Simulation exercise using the exponential function

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Simulation exercise

Overview

This simulation exercise will draw 40 variables from a random exponential distribution of data with $\lambda = 0.2$. A mean distribution of 1000 simulations will be sampled and the mean and variance of this distribution, calculated. Finally, a simple histogram plot will be used to visualize the distribution.

Simulations

In this section, the initial variables are set, then each sample of the simulations will be stored as a row in a matrix. As we have 1000 simulations, the matrix will by default contain 1000 rows (as well as 40 columns).

Variable initialization

Loading initial packages.

```
packages <- c('ggplot2', 'dplyr')
sapply(packages, require, character.only = TRUE, quietly = TRUE)
```

```
## ggplot2    dplyr
##    TRUE     TRUE
```

The initial variables are set to the following values.

```
set.seed(9)
n <- 40
lambda <- 0.2
draws <- 1000
theoreticalMean <- 1 / lambda
theoreticalSD <- 1 / lambda
```

Simulated matrix generation

The matrix of the random draws is calculated using the standard R function `rexp()`.

```
simulations <- matrix(rexp(n * draws, lambda), nrow = draws)
str(simulations)
```

```
##  num [1:1000, 1:40] 7.02 7.4 6.28 5.85 1.69 ...
```
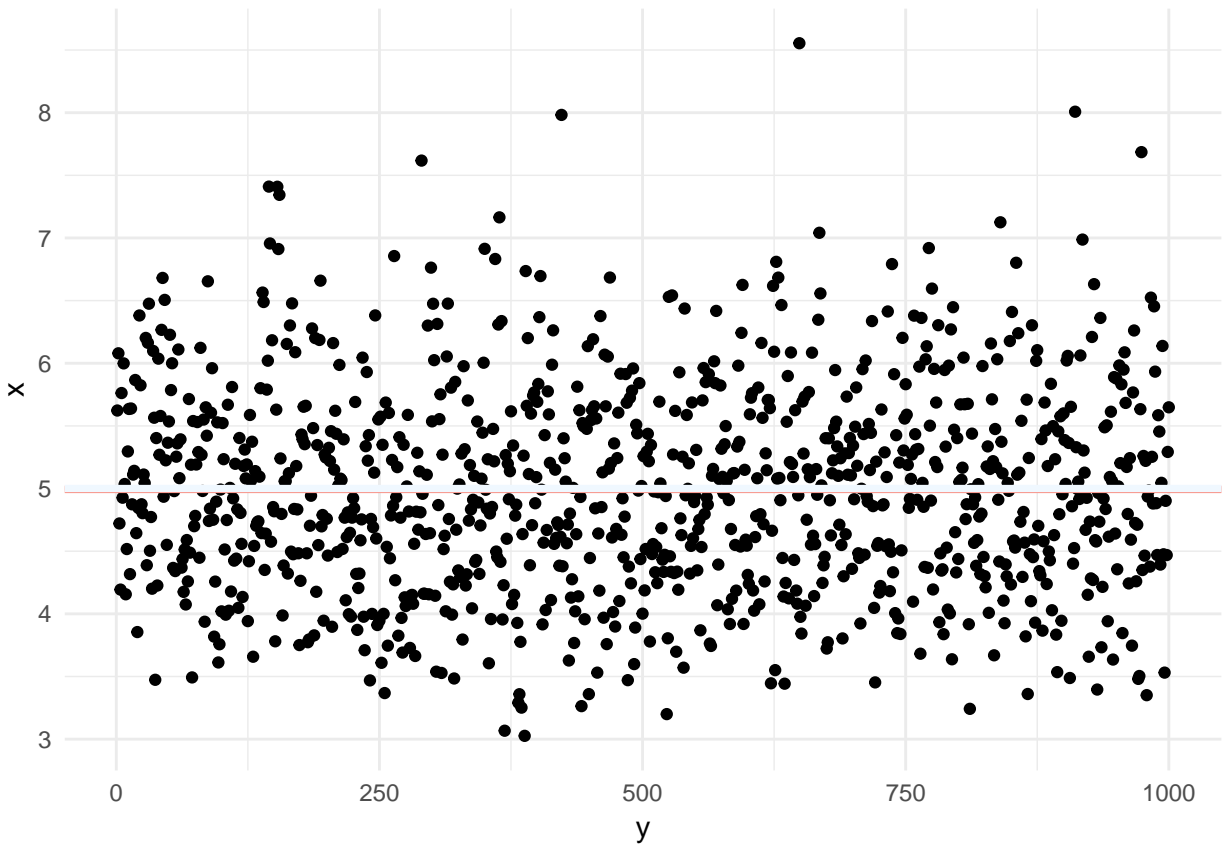
Sample versus theoretical mean

Calculating the means of the simulations.

```
xBar <- rowMeans(simulations)
c(mean(xBar), theoreticalMean)
```

[1] 4.993253 5.000000

Plotting the means.

As we can see in the data plot, the theoretical mean of the data and the estimated mean from the sample distribution almost overlap considering 1000 simulations.