

# Statistical Inference project

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## Background

In this project 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  $1/\lambda$ .

**Illustrate via simulation and associated explanatory text the properties of the distribution of the mean of 40 exponentials**

1000 simulated distributions with sample size = 40. drawn from exponential distribution with  $\lambda = 0.2$

```
lambda <- 0.2 #as required by project

MeanDistributionExp <- function(amount,size)
{
  distribution <- NULL
  for (i in 1 : amount) distribution = c(distribution, mean(rexp(size,lambda)))
  return(distribution)
}

mns <- MeanDistributionExp(1000,40)
simulatedMean <- round(mean(mns),2)
simulatedSD <- round(sd(mns),2)
```

## Simulated versus Theoretical Mean

the

```
simulatedMean
```

```
## [1] 5.04
```

is close to the theoretical mean of

```
round(1/lambda,2)
```

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

## Simulated versus Theoretical Variance

the

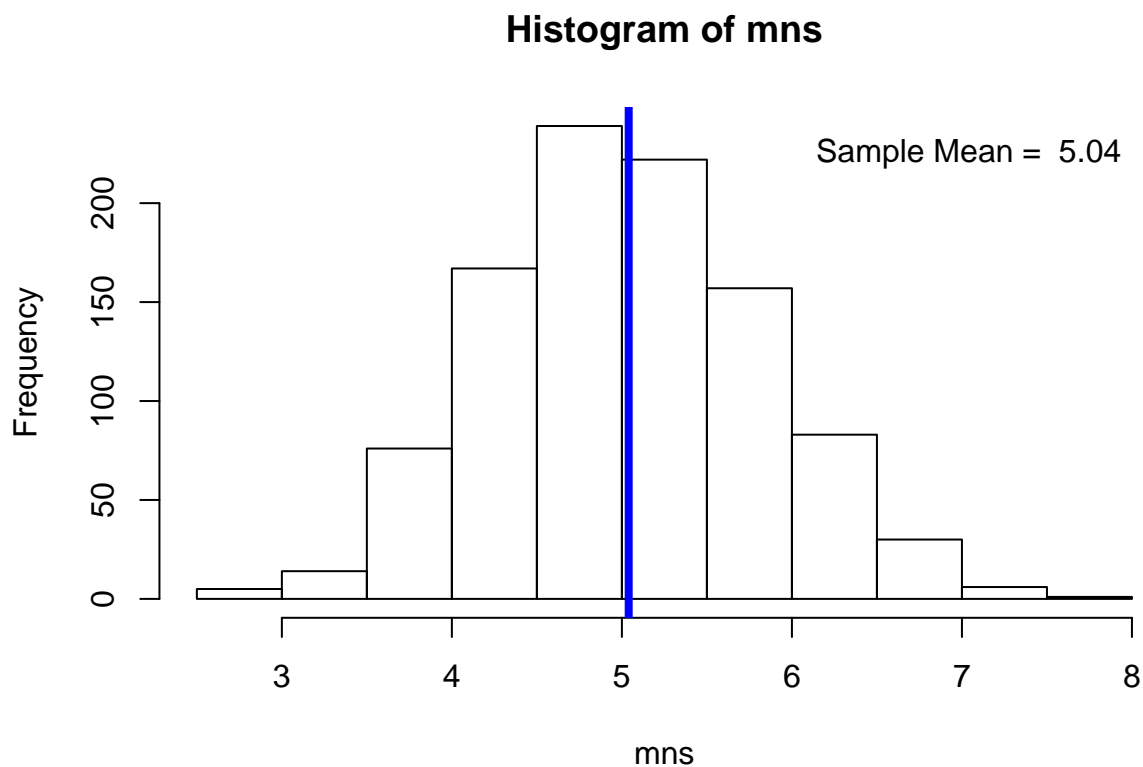
```
simulatedSD
```

```
## [1] 0.8
```

shows the variability of the 1000 means around the total simulated mean. The SD of the Simulated mean can't be compared to the Theoretical SD

## Normality of Simulated distribution of Means

```
hist(mns)
abline(v=simulatedMean, col="blue", lwd=4)
text(simulatedMean+2,225,paste("Sample Mean = ",round(simulatedMean,2)))
```



using this simple graphical presentation we can easily see that the simulated distribution of means is approximately normal.