Statistical Inference- Exponential Distribution

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Summary

The project consists from simulation of data and take a inferential data analysis. ##Task request 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.

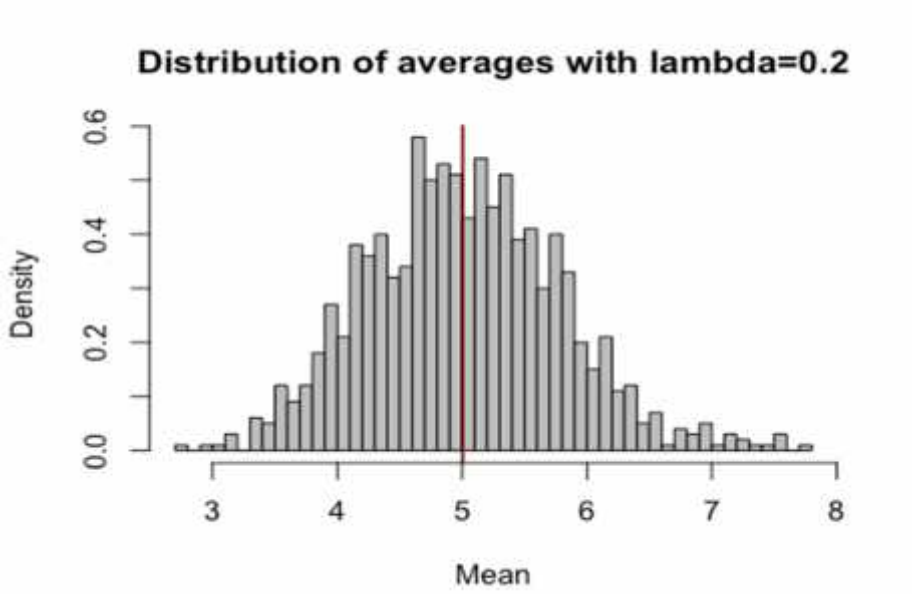
```
# put a seed for generate same data all times
set.seed(123)
# lambda request is 0.2
lambda <- 0.2
#simulation number request is 1000
simulation <- 1000
#exponential number
data <- 40
#generate a data
simulation_data <- matrix(rexp(simulation*data, rate=lambda), simulation,
data)
#take a mean information from each row
rM <- rowMeans(simulation_data)
```

Question 1

Show the sample mean and compare it to the theoretical mean of the distribution. Result: The simulated mean is 5.011911 versus theoretical mean that is 5

```
#mean distribution calculated
mean_cal<-mean(rM)

## [1]

#mean distribution theorical
mean_th<- 1/lambda

## [1] 5

# histogram of averages
hist(rM, prob=TRUE,main="Distribution of averages with lambda=0.2",
breaks=50, xlab="Mean",col="gray")
#add a plot
```

```
abline(v=mean_cal, col="red")
abline(v=mean_th, col="black")
```



Question 2

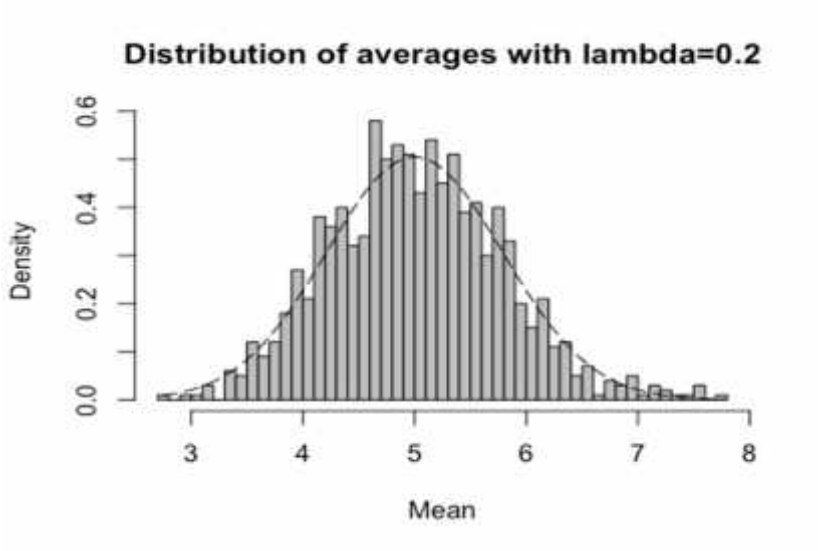
Show how variable the sample is (via variance) and compare it to the theoretical variance of the distribution. Result: The simulated variance is 0.6088292 versus theorical variance from 0.625.

```
#standard deviation
sd<-sd(rM)

## [1] 0.7802751

#variance
variance<-sd^2

## [1] 0.6088292

#standard deviation from theorical exp
sd_th<-(1/lambda)/sqrt(data)

## [1] 0.7905694

#variance from theorical exp
variance_th<-sd_th^2
## [1] 0.625
```

Question 3

Show that the distribution is approximately normal. Result: We can see in the plots that distribution looks like a normal distribution. Either normal distribution as Normal plot confirm.

```
#theorical normal distribution to plot
m<-1/lambda
sd<-1/lambda/sqrt(data)
xfit <- seq(min(rM), max(rM), length = 100)
yfit <- dnorm(xfit, mean =m , sd =sd )
# histogram of distribution
hist(rM, prob=TRUE,main="Distribution of averages with lambda=0.2",
breaks=data, xlab="Mean",col="gray")
lines(xfit, yfit, lty=5)
```




```
#compare two distributions for demostrate similitutes
qqnorm(rM)
#adline for mean
qqline(rM, col = 2)
```