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MIIVsem-package

Model Implied Instrumental Variable Estimation of Structural Equation Models

Description

MIIVsem is a package for estimating structural equation models using model-implied instrumental variables (MIIVs).

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See Also

Useful links:

• https://github.com/zackfisher/MIIVsem
• Report bugs at https://github.com/zackfisher/MIIVsem/issues
Description

A dataset from Bollen (1989) containing measures of political democracy and industrialization for 75 developing countries in 1960 and 1965. The variables are as follows:

Usage

bollen1989a

Format

A data frame with 75 rows and 9 variables

Details

- y1. freedom of the press, 1960
- y2. freedom of political opposition, 1960
- y3. fairness of elections, 1960
- y4. effectiveness of elected legislature, 1960
- y5. freedom of the press, 1965
- y6. freedom of political opposition, 1965
- y7. fairness of elections, 1965
- y8. effectiveness of elected legislature, 1965
- x1. natural log of GNP per capita, 1960
- x2. natural log of energy consumption per capita, 1960
- x3. arcsin of square root of percentage of labor force in industry, 1960

References


Examples

```r
## Not run:
model <- ' 
  Eta1 ~ y1 + y2 + y3 + y4
  Eta2 ~ y5 + y6 + y7 + y8
  Xi1 ~ x1 + x2 + x3
  Eta1 ~ Xi1
  Eta2 ~ Xi1
  Eta2 ~ Eta1
```
## bollen1989b

### Union sentiment data


### Usage

bollen1989b

### Format

A data frame with 173 rows and 5 variables

- deferenc. deference (submissiveness) to managers
- laboract. support for labor activism
- unionsen. sentiment towards unions
- yrsmill. log of years spent in textile mill
- age. centered age

### References


Examples

```r
# Not run:
model <- ' 
  unionsen ~ deferenc + laboract + yrsmill 
  deferenc ~ age 
  laboract ~ age + deferenc 
  yrsmill ~~ age 
',

# End(Not run)
```

bollen1989c  Subjective class data

Description

The following data is from Bollen (1989) using data from Kluegel et al. (1977). These data include measures of actual income (inc) and occupational prestige (occ), measures of respondents’ subjective assessments of income (subinc), occupational prestige (subocc), and overall SES status (subgen).

Usage

bollen1989c

Format

A data frame with 432 rows and 5 variables

Details

- occ. actual occupational prestige
- inc. actual income
- subocc. respondents’ subjective assessments of prestige
- subinc. respondents’ subjective assessments of income
- subgen. respondents’ subjective assessments of SES status

References

Examples

```r
## Not run:
model <-
  subinc ~ inc + subocc
  subocc ~ occ + subinc
  subgen ~ subinc + subocc
  subinc ~~ subocc + subgen
  subocc ~~ subgen
  inc ~~ occ

## End(Not run)
```

## Perceived accessibility data

### Description

Data come from a survey that was conducted in rural clusters of Tanzania in 1993. The goal was to collect information on the perceived accessibility of a specific family planning facility that serviced each cluster. Six informants were chosen: 3 female and 3 male. New informants were chosen for each cluster. Each informant was independently asked to rate the accessibility of the facility, and how easy it was to get to the facility. More specifically the women informants were asked to rate how women of childbearing age perceived the accessibility and easiness and men were asked to rate how accessible and easy men perceived access to the clinic to be. Higher values indicate greater accessibility and ease of travel. The female informants’ ratings are 1 to 3 and the male informants’ ratings are 4 to 6.

### Usage

`bollen1996`

### Format

A data frame with 220 rows and 12 variables

### Details

- `access1`
- `access2`
- `access3`
- `access4`
- `access5`
- `access6`
estimatesTable

• easy1.
• easy2.
• easy3.
• easy4.
• easy5.
• easy6.

References


Examples

```r
## Not run:
model <- '  femaleAccess  <- access1 + access2 + access3
  maleAccess   <- access4 + access5 + access6
  femaleEasy   <- easy1  + easy2  + easy3
  maleEasy     <- easy4  + easy5  + easy6
',

## End(Not run)
```

estimatesTable  
return a dataframe of parameter estimates for a fitted model.

Description

return a dataframe of parameter estimates for a fitted model.

Usage

estimatesTable(x, v = NULL, sarg = FALSE)

Arguments

x  An object of class miive
v  A list containing variance snd covariance parameter information.
sarg  Logical. Should Sargan test results be included.
This data comes from a study by Felson and Borhnstedt (1979) of perceived attractiveness and academic ability in teenagers, sixth through ninth grade. The six variables are perception of academic ability (academic), perception of physical attractiveness (attract), grade point average (gpa), height, weight, and a strangers’ rating of attractiveness (rating).

Usage

A data frame with 209 rows and 7 variables

Details

- acad.
- athl.
- attract.
- gpa.
- height.
- weight.
- rating.

References


Examples

```r
# Not run:
model <- quotes('acad ~ gpa + attract
               attract ~ height + weight + rating + acad

# End(Not run)```
miive  

Model-implied instrumental variable (MIIV) estimation

Description

Estimate structural equation models using model-implied instrumental variables (MIIVs).

Usage

miive(model = model, 
data = NULL, 
instruments = NULL, 
sample.cov = NULL, 
sample.mean = NULL, 
sample.nobs = NULL, 
sample.cov.rescale = TRUE, 
estimator = "2SLS", 
se = "standard", 
bootstrap = 1000L, 
boot.ci = "norm", 
missing = "listwise", 
est.only = FALSE, 
var.cov = FALSE, 
miiv.check = TRUE, 
ordered = NULL, 
sarg.adjust = "none", 
overid.degree = NULL, 
overid.method = "stepwise.R2"
)

Arguments

model  
A model specified using lavaan model syntax or a miivs object returned by the miivs function. See Details for more information about permissible operators and example model syntax.

data  
A data frame, list or environment or an object coercible by as.data.frame to data frame. The most common application is to supply a data.frame.

instruments  
This allows user to specify the instruments for each equation. See Details and the miivs.out argument of summary.miivs for more information on the correct input format. External (auxiliary) instruments can be supplied, however, the miiv.check argument must be set to FALSE. In the typical application, the program will choose the MIIVs for each equation based on the model specification. To view the model implied instruments after estimation see the eq.info argument of summary.miive.
sample.cov Numeric matrix. A sample variance-covariance matrix. The rownames and col-
names attributes must contain all the observed variable names indicated in the
model syntax.

sample.mean A sample mean vector. If sample.cov is provided and the sample.mean argu-
ment is NULL, intercepts for all endogenous variables will not be estimated.

sample.nobs Number of observations in the full data frame.

sample.cov.rescale If TRUE, the sample covariance matrix provided by the user is internally rescaled
by multiplying it with a factor (N-1)/N.

estimator Options "2SLS" or "GMM" for estimating the model parameters. Default is "2SLS".
Currently, only 2SLS is supported.

se If "standard", asymptotic standard errors are computed. If "bootstrap" (or
"boot"), bootstrap standard errors are computed.

bootstrap Number of bootstrap draws, if bootstrapping is used. The default is 1000

boot.ci Method for calculating bootstrap confidence intervals. Options are normal ap-
proximation ("norm"), basic bootstrap interval ("basic"), percentile interval
("perc"), and adjusted bootstrap percentile ("bca"). The default is normal ap-
proximation. See boot.ci for more information.

missing Default is "listwise" however, a maximum likelihood related missing data
method called "twostage" is also available. See Details below on missing for
more information.

est.only If TRUE, only the coefficients are returned.

var.cov If TRUE, variance and covariance parameters are estimated.

miiv.check Default is TRUE. miiv.check provides a check to determine whether user-upplied
instruments are implied by the model specification (e.g. valid MIVs). When
auxiliary or external instruments are provided miiv.check should be set to
FALSE.

ordered A vector of variable names to be treated as ordered factors in generating the
polychoric correlation matrix and subsequent PIV estimates. See details on
ordered below for more information.

sarg.adjust Adjustment methods used to adjust the p-values associated with the Sargan test
due to multiple comparisons. Defaults is none. For options see p.adjust.

overid.degree A numeric value indicating the degree of overidentification to be used in esti-
mation.

overid.method The method by which excess MIVs should be pruned to satisfy the overid.degree.
Options include random (minimum.eigen) or stepwise R2. (stepwise.R2). The
default is stepwise.R2.

Details

• model
The following model syntax operators are currently supported: =~, ~, ~~ and *. See below
for details on default behavior, descriptions of how to specify the scaling indicator in latent
variable models, and how to impose equality constraints on the parameter estimates.
Example using Syntax Operators

In the model below, \( 'L1 \sim Z1 + Z2 + Z3' \) indicates the latent variable \( L1 \) is measured by 3 indicators, \( Z1, Z2, \) and \( Z3. \) Likewise, \( L2 \) is measured by 3 indicators, \( Z4, Z5, \) and \( Z6. \) The statement \( 'L1 \sim L2' \) specifies latent variable \( L1 \) is regressed on latent variable \( L2. \) \( 'Z1 \sim Z2' \) indicates the error of \( Z2 \) is allowed to covary with the error of \( Z3. \) The label \( LA3 \) appended to \( Z3 \) and \( Z6 \) in the measurement model constrains the factor loadings for \( Z3 \) and \( Z6 \) to equality. For additional details on constraints see Equality Constraints and Parameter Restrictions.

```r
model <- ' 
  L1 =~ Z1 + Z2 + LA3*Z3 
  L2 =~ Z4 + Z5 + LA3*Z6 
  L1 ~ L2 
  Z2 ~~ Z3 
',
```

Scaling Indicators

Following the `lavaan` model syntax, latent variables are defined using the \( \sim \) operator. For first order factors, the scaling indicator chosen is the first observed variable on the RHS of an equation. For the model below \( Z1 \) would be chosen as the scaling indicator for \( L1 \) and \( Z4 \) would be chosen as the scaling indicator for \( L2. \)

```r
model <- ' 
  L1 =~ Z1 + Z2 + Z3 
  L2 =~ Z4 + Z5 + Z6 
',
```

Equality Constraints and Parameter Restrictions

Within- and across-equation equality constraints on the factor loading and regression coefficients can be imposed directly in the model syntax. To specify equality constraints between different parameters equivalent labels should be prepended to the variable name using the \(*\) operator. For example, we could constrain the factor loadings for the two non-scaling indicators of \( L1 \) to equality using the following model syntax.

```r
model <- ' 
  L1 =~ Z1 + LA2*Z2 + LA2*Z3 
  L2 =~ Z4 + Z5 + Z6 
',
```

Researchers also can constrain the factor loading and regression coefficients to specific numeric values in a similar fashion. Below we constrain the regression coefficient of \( L1 \) on \( L2 \) to 1.

```r
model <- ' 
  L1 =~ Z1 + Z2 + Z3 
  L2 =~ Z4 + Z5 + Z6 
  L3 =~ Z7 + Z8 + Z9 
  L1 ~ 1*L2 + L3 
',
```

Higher-order Factor Models
For example, in the model below, the scaling indicator for the higher-order factor $H_1$ is taken to be $Z_1$, the scaling indicator that would have been assigned to the first lower-order factor $L_1$. The intercepts for lower-order latent variables are set to zero, by default.

```r
model <- ' 
  H1 =~ L1 + L2 + L3 
  L1 =~ Z1 + Z2 + Z3 
  L2 =~ Z4 + Z5 + Z6 
  L3 =~ Z7 + Z8 + Z9 
',
```

**Model Defaults**

In addition to those relationships specified in the model syntax **MIIVsem** will automatically include the intercepts of any observed or latent endogenous variable. The intercepts for any scaling indicators and lower-order latent variables are set to zero by default. Covariances among exogenous latent and observed variables are included when `var.cov = TRUE`. Where appropriate the covariances of the errors of latent and observed dependent variables are automatically included in the model specification. These defaults correspond to those used by **lavaan** and `auto = TRUE`, except that endogenous latent variable intercepts are estimated by default, and the intercepts of scaling indicators are fixed to zero.

**Invalid Specifications**

Certain model specifications are not currently supported. For example, the scaling indicator of a latent variable is not permitted to cross-load on another latent variable. In the model below $Z_1$, the scaling indicator for $L_1$, cross-loads on the latent variable $L_2$. Executing a search on the model below will result in the warning: *miivs: scaling indicators with a factor complexity greater than 1 are not currently supported.*

```r
model <- ' 
  L1 =~ Z1 + Z2 + Z3 
  L2 =~ Z4 + Z5 + Z6 + Z1 
',
```

In addition, **MIIVsem** does not currently support relations where the scaling indicator of a latent variable is also the dependent variable in a regression equation. The model below would not be valid under the current algorithm.

```r
model <- ' 
  L1 =~ Z1 + Z2 + Z3 
  Z1 ~ Z4 
  Z4 ~ Z5 + Z6 
',
```

• **instruments**

To utilize this option you must first define a list of instruments using the syntax displayed below. Here, the dependent variable for each equation is listed on the LHS of the ~ operator. In the case of latent variable equations, the dependent variable is the scaling indicator associated with that variable. The instruments are then given on the RHS, separated by + signs. The instrument syntax is then encloses in single quotes. For example,

```r
customIVs <- ' 
  y1 ~ z1 + z2 + z3 
',
```
After this list is defined, set the instruments argument equal to the name of the list of instruments (e.g. customIVs). Note, that instruments are specified for an equation, and not for a specific endogenous variable. If only a subset of dependent variables are listed in the instruments argument, only those equations listed will be estimated. If external or auxiliary instruments (instruments not otherwise included in the model) are included the miiv.check argument should be set to FALSE.

• sample.cov

The user may provide a sample covariance matrix in lieu of raw data. The rownames and colnames must contain the observed variable names indicated in the model syntax. If sample.cov is not NULL the user must also supply a vector of sample means (sample.mean), and the number of sample observations (sample.nobs) from which the means and covariances were calculated. If no vector of sample means is provided intercepts will not be estimated. MIIVsem does not support bootstrap standard errors or polychoric instrumental variable estimation when the sample moments, rather than raw data, are used as input.

• sample.mean

A vector of length corresponding to the row and column dimensions of the sample.cov matrix. The names of sample.mean must match those in the sample.cov. If the user supplies a covariance matrix but no vector of sample means intercepts will not be estimated.

• sample.cov.rescale

Default is TRUE. If the sample covariance matrix provided by the user should be internally rescaled by multiplying it with a factor (N-1)/N.

• estimator

The default estimator is 2SLS. For equations with continuous variables only and no restrictions the estimates are identical to those described in Bollen (1996, 2001). If restrictions are present a restricted MIIV-2SLS estimator is implemented using methods similar to those described by Greene (2003) but adapted for moment based estimation. 2SLS coefficients and overidentification tests are constructed using the sample moments for increased computational efficiency.

If an equation contains ordered categorical variables, declared in the ordered argument, the PIV estimator described by Bollen and Maydeu-Olivares (2007) is implemented. The PIV estimator does not currently support exogenous observed predictors of endogenous categorical variables. See details of the ordered argument for more information about the PIV estimator.

• se

When se is set to "boot" or "bootstrap" standard errors are computed using a non-parametric bootstrap assuming an independent random sample. If var.cov = TRUE nonconvergence may occur and any datasets with improper solutions will be recorded as such and discarded. Bootstrapping is implemented using the boot by resampling the observations in data and refitting the model with the resampled data. The number of bootstrap replications is set using the bootstrap argument, the default is 1000. Here, the standard errors are based on the standard deviation of successful bootstrap replications. Note, the Sargan test statistic is calculated from the original sample and is not a bootstrap-based estimate. When se is set to "standard" standard errors for the MIIV-2SLS coefficients are calculated using analytic expressions. For equations with categorical endogenous variables, the asymptotic distribution of the coefficients is obtained via a first order expansion where the matrix of partial derivatives
is evaluated at the sample polychoric correlations. For some details on these standard errors see Bollen & Maydeu-Olivares (2007, p. 315). If \texttt{var.cov = TRUE} only point estimates for the variance and covariance estimates are calculated. To obtain standard errors for the variance and covariance parameters we recommend setting \texttt{se = "bootstrap"}. Analytic standard errors for the variance covariance parameters accounting for the first stage estimation have been derived and will be available in future releases.

- **missing** There are two ways to handle missing data in \texttt{MIIVsem}. First, missing data may be handled by listwise deletion (\texttt{missing = "listwise"}). In this case any row of data containing missing observation is excluded from the analysis and the sample moments are adjusted accordingly. Estimation then proceeds normally. The second option for handling missing data is through a two-stage procedures \texttt{missing = "twostage"} where consistent estimates of the saturated populations means and covariance are obtained in the first stage. These quantities are often referred to as the "EM means" and "EM covariance matrix." In the second stage the saturated estimates are used to calculate the MIIV-2SLS structural coefficients. Bootstrap standard errors are recommended but will be computationally burdensome due to the cost of calculating the EM-based moments at each bootstrap replication.

- **ordered** For equations containing ordered categorical variables MIIV-2SLS coefficients are estimated using the approach outlined in Bollen & Maydeu-Olivares (2007). The asymptotic distribution of the the coefficients is obtained via a first order expansion where the matrix of partial derivatives is evaluated at the sample polychoric correlations. For some details on these standard errors see Bollen & Maydeu-Olivares (2007, p. 315). If \texttt{var.cov = TRUE} only point estimates for the variance and covariance estimates are calculated using the \texttt{DWLS} estimator in \texttt{lavaan}. To obtain standard errors for the variance and covariance parameters we recommend the bootstrap approach. Analytic standard errors for the variance covariance parameters in the presence of endogenous categorical variables will be available in future releases. Currently \texttt{MIIVsem} does not support exogenous variables in equations with categorical endogenous variables.

### Sargan’s Test of Overidentification

An essential ingredient in the MIIV-2SLS approach is the application of overidentification tests when a given model specification leads to an excess of instruments. Empirically, overidentification tests are used to evaluate the assumption of orthogonality between the instruments and equation residuals. Rejection of the null hypothesis implies a deficit in the logic leading to the instrument selection. In the context of MIIV-2SLS this is the model specification itself. By default, \texttt{MIIVsem} provides Sargan’s overidentification test (Sargan, 1958) for each overidentified equation in the system. When cross-equation restrictions or missing data are present the properties of the test are not known. When the system contains many equations the \texttt{sarg.adjust} option provides methods to adjust the p-values associated with the Sargan test due to multiple comparisons. Defaults is none. For other options see \texttt{p.adjust}.

### References


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**miivs**

*Model-implied instrumental variable (MIIV) search*

**Description**

A key step in the MIIV-2SLS approach is to transform the SEM by replacing the latent variables with their scaling indicators minus their errors. Upon substitution the SEM is transformed from a model with latent variables to one containing observed variables with composite errors. The miivs function automatically makes this transformation. The miivs function will also identify equation-specific model-implied instrumental variables in simultaneous equation models without latent variables.

**Usage**

```
miivs(model)
```

**Arguments**

- **model**: A model specified using lavaan model syntax. See the `model` argument within the `lavaanify` function for more information. See the documentation below for a description of how to specify the scaling indicator in latent variable models and impose equality constraints on the parameter estimates.
Details

• model

A model specified using the model syntax employed by lavaan. The following model syntax operators are currently supported: =~, ~, ~~ and *. See below for details on default behaviors, how to specify the scaling indicator in latent variable models, and how to impose equality constraints on the parameter estimates.

Example using Syntax Operators

In the model below, 'L1 =~ Z1 + Z2 + Z3' indicates the latent variable L1 is measured by 3 indicators, Z1, Z2, and Z3. Likewise, L2 is measured by 3 indicators, Z4, Z5, and Z6. The statement 'L1 ~ L2' specifies latent variable L1 is regressed on latent variable L2. 'Z1 ~~ Z2' indicates the error of Z2 is allowed to covary with the error of Z3. The label LA3 appended to Z3 and Z6 in the measurement model equations constrains the factor loadings for Z3 and Z6 to equality. For additional details on constraints see Equality Constraints and Parameter Restrictions.

```r
model <-
  L1 =~ Z1 + Z2 + LA3*Z3
  L2 =~ Z4 + Z5 + LA3*Z6
  L1 ~ L2
  Z2 ~~ Z3,
```

Scaling Indicators

Following the lavaan model syntax, latent variables are defined using the =~ operator. For first order factors, the scaling indicator chosen is the first observed variable on the RHS of an equation. For the model below Z1 would be chosen as the scaling indicator for L1 and Z4 would be chosen as the scaling indicator for L2.

```r
model <-
  L1 =~ Z1 + Z2 + Z3
  L2 =~ Z4 + Z5 + Z6,
```

Equality Constraints and Parameter Restrictions

Within- and across-equation equality constraints on the factor loading and regression coefficients can be imposed directly in the model syntax. To specify equality constraints between different parameters equivalent labels should be prepended to the variable name using the * operator. For example, we could constrain the factor loadings for two non-scaling indicators of latent factor L1 to equality using the following model syntax.

```r
model <-
  L1 =~ Z1 + LA2*Z2 + LA2*Z3
  L2 =~ Z4 + Z5 + Z6,
```

Researchers can also constrain the factor loadings and regression coefficients to specific numeric values in a similar fashion. Below we constrain the regression coefficient of L1 on L2 to 1.

```r
model <-
  L1 =~ Z1 + LA2*Z2 + LA2*Z3
  L2 =~ Z4 + Z5 + Z6
  L1 ~ 1*
  L2 ~ 1*
```
Higher-order Factor Models

For example, in the model below, the scaling indicator for the higher-order factor $H_1$ is taken to be $Z_1$, the scaling indicator that would have been assigned to the first lower-order factor $L_1$. The intercepts for lower-order latent variables are set to zero, by default.

```
model <- '
  H1 =~ L1 + L2 + L3
  L1 =~ Z1 + Z2 + Z3
  L2 =~ Z4 + Z5 + Z6
  L3 =~ Z7 + Z8 + Z9
',
```

Model Defaults

In addition to those relationships specified in the model syntax `MIIVsem` will automatically include the intercepts of any observed or latent endogenous variable. The intercepts for any scaling indicators and lower-order latent variables are set to zero. Covariances among exogenous latent and observed variables are included by default when `var.cov = TRUE`. Where appropriate the covariances of the errors of latent and observed dependent variables are also automatically included in the model specification. These defaults correspond to those used by `lavaan` and `auto = TRUE`, except that endogenous latent variable intercepts are estimated by default, and the intercepts of scaling indicators are fixed to zero.

Invalid Specifications

Certain model specifications are not currently supported. For example, the scaling indicator of a latent variable is not permitted to cross-load on another latent variable. In the model below $Z_1$, the scaling indicator for $L_1$, cross-loads on the latent variable $L_2$. Executing a search on the model below will result in the warning: `miivs: scaling indicators with a factor complexity greater than 1 are not currently supported`.

```
model <- '
  L1 =~ Z1 + Z2 + Z3
  L2 =~ Z4 + Z5 + Z6 + Z1
',
```

In addition, `MIIVsem` does not currently support relations where the scaling indicator of a latent variable is also the dependent variable in a regression equation. For example, the model below would not be valid under the current algorithm.

```
model <- '
  L1 =~ Z1 + Z2 + Z3
  Z1 ~ Z4
  Z4 ~ Z5 + Z6
',
```
The `miivs` function displays a table containing the following information for each equation in the system:

- **LHS** The "dependent" variable.
- **RHS** The right hand side variables of the transformed equation.
- **MIIVs** The model-implied instrumental variables for each equation.

**Value**

A list of model equations.

**References**


**See Also**

`miive`

---

### Description

Print method for a MIIV estimation object

### Usage

```r
## S3 method for class 'miive'
print(x, ...)```

### Arguments

- `x` a miive object
- `...` Optional arguments to print, not used by user.
Description

Print method for a MIIV search object

Usage

```r
## S3 method for class 'miivs'
print(x, ...)
```

Arguments

- `x`: a miivs object
- `...`: Optional arguments to print, not used by user.

Description

This dataset comes from Reisenzein (1986). In this paper Reisenzein designed a randomized experiment to test Weiner’s attribution-affect model of helping behavior. According to this theory, whether people help others is determined by their anger or sympathy. Anger and sympathy are affected by perceived controllability. If the individuals have gotten into difficult situations as a result of their own controllable actions, then this negatively affects sympathy and positively affects anger of the potential helpers. The opposite holds if the situation seems beyond the individuals’ control. This data comes from an experiment that describes a person collapsing and lying on the floor of a subway. Subjects were told that the person was either drunk (controllable situation) or ill (uncontrollable situation). This randomized story was intended to affect perceptions of controllability, and controllability in turn affected feelings of sympathy and anger. Finally, sympathy should positively affect helping behavior while anger would negatively affect helping.

Usage

`reisenzein1986`

Format

A data frame with 138 rows and 13 variables
Details

- Z1. Eliciting Situation
- Z2. How controllable, do you think, is the cause of the person’s present condition? (1 = not at all under personal control, 9 = completely under personal control).
- Z3. How responsible, do you think, is that person for his present condition? (1 = not at all responsible, 9 = very much responsible).
- Z4. I would think that it was the person’s own fault that he is in the present situation. (1 = no. not at all. 9 = yes, absolutely so).
- Z5. How much sympathy would you feel for that person? (1 = none at all. 9 = very much).
- Z6. I would feel pity for this person. (1 = none at all, 9 = very much).
- Z7. How much concern would you feel for this person? (1 = none at all, 9 = very much).
- Z8. How angry would you feel at that person? (1 = not at all, 9 = very much).
- Z9. How irritated would you feel by that person? (1 = not at all, 9 = very much).
- Z10. I would feel aggravated by that person. (1 = not at all, 9 = very much so).
- Z11. How likely is it that you would help that person? (1 = definitely would not help. 9 = definitely would help).
- Z12. How certain would you feel that you would help the person? (1 = not at all certain. 9 = absolutely certain).
- Z13. Which of the following actions would you most likely engage in? 1 = not help at all; 2 = try to alert other bystanders, but stay uninvolved myself; 3 = try to inform the conductor or another official in charge; 4 = go over and help the person to a seat; 5 = help in any way that might be necessary, including if necessary first aid and/or accompanying the person to a hospital.

References


summary.miive

summary.miive

Summary information for a MIIV estimation object

Usage

## S3 method for class 'miive'
summary(object, eq.info = FALSE, restrict.tests = FALSE, rsquare = FALSE, ...)
### Arguments

- **object**: An object of class `miive`
- **eq.info**: A logical indicating whether equation-specific information should be printed. Useful in models with large numbers of variables.
- **restrict.tests**: A logical indicating whether two test statistics for a large-sample Wald test of linear hypotheses imposed on the MIIV-2SLS coefficient matrix should be provided. The first statistic is an approximate F and the second is Chi-square. Assumptions and additional details for each test are given by Greene (2000, p. 346-347) and Henningsen and Hamann (2007).
- **rsquare**: A logical indicating whether R-square values for endogeneous variables are included in the output. Only available when `var.cov` is `TRUE`.
- **...**: Optional arguments to `summary`, not used by user.

### References


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**summary.miivs**

Summary information for a MIIV search object

**Description**

Summary information for a MIIV search object

**Usage**

```r
## S3 method for class 'miivs'
summary(object, miivs.out = FALSE, eq.info = FALSE, ...)
```

**Arguments**

- **object**: An object of class `miivs`
- **miivs.out**: A logical indicating whether the model-implied instrumental variables found for model should be printed to the console. This is a temporary convenience function to provide an editable, baseline format, for the `instruments` argument of `miive`.
- **eq.info**: A logical indicating whether equation-specific information should be printed. Useful in models with a large number of variables.
- **...**: Optional arguments to `summary`, not used by user.
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