

Template_Rmd

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Part 1: explanation of the variables and the parameters of the population:

nSims: Number of simulations
N: Population size
n: Sample size
y: Population generated from $N(\theta, \sigma^2)$
 θ : Mean of y
 σ^2 : Variance of y
Y: Sample selected without replacement from y
 $\bar{\theta}$: Mean of the sample
 var : Variance of Monte Carlo Draws

Part 2: Presenting the findings

```
nSims=10000
theta=2
sigma2=1
N=10000
n=c(100,1000,5000,9000,9900)
```

```
for (i in 1:length(n)){
  cat(paste0('n=',n[i],'\n'))
  print(simulation(nSims,theta,sigma2,N,n[i]))
  cat('\n\n')
}
```

```
## n=100
## [[1]]
##           sampleMean  sampleVar
## Observed      2.008476 0.009681057
## Theoretical    2.000000 0.009900000
##
## [[2]]
##  nSims  theta sigma2      N      n
## 10000     2      1 10000    100
##
## [[3]]
##      Expected_Mean  Expected_Variance
##      "theta" "(N-n)/(N*n)*sigma2"
```

```

##
##
##
##
## n=1000
## [[1]]
##          sampleMean    sampleVar
## Observed      1.986842 0.0008827798
## Theoretical    2.000000 0.0009000000
##
## [[2]]
## nSims  theta sigma2      N      n
## 10000    2      1 10000  1000
##
## [[3]]
##      Expected_Mean    Expected_Variance
##      "theta" "(N-n)/(N*n)*sigma2"
##
##
##
##
## n=5000
## [[1]]
##          sampleMean    sampleVar
## Observed      1.995769 9.746047e-05
## Theoretical    2.000000 1.000000e-04
##
## [[2]]
## nSims  theta sigma2      N      n
## 10000    2      1 10000  5000
##
## [[3]]
##      Expected_Mean    Expected_Variance
##      "theta" "(N-n)/(N*n)*sigma2"
##
##
##
##
## n=9000
## [[1]]
##          sampleMean    sampleVar
## Observed      2.002252 1.141088e-05
## Theoretical    2.000000 1.111111e-05
##
## [[2]]
## nSims  theta sigma2      N      n
## 10000    2      1 10000  9000
##
## [[3]]
##      Expected_Mean    Expected_Variance
##      "theta" "(N-n)/(N*n)*sigma2"
##
##
##
##

```

```

##
## n=9900
## [[1]]
##          sampleMean    sampleVar
## Observed      2.023749 1.012807e-06
## Theoretical  2.000000 1.010101e-06
##
## [[2]]
##  nSims  theta sigma2      N      n
## 10000    2      1 10000  9900
##
## [[3]]
##      Expected_Mean    Expected_Variance
##      "theta" "(N-n)/(N*n)*sigma2"

```