Exponential Distribution Simulation

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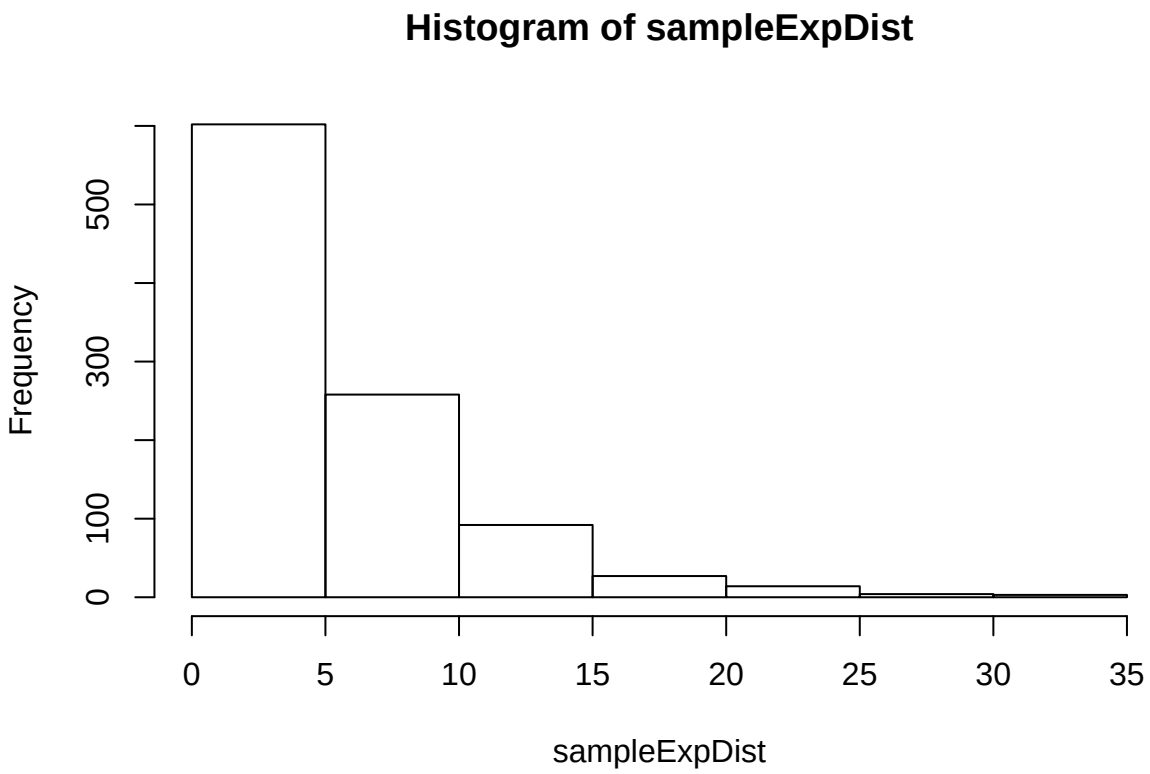
Overview:

This paper explores simulations on an Exponential Distribution.

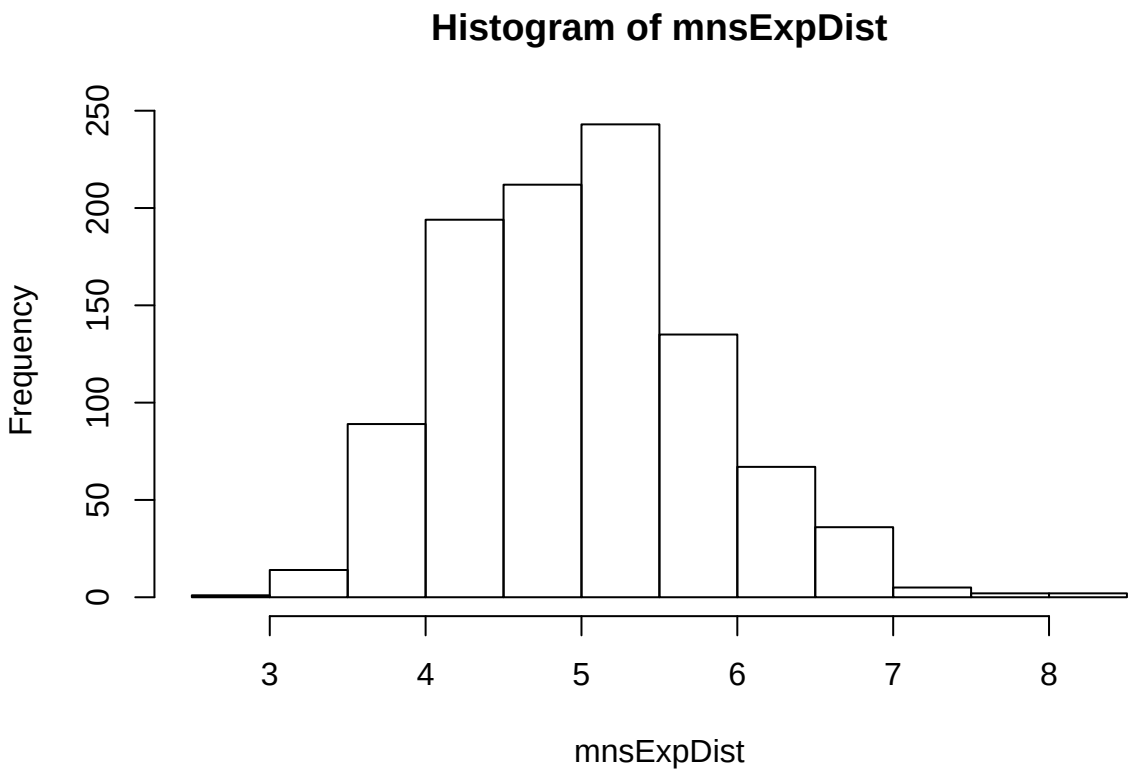
```
# Set parameters for distribution
n <- 40
lambda <- 0.2




# An exploratory plot
```

Simulations:

```
set.seed(0)

# Generate 1,000 random deviates for an exponential distribution
sampleExpDist <- rexp(1000, lambda)

# Generate a distribution of 1000 averages of 40
# random deviates for an exponential distribution
# and calculate the variances in each sample
expSample = NULL
mnsExpDist = NULL
varExpDist = NULL
for (i in 1 : 1000) {
  expSample = rexp(n, lambda)
  mnsExpDist = c(mnsExpDist, mean(expSample))
  varExpDist = c(varExpDist, var(expSample))
}

# Create a histogram of the distribution of exponentials
hist(sampleExpDist)
```




```
# Create histogram of the distribution of exponential averages
hist(mnsExpDist)
```



Sample Mean versus Theoretical Mean

This distribution is centered at ... The theoretical center, or mean of the distribution is centered at ...

```
# Load libraries
library(knitr)

# Calculate the mean of the sample exponential distribution
sampleExpDistMean <- round(mean(sampleExpDist),3)

# Calculate mean of the distribution of exponential averages
mnsDistMean <- round(mean(mnsExpDist),3)

# Calculate hypothetical mean for the exponential distribution
hypoDistMean <- 1/lambda

# Combine means in a row
rowMeans <- rbind(c(sampleExpDistMean, mnsDistMean, hypoDistMean))

# Display table of calculated means
kable(rowMeans, caption = "Comparison of Sample and Hypothetical Means", col.names = c("Sample","Averag
```

Table 1: Comparison of Sample and Hypothetical Means

Sample	Averages	Hypothetical
5.148	4.994	5

Sample Variance versus Theoretical Variance

This distribution's variance is . . . The theoretical variance of this distribution would be . . .

```
# Calculate variance of the sample exponential distribution
sampleExpDistVariance <- round(var(sampleExpDist),3)

# Calculate variance of the distribution of exponential averages
mnsExpDistVariance <- round(mean(varExpDist),3)

# Calculate hypothetical mean for the exponential distribution
hypoDistVariance <- (1/lambda)^2

# Combine variances in a row
rowVar <- rbind(c(sampleExpDistVariance, mnsExpDistVariance, hypoDistVariance))

# Display table of calculated variances
kable(rowVar, caption = "Comparison of Sample and Hypothetical Variances", col.names = c("Sample","Avera
```

Table 2: Comparison of Sample and Hypothetical Variances

Sample	Averages	Hypothetical
24.418	25.386	25

Distribution

We know this distribution is normal because . . .

Our conclusions and assumptions . . .