Central Limit Theory and the Exponential Distribution

Andrew Crisp

November 13, 2015

Overview

Through a simulation, the Central Limit Theory will be demonstrated. The mean and variance of the exponential distribution will be simulated and compared to calculated values.

Simulations

During the simulation, lambda will be set to a controlled 0.2.

```
lambda <- 0.2
nosims <- 1000
means <- NULL
rexpValues <- NULL
n <- 40
rexpValues <- rexp(n = nosims, rate = lambda)
#for (i in 1:nosims) rexpValues <- c(rexpValues,rexp(n = n, rate = lambda))
```

Sample mean versus Theoretical mean

The mean of an exponential distribution is 1/lambda. This theoretical mean can be calculated easily and compared with the actual collected sample mean.

```
calcMean <- 1/lambda
n40CLTMean <- mean(sample(rexpValues, n, replace = FALSE))
n100CLTMean <- mean(sample(rexpValues, 100, replace = FALSE))
simMean <- mean(rexpValues)
```

The calculated mean is 5.

The mean according to Central Limit Theory with a sample size of 40 should be near 4.0033626. With a sample size of 100, the mean should be near 5.8199523.

The actual mean of the simulated values is 5.1273181.

Sample variance versus Theoretical variance

Distribution