betaMC: Internal Tests

Ivan Jacob Agaloos Pesigan

Tests

```
#> test-betaMC-beta-mc-est
#> Call:
#> BetaMC(object = mc)
#>
#> Standardized regression slopes
#> type = "mvn"
#>             est      se R  0.05%    0.5%    2.5%  97.5%   99.5% 99.95%
#> NARTIC   0.4951 0.0723 5 0.4514 0.4517 0.4529 0.6223 0.6320 0.6342
#> PCTGRT   0.3915 0.1049 5 0.2816 0.2823 0.2856 0.5359 0.5449 0.5470
#> PCTSUPP  0.2632 0.0816 5 0.0753 0.0779 0.0893 0.2748 0.2753 0.2754
#> Call:
#> BetaMC(object = mc)
#>
#> Standardized regression slopes
#> type = "mvn"
#> Test passed
#> Call:
#> BetaMC(object = mc)
#>
#> Standardized regression slopes
#> type = "mvn"
#>          est     se R 0.05%   0.5%    2.5%  97.5%   99.5% 99.95%
#> NARTIC 0.7622 0.055 5   0.67 0.6705 0.6727 0.8017 0.8048 0.8055
#> Call:
#> BetaMC(object = mc)
#>
#> Standardized regression slopes
#> type = "mvn"

#> test-betaMC-delta-r-sq-mc-est

#> Call:
#> DeltaRSqMC(object = mc)
#>
#> Improvement in R-squared
```

```
#> type = "mvn"
#>          est     se R   0.05%   0.5%    2.5%  97.5%  99.5% 99.95%
#> NARTIC  0.1859 0.0436 5 0.1180 0.1189 0.1232 0.2340 0.2372 0.2380
#> PCTGRT  0.1177 0.0658 5 0.0853 0.0853 0.0855 0.2342 0.2408 0.2422
#> PCTSUPP 0.0569 0.0134 5 0.0180 0.0182 0.0191 0.0491 0.0492 0.0492
#> Call:
#> DeltaRSqMC(object = mc)
#>
#> Improvement in R-squared
#> type = "mvn"
#> Test passed
#> Test passed

#> test-betaMC-diff-beta-mc-est

#> Call:
#> DiffBetaMC(object = mc)
#>
#> Differences of standardized regression slopes
#> type = "mvn"
#>                    est     se R    0.05%    0.5%     2.5%  97.5%  99.5% 99.95%
#> NARTIC-PCTGRT   0.1037 0.2389 5  -0.1912 -0.1880 -0.1738 0.3370 0.3393 0.3398
#> NARTIC-PCTSUPP  0.2319 0.1349 5   0.1239  0.1247  0.1282 0.4445 0.4544 0.4566
#> PCTGRT-PCTSUPP  0.1282 0.1335 5  -0.0180 -0.0173 -0.0141 0.3020 0.3128 0.3152
#> Call:
#> DiffBetaMC(object = mc)
#>
#> Differences of standardized regression slopes
#> type = "mvn"
#> Test passed
#> Test passed

#> test-betaMC-mc-fixed-x

#> MC(object = object, R = R, type = "mvn", fixed_x = TRUE)
#> MC(object = object, R = R, type = "adf", fixed_x = TRUE)
#> MC(object = object, R = R, type = "hc0", fixed_x = TRUE)
#> MC(object = object, R = R, type = "hc1", fixed_x = TRUE)
#> MC(object = object, R = R, type = "hc2", fixed_x = TRUE)
#> MC(object = object, R = R, type = "hc3", fixed_x = TRUE)
#> MC(object = object, R = R, type = "hc4", fixed_x = TRUE)
#> MC(object = object, R = R, type = "hc4m", fixed_x = TRUE)
#> MC(object = object, R = R, type = "hc5", fixed_x = TRUE)
#> Test passed
#> Test passed
#> Test passed
#> Test passed
```

```
#> Test passed
#> Test passed
#> Test passed
#> Test passed
#> Test passed
#> Call:
#> MC(object = object, R = 5L, decomposition = "chol", fixed_x = TRUE)
#> The first set of simulated parameter estimates
#> and model-implied covariance matrix.
#>
#> $coef
#> [1] 0.4590612 0.5572828
#>
#> $sigmasq
#> [1] 0.5567167
#>
#> $vechsigmacapx
#> [1] 1.000000e+00 2.496804e-16 1.000000e+00
#>
#> $sigmacapx
#>                [,1]          [,2]
#> [1,] 1.000000e+00 2.496804e-16
#> [2,] 2.496804e-16 1.000000e+00
#>
#> $sigmaysq
#> [1] 1.078018
#>
#> $sigmayx
#> [1] 0.4590612 0.5572828
#>
#> $sigmacap
#>            [,1]         [,2]         [,3]
#> [1,] 1.0780181 4.590612e-01 5.572828e-01
#> [2,] 0.4590612 1.000000e+00 2.496804e-16
#> [3,] 0.5572828 2.496804e-16 1.000000e+00
#>
#> $pd
#> [1] TRUE
#>
#> Call:
#> MC(object = object, R = 5L, decomposition = "svd", fixed_x = TRUE)
#> The first set of simulated parameter estimates
#> and model-implied covariance matrix.
#>
#> $coef
#> [1] 0.4184348 0.5301722
```

3

```
#>
#> $sigmasq
#> [1] 0.575233
#>
#> $vechsigmacapx
#> [1] 1.000000e+00 2.496804e-16 1.000000e+00
#>
#> $sigmacapx
#>              [,1]         [,2]
#> [1,] 1.000000e+00 2.496804e-16
#> [2,] 2.496804e-16 1.000000e+00
#>
#> $sigmaysq
#> [1] 1.031403
#>
#> $sigmayx
#> [1] 0.4184348 0.5301722
#>
#> $sigmacap
#>           [,1]         [,2]         [,3]
#> [1,] 1.0314033 4.184348e-01 5.301722e-01
#> [2,] 0.4184348 1.000000e+00 2.496804e-16
#> [3,] 0.5301722 2.496804e-16 1.000000e+00
#>
#> $pd
#> [1] TRUE

#> test-betaMC-mc-mi

#> MCMI(object = object, R = R, type = "mvn", data = df)
#> MCMI(object = object, R = R, type = "adf", data = df)
#> MCMI(object = object, R = R, type = "hc0", data = df)
#> MCMI(object = object, R = R, type = "hc1", data = df)
#> MCMI(object = object, R = R, type = "hc2", data = df)
#> MCMI(object = object, R = R, type = "hc3", data = df)
#> MCMI(object = object, R = R, type = "hc4", data = df)
#> MCMI(object = object, R = R, type = "hc4m", data = df)
#> MCMI(object = object, R = R, type = "hc5", data = df)
#> Test passed
#> Test passed
#> Test passed
#> Test passed
#> Test passed
#> Test passed
#> Test passed
#> Test passed
#> Test passed
```

```
#> Call:
#> MCMI(object = object, R = 5L, decomposition = "chol", data = df)
#> The first set of simulated parameter estimates
#> and model-implied covariance matrix.
#>
#> $coef
#> [1] 0.4484878 0.4571924
#>
#> $sigmasq
#> [1] 0.5438763
#>
#> $vechsigmacapx
#> [1]   1.01085074 -0.03573607  0.91166820
#>
#> $sigmacapx
#>             [,1]         [,2]
#> [1,]  1.01085074 -0.03573607
#> [2,] -0.03573607  0.91166820
#>
#> $sigmaysq
#> [1] 0.9231065
#>
#> $sigmayx
#> [1] 0.4370159 0.4007806
#>
#> $sigmacap
#>           [,1]        [,2]        [,3]
#> [1,] 0.9231065  0.43701592  0.40078063
#> [2,] 0.4370159  1.01085074 -0.03573607
#> [3,] 0.4007806 -0.03573607  0.91166820
#>
#> $pd
#> [1] TRUE
#>
#> Call:
#> MCMI(object = object, R = 5L, decomposition = "svd", data = df)
#> The first set of simulated parameter estimates
#> and model-implied covariance matrix.
#>
#> $coef
#> [1] 0.4383044 0.4905801
#>
#> $sigmasq
#> [1] 0.5179053
#>
#> $vechsigmacapx
```

```
#> [1] 0.96884541 0.06248955 1.03454683
#>
#> $sigmacapx
#>            [,1]       [,2]
#> [1,] 0.96884541 0.06248955
#> [2,] 0.06248955 1.03454683
#>
#> $sigmaysq
#> [1] 0.9798875
#>
#> $sigmayx
#> [1] 0.4553053 0.5349175
#>
#> $sigmacap
#>           [,1]       [,2]       [,3]
#> [1,] 0.9798875 0.45530535 0.53491750
#> [2,] 0.4553053 0.96884541 0.06248955
#> [3,] 0.5349175 0.06248955 1.03454683
#>
#> $pd
#> [1] TRUE

#> test-betaMC-mc

#> MC(object = object, R = R, type = "mvn")
#> MC(object = object, R = R, type = "adf")
#> MC(object = object, R = R, type = "hc0")
#> MC(object = object, R = R, type = "hc1")
#> MC(object = object, R = R, type = "hc2")
#> MC(object = object, R = R, type = "hc3")
#> MC(object = object, R = R, type = "hc4")
#> MC(object = object, R = R, type = "hc4m")
#> MC(object = object, R = R, type = "hc5")
#> Test passed
#> Test passed
#> Test passed
#> Test passed
#> Test passed
#> Test passed
#> Test passed
#> Test passed
#> Test passed
#> Call:
#> MC(object = object, R = 5L, decomposition = "chol")
#> The first set of simulated parameter estimates
#> and model-implied covariance matrix.
#>
```

```
#> $coef
#> [1] 0.4834591 0.4936760
#>
#> $sigmasq
#> [1] 0.5282262
#>
#> $vechsigmacapx
#> [1] 1.05376235 0.02467866 1.04064604
#>
#> $sigmacapx
#>             [,1]       [,2]
#> [1,] 1.05376235 0.02467866
#> [2,] 0.02467866 1.04064604
#>
#> $sigmaysq
#> [1] 1.039927
#>
#> $sigmayx
#> [1] 0.5216343 0.5256731
#>
#> $sigmacap
#>           [,1]       [,2]       [,3]
#> [1,] 1.0399273 0.52163431 0.52567313
#> [2,] 0.5216343 1.05376235 0.02467866
#> [3,] 0.5256731 0.02467866 1.04064604
#>
#> $pd
#> [1] TRUE
#>
#> Call:
#> MC(object = object, R = 5L, decomposition = "svd")
#> The first set of simulated parameter estimates
#> and model-implied covariance matrix.
#>
#> $coef
#> [1] 0.4891556 0.5156816
#>
#> $sigmasq
#> [1] 0.5342573
#>
#> $vechsigmacapx
#> [1] 0.99430782 0.03701858 0.97050286
#>
#> $sigmacapx
#>             [,1]       [,2]
```

```
#> [1,] 0.99430782 0.03701858
#> [2,] 0.03701858 0.97050286
#>
#> $sigmaysq
#> [1] 1.048928
#>
#> $sigmayx
#> [1] 0.5054611 0.5185783
#>
#> $sigmacap
#>            [,1]       [,2]       [,3]
#> [1,] 1.0489277 0.50546107 0.51857834
#> [2,] 0.5054611 0.99430782 0.03701858
#> [3,] 0.5185783 0.03701858 0.97050286
#>
#> $pd
#> [1] TRUE

#> test-betaMC-p-cor-mc-est

#> Call:
#> PCorMC(object = mc)
#>
#> Squared partial correlations
#> type = "mvn"
#>             est     se R  0.05%    0.5%    2.5%  97.5%  99.5% 99.95%
#> NARTIC   0.4874 0.1562 5 0.2228 0.2248 0.2339 0.6257 0.6416 0.6451
#> PCTGRT   0.3757 0.1144 5 0.1751 0.1763 0.1814 0.4545 0.4613 0.4629
#> PCTSUPP 0.2254 0.1029 5 0.1212 0.1224 0.1277 0.3831 0.3922 0.3942
#> Call:
#> PCorMC(object = mc)
#>
#> Squared partial correlations
#> type = "mvn"
#> Test passed
#> Test passed

#> test-betaMC-r-sq-mc-est

#> Call:
#> RSqMC(object = mc)
#>
#> R-squared and adjusted R-squared
#> type = "mvn"
#>        est     se R  0.05%    0.5%    2.5%  97.5%  99.5% 99.95%
#> rsq 0.8045 0.0643 5 0.6948 0.6952 0.6968 0.8414 0.8434 0.8439
#> adj 0.7906 0.0689 5 0.6730 0.6734 0.6751 0.8300 0.8323 0.8328
```

```
#> Call:
#> RSqMC(object = mc)
#>
#> R-squared and adjusted R-squared
#> type = "mvn"
#> Test passed
#> Call:
#> RSqMC(object = mc)
#>
#> R-squared and adjusted R-squared
#> type = "mvn"
#>        est     se R  0.05%   0.5%   2.5%  97.5%  99.5% 99.95%
#> rsq 0.5809 0.0322 5 0.5914 0.5914 0.5914 0.6652 0.6692 0.6702
#> adj 0.5714 0.0329 5 0.5821 0.5821 0.5822 0.6576 0.6617 0.6627
#> Call:
#> RSqMC(object = mc)
#>
#> R-squared and adjusted R-squared
#> type = "mvn"
#> Test passed

#> test-betaMC-s-cor-mc-est

#> Call:
#> SCorMC(object = mc)
#>
#> Semipartial correlations
#> type = "mvn"
#>           est     se R  0.05%   0.5%   2.5%  97.5%  99.5% 99.95%
#> NARTIC  0.4312 0.0627 5 0.3809 0.3811 0.3820 0.5233 0.5264 0.5271
#> PCTGRT  0.3430 0.0382 5 0.2617 0.2622 0.2645 0.3579 0.3602 0.3607
#> PCTSUPP 0.2385 0.0606 5 0.1173 0.1190 0.1266 0.2668 0.2673 0.2674
#> Call:
#> SCorMC(object = mc)
#>
#> Semipartial correlations
#> type = "mvn"
#> Test passed
#> Test passed
#> [[1]]
#> [[1]][[1]]
#> [[1]][[1]]$value
#> [[1]][[1]]$value[[1]]
#>      2.5%     97.5%
#> 0.6726747 0.8017235
#>
#>
```

```
#> [[1]][[1]]$visible
#> [1] TRUE
#>
#>
#> [[1]][[2]]
#> [[1]][[2]]$value
#> [[1]][[2]]$value[[1]]
#> [1] TRUE
#>
#>
#> [[1]][[2]]$visible
#> [1] TRUE
#>
#>
#> [[1]][[3]]
#> [[1]][[3]]$value
#> [[1]][[3]]$value[[1]]
#> [1] TRUE
#>
#>
#> [[1]][[3]]$visible
#> [1] TRUE
#>
#>
#> [[1]][[4]]
#> [[1]][[4]]$value
#> [[1]][[4]]$value[[1]]
#> [[1]][[4]]$value[[1]]$coef
#> [1] 0.4184348 0.5301722
#>
#> [[1]][[4]]$value[[1]]$sigmasq
#> [1] 0.575233
#>
#> [[1]][[4]]$value[[1]]$vechsigmacapx
#> [1] 1.000000e+00 2.496804e-16 1.000000e+00
#>
#> [[1]][[4]]$value[[1]]$sigmacapx
#>               [,1]           [,2]
#> [1,] 1.000000e+00 2.496804e-16
#> [2,] 2.496804e-16 1.000000e+00
#>
#> [[1]][[4]]$value[[1]]$sigmaysq
#> [1] 1.031403
#>
#> [[1]][[4]]$value[[1]]$sigmayx
```

```
#> [1] 0.4184348 0.5301722
#>
#> [[1]][[4]]$value[[1]]$sigmacap
#>           [,1]          [,2]          [,3]
#> [1,] 1.0314033 4.184348e-01 5.301722e-01
#> [2,] 0.4184348 1.000000e+00 2.496804e-16
#> [3,] 0.5301722 2.496804e-16 1.000000e+00
#>
#> [[1]][[4]]$value[[1]]$pd
#> [1] TRUE
#>
#>
#>
#> [[1]][[4]]$visible
#> [1] TRUE
#>
#>
#> [[1]][[5]]
#> [[1]][[5]]$value
#> [[1]][[5]]$value[[1]]
#>          beta1 beta2 rsq sigmax1x1 sigmax2x1 sigmax2x2
#> sigmaysq     1     1  -2      0.25       0.5      0.25
#> sigmayx1     1     0   0      0.50       0.5      0.00
#> sigmayx2     0     1   0      0.00       0.5      0.50
#> sigmax1x1    0     0   0      1.00       0.0      0.00
#> sigmax2x1    0     0   0      0.00       1.0      0.00
#> sigmax2x2    0     0   0      0.00       0.0      1.00
#>
#>
#> [[1]][[5]]$visible
#> [1] TRUE
#>
#>
#> [[1]][[6]]
#> [[1]][[6]]$value
#> [[1]][[6]]$value[[1]]
#>          beta1 beta2 rsq sigmax1x1 sigmax2x1 sigmax2x2
#> sigmaysq     1     1  -2      0.25       0.5      0.25
#> sigmayx1     1     0   0      0.50       0.5      0.00
#> sigmayx2     0     1   0      0.00       0.5      0.50
#> sigmax1x1    0     0   0      1.00       0.0      0.00
#> sigmax2x1    0     0   0      0.00       1.0      0.00
#> sigmax2x2    0     0   0      0.00       0.0      1.00
#>
#>
```

```
#> [[1]][[6]]$visible
#> [1] TRUE
#>
#>
#> [[1]][[7]]
#> [[1]][[7]]$value
#> [[1]][[7]]$value[[1]]
#> [1] TRUE
#>
#>
#> [[1]][[7]]$visible
#> [1] TRUE
#>
#>
#> [[1]][[8]]
#> [[1]][[8]]$value
#> [[1]][[8]]$value[[1]]
#> [1] TRUE
#>
#>
#> [[1]][[8]]$visible
#> [1] TRUE
#>
#>
#> [[1]][[9]]
#> [[1]][[9]]$value
#> [[1]][[9]]$value[[1]]
#> [1] TRUE
#>
#>
#> [[1]][[9]]$visible
#> [1] TRUE
```

Environment

```r
ls()

#> [1] "nas1982"  "root"     "tex_file"
```

Class

```
#> [[1]]
#> [1] "data.frame"
#>
#> [[2]]
#> [1] "root_criterion"
#>
#> [[3]]
#> [1] "character"
```

References

R Core Team. (2023). *R: A language and environment for statistical computing.* R Foundation for Statistical Computing. Vienna, Austria. https://www.R-project.org/