

longMI: Internal Tests

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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)
#>
#> Fit Measures
#>           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
#>
#>
#>
#> 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                Standard
#>   Information                    Observed
#>   Observed information based on   Hessian
#>
#> Latent Variables:
#>           Estimate Std.Err z-value P(>|z|)
#>   f1t1 =~
#>     y1_1      (l11)   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      (l11)   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|)

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#>   .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
#>   fit1        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

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#>      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|)
#>      f1t1 ~~
#>      f1t6              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

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#>
#>   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

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#>
#> 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
#>   fit1               1.000
#>   fit6               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|)
#> fit1 =~
#>   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

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#>      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 ~~
#>      f1t6              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
#>      f1t1              0.000
#>      f1t6              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
#>      f1t1              1.000
#>      f1t6              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)
#>
#> Fit Measures
#>           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
#>
#>
#> 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      (l11)   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      (l11)   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
#>   fit1        1.000
#>   fit6        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|)
#>   fit1 =~
#>     y1_1   (111)    4.933    0.342   14.420    0.000
#>     y1_2   (112)    5.172    0.413   12.534    0.000
#>     y1_3   (113)    5.072    0.398   12.733    0.000
#>     y1_4   (114)    4.865    0.330   14.733    0.000
#>   fit6 =~
#>     y6_1   (111)    4.933    0.342   14.420    0.000
#>     y6_2   (112)    5.172    0.413   12.534    0.000

```

```

#>      y6_3      (113)      5.072      0.398      12.733      0.000
#>      y6_4      (114)      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
#>      f1t1              1.000
#>      f1t6              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|)
#>   f1t1 =~
#>     y1_1    (l11)    5.270   0.333  15.813   0.000
#>     y1_2    (l12)    4.525   0.308  14.681   0.000
#>     y1_3    (l13)    4.960   0.328  15.120   0.000
#>     y1_4    (l14)    4.547   0.289  15.707   0.000
#>   f1t6 =~
#>     y6_1    (l11)    5.270   0.333  15.813   0.000
#>     y6_2    (l12)    4.525   0.308  14.681   0.000
#>     y6_3    (l13)    4.960   0.328  15.120   0.000
#>     y6_4    (l14)    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
#>   fit1              1.000
#>   fit6              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|)
#> fit1 =~
#>   y1_1   (111)    5.083   0.364  13.968   0.000
#>   y1_2   (112)    4.309   0.325  13.248   0.000
#>   y1_3   (113)    4.785   0.354  13.521   0.000
#>   y1_4   (114)    4.358   0.312  13.971   0.000
#> fit6 =~

```

```

#>   y6_1   (111)   5.083   0.364   13.968   0.000
#>   y6_2   (112)   4.309   0.325   13.248   0.000
#>   y6_3   (113)   4.785   0.354   13.521   0.000
#>   y6_4   (114)   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
#>   f1t1           1.000
#>   f1t6           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/>