Statistical Inference Course Project

Maciej Gielnik

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Overwiew

In this project for Statistical Inference course I will report my results of exponential distribution simulation and basic inferential data analysis of the tooth growth in Guinea Pigs supplemented with a vitamin C.

Part 1: Simulation Exercise Instructions

I simulate the exponential distribution with 40 observations and lambda = 0.2. Then I calculate the mean of the distribution and the variance of the distribution. I store means in means variable and variance in variance variable. I repeat that process 1000 times.

```
means <- NULL
variance <- NULL
for (i in 1:1000) {
    means <- c(means,  mean (rexp(40, rate = 0.2)))
    variance <- c (variance, var(rexp(40, rate = 0.2)))
}
```

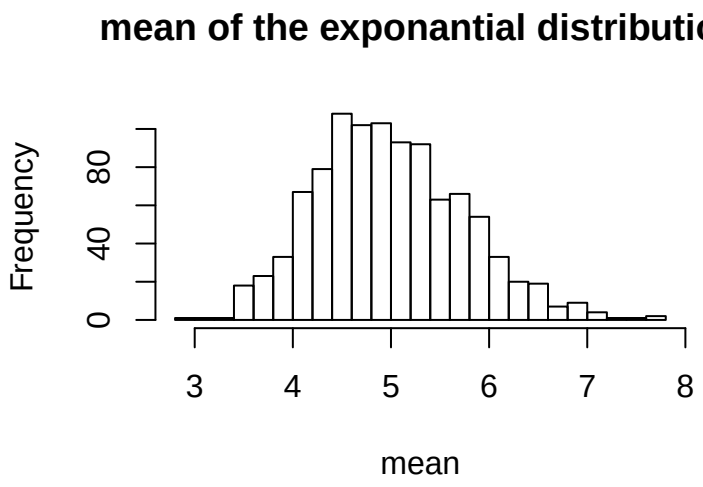
For the exponential distribution

$$mean = 1/lambda$$

Therefore with lambda = 0.2 mean od this distribution should be equal to 5.

I make a histogram of means and calculate the mean

```
hist(means, xlab = "mean", main = "mean of the exponantial distribution", breaks = 20)
```




```
mean(means)
```

```
## [1] 4.985876
```

Calculated mean is very close to 5.

Also for the exponential distribution

$$standard_{deviation} = 1/lambda$$

And

$$variance = (standard_{deviation})^2$$

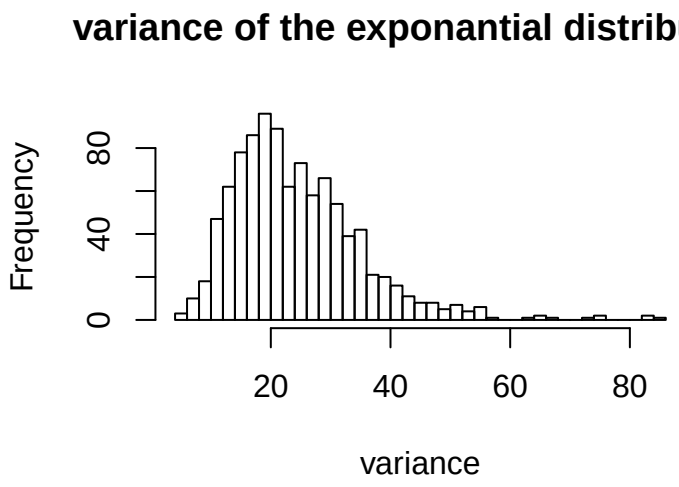
Therefore:

$$variance = (1/lambda)^2$$

With lambda = 0.2 variance have to be equal to 25.

I make a histogram of variance and calculate the variance

```
hist(variance, xlab = "variance", main = "variance of the exponantial distribution", breaks = 50)
```



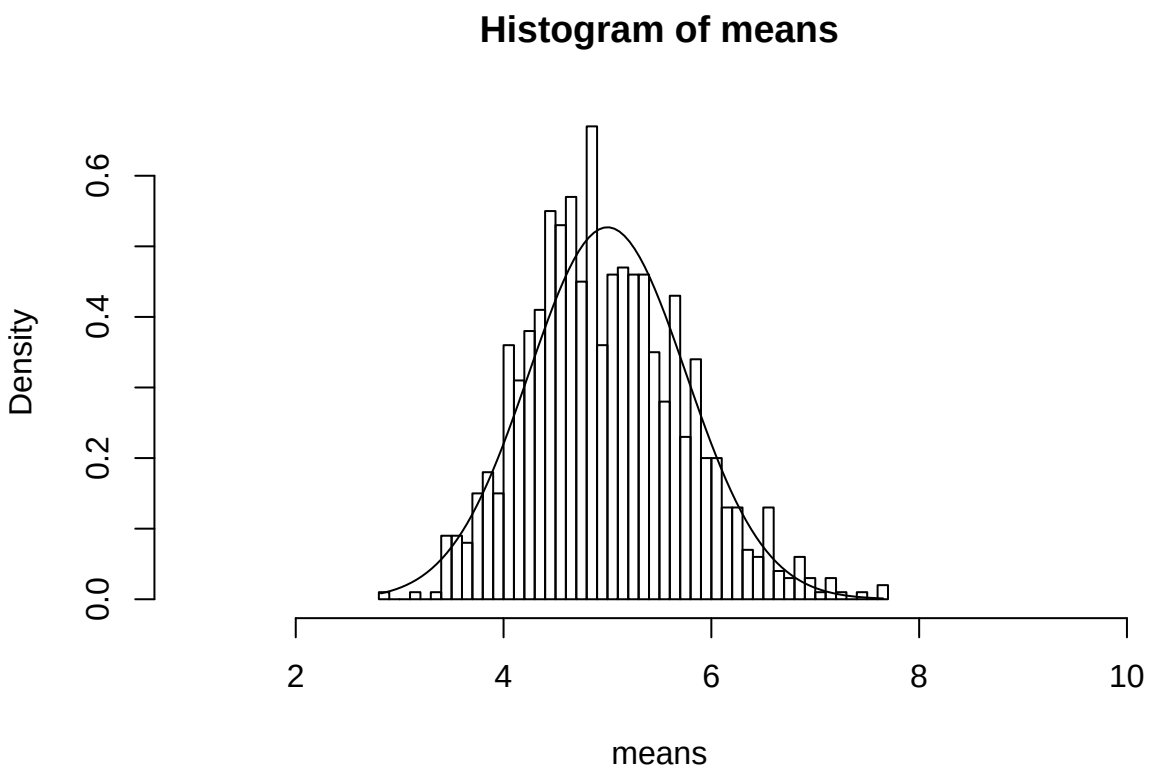

```
mean(variance)
```

```
## [1] 24.43374
```

Calculated variance is close to 25.

The histogram distribution of means was changed to a density. A normal distribution with mean of 5 and sigma = sd (means) was drawn with a line. The distribution is approximately normal.

```
hist(means, breaks = 50, freq = FALSE, xlim = c(1, 10))
x <- seq(min(means), max(means), length = 100)
y <- dnorm(x, 5, sd = sd(means))
lines(x, y)
```


Histogram of means
Density
0.0
0.2
0.4
0.6
2
4
6
8
10
means