

Part 1-Simulation Exercise

Harikrishna Vemula

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```
library(knitr)
library(ggplot2)
```

Overview

This is part 1 assignment on Simulation Exercise using R. This Simulation Exercise intension is, investigating the exponential distribution and compare it with the Central Limit Theorem.

Simulations

initializing variables lambda, seed, n and n's simulation.

```
ECHO=TRUE
set.seed(1337)
lambda = 0.2
n = 40
nsm = 1000
```

Calculating mean for 1000 samples of 40 exponentials

```
ex <- replicate(nsm, rexp(n, lambda))
exp_means <- apply(ex, 2, mean)
```

1.Sample Mean versus Theoretical Mean

Sample Mean Calculating the mean .

```
mean(exp_means)
```

```
## [1] 5.055995
```

Theoretical Mean Calculating theoretical mean.

```
lambda^-1
```

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

Difference sample mean Vs exponential distribution theoretical mean.

```
abs(mean(exp_means)-lambda^-1)
```

```
## [1] 0.05599526
```

2.Sample Variance versus Theoretical Variance

Sample Variance Calculating sample variance variance.

```
var(exp_means)
```

```
## [1] 0.6543703
```

Theoretical Variance Calculating theoretical variance

```
(lambda * sqrt(n))^-2
```

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

Difference Sample Variance Vs Theoretical Variance

```
abs(var(exp_means)-(lambda * sqrt(n))^-2)
```

```
## [1] 0.0293703
```

Distribution

The following graph illustrates histogram for 1000 simulations.

```
library(ggplot2)
ggplot(data.frame(y=exp_means), aes(x=y)) +
  geom_histogram(aes(y=..density..), binwidth=0.2, fill="blue",color="red") +
  stat_function(fun=dnorm, args=list(mean=lambda^-1,sd=(lambda*sqrt(n))^-1),
               size=2) +
  labs(title="Simulations", x="Mean")
```

Simulations

