Package ‘robustsur’

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Title Robust Estimation for Seemingly Unrelated Regression Models

Maintainer Claudio Agostinelli <claudio.agostinelli@unitn.it>

Description Data sets are often corrupted by outliers. When data are multivariate outliers can be classified as case-wise or cell-wise. The latters are particularly challenge to handle. We implement a robust estimation procedure for Seemingly Unrelated Regression Models which is able to cope well with both type of outliers. Giovanni Saraceno, Fatemah Alqalalaf, Claudio Agostinelli (2021) <arXiv:2107.00975>.

Depends R (>= 3.0.0), robustbase, robreg3S

Imports Matrix, GSE

Suggests systemfit

License GPL (>= 2)

NeedsCompilation no

Author Claudio Agostinelli [aut, cre]
(https://orcid.org/0000-0001-6702-4312),
Giovanni Saraceno [aut] (https://orcid.org/0000-0002-1753-2367)

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eigenkronecker

Spectral Decomposition of a kronecker product of a matrix with an identity matrix

Description
Computes eigenvalues and eigenvectors of the kronecker product of a matrix with an identity matrix.

Usage
eigenkronecker(x, n)

Arguments
x a numeric or complex symmetric matrix whose spectral decomposition is to be computed. Logical matrices are coerced to numeric.
n dimension of the identity matrix.

Details
Only symmetric matrices are considered.

Value
The spectral decomposition of kronecker product between x and an identity matrix of dimension n is returned as a list with components

values a vector containing the eigenvalues.
vectors a matrix whose columns contain the eigenvectors.

Author(s)
Claudio Agostinelli and Giovanni Saraceno

References

See Also
eigen and kronecker.

Examples
eigenkronecker(x=cbind(c(1,-1), c(-1,1)), n=2)
Summary of surerob estimation

Description

These functions create and print summary results of the estimated equation system.

Usage

```r
## S3 method for class 'surerob'
summary(object, residCov=TRUE, equations=TRUE, ...)
## S3 method for class 'summary.surerob'
print(x, digits=max(3, getOption("digits")-1),
     residCov=x$printResidCov, equations=x$printEquations, ...)
```

Arguments

- `object`: an object of class `surerob`.
- `x`: an object of class `summary.surerob`.
- `residCov`: logical. If `TRUE`, the residual correlation matrix, the residual covariance matrix, and its determinant are printed.
- `equations`: logical. If `TRUE`, summary results of each equation are printed. If `FALSE`, just the coefficients are printed.
- `digits`: number of digits to print.
- `...`: not yet used.

Value

Applying `summary` on an object of class `surerob` returns a list of class `summary.surerob`. An object of class `summary.surerob` contains all results that belong to the whole system. This list contains one special object: `eq`. This is a list and contains objects of class `summary.lmrob`. These objects contain the results that belong to each of the estimated equations.

The objects of classes `summary.surerob` have the following components

- `method`: estimation method.
- `residuals`: residuals.
- `residCovEst`: residual covariance matrix used for estimation.
- `residCov`: estimated residual covariance matrix.
- `residCor`: correlation matrix of the residuals.
- `detResidCov`: determinant of `residCov`.
- `rweights`: matrix of robust weights.
- `eq`: a list containing the summary from function `summary.lmrob` and `ssr`: residual sum of squares, `eqnNo`: equation number and `eqnLabel`: equation label.
df degrees of freedom, a 2-vector, where the first element is the number of coefficients and the second element is the number of observations minus the number of coefficients.

coefficients a matrix with columns for the estimated coefficients, their standard errors, t-statistic and corresponding (two-sided) p-values.

ssr_weighted weighted residual sum of squares.

r.squared $R^2$ value.

adj.r.squared adjusted $R^2$ value.

coefCov estimated covariance matrix of the coefficients.

printResidCov argument residCov.

printEquations argument equations.

control list of control parameters used for the estimation.

call the matched call of surerob.

Author(s)

Claudio Agostinelli and Giovanni Saraceno

References

Giovanni Saraceno, Fatemah Alqallaf and Claudio Agostinelli (2021?) A Robust Seemingly Unrelated Regressions For Row-Wise And Cell-Wise Contamination, submitted

See Also

surerob

Examples

```r
library(systemfit)
data("Kmenta")
eqDemand <- consump~price+income
eqSupply <- consump~price+farmPrice+trend
system <- list(demand=eqDemand, supply=eqSupply)

## Robust estimation
fitrob <- surerob(system, data=Kmenta)
summary(fitrob)
```
Robust estimation for Seemingly Unrelated Regression Models

Description

Robust estimation for Seemingly Unrelated Regression Models in presence of cell-wise and case-wise outliers performed using a three-stage procedure. In the first step estimation of the coefficients in each single-equation model is obtained using a Robust Regression procedure, robust estimation of the residual covariance is obtained by a Two-Step Generalized S-estimator, a weighted least square is performed on the whole system to get final estimates of the regression coefficients.

Usage

surerob(formula, data, control=lmrob.control(), ...)

## S3 method for class 'surerob'
print(x, digits=max(3,getOption("digits")-1), ...)

Arguments

formula a list of objects of class formula for multiple-equation models; for single-equation models use function lmrob.
data a list of objects of class data.frame. Each data.frame contains the data for the corresponding model and all the data.frames must have the same number of observations.
control list of control parameters. The default is constructed by the function lmrob.control, and it is passed to function lmrob.
... arguments passed to the function TSGS.
x an object of class surerob.
digits number of digits to print.

Details

The estimation of systems of equations with unequal numbers of observations is not implemented.

Value

surerob returns a list of the class surerob and contains all results that belong to the whole system. This list contains one special object: "eq". It is a list and contains one object for each estimated equation. These objects are of the class lmrob and contain the results that belong only to the regarding equation.

The objects of the class surerob have the following components:

eq a list that contains the results that belong to the individual equations.
call the matched call.
method estimation method.
rank  total number of linear independent coefficients.
coefficients  vector of all estimated coefficients.
fitted.values  matrix of fitted values.
residuals  matrix of residuals
imp.residuals  imputed residuals from TSGS.
residCovEst  residual covariance matrix used for estimation.
residCov  estimated residual covariance matrix.
rweights  matrix of robust weights.
TSGS  object from function TSGS.
control  list of control parameters used for the estimation.
df.residual  degrees of freedom of the whole system.
y  response observations used in the second step.
x  design matrix used in the second step.

Author(s)
Claudio Agostinelli and Giovanni Saraceno

References
Giovanni Saraceno, Fatemah Alqallaf and Claudio Agostinelli (2021?) A Robust Seemingly Unrelated Regressions For Row-Wise And Cell-Wise Contamination, submitted

See Also
lmrob, lm and systemfit

Examples
library(systemfit)
data("Kmenta")
eqDemand <- consump~price+income
eqSupply <- consump~price+farmPrice+trend
system <- list(demand=eqDemand, supply=eqSupply)

## Robust estimation
fitrob <- surerob(system, data=Kmenta)
print(fitrob)
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