betaSandwich: Internal Tests

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Tests

```
#> test-betaSandwich-beta-sandwich-adf
#> Test passed
#> Call:
#> BetaADF(object = object)
#>
#> Standardized regression slopes with ADF standard errors:
#> Call:
#> BetaADF(object = object)
#>
#> Standardized regression slopes with ADF standard errors:
#> Test passed
```

```
#> test-betaSandwich-beta-sandwich-hc
```

```
#> Test passed
#> Call:
#> BetaHC(object = object, type = "hc0")
#>
#> Standardized regression slopes with HC0 standard errors:
#> Call:
#> BetaHC(object = object, type = "hc0")
#>
#> Standardized regression slopes with HC0 standard errors:
#> Test passed
#> Call:
#> BetaHC(object = object, type = "hc1")
#>
#> Standardized regression slopes with HC1 standard errors:
#> Call:
#> BetaHC(object = object, type = "hc1")
#>
#> Standardized regression slopes with HC1 standard errors:
#> Test passed
#> Call:
#> BetaHC(object = object, type = "hc2")
```

```
#>
#> Standardized regression slopes with HC2 standard errors:
#> Call:
#> BetaHC(object = object, type = "hc2")
#>
#> Standardized regression slopes with HC2 standard errors:
#> Test passed
#> Call:
#> BetaHC(object = object, type = "hc3")
#>
#> Standardized regression slopes with HC3 standard errors:
#> Call:
#> BetaHC(object = object, type = "hc3")
#>
#> Standardized regression slopes with HC3 standard errors:
#> Test passed
#> Call:
#> BetaHC(object = object, type = "hc4")
#>
#> Standardized regression slopes with HC4 standard errors:
#> Call:
#> BetaHC(object = object, type = "hc4")
#>
#> Standardized regression slopes with HC4 standard errors:
#> Test passed
#> Call:
#> BetaHC(object = object, type = "hc4m")
#>
#> Standardized regression slopes with HC4M standard errors:
#> Call:
#> BetaHC(object = object, type = "hc4m")
#>
#> Standardized regression slopes with HC4M standard errors:
#> Test passed
#> Call:
#> BetaHC(object = object, type = "hc5")
#>
#> Standardized regression slopes with HC5 standard errors:
#> Call:
#> BetaHC(object = object, type = "hc5")
#>
#> Standardized regression slopes with HC5 standard errors:
#> Test passed
```

```
#> test-betaSandwich-beta-sandwich-methods
```

```
#> Call:
```

```
#> BetaHC(object = object)
#>
#> Standardized regression slopes with HC3 standard errors:
#>           est     se      t      p   0.05%   0.5%   2.5%  97.5%  99.5% 99.95%
#> NARTIC  0.4951 0.0786 6.3025 0.0000  0.2172 0.2832 0.3366 0.6537 0.7071 0.7731
#> PCTGRT  0.3915 0.0818 4.7831 0.0000  0.1019 0.1707 0.2263 0.5567 0.6123 0.6810
#> PCTSUPP 0.2632 0.0855 3.0786 0.0037 -0.0393 0.0325 0.0907 0.4358 0.4940 0.5658
#> Call:
#> BetaHC(object = object)
#>
#> Standardized regression slopes with HC3 standard errors:
#> Call:
#> BetaN(object = object)
#>
#> Standardized regression slopes with MVN standard errors:
#>           est     se      t     p   0.05%   0.5%   2.5%  97.5%  99.5% 99.95%
#> NARTIC  0.4951 0.0759 6.5272 0.000  0.2268 0.2905 0.3421 0.6482 0.6998 0.7635
#> PCTGRT  0.3915 0.0770 5.0824 0.000  0.1190 0.1837 0.2360 0.5469 0.5993 0.6640
#> PCTSUPP 0.2632 0.0747 3.5224 0.001 -0.0011 0.0616 0.1124 0.4141 0.4649 0.5276
#> Call:
#> BetaN(object = object)
#>
#> Standardized regression slopes with MVN standard errors:
#> Call:
#> BetaADF(object = object)
#>
#> Standardized regression slopes with ADF standard errors:
#>           est     se      t      p   0.05%   0.5%   2.5%  97.5%  99.5% 99.95%
#> NARTIC  0.4951 0.0674 7.3490 0.0000  0.2568 0.3134 0.3592 0.6311 0.6769 0.7335
#> PCTGRT  0.3915 0.0710 5.5164 0.0000  0.1404 0.2000 0.2483 0.5347 0.5830 0.6426
#> PCTSUPP 0.2632 0.0769 3.4231 0.0014 -0.0088 0.0558 0.1081 0.4184 0.4707 0.5353
#> Call:
#> BetaADF(object = object)
#>
#> Standardized regression slopes with ADF standard errors:
#> Call:
#> BetaHC(object = object)
#>
#> Standardized regression slopes with HC3 standard errors:
#>           est     se       t p  0.05%   0.5%   2.5%  97.5%  99.5% 99.95%
#> NARTIC 0.7622 0.0645 11.8222 0 0.5349 0.5886 0.6322 0.8921 0.9357 0.9895
#> Call:
#> BetaHC(object = object)
#>
#> Standardized regression slopes with HC3 standard errors:
```

```
#> Call:
#> BetaN(object = object)
#>
#> Standardized regression slopes with MVN standard errors:
#>           est     se       t p  0.05%   0.5%   2.5%  97.5%  99.5% 99.95%
#> NARTIC 0.7622 0.0618 12.3341 0 0.5443 0.5958 0.6376 0.8867 0.9285   0.98
#> Call:
#> BetaN(object = object)
#>
#> Standardized regression slopes with MVN standard errors:
#> Call:
#> BetaADF(object = object)
#>
#> Standardized regression slopes with ADF standard errors:
#>           est     se      t p  0.05%   0.5%   2.5%  97.5%  99.5% 99.95%
#> NARTIC 0.7622 0.0604 12.625 0 0.5493 0.5996 0.6405 0.8838 0.9247  0.975
#> Call:
#> BetaADF(object = object)
#>
#> Standardized regression slopes with ADF standard errors:

#> test-betaSandwich-beta-sandwich-mvn

#> Test passed
#> Call:
#> BetaN(object = object)
#>
#> Standardized regression slopes with MVN standard errors:
#> Call:
#> BetaN(object = object)
#>
#> Standardized regression slopes with MVN standard errors:
#> Test passed

#> test-betaSandwich-diff-beta-sandwich-methods

#> Difference between standardized regression coefficients with MVN standard errors:
#>                   est     se      z      p   0.05%    0.5%    2.5%  97.5%
#> NARTIC-PCTGRT  0.1037 0.3604 0.2876 0.7737 -1.0824 -0.8248 -0.6028 0.8101
#> NARTIC-PCTSUPP 0.2319 0.4218 0.5498 0.5825 -1.1561 -0.8546 -0.5949 1.0587
#> PCTGRT-PCTSUPP 0.1282 0.4001 0.3205 0.7486 -1.1884 -0.9024 -0.6560 0.9125
#>                 99.5% 99.95%
#> NARTIC-PCTGRT  1.0321 1.2897
#> NARTIC-PCTSUPP 1.3184 1.6199
#> PCTGRT-PCTSUPP 1.1589 1.4449
#> Difference between standardized regression coefficients with MVN standard errors:
#> Difference between standardized regression coefficients with ADF standard errors:
```

```
#>                    est     se      z      p   0.05%    0.5%    2.5%  97.5%
#> NARTIC-PCTGRT  0.1037 0.4703 0.2204 0.8256 -1.4440 -1.1078 -0.8182 1.0255
#> NARTIC-PCTSUPP 0.2319 0.4880 0.4752 0.6346 -1.3737 -1.0250 -0.7245 1.1883
#> PCTGRT-PCTSUPP 0.1282 0.4727 0.2713 0.7862 -1.4272 -1.0894 -0.7982 1.0547
#>                  99.5% 99.95%
#> NARTIC-PCTGRT  1.3151 1.6513
#> NARTIC-PCTSUPP 1.4888 1.8375
#> PCTGRT-PCTSUPP 1.3459 1.6837
#> Difference between standardized regression coefficients with ADF standard errors:
#> Difference between standardized regression coefficients with HC0 standard errors:
#>                    est     se      z      p   0.05%    0.5%    2.5%  97.5%
#> NARTIC-PCTGRT  0.1037 0.1175 0.8820 0.3778 -0.2830 -0.1990 -0.1267 0.3340
#> NARTIC-PCTSUPP 0.2319 0.1143 2.0281 0.0425 -0.1443 -0.0626  0.0078 0.4560
#> PCTGRT-PCTSUPP 0.1282 0.1175 1.0911 0.2752 -0.2585 -0.1745 -0.1021 0.3586
#>                  99.5% 99.95%
#> NARTIC-PCTGRT  0.4064 0.4904
#> NARTIC-PCTSUPP 0.5264 0.6081
#> PCTGRT-PCTSUPP 0.4310 0.5150
#> Difference between standardized regression coefficients with HC0 standard errors:
#> Difference between standardized regression coefficients with HC1 standard errors:
#>                    est     se      z      p   0.05%    0.5%    2.5%  97.5%
#> NARTIC-PCTGRT  0.1037 0.1175 0.8820 0.3778 -0.2830 -0.1990 -0.1267 0.3340
#> NARTIC-PCTSUPP 0.2319 0.1143 2.0281 0.0425 -0.1443 -0.0626  0.0078 0.4560
#> PCTGRT-PCTSUPP 0.1282 0.1175 1.0911 0.2752 -0.2585 -0.1745 -0.1021 0.3586
#>                  99.5% 99.95%
#> NARTIC-PCTGRT  0.4064 0.4904
#> NARTIC-PCTSUPP 0.5264 0.6081
#> PCTGRT-PCTSUPP 0.4310 0.5150
#> Difference between standardized regression coefficients with HC1 standard errors:
#> Difference between standardized regression coefficients with HC2 standard errors:
#>                    est     se      z      p   0.05%    0.5%    2.5%  97.5%
#> NARTIC-PCTGRT  0.1037 0.1274 0.8137 0.4158 -0.3155 -0.2245 -0.1460 0.3533
#> NARTIC-PCTSUPP 0.2319 0.1213 1.9119 0.0559 -0.1672 -0.0805 -0.0058 0.4696
#> PCTGRT-PCTSUPP 0.1282 0.1256 1.0212 0.3072 -0.2850 -0.1952 -0.1179 0.3744
#>                  99.5% 99.95%
#> NARTIC-PCTGRT  0.4318 0.5228
#> NARTIC-PCTSUPP 0.5443 0.6310
#> PCTGRT-PCTSUPP 0.4517 0.5415
#> Difference between standardized regression coefficients with HC2 standard errors:
#> Difference between standardized regression coefficients with HC3 standard errors:
#>                    est     se      z      p   0.05%    0.5%    2.5%  97.5%
#> NARTIC-PCTGRT  0.1037 0.1386 0.7478 0.4546 -0.3524 -0.2534 -0.1680 0.3753
#> NARTIC-PCTSUPP 0.2319 0.1289 1.7986 0.0721 -0.1924 -0.1002 -0.0208 0.4846
#> PCTGRT-PCTSUPP 0.1282 0.1345 0.9536 0.3403 -0.3143 -0.2182 -0.1353 0.3918
#>                  99.5% 99.95%
```

```
#> NARTIC-PCTGRT  0.4607 0.5598
#> NARTIC-PCTSUPP 0.5640 0.6562
#> PCTGRT-PCTSUPP 0.4746 0.5708
#> Difference between standardized regression coefficients with HC3 standard errors:
#> Difference between standardized regression coefficients with HC4 standard errors:
#>                    est     se      z      p   0.05%    0.5%    2.5%  97.5%
#> NARTIC-PCTGRT  0.1037 0.1421 0.7297 0.4656 -0.3638 -0.2622 -0.1748 0.3821
#> NARTIC-PCTSUPP 0.2319 0.1268 1.8289 0.0674 -0.1853 -0.0947 -0.0166 0.4804
#> PCTGRT-PCTSUPP 0.1282 0.1332 0.9630 0.3356 -0.3100 -0.2148 -0.1328 0.3893
#>                 99.5% 99.95%
#> NARTIC-PCTGRT  0.4696 0.5711
#> NARTIC-PCTSUPP 0.5585 0.6491
#> PCTGRT-PCTSUPP 0.4713 0.5664
#> Difference between standardized regression coefficients with HC4 standard errors:
#> Difference between standardized regression coefficients with HC4M standard errors:
#>                    est     se      z      p   0.05%    0.5%    2.5%  97.5%
#> NARTIC-PCTGRT  0.1037 0.1433 0.7234 0.4694 -0.3678 -0.2654 -0.1772 0.3845
#> NARTIC-PCTSUPP 0.2319 0.1309 1.7716 0.0765 -0.1988 -0.1053 -0.0247 0.4884
#> PCTGRT-PCTSUPP 0.1282 0.1375 0.9326 0.3510 -0.3242 -0.2260 -0.1413 0.3978
#>                 99.5% 99.95%
#> NARTIC-PCTGRT  0.4727 0.5751
#> NARTIC-PCTSUPP 0.5691 0.6626
#> PCTGRT-PCTSUPP 0.4824 0.5807
#> Difference between standardized regression coefficients with HC4M standard errors:
#> Difference between standardized regression coefficients with HC5 standard errors:
#>                    est     se      z      p   0.05%    0.5%    2.5%  97.5%
#> NARTIC-PCTGRT  0.1037 0.1284 0.8074 0.4194 -0.3188 -0.2270 -0.1480 0.3553
#> NARTIC-PCTSUPP 0.2319 0.1200 1.9326 0.0533 -0.1629 -0.0772 -0.0033 0.4671
#> PCTGRT-PCTSUPP 0.1282 0.1246 1.0290 0.3035 -0.2818 -0.1928 -0.1160 0.3725
#>                 99.5% 99.95%
#> NARTIC-PCTGRT  0.4343 0.5261
#> NARTIC-PCTSUPP 0.5410 0.6267
#> PCTGRT-PCTSUPP 0.4492 0.5383
#> Difference between standardized regression coefficients with HC5 standard errors:
```

#> test-betaSandwich-diff-beta-sandwich

```
#> Test passed
#> Test passed
#> Test passed
#> Test passed
#> Test passed
#> Test passed
#> Test passed
#> Test passed
#> Test passed
#> Test passed
```

```
#> Test passed
#> Test passed
#> Test passed
#> Test passed
#> Test passed
#> Test passed
#> Test passed
#> Test passed
```

#> test-betaSandwich-r-sq-beta-sandwich-methods

```
#> Multiple correlation with MVN standard errors:
#>        est     se       t p  0.05%   0.5%   2.5%  97.5%  99.5% 99.95%
#> rsq 0.8045 0.0328 24.5344 0 0.6885 0.7161 0.7383 0.8707 0.8930 0.9205
#> adj 0.7906 0.0351 22.5014 0 0.6663 0.6958 0.7197 0.8615 0.8854 0.9149
#> Multiple correlation with MVN standard errors:
#> Multiple correlation with ADF standard errors:
#>        est     se       t p  0.05%   0.5%   2.5%  97.5%  99.5% 99.95%
#> rsq 0.8045 0.0287 28.0431 0 0.7030 0.7271 0.7466 0.8624 0.8819 0.9060
#> adj 0.7906 0.0307 25.7193 0 0.6818 0.7076 0.7285 0.8526 0.8735 0.8993
#> Multiple correlation with ADF standard errors:
#> Multiple correlation with HC3 standard errors:
#>        est     se       t p  0.05% 0.5%   2.5%  97.5%  99.5% 99.95%
#> rsq 0.8045 0.0313 25.6916 0 0.6937 0.72 0.7413 0.8677 0.8890 0.9153
#> adj 0.7906 0.0336 23.5627 0 0.6719 0.70 0.7229 0.8583 0.8811 0.9093
#> Multiple correlation with HC3 standard errors:
#> Multiple correlation with MVN standard errors:
#>        est     se       t p  0.05%   0.5%   2.5%  97.5%  99.5% 99.95%
#> rsq 0.5809 0.0508 11.4431 0 0.4019 0.4442 0.4786 0.6832 0.7176 0.7599
#> adj 0.5714 0.0519 11.0053 0 0.3883 0.4316 0.4667 0.6760 0.7111 0.7544
#> Multiple correlation with MVN standard errors:
#> Multiple correlation with ADF standard errors:
#>        est     se       t p  0.05%   0.5%   2.5%  97.5%  99.5% 99.95%
#> rsq 0.5809 0.0491 11.8379 0 0.4079 0.4488 0.4820 0.6798 0.7130 0.7539
#> adj 0.5714 0.0502 11.3850 0 0.3944 0.4363 0.4702 0.6725 0.7065 0.7483
#> Multiple correlation with ADF standard errors:
#> Multiple correlation with HC3 standard errors:
#>        est     se      t p  0.05%   0.5%   2.5%  97.5%  99.5% 99.95%
#> rsq 0.5809 0.0511 11.371 0 0.4008 0.4434 0.4779 0.6839 0.7184 0.7610
#> adj 0.5714 0.0522 10.936 0 0.3872 0.4307 0.4661 0.6767 0.7120 0.7556
#> Multiple correlation with HC3 standard errors:
```

#> test-betaSandwich-r-sq-beta-sandwich

```
#> Multiple correlation with MVN standard errors:
#> Test passed
#> Multiple correlation with ADF standard errors:
```

```
#> Test passed
#> Multiple correlation with HC3 standard errors:
#> Test passed
#> Multiple correlation with MVN standard errors:
#> Test passed
#> Multiple correlation with ADF standard errors:
#> Test passed
#> Multiple correlation with HC3 standard errors:
#> Test passed
#> [[1]]
#> [[1]][[1]]
#> [[1]][[1]]$value
#> [[1]][[1]]$value[[1]]
#> [1] TRUE
#>
#>
#> [[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]]
#>      2.5%     97.5%
#> 0.6404985 0.8838331
#>
#>
#> [[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]]$value[[1]]
#>                          2.5%     97.5%
#> NARTIC-PCTGRT  -0.147967260 0.3552801
#> NARTIC-PCTSUPP -0.003283367 0.4670783
#> PCTGRT-PCTSUPP -0.116012725 0.3724948
#>
#>
#> [[1]][[5]]$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]]$value[[1]]
#>         2.5%     97.5%
#> rsq 0.477940 0.6838535
#> adj 0.466075 0.6766683
#>
#>
#> [[1]][[7]]$visible
#> [1] TRUE
#>
#>
#> [[1]][[8]]
#> [[1]][[8]]$value
#> [[1]][[8]]$value[[1]]
#> [1] TRUE
#>
#>
```

```
#> [[1]][[8]]$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. (2022). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing. Vienna, Austria. https://www.R-project.org/