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 0.0373 5 0.5093 0.5096 0.5110 0.5987 0.6008 0.6013
#> PCTGRT   0.3915 0.0594 5 0.3013 0.3014 0.3020 0.4234 0.4236 0.4236
#> PCTSUPP  0.2632 0.0849 5 0.1280 0.1293 0.1353 0.3428 0.3479 0.3491
#> 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 0.0966 5 0.6003 0.6035 0.6179 0.8435 0.8467 0.8474
#> 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 0.0306 5 0.1200 0.1209 0.1247 0.2024 0.2052 0.2058
#> PCTGRT  0.1177 0.0311 5 0.0621 0.0624 0.0639 0.1396 0.1433 0.1441
#> PCTSUPP 0.0569 0.0257 5 0.0185 0.0187 0.0200 0.0821 0.0837 0.0840
#> 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 0.0887 5 -0.0008 0.0005 0.0061 0.2238 0.2289 0.2300
#> NARTIC-PCTSUPP 0.2319 0.0683 5  0.1981 0.1993 0.2043 0.3774 0.3834 0.3848
#> PCTGRT-PCTSUPP 0.1282 0.0802 5  0.1176 0.1178 0.1186 0.2951 0.3076 0.3104
#> 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] 0.4881625 0.5616302
#>
#> $sigmasq
#> [1] 0.5434381
#>
#> $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] 1.097169
#>
#> $sigmayx
#> [1] 0.4881625 0.5616302
#>
#> $sigmacap
#>             [,1]          [,2]          [,3]
#> [1,] 1.0971692 4.881625e-01 5.616302e-01
#> [2,] 0.4881625 1.000000e+00 2.496804e-16
#> [3,] 0.5616302 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] 0.4994301 0.4754995
```

```
#>
#> $sigmasq
#> [1] 0.5378266
#>
#> $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] 1.013357
#>
#> $sigmayx
#> [1] 0.4994301 0.4754995
#>
#> $sigmacap
#>            [,1]         [,2]         [,3]
#> [1,] 1.0133568 4.994301e-01 4.754995e-01
#> [2,] 0.4994301 1.000000e+00 2.496804e-16
#> [3,] 0.4754995 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
```

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```
#> Call:
#> MCMI(object = object, R = 5L, decomposition = "chol", data = df)
#> The first set of simulated parameter estimates
#> and model-implied covariance matrix.
#>
#> $coef
#> [1] 0.5028717 0.4574927
#>
#> $sigmasq
#> [1] 0.5350545
#>
#> $vechsigmacapx
#> [1]   1.04697766 -0.01113692  0.91243256
#>
#> $sigmacapx
#>             [,1]         [,2]
#> [1,]   1.04697766 -0.01113692
#> [2,] -0.01113692   0.91243256
#>
#> $sigmaysq
#> [1] 0.9856616
#>
#> $sigmayx
#> [1] 0.5214004 0.4118308
#>
#> $sigmacap
#>            [,1]        [,2]         [,3]
#> [1,] 0.9856616  0.52140038  0.41183080
#> [2,] 0.5214004  1.04697766 -0.01113692
#> [3,] 0.4118308 -0.01113692  0.91243256
#>
#> $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] 0.4635025 0.5227909
#>
#> $sigmasq
#> [1] 0.5296266
#>
#> $vechsigmacapx
```

```
#> [1]   1.04447335 -0.04697282   0.96838506
#>
#> $sigmacapx
#>              [,1]          [,2]
#> [1,]   1.04447335 -0.04697282
#> [2,] -0.04697282   0.96838506
#>
#> $sigmaysq
#> [1] 0.9959208
#>
#> $sigmayx
#> [1] 0.4595591 0.4844909
#>
#> $sigmacap
#>             [,1]          [,2]          [,3]
#> [1,] 0.9959208   0.45955908   0.48449086
#> [2,] 0.4595591   1.04447335 -0.04697282
#> [3,] 0.4844909 -0.04697282   0.96838506
#>
#> $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] 0.4729177 0.4799067
#>
#> $sigmasq
#> [1] 0.5421119
#>
#> $vechsigmacapx
#> [1]  1.05174856 -0.01496579  0.98809083
#>
#> $sigmacapx
#>              [,1]         [,2]
#> [1,]  1.05174856 -0.01496579
#> [2,] -0.01496579  0.98809083
#>
#> $sigmaysq
#> [1] 0.9981112
#>
#> $sigmayx
#> [1] 0.4902083 0.4671138
#>
#> $sigmacap
#>           [,1]         [,2]         [,3]
#> [1,] 0.9981112  0.49020834  0.46711385
#> [2,] 0.4902083  1.05174856 -0.01496579
#> [3,] 0.4671138 -0.01496579  0.98809083
#>
#> $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] 0.5163011 0.5226525
#>
#> $sigmasq
#> [1] 0.5370268
#>
#> $vechsigmacapx
#> [1] 0.979178742 0.003425082 1.014548551
#>
#> $sigmacapx
#>              [,1]         [,2]
```

```
#> [1,] 0.979178742 0.003425082
#> [2,] 0.003425082 1.014548551
#>
#> $sigmaysq
#> [1] 1.077032
#>
#> $sigmayx
#> [1] 0.5073412 0.5320247
#>
#> $sigmacap
#>            [,1]        [,2]        [,3]
#> [1,] 1.0770316 0.507341164 0.532024684
#> [2,] 0.5073412 0.979178742 0.003425082
#> [3,] 0.5320247 0.003425082 1.014548551
#>
#> $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 0.0485 5 0.3507 0.3509 0.3518 0.4648 0.4679 0.4687
#> PCTGRT   0.3757 0.0912 5 0.1930 0.1955 0.2062 0.4206 0.4222 0.4225
#> PCTSUPP  0.2254 0.0859 5 0.0891 0.0903 0.0958 0.3043 0.3098 0.3111
#> 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 0.0712 5 0.6496 0.6513 0.6588 0.8341 0.8370 0.8377
#> adj 0.7906 0.0762 5 0.6246 0.6264 0.6344 0.8222 0.8254 0.8261
```

```
#> 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 0.1490 5 0.3464 0.3490 0.3606 0.6983 0.6983 0.6983
#> adj 0.5714 0.1524 5 0.3315 0.3342 0.3460 0.6914 0.6915 0.6915
#> 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 0.1044 5 0.2681 0.2700 0.2784 0.5390 0.5464 0.5481
#> PCTGRT  0.3430 0.0543 5 0.2053 0.2062 0.2104 0.3453 0.3486 0.3493
#> PCTSUPP 0.2385 0.0271 5 0.1488 0.1491 0.1505 0.2142 0.2152 0.2155
#> 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%
#> 0.6178999 0.8435330
#>
#>
```

```
#> [[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]]$coef
#> [1] 0.4994301 0.4754995
#>
#> [[1]][[4]]$value[[1]]$sigmasq
#> [1] 0.5378266
#>
#> [[1]][[4]]$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]]$sigmaysq
#> [1] 1.013357
#>
#> [[1]][[4]]$value[[1]]$sigmayx
```

```
#> [1] 0.4994301 0.4754995
#>
#> [[1]][[4]]$value[[1]]$sigmacap
#>           [,1]         [,2]         [,3]
#> [1,] 1.0133568 4.994301e-01 4.754995e-01
#> [2,] 0.4994301 1.000000e+00 2.496804e-16
#> [3,] 0.4754995 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/