Statistical Inference Course Project. Part 1

Pedro Villalba

12 de junio de 2018

A simulation exercise: the exponential distribution

In this project the exponential distribution is compared with the Central Limit Theorem. First, 1000 simulations are performed with 40 exponentials in each simulation. The parameter lambda will be set to 0.2 for all of the simulations.

```
lambda <- 0.2
nexp <- 40
nsim <- 1000
vmeans <- c()
# Perform the simulations
for (i in 1:nsim){
    vmeans <- c(vmeans,mean(rexp(nexp, lambda)))
}
```

Sample mean

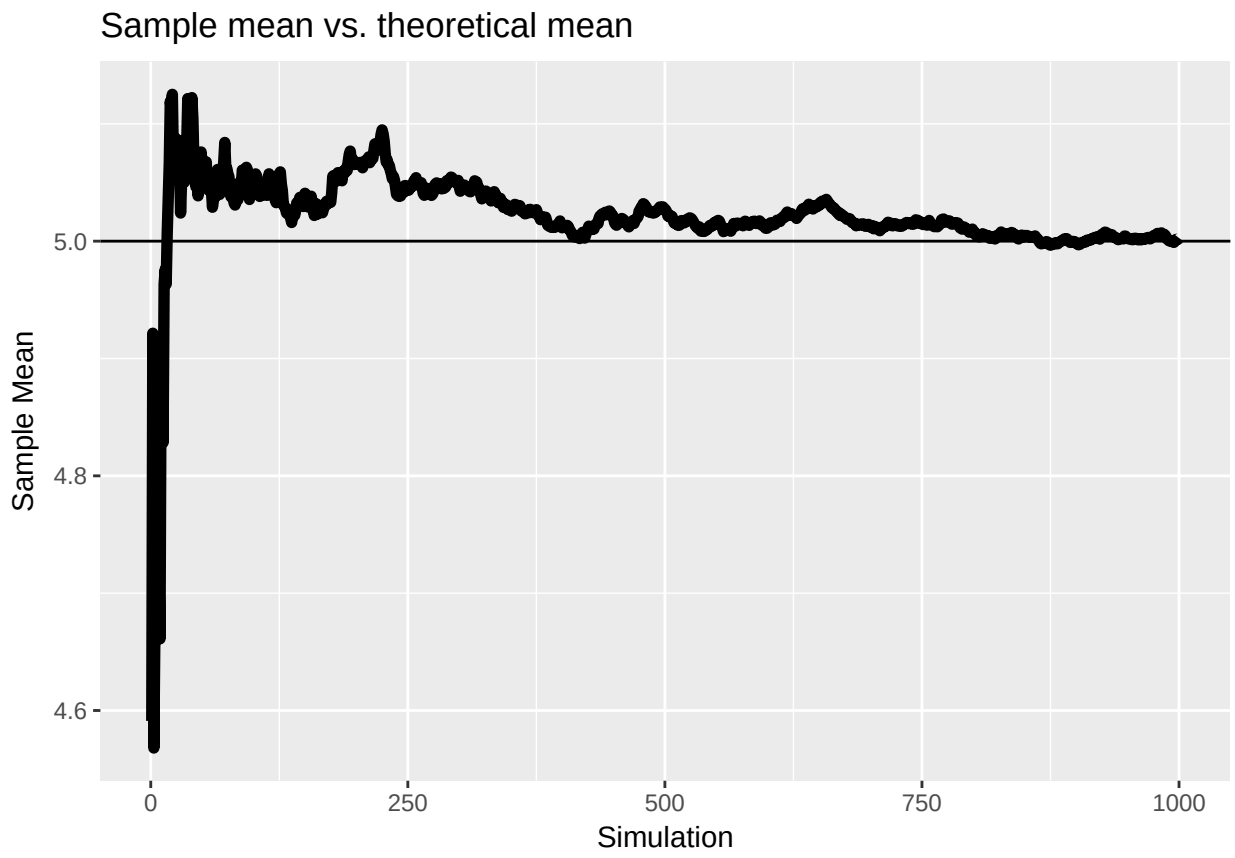
Compute the cumulated mean for each simulation.

The mean after 1000 simulations is ...

```
## [1] "Mean after 1000 simulations: 5.00273529371625"
```

... which is very close to the theoretical mean of the exponential distribution which is 1/lambda = 5.

The following plot shows the evolution of the cumulated mean for every simulation. We can see how it converges to the theoretical mean.



Variance

The variance of the sample means is ...

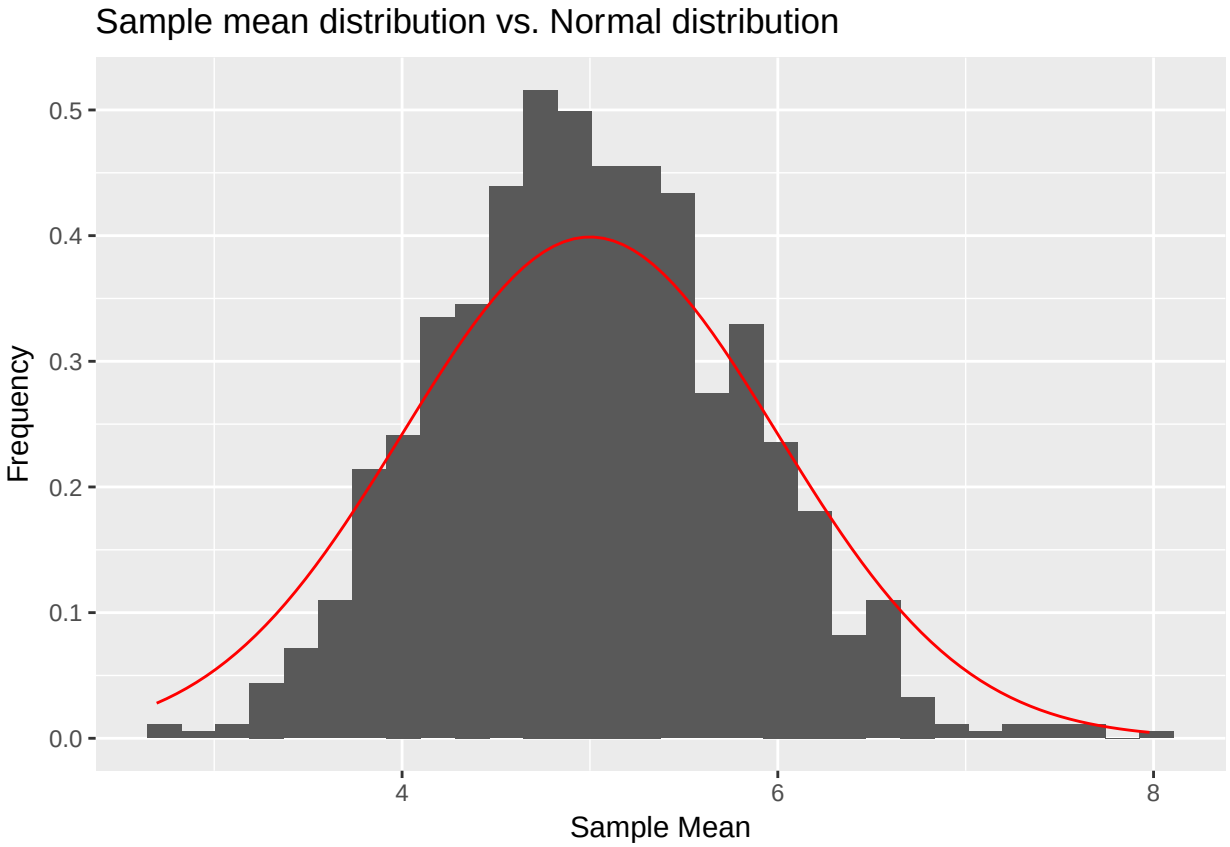
```
## [1] "Variance after 1000 simulations: 25.0454646088261"
```

... which close to the theoretical variance of exponential distribution which is (1/lambda)^2, that is, 25.

Distribution of means

The following plot shows the histogram of sample means and compares it to the normal distribution.

```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```


Sample mean distribution vs. Normal distribution
Frequency
0.5
0.4
0.3
0.2
0.1
0.0
4
6
8
Sample Mean