Simulations

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 1/lambda. For these simulations, we set lambda to 0.2. We investigate the distribution of averages of 40 exponentials. For this purpose, we perform a thousand or so simulated averages of 40 exponentials.

```
setwd("D:/Programming/GitHub/coursera-statinference/assignment1")
library(xtable)
library(plyr)

n <- 40
lambda <- 0.2
reps <- 1000

Exp <- 0
for (i in 1:reps)
{
  Exp <- Exp + rexp(n,lambda)
}
Exp <- Exp / reps

summary(Exp)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   4.711   4.910   4.973   4.987   5.035   5.226
```

```
###Results
#1. Show where the distribution is centered at and compare it to the theoretical center of the distribu
#theoretical mean = 1/lambda = 5
#simulated mean:
mean <- mean(Exp)
mean
```

```
## [1] 4.987217
```

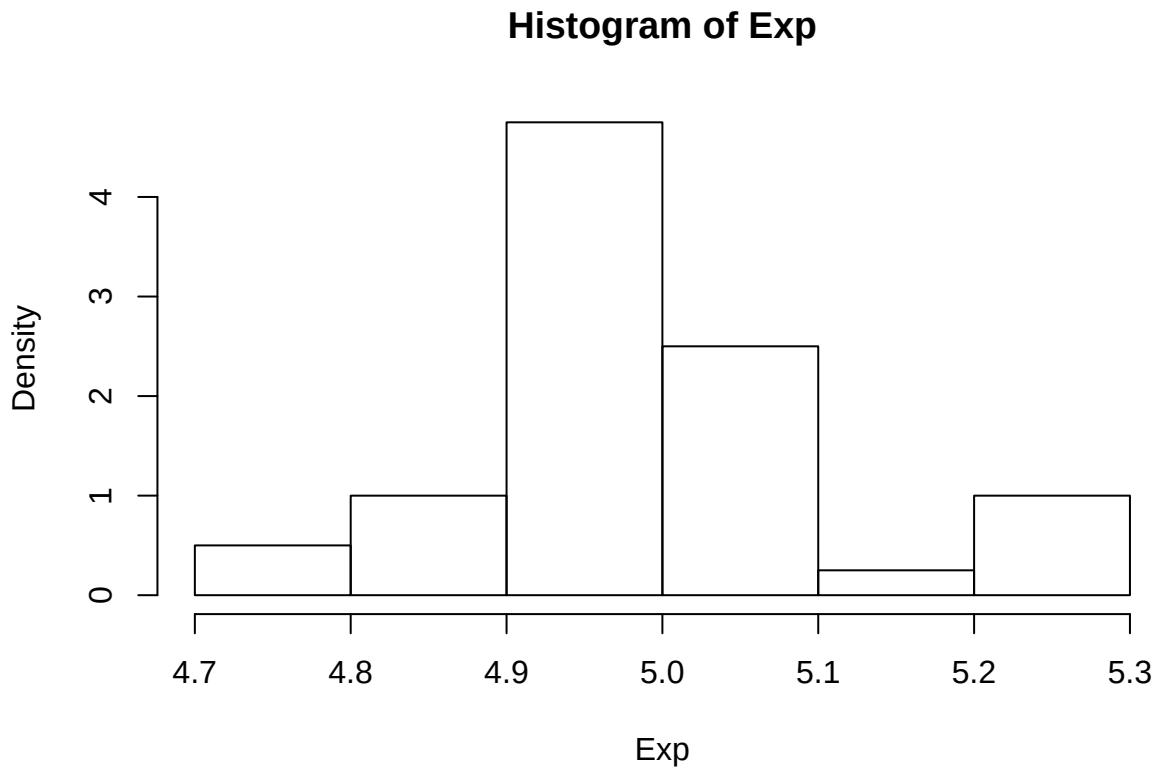
2. Show how variable it is and compare it to the theoretical variance of the distribution.

```
#theoretical variance = lambda^-2 = 0.04
#simulated variance:
1/(mean(Exp))^2
```

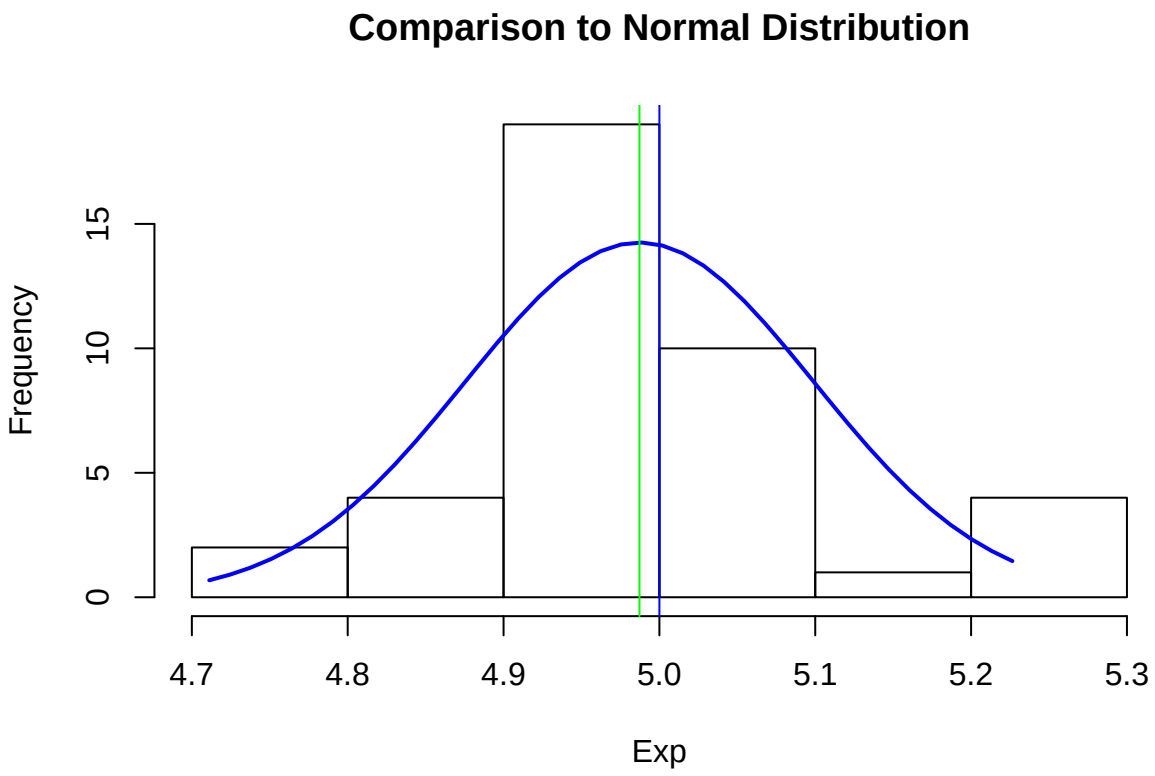
```
## [1] 0.04020531
```

3. Show that the distribution is approximately normal.

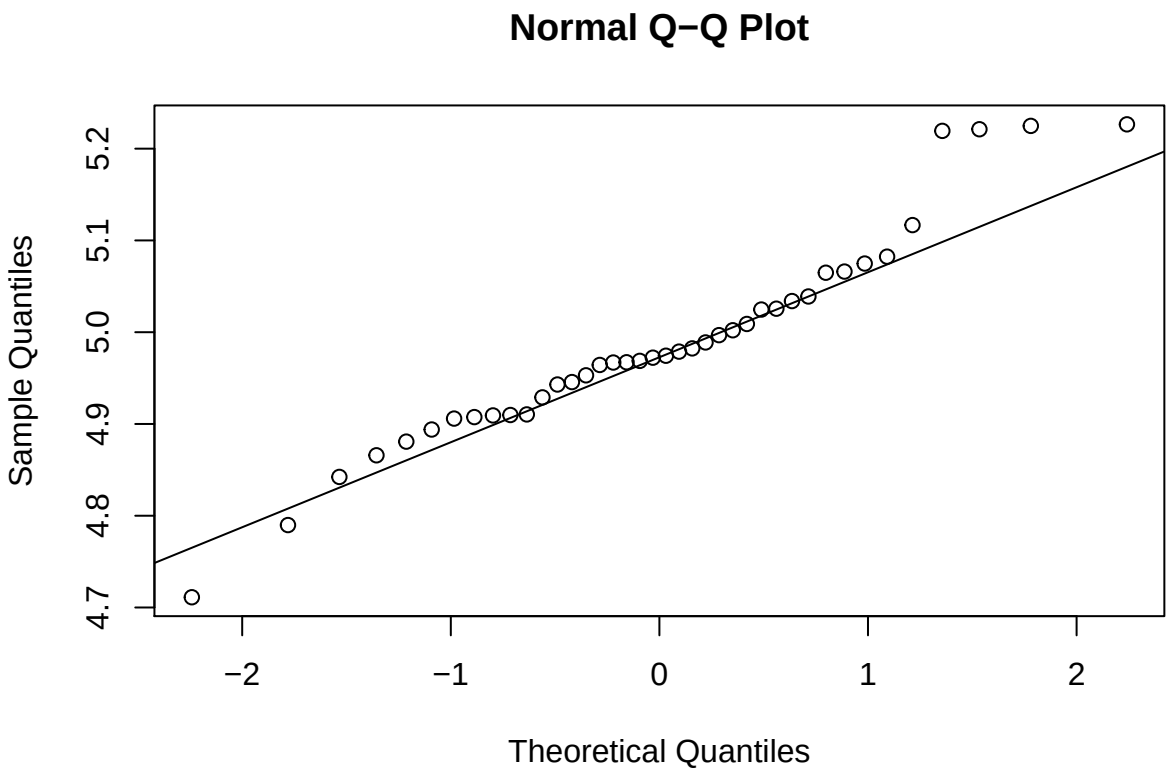
```
h <- hist(Exp,freq=FALSE)
```




```
xfit<-seq(min(Exp),max(Exp),length=40)
yfit<-dnorm(xfit,mean=mean(Exp),sd=sd(Exp))
yfit <- yfit*diff(h$mids[1:2])*length(Exp)
plot(h, main="Comparison to Normal Distribution")
lines(xfit, yfit, col="blue", lwd=2)
abline(v=1/lambda,col="blue")
abline(v=mean,col="green")
```




```
qqnorm(Exp)
qqline(Exp)
```



4. Evaluate the coverage of the confidence interval for 1/lambda

```
left <- mean - qt(.95,40)*sd(Exp)/sqrt(n)
right <- mean + qt(.95,40)*sd(Exp)/sqrt(n)
left
```

```
## [1] 4.957408
```

```
right
```

```
## [1] 5.017026
```