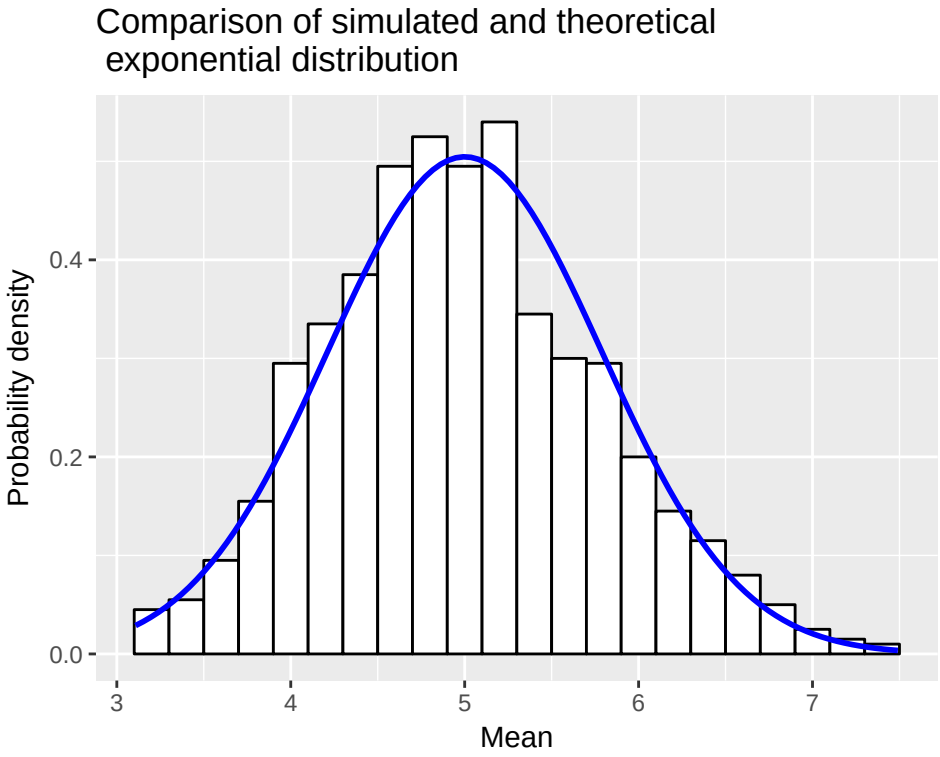
Course_Project_IS_part1

We theoretical mean and standard deviation, respectively, of the exponential distribution are 1/lambda. These are to be compared to simulated values for a distribution of 1000 averages of 40 random exponentials:

```
set.seed(1)

averages = 1000
n = 40
lambda = 0.2

mns = NULL
for (i in 1 : 1000) mns = c(mns, mean(rexp(n, lambda)))

# normalize means
# mns = mns/n

sim_mean = mean(mns)
expected_mean = 1/lambda

var_mns = var(mns)
```

1. The sample mean is 4.99 and the theoretical mean is 5.
2. The sample variance is 0.611 and the theoretical variance is 0.625.
3. The means are normally distributed, see figure below.

```
g = ggplot(data.frame(y = mns), aes(x = y)) +
    geom_histogram(aes(y = ..density..), binwidth = 0.2,
                   color = "black", fill = "white") +
    stat_function(fun = dnorm, geom = "line",
            args = list(mean = 1/lambda,
            sd = 1/(lambda*sqrt(n))),
            size = 1, col = "blue") +
    ylab("Probability density") +
    xlab("Mean") +
    ggtitle("Comparison of simulated and theoretical\n exponential distribution")
g
```


Comparison of simulated and theoretical
exponential distribution
Probability density
0.4
0.2
0.0
3
4
5
6
7
Mean