Kennedy Mwai

"Statistical Inference Assignment" - Simulation exercise.

Synopsis

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, we investigate the distribution of averages of 40 exponential(0.2)s. We do a thousand simulated averages of 40 exponentials.

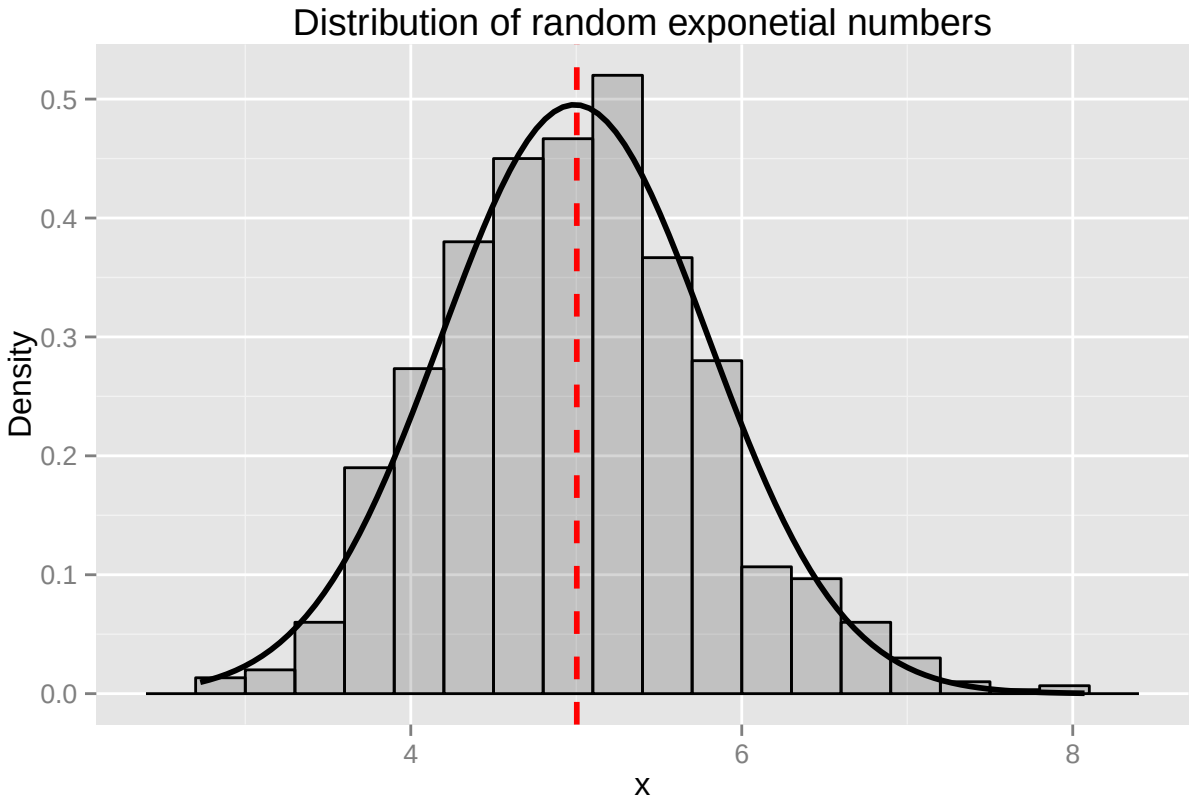
We Illustrate via simulation and associated explanatory text the properties of the distribution of the mean of 40 exponential(0.2)s.
1. Show where the distribution is centered at and compare it to the theoretical center of the distribution. 2. Show how variable it is and compare it to the theoretical variance of the distribution. 3. Show that the distribution is approximately normal. 4. Evaluate the coverage of the confidence interval for 1/lambda: $\bar{X} \pm 1.96Sn$. (This only needs to be done for the specific value of lambda).

Data

```
library(ggplot2)
data <- data.frame(replicate(1000, mean(rexp(40,0.2))))
names(data) <- c("x")
```

Showing Distribution

```
g <- ggplot(data, aes(x = x)) + geom_histogram(alpha = .20, binwidth=.3, colour = "black", aes(y = ..de
  stat_function(fun=dnorm,size = 1, args=list(mean=mean(data$x), sd=sd(data$x)))+ labs(title="Distributi
                                                                                      y="Density") +
  geom_vline(aes(xintercept=median(x, na.rm=T)), color="red", linetype="dashed", size=1)
print(g)
```



SD and Ci calculation

```
#calculate the confidence interval
x_bar <- mean(data$x)
x_sd <- sd(data$x)

x_ci <- round((x_bar +( c(-1, 1) * 1.96 * sd(data$x) / sqrt(length(data$x))) ),2)
```

The **mean** of my data set is 4.9907 and the **standard deviation** is 0.8055 and the **confidence interval** is 4.94, 5.04