Statistical Inference Course Project1

doyougnu

July 20, 2015

Overview

Overview to be writting here...

Simulations

```
#set seed
set.seed = 1234

#number of simulations to run
simnum <- 1000

#number of distributions to generate
exp_n <- 40

#exponential distribution parameters
exp_lambda <- 0.2
simMatrix <- matrix(rexp(exp_n * simnum, rate = exp_lambda), simnum, exp_n)
expMean <- rowMeans(simMatrix)
```

The simulation is done by generating 40,000 random exponential deviates with a lambda value = 0.2. Then populating a 1000 x 40 matrix with those values. We then call the rowMeans function to find the mean of each row (that is the mean of 40 simulation random exponential deviates). The rowMeans create our simulation distribution of means, called expMean.

Plots Comparing Simulation to Population

```
#load ggplot2
library(ggplot2)

#Compare Means
popMean <- 1 / exp_lambda
simMean <- mean(expMean)
popMean
```

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

```
simMean
```

```
## [1] 4.95162
```

The means are very close, the population mean is 5, the simulated mean is 4.9516204

```
#Compare Variances
popVariance <- (1 / exp_lambda) ^ 2 / exp_n
simVariance <- var(expMean)
popVariance
```

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

```
simVariance
```

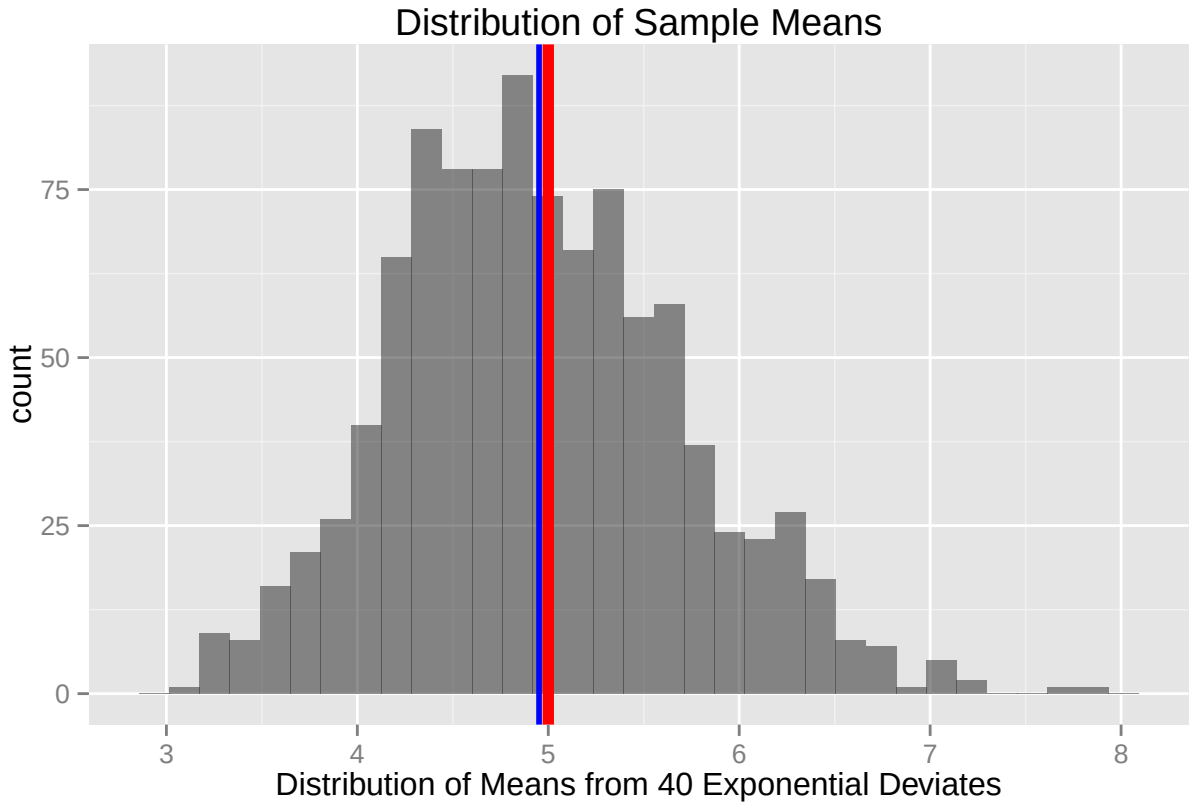
```
## [1] 0.5747062
```

Similarly for the Variances, the pop variance is 0.625, the sim variance is 0.5747062

Comparison between Random Variables and Sample Distributions

```
#load libs
library(ggplot2)

#compare Variances visually
plt <- qplot(expMean, main = "Distribution of Sample Means", alpha = 0.3) +
    xlab("Distribution of Means from 40 Exponential Deviates") +
    geom_vline(size = 2, xintercept = popMean, colour = "red") +
    geom_vline(size = 1, xintercept = simMean, colour = "blue") +
    theme(legend.position = "none")
plt
```



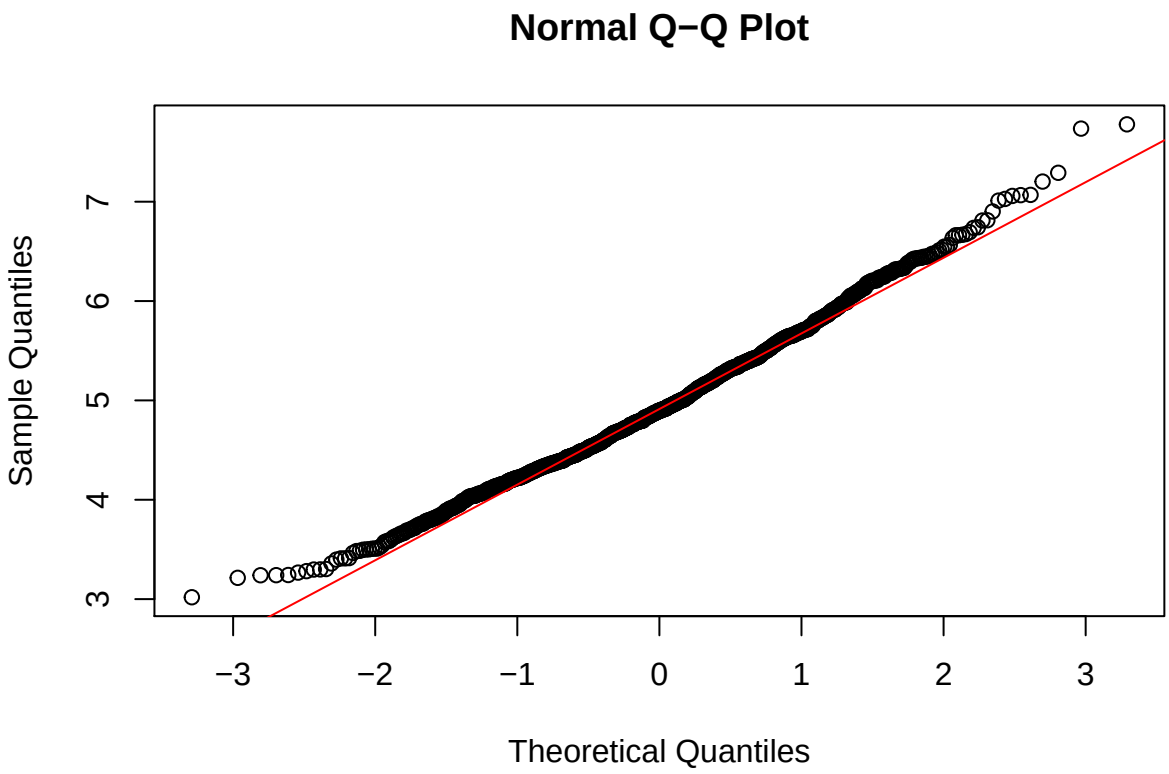
In this plot we can see the CLT in action ...

Normality test

```
#perform shapiro normality test
shapiro.test(expMean)
```

```
##
##  Shapiro-Wilk normality test
##
## data:  expMean
## W = 0.99173, p-value = 2.164e-05
```

```
#plot QQ plot
qqnorm(expMean); qqline(expMean, col = 2)
```


Normal Q−Q Plot
Sample Quantiles
Theoretical Quantiles
3
4
5
6
7
−3
−2
−1
0
1
2
3