A Simulation for Exponential Distribution

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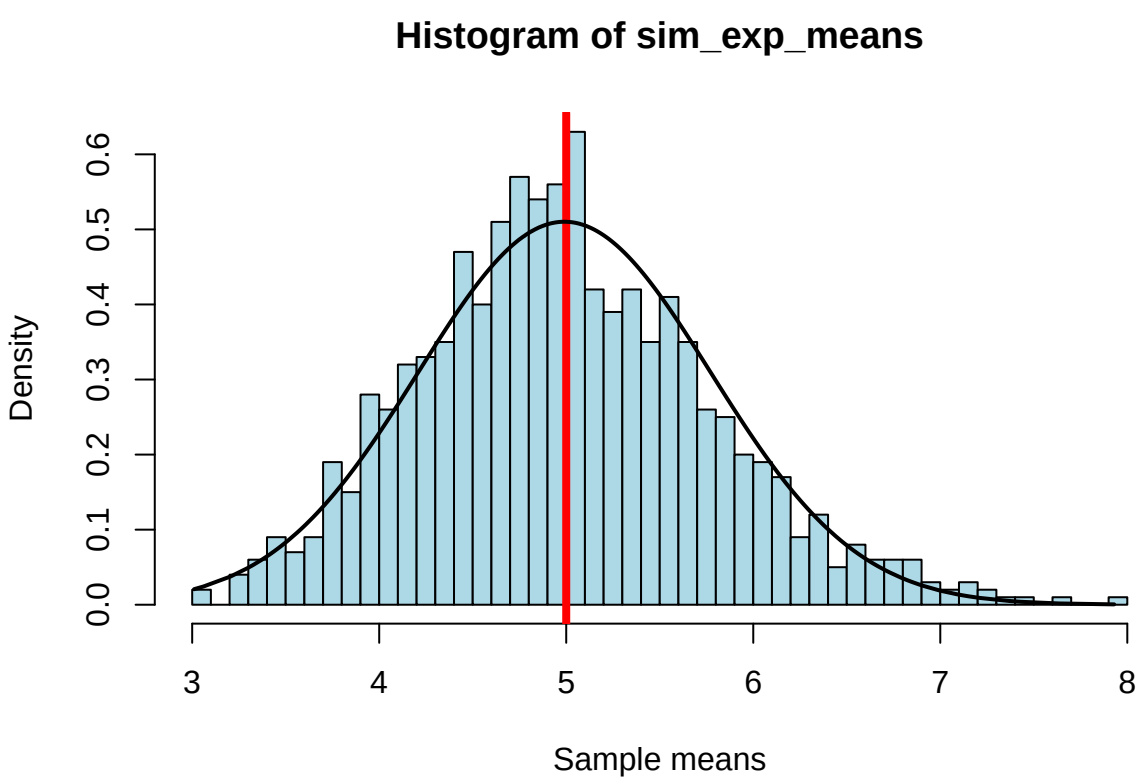
In this project you will investigate the exponential distribution in R and compare it with the Central Limit Theorem. We investigate the distribution of averages of 40 exponentials of a thousand simulations.

```
set.seed(10302)
sim_exp_means = NULL
for (i in 1 : 1000) sim_exp_means = c(sim_exp_means, mean(rexp(40, 0.2)))
```

```
x1<-sort(sim_exp_means)
y1<- dnorm(x1, mean=mean(sim_exp_means), sd=sd(sim_exp_means))

hist(sim_exp_means,freq=FALSE,col="lightblue",breaks=40, xlab="Sample means")
abline(v=5.0,col="red",lwd=4)
lines(x1,y1,type="l",lwd=2)
```



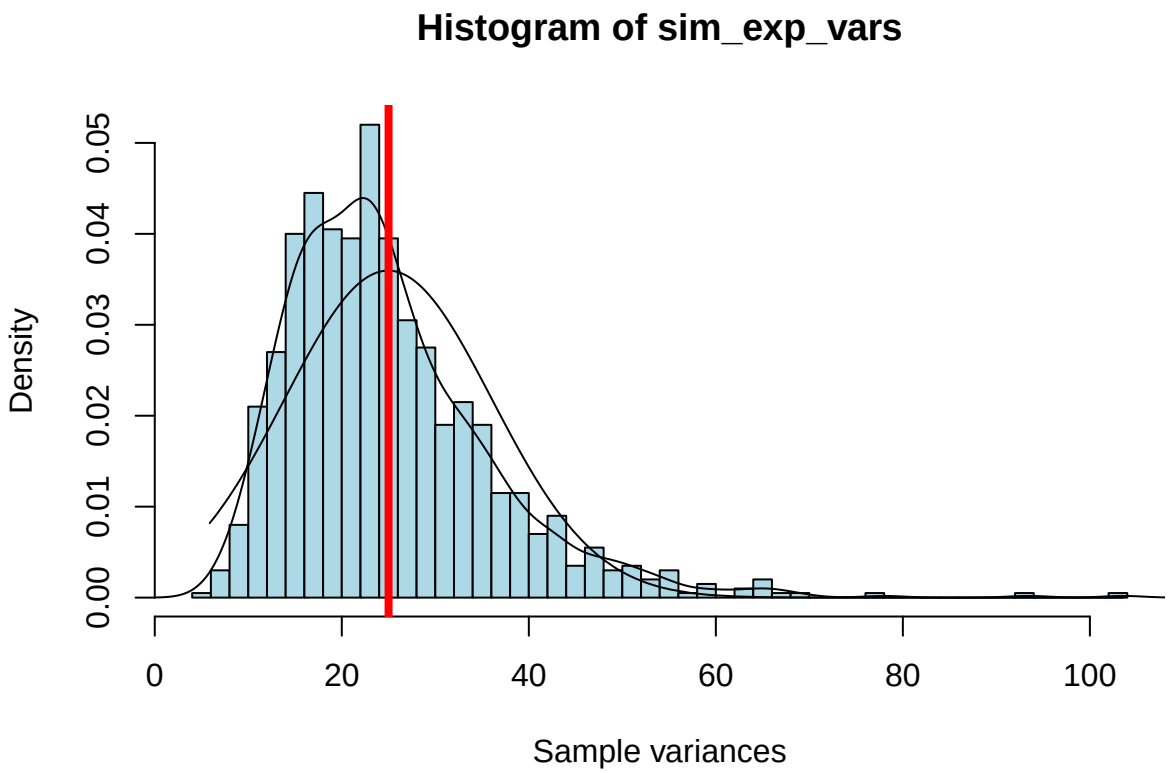

```
sim_exp_mean <- mean(sim_exp_means)
sim_exp_mean
```

```
## [1] 4.990325
```

The average of mean value from my simulation is 4.990325. The theoretical mean value is 1/gamma, i.e. 5 here.

```
set.seed(10302)
sim_exp_vars = NULL
for (i in 1 : 1000) sim_exp_vars = c(sim_exp_vars, var(rexp(40, 0.2)))
x2<-sort(sim_exp_vars)
y2<- dnorm(x2, mean=mean(sim_exp_vars), sd=sd(sim_exp_vars))
data_var_norm <- cbind(x2,y2)

hist(sim_exp_vars,freq=FALSE,breaks=40,col="lightblue",xlab="Sample variances")
lines(x2,y2)
lines(density(sim_exp_vars))
abline(v=25.0,col="red", lwd=4 )
```

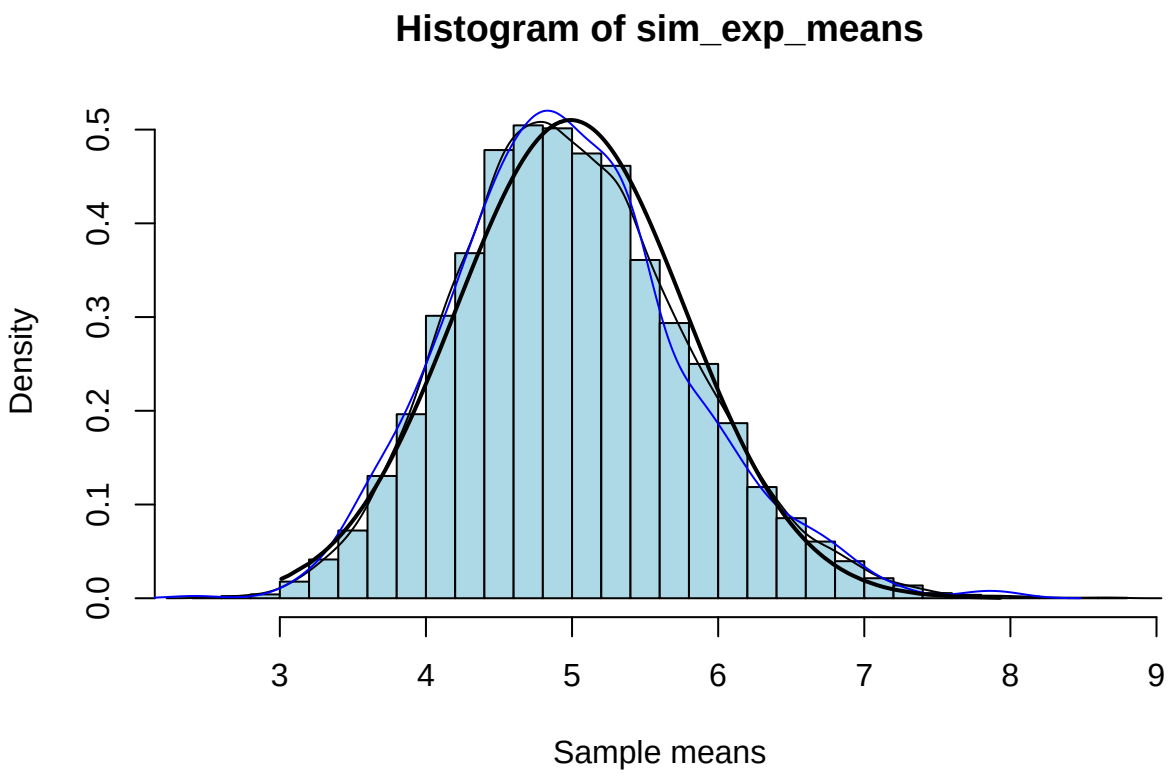



```
mean(sim_exp_vars)
```

```
## [1] 24.96423
```

The average of variations is 24.96423, the theoretical varience is 1/gamma^2, 25.

```
for (i in 1 : 10000) sim_exp_means = c(sim_exp_means, mean(rexp(40, 0.2)))
fit<-density(sim_exp_means)
yy <- rnorm(1000, sample(sim_exp_means, size = 1000, replace = TRUE), fit$bw)
hist(sim_exp_means,freq=FALSE,col="lightblue",breaks=40, xlab="Sample means")
lines(fit)
lines(density(yy), col = "blue")
lines(x1,y1,type="l",lwd=2)
```


Histogram of sim_exp_means
Density
0.0
0.1
0.2
0.3
0.4
0.5
3
4
5
6
7
8
9
Sample means