betaMC: Internal Tests

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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 0.0594 5 0.4729 0.4732 0.4748 0.6181 0.6250 0.6265
#> PCTGRT  0.3915 0.0455 5 0.3001 0.3016 0.3083 0.4120 0.4124 0.4125
#> PCTSUPP 0.2632 0.0346 5 0.1788 0.1793 0.1811 0.2671 0.2710 0.2718
#> 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 0.0511 5 0.6398 0.6413 0.648 0.7643 0.765 0.7652
#> 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 0.0494 5 0.0297 0.0307 0.0352 0.1495 0.1504 0.1506
#> PCTGRT  0.1177 0.0721 5 0.0955 0.0956 0.0961 0.2484 0.2608 0.2636
#> PCTSUPP 0.0569 0.0224 5 0.0286 0.0288 0.0298 0.0819 0.0827 0.0829
#> 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 0.0773 5 -0.0756 -0.0742 -0.0682 0.1089 0.1094 0.1095
#> NARTIC-PCTSUPP 0.2319 0.1259 5  0.0295  0.0315  0.0405 0.3578 0.3679 0.3702
#> PCTGRT-PCTSUPP 0.1282 0.0592 5  0.1051  0.1057  0.1085 0.2499 0.2588 0.2608
#> 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] 0.4853030 0.5399942
#>
#> $sigmasq
#> [1] 0.5255739
#>
#> $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] 1.052687
#>
#> $sigmayx
#> [1] 0.4853030 0.5399942
#>
#> $sigmacap
#>           [,1]         [,2]         [,3]
#> [1,] 1.0526866 4.853030e-01 5.399942e-01
#> [2,] 0.4853030 1.000000e+00 2.496804e-16
#> [3,] 0.5399942 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] 0.4918161 0.5158232
```

```
#>
#> $sigmasq
#> [1] 0.5506733
#>
#> $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] 1.05863
#>
#> $sigmayx
#> [1] 0.4918161 0.5158232
#>
#> $sigmacap
#>           [,1]         [,2]         [,3]
#> [1,] 1.0586299 4.918161e-01 5.158232e-01
#> [2,] 0.4918161 1.000000e+00 2.496804e-16
#> [3,] 0.5158232 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] 0.4925391 0.4588836
#>
#> $sigmasq
#> [1] 0.5483345
#>
#> $vechsigmacapx
#> [1] 1.04726730 0.01938984 0.96133466
#>
#> $sigmacapx
#>            [,1]       [,2]
#> [1,] 1.04726730 0.01938984
#> [2,] 0.01938984 0.96133466
#>
#> $sigmaysq
#> [1] 1.013593
#>
#> $sigmayx
#> [1] 0.5247177 0.4506910
#>
#> $sigmacap
#>           [,1]       [,2]       [,3]
#> [1,] 1.0135932 0.52471774 0.45069096
#> [2,] 0.5247177 1.04726730 0.01938984
#> [3,] 0.4506910 0.01938984 0.96133466
#>
#> $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] 0.4679303 0.4312954
#>
#> $sigmasq
#> [1] 0.517697
#>
#> $vechsigmacapx
```

```
#> [1] 0.921683 0.001177 1.042498
#>
#> $sigmacapx
#>          [,1]     [,2]
#> [1,] 0.921683 0.001177
#> [2,] 0.001177 1.042498
#>
#> $sigmaysq
#> [1] 0.9139036
#>
#> $sigmayx
#> [1] 0.4317911 0.4501752
#>
#> $sigmacap
#>           [,1]      [,2]      [,3]
#> [1,] 0.9139036 0.4317911 0.4501752
#> [2,] 0.4317911 0.9216830 0.0011770
#> [3,] 0.4501752 0.0011770 1.0424977
#>
#> $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] 0.4923224 0.4837298
#>
#> $sigmasq
#> [1] 0.5468832
#>
#> $vechsigmacapx
#> [1] 1.02292455 0.02522022 0.98757740
#>
#> $sigmacapx
#>            [,1]       [,2]
#> [1,] 1.02292455 0.02522022
#> [2,] 0.02522022 0.98757740
#>
#> $sigmaysq
#> [1] 1.037921
#>
#> $sigmayx
#> [1] 0.5158084 0.4901371
#>
#> $sigmacap
#>           [,1]       [,2]       [,3]
#> [1,] 1.0379212 0.51580843 0.49013710
#> [2,] 0.5158084 1.02292455 0.02522022
#> [3,] 0.4901371 0.02522022 0.98757740
#>
#> $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] 0.4626223 0.5061133
#>
#> $sigmasq
#> [1] 0.4983868
#>
#> $vechsigmacapx
#> [1] 0.97512023 0.05966798 1.01482016
#>
#> $sigmacapx
#>            [,1]       [,2]
```

```
#> [1,] 0.97512023 0.05966798
#> [2,] 0.05966798 1.01482016
#>
#> $sigmaysq
#> [1] 0.9949695
#>
#> $sigmayx
#> [1] 0.4813111 0.5412177
#>
#> $sigmacap
#>           [,1]       [,2]       [,3]
#> [1,] 0.9949695 0.48131113 0.54121771
#> [2,] 0.4813111 0.97512023 0.05966798
#> [3,] 0.5412177 0.05966798 1.01482016
#>
#> $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 0.1198 5 0.4191 0.4201 0.4246 0.7158 0.7304 0.7337
#> PCTGRT  0.3757 0.0602 5 0.3561 0.3571 0.3613 0.5137 0.5200 0.5214
#> PCTSUPP 0.2254 0.1018 5 0.0629 0.0642 0.0701 0.3067 0.3091 0.3096
#> 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 0.0579 5 0.6658 0.6662 0.6682 0.8003 0.8022 0.8026
#> adj 0.7906 0.0621 5 0.6419 0.6424 0.6445 0.7861 0.7880 0.7885
```

```
#> 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 0.1104 5 0.295 0.2989 0.3160 0.5736 0.5778 0.5787
#> adj 0.5714 0.1129 5 0.279 0.2829 0.3005 0.5639 0.5682 0.5692
#> 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 0.0771 5 0.3498 0.3509 0.3558 0.5497 0.5570 0.5587
#> PCTGRT  0.3430 0.0504 5 0.2650 0.2657 0.2691 0.3963 0.4016 0.4027
#> PCTSUPP 0.2385 0.0534 5 0.1342 0.1357 0.1427 0.2709 0.2733 0.2738
#> 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%
#> 0.6479815 0.7643421
#>
#>
```

```
#> [[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]]$coef
#> [1] 0.4918161 0.5158232
#>
#> [[1]][[4]]$value[[1]]$sigmasq
#> [1] 0.5506733
#>
#> [[1]][[4]]$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]]$sigmaysq
#> [1] 1.05863
#>
#> [[1]][[4]]$value[[1]]$sigmayx
```

```
#> [1] 0.4918161 0.5158232
#>
#> [[1]][[4]]$value[[1]]$sigmacap
#>           [,1]         [,2]         [,3]
#> [1,] 1.0586299 4.918161e-01 5.158232e-01
#> [2,] 0.4918161 1.000000e+00 2.496804e-16
#> [3,] 0.5158232 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

```
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/