

# Package ‘siren’

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**Type** Package

**Title** Hybrid FA-CFA for Controlling Acquiescence in Restricted Factorial Solutions

**Version** 1.0.5

**Date** 2024-10-25

**Description** Performs hybrid multi-stage factor analytic procedure for controlling acquiescence in restricted solutions (Ferrando & Lorenzo-Seva, 2000 <<https://www.uv.es/revispsi/articulos3.00/ferran7.pdf>>).

**Depends** R (>= 3.5.0)

**Imports** stats, psych, EFA.MRFA, lavaan

**Suggests** knitr, rmarkdown

**License** GPL-3

**Encoding** UTF-8

**LazyData** true

**RoxygenNote** 6.0.1

**VignetteBuilder** knitr

**NeedsCompilation** no

**Author** David Navarro-Gonzalez [aut, cre],  
Pere J. Ferrando [aut],  
Fabia Morales-Vives [aut],  
Ana Hernandez-Dorado [aut]

**Maintainer** David Navarro-Gonzalez <david.navarro@udl.cat>

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siren-package	<i>An hybrid CFA-EFA R package for controlling acquiescence in restricted solutions</i>
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**Description**

Hybrid multi-stage factor analytic procedure for controlling the effects of acquiescence in multidimensional questionnaires for which a restricted factorial solution (Ferrando & Lorenzo-Seva, 2000) can be specified.

**Value**

`\link{acquihybrid}`

Performs hybrid multi-stage factor analytic procedure for controlling acquiescence in restricted solutions.

**Author(s)**

David Navarro-Gonzalez

Pere J. Ferrando

Fabia Morales-Vives

Ana Hernandez-Dorado

**References**

Ferrando, P. J., & Seva, U. L. (2000). Unrestricted versus restricted factor analysis of multidimensional test items: Some aspects of the problem and some suggestions. *Psicologica*, 21(2), 301-323.

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acquihybrid	<i>An hybrid CFA-EFA R package for controlling acquiescence in restricted solutions</i>
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**Description**

Hybrid multi-stage factor analytic procedure for controlling the effects of ACQ in multidimensional questionnaires for which a restricted factorial solution (Ferrando & Lorenzo-Seva, 2000) can be specified. In the first stage, an ACQ factor is estimated and its effects are partialled-out from the inter-item correlations. In the second, a specified CFA solution is fitted to the cleaned matrix. This solution can be specified in two ways: (a) using the cleaned correlation matrix as input, or (b) specifying a full solution which has fixed loadings on the ACQ factor. The use of the program allows (a) the structural properties of the questionnaire to be assessed and (b) unbiased factor score estimates to be obtained for each respondent.

**Usage**

```
acquihybrid(x, content_factors, target, corr = "Pearson", raw_data=TRUE,
            method = "fixed", display = TRUE)
```

**Arguments**

x	Raw sample scores or a covariance/correlation matrix.
content_factors	The number of content factors to be retained. At least, each factor has to be defined by 3 items, so the maximum number of content factors will be the number of items / 3.
target	Target matrix, providing the direction of each item in their corresponding factor. The target is only used as reference for assessing which items have significant loadings on which factors, and the exact value is not used.
corr	Determines the type of matrices to be used in the factor analysis. "Pearson": Computes Pearson correlation matrices (linear model); "Polychoric": Computes Polychoric/Tetrachoric correlation matrices (graded model). If the matrix is not positive definite, the smoothing procedure proposed by Bentler and Yuan (2011) is used.
raw_data	Logical argument, if TRUE, the entered data will be treated as raw scores (default). If FALSE, the entered data will be treated as a covariance/correlation matrix.
method	Two possibilities are provided: fixed, which use the AC loadings obtained in the first step to use it as input for CFA and resid, which use the AC free covariance matrix as input for the CFA.
display	Determines if the output will be displayed in the console, TRUE by default. If it is TRUE, the output is printed in console and if it is FALSE, the output is returned silently to the output variable.

**Details**

Hybrid multi-stage factor analytic procedure for controlling the effects of ACQ in multidimensional questionnaires for which a restricted factorial solution (Ferrando & Lorenzo-Seva, 2000) can be specified.

The procedure is structured in several steps:

1. Estimate the ACQ loadings obtaining the first MRFA factor of the inter-item correlation matrix, thereafter, obtaining the centroid of this matrix (using it as target) and rotating the MRFA factor to the position of maximal congruence with respect to target.
2. Obtain the corrected inter-item residual matrix, that is, free of ACQ. This matrix will be treated as a residual covariance matrix.
3. Specify the prescribed CFA solution. There are two alternatives. (a) using the cleaned correlation matrix as input, or (b) specifying a full solution which has fixed loadings on the ACQ factor. This step uses the [cfa](#) (Rosseel, 2012), with the model obtained in the previous steps.
4. Obtain the goodness fit indices and factor scores. The factor scores are obtained using [fitmeasures](#) (Rosseel, 2012).

**Value**

loadings	Obtained loading matrix.
fit_indices	Fit indices: Goodness of Fit Index (GFI), Root Mean Square Residuals (RMSR), Root Mean Square Error of Approximation (RMSEA) and Comparative Fit Index (CFA)
AC_variance	The amount of variance explained by AC
pfactors	factor scores. If corr="Pearson", the method is "regression". In the categorical case, with Polychoric correlation, the option is the empirical bayes Modal approach (EBM)

**Author(s)**

David Navarro-Gonzalez

Pere J. Ferrando

Fabia Morales-Vives

Ana Hernandez-Dorado

**References**

Bentler, P. M., & Yuan, K. H. (2011). Positive definiteness via off-diagonal scaling of a symmetric indefinite matrix. *Psychometrika*, 76(1), 119-123. doi:10.1007/s1133601091913

Ferrando, P. J., & Seva, U. L. (2000). Unrestricted versus restricted factor analysis of multidimensional test items: Some aspects of the problem and some suggestions. *Psicológica*, 21(2), 301-323.

Rosseel, Y. (2012). lavaan: An R Package for Structural Equation Modeling. *Journal of Statistical Software*, 48(2).doi:10.18637/jss.v048.i02

**Examples**

```
## This is an example using the psymas dataset, which contains 1309 responders to PSYMAS
## questionnaire. For this example, only 10 items are used, measuring two subscales.
```

```
psymas_target=cbind(c(-9,-9,0,0,0,9,0,0,9,0),c(0,0,-9,9,-9,0,9,-9,0,9))
```

```
acquihybrid(psymas,content_factors=2,psymas_target)
```

```
## For speeding purposes, some options have been disabled. Pearson correlation matrix is
## being used, but Polychoric matrix may be advisable.
```

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psymas

*psymas database*

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### **Description**

A database to be used as example in the functions included on siren package. It contains the answers of 1309 participants to the Psychological Maturity Assessment Scale (Morales-Vives et al., 2012, 2013). The example database provided only contains 10 items and measures two subscales.

### **Usage**

```
data("psymas")
```

### **Format**

A data frame with 1309 observations and 10 variables.

### **Details**

This questionnaire estimates the psychological maturity of adolescents, understood as the ability to take responsibility for one's own obligations, taking into account one's own characteristics and needs, without showing excessive dependence on others. More specifically, we have used twelve items from two of the subscales of this questionnaire (four items of Self-reliance subscale and six items of Identity subscale) so that within each subscale half of the items were in one direction (lack of maturity) and the other half in the opposite direction (high maturity). Self-reliance refers to willingness to take the initiative without allowing others to exercise excessive control, and Identity refers to knowledge about own's characteristics and needs. The study carried out by Morales-Vives et al. (2013) shows that these factors are correlated, and that some of the items are affected by the acquiescence response bias.

### **References**

Morales-Vives, F., Camps, E., & Lorenzo-Seva, U. (2012). Manual del Cuestionario de Madurez Psicológica PSYMAS. TEA Ediciones, S.A. Morales-Vives, F., Camps, E., & Lorenzo-Seva, U. (2013). Development and validation of the psychological maturity assessment scale (PSYMAS). European Journal of Psychological Assessment. doi:10.1027/10155759/a000115

### **Examples**

```
data(psymas)
```

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