

Statistical Inference Course Project

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Requirements

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.

Illustrate via simulation and associated explanatory text the properties of the distribution of the mean of 40 exponentials. You should

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

Extract 1000 means of samples from 40 random exponentials

```
exp<-NULL
for(i in 1:1000) exp<-c(exp, mean(rexp(n=40, rate=0.2)))
```

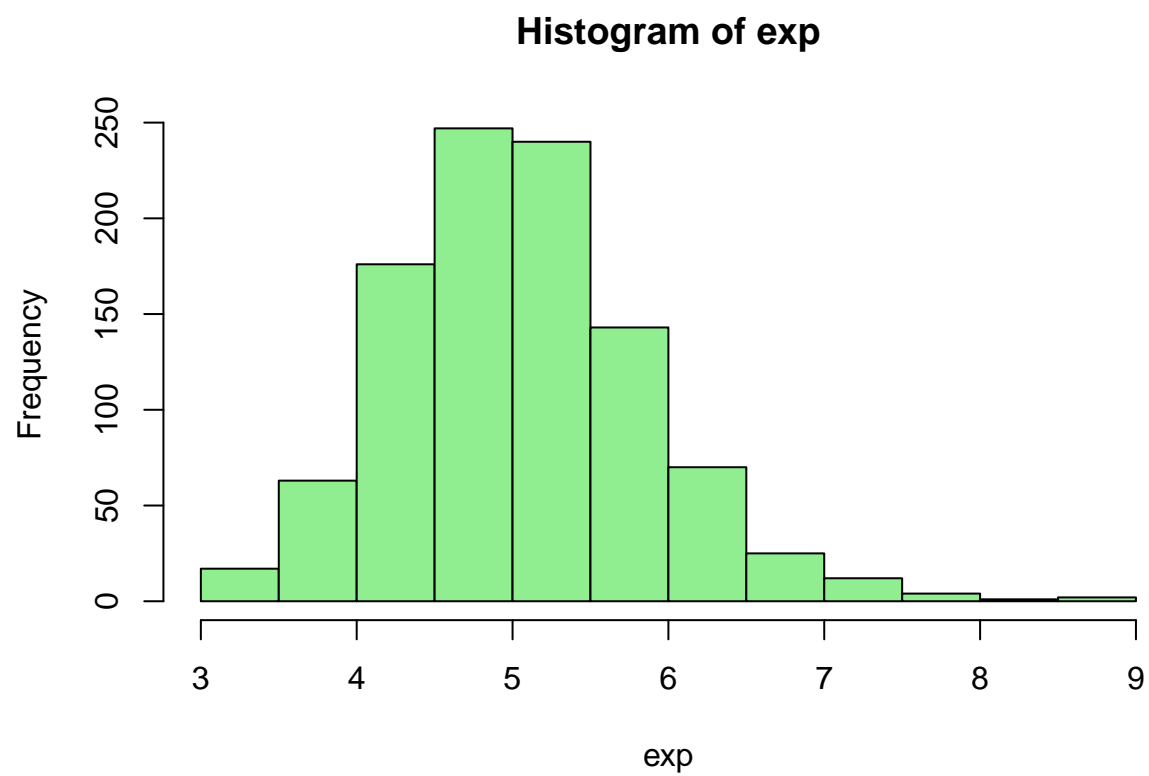
Compare the sample mean to the theoretical mean of the distribution. The sample mean is `{r echo=F}mean(exp)`, which is close to the theoretical mean `{r echo=F}1/0.2`.

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

The variance of the sample is `{r echo=F}sd(exp)`, and the theoretical variance of the distribution is `{r echo=F}1/0.2`

3. Show that the distribution is approximately normal.

```
hist(exp, col="lightgreen")
```



use Q-Q plot to see if the distribution is normal:

```
qqnorm(exp)
qqline(exp, col="red", lwd=2)
```

Normal Q-Q Plot

