

longMI: Internal Tests

Ivan Jacob Agaloos Pesigan

Tests

```
#> test
#> Call:
#> Comparison(configural = configural_fit, weak = weak_fit, strong = strong_fit,
#>   strict = strict_fit)
#>           chisq df pvalue    cfi    tli  rmsea  srmr      aic      bic
#> configural  25.9682 19 0.1311 0.9915 0.9875 0.0424 0.0306 11252.23 11335.18
#> weak        41.8973 22 0.0064 0.9757 0.9691 0.0666 0.0763 11262.16 11335.16
#> strong      53.7228 25 0.0007 0.9650 0.9608 0.0750 0.0872 11267.98 11331.03
#> strict     134.5591 29 0.0000 0.8712 0.8757 0.1336 0.1690 11340.82 11390.59
#> Call:
#> Comparison(configural = configural_fit, weak = weak_fit, strong = strong_fit,
#>   strict = strict_fit)
#>
#>
#> CONFIGURAL INVARIANCE MODEL
#>
#> lavaan 0.6.16 ended normally after 75 iterations
#>
#> Estimator ML
#> Optimization method NLMINB
#> Number of model parameters 27
#> Number of equality constraints 2
#>
#> Number of observations 204
#> Number of missing patterns 1
#>
#> Model Test User Model:
#>
#> Test statistic 25.968
#> Degrees of freedom 19
#> P-value (Chi-square) 0.131
#>
#> Parameter Estimates:
#>
```

```

#> Standard errors
#> Information
#> Observed information based on
#> Observed Hessian
#>
#> Latent Variables:
#> Estimate Std.Err z-value P(>|z|)
#> f1t1 =~
#> y1_1 (111) 4.451 0.400 11.137 0.000
#> y1_2 6.850 0.637 10.745 0.000
#> y1_3 4.590 0.520 8.821 0.000
#> y1_4 5.039 0.396 12.728 0.000
#> f1t6 =~
#> y6_1 (111) 4.451 0.400 11.137 0.000
#> y6_2 4.006 0.489 8.194 0.000
#> y6_3 4.551 0.545 8.346 0.000
#> y6_4 4.102 0.453 9.057 0.000
#>
#> Covariances:
#> Estimate Std.Err z-value P(>|z|)
#> f1t1 ~~
#> f1t6 1.837 0.215 8.558 0.000
#>
#> Intercepts:
#> Estimate Std.Err z-value P(>|z|)
#> .y1_1 (i1) 19.776 0.427 46.273 0.000
#> .y1_2 21.797 0.680 32.036 0.000
#> .y1_3 14.903 0.528 28.223 0.000
#> .y1_4 20.396 0.439 46.416 0.000
#> .y6_1 (i1) 19.776 0.427 46.273 0.000
#> .y6_2 19.317 2.299 8.404 0.000
#> .y6_3 11.922 2.516 4.738 0.000
#> .y6_4 17.970 1.844 9.747 0.000
#> f1t1 0.000
#> f1t6 6.455 0.606 10.649 0.000
#>
#> Variances:
#> Estimate Std.Err z-value P(>|z|)
#> .y1_1 17.448 2.240 7.789 0.000
#> .y1_2 47.511 5.754 8.257 0.000
#> .y1_3 35.810 4.031 8.884 0.000
#> .y1_4 13.999 2.133 6.563 0.000
#> .y6_1 47.096 6.432 7.322 0.000
#> .y6_2 73.850 8.388 8.805 0.000
#> .y6_3 88.920 10.354 8.588 0.000
#> .y6_4 23.267 4.182 5.564 0.000
#> f1t1 1.000

```

```

#>      fit6          5.834      1.167      4.997      0.000
#>
#>
#> WEAK INVARIANCE MODEL
#>
#> lavaan 0.6.16 ended normally after 54 iterations
#>
#>      Estimator                      ML
#>      Optimization method          NLMINB
#>      Number of model parameters      27
#>      Number of equality constraints    5
#>
#>      Number of observations          204
#>      Number of missing patterns      1
#>
#> Model Test User Model:
#>
#>      Test statistic                  41.897
#>      Degrees of freedom              22
#>      P-value (Chi-square)            0.006
#>
#> Parameter Estimates:
#>
#>      Standard errors                  Standard
#>      Information                      Observed
#>      Observed information based on      Hessian
#>
#> Latent Variables:
#>
#>      Estimate  Std.Err  z-value  P(>|z|)
#>      fit1 =~
#>      y1_1      (111)    4.933    0.339    14.562    0.000
#>      y1_2      (112)    5.172    0.429    12.052    0.000
#>      y1_3      (113)    5.072    0.397    12.762    0.000
#>      y1_4      (114)    4.865    0.336    14.492    0.000
#>      fit6 =~
#>      y6_1      (111)    4.933    0.339    14.562    0.000
#>      y6_2      (112)    5.172    0.429    12.052    0.000
#>      y6_3      (113)    5.072    0.397    12.762    0.000
#>      y6_4      (114)    4.865    0.336    14.492    0.000
#>
#> Covariances:
#>
#>      Estimate  Std.Err  z-value  P(>|z|)
#>      fit1 ~~
#>      fit6      1.558    0.136    11.439    0.000
#>

```

```

#> Intercepts:
#>               Estimate Std.Err z-value P(>|z|)
#>   .y1_1      (i1)  19.776   0.445  44.430   0.000
#>   .y1_2                21.797   0.629  34.633   0.000
#>   .y1_3                14.903   0.544  27.411   0.000
#>   .y1_4                20.396   0.436  46.803   0.000
#>   .y6_1      (i1)  19.776   0.445  44.430   0.000
#>   .y6_2                15.049   2.299   6.547   0.000
#>   .y6_3                11.756   2.212   5.315   0.000
#>   .y6_4                16.111   1.765   9.130   0.000
#>   f1t1                0.000
#>   f1t6                5.824   0.429  13.591   0.000
#>
#> Variances:
#>               Estimate Std.Err z-value P(>|z|)
#>   .y1_1                16.079   2.188   7.349   0.000
#>   .y1_2                54.055   6.012   8.992   0.000
#>   .y1_3                34.578   3.941   8.775   0.000
#>   .y1_4                15.075   2.109   7.149   0.000
#>   .y6_1                49.748   6.494   7.661   0.000
#>   .y6_2                72.254   8.353   8.650   0.000
#>   .y6_3                91.610  10.487   8.736   0.000
#>   .y6_4                22.022   4.032   5.462   0.000
#>   f1t1                 1.000
#>   f1t6                 4.240   0.546   7.759   0.000
#>
#>
#>
#> STRONG INVARIANCE MODEL
#>
#> lavaan 0.6.16 ended normally after 52 iterations
#>
#> Estimator ML
#> Optimization method NLMINB
#> Number of model parameters 27
#> Number of equality constraints 8
#>
#> Number of observations 204
#> Number of missing patterns 1
#>
#> Model Test User Model:
#>
#> Test statistic 53.723
#> Degrees of freedom 25
#> P-value (Chi-square) 0.001
#>

```

```

#> Parameter Estimates:
#>
#> Standard errors          Standard
#> Information              Observed
#> Observed information based on Hessian
#>
#> Latent Variables:
#>      Estimate Std.Err z-value P(>|z|)
#> f1t1 =~
#>   y1_1      (l11)   5.270   0.331  15.917   0.000
#>   y1_2      (l12)   4.525   0.312  14.487   0.000
#>   y1_3      (l13)   4.960   0.328  15.112   0.000
#>   y1_4      (l14)   4.547   0.291  15.634   0.000
#> f1t6 =~
#>   y6_1      (l11)   5.270   0.331  15.917   0.000
#>   y6_2      (l12)   4.525   0.312  14.487   0.000
#>   y6_3      (l13)   4.960   0.328  15.112   0.000
#>   y6_4      (l14)   4.547   0.291  15.634   0.000
#>
#> Covariances:
#>      Estimate Std.Err z-value P(>|z|)
#> f1t1 ~~
#>   f1t6      1.608   0.142  11.316   0.000
#>
#> Intercepts:
#>      Estimate Std.Err z-value P(>|z|)
#> .y1_1      (i1)  19.929   0.457  43.623   0.000
#> .y1_2      (i2)  21.459   0.598  35.901   0.000
#> .y1_3      (i3)  14.882   0.529  28.146   0.000
#> .y1_4      (i4)  20.311   0.421  48.252   0.000
#> .y6_1      (i1)  19.929   0.457  43.623   0.000
#> .y6_2      (i2)  21.459   0.598  35.901   0.000
#> .y6_3      (i3)  14.882   0.529  28.146   0.000
#> .y6_4      (i4)  20.311   0.421  48.252   0.000
#> f1t1      0.000
#> f1t6      5.337   0.354  15.077   0.000
#>
#> Variances:
#>      Estimate Std.Err z-value P(>|z|)
#> .y1_1      15.124   2.238   6.757   0.000
#> .y1_2      57.819   6.150   9.402   0.000
#> .y1_3      34.209   3.869   8.841   0.000
#> .y1_4      16.339   2.114   7.729   0.000
#> .y6_1      45.360   6.338   7.157   0.000
#> .y6_2      74.229   8.352   8.887   0.000
#> .y6_3      89.572  10.110   8.860   0.000

```

```

#>      .y6_4      24.586    3.951    6.223    0.000
#>      f1t1       1.000
#>      f1t6       4.557    0.585    7.791    0.000
#>
#>
#>
#> STRICT INVARIANCE MODEL
#>
#> lavaan 0.6.16 ended normally after 57 iterations
#>
#>      Estimator                      ML
#>      Optimization method          NLMINB
#>      Number of model parameters      27
#>      Number of equality constraints   12
#>
#>      Number of observations          204
#>      Number of missing patterns      1
#>
#> Model Test User Model:
#>
#>      Test statistic                  134.559
#>      Degrees of freedom              29
#>      P-value (Chi-square)            0.000
#>
#> Parameter Estimates:
#>
#>      Standard errors                Standard
#>      Information                    Observed
#>      Observed information based on    Hessian
#>
#> Latent Variables:
#>
#>      Estimate  Std.Err  z-value  P(>|z|)
#>      f1t1 =~
#>      y1_1      (111)    5.083    0.364    13.978    0.000
#>      y1_2      (112)    4.309    0.333    12.944    0.000
#>      y1_3      (113)    4.785    0.356    13.447    0.000
#>      y1_4      (114)    4.358    0.317    13.765    0.000
#>      f1t6 =~
#>      y6_1      (111)    5.083    0.364    13.978    0.000
#>      y6_2      (112)    4.309    0.333    12.944    0.000
#>      y6_3      (113)    4.785    0.356    13.447    0.000
#>      y6_4      (114)    4.358    0.317    13.765    0.000
#>
#> Covariances:
#>
#>      Estimate  Std.Err  z-value  P(>|z|)
#>      f1t1 ~~

```

```

#>      fit6      1.812    0.168   10.812    0.000
#>
#> Intercepts:
#>           Estimate Std.Err z-value P(>|z|)
#>   .y1_1 (i1)  20.019   0.509   39.339   0.000
#>   .y1_2 (i2)  21.513   0.621   34.648   0.000
#>   .y1_3 (i3)  14.805   0.617   23.988   0.000
#>   .y1_4 (i4)  20.313   0.433   46.915   0.000
#>   .y6_1 (i1)  20.019   0.509   39.339   0.000
#>   .y6_2 (i2)  21.513   0.621   34.648   0.000
#>   .y6_3 (i3)  14.805   0.617   23.988   0.000
#>   .y6_4 (i4)  20.313   0.433   46.915   0.000
#>   fit1      0.000
#>   fit6      5.557    0.415   13.396    0.000
#>
#> Variances:
#>           Estimate Std.Err z-value P(>|z|)
#>   .y1_1 (u1)  28.657   2.958    9.689   0.000
#>   .y1_2 (u2)  68.013   5.253   12.946   0.000
#>   .y1_3 (u3)  61.387   4.897   12.535   0.000
#>   .y1_4 (u4)  20.878   2.142    9.746   0.000
#>   .y6_1 (u1)  28.657   2.958    9.689   0.000
#>   .y6_2 (u2)  68.013   5.253   12.946   0.000
#>   .y6_3 (u3)  61.387   4.897   12.535   0.000
#>   .y6_4 (u4)  20.878   2.142    9.746   0.000
#>   fit1      1.000
#>   fit6      5.056    0.692    7.304    0.000
#>
#> Call:
#> Comparison(configural = configural_fit, weak = weak_fit, strong = strong_fit,
#>   strict = strict_fit)
#>
#> Chi-Squared Difference Test
#>
#>           Df    AIC    BIC    Chisq Chisq diff    RMSEA Df diff Pr(>Chisq)
#> 1.configural 19 11252 11335 25.968
#> 1.weak       22 11262 11335 41.897    15.929 0.14535     3 0.0011726 **
#> 2.configural 19 11252 11335 25.968
#> 2.strong     25 11268 11331 53.723    27.755 0.13332     6 0.0001045 ***
#> 3.configural 19 11252 11335 25.968
#> 3.strict     29 11341 11391 134.559   108.591 0.21984    10 < 2.2e-16 ***
#> 4.weak       22 11262 11335 41.897
#> 4.strong     25 11268 11331 53.723    11.826 0.12009     3 0.0080053 **
#> 5.weak       22 11262 11335 41.897
#> 5.strict     29 11341 11391 134.559    92.662 0.24492     7 < 2.2e-16 ***
#> 6.strong     25 11268 11331 53.723

```

```

#> 6.strict      29 11341 11391 134.559      80.836 0.30686      4 < 2.2e-16 ***
#> ---
#> Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
#> Call:
#> Invariance(data = osbornesudick1972, time_points = time_points,
#>   factor_loadings = factor_loadings)
#>           chisq df pvalue    cfi    tli rmsea  srmr      aic      bic
#> configural  25.9682 19 0.1311 0.9915 0.9875 0.0424 0.0306 11252.23 11335.18
#> weak        41.8973 22 0.0064 0.9757 0.9691 0.0666 0.0720 11262.16 11335.16
#> strong      53.7228 25 0.0007 0.9650 0.9608 0.0750 0.0859 11267.98 11331.03
#> strict     134.5591 29 0.0000 0.8712 0.8757 0.1336 0.1328 11340.82 11390.59
#> Call:
#> Invariance(data = osbornesudick1972, time_points = time_points,
#>   factor_loadings = factor_loadings)
#>
#>
#> CONFIGURAL INVARIANCE MODEL
#>
#> lavaan 0.6.16 ended normally after 75 iterations
#>
#> Estimator                      ML
#> Optimization method            NLMINB
#> Number of model parameters      27
#> Number of equality constraints    2
#>
#> Number of observations          204
#>
#> Model Test User Model:
#>
#> Test statistic                  25.968
#> Degrees of freedom              19
#> P-value (Chi-square)            0.131
#>
#> Parameter Estimates:
#>
#> Standard errors                  Standard
#> Information                      Expected
#> Information saturated (h1) model  Structured
#>
#> Latent Variables:
#>           Estimate Std.Err z-value P(>|z|)
#> f1t1 =~
#>   y1_1    (111)    4.451   0.396  11.244   0.000
#>   y1_2          6.850   0.637  10.750   0.000
#>   y1_3          4.590   0.515   8.918   0.000
#>   y1_4          5.039   0.393  12.809   0.000

```



```

#> f1t6 =~
#> y6_1 (111) 4.451 0.396 11.244 0.000
#> y6_2 4.006 0.485 8.261 0.000
#> y6_3 4.551 0.546 8.342 0.000
#> y6_4 4.102 0.448 9.150 0.000
#>
#> Covariances:
#> Estimate Std.Err z-value P(>|z|)
#> f1t1 ~~
#> f1t6 1.837 0.211 8.703 0.000
#>
#> Intercepts:
#> Estimate Std.Err z-value P(>|z|)
#> .y1_1 (i1) 19.776 0.427 46.273 0.000
#> .y1_2 21.797 0.680 32.036 0.000
#> .y1_3 14.903 0.528 28.223 0.000
#> .y1_4 20.396 0.439 46.416 0.000
#> .y6_1 (i1) 19.776 0.427 46.273 0.000
#> .y6_2 19.317 2.281 8.467 0.000
#> .y6_3 11.922 2.538 4.697 0.000
#> .y6_4 17.970 1.815 9.903 0.000
#> f1t1 0.000
#> f1t6 6.455 0.601 10.743 0.000
#>
#> Variances:
#> Estimate Std.Err z-value P(>|z|)
#> .y1_1 17.448 2.186 7.981 0.000
#> .y1_2 47.511 5.748 8.266 0.000
#> .y1_3 35.810 3.969 9.022 0.000
#> .y1_4 13.999 2.085 6.712 0.000
#> .y6_1 47.096 6.305 7.470 0.000
#> .y6_2 73.850 8.395 8.797 0.000
#> .y6_3 88.920 10.222 8.699 0.000
#> .y6_4 23.267 4.076 5.709 0.000
#> f1t1 1.000
#> f1t6 5.834 1.159 5.035 0.000
#>
#>
#> WEAK INVARIANCE MODEL
#>
#> lavaan 0.6.16 ended normally after 54 iterations
#>
#> Estimator ML
#> Optimization method NLMINB
#> Number of model parameters 27

```

```

#>   Number of equality constraints          5
#>
#>   Number of observations          204
#>
#> Model Test User Model:
#>
#>   Test statistic          41.897
#>   Degrees of freedom          22
#>   P-value (Chi-square)          0.006
#>
#> Parameter Estimates:
#>
#>   Standard errors          Standard
#>   Information          Expected
#>   Information saturated (h1) model          Structured
#>
#> Latent Variables:
#>
#>           Estimate   Std.Err   z-value   P(>|z|)
#>   f1t1 =~
#>     y1_1   (l11)    4.933    0.342    14.420    0.000
#>     y1_2   (l12)    5.172    0.413    12.534    0.000
#>     y1_3   (l13)    5.072    0.398    12.733    0.000
#>     y1_4   (l14)    4.865    0.330    14.733    0.000
#>   f1t6 =~
#>     y6_1   (l11)    4.933    0.342    14.420    0.000
#>     y6_2   (l12)    5.172    0.413    12.534    0.000
#>     y6_3   (l13)    5.072    0.398    12.733    0.000
#>     y6_4   (l14)    4.865    0.330    14.733    0.000
#>
#> Covariances:
#>
#>           Estimate   Std.Err   z-value   P(>|z|)
#>   f1t1 ~~
#>     f1t6          1.558    0.136    11.482    0.000
#>
#> Intercepts:
#>
#>           Estimate   Std.Err   z-value   P(>|z|)
#>   .y1_1   (i1)    19.776    0.445    44.430    0.000
#>   .y1_2           21.797    0.629    34.633    0.000
#>   .y1_3           14.903    0.544    27.411    0.000
#>   .y1_4           20.396    0.436    46.803    0.000
#>   .y6_1   (i1)    19.776    0.445    44.430    0.000
#>   .y6_2           15.049    2.223     6.770    0.000
#>   .y6_3           11.756    2.238     5.253    0.000
#>   .y6_4           16.111    1.699     9.484    0.000
#>   f1t1           0.000
#>   f1t6           5.824    0.432    13.476    0.000

```

```

#>
#> Variances:
#>           Estimate Std.Err z-value P(>|z|)
#>   .y1_1          16.079   2.165   7.427   0.000
#>   .y1_2          54.055   5.831   9.270   0.000
#>   .y1_3          34.578   3.922   8.817   0.000
#>   .y1_4          15.075   2.051   7.350   0.000
#>   .y6_1          49.748   6.242   7.970   0.000
#>   .y6_2          72.254   8.498   8.503   0.000
#>   .y6_3          91.610  10.272   8.919   0.000
#>   .y6_4          22.022   3.989   5.521   0.000
#>   fit1           1.000
#>   fit6           4.240   0.539   7.867   0.000
#>
#>
#>
#> STRONG INVARIANCE MODEL
#>
#> lavaan 0.6.16 ended normally after 52 iterations
#>
#> Estimator ML
#> Optimization method NLMINB
#> Number of model parameters 27
#> Number of equality constraints 8
#>
#> Number of observations 204
#>
#> Model Test User Model:
#>
#> Test statistic 53.723
#> Degrees of freedom 25
#> P-value (Chi-square) 0.001
#>
#> Parameter Estimates:
#>
#> Standard errors Standard
#> Information Expected
#> Information saturated (h1) model Structured
#>
#> Latent Variables:
#>           Estimate Std.Err z-value P(>|z|)
#> fit1 =~
#>   y1_1 (111)  5.270   0.333  15.813   0.000
#>   y1_2 (112)  4.525   0.308  14.681   0.000
#>   y1_3 (113)  4.960   0.328  15.120   0.000
#>   y1_4 (114)  4.547   0.289  15.707   0.000

```

```

#> f1t6 =~
#> y6_1 (111) 5.270 0.333 15.813 0.000
#> y6_2 (112) 4.525 0.308 14.681 0.000
#> y6_3 (113) 4.960 0.328 15.120 0.000
#> y6_4 (114) 4.547 0.289 15.707 0.000
#>
#> Covariances:
#> Estimate Std.Err z-value P(>|z|)
#> f1t1 ~~
#> f1t6 1.608 0.143 11.281 0.000
#>
#> Intercepts:
#> Estimate Std.Err z-value P(>|z|)
#> .y1_1 (i1) 19.929 0.456 43.727 0.000
#> .y1_2 (i2) 21.459 0.598 35.868 0.000
#> .y1_3 (i3) 14.882 0.529 28.153 0.000
#> .y1_4 (i4) 20.311 0.421 48.237 0.000
#> .y6_1 (i1) 19.929 0.456 43.727 0.000
#> .y6_2 (i2) 21.459 0.598 35.868 0.000
#> .y6_3 (i3) 14.882 0.529 28.153 0.000
#> .y6_4 (i4) 20.311 0.421 48.237 0.000
#> f1t1 0.000
#> f1t6 5.337 0.353 15.109 0.000
#>
#> Variances:
#> Estimate Std.Err z-value P(>|z|)
#> .y1_1 15.124 2.193 6.895 0.000
#> .y1_2 57.819 6.078 9.512 0.000
#> .y1_3 34.209 3.850 8.885 0.000
#> .y1_4 16.339 2.062 7.925 0.000
#> .y6_1 45.360 6.182 7.337 0.000
#> .y6_2 74.229 8.350 8.890 0.000
#> .y6_3 89.572 10.064 8.900 0.000
#> .y6_4 24.586 3.878 6.339 0.000
#> f1t1 1.000
#> f1t6 4.557 0.584 7.806 0.000
#>
#>
#> STRICT INVARIANCE MODEL
#>
#> lavaan 0.6.16 ended normally after 57 iterations
#>
#> Estimator ML
#> Optimization method NLMINB
#> Number of model parameters 27

```

```

#>   Number of equality constraints           12
#>
#>   Number of observations           204
#>
#> Model Test User Model:
#>
#>   Test statistic           134.559
#>   Degrees of freedom           29
#>   P-value (Chi-square)           0.000
#>
#> Parameter Estimates:
#>
#>   Standard errors           Standard
#>   Information           Expected
#>   Information saturated (h1) model   Structured
#>
#> Latent Variables:
#>
#>           Estimate   Std.Err   z-value   P(>|z|)
#>   f1t1 =~
#>     y1_1   (l11)    5.083    0.364    13.968    0.000
#>     y1_2   (l12)    4.309    0.325    13.248    0.000
#>     y1_3   (l13)    4.785    0.354    13.521    0.000
#>     y1_4   (l14)    4.358    0.312    13.971    0.000
#>   f1t6 =~
#>     y6_1   (l11)    5.083    0.364    13.968    0.000
#>     y6_2   (l12)    4.309    0.325    13.248    0.000
#>     y6_3   (l13)    4.785    0.354    13.521    0.000
#>     y6_4   (l14)    4.358    0.312    13.971    0.000
#>
#> Covariances:
#>
#>           Estimate   Std.Err   z-value   P(>|z|)
#>   f1t1 ~~
#>     f1t6           1.812    0.168    10.790    0.000
#>
#> Intercepts:
#>
#>           Estimate   Std.Err   z-value   P(>|z|)
#>   .y1_1   (i1)    20.019    0.506    39.547    0.000
#>   .y1_2   (i2)    21.513    0.621    34.617    0.000
#>   .y1_3   (i3)    14.805    0.617    24.001    0.000
#>   .y1_4   (i4)    20.313    0.433    46.903    0.000
#>   .y6_1   (i1)    20.019    0.506    39.547    0.000
#>   .y6_2   (i2)    21.513    0.621    34.617    0.000
#>   .y6_3   (i3)    14.805    0.617    24.001    0.000
#>   .y6_4   (i4)    20.313    0.433    46.903    0.000
#>   f1t1           0.000
#>   f1t6           5.557    0.411    13.526    0.000

```

```

#>
#> Variances:
#>
#>           Estimate Std.Err z-value P(>|z|)
#>   .y1_1      (u1)  28.657   2.747  10.433   0.000
#>   .y1_2      (u2)  68.013   5.170  13.155   0.000
#>   .y1_3      (u3)  61.387   4.821  12.734   0.000
#>   .y1_4      (u4)  20.878   2.008  10.398   0.000
#>   .y6_1      (u1)  28.657   2.747  10.433   0.000
#>   .y6_2      (u2)  68.013   5.170  13.155   0.000
#>   .y6_3      (u3)  61.387   4.821  12.734   0.000
#>   .y6_4      (u4)  20.878   2.008  10.398   0.000
#>   fit1              1.000
#>   fit6              5.056   0.685   7.378   0.000
#>
#> Call:
#> Invariance(data = osbornesudick1972, time_points = time_points,
#>   factor_loadings = factor_loadings)
#>
#> Chi-Squared Difference Test
#>
#>           Df    AIC    BIC    Chisq Chisq diff    RMSEA Df diff Pr(>Chisq)
#> 1.configural 19 11252 11335 25.968
#> 1.weak       22 11262 11335 41.897    15.929 0.14535      3 0.0011726 **
#> 2.configural 19 11252 11335 25.968
#> 2.strong     25 11268 11331 53.723    27.755 0.13332      6 0.0001045 ***
#> 3.configural 19 11252 11335 25.968
#> 3.strict     29 11341 11391 134.559   108.591 0.21984     10 < 2.2e-16 ***
#> 4.weak       22 11262 11335 41.897
#> 4.strong     25 11268 11331 53.723    11.826 0.12009      3 0.0080053 **
#> 5.weak       22 11262 11335 41.897
#> 5.strict     29 11341 11391 134.559    92.662 0.24492      7 < 2.2e-16 ***
#> 6.strong     25 11268 11331 53.723
#> 6.strict     29 11341 11391 134.559    80.836 0.30686      4 < 2.2e-16 ***
#> ---
#> Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
#> Test passed
#> Test passed
#> Test passed
#> Test passed
#> Test passed
#> Test passed
#> [[1]]
#> [[1]][[1]]
#> [[1]][[1]]$value
#> [[1]][[1]]$value[[1]]
#> lavaan 0.6.16 ended normally after 90 iterations

```

```

#>
#> Estimator ML
#> Optimization method NLMINB
#> Number of model parameters 31
#> Number of equality constraints 12
#>
#> Number of observations 204
#> Number of missing patterns 1
#>
#> Model Test User Model:
#>
#> Test statistic 133.220
#> Degrees of freedom 25
#> P-value (Chi-square) 0.000
#>
#>
#> [[1]][[1]]$visible
#> [1] TRUE

```

Environment

```
ls()
```

```
#> [1] "osbornesudick1972" "root"          "tex_file"
```


Class

```
#> [[1]]  
#> [1] "data.frame"  
#>  
#> [[2]]  
#> [1] "root_criterion"  
#>  
#> [[3]]  
#> [1] "character"
```

References

- Pesigan, I. J. A., Sun, R. W., & Cheung, S. F. (2023). betaDelta and betaSandwich: Confidence intervals for standardized regression coefficients in R. *Multivariate Behavioral Research*, 1–4. <https://doi.org/10.1080/00273171.2023.2201277>
- R Core Team. (2023). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing. Vienna, Austria. <https://www.R-project.org/>