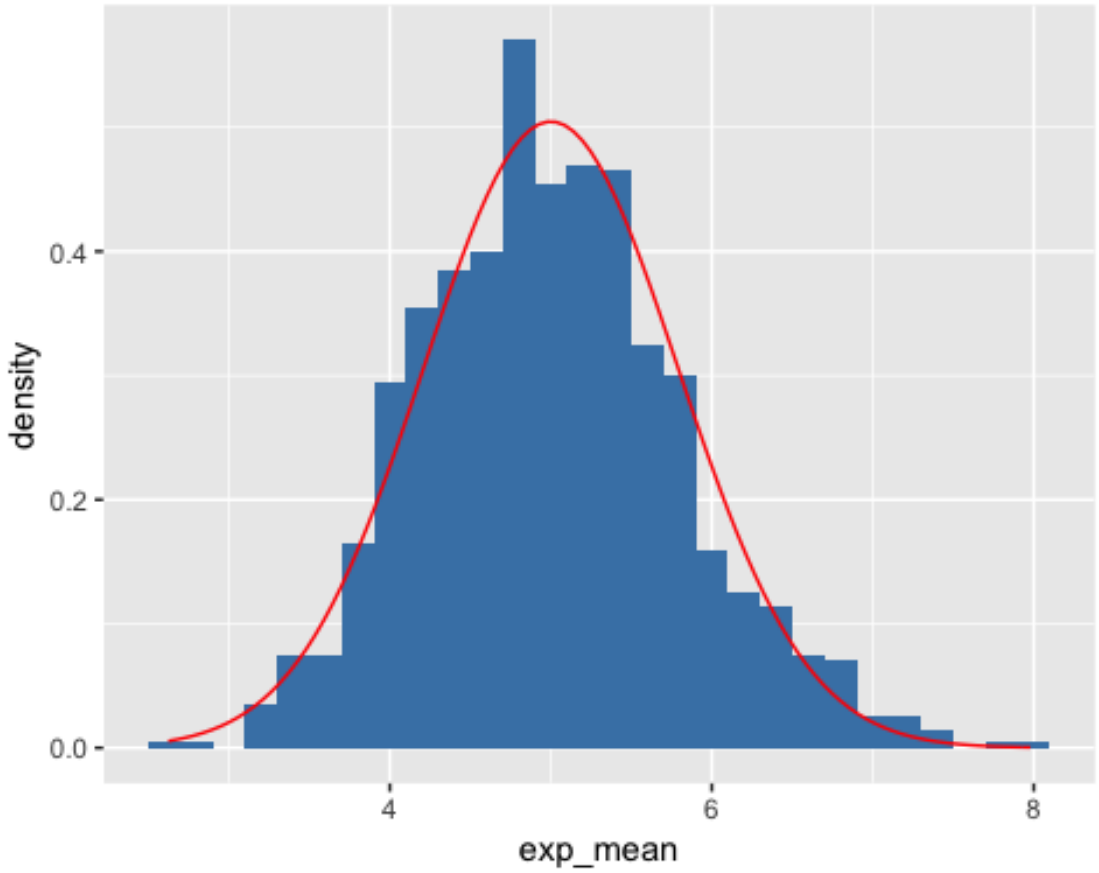
In this case the simulation is a little further.

Show that the distribution is approximately normal.

To probe normality the exp_mean could be plotted in a histrogram

```
library(ggplot2)

data <- data.frame(exp_mean,n)
ggplot(data = data,aes(exp_mean))+
  geom_histogram(aes(y=..density..),fill = "steelBlue",binwidth = 0.2)+
  stat_function(fun = dnorm,args=
list(mean=1/lambda,sd=1/lambda/sqrt(40)),color ="red")
```


density
0.4
0.2
0.0
4
6
8
exp_mean