Statistical Inference, Course Project - Part1

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Introdaction 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 also $1/\lambda$. Set $\lambda = 0.2$ for all of the simulations. In this simulation, you will investigate the distribution of averages of 40 exponential(0.2)s. Note that you will need to do a thousand or so simulated averages of 40 exponentials.

$$1/\lambda$$

In this exercise we should

1. Show the sample mean and compare it to the theoretical mean of the distribution.
2. Show how variable the sample is (via variance) and compare it to the theoretical variance of the distribution.
3. Show that the distribution is approximately normal.

```
lambda <- 0.2 #Set rate to 0.2
sampleSize <- 40 #Set sample size to 40
nSamples <- 1000 #Draw 1000 samples
```

Exponential sampling parameters Let's do a thousand simulated averages of 40 exponentials.

```
expoDist <- replicate(n = nSamples, expr = rexp(n = sampleSize, lambda))
```

Calculate theoretical and sample summary statistics Means

```
theoMean <- round((1/lambda), 3) #Theoretical
sampleMean <- round(mean(colMeans(expoDist)), 3) #Sample
```

Standard Deviations

```
theoSd <- round((1/lambda * (1/sqrt(sampleSize))), 3) #Theoretical
sampleSd <- round(sd(colMeans(expoDist)), 3) #Sample
```

Varince

```
theoVar <- round((theoSd^2),3)
sampleVar <- round((sampleSd^2),3)
```

Results of calculation are showed in table 1.

Table 1: Summary statistics

	Mean	Standart Diviation	Variance
Theoretical	5	0.791	0.626
Sample	4.941	0.77	0.593