Exponential Distribution

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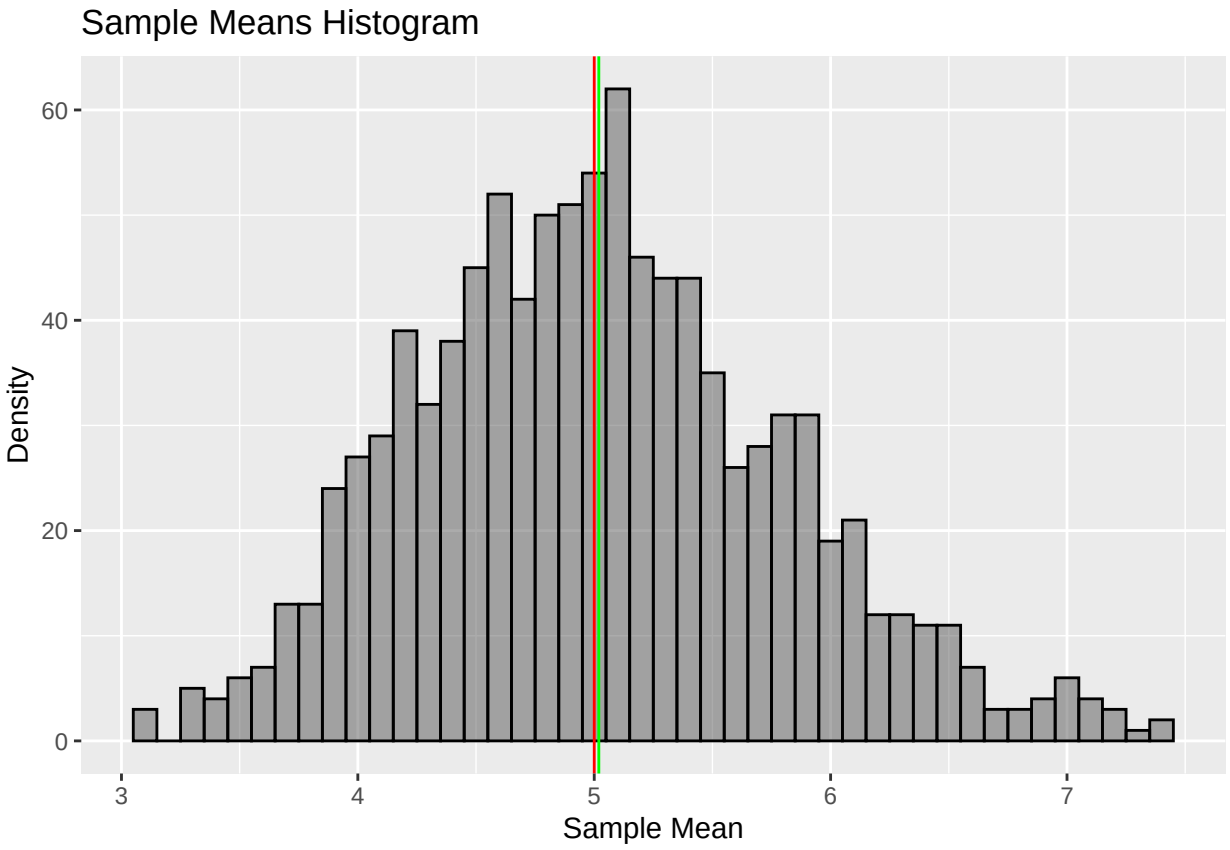
12/29/2020

We have 40 observations with exponential distribution of rate 0.2. We simulate 40 observation 1000 times. The mean and standard deviation of exponential distribution is 1/lambda.

Let's calculate theoretical mean and sample mean and compare the difference between these means.

```
##                       Mean
## Sample mean      5.019398
## Theoretical mean 5.000000
```

We can see that these two means are very close. Let's plot the histogram for sample means.

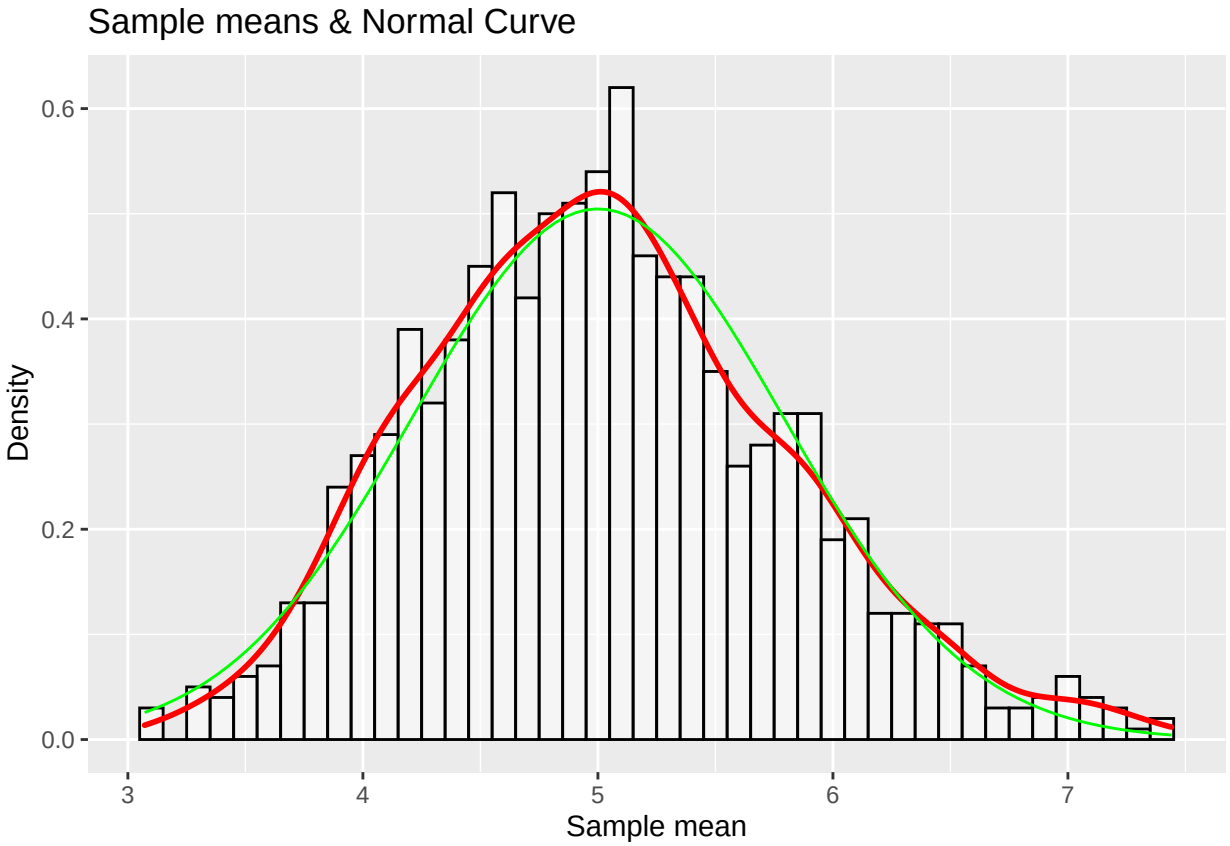


Sample variance vs sample mean

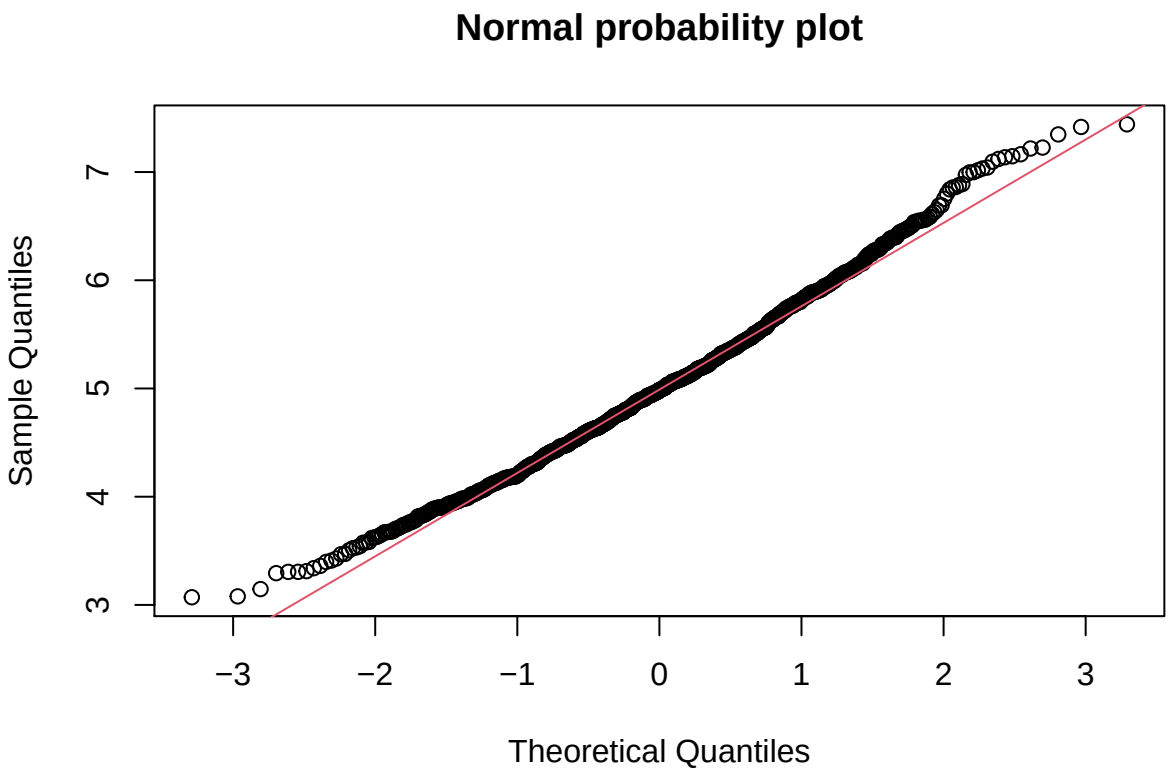
```
##                       variance
```

```
## Sample Variance      0.6057862
## Theoretical variance 0.6250000
```

Central limit theorem states that if we have sufficiently large sample size from a population with finite level of variance, the mean of all the samples from the same population will be approximately equal to the mean of the population.(Investopedia) In simple words, the mean of samples follow normal distribution.Let's see the distribution of sample means and normal distribution.



We can see the distribution of sample mean shown in red approximately matches the normal distribution.Another way of looking at it is to draw the Normal probability plot.



We can see that sample mean closely matches the normal probability plot.