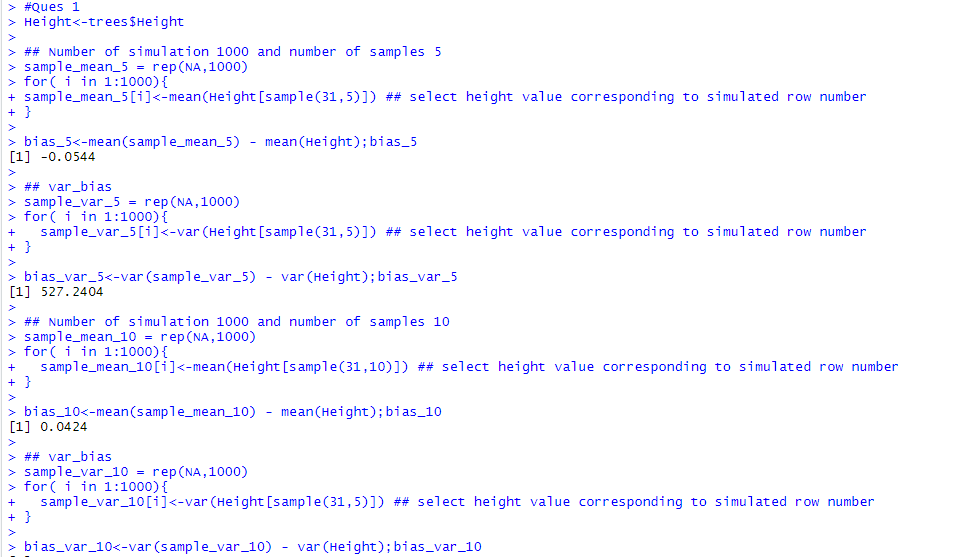
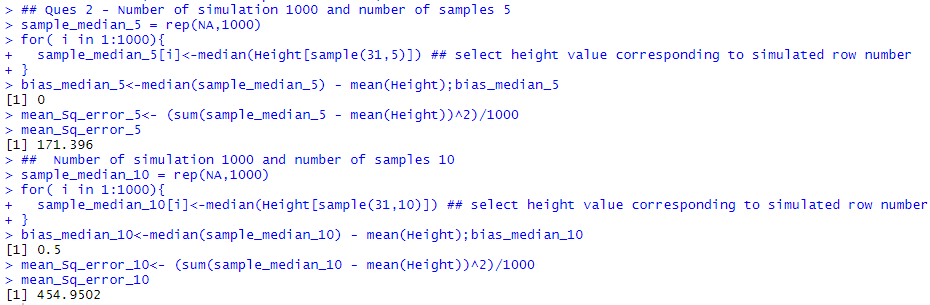
1. Consider “Height” of trees Data set in R as a population . Using simuation find the biases of for n=5 and 10 and compare them. Give a commont on the results. (SRS is used)





1. For Question 1, if we use the sample median as an estimation of the mean compute its baises and its Mean Square Errors using simulation.



1. Show that E( in simple random sampling, where the sample variance is defind with n-1 in the denominator and the population variance is defind with N-1 in the denominator. [Hint; Write as , Verify that

Proof :

and either take expectation over all possible samples or define an indicator variable for each unit, indicating wheather it is included in tha sample].

1. Consider a samll population of N=5 units, labled 1,2,3,4,5, with repective y-values 3,1,0,1,5. Consider a simple random sampling design with a sample size n=3. For your convenience, several parts of the following may be combined into a single table.
2. Give the values of the population parameters . List every possible samples of size n=3. For each sample, what is the probability that it is the one selected

N = 5

n = 3

Possible number of sample = 5C3 = 10

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Units | 1 | 2 | 3 | 4 | 5 |
| yi | 3 | 1 | 0 | 1 | 5 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Sample** | **Units** | **yi** | **Probability** | **y ̅i** | **sample median** |
| 1 | (1,2,3) | 3,1,0 | 0.10 | 1.33 | 1 |
| 2 | (1,2,4) | 3,1,1 | 0.10 | 1.67 | 1 |
| 3 | (1,2,5) | 3,1,5 | 0.10 | 3.00 | 3 |
| 4 | (2,3,4) | 1,0,1 | 0.10 | 0.67 | 1 |
| 5 | (2,3,5) | 1,0,5 | 0.10 | 2.00 | 1 |
| 6 | (3,4,5) | 0,1,5 | 0.10 | 2.00 | 1 |
| 7 | (2,4,5) | 1,1,5 | 0.10 | 2.33 | 1 |
| 8 | (1,3,4) | 3,0,1 | 0.10 | 1.33 | 1 |
| 9 | (1,3,5) | 3,0,5 | 0.10 | 2.67 | 3 |
| 10 | (1,4,5) | 3,1,5 | 0.10 | 3.00 | 3 |
| Total |  |  |  | 20.00 |  |

1. For each sample, compute the sample mean and the sample median . Demonstate that the sample mean is undiased for the population mean and determine wheather the sample median is undiased for the population median.

|  |  |
| --- | --- |
| **sample mean (y ̅)** | 2 |
| **population mean (Y ̅)** | 2 |
| **sample median** | 1 |
| **population median** | 1 |