Tutorial

Interactive web app ‘Chi-bar-square difference test’

https://www.uu.nl/staff/RMKuiper/Websites%20%2F%20Shiny%20apps

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D:/Shiny Apps and R packages/AF_1_Chi-bar-square difference test - Shiny

http://127.0.0.1:5432 | Open in Browser

Critical value and p-value of the Chi-bar-square ($\bar{X}^2$) difference test: | **RI-CLPM vs CLPM or another test of variances** | **General** | *By using this app you agree with the Terms of Usage* | Contact

Click here to open a folder with example input files

Input

Fill in the total number of variances (q = n + k), that is, the sum of the number of nuisance variances (n) and the number of constrained variances (k). When testing RI-CLPM vs CLPM (see Hamaker et al., 2015), q = k; in case of another test of variances (see Stoel et al., 2006), q >= k.

1

Fill in the number of random intercepts (k), that is, the number of constrained variances, whose values may be on the boundary of the parameter space under the null and the alternative hypotheses.

1

Choose your type of (k times k) covariance matrix input. That is, the type of input for the covariance matrix of the k constrained variances.

Full matrix (a k times k matrix or a vector of k*k elements)

Select the tab delimited .txt file that contains the covariance matrix of the k constrained variances (S).

Browse... | No file selected

Fill in the Chi-square (X^2) value for the CLPM. In case of another test of variances, this refers to the Chi-square (X^2) of the model with the k constrained variances. Use a dot (.) as decimal mark.

0

Fill in the Chi-square (X^2) value for the RI-CLPM. In case of another test of variances, this refers to the Chi-square (X^2) of the model without the k constrained variances. Use a dot (.) as decimal mark.

0

Fill in the degrees of freedom of the Chi-square (X^2) test in the CLPM (i.e., the model with the k constrained variances).

1

Output

Critical value and p-value of the Chi-bar-square ($\bar{X}^2$) difference test

NULL

Clarification on notation

k = number of constrained variances of interest (input).

u = number of unconstrained variances of interest and unconstrained covariances of interest (k*n + k*(k-1)/2), with n = number of nuisance variances (which are not of interest).

S = k times k covariance matrix of the constrained variances (input).

ChiBar2_weights = the Chi-bar-square ($\bar{X}^2$) weigths, also known as level probabilities.

critical_value = the critical value of the Chi-bar-square ($\bar{X}^2$) difference test.

DiffChi2 = the differences in Chi-square (X^2) between the CLPM and the RI-CLPM (input).

CritValSmallerDiffChi2 = check whether critical_value < DiffChi2.

p_value = the p-value of the Chi-bar-square ($\bar{X}^2$) difference test.

pSmallerAlpha = check whether p_value < alpha, where alpha = .05 or as specified in input.

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1

Choose your type of (k times k) covariance matrix input. That is, the type of input for the covariance matrix of the k constrained variances.

Full matrix (a k times k matrix or a vector of k*k elements)

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0

Fill in the Chi-square (X^2) value for the RI-CLPM. In case of another test of variances, this refers to the Chi-square (X^2) of the model without the k constrained variances. Use a dot (.) as decimal mark.

0

Fill in the degrees of freedom of the Chi-square (X^2) test in the CLPM (i.e., the model with the k constrained variances).

1

Fill in the degrees of freedom of the Chi-square (X^2) test in the RI-CLPM (i.e., the model without the k constrained variances).

1

Optional settings

Nominal α value (default is .05)

0,05

Seed value (default is 123)

123

Number of iterations in calculating the $\bar{X}^2$ probabilities (default is 100000)

100000

critical_value = the critical value of the Chi-bar-square ($\bar{X}^2$) difference test.

DiffChi2 = the differences in Chi-square (X^2) between the CLPM and the RI-CLPM (input).

CritValSmallerDiffChi2 = check whether critical_value < DiffChi2.

p_value = the p-value of the Chi-bar-square ($\bar{X}^2$) difference test.

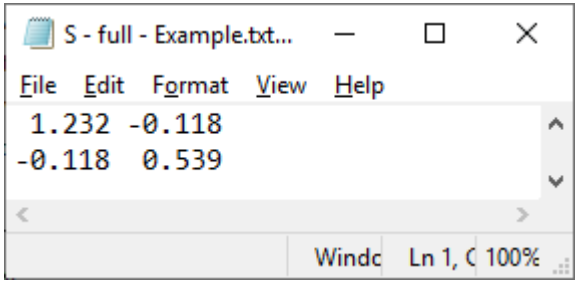
pSmallerAlpha = check whether p_value < alpha, where alpha = .05 or as specified in input.

Input: Example based on ‘RI-CLPM in R tutorial’

Compare fit CLPM vs RI-CLPM

There are 2 random intercepts in the RI-CLPM (omega and kappa): q = k = 2

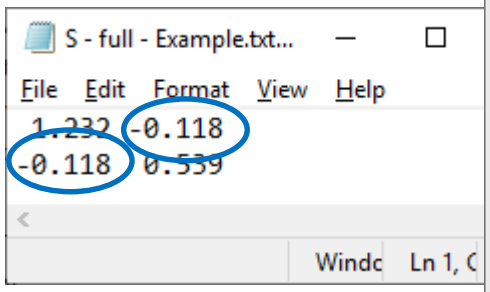
The full covariance matrix of the random intercepts is:

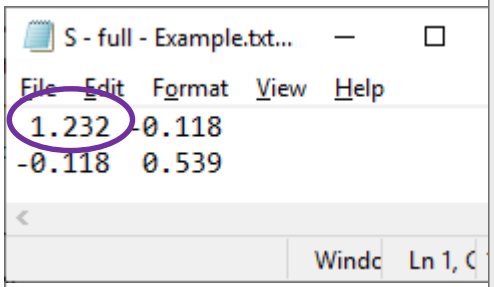


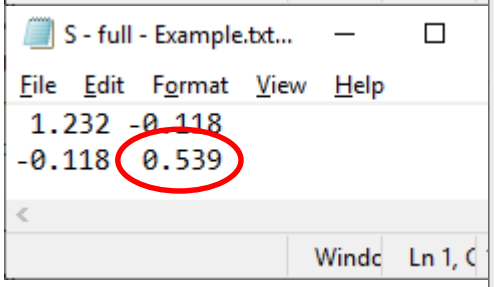
Chi-square values
The Chi-square value of CLPM is 20.6779
The Chi-square value of RI-CLPM is 3.2127

Degrees of freedom (df)
The df in CLPM is 4
The df in RI-CLPM is 1

Input intermezzo: Covariance matrix of the random intercepts





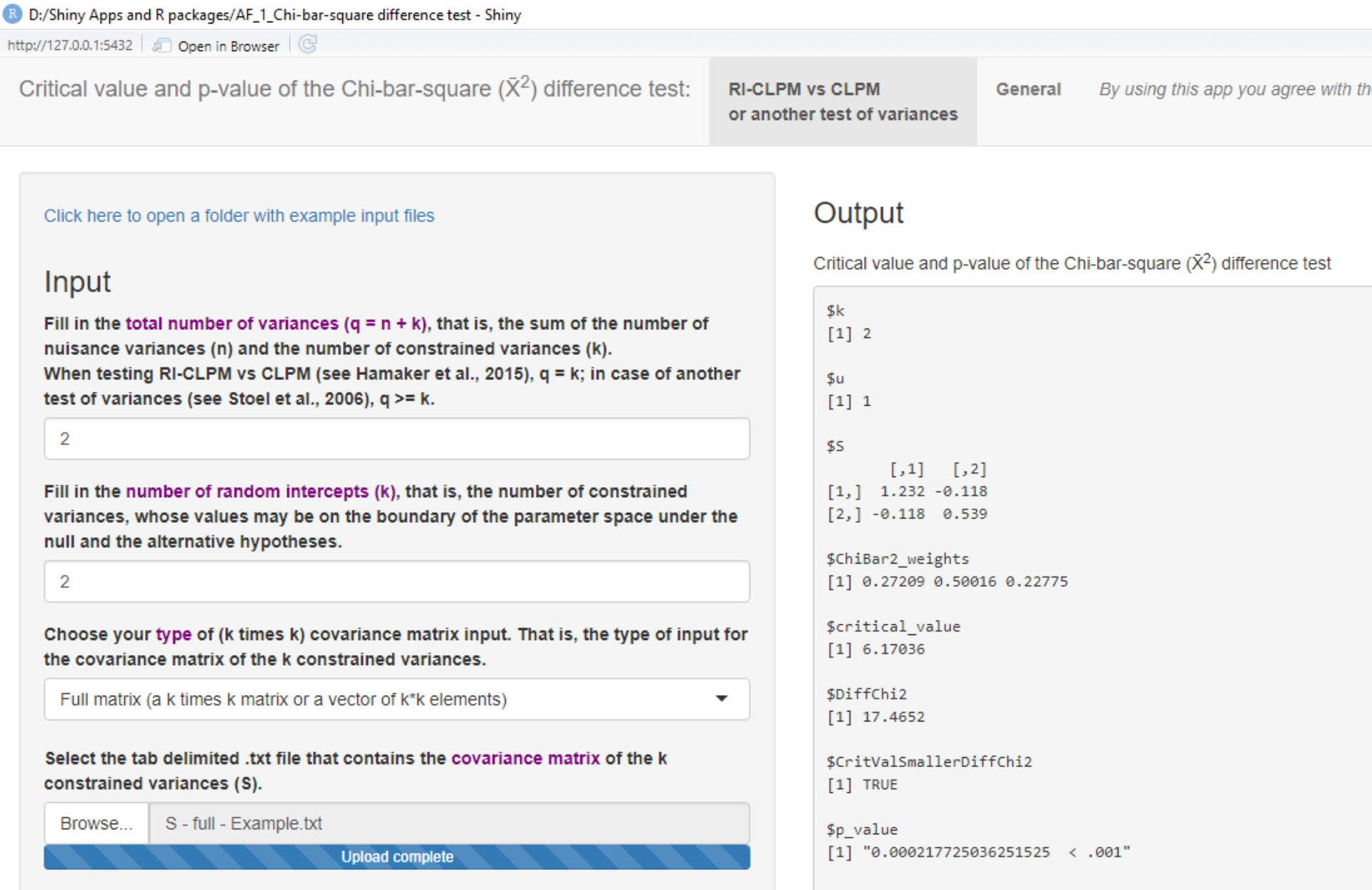



```
##
## Covariances:
##                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
##   kappa ~~
##     omega           -0.118    0.157   -0.754    0.451   -0.145   -0.145
##   p1 ~~
##     q1               0.017    0.160    0.107    0.915    0.025    0.025
##  .p2 ~~
##    .q2              -0.117    0.114   -1.025    0.305   -0.091   -0.091
##  .p3 ~~
##    .q3              -0.115    0.071   -1.624    0.104   -0.111   -0.111
##
## Intercepts:
##                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
##    .x1       (mu1)   1.662    0.082   20.217    0.000    1.662    1.005
##    .x2       (mu2)   1.985    0.103   19.189    0.000    1.985    0.981
##    .x3       (mu3)   1.898    0.107   17.658    0.000    1.898    0.977
##    .y1       (pi1)   2.523    0.046   54.925    0.000    2.523    2.729
##    .y2       (pi2)   4.066    0.055   74.267    0.000    4.066    3.760
```



```
##    .y3       (pi3)   5.023    0.064   78.328    0.000    5.023    4.256
##     kappa             0.000                               0.000    0.000
##     omega             0.000                               0.000    0.000
##     p1                0.000                               0.000    0.000
##    .p2                0.000                               0.000    0.000
##    .p3                0.000                               0.000    0.000
##     q1                0.000                               0.000    0.000
##    .q2                0.000                               0.000    0.000
##    .q3                0.000                               0.000    0.000
##
## Variances:
##                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
##     kappa             1.232    0.271    4.550    0.000    1.000    1.000
##     omega             0.539    0.177    3.042    0.002    1.000    1.000
##     p1                1.504    0.281    5.361    0.000    1.000    1.000
##    .p2        (u2)   2.821    0.316    8.929    0.000    0.985    0.985
##    .p3        (u3)   2.110    0.204   10.341    0.000    0.830    0.830
##     q1                0.316    0.172    1.832    0.067    1.000    1.000
##    .q2        (v2)   0.582    0.086    6.811    0.000    0.923    0.923
##    .q3        (v3)   0.509    0.046   11.125    0.000    0.596    0.596
##    .x1               0.000                               0.000    0.000
```

Example input & output: Top (zoomed in)



Example input & output: Bottom (zoomed in)

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2

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Select the tab delimited .txt file that contains the covariance matrix of the k constrained variances (S).

Browse... S - full - Example.txt

Upload complete

Fill in the Chi-square (X^2) value for the CLPM. In case of another test of variances, this refers to the Chi-square (X^2) of the model with the k constrained variances. Use a dot (.) as decimal mark.

20.6779

Fill in the Chi-square (X^2) value for the RI-CLPM. In case of another test of variances, this refers to the Chi-square (X^2) of the model without the k constrained variances. Use a dot (.) as decimal mark.

3.2127

Fill in the degrees of freedom of the Chi-square (X^2) test in the CLPM (i.e., the model with the k constrained variances).

4

Fill in the degrees of freedom of the Chi-square (X^2) test in the RI-CLPM (i.e., the model without the k constrained variances).

1

```
$ChiBar2_weights
[1] 0.27209 0.50016 0.22775

$critical_value
[1] 6.17036

$DiffChi2
[1] 17.4652

$CritValSmallerDiffChi2
[1] TRUE

$p_value
[1] "0.000217725036251525  < .001"

$pSmallerAlpha
[1] TRUE
```

Clarification on notation

k = number of constrained variances of interest (input).

u = number of unconstrained variances of interest and unconstrained covariances of interest

S = k times k covariance matrix of the constrained variances (input).

ChiBar2_weights = the Chi-bar-square ($\bar{X}^2$) weigths, also known as level probabilities.

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Example output: Chi-bar-squared vs Chi-squared

Output

Critical value and p-value of the Chi-bar-square ($\bar{X}^2$) difference test

```
$k
[1] 2

$u
[1] 1

$S
       [,1]   [,2]
[1,]  1.232 -0.118
[2,] -0.118  0.539

$ChiBar2_weights
[1] 0.27209 0.50016 0.22775

$critical_value
[1] 6.17036

$DiffChi2
[1] 17.4652

$CritValSmallerDiffChi2
[1] TRUE

$p_value
[1] "0.000217725036251525 < .001"

$pSmallerAlpha
[1] TRUE
```

The p-value of the Chi-bar-square difference test is more than two times smaller:

Chi Square Difference Test
##

	Df	Chisq	Chisq diff	Df diff	Pr(>Chisq)
fit	1	3.2127			
fitCLPM	4	20.6779	17.465	3	0.0005669

Note: In this example, the conclusions wrt both test do not differ; but they can.