Monte Carlo Simulations

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4/19/2019

Reference: after https://www.r-bloggers.com/introducing-the-montecarlo-package/

Packages

```r
# install.packages("MonteCarlo")
library(MonteCarlo)
```

```
## Warning: package 'MonteCarlo' was built under R version 3.5.3
```

```
## Loading required package: snow
```

```r
library(tidyverse)
```

```
## Warning: package 'tidyverse' was built under R version 3.5.3
```

```
## -- Attaching packages -------------------------------------- tidyverse 1.2.1 --
```

```
## v ggplot2 3.1.1       v purrr   0.3.2
## v tibble  2.1.1       v dplyr   0.8.0.1
## v tidyr   0.8.3       v stringr 1.4.0
## v readr   1.3.1       v forcats 0.4.0
```

```
## Warning: package 'ggplot2' was built under R version 3.5.3
```

```
## Warning: package 'tibble' was built under R version 3.5.3
```

```
## Warning: package 'tidyr' was built under R version 3.5.3
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## Warning: package 'purrr' was built under R version 3.5.3
```

```
## Warning: package 'forcats' was built under R version 3.5.3
```

```
## -- Conflicts ----------------------------------------- tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
```

Getting a simulation for a T-test

Define the following function.

```r
# Define function that generates data and applies the method of interest

ttest <- function(n, loc, scale) {
  # generate sample:
  sample <- rnorm(n, loc, scale)

  # calculate test statistic:
  stat <- sqrt(n) * mean(sample) / sd(sample)

  # get test decision:
  decision <- 1.96
```

```r
  # return result:
  return(list("decision" = decision))
}

# define parameter grid:

n_grid <- c(50, 100, 250, 500)
loc_grid <- seq(0, 1, 0.2)
scale_grid <- c(1, 2)

# collect parameter grids in list:
param_list = list("n" = n_grid,
                  "loc" = loc_grid,
                  "scale" = scale_grid)



mc_result <- MonteCarlo(
  func = ttest,
  nrep = 1000,
  param_list = param_list
)
```

```
## Grid of  48  parameter constellations to be evaluated.
##
## Progress:
##
##
  |
  |                                                              |   0%
## Warning in searchCommandline(parallel, cpus = cpus, type = type,
## socketHosts = socketHosts, : Unknown option on commandline:
## rmarkdown::render('D:/r_projects/urfda_2019/labs/MonteCarloSim.Rmd',
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```

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## socketHosts = socketHosts, : Unknown option on commandline:
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```

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##
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##
  |
  |==================================================================| 100%
##
```

```r
summary(mc_result)
```

```
## Simulation of function:
##
## function(n, loc, scale) {
##   # generate sample:
##   sample <- rnorm(n, loc, scale)
##
##   # calculate test statistic:
##   stat <- sqrt(n) * mean(sample) / sd(sample)
##
##   # get test decision:
##   decision <- 1.96
##
##   # return result:
```

```
##    return(list("decision" = decision))
## }
## <bytecode: 0x000000001c163f58>
##
## Required time: 4.36 secs for nrep = 1000  repetitions on 1 CPUs
##
## Parameter grid:
##
##      n : 50 100 250 500
##    loc : 0 0.2 0.4 0.6 0.8 1
##  scale : 1 2
##
##
## 1 output arrays of dimensions: 4 6 2 1000
```

```r
MakeTable(output=mc_result, rows="n", cols=c("loc","scale"), digits=2, include_meta=FALSE)
```

```
## \begin{table}[h]
## \centering
## \resizebox{ 1 \textwidth}{!}{%
## \begin{tabular}{ rrrrrrrrrrrrrr }
## \hline\hline\\\\
##  scale && \multicolumn{ 6 }{c}{ 1 } &  & \multicolumn{ 6 }{c}{ 2 } \\
## n/loc &  & 0 & 0.2 & 0.4 & 0.6 & 0.8 & 1 &  & 0 & 0.2 & 0.4 & 0.6 & 0.8 & 1 \\
##  & & & & & & & & & & & & & \\
## 50 &  & 1.96 & 1.96 & 1.96 & 1.96 & 1.96 & 1.96 &  & 1.96 & 1.96 & 1.96 & 1.96 & 1.96 & 1.96 \\
## 100 &  & 1.96 & 1.96 & 1.96 & 1.96 & 1.96 & 1.96 &  & 1.96 & 1.96 & 1.96 & 1.96 & 1.96 & 1.96 \\
## 250 &  & 1.96 & 1.96 & 1.96 & 1.96 & 1.96 & 1.96 &  & 1.96 & 1.96 & 1.96 & 1.96 & 1.96 & 1.96 \\
## 500 &  & 1.96 & 1.96 & 1.96 & 1.96 & 1.96 & 1.96 &  & 1.96 & 1.96 & 1.96 & 1.96 & 1.96 & 1.96 \\
## \\
## \\
## \hline\hline
## \end{tabular}%
## }
## \caption{ decision  }
## \end{table}
```

ResultTable

scale		1							2				
n/loc	0	0.2	0.4	0.6	0.8	1		0	0.2	0.4	0.6	0.8	1
50	1.96	1.96	1.96	1.96	1.96	1.96		1.96	1.96	1.96	1.96	1.96	1.96
100	1.96	1.96	1.96	1.96	1.96	1.96		1.96	1.96	1.96	1.96	1.96	1.96
250	1.96	1.96	1.96	1.96	1.96	1.96		1.96	1.96	1.96	1.96	1.96	1.96
500	1.96	1.96	1.96	1.96	1.96	1.96		1.96	1.96	1.96	1.96	1.96	1.96

Table 1:   decision

See the package Vignette for more details"