Project Statical Inference

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Sampling values in the project.

```
lambda <- 0.2 # Set lambda = 0.2 for all of the simulations.
n <- 40  # You will investigate the distribution of averages of 40 exponentials.
simulations <- 1000 # You will need to do a thousand simulations.
```

Run Simulation

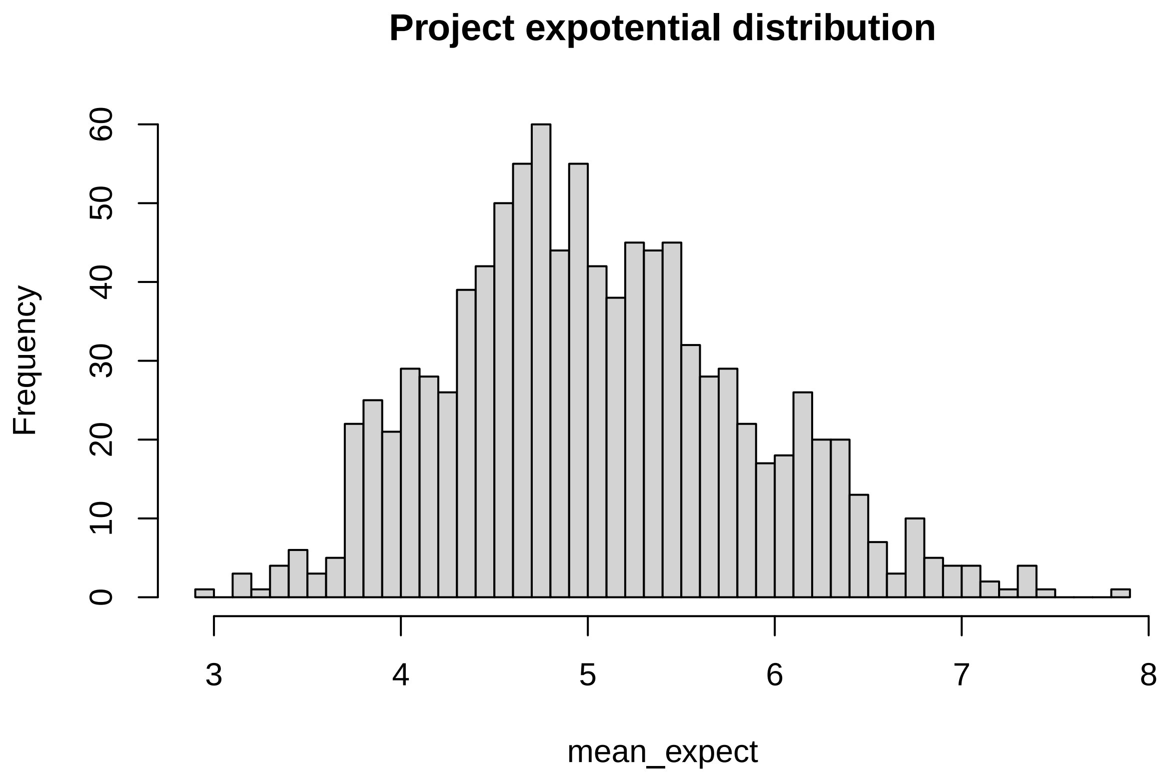
```
sim_expect <- replicate(simulations, rexp(n,lambda))
```

Find the means

```
mean_expect <- apply(sim_expect, 2, mean)
```

Histogram

```
hist(mean_expect, breaks = n, main = "Project expotential distribution")
```

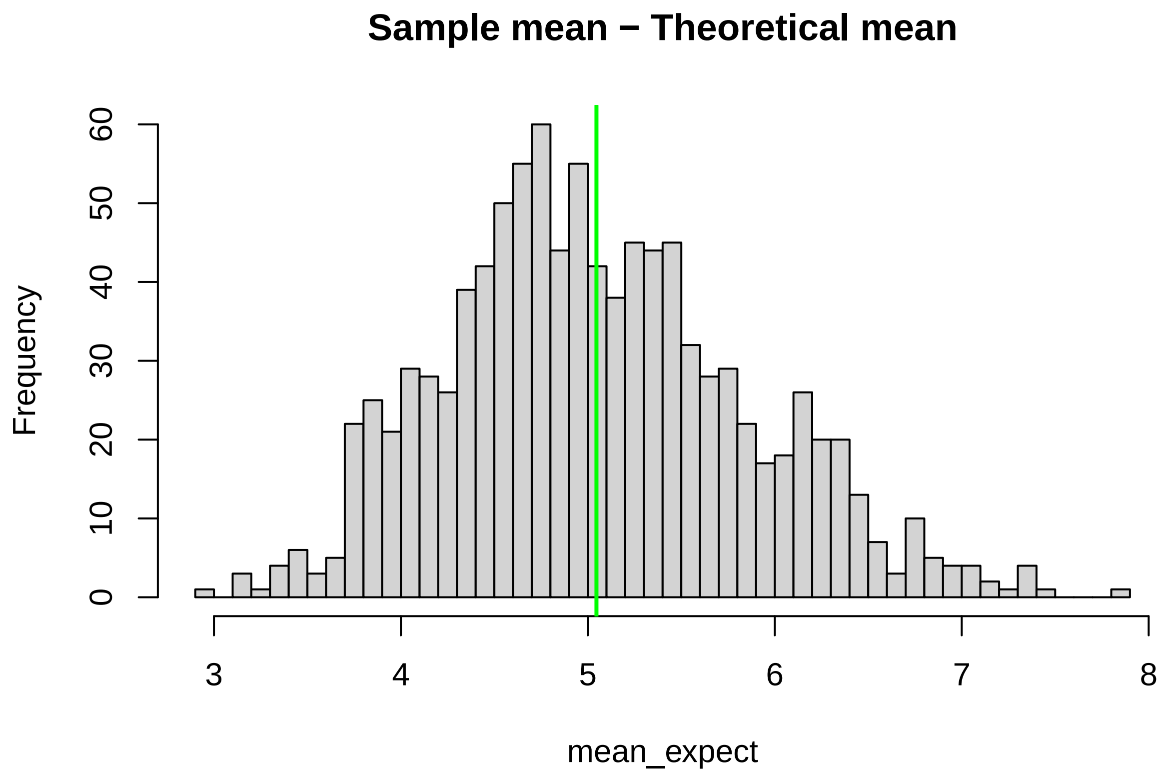


1.Show the sample mean and compare it to the theoretical mean of the distribution.

```r
mean(mean_expect)
```

```
## [1] 5.046106
```

```r
hist(mean_expect, breaks = n, main = "Sample mean - Theoretical mean")
abline(v = mean(mean_expect), col = "green", lwd = 2)
```



2.Show how variable the sample is (via variance) and compare it to the theoretical variance of the distribution.

The variances is very close.

```
#Sample Variance

sd(mean_expect)^2
```

```
## [1] 0.6495762
```

```
#Theoretical Variance

(1/lambda / sqrt(n))^2
```

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

```
tv <- (1/lambda / sqrt(n))^2
```

3.Show that the distribution is approximately normal.

The plot shows a normal distribution to the Central Limit Theorem.

```
hist(mean_expect, prob=TRUE,main="Distribution", breaks=n, xlim=c(2,9))
lines(density(mean_expect), col="red",lwd=2)
```

```r
x <- seq(min(mean_expect), max(mean_expect), length.out = 2*n)
y <- dnorm(x, mean = 1/lambda, sd = sqrt(tv))
lines(x,y,lwd = 2, col = "black", lty = 2)
```