betaMC: Internal Tests

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Tests

```
#> test-betaMC-beta-mc-est-mi
#> 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 0.0217 5 0.4276 0.4280 0.4295 0.4797 0.4799 0.4800
#> PCTGRT  0.3915 0.0379 5 0.3937 0.3939 0.3950 0.4851 0.4879 0.4885
#> PCTSUPP 0.2632 0.0703 5 0.1181 0.1186 0.1206 0.2878 0.2936 0.2949
#> 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 0.0733 5 0.6449 0.6469 0.6558 0.8262 0.8278 0.8282
#> Call:
#> BetaMC(object = mc)
#>
#> Standardized regression slopes
#> type = "mvn"

#> 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 0.0929 5 0.3718 0.3720 0.3733 0.5841 0.5908 0.5924
#> PCTGRT  0.3915 0.0901 5 0.3007 0.3021 0.3081 0.5220 0.5258 0.5267
#> PCTSUPP 0.2632 0.0800 5 0.1497 0.1520 0.1624 0.3543 0.3567 0.3572
#> 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 0.0614 5 0.6372 0.6376 0.6392 0.7782 0.7803 0.7808
#> Call:
#> BetaMC(object = mc)
#>
#> Standardized regression slopes
#> type = "mvn"
```

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

```
#> 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 0.0653 5 0.1577 0.1586 0.1625 0.3132 0.3148 0.3151
#> PCTGRT  0.1177 0.0293 5 0.0375 0.0382 0.0414 0.1098 0.1100 0.1100
#> PCTSUPP 0.0569 0.0308 5 0.0163 0.0163 0.0165 0.0847 0.0868 0.0872
#> Call:
#> DeltaRSqMC(object = mc)
#>
#> Improvement in R-squared
#> type = "mvn"
#> Test passed
#> Test passed
```

#> *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 0.0353 5 0.0982 0.0993 0.1041 0.1860 0.1867 0.1869
#> PCTGRT  0.1177 0.0147 5 0.0920 0.0923 0.0932 0.1303 0.1316 0.1319
#> PCTSUPP 0.0569 0.0516 5 0.0395 0.0399 0.0416 0.1665 0.1731 0.1746
#> Call:
#> DeltaRSqMC(object = mc)
#>
#> Improvement in R-squared
#> type = "mvn"
#> Test passed
#> Test passed

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

#> 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 0.1427 5  -0.0050 -0.0035   0.0032 0.3333 0.3387 0.3400
#> NARTIC-PCTSUPP 0.2319 0.1423 5   0.0772  0.0791   0.0877 0.4311 0.4383 0.4399
#> PCTGRT-PCTSUPP 0.1282 0.1351 5  -0.0879 -0.0848  -0.0712 0.2634 0.2697 0.2711
#> Call:
#> DiffBetaMC(object = mc)
#>
#> Differences of standardized regression slopes
#> 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 0.2106 5  -0.0817 -0.0802  -0.0737 0.4217 0.4360 0.4392
#> NARTIC-PCTSUPP 0.2319 0.0534 5   0.2007  0.2018   0.2065 0.3374 0.3401 0.3407
#> PCTGRT-PCTSUPP 0.1282 0.2149 5  -0.1328 -0.1305  -0.1199 0.4026 0.4187 0.4223
#> Call:
#> DiffBetaMC(object = mc)
```

```
#>
#> Differences of standardized regression slopes
#> type = "mvn"
#> Test passed
#> Test passed

#> test-betaMC-mc-fixed-x-mi

#> MCMI(object = object, mi = mi, R = R, type = "mvn", fixed_x = TRUE)
#> MCMI(object = object, mi = mi, R = R, type = "adf", fixed_x = TRUE)
#> MCMI(object = object, mi = mi, R = R, type = "hc0", fixed_x = TRUE)
#> MCMI(object = object, mi = mi, R = R, type = "hc1", fixed_x = TRUE)
#> MCMI(object = object, mi = mi, R = R, type = "hc2", fixed_x = TRUE)
#> MCMI(object = object, mi = mi, R = R, type = "hc3", fixed_x = TRUE)
#> MCMI(object = object, mi = mi, R = R, type = "hc4", fixed_x = TRUE)
#> MCMI(object = object, mi = mi, R = R, type = "hc4m", fixed_x = TRUE)
#> MCMI(object = object, mi = mi, 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
#> 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] 0.4792645 0.4914246
#>
#> $sigmasq
#> [1] 0.5349764
#>
#> $vechsigmacapx
#> [1] 1.000000e+00 5.848434e-17 1.000000e+00
#>
#> $sigmacapx
#>               [,1]         [,2]
#> [1,] 1.000000e+00 5.848434e-17
#> [2,] 5.848434e-17 1.000000e+00
#>
#> $sigmaysq
#> [1] 1.006169
#>
#> $sigmayx
#> [1] 0.4792645 0.4914246
#>
#> $sigmacap
#>            [,1]         [,2]         [,3]
#> [1,] 1.0061690 4.792645e-01 4.914246e-01
#> [2,] 0.4792645 1.000000e+00 5.848434e-17
#> [3,] 0.4914246 5.848434e-17 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] 0.4903354 0.5025061
#>
#> $sigmasq
#> [1] 0.5394023
#>
```

```
#> $vechsigmacapx
#> [1] 1.000000e+00 5.848434e-17 1.000000e+00
#>
#> $sigmacapx
#>               [,1]          [,2]
#> [1,] 1.000000e+00 5.848434e-17
#> [2,] 5.848434e-17 1.000000e+00
#>
#> $sigmaysq
#> [1] 1.032344
#>
#> $sigmayx
#> [1] 0.4903354 0.5025061
#>
#> $sigmacap
#>            [,1]         [,2]         [,3]
#> [1,] 1.0323435 4.903354e-01 5.025061e-01
#> [2,] 0.4903354 1.000000e+00 5.848434e-17
#> [3,] 0.5025061 5.848434e-17 1.000000e+00
#>
#> $pd
#> [1] TRUE

#> test-betaMC-mc-mi

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

#> 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] 0.5029105 0.4660503
#>
#> $sigmasq
#> [1] 0.5121768
#>
#> $vechsigmacapx
#> [1] 1.001740467 0.003505748 1.044922478
#>
#> $sigmacapx
#>              [,1]        [,2]
#> [1,] 1.001740467 0.003505748
#> [2,] 0.003505748 1.044922478
#>
#> $sigmaysq
#> [1] 0.9941395
#>
#> $sigmayx
#> [1] 0.5054197 0.4887495
#>
#> $sigmacap
#>           [,1]        [,2]        [,3]
#> [1,] 0.9941395 0.505419661 0.488749520
```

```
#> [2,] 0.5054197 1.001740467 0.003505748
#> [3,] 0.4887495 0.003505748 1.044922478
#>
#> $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] 0.5248594 0.4793406
#>
#> $sigmasq
#> [1] 0.549016
#>
#> $vechsigmacapx
#> [1]   1.02209621 -0.02393853  0.99077488
#>
#> $sigmacapx
#>             [,1]        [,2]
#> [1,]  1.02209621 -0.02393853
#> [2,] -0.02393853  0.99077488
#>
#> $sigmaysq
#> [1] 1.046183
#>
#> $sigmayx
#> [1] 0.5249821 0.4623543
#>
#> $sigmacap
#>            [,1]        [,2]        [,3]
#> [1,] 1.0461829  0.52498206  0.46235425
#> [2,] 0.5249821  1.02209621 -0.02393853
#> [3,] 0.4623543 -0.02393853  0.99077488
#>
#> $pd
#> [1] TRUE
#> test-betaMC-p-cor-mc-est-mi
```

```
#> Call:
#> PCorMC(object = mc)
#>
#> Squared partial correlations
#> type = "mvn"
```

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```
#>            est      se R   0.05%    0.5%    2.5%  97.5%  99.5% 99.95%
#> NARTIC   0.4874 0.0424 5 0.4157 0.4172 0.4237 0.5177 0.5179 0.5180
#> PCTGRT   0.3757 0.0864 5 0.1590 0.1592 0.1603 0.3590 0.3646 0.3659
#> PCTSUPP 0.2254 0.0305 5 0.1316 0.1319 0.1334 0.2060 0.2074 0.2078
#> Call:
#> PCorMC(object = mc)
#>
#> Squared partial correlations
#> type = "mvn"
#> Test passed
#> Test passed

#> 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 0.1164 5 0.2754 0.2778 0.2880 0.5477 0.5479 0.5480
#> PCTGRT   0.3757 0.1111 5 0.2343 0.2360 0.2436 0.4994 0.5008 0.5012
#> PCTSUPP 0.2254 0.0859 5 0.1204 0.1223 0.1308 0.3492 0.3563 0.3578
#> Call:
#> PCorMC(object = mc)
#>
#> Squared partial correlations
#> type = "mvn"
#> Test passed
#> Test passed

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

#> 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 0.0342 5 0.7288 0.7297 0.7339 0.8198 0.8220 0.8224
#> adj 0.7906 0.0366 5 0.7094 0.7104 0.7149 0.8070 0.8093 0.8098
#> 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 0.1449 5 0.3793 0.3825 0.3970 0.7100 0.7101 0.7101
#> adj 0.5714 0.1482 5 0.3652 0.3685 0.3833 0.7034 0.7035 0.7035
#> Call:
#> RSqMC(object = mc)
#>
#> R-squared and adjusted R-squared
#> type = "mvn"
#> 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 0.0413 5 0.7690 0.7702 0.7753 0.8731 0.8746 0.8750
#> adj 0.7906 0.0442 5 0.7525 0.7538 0.7593 0.8641 0.8657 0.8661
#> 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 0.0601 5 0.5116 0.5121 0.5141 0.6570 0.6611 0.6620
#> adj 0.5714 0.0615 5 0.5005 0.5010 0.5031 0.6492 0.6534 0.6544
#> Call:
#> RSqMC(object = mc)
#>
#> R-squared and adjusted R-squared
#> type = "mvn"
#> Test passed

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

```
#> 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 0.0804 5 0.3614 0.3617 0.3631 0.5523 0.5632 0.5656
#> PCTGRT   0.3430 0.0738 5 0.2922 0.2932 0.2977 0.4787 0.4840 0.4852
#> PCTSUPP  0.2385 0.0491 5 0.1719 0.1731 0.1782 0.3017 0.3049 0.3056
#> Call:
#> SCorMC(object = mc)
#>
#> Semipartial correlations
#> type = "mvn"
#> Test passed
#> 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 0.0487 5 0.3719 0.3733 0.3795 0.4946 0.4954 0.4955
#> PCTGRT   0.3430 0.0960 5 0.2061 0.2070 0.2107 0.4433 0.4532 0.4555
#> PCTSUPP  0.2385 0.0688 5 0.1138 0.1156 0.1234 0.2917 0.2943 0.2949
#> Call:
#> SCorMC(object = mc)
#>
#> Semipartial correlations
#> type = "mvn"
#> Test passed
#> Test passed

#> test-zzz-coverage

#>              beta1      beta2      beta3 sigmasq   sigmax1x1  sigmax2x1  sigmax3x1
#> sigmaysq   909.1981  257.2976  276.0367       1 0.007091036 0.03637752 0.01896371
#> sigmayx1  3507.1691  471.2058  510.5430       0 0.084208291 0.21599726 0.11260003
#> sigmayx2   471.2058  333.2295  150.9121       0 0.000000000 0.08420829 0.00000000
#> sigmayx3   510.5430  150.9121  554.4386       0 0.000000000 0.00000000 0.08420829
#> sigmax1x1    0.0000    0.0000    0.0000       0 1.000000000 0.00000000 0.00000000
#> sigmax2x1    0.0000    0.0000    0.0000       0 0.000000000 1.00000000 0.00000000
#> sigmax3x1    0.0000    0.0000    0.0000       0 0.000000000 0.00000000 1.00000000
#> sigmax2x2    0.0000    0.0000    0.0000       0 0.000000000 0.00000000 0.00000000
```

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```
#> sigmax3x2    0.0000    0.0000    0.0000         0 0.000000000 0.00000000 0.00000000
#> sigmax3x3    0.0000    0.0000    0.0000         0 0.000000000 0.00000000 0.00000000
#>            sigmax2x2 sigmax3x2  sigmax3x3
#> sigmaysq  0.04665482 0.0486426 0.01267877
#> sigmayx1  0.00000000 0.0000000 0.00000000
#> sigmayx2  0.21599726 0.1126000 0.00000000
#> sigmayx3  0.00000000 0.2159973 0.11260003
#> sigmax1x1 0.00000000 0.0000000 0.00000000
#> sigmax2x1 0.00000000 0.0000000 0.00000000
#> sigmax3x1 0.00000000 0.0000000 0.00000000
#> sigmax2x2 1.00000000 0.0000000 0.00000000
#> sigmax3x2 0.00000000 1.0000000 0.00000000
#> sigmax3x3 0.00000000 0.0000000 1.00000000
#>              beta1    beta2    beta3 sigmasq
#> sigmaysq  909.1981 257.2976 276.0367       1
#> sigmayx1 3507.1691 471.2058 510.5430       0
#> sigmayx2  471.2058 333.2295 150.9121       0
#> sigmayx3  510.5430 150.9121 554.4386       0
#> sigmax1x1   0.0000   0.0000   0.0000       0
#> sigmax2x1   0.0000   0.0000   0.0000       0
#> sigmax3x1   0.0000   0.0000   0.0000       0
#> sigmax2x2   0.0000   0.0000   0.0000       0
#> sigmax3x2   0.0000   0.0000   0.0000       0
#> sigmax3x3   0.0000   0.0000   0.0000       0
#>              beta1    beta2    beta3       rsq   sigmax1x1  sigmax2x1
#> sigmaysq  909.1981 257.2976 276.0367 -126.0843 0.007091036 0.03637752
#> sigmayx1 3507.1691 471.2058 510.5430    0.0000 0.084208291 0.21599726
#> sigmayx2  471.2058 333.2295 150.9121    0.0000 0.000000000 0.08420829
#> sigmayx3  510.5430 150.9121 554.4386    0.0000 0.000000000 0.00000000
#> sigmax1x1   0.0000   0.0000   0.0000    0.0000 1.000000000 0.00000000
#> sigmax2x1   0.0000   0.0000   0.0000    0.0000 0.000000000 1.00000000
#> sigmax3x1   0.0000   0.0000   0.0000    0.0000 0.000000000 0.00000000
#> sigmax2x2   0.0000   0.0000   0.0000    0.0000 0.000000000 0.00000000
#> sigmax3x2   0.0000   0.0000   0.0000    0.0000 0.000000000 0.00000000
#> sigmax3x3   0.0000   0.0000   0.0000    0.0000 0.000000000 0.00000000
#>            sigmax3x1  sigmax2x2 sigmax3x2  sigmax3x3
#> sigmaysq  0.01896371 0.04665482 0.0486426 0.01267877
#> sigmayx1  0.11260003 0.00000000 0.0000000 0.00000000
#> sigmayx2  0.00000000 0.21599726 0.1126000 0.00000000
#> sigmayx3  0.08420829 0.00000000 0.2159973 0.11260003
#> sigmax1x1 0.00000000 0.00000000 0.0000000 0.00000000
#> sigmax2x1 0.00000000 0.00000000 0.0000000 0.00000000
#> sigmax3x1 1.00000000 0.00000000 0.0000000 0.00000000
#> sigmax2x2 0.00000000 1.00000000 0.0000000 0.00000000
#> sigmax3x2 0.00000000 0.00000000 1.0000000 0.00000000
#> sigmax3x3 0.00000000 0.00000000 0.0000000 1.00000000
```

```
#>              beta1    beta2    beta3       rsq
#> sigmaysq   909.1981 257.2976 276.0367 -126.0843
#> sigmayx1  3507.1691 471.2058 510.5430    0.0000
#> sigmayx2   471.2058 333.2295 150.9121    0.0000
#> sigmayx3   510.5430 150.9121 554.4386    0.0000
#> sigmax1x1    0.0000   0.0000   0.0000    0.0000
#> sigmax2x1    0.0000   0.0000   0.0000    0.0000
#> sigmax3x1    0.0000   0.0000   0.0000    0.0000
#> sigmax2x2    0.0000   0.0000   0.0000    0.0000
#> sigmax3x2    0.0000   0.0000   0.0000    0.0000
#> sigmax3x3    0.0000   0.0000   0.0000    0.0000
#> [[1]]
#> [[1]][[1]]
#> [[1]][[1]]$value
#> [[1]][[1]]$value[[1]]
#>            2.5 %    97.5 %
#> NARTIC 0.6558403 0.8261593
#>
#>
#> [[1]][[1]]$visible
#> [1] TRUE
#>
#>
#> [[1]][[2]]
#> [[1]][[2]]$value
#> [[1]][[2]]$value[[1]]
#>            2.5 %    97.5 %
#> NARTIC 0.6391581 0.7782007
#>
#>
#> [[1]][[2]]$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]]$value[[1]]
#> [1] TRUE
#>
#>
#> [[1]][[4]]$visible
#> [1] TRUE
#>
#>
#> [[1]][[5]]
#> [[1]][[5]]$value
#> [[1]][[5]]$value[[1]]
#> [1] TRUE
#>
#>
#> [[1]][[5]]$visible
#> [1] TRUE
#>
#>
#> [[1]][[6]]
#> [[1]][[6]]$value
#> [[1]][[6]]$value[[1]]
#> [1] TRUE
#>
#>
#> [[1]][[6]]$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]]$value[[1]]
#> [[1]][[8]]$value[[1]]$coef
#> [1] 0.4903354 0.5025061
#>
#> [[1]][[8]]$value[[1]]$sigmasq
```

```
#> [1] 0.5394023
#>
#> [[1]][[8]]$value[[1]]$vechsigmacapx
#> [1] 1.000000e+00 5.848434e-17 1.000000e+00
#>
#> [[1]][[8]]$value[[1]]$sigmacapx
#>              [,1]          [,2]
#> [1,] 1.000000e+00 5.848434e-17
#> [2,] 5.848434e-17 1.000000e+00
#>
#> [[1]][[8]]$value[[1]]$sigmaysq
#> [1] 1.032344
#>
#> [[1]][[8]]$value[[1]]$sigmayx
#> [1] 0.4903354 0.5025061
#>
#> [[1]][[8]]$value[[1]]$sigmacap
#>            [,1]          [,2]          [,3]
#> [1,] 1.0323435 4.903354e-01 5.025061e-01
#> [2,] 0.4903354 1.000000e+00 5.848434e-17
#> [3,] 0.5025061 5.848434e-17 1.000000e+00
#>
#> [[1]][[8]]$value[[1]]$pd
#> [1] TRUE
#>
#>
#>
#> [[1]][[8]]$visible
#> [1] TRUE
#>
#>
#> [[1]][[9]]
#> [[1]][[9]]$value
#> [[1]][[9]]$value[[1]]
#> [1] TRUE
#>
#>
#> [[1]][[9]]$visible
#> [1] TRUE
#>
#>
#> [[1]][[10]]
#> [[1]][[10]]$value
#> [[1]][[10]]$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]][[10]]$visible
#> [1] TRUE
#>
#>
#> [[1]][[11]]
#> [[1]][[11]]$value
#> [[1]][[11]]$value[[1]]
#> [1] TRUE
#>
#>
#> [[1]][[11]]$visible
#> [1] TRUE
#>
#>
#> [[1]][[12]]
#> [[1]][[12]]$value
#> [[1]][[12]]$value[[1]]
#> [1] TRUE
#>
#>
#> [[1]][[12]]$visible
#> [1] TRUE
#>
#>
#> [[1]][[13]]
#> [[1]][[13]]$value
#> [[1]][[13]]$value[[1]]
#> [1] TRUE
#>
#>
#> [[1]][[13]]$visible
#> [1] TRUE
#>
#>
#> [[1]][[14]]
#> [[1]][[14]]$value
#> [[1]][[14]]$value[[1]]
#> [1] TRUE
```

```
#>
#>
#> [[1]][[14]]$visible
#> [1] TRUE
#>
#>
#> [[1]][[15]]
#> [[1]][[15]]$value
#> [[1]][[15]]$value[[1]]
#> [1] TRUE
#>
#>
#> [[1]][[15]]$visible
#> [1] TRUE
#>
#>
#> [[1]][[16]]
#> [[1]][[16]]$value
#> [[1]][[16]]$value[[1]]
#> [1] TRUE
#>
#>
#> [[1]][[16]]$visible
#> [1] TRUE
#>
#>
#> [[1]][[17]]
#> [[1]][[17]]$value
#> [[1]][[17]]$value[[1]]
#> [1] FALSE
#>
#>
#> [[1]][[17]]$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/