

Statistical Inference Course Project Part 1

Muhammad Ali Shaaban

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Peer Graded Assignment: Statistical Inference Course Project

Instructions

The project consists of two parts:

- A simulation exercise.
- Basic inferential data analysis.

Part 1: Simulation Exercise Instructions

Overview

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.

Question 1 : Show the sample mean and compare it to the theoretical mean distribution

```
n <- 40
Simulations <- 1000
Lambda <- 0.2

SampleMean <- NULL
for(i in 1:Simulations) {
  SampleMean <- c(SampleMean, mean(rexp(n, Lambda)))
}
mean(SampleMean)

## [1] 4.978479
```

So, as we can see, compared to the theoretical mean distribution of 5 , our mean 5 is close.

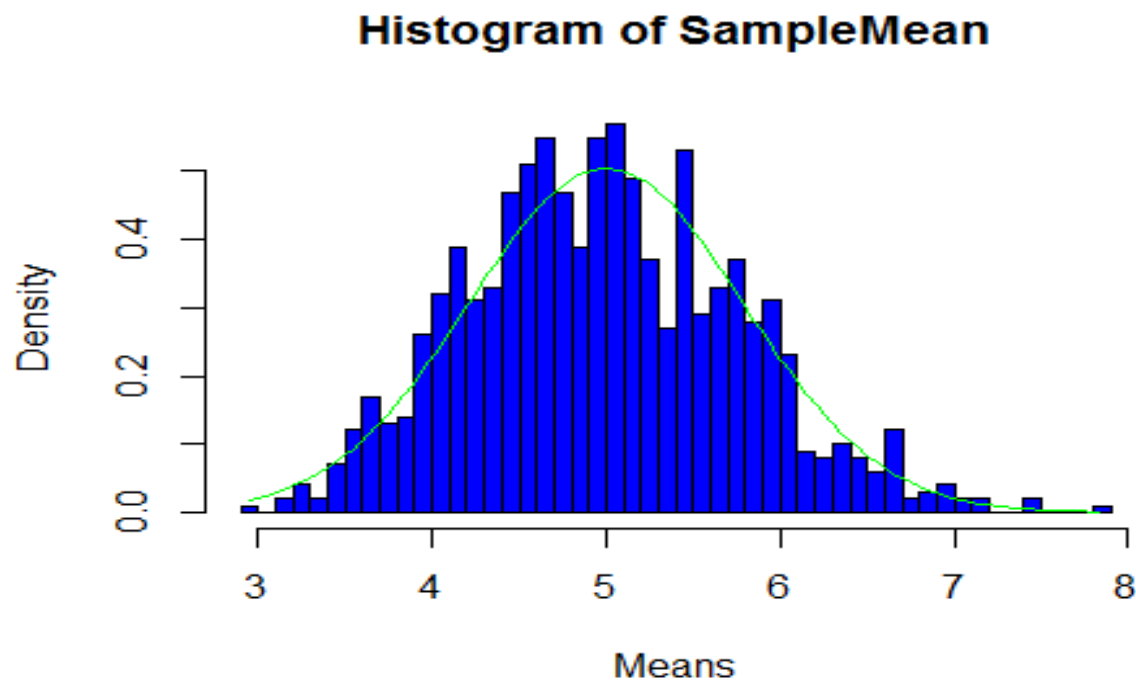
Question 2: Show the sample is (via variance) and compare it to the theoretical variance of the distribution.

The theoretical standard deviation of the distribution is also $1/\lambda$, which, for a λ of 0.2, equates to 5. The variance is the square of the standard deviation, which is 25.

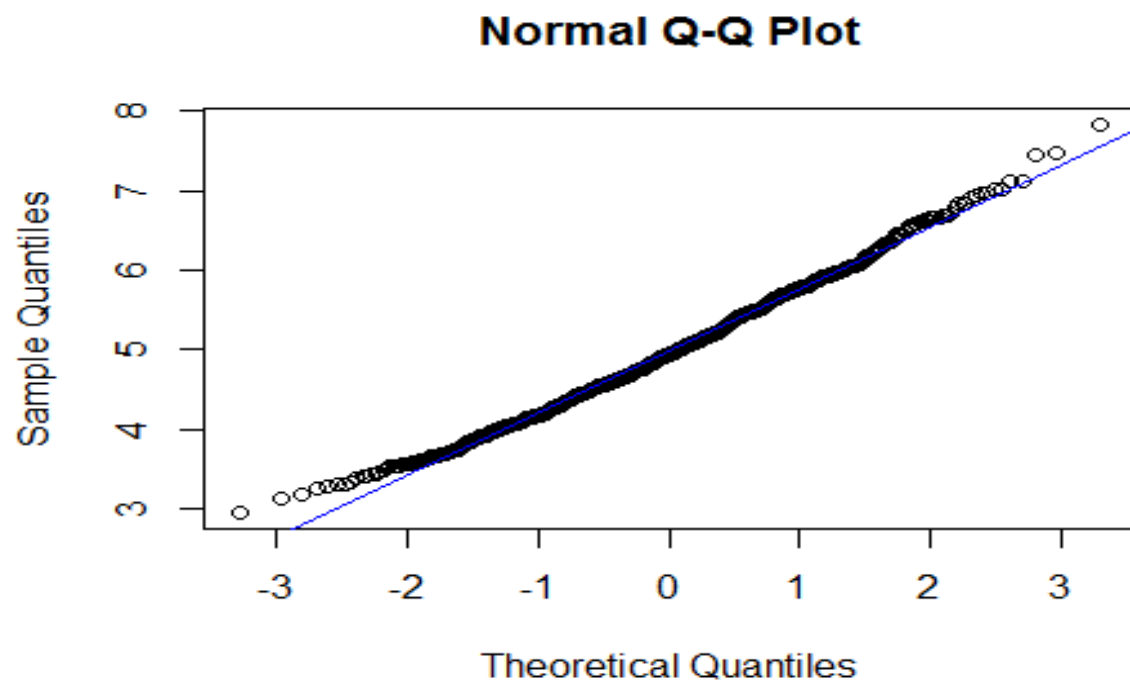
0.6 is close to the theoretical distribution.

Show that the distribution is approximately normal

```
hist(SampleMean, breaks = n, prob = T, col = "blue", xlab = "Means")
x <- seq(min(SampleMean), max(SampleMean), length = 100)
lines(x, dnorm(x, mean = 1/Lambda, sd = (1/Lambda/sqrt(n))), pch = 25, col = "green")
```



```
qqnorm(SampleMean)
qqline(SampleMean, col = "blue")
```



The distribution averages of 40 exponentials is very close to a normal distribution