

Statistical Inference Course Project

Composed by: Akihiro Hayashi (21/03/2015)

The project consists of two parts:

1. A simulation exercise.
2. Basic inferential data analysis.

Requirements:

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.

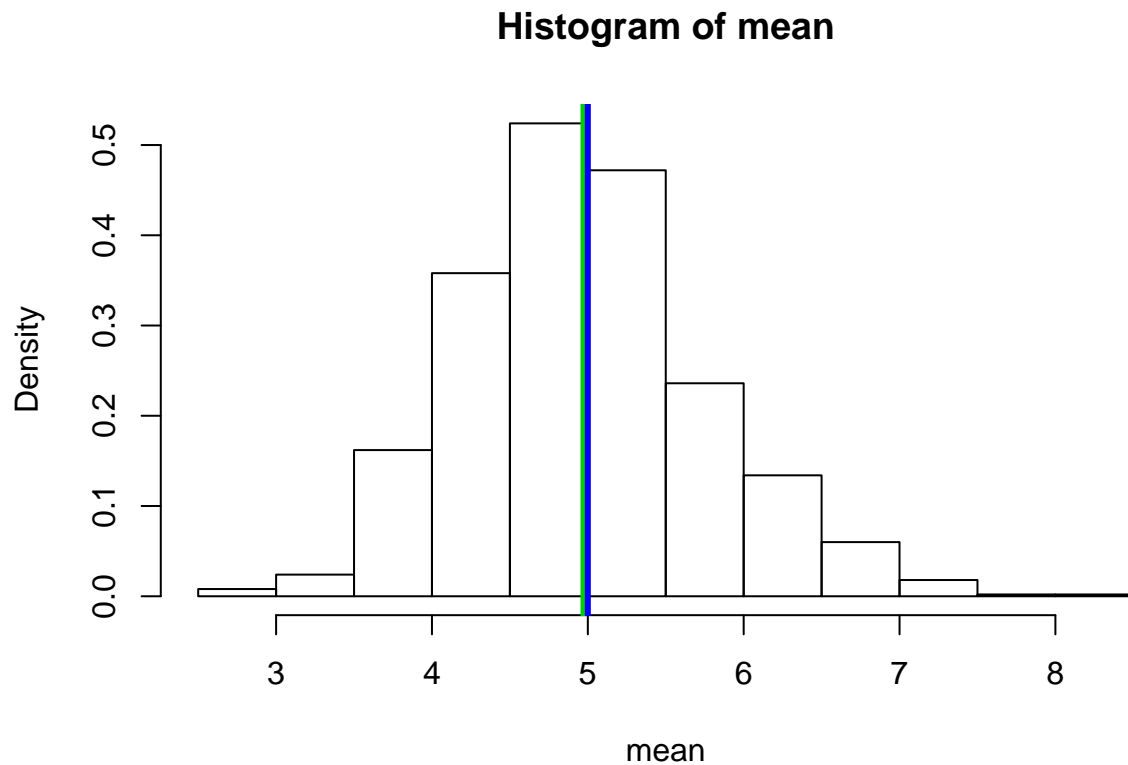
Processes of this report: Make simulation —> Calculate and compare the mean —> Calculate and compare the sd —> Test the distribution

1. Simulation

```
set.seed(0412) #this is my birthday!
n <- 40
lambda <- 0.2
nosim <- 1000
sim <- rexp(n = n * nosim, rate = lambda)
sim.df <- as.data.frame(matrix(sim, ncol = 1000, byrow = FALSE))
```

2. Mean of Exp

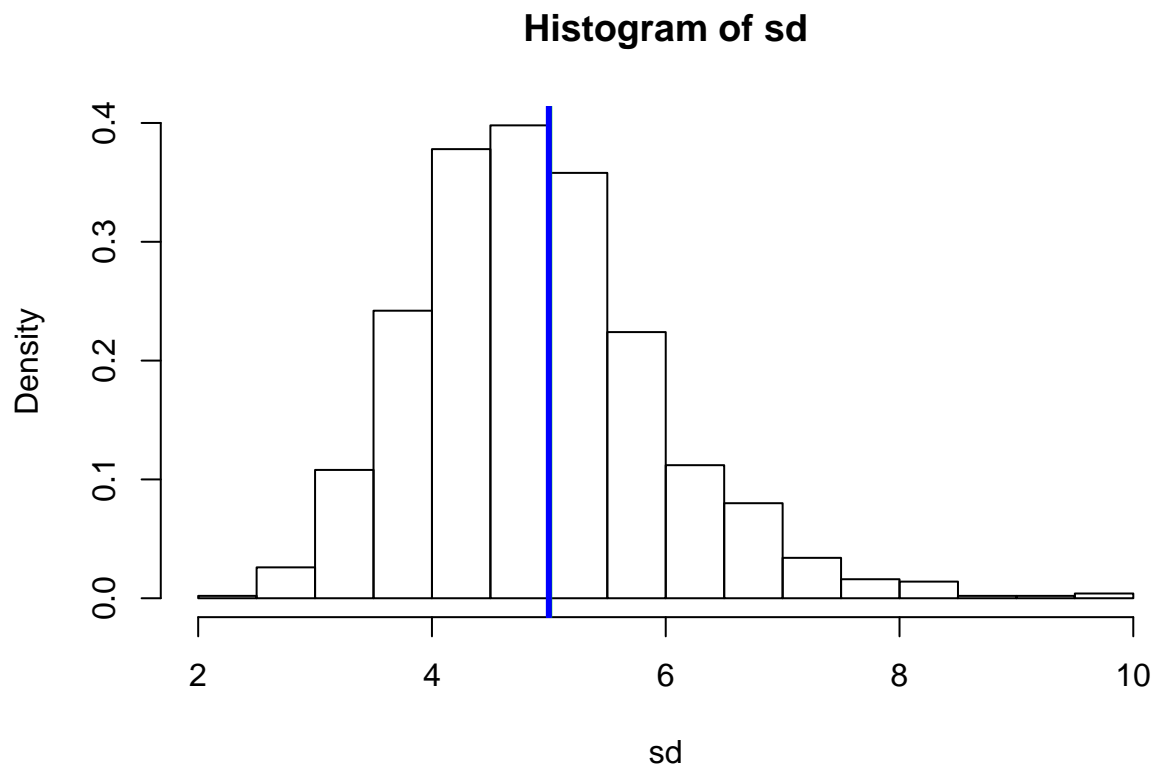
```
mean <- sapply(sim.df, mean)
hist(mean, prob = TRUE)
sam.mean <- mean(sim)
theo.mean <- 1/lambda
abline(v = mean(sim), lwd = 3, col = 3)
abline(v = 1/lambda, lwd = 3, col = 20)
```



The sample mean (4.9723193) and theoretical mean (5) are very close to each other, and the means of each group seems like normal distribution.

3. Sd of Exp

```
sd <- sapply(sim.df, sd)
hist(sd, prob = TRUE)
sam.sd <- sd(sim)
theo.sd <- 1/lambda
abline(v = sd(sim), lwd = 3, col = 3)
abline(v = 1/lambda, lwd = 3, col = 20)
```

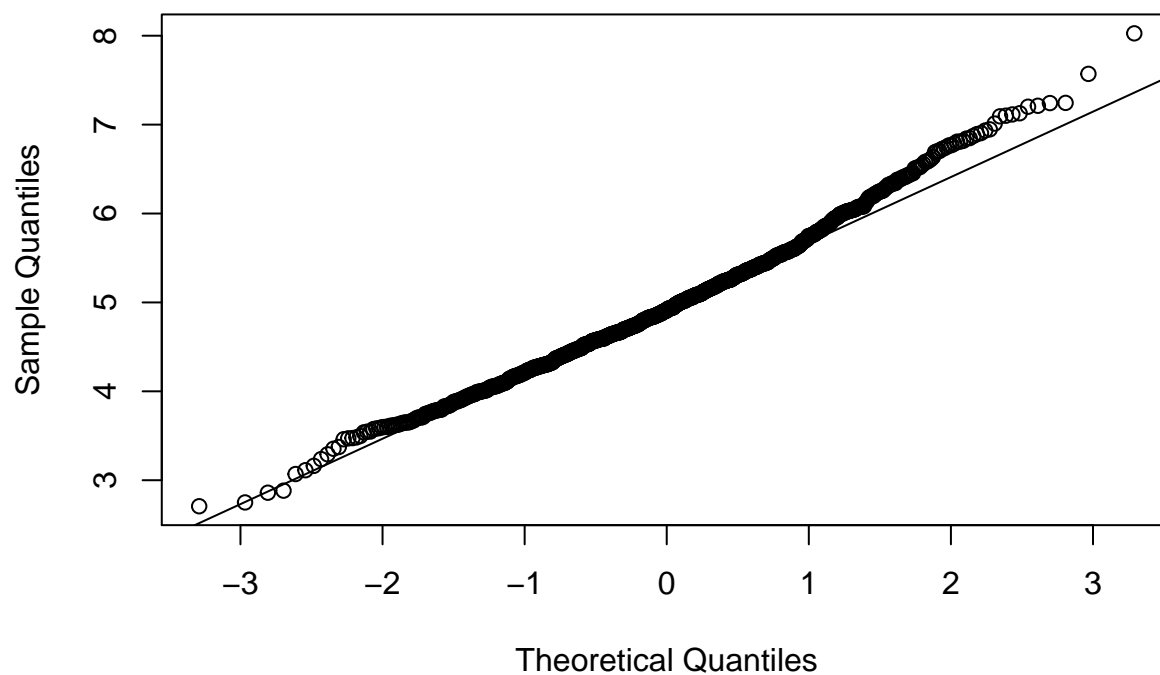


The sample sd (5.003558) and theoretical sd (5) are very close to each other, and the sd of each group seems like normal distribution.

4. Show distribution

```
qqnorm(mean)
qqline(mean)
```

Normal Q-Q Plot



From Normal Q-Q plot above, we can say the distribution of sample mean is normal distribution. And the result fits the Central Limit Theorem.