StatisticalInference_CourseProject-Part1

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The exponential distribution can be simulated in R with rexp(n, lambda) where lambda is the rate parameter. The mean of exponential distribution is 1/lambda and the standard deviation is also also 1/lambda. Set lambda = 0.2 for all of the simulations. In this simulation, you will investigate the distribution of averages of 40 exponential(0.2)s. Note that you will need to do a thousand or so simulated averages of 40 exponentials.

lambda=0.2 , n=40, and Number of simulation is 1000
Replicate function will evaluate mean function 1000 times variable means captures all the means of 1000 samples

1.Show where the distribution is centered at and compare it to the theoretical center of the distribution
The Calculated center is at

```
set.seed(1)
means=replicate(1000,mean(rexp(40,0.2)))
mean(means)
```

```
## [1] 4.990025
```

The Theoretical Mean is at

```
lambda=0.2
theory_mean=1/0.2
theory_mean
```

```
## [1] 5
```

2. Show how variable it is and compare it to the theoretical variance of the distribution.
   The calculated variance is

```
var(means)
```

```
## [1] 0.6111165
```

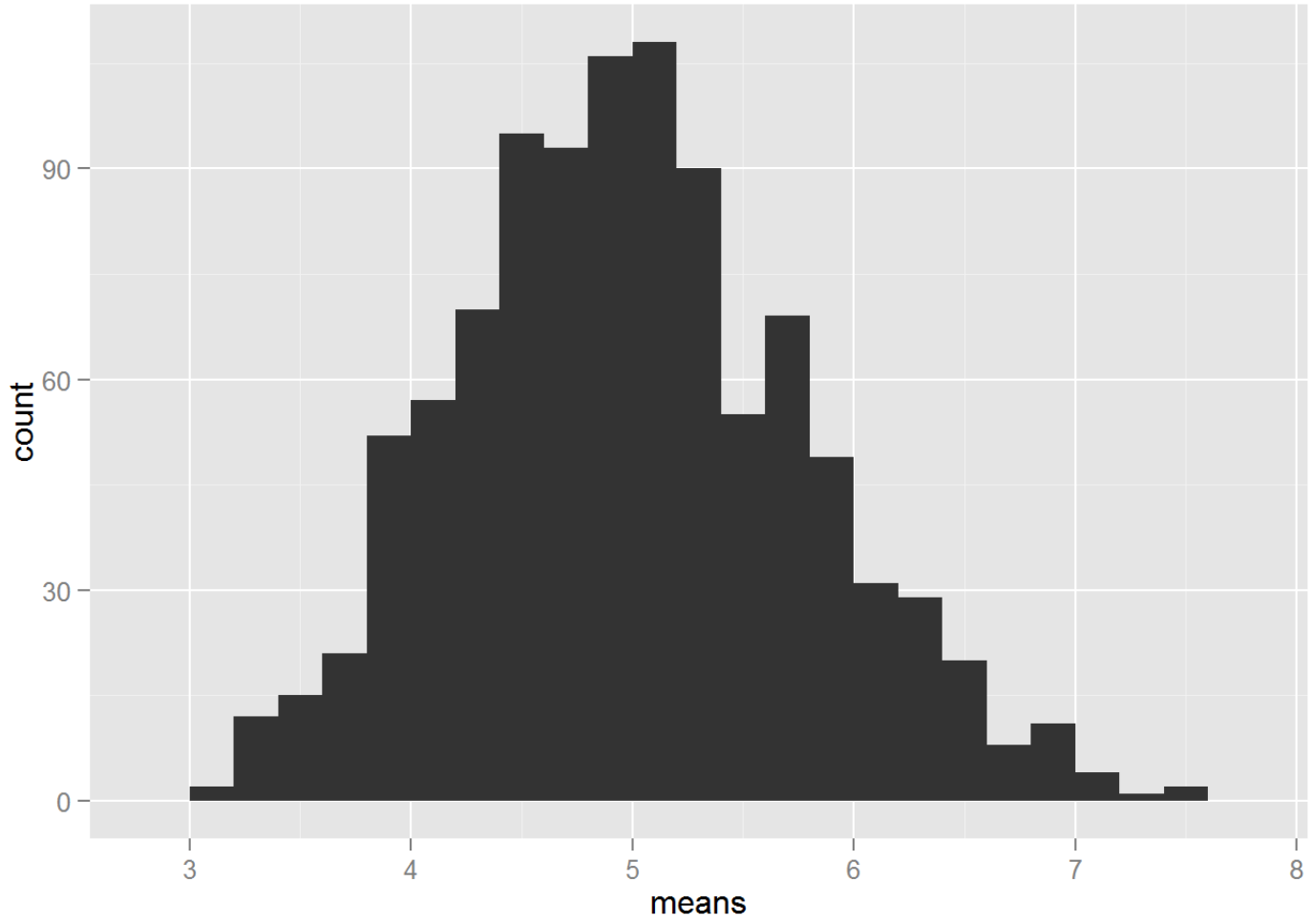
The Expected Variance is

```
(1/lambda)^2/40
```

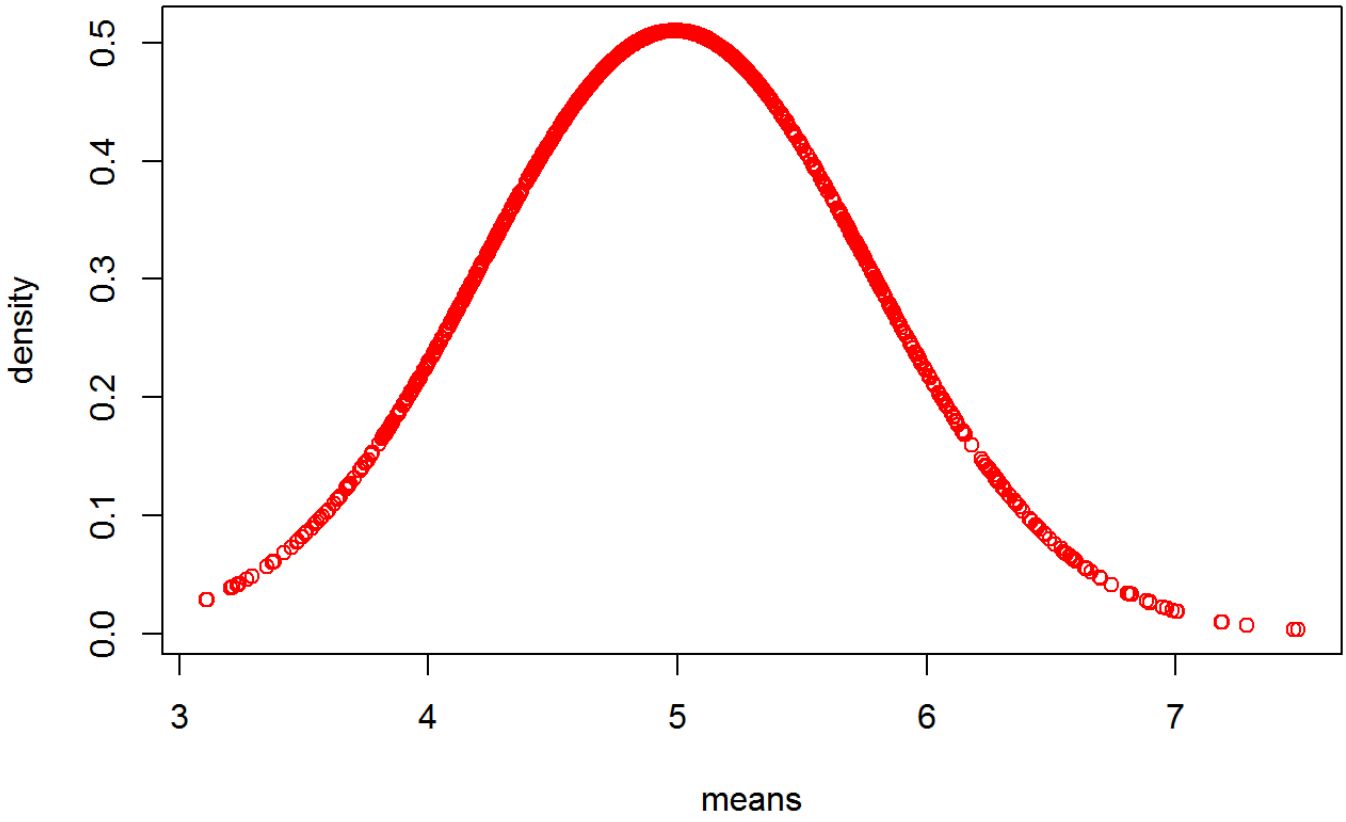
```
## [1] 0.625
```

3. Show that the distribution is approximately normal.

```
library(ggplot2)
qplot(means,binwidth=.2)
```




```
plot(means,dnorm(means,mean=mean(means),sd=sd(means)),col="red",ylab="density")
```



From the two plots we can make out that Histogram resembles Normal Distribution 4. Evaluate the coverage of the confidence interval for 1/lambda: $\bar{X} \pm 1.96S/???n$.

```
mean(means) + c(-1,1)*1.96*sd(means)/sqrt(1000)
```

```
## [1] 4.941572 5.038478
```