Statistical Inference Assignment Part A

Teja Kodali

22 March 2015

Overview

Here, we will investigate the exponential distribution in R and compare it with the Central Limit Theorem. 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.

Sample mean versus Theoretical mean

```
lambda = 0.2
n = 40
nsms = 1:1000
set.seed(500)
means <- data.frame(x = sapply(nsms, function(x) {mean(rexp(n,
lambda))}))

round(mean(means$x), 2)

## [1] 5.01
```

As we can see, the sample mean is 5.01.

The theoretical mean can be calculated by

```
theoreticalMean <- 1/lambda
theoreticalMean

## [1] 5
```

The theoretical mean is 5, and is approximately equal to the sample mean.

Sample Variance versus Theoretical Variance

```
round(var(means$x), 2)

## [1] 0.62
```

As we can see, the sample variance is 0.62.

The theoretical variance can be calculated by

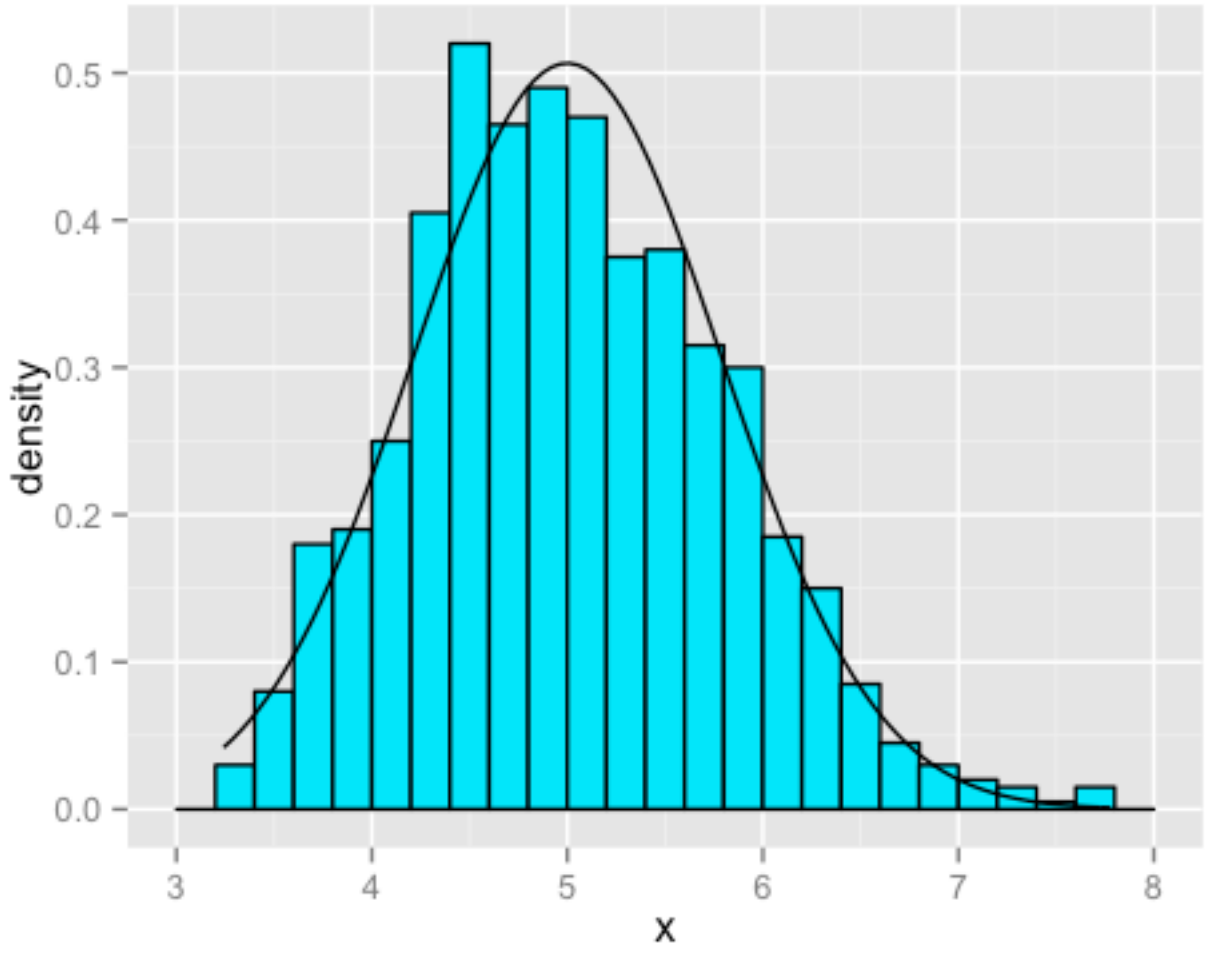
```
theoreticalVariance <- round(((1/lambda)/sqrt(40)) ^ 2, 2)
theoreticalVariance
```

```
## [1] 0.62
```

As expected, the theoretical variance is 0.62 and is equal to the sample variance.

Distribution

```
library(ggplot2)
distPlot <- ggplot(data = means, aes(x = x)) +
        geom_histogram(aes(y = ..density..), fill = I('#00e6fa'),
binwidth = 0.20,
                       color = I('black')) +
        stat_function(fun = dnorm, arg = list(mean = 5, sd =
sd(means$x)))
distPlot
```



Above, we have a histogram plot of the means of the simulation. It is overload with a normal distribution with mean = 5 and standard deviation = 0.79. As we can see, the distribution of the simulations appears normal.