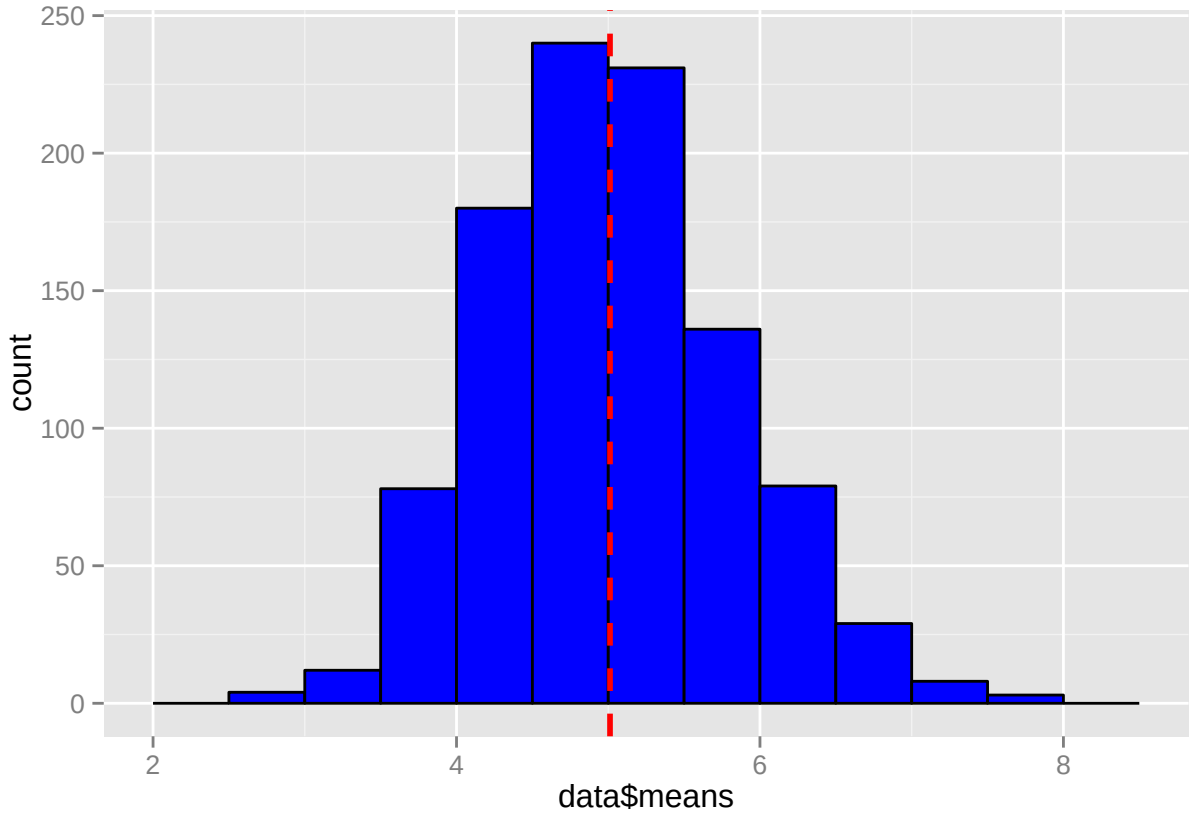
The project for the statistical inference class

PART 1. Simulation.

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.

Show where the distribution is centered at and compare it to the theoretical center of the distribution.

Simulating the distribution of averages of 40 exponential(0.2)s:



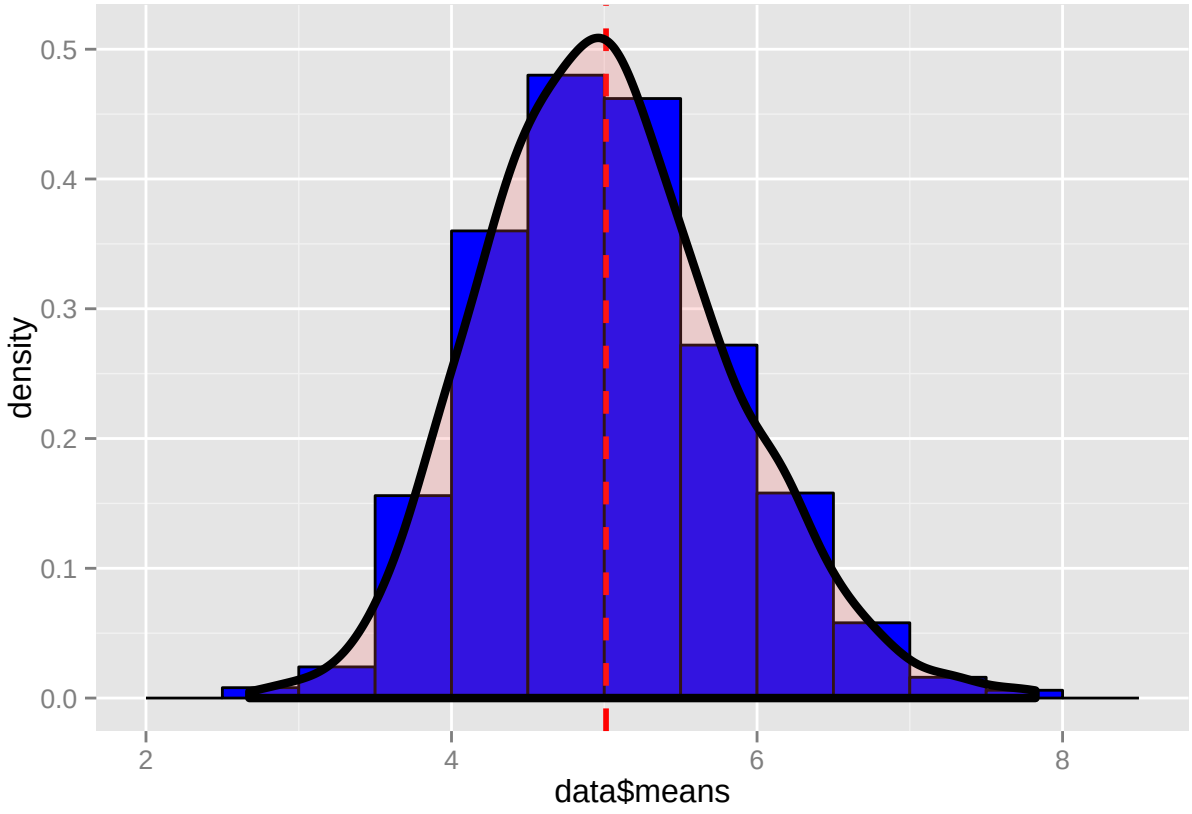
The center of the sample distribution is mean 5.0116 (red dashed line).

The theoretical center of the distribution (mean) is 1/lambda: 5.
The mean of the sample distribution approximately equals to the theoretical mean.

Show how variable it is and compare it to the theoretical variance of the distribution.

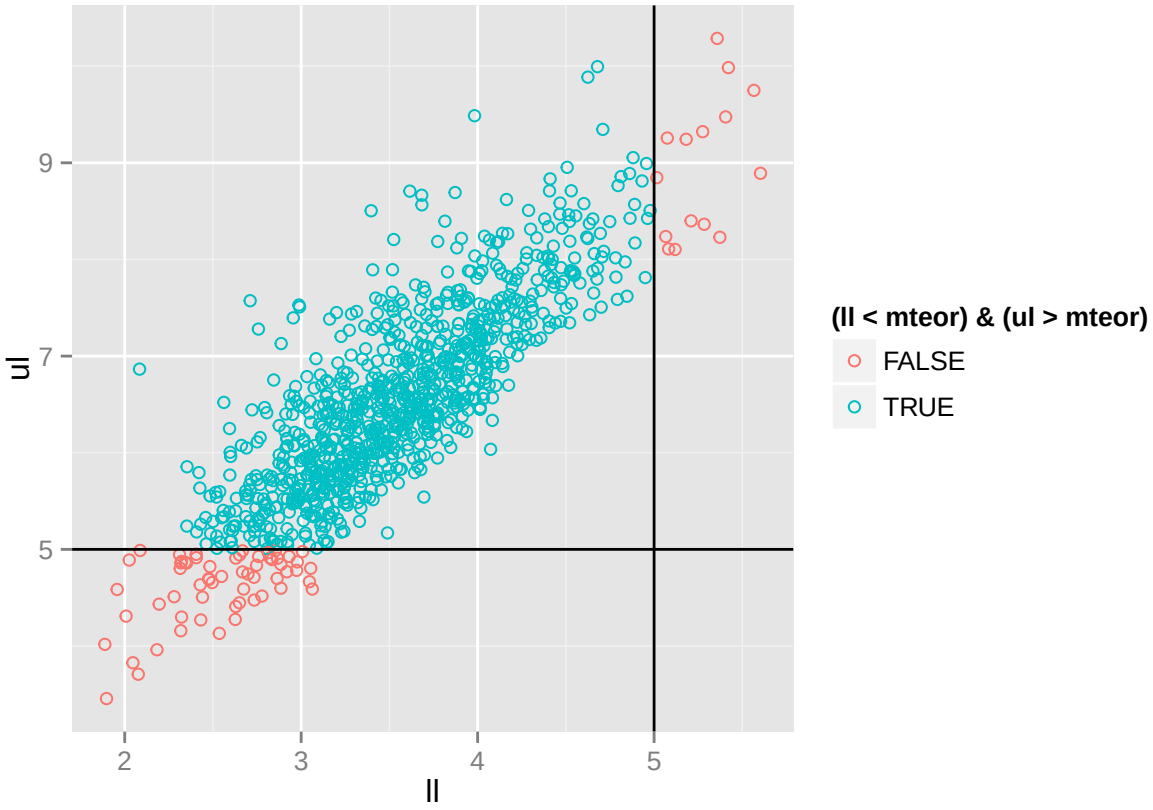
The variance of the sample distribution is 0.6349. The theoretical variance is 0.625, which is calculated as varicance of exponential distribution divided by n. The variances are approximately the same.

Show that the distribution is approximately normal.



Evaluate the coverage of the confidence interval for 1/lambda.

I interpreted this question to mean: discover proportion of time when 95% confidence interval contains the point estimate (the theoretical mean = 1/lambda). The plot below shows when the point estimate is within 95% confidence level [`ll`, `ul`], where `ll` - lower limit, 'ul' - upper limit of the interval.



The theoretical mean (1/lambda) = `mteor` = 5. Percent of confidence intervals containing the theoretical mean is 92 %.