

semmcci: Internal Tests

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Tests

```
#> test-semmcci-mc-func-simple-med
#> Test passed
#> Test passed
#> Test passed
#> Test passed

#> test-semmcci-mc-generic-simple-med-defined

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

#> test-semmcci-mc-latent-med-defined-none

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

#> test-semmcci-mc-latent-med-defined

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

#> test-semmcci-mc-latent-med-std-defined-none

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

#> test-semmcci-mc-latent-med-std-defined

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

#> test-semmcci-mc-moment
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#> Test passed

#> test-semmcci-mc-simple-med-defined-equality

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

#> test-semmcci-mc-simple-med-defined-inequality

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

#> test-semmcci-mc-simple-med-defined-meanstructure

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

#> test-semmcci-mc-simple-med-defined-mi-amelia

#> Test passed

#> test-semmcci-mc-simple-med-defined-mi-list

#> Test passed

#> test-semmcci-mc-simple-med-defined-mi-mice

#> Test passed

#> test-semmcci-mc-simple-med-defined-none

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

#> test-semmcci-mc-simple-med-defined

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

#> test-semmcci-mc-simple-med-std-defined-meanstructure

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

#> test-semmcci-mc-simple-med-std-defined-none-random-x

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

#> test-semmcci-mc-simple-med-std-defined-none

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

#> test-semmcci-mc-simple-med-std-defined

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

#> test-semmcci-mc-methods

#> Monte Carlo Confidence Intervals
#>
      est      se    R  0.05%   0.5%   2.5%  97.5%  99.5% 99.95%
#> visual=~x1      1.0000 0.0000 100 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000
#> visual=~x2      0.5535 0.0952 100 0.3153 0.3219 0.3792 0.7582 0.7738 0.7773
#> visual=~x3      0.7294 0.1055 100 0.4848 0.4968 0.5149 0.9160 0.9368 0.9442
#> textual=~x4      1.0000 0.0000 100 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000
#> textual=~x5      1.1131 0.0627 100 0.9019 0.9145 0.9560 1.2100 1.2398 1.2635
#> textual=~x6      0.9261 0.0584 100 0.8051 0.8082 0.8308 1.0478 1.0837 1.0946
#> speed=~x7        1.0000 0.0000 100 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000
#> speed=~x8        1.1800 0.1691 100 0.7717 0.7856 0.8611 1.5825 1.6198 1.6201
#> speed=~x9        1.0815 0.1496 100 0.7335 0.7337 0.7882 1.3501 1.4501 1.4936
#> x1~~x1           0.5491 0.1153 100 0.2343 0.2491 0.3651 0.8227 0.9077 0.9110
#> x2~~x2           1.1338 0.1087 100 0.8106 0.8657 0.9560 1.3552 1.3900 1.4005
#> x3~~x3           0.8443 0.0924 100 0.6464 0.6495 0.6706 1.0210 1.0346 1.0360
#> x4~~x4           0.3712 0.0458 100 0.2709 0.2753 0.2848 0.4632 0.4764 0.4789
#> x5~~x5           0.4463 0.0676 100 0.2698 0.2905 0.3196 0.5737 0.6150 0.6331
#> x6~~x6           0.3562 0.0432 100 0.2732 0.2746 0.2852 0.4337 0.4442 0.4492
#> x7~~x7           0.7994 0.0717 100 0.6246 0.6329 0.6672 0.9401 0.9522 0.9529
#> x8~~x8           0.4877 0.0721 100 0.3302 0.3353 0.3548 0.6340 0.6588 0.6788
#> x9~~x9           0.5661 0.0631 100 0.4025 0.4220 0.4473 0.6726 0.7239 0.7451
#> visual~~visual   0.8093 0.1264 100 0.4797 0.5012 0.5709 1.0347 1.0990 1.1101
#> textual~~textual 0.9795 0.1185 100 0.6849 0.6971 0.7521 1.2129 1.2834 1.3306
#> speed~~speed     0.3837 0.0843 100 0.1006 0.1348 0.2298 0.5292 0.5676 0.5756
#> visual~~textual  0.4082 0.0670 100 0.2467 0.2554 0.2661 0.5426 0.5524 0.5571
#> visual~~speed    0.2622 0.0545 100 0.1369 0.1408 0.1645 0.3551 0.3629 0.3638
#> textual~~speed   0.1735 0.0516 100 0.0426 0.0477 0.0821 0.2789 0.3214 0.3349
#> Monte Carlo Confidence Intervals (Multiple Imputation Estimates)
#>
      est      se    R  0.05%   0.5%   2.5%  97.5%  99.5% 99.95%
#> visual=~x1      1.0000 0.0000 100 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000
#> visual=~x2      0.5535 0.1011 100 0.2572 0.2843 0.3692 0.7636 0.8380 0.8663

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#> visual=~x3      0.7294 0.1203 100 0.2924 0.3508 0.4939 0.9330 0.9790 0.9896
#> textual=~x4     1.0000 0.0000 100 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000
#> textual=~x5     1.1131 0.0573 100 0.9818 0.9891 1.0032 1.2323 1.2600 1.2649
#> textual=~x6     0.9261 0.0538 100 0.7889 0.7943 0.8149 1.0323 1.0548 1.0599
#> speed=~x7       1.0000 0.0000 100 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000
#> speed=~x8       1.1800 0.1645 100 0.8443 0.8692 0.9165 1.5372 1.6276 1.6632
#> speed=~x9       1.0815 0.1442 100 0.7945 0.8077 0.8275 1.3836 1.4658 1.5199
#> x1~~x1          0.5491 0.1232 100 0.2103 0.2113 0.2671 0.7411 0.8158 0.8158
#> x2~~x2          1.1338 0.0981 100 0.8187 0.8669 0.9795 1.3254 1.3461 1.3574
#> x3~~x3          0.8443 0.0986 100 0.5445 0.6078 0.6876 1.0371 1.0821 1.0901
#> x4~~x4          0.3712 0.0495 100 0.2357 0.2564 0.2900 0.4625 0.5028 0.5293
#> x5~~x5          0.4463 0.0568 100 0.3177 0.3254 0.3451 0.5712 0.5920 0.6059
#> x6~~x6          0.3562 0.0415 100 0.2442 0.2546 0.2717 0.4303 0.4440 0.4444
#> x7~~x7          0.7994 0.0806 100 0.6236 0.6321 0.6587 0.9455 1.0475 1.0698
#> x8~~x8          0.4877 0.0755 100 0.2858 0.3163 0.3570 0.6501 0.6735 0.6880
#> x9~~x9          0.5661 0.0652 100 0.3270 0.3676 0.4368 0.6843 0.7001 0.7114
#> visual~~visual  0.8093 0.1566 100 0.4745 0.4779 0.5262 1.1124 1.1807 1.2061
#> textual~~textual 0.9795 0.1147 100 0.6911 0.6990 0.7551 1.1753 1.2905 1.3271
#> speed~~speed    0.3837 0.0784 100 0.1327 0.1641 0.2342 0.5296 0.5426 0.5508
#> visual~~textual 0.4082 0.0724 100 0.2519 0.2534 0.2836 0.5375 0.5721 0.5797
#> visual~~speed   0.2622 0.0528 100 0.1368 0.1480 0.1741 0.3683 0.3828 0.3861
#> textual~~speed  0.1735 0.0500 100 0.0184 0.0546 0.0983 0.2720 0.2897 0.3006
#> Standardized Monte Carlo Confidence Intervals
#>      est      se    R  0.05%   0.5%   2.5%  97.5%  99.5% 99.95%
#> visual=~x1      0.7719 0.0531 100 0.6020 0.6255 0.6590 0.8537 0.8963 0.8981
#> visual=~x2      0.4236 0.0618 100 0.2511 0.2681 0.3064 0.5476 0.5846 0.5852
#> visual=~x3      0.5811 0.0572 100 0.4183 0.4315 0.4469 0.6823 0.6878 0.6909
#> textual=~x4      0.8516 0.0229 100 0.8019 0.8026 0.8054 0.8859 0.9038 0.9111
#> textual=~x5      0.8551 0.0260 100 0.7683 0.7825 0.8025 0.8970 0.9048 0.9061
#> textual=~x6      0.8380 0.0241 100 0.7815 0.7819 0.7858 0.8768 0.8830 0.8841
#> speed=~x7        0.5695 0.0562 100 0.3134 0.3562 0.4556 0.6476 0.6536 0.6547
#> speed=~x8        0.7230 0.0504 100 0.5693 0.5731 0.5874 0.7977 0.8077 0.8099
#> speed=~x9        0.6650 0.0517 100 0.4951 0.5157 0.5463 0.7582 0.7772 0.7816
#> x1~~x1          0.4042 0.0806 100 0.1934 0.1966 0.2712 0.5657 0.6081 0.6375
#> x2~~x2          0.8206 0.0528 100 0.6576 0.6582 0.7001 0.9061 0.9278 0.9369
#> x3~~x3          0.6623 0.0649 100 0.5226 0.5269 0.5345 0.8003 0.8136 0.8250
#> x4~~x4          0.2748 0.0388 100 0.1698 0.1831 0.2152 0.3514 0.3559 0.3569
#> x5~~x5          0.2689 0.0441 100 0.1789 0.1814 0.1954 0.3560 0.3875 0.4096
#> x6~~x6          0.2977 0.0402 100 0.2184 0.2203 0.2312 0.3824 0.3886 0.3892
#> x7~~x7          0.6757 0.0602 100 0.5713 0.5728 0.5806 0.7921 0.8708 0.9014
#> x8~~x8          0.4772 0.0704 100 0.3441 0.3477 0.3636 0.6549 0.6715 0.6759
#> x9~~x9          0.5578 0.0673 100 0.3892 0.3959 0.4251 0.7015 0.7335 0.7548
#> visual~~visual  1.0000 0.0000 100 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000
#> textual~~textual 1.0000 0.0000 100 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000
#> speed~~speed    1.0000 0.0000 100 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000
#> visual~~textual 0.4585 0.0634 100 0.3010 0.3035 0.3429 0.5760 0.6157 0.6253

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#> visual~~speed      0.4705 0.0838 100 0.2854 0.2962 0.3110 0.6414 0.6646 0.6688
#> textual~~speed     0.2830 0.0689 100 0.0793 0.0914 0.1669 0.4274 0.4399 0.4428
#> Standardized Monte Carlo Confidence Intervals
#>           est      se    R  0.05%   0.5%   2.5%  97.5%  99.5% 99.95%
#> visual=~x1       0.7719 0.0610 100 0.6069 0.6120 0.6421 0.8906 0.9209 0.9221
#> visual=~x2       0.4236 0.0625 100 0.2157 0.2200 0.2806 0.5455 0.5680 0.5685
#> visual=~x3       0.5811 0.0625 100 0.3004 0.3442 0.4381 0.6517 0.6662 0.6701
#> textual=~x4      0.8516 0.0234 100 0.7885 0.7897 0.8025 0.8874 0.9043 0.9130
#> textual=~x5      0.8551 0.0218 100 0.7918 0.7929 0.8018 0.8856 0.8993 0.9045
#> textual=~x6      0.8380 0.0234 100 0.7748 0.7766 0.7971 0.8852 0.8904 0.8915
#> speed=~x7        0.5695 0.0533 100 0.3529 0.3969 0.4532 0.6496 0.6621 0.6674
#> speed=~x8        0.7230 0.0511 100 0.5945 0.5964 0.6124 0.8149 0.8171 0.8181
#> speed=~x9        0.6650 0.0498 100 0.5282 0.5508 0.5807 0.7518 0.7936 0.8123
#> x1~~x1           0.4042 0.0938 100 0.1497 0.1519 0.2068 0.5875 0.6254 0.6317
#> x2~~x2           0.8206 0.0514 100 0.6768 0.6773 0.7025 0.9209 0.9516 0.9535
#> x3~~x3           0.6623 0.0665 100 0.5509 0.5562 0.5752 0.8072 0.8791 0.9093
#> x4~~x4           0.2748 0.0395 100 0.1663 0.1822 0.2124 0.3560 0.3763 0.3783
#> x5~~x5           0.2689 0.0370 100 0.1819 0.1911 0.2157 0.3572 0.3713 0.3730
#> x6~~x6           0.2977 0.0392 100 0.2052 0.2072 0.2165 0.3646 0.3969 0.3997
#> x7~~x7           0.6757 0.0579 100 0.5546 0.5616 0.5780 0.7946 0.8401 0.8750
#> x8~~x8           0.4772 0.0730 100 0.3307 0.3323 0.3359 0.6250 0.6443 0.6466
#> x9~~x9           0.5578 0.0665 100 0.3401 0.3697 0.4348 0.6628 0.6960 0.7209
#> visual~~visual    1.0000 0.0000 100 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000
#> textual~~textual  1.0000 0.0000 100 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000
#> speed~~speed      1.0000 0.0000 100 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000
#> visual~~textual   0.4585 0.0566 100 0.3183 0.3257 0.3461 0.5577 0.5782 0.5803
#> visual~~speed     0.4705 0.0762 100 0.2804 0.2901 0.3417 0.6249 0.6431 0.6441
#> textual~~speed    0.2830 0.0741 100 0.0358 0.0984 0.1786 0.4111 0.4650 0.4973
#> Monte Carlo Confidence Intervals
#> Monte Carlo Confidence Intervals (Multiple Imputation Estimates)
#> Standardized Monte Carlo Confidence Intervals
#> Standardized Monte Carlo Confidence Intervals

#> test-semmcci-npd

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

#> test-semmcci-zzz-coverage
#> test-semmcci-zzz-heywood

#> lavaan 0.6-18 ended normally after 18 iterations
#>
#> Estimator ML
#> Optimization method NLMINB

```

```

#>   Number of model parameters      8
#>
#>   Number of observations      50
#>
#> Model Test User Model:
#>
#>   Test statistic      0.000
#>   Degrees of freedom      2
#>   P-value (Chi-square)      1.000
#>
#> Parameter Estimates:
#>
#>   Standard errors      Standard
#>   Information      Expected
#>   Information saturated (h1) model      Structured
#>
#> Latent Variables:
#>
#>           Estimate Std.Err z-value P(>|z|)
#>   eta1 =~
#>     y1      1.000
#>     y2      0.991    0.152    6.524    0.000
#>     y3      0.901    0.138    6.537    0.000
#>     y4      1.399    0.143    9.814    0.000
#>
#> Variances:
#>
#>           Estimate Std.Err z-value P(>|z|)
#>   .y1      0.000    0.055    0.000    1.000
#>   .y2      0.980    0.203    4.822    0.000
#>   .y3      0.807    0.167    4.820    0.000
#>   .y4      0.696    0.176    3.960    0.000
#>   eta1      0.980    0.204    4.815    0.000
#>
#> Standardized Monte Carlo Confidence Intervals
#>
#>           est se R 0.05% 0.5% 2.5% 97.5% 99.5% 99.95%
#> eta1=~y1  1.0000 NA 0    NA    NA    NA    NA    NA    NA
#> eta1=~y2  0.7039 NA 0    NA    NA    NA    NA    NA    NA
#> eta1=~y3  0.7047 NA 0    NA    NA    NA    NA    NA    NA
#> eta1=~y4  0.8566 NA 0    NA    NA    NA    NA    NA    NA
#> y1~~y1    0.0000 NA 0    NA    NA    NA    NA    NA    NA
#> y2~~y2    0.5045 NA 0    NA    NA    NA    NA    NA    NA
#> y3~~y3    0.5034 NA 0    NA    NA    NA    NA    NA    NA
#> y4~~y4    0.2662 NA 0    NA    NA    NA    NA    NA    NA
#> eta1~~eta1 1.0000 NA 0    NA    NA    NA    NA    NA    NA
#> [[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]]
#>
#>          est      se      R    0.05%    0.5%    2.5%   97.5%   99.5%  99.95%
#> x * m -0.0016 0.003 2000 -0.0168 -0.0116 -0.0086 0.0038 0.0062 0.008
#>
#>
#> [[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
#>
#>
#>

```



```

#> alien71=~powerless71      1.0376   1.0755   1.1176
#> alien71~alien67           0.7057   0.7372   0.7691
#> alien71~ses               -0.1242  -0.0909  -0.0510
#> alien67~ses               -0.4652  -0.4314  -0.3960
#> anomia67~~anomia71        2.2411   2.4356   2.6727
#> powerless67~~powerless71   0.8540   1.0132   1.1764
#> education~~education      3.7746   4.1095   4.4378
#> sei~~sei                  300.1256 311.1796 323.1749
#> anomia67~~anomia67        5.6244   5.9244   6.2183
#> powerless67~~powerless67   3.3506   3.5922   3.9024
#> anomia71~~anomia71        5.3962   5.7309   6.0838
#> powerless71~~powerless71   3.9296   4.2128   4.4850
#> ses~~ses                  8.0804   8.4995   8.8591
#> alien67~~alien67          5.7500   6.0362   6.4045
#> alien71~~alien71          4.8720   5.1547   5.4524
#>
#>
#> [[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]]$visible
#> [1] TRUE
#>
#>
#> [[1]][[10]]
#> [[1]][[10]]$value
#> [[1]][[10]]$value[[1]]
#> [1] TRUE
#>

```

```

#>
#> [[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] TRUE
#>
#>
#> [[1]][[17]]$visible
#> [1] TRUE
#>
#>
#> [[1]][[18]]
#> [[1]][[18]]$value
#> [[1]][[18]]$value[[1]]
#> [1] TRUE
#>
#>
#> [[1]][[18]]$visible
#> [1] TRUE
#>
#>
#> [[1]][[19]]
#> [[1]][[19]]$value
#> [[1]][[19]]$value[[1]]
#> [1] TRUE
#>
#>
#>

```

```

#> [[1]][[19]]$visible
#> [1] TRUE
#>
#>
#> [[1]][[20]]
#> [[1]][[20]]$value
#> [[1]][[20]]$value[[1]]
#>
#>          2.5 %      97.5 %
#> visual=~x1      0.6420550 0.8905828
#> visual=~x2      0.2805691 0.5454672
#> visual=~x3      0.4381215 0.6517292
#> textual=~x4      0.8025033 0.8874283
#> textual=~x5      0.8017605 0.8856330
#> textual=~x6      0.7971373 0.8851563
#> speed=~x7       0.4532090 0.6495836
#> speed=~x8       0.6123562 0.8149249
#> speed=~x9       0.5807283 0.7517920
#> x1~~x1          0.2068314 0.5874893
#> x2~~x2          0.7024550 0.9208880
#> x3~~x3          0.5752490 0.8071817
#> x4~~x4          0.2124433 0.3559868
#> x5~~x5          0.2156542 0.3571661
#> x6~~x6          0.2164959 0.3645676
#> x7~~x7          0.5780244 0.7945894
#> x8~~x8          0.3358974 0.6249553
#> x9~~x9          0.4348001 0.6627511
#> visual~~visual  1.0000000 1.0000000
#> textual~~textual 1.0000000 1.0000000
#> speed~~speed    1.0000000 1.0000000
#> visual~~textual 0.3461207 0.5577182
#> visual~~speed   0.3417283 0.6249328
#> textual~~speed  0.1785621 0.4110934
#>
#>
#> [[1]][[20]]$visible
#> [1] TRUE
#>
#>
#> [[1]][[21]]
#> [[1]][[21]]$value
#> [[1]][[21]]$value[[1]]
#> [[1]][[21]]$value[[1]]$thetahatstar
#>
#>          y1          y2          y3
#> [1,] -4.246806e-01 -0.5674344544 -0.844470405
#> [2,]  1.285923e+00  1.3721426626  2.365001749

```

```

#> [3,] 1.163091e-01 -1.0861272136 -0.457720098
#> [4,] -3.702629e-01 0.0087967812 -0.456828435
#> [5,] 1.718771e-01 0.4957076624 0.489424273
#> [6,] -3.411976e-02 0.9067666709 0.460670898
#> [7,] 9.358973e-01 0.8692087206 1.649419308
#> [8,] 2.606123e-01 -0.7845996957 -0.110441820
#> [9,] 3.114685e-01 -0.0535844114 0.358657813
#> [10,] 9.897516e-01 0.5705621874 1.550838124
#> [11,] -1.526909e+00 -1.4936898671 -2.732960029
#> [12,] 1.092488e+00 0.8953888500 1.859214133
#> [13,] -1.256035e+00 -1.2760443405 -2.274401072
#> [14,] 2.394827e-01 0.8643377866 0.778301301
#> [15,] -1.821778e-01 -0.5833480251 -0.550905729
#> [16,] 1.567170e+00 1.9744495497 3.049966084
#> [17,] 6.338543e-01 2.4703094599 2.161321764
#> [18,] 1.391986e+00 2.2150786670 2.965053675
#> [19,] -3.775255e-01 -1.3658394759 -1.228750318
#> [20,] -1.665505e-01 -0.3868979388 -0.422397255
#> [21,] -6.810469e-01 -1.2718366106 -1.555067624
#> [22,] 1.574423e+00 1.4567694279 2.771719317
#> [23,] -5.414014e-01 0.3340344021 -0.489741369
#> [24,] 1.067092e+00 3.1023927751 3.052340146
#> [25,] 1.004737e+00 1.2216146971 1.930831486
#> [26,] -6.375036e-02 0.0525931144 -0.050308420
#> [27,] 8.723528e-01 2.5689393198 2.513459921
#> [28,] 1.073842e+00 1.4806232742 2.160742598
#> [29,] 3.228785e-01 0.0111139123 0.408790598
#> [30,] -9.964082e-01 -1.4121892694 -2.026206560
#> [31,] 9.750292e-01 1.7286461249 2.175167703
#> [32,] -2.641183e+00 -5.6837326372 -6.447734615
#> [33,] 1.035778e-01 0.0813528760 0.174306817
#> [34,] -2.909126e-01 -0.5379891968 -0.661323533
#> [35,] 2.373802e+00 3.6007962879 4.958374092
#> [36,] 1.424798e+00 2.4344197578 3.127694820
#> [37,] 1.949218e-01 2.2931584136 1.515670423
#> [38,] 9.535264e-02 0.5650217926 0.432466230
#> [39,] 2.875480e+00 5.1368035275 6.436375300
#> [40,] 9.874190e-01 1.6623678919 2.153835985
#> [41,] 2.795543e+00 6.1613362479 6.905269085
#> [42,] 8.079498e-02 -0.4093790103 -0.126438513
#> [43,] -2.187906e+00 -3.0390072179 -4.414795628
#> [44,] 1.678974e+00 2.9193718438 3.713775208
#> [45,] -2.651958e-01 0.0307554419 -0.313625806
#> [46,] 1.606499e-01 0.2963384546 0.364782531
#> [47,] -1.324144e+00 -1.8681300179 -2.687914663

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#> [48,] 6.344300e-01 1.5371237237 1.644160519
#> [49,] -2.699770e+00 -4.0509676021 -5.614675478
#> [50,] 9.905222e-02 -0.3274457675 -0.058202590
#> [51,] 3.272955e-01 0.5980031453 0.739997499
#> [52,] -8.337031e-01 -2.3033357652 -2.317865663
#> [53,] -4.818745e-02 0.4095994074 0.167221749
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#> [55,] 2.998949e-01 0.1026549873 0.430932101
#> [56,] 5.450611e-01 0.0501875922 0.707532142
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#> [59,] -1.025963e+00 -2.2365345124 -2.520538097
#> [60,] 9.907188e-02 -0.5338005578 -0.172696346
#> [61,] -9.838347e-02 -0.8525640781 -0.595819554
#> [62,] 3.155431e-01 0.0017227112 0.394431784
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#> [64,] 1.501999e+00 2.4498420073 3.232521265
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#> [69,] 1.125354e+00 3.0106136085 3.074058286
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#> [79,] -3.655801e-01 -1.3490349707 -1.204528812
#> [80,] -1.368797e+00 -2.6970252112 -3.203597713
#> [81,] -6.587049e-01 -0.6158615716 -1.163168937
#> [82,] 1.661865e+00 2.6976956370 3.569419533
#> [83,] 1.523454e-01 0.8387330721 0.655433386
#> [84,] 5.122381e-02 0.5498720600 0.369031021
#> [85,] 1.279672e+00 3.2563981170 3.402889358
#> [86,] 1.049299e+00 0.6768178926 1.684060197
#> [87,] 2.574452e-01 0.3516376273 0.516173065
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#> [90,] 1.573710e+00 2.4485276826 3.321214380
#> [91,] -2.298735e-01 0.0411480469 -0.263812142
#> [92,] 2.284738e-02 -0.9978945398 -0.525299473

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#> [93,] 9.178086e-01 1.5804506351 2.021572517
#> [94,] 7.582010e-01 0.6021365224 1.279621778
#> [95,] 8.892111e-02 0.0623609583 0.145490528
#> [96,] -1.345773e+00 -1.6758189125 -2.608160733
#> [97,] -7.022393e-01 -0.9639956134 -1.410655248
#> [98,] -3.241345e-01 -0.8927555622 -0.899631110
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#> [109,] 1.282522e+00 2.1808300360 2.809548056
#> [110,] 1.292492e-01 0.4065028225 0.386763206
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#> [115,] 2.703609e+00 3.9186938029 5.546055819
#> [116,] -7.728166e-01 -1.9525422907 -2.047265718
#> [117,] -1.711421e+00 -4.3465462265 -4.546258477
#> [118,] 1.307784e+00 1.6555484862 2.549539666
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#> [132,] 8.819398e-01 2.6193017292 2.553363784
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#> [135,] -2.774682e-01 -1.5944426596 -1.230846112
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#> [138,] 1.987515e+00 4.1848343921 4.800798260
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#> [162,] 1.398565e+00 3.2719748842 3.559790494
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#> [166,] -2.253622e+00 -4.4515434193 -5.280640470
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#> [168,] -1.217251e+00 -2.4419115981 -2.873046192
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#> [170,] 1.793389e+00 3.8983074586 4.399716673
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#> [172,] -1.145682e+00 -2.5990820865 -2.871023974
#> [173,] 6.150889e-01 1.1042720956 1.379828068
#> [174,] 2.410041e+00 3.0303128073 4.686968497
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#> [176,] 1.224204e+00 1.6741328522 2.455630505
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#> [178,] -3.110317e+00 -5.8459402041 -7.122754310
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#> [180,] -1.454782e+00 -3.2324907824 -3.607980384
#> [181,] 1.481044e+00 2.7139421393 3.352955445
#> [182,] 1.364860e+00 2.1964623985 2.920897279

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#> [183,] -4.211436e-01 -0.8986566564 -1.023874283
#> [184,] 1.318787e-01 1.1699177899 0.813705388
#> [185,] 8.989654e-01 1.4122401808 1.904725701
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#> [189,] 3.380480e-01 0.2763727380 0.574914237
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#> [195,] -2.886879e-02 0.1054947446 0.022546371
#> [196,] 7.050448e-01 1.6154788808 1.775699568
#> [197,] -1.347606e+00 -2.6189456754 -3.133841865
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#> [199,] 1.772397e-01 -0.2519759217 0.081178171
#> [200,] 6.208782e-01 0.1051235778 0.832561586
#> [201,] -1.816967e-01 -0.0577651381 -0.258629267
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#> [207,] 2.285016e+00 3.4311146923 4.753493114
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#> [218,] -1.492266e+00 -2.4745823835 -3.234114747
#> [219,] 1.193678e+00 3.6992418305 3.541416926
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#> [221,] 8.249953e-01 1.7532846346 2.001751828
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#> [225,] 1.296065e+00 1.9552063591 2.701223805
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#> [227,] 4.253631e-01 1.7928206959 1.525359563

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#> [228,] -1.002814e+00 -2.6492514055 -2.720712828
#> [229,] -3.384915e+00 -4.9556958783 -6.971123804
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#> [241,] 1.120664e+00 2.0480526055 2.534028184
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#> [244,] -5.114840e-01 -1.8149096681 -1.645008955
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#> [248,] 1.731469e+00 4.4095762247 4.606237334
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#> [251,] -3.685821e-02 0.2486917757 0.092052087
#> [252,] 3.208647e-01 0.8623942673 0.878704479
#> [253,] 7.060893e-01 1.5187783839 1.723337336
#> [254,] 9.022233e-01 0.5445810156 1.427273744
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#> [260,] 1.057272e+00 2.0886482819 2.477509074
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#> [263,] 1.238622e+00 2.6477816127 3.013943777
#> [264,] 1.542581e+00 3.0290144201 3.604543317
#> [265,] -8.419891e-01 -1.7182805603 -2.003516974
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#> [272,] 1.762544e+00 2.9645521398 3.843058304

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#> [1091,] 2.644534e-01 1.4537137310 1.136518253
#> [1092,] 3.271788e-01 0.3897683229 0.624290379
#> [1093,] 8.460508e-01 2.3717453828 2.371227533
#> [1094,] 7.078545e-01 2.3982199552 2.213591834
#> [1095,] 1.385247e-01 0.1338544406 0.247021135
#> [1096,] -1.982211e+00 -3.0530861581 -4.166111381
#> [1097,] 1.467715e+00 2.4548957731 3.192574853
#> [1098,] -7.561049e-01 -1.8149618190 -1.950075156
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#> [1102,] 9.814156e-01 1.2807622434 1.934574677
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#> [1106,] -3.013033e-01 -1.2860545466 -1.089425467
#> [1107,] -1.805248e+00 -2.5711660349 -3.677996647
#> [1108,] -8.430867e-01 -0.3241804414 -1.231218503
#> [1109,] 1.172985e+00 2.4120655511 2.801283158
#> [1110,] 1.745293e+00 3.1473264438 3.922979389
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#> [1118,] 9.916469e-01 2.1790456536 2.445842606
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#> [1121,] 1.018362e+00 1.1110876098 1.886484363
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#> [1123,] -1.026951e-01 -1.1230837033 -0.751323119
#> [1124,] 1.693464e+00 1.9578722853 3.198252264
#> [1125,] 3.984147e-01 0.6848893073 0.876899887
#> [1126,] -1.116515e+00 -1.1320896925 -2.020533336
#> [1127,] 1.367476e+00 3.5981198111 3.702020849

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#> [1128,] 1.119688e+00 2.5753958475 2.825465508
#> [1129,] -1.936105e-01 -0.7698370684 -0.668655676
#> [1130,] -1.223152e+00 -2.8673747605 -3.116518567
#> [1131,] 1.689028e+00 3.0311073128 3.788320874
#> [1132,] -1.030036e+00 -1.7486185573 -2.254843398
#> [1133,] 1.994689e+00 2.7704314755 4.024809382
#> [1134,] -1.523176e+00 -2.3176503599 -3.185568468
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#> [1136,] 6.263379e-01 1.6520509846 1.697849735
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#> [1172,] 1.601026e+00 2.9034250842 3.607726262

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#> [1173,] -8.986111e-01 -1.5372657982 -1.973667914
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#> [1352,] -1.959651e-01  0.0758995913 -0.202243445

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#> [1356,] 1.291060e+00 3.9842685485 3.821027937
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#> [1612,] -1.538655e+00 -2.7539766302 -3.447013540
#> [1613,] -1.262225e-01 -0.1319079687 -0.230600338
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#> [1615,] -5.785051e-02 1.1602912879 0.571774676
#> [1616,] 4.850498e-01 0.5296186038 0.898763338
#> [1617,] -1.496232e+00 -3.3643127072 -3.732822954
#> [1618,] -4.884473e-01 -1.6220425169 -1.509249497
#> [1619,] -1.167538e+00 -1.7432607885 -2.423333183
#> [1620,] -2.140183e+00 -2.5939113478 -4.108277333
#> [1621,] 7.753856e-01 0.8609099077 1.444659020
#> [1622,] 4.259974e-01 -0.1035767717 0.473729278

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#> [1625,] -2.334092e-01 -2.2845896923 -1.558908085
#> [1626,]  3.784101e-02  1.2450669565  0.738147006
#> [1627,]  3.085696e-01  1.0351626757  0.959251913
#> [1628,] -2.382587e+00 -3.1998492461 -4.746819723
#> [1629,] -3.354658e-01 -0.9408765321 -0.940466114
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#> [1631,]  2.623070e+00  3.8465667781  5.405598828
#> [1632,] -2.849974e-01  0.1347812463 -0.280587980
#> [1633,] -3.840003e-01 -1.4747341439 -1.297256282
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#> [1664,]  8.446352e-01  1.4935865703  1.882120937
#> [1665,]  2.546950e+00  4.9228829039  5.907988174
#> [1666,]  1.571047e+00  4.5358402275  4.476265136
#> [1667,]  3.247333e-01  1.6214844556  1.304791757

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#> [1676,] 1.475534e+00 2.6175228694 3.292576467
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#> [1803,] 3.457584e-01 1.3129378900 1.159779237
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#> [1818,] -5.600042e-01 -0.8974885957 -1.196382413
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#> [1820,] 1.213007e+00 1.2564355798 2.209864359
#> [1821,] 1.093193e+00 2.2537560482 2.613929080
#> [1822,] 1.923324e+00 2.9397184273 4.029766128
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#> [1847,] 2.707092e-01 0.5671564860 0.652316901

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#> [1848,] 1.599642e+00 2.7688219877 3.531300779
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#> [1874,] 1.513100e+00 2.6190729446 3.340280728
#> [1875,] 5.393668e-01 0.7220872918 1.073307599
#> [1876,] 1.570542e+00 2.4400138201 3.312539766
#> [1877,] 1.385532e+00 2.6793681422 3.214667674
#> [1878,] 4.897640e-01 0.8173910028 1.064343517
#> [1879,] 2.245749e+00 4.0861126886 5.068024928
#> [1880,] 1.850450e-01 -1.2231174897 -0.448031640
#> [1881,] 1.502703e+00 2.0956481569 3.036837162
#> [1882,] 1.786055e+00 1.7843490377 3.217413023
#> [1883,] -1.306063e-01 1.1272612394 0.462719364
#> [1884,] -4.985731e-01 -1.2851109972 -1.334893306
#> [1885,] -1.539934e+00 -2.7664346300 -3.455521956
#> [1886,] -4.162679e-01 -0.8090390793 -0.968060354
#> [1887,] 8.996779e-01 0.8126721776 1.572878973
#> [1888,] 1.084997e+00 1.8917872891 2.402831385
#> [1889,] -2.470742e-01 -1.7607040242 -1.285213469
#> [1890,] 1.584463e+00 1.9397306842 3.052261801
#> [1891,] -1.936260e+00 -4.4039497322 -4.858484445
#> [1892,] 5.618165e-01 0.9113296334 1.206323555

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#> [1893,] -1.680325e+00 -1.8004579217 -3.094509994
#> [1894,]  1.342447e-01  0.1366046405  0.243210307
#> [1895,] -2.205224e+00 -2.5215234527 -4.149209379
#> [1896,]  3.464779e-01  1.0851931686  1.034287624
#> [1897,]  8.616328e-01  1.6485736347  1.989327859
#> [1898,] -1.491266e-01  0.1911124485 -0.079898374
#> [1899,] -1.251428e+00 -2.7310706847 -3.076135650
#> [1900,] -6.581081e-01 -0.2543508525 -0.961801402
#> [1901,]  5.184317e-02  0.2705653547  0.214799817
#> [1902,]  3.259528e-01  1.5485174610  1.265818844
#> [1903,]  2.168287e-01  1.2694548573  0.974875214
#> [1904,]  1.477220e+00  2.9611431909  3.485373648
#> [1905,]  1.645627e+00  2.7676437325  3.587989726
#> [1906,]  3.425769e-01 -0.2825448796  0.270385867
#> [1907,]  1.792409e-01  0.0384298558  0.244836739
#> [1908,]  6.083347e-01  1.2244351384  1.438091230
#> [1909,] -1.308000e+00 -2.4281036078 -2.978545553
#> [1910,] -4.943796e-01 -0.1909064223 -0.722426328
#> [1911,] -9.786356e-01 -2.1123511485 -2.392605065
#> [1912,]  2.857161e-01  0.5568770712  0.665325561
#> [1913,] -1.946338e+00 -1.8946928540 -3.478518825
#> [1914,]  3.849135e-01  0.8018557345  0.924975695
#> [1915,] -4.767156e-02  0.1975269506  0.050173721
#> [1916,] -8.549068e-01 -1.6380243526 -1.975086318
#> [1917,] -4.533790e-01 -0.2550966835 -0.706922355
#> [1918,]  3.534257e-01  0.4441079691  0.687175914
#> [1919,]  2.094577e+00  4.0226574468  4.844300802
#> [1920,]  4.806472e-01  1.0075764994  1.158519984
#> [1921,] -2.892735e+00 -4.4175286744 -6.058725344
#> [1922,] -1.011067e+00 -0.9719458506 -1.800168574
#> [1923,]  9.390341e-01  0.9397931712  1.692502261
#> [1924,] -8.077082e-01 -1.0493995387 -1.589568401
#> [1925,] -5.354221e-01 -0.4108082768 -0.895641794
#> [1926,] -1.615704e-01  0.8420010072  0.265800284
#> [1927,] -6.045557e-01 -1.2092156535 -1.424932666
#> [1928,] -1.218597e+00 -2.7957586602 -3.071094204
#> [1929,]  5.907800e-01  0.7880813965  1.174042828
#> [1930,] -4.050491e-01 -1.2733691101 -1.211754478
#> [1931,] -2.354610e+00 -3.6489655353 -4.961173392
#> [1932,]  1.251537e+00  1.5532219781  2.422614775
#> [1933,] -1.014775e+00 -2.7121171565 -2.770514642
#> [1934,]  9.893625e-02  1.0348772313  0.697685022
#> [1935,] -7.161154e-01 -1.3875481892 -1.663012412
#> [1936,]  6.644394e-01  0.3438304733  1.019353847
#> [1937,]  2.214262e-01  1.3179067710  1.007497030

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#> [1938,] -1.386690e+00 -2.1737317325 -2.935503872
#> [1939,]  8.644289e-01  1.6334770308  1.984436558
#> [1940,]  1.097050e-01 -0.2360071705  0.005825856
#> [1941,]  1.265274e-01 -0.8702786002 -0.325191124
#> [1942,] -8.372518e-01 -1.2919386918 -1.761007851
#> [1943,] -3.347568e-01 -1.3904009241 -1.189049218
#> [1944,]  2.161592e-01  0.1696572965  0.363698797
#> [1945,] -1.084723e+00 -0.8298860991 -1.813179997
#> [1946,]  3.306022e-02  0.3226199251  0.220265967
#> [1947,] -6.629877e-01 -1.8393806530 -1.847511341
#> [1948,]  1.089397e+00  1.7300331242  2.318552106
#> [1949,] -7.923771e-01 -2.8004096705 -2.542188160
#> [1950,]  1.480753e+00  1.4980399353  2.677818209
#> [1951,] -1.587792e+00 -2.3974445248 -3.310425286
#> [1952,]  5.830965e-01  2.8900480422  2.330965111
#> [1953,]  6.562020e-01  0.6533309581  1.180841893
#> [1954,] -1.621898e-01 -0.8813655537 -0.691368353
#> [1955,]  9.499440e-01  1.9509026061  2.267229998
#> [1956,]  6.908838e-01  2.1475779399  2.053333877
#> [1957,]  5.214413e-01  1.1368250658  1.281116941
#> [1958,] -9.223656e-01 -1.0189435270 -1.715642067
#> [1959,] -9.539502e-01 -1.2505358122 -1.883551432
#> [1960,] -1.531442e+00 -3.0818437968 -3.619970852
#> [1961,] -3.395726e-02  1.1724339351  0.608307739
#> [1962,] -7.871690e-01 -1.0226524282 -1.549113002
#> [1963,] -2.186513e+00 -3.6101488035 -4.730018497
#> [1964,] -3.893720e-01 -1.2465786839 -1.177337982
#> [1965,] -2.806200e+00 -4.4052940609 -5.944027934
#> [1966,]  4.119151e-01  0.9703087646  1.052130447
#> [1967,]  7.796729e-01  0.8173819376  1.425848962
#> [1968,]  6.860902e-01  0.2260355623  0.980980813
#> [1969,]  1.296920e+00  1.4925881478  2.445556781
#> [1970,]  1.645752e+00  2.3462460143  3.354287407
#> [1971,] -4.638702e-01 -0.7246752698 -0.980601113
#> [1972,] -9.349258e-01 -0.2048858263 -1.279536414
#> [1973,] -5.216834e-01 -0.8416500049 -1.117609076
#> [1974,] -7.057597e-02  0.2980869487  0.077418987
#> [1975,] -1.408524e+00 -3.3066748157 -3.591467146
#> [1976,] -4.285182e-02 -0.2529623960 -0.193818884
#> [1977,] -1.594761e+00 -2.9523940715 -3.627089839
#> [1978,]  1.439954e+00  2.2265592977  3.031240020
#> [1979,] -1.702954e+00 -2.6458116710 -3.591863386
#> [1980,] -3.977133e-01  0.9812809438  0.048629498
#> [1981,]  1.618050e+00  3.6272844437  4.030666598
#> [1982,] -1.460555e+00 -3.1236674340 -3.554786792

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#> [1983,] -4.506009e-01 -1.3024276916 -1.284683013
#> [1984,] -1.983810e-01  0.8990881290  0.251579235
#> [1985,] -5.258611e-01 -0.1834056624 -0.757520482
#> [1986,] -1.139864e+00 -1.5954386813 -2.306788704
#> [1987,]  3.660857e-02  0.0449265396  0.070582492
#> [1988,]  2.295783e+00  3.8844758685  5.018516275
#> [1989,] -5.540542e-01 -0.6766618100 -1.066413279
#> [1990,] -1.228960e+00 -2.4142150343 -2.872276672
#> [1991,]  1.904886e+00  2.5395997793  3.784725775
#> [1992,] -2.819741e-01 -0.7869651607 -0.788348693
#> [1993,]  3.961480e+00  5.6490117315  8.074849871
#> [1994,] -1.631457e+00 -2.1341136753 -3.218737342
#> [1995,] -1.214776e+00 -1.9786218079 -2.612853469
#> [1996,]  3.992245e-01  1.0953806010  1.105715126
#> [1997,]  2.540290e+00  3.5350541849  5.129497190
#> [1998,] -1.163480e+00 -0.7396546999 -1.861313802
#> [1999,]  6.990512e-01  2.0548380063  2.012051633
#> [2000,] -4.494133e-01 -1.2760224599 -1.268548255
#>
#> [[1]][[21]]$value[[1]]$decomposition
#> [1] "eigen"
#>
#>
#>
#> [[1]][[21]]$visible
#> [1] TRUE
#>
#>
#> [[1]][[22]]
#> [[1]][[22]]$value
#> [[1]][[22]]$value[[1]]
#> [[1]][[22]]$value[[1]]$M
#> [1] 2
#>
#> [[1]][[22]]$value[[1]]$est
#> [1] 0 0 0
#>
#> [[1]][[22]]$value[[1]]$within
#>      [,1] [,2] [,3]
#> [1,]    1    0    0
#> [2,]    0    1    0
#> [3,]    0    0    1
#>
#> [[1]][[22]]$value[[1]]$between
#>      [,1] [,2] [,3]

```

```

#> [1,] 0 0 0
#> [2,] 0 0 0
#> [3,] 0 0 0
#>
#> [[1]][[22]]$value[[1]]$total
#>      [,1] [,2] [,3]
#> [1,] 1 0 0
#> [2,] 0 1 0
#> [3,] 0 0 1
#>
#> [[1]][[22]]$value[[1]]$ariv
#> [1] NA
#>
#> [[1]][[22]]$value[[1]]$total_adj
#> [1] NA
#>
#>
#>
#> [[1]][[22]]$visible
#> [1] TRUE
#>
#>
#> [[1]][[23]]
#> [[1]][[23]]$value
#> [[1]][[23]]$value[[1]]
#>      est se R 0.05% 0.5% 2.5% 97.5% 99.5% 99.95%
#> eta1=~y1 1.0000 NA 0 NA NA NA NA NA NA
#> eta1=~y2 0.7039 NA 0 NA NA NA NA NA NA
#> eta1=~y3 0.7047 NA 0 NA NA NA NA NA NA
#> eta1=~y4 0.8566 NA 0 NA NA NA NA NA NA
#> y1~~y1 0.0000 NA 0 NA NA NA NA NA NA
#> y2~~y2 0.5045 NA 0 NA NA NA NA NA NA
#> y3~~y3 0.5034 NA 0 NA NA NA NA NA NA
#> y4~~y4 0.2662 NA 0 NA NA NA NA NA NA
#> eta1~~eta1 1.0000 NA 0 NA NA NA NA NA NA
#>
#>
#> [[1]][[23]]$visible
#> [1] TRUE

```

Environment

```
ls()  
#> [1] "root"
```

Class

```
#> [[1]]  
#> [1] "root_criterion"
```

References

- Pesigan, I. J. A., & Cheung, S. F. (2023). Monte Carlo confidence intervals for the indirect effect with missing data. *Behavior Research Methods*, 56(3), 1678–1696. <https://doi.org/10.3758/s13428-023-02114-4>
- R Core Team. (2024). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing. Vienna, Austria. <https://www.R-project.org/>