Statistican Inference Project

Oliver Ledesma

Friday, October 24, 2014

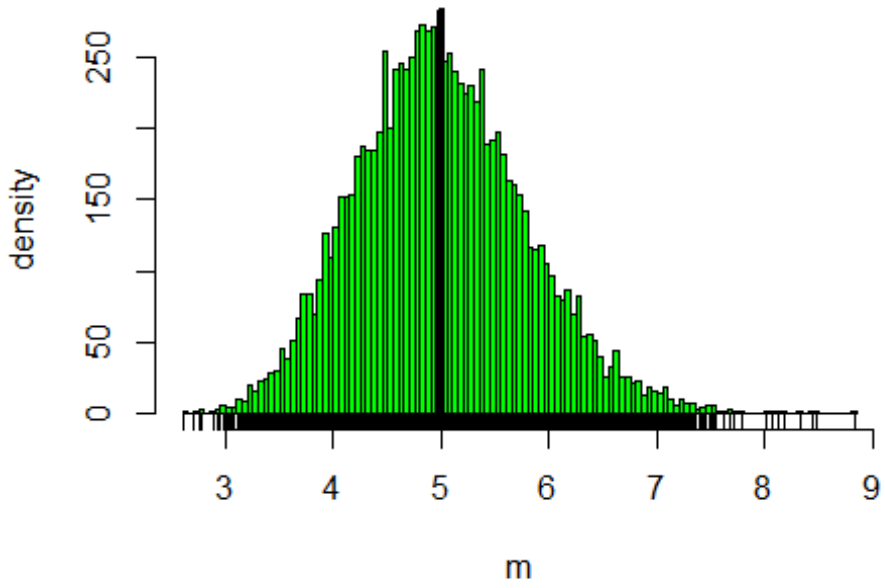
Simulation

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.

```
set.seed(12345)
lambda<-0.2
n<-40
nsim<-10000
data<-replicate(nsim,rexp(40,lambda))
m<-apply(data,2,mean)
```

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

```
hist(m,breaks=nsim/100,col="green",main="",ylab="density")
rug(m)
abline(v=mean(m),col="black",lwd=4)
```



Compare to Theoretical Center

```
print(c("Calculated center",mean(m)))
```

```
## [1] "Calculated center" "4.99725415743575"
```

```
print(c("Theoretical center",1/lambda))
```

```
## [1] "Theoretical center" "5"
```

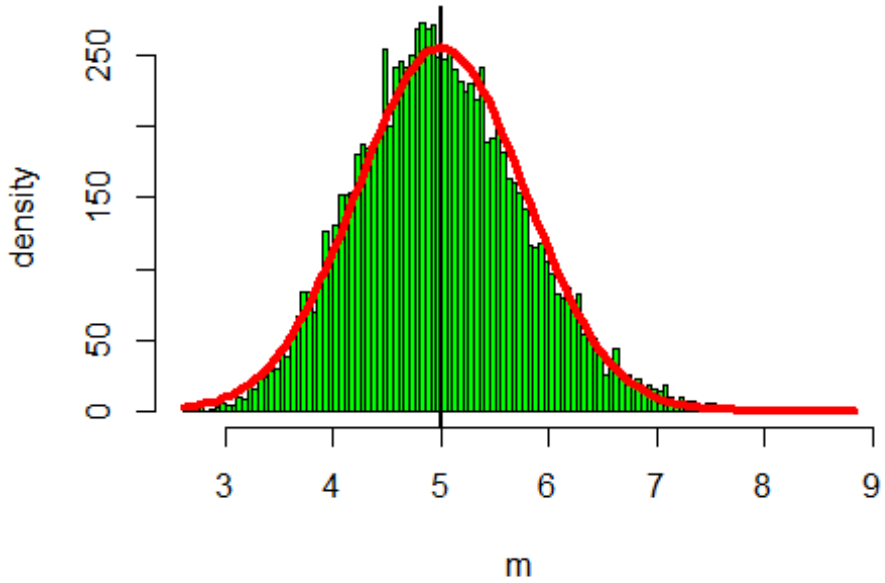
2. Show how variable it is and compare it to the theoretical variance of the distribution.

```
matrix(data=c(sd(m),(1/lambda)*(1/sqrt(n)),sd(m)^2,((1/lambda)*(1/sqrt(n)))^2
),nrow=2,ncol=2,byrow=TRUE,dimnames=list(c("Standard
deviation","Variance"),c("Estimated","Theoretical")))
```

```
##                    Estimated Theoretical
## Standard deviation    0.7815      0.7906
## Variance              0.6107      0.6250
```

3. Show that the distribution is approximately normal.

```
h<-hist(m,breaks=nsim/100,col="green",main="",ylab="density")
xfit<-seq(min(m),max(m),length=nsim/100)
yfit<-dnorm(xfit,mean=mean(m),sd=sd(m))
yfit<-yfit*diff(h$mids[1:2])*length(m)
abline(v=mean(m),col="black",lwd=2)
lines(xfit,yfit,col="red",lwd=4)
```



4. Evaluate the coverage of the confidence interval.

```
mean(m) + c(-1,1)*1.96*sd(m)/sqrt(n)
```

```
## [1] 4.755 5.239
```