Coursera Course Project Part 1

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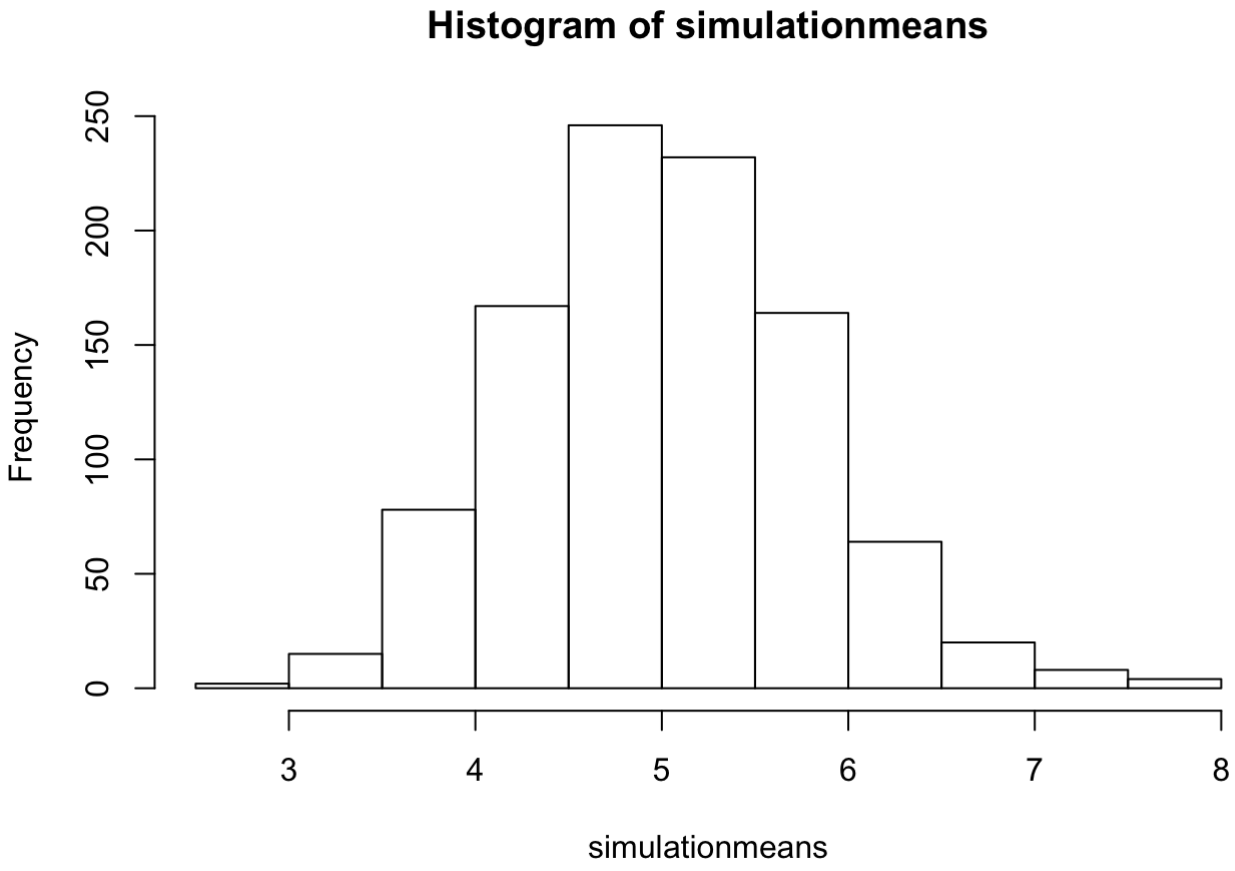
Part 1

```
## set parameters
numsim <- 1000
n <- 40
lambda <- .20
set.seed(123)

simulation1 <- matrix(rexp(numsim*n, rate = lambda), numsim)
simulationmeans <- apply(simulation1, 1, mean)

hist(simulationmeans)
```



1.1 Theoretical distribution vs sample distribution

no we compare the distributions of the sample mean versus the theoretical mean

```
actual_mean <- mean(simulationmeans)
theoretical_mean <- 1/lambda
print(actual_mean)
```

```
## [1] 5.011911
```

```
print(theoretical_mean)
```

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

the sample mean (5.01) approximates the theoretical mean (5.0), not quite the same but almost.

1.2 Theoretical Variance vs Sample Variance

```
sample_variance <- var(simulationmeans)
theoretical_variance <- (1/lambda)^2/n
print(sample_variance)
```

```
## [1] 0.6088292
```

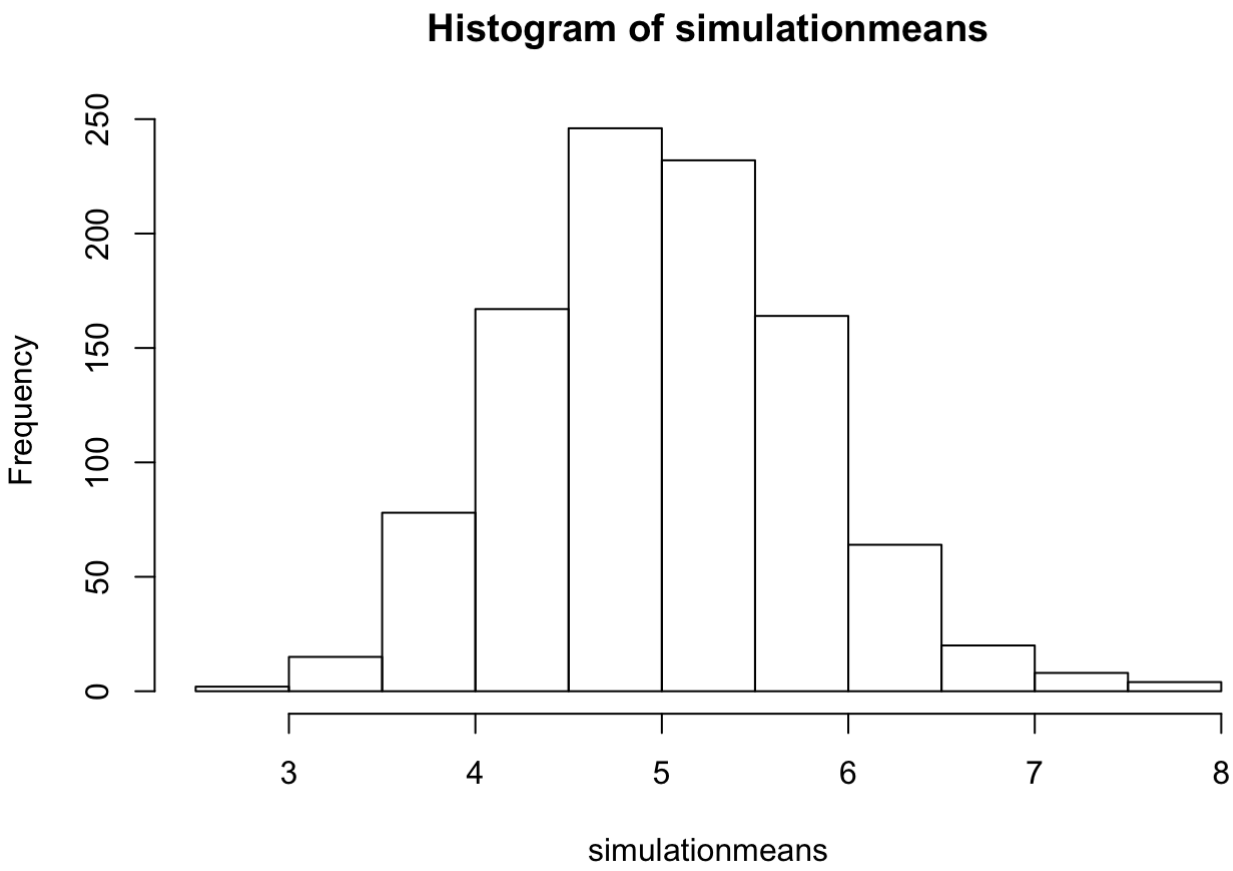
```
print(theoretical_variance)
```

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

Again the sample mean (.608) approximates the theoretical variance (.625)

1.3 demonstrate distribution approximates normal distribution

```
hist(simulationmeans)
```



from

the looks of the graph our data does indeed seem to be normaly distributed.

We can run a run a Shapiro-Wilk test to support our observation.

```
shapiro.test(simulationmeans)
```

```
##
##  Shapiro-Wilk normality test
##
## data:  simulationmeans
## W = 0.99474, p-value = 0.001491
```