Package ‘ssmrob’

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Description

Package provides a set of tools for robust estimation and inference for models with sample selectivity and endogenous treatment model.

Details

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coef.etregrob

Author(s)
Mikhail Zhelonkin, Marc G. Genton, Elvezio Ronchetti
Maintainer: Mikhail Zhelonkin <Mikhail.Zhelonkin@gmail.com>

References


See Also
ssmrob, etregrob, heckitrob, heckit5rob, selection

Examples
# Zhelonkin, Genton, Ronchetti (2016): page 823
data(MEPS2001)
selectEq <- dambexp ~ age + female + educ + blhisp + totchr + ins
outcomeEq <- lnambx ~ age + female + educ + blhisp + totchr + ins
meps.fit <- ssmrob(selectEq, outcomeEq, data = MEPS2001, control = heckitrob.control(tcc = 3.2))
summary(meps.fit)

---

coef.etregrob

Extract Coefficients from Robust Endogenous Treatment Model Fit

Description
Returns the coefficients of the robust two-stage estimator for endogenous treatment model.

Usage

```
# S3 method for class 'etregrob'
coef(object, ...)  
```

Arguments

object object of class "etregrob"

... currently not used
**Value**

Returns a list of two vectors of parameters of two stages.

- **S** coefficients of the selection equation.
- **0** coefficients of the outcome equation.

**Author(s)**

Mikhail Zhelonkin

---

**Description**

Returns the coefficients of the robust two-stage estimator for simple Heckman’s selection model or switching regression model.

**Usage**

```r
## S3 method for class 'heckit5rob'
coef(object, ...)
```

**Arguments**

- `object` object of class "heckitrob" or "heckit5rob"
- `...` currently not used

**Value**

Returns a list of two (censored) or three (switching) vectors of parameters of two stages.

- **S** coefficients of the selection equation.
- **0** coefficients of the outcome equation(s).

**Author(s)**

Mikhail Zhelonkin, Marc G. Genton, Elvezio Ronchetti
**Extract Coefficients from Robust Sample Selection Model Fit**

**Description**

Returns the coefficients of the robust two-stage estimator for simple Heckman’s selection model or switching regression model.

**Usage**

```r
## S3 method for class 'heckitrob'
coef(object, ...)
```

**Arguments**

- `object`: object of class "heckitrob" or "heckit5rob"
- `...`: currently not used

**Value**

Returns a list of two (censored) or three (switching) vectors of parameters of two stages.

- `S`: coefficients of the selection equation.
- `O`: coefficients of the outcome equation(s).

**Author(s)**

Mikhail Zhelonkin, Marc G. Genton, Elvezio Ronchetti

---

**Inverse Mills Ratio Derivative**

**Description**

Computes a derivative of the inverse Mills ratio with respect to the parameter vector.

**Usage**

```r
dLambdadSM(x, beta)
```

**Arguments**

- `x`: vector of exogenous variables
- `beta`: vector of parameters
Details
This function is necessary for computation of the asymptotic variance. In case of switching regressions the inverse Mills ratio term is different, and its derivative is computed in function dLambdadSM5. It can also be used to compute the influence function of the two-stage estimator.

Value
The gradient of the inverse Mills ratio is returned as a vector

Author(s)
Mikhail Zhelonkin, Marc G. Genton, Elvezio Ronchetti

References

---

dLambdadSM5  Inverse Mills Ratio Derivative

Description
Computes a derivative of the inverse Mills ratio with respect to the parameter vector.

Usage
dLambdadSM5(x, beta)

Arguments
- x  vector of exogenous variables
- beta  vector of parameters

Details
This function is necessary for computation of the asymptotic variance. In case of switching regressions the inverse Mills ratio term is different, and its derivative is computed in function dLambdadSM5. It can also be used to compute the influence function of the two-stage estimator.

Value
The gradient of the inverse Mills ratio is returned as a vector

Author(s)
Mikhail Zhelonkin, Marc G. Genton, Elvezio Ronchetti
etreg2steprobVcov

References


etreg2steprobVcov Variance Covariance Matrix

Description

Computation of the asymptotic variance matrix of the robust Heckman’s two-stage estimator for endogenous treatment model.

Usage

```
etreg2steprobVcov(y1vec, y2vec, x1Matr, x2Matr, eststage1, eststage2, eststage2sigma, 
weights = rep(1, nrow(y1vec)), t.c = 1.345)
```

Arguments

- `y1vec` vector of endogenous variables of the selection stage
- `y2vec` vector of endogenous variables of the outcome stage
- `x1Matr` matrix of exogenous variables of the selection stage
- `x2Matr` matrix of exogenous variables of the outcome stage
- `eststage1` object of class "glmrob", corresponding to the robust probit fit
- `eststage2` vector of the coefficients of the outcome stage
- `eststage2sigma` the robust scale estimate of the second stage regression
- `weights` robustness weights
- `t.c` tuning constant of the second stage

Details

The computation is made using the Huber (1967) - White (1980) sandwich estimator. In the computation of leverage weights the lambda’s are assumed to be fixed.

Value

Variance covariance matrix of the second stage estimator

Author(s)

Mikhail Zhelonkin
etregrob

References


---

etregrob

Robust Fit of Endogenous Treatment Model

Description

Fits the endogenous treatment model using a robust two-stage estimator

Usage

etregrob(selection, outcome, data, control = heckitrob.control())

Arguments

- **selection**: formula, the selection equation
- **outcome**: formula, the outcome equation
- **data**: an optional data frame containing the variables in the model. If not found in data, the variables are taken from `environment(formula)`, typically the environment from which etregrob is called.
- **control**: a list of parameters for controlling the fitting process. The same list as for sample selection model

Details

Compute robust two-step estimates of the Endogenous Treatment Model. The robust probit is fitted in the first stage. In the second stage the Mallows type M-estimator is used instead of traditional OLS. The correction for endogeneity is made by means of control function, which is the inverse Mills ratio for a complete sample (see Maddala, 1983, p. 120-122). The values of the tuning constants and the robustness weights can be modified in `heckitrob.control`.

Value

Object of class "etregrob".

- **coefficients**: a named vector of coefficients
- **stage1**: object of class glmrob that contains robust probit fit
- **stage2**: object of class rlrob that contains second stage robust fit. Note that the standard errors in this object are biased, since they are not corrected for the uncertainty in the first estimation step. Use `vcov` below
etregrob

vcov variance matrix of the second stage
sigma the standard error of the error term of the outcome equation
CIMR inverse Mills ratio for the complete sample
call the matched call
method method of estimation, currently only "robust two-stage" is implemented
converged logical. Did all the estimators converge?
iterations list containing the numbers of iterations

Note
The treatment variable is automatically included in the formula for the second estimation step, i.e. one should not add the dependent variable from the selection equation in the formula of the outcome equation.

Author(s)
Mikhail Zhelonkin

References


See Also
glmrob, rlm, ssmrob, heckitrob.control

Examples
library(mvtnorm)
set.seed(2)
N <- 3000
beta1 <- c(1.0, 1.0, 0.75)
beta2 <- c(1.5, 1.0, 0.5)
alpha <- 1.25
x1 <- rmvnorm(N, mean = c(0, -1, 1), sigma = diag(c(1, 0.5, 1)))
x2 <- x1
x2[, 3] <- rnorm(N, 1, 1)
eps <- rmvnorm(N, mean = rep(0, 2), sigma = matrix(c(1, -0.7, -0.7, 1), 2, 2))
x1beta1 <- x1[, 1]*beta1[1] + x1[, 2]*beta1[2] + x1[, 3]*beta1[3]
y1 <- ifelse(x1beta1 + eps[, 1] > 0, 1, 0)
y2 <- x2beta2 + alpha*y1 + eps[, 2]
etm.ctrl1 <- heckitrob.control(weights.x1 = "hat", weights.x2 = "covMcd")
etmsim.fit <- etregrob(y1 ~ x1, y2 ~ x2, control = etm.ctrl1)
summary(etmsim.fit)
fitted.etregrob  
*Fitted values of endogenous treatment model*

**Description**
Calculate the fitted values of the endogenous treatment model using robust fit.

**Usage**
```r
## S3 method for class 'etregrob'
fitted(object, ...)
```

**Arguments**
- `object` object of class "etregrob"
- `...` currently not used

**Value**
vector of fitted values

**Author(s)**
Mikhail Zhelonkin

---

fitted.heckit5rob  
*Fitted values of robust sample selection model*

**Description**
Calculate the fitted values of the sample selection model using robust fit.

**Usage**
```r
## S3 method for class 'heckit5rob'
fitted(object, ...)
```

**Arguments**
- `object` object of class "heckitrob" or object of class "heckit5rob"
- `...` currently not used
**fitted.heckitrob**

**Details**

In case of truncated selection model one vector of fitted values is returned. In case of switching regression model a list, that contains two vectors corresponding to two regimes, is returned.

**Value**

vector of fitted values or a list that contains two vectors of fitted values

**Author(s)**

Mikhail Zhelonkin, Marc G. Genton, Elvezio Ronchetti

---

**fitted.heckitrob**

*Fitted values of robust sample selection model*

**Description**

Calculate the fitted values of the sample selection model using robust fit.

**Usage**

```r
## S3 method for class 'heckitrob'
fitted(object, ...)
```

**Arguments**

- `object` object of class "heckitrob" or object of class "heckit5rob"
- `...` currently not used

**Details**

In case of truncated selection model one vector of fitted values is returned. In case of switching regression model a list, that contains two vectors corresponding to two regimes, is returned.

**Value**

vector of fitted values or a list that contains two vectors of fitted values

**Author(s)**

Mikhail Zhelonkin, Marc G. Genton, Elvezio Ronchetti
Description

Computation of the asymptotic variance matrix of the robust Heckman’s two-stage estimator for truncated selection model.

Usage

heck2steprobVcov(y1vec, y2vec, x1Matr, x2Matr, eststage1, eststage2, eststage2sigma, weights = rep(1,nrow(y1vec)), t.c = 1.345)

Arguments

- **y1vec**: vector of endogenous variables of the selection stage
- **y2vec**: vector of endogenous variables of the outcome stage
- **x1Matr**: matrix of exogenous variables of the selection stage
- **x2Matr**: matrix of exogenous variables of the outcome stage
- **eststage1**: object of class "glmrob", corresponding to the robust probit fit
- **eststage2**: vector of the coefficients of the outcome stage
- **eststage2sigma**: the robust scale estimate of the second stage regression
- **weights**: vector of robustness weights
- **t.c**: tuning constant of the second stage

Details

The computation is made using the Huber (1967) - White (1980) sandwich estimator with Heckman (1979) correction. In the computation of leverage weights the lambda’s are assumed to be fixed.

Value

Variance covariance matrix of the second stage estimator

Author(s)

Mikhail Zhelonkin, Marc G. Genton, Elvezio Ronchetti

References


heck5twosteprobVcov

See Also

glmrob

heck5twosteprobVcov  Variance Covariance Matrix

Description

Computation of the asymptotic variance matrix of the robust Heckman's two-stage estimator for the second regime of switching regression model, i.e. when \( y_1 = 0 \).

Usage

heck5twosteprobVcov(y1vec, y2vec, x1Matr, x2Matr, eststage1, eststage2, eststage2sigma, weights = rep(1,nrow(y1vec)), t.c = 1.345)

Arguments

- **y1vec**: vector of endogenous variables of the selection stage
- **y2vec**: vector of endogenous variables of the outcome stage
- **x1Matr**: matrix of exogenous variables of the selection stage
- **x2Matr**: matrix of exogenous variables of the outcome stage
- **eststage1**: object of class "glmrob", corresponding to the robust probit fit
- **eststage2**: vector of the coefficients of the outcome stage
- **eststage2sigma**: the robust scale estimate of the second stage regression
- **weights**: vector of robustness weights
- **t.c**: tuning constant of the second stage

Details

The computation is made using the Huber (1967) - White (1980) sandwich estimator with Heckman (1979) correction. In the computation of leverage weights the \( \lambda \)'s are assumed to be fixed.

Value

Variance covariance matrix of the second stage estimator

Author(s)

Mikhail Zhelonkin, Marc G. Genton, Elvezio Ronchetti
hectic5rob

References


---

**hectic5rob**

*Robust Heckit Fit: Switching Regressions*

**Description**

Fits the switching regression model with probit selection using a robust two-stage estimator

**Usage**

```r
hectic5rob(selection, outcome1, outcome2, data, control = hectic5rob.control())
```

**Arguments**

- `selection`: formula, the selection equation
- `outcome1`: formula, first outcome equation
- `outcome2`: formula, second outcome equation
- `data`: an optional data frame containing the variables in the model. If not found in data, the variables are taken from `environment(formula)`, typically the environment from which *hectic5rob* is called.
- `control`: a list of parameters for controlling the fitting process

**Details**

Compute robust two-stage estimates of the switching regression model with probit selection. The robust probit is fitted in the first stage. In the second stage the Mallows type M-estimators are used. The values of the tuning constants and the robustness weights can be modified in `hectic5rob.control`.

**Value**

Object of class "hectic5rob".

- `coefficients`: a named vector of coefficients
- `stage1`: object of class `glmrob` that contains (first stage) robust probit fit
heckit5rob

stage1 object of class rlm that contains second stage first regime robust fit. Note that the standard errors in this object are biased, since they are not corrected for the uncertainty in the first estimation step. Use vcov1 below

stage2 object of class rlm that contains second stage second regime robust fit. Note that the standard errors in this object are biased, since they are not corrected for the uncertainty in the first estimation step. Use vcov2 below

vcov1 variance matrix of the second stage first regime
vcov2 variance matrix of the second stage second regime
sigma1 the standard error of the error term of the outcome equation when y_1=1
sigma2 the standard error of the error term of the outcome equation when y_1=0
IMR1 inverse Mills ratio for the case when y_1=1
IMR2 inverse Mills ratio for the case when y_1=0
call the matched call
method method of estimation, currently only "robust two-stage" is implemented
converged logical. Did all the estimators converge?
iterations list containing the numbers of iterations

Author(s)
Mikhail Zhelonkin, Marc G. Genton, Elvezio Ronchetti

References

See Also
glmrob, rlm, ssmrob, heckitrob, heckitrob.control

Examples
## Not run:
library(mvtnorm)
set.seed(2)
N <- 5000
beta1 <- c(0, 1.0, 1.0, 0.75)
beta21 <- c(0, 1.5, 1.0, 0.5)
beta22 <- c(1, -1.5, 1.0, 0.5)
covm <- diag(3)
covm[lower.tri(covm)] <- c(0.75, 0.5, 0.25)
covm[upper.tri(covm)] <- covm[lower.tri(covm)]
heckitrob <- rmvnorm(N, rep(0, 3), covm)
x1 <- rmvnorm(N, mean=c(0, -1, 1), sigma=diag(c(1, 0.5, 1)))
x21 <- x1
x22 <- x1
x21[, 3] <- rnorm(N, 1, 1)
x22[, 3] <- rnorm(N, 1, 1)
y1 <- ifelse(x1beta1 + eps[, 1] > 0, 1, 0)
y2 <- ifelse(y1 > 0.5, x21beta21 + eps[, 2],
x22beta22 + eps[, 3])
srsim.fit <- ssmrob(y1 ~ x1, list(y2 ~ x21, y2 ~ x22),
control = heckitrob.control(weights.x1 = "hat", weights.x2 = "covMcd"))
summary(srsim.fit)

## End(Not run)

### heckitrob

#### Robust Heckit Fit

**Description**

 Fits the sample selection model using a robust two-stage estimator

**Usage**

    heckitrob(selection, outcome, data, control = heckitrob.control())

**Arguments**

- `selection` : formula, the selection equation
- `outcome` : formula, the outcome equation
- `data` : an optional data frame containing the variables in the model. If not found in data, the variables are taken from `environment(formula)`, typically the environment from which heckitrob is called.
- `control` : a list of parameters for controlling the fitting process

**Details**

 Compute robust two-stage estimates of the Heckman’s selection model. The robust probit is fitted in the first stage. In the second stage the Mallows type M-estimator is used. The values of the tuning constants and the robustness weights can be modified in `heckitrob.control`.  
Value

Object of class "heckitrob".

coefficients a named vector of coefficients

stage1 object of class glmrob that contains robust probit fit

stage2 object of class rlm that contains second stage robust fit. Note that the standard errors in this object are biased, since they are not corrected for the uncertainty in the first estimation step. Use vcov below

vcov variance matrix of the second stage

sigma the standard error of the error term of the outcome equation

IMR1 inverse Mills ratio for the case when y_1=1

call the matched call

method method of estimation, currently only "robust two-stage" is implemented

converged logical. Did all the estimators converge?

iterations list containing the numbers of iterations

Author(s)

Mikhail Zhelonkin, Marc G. Genton, Elvezio Ronchetti

References


See Also

glmrob, rlm, ssmrob, heckitrob.control, heckit5rob, etregrob

Examples

```r
# Zhelonkin, Genton, Ronchetti (2016): page 823
data(MEPS2001)
selectEq <- darnbexp ~ age + female + educ + blhisp + totchr + ins
outcomeEq <- lnambx ~ age + female + educ + blhisp + totchr + ins
meps.fit <- ssmrob(selectEq, outcomeEq, data = MEPS2001, control = heckitrob.control(tcc = 3.2))
summary(meps.fit)
```
heckitrob.control  

Auxiliary for Controlling Robust Fitting

Description

Auxiliary function used for fitting the sample selection models. Contains control sequences, tuning constants and robustness weight functions.

Usage

heckitrob.control(acc = 1e-04, test.acc = "coef", maxit = 50, maxit0 = 50,
weights.x1 = c("none", "hat", "robCov", "covMcd"),
weights.x2 = c("none", "hat", "robCov", "covMcd"),
tcc = 1.345, t.c = 1.345)

Arguments

acc  positive convergence level

weights.x1  vector of robustness weights controlling for the leverage effect in the selection equation

weights.x2  vector of robustness weights controlling for the leverage effect in the outcome equation

tcc  tuning constant c for Huber's psi-function for the selection stage

t.c  tuning constant c for Huber's psi-function for the outcome stage

Value

A list with the arguments as components.

Author(s)

Mikhail Zhelonkin, Marc G. Genton, Elvezio Ronchetti
**Description**

The dataset is an extract from the Medical Expenditures Panel Survey. Sample of 3328 observations, with 526 zero expenditures. It was used for illustrative examples by Cameron and Trivedi (2009, Chapter 16).

**Usage**

```r
data(MEPS2001)
```

**Format**

A data frame with 3328 observations on the following 12 variables.

- **educ** Educational attainment, in years.
- **age** Age.
- **income** Income.
- **female** Logical, TRUE if female.
- **totchr** Number of chronic diseases.
- **age2** Age squared
- **ambexp** Ambulatory expenditures.
- **lambexp** Log ambulatory expenditures.
- **blhisp** Ethnicity. Logical, TRUE if black or hispanic.
- **dambexp** Logical, TRUE if the ambulatory expenditures are greater than zero.
- **lnambx** Log ambulatory expenditures, with zeros replacing NA's.
- **ins** Insurance status. Logical, TRUE if insured.

**Source**

2001 Medical Expenditure Panel Survey by the Agency for Healthcare Research and Quality.

**References**


**Examples**

```r
data(MEPS2001)
summary(MEPS2001)
```
**MmatrM**  

*M Matrix*

**Description**

M matrix of a linear regression M-estimator of Mallows type.

**Usage**

`MmatrM(x, y, beta, sigma, t.c = 1.345, weights = 1)`

**Arguments**

- **x**: matrix of explanatory variables
- **y**: vector of dependent variables
- **beta**: vector of parameters
- **sigma**: robust scale estimate
- **t.c**: tuning constant c for Huber’s psi-function
- **weights**: vector of robustness weights controlling for the leverage effects

**Details**

Computes the M matrix of the M-estimator of Mallows type. In current implementation only the Huber score function is available.

**Value**

M matrix for the sandwich formula.

**Author(s)**

Mikhail Zhelonkin, Marc G. Genton, Elvezio Ronchetti

---

**model.matrix.etregrob**  

*Design Matrix of Endogenous Treatment Model*

**Description**

Create design matrix of endogenous treatment model

**Usage**

```r
## S3 method for class 'etregrob'
model.matrix(object, part = "outcome", ...)
```
model.matrix.heckit5rob

Arguments

object object of class etregrob
part character string indicating which matrix to extract: "outcome" for the outcome equation, "selection" for the selection equation.
... currently not used

Value

If argument part is "outcome", the design matrix of the outcome equation is returned.
If argument part is "selection", the design matrix of the selection equation is returned.

Author(s)

Mikhail Zhelonkin

model.matrix.heckit5rob

Description

Create design matrix of switching regression model

Usage

## S3 method for class 'heckit5rob'
model.matrix(object, part = "outcome", ...)

Arguments

object object of class heckit5rob
part character string indicating which matrix to extract: "outcome" for the outcome equations, "selection" for the selection equation.
... currently not used

Value

If argument part is "outcome", the list containing design matrices of the outcome equations is returned.

If argument part is "selection", the design matrix of the selection equation is returned.

Author(s)

Mikhail Zhelonkin
model.matrix.heckitrob

*Design Matrix of Sample Selection Model*

**Description**

Create design matrix of sample selection model

**Usage**

```r
## S3 method for class 'heckitrob'
model.matrix(object, part = "outcome", ...)
```

**Arguments**

- `object`: object of class `heckitrob`
- `part`: character string indicating which matrix to extract: "outcome" for the outcome equation, "selection" for the selection equation.
- `...`: currently not used

**Value**

If argument `part` is "outcome", the design matrix of the outcome equation is returned.

If argument `part` is "selection", the design matrix of the selection equation is returned.

**Author(s)**

Mikhail Zhelonkin

---

**MROZ.RAW**

*Wage Offer Data*

**Description**

Sample of 753 observations, with 325 truncated observations.

**Usage**

data(MROZ.RAW)
Format

A data frame with 753 observations on the following 22 variables.

*inlf* Logical, TRUE if in labor force.
*hours* Hours worked by wife in 1975.
*kidslt6* Number of young children, 5 year or younger.
*kidsge6* Number of children greater than 6 years of age.
*age* Wife’s age.
*educ* Education level in years.
*wage* Average hourly earnings in 1975.
*repwage* Wife’s wage reported at the time of the 1976 interview.
*hushrs* Husband’s hours worked in 1975.
*husage* Husband’s age.
*huseduc* Husband’s education in years.
*huswage* Husband’s wage in 1975.
*faminc* Family income in 1975.
*mtr* Marginal tax rate facing the wife.
*motheduc* Wife’s mother’s education in years.
*fatheduc* Wife’s father’s education in years.
*unem* Unemployment rate in county of residence.
*city* Logical, TRUE if live in large city.
*exper* Wife’s labor market experience in years.
*nwifeinc* Non-wife income, household’s total money minus wife’s labor income.
*lwage* Wife’s log-wage.
*expersq* Wife’s squared experience.

References


Examples

data(MROZ.RAW)
summary(MROZ.RAW)
nobs.heckitrob  Number of Observations

### Description

Number of observations

### Usage

```r
## S3 method for class 'heckitrob'
nobs(object, ...)
```

### Arguments

- `object`  object of class `heckitrob`, or `heckit5rob` or `etregrob`
- `...` currently not used

### Author(s)

Mikhail Zhelonkin

---

print.etregrob  Print a etregrob Object

### Description

Print an object generated by `etregrob`

### Usage

```r
## S3 method for class 'etregrob'
print(x, digits = 4, ...)
```

### Arguments

- `x`  object of `etregrob` class
- `digits` number of significant digits to be printed
- `...` currently not used

### Author(s)

Mikhail Zhelonkin

### See Also

- `etregrob`
Description
Print an object generated by \texttt{ssmrob}

Usage
## S3 method for class 'heckit5rob'
print(x, digits = 4, ...)

Arguments
\begin{itemize}
  \item \texttt{x} \hspace{1cm} \text{object returned from the \texttt{heckit5rob} representing the fit of the model}
  \item \texttt{digits} \hspace{1cm} \text{number of significant digits to be printed}
  \item \texttt{...} \hspace{1cm} \text{currently not used}
\end{itemize}

Author(s)
Mikhail Zhelonkin, Marc G. Genton, Elvezio Ronchetti

See Also
\texttt{ssmrob}

Description
Print an object generated by \texttt{ssmrob}

Usage
## S3 method for class 'heckitrob'
print(x, digits = 4, ...)

Arguments
\begin{itemize}
  \item \texttt{x} \hspace{1cm} \text{object returned from the \texttt{heckitrob} representing the fit of the model}
  \item \texttt{digits} \hspace{1cm} \text{number of significant digits to be printed}
  \item \texttt{...} \hspace{1cm} \text{currently not used}
\end{itemize}
Author(s)
Mikhail Zhelonkin, Marc G. Genton, Elvezio Ronchetti

See Also
ssmrob

print.summary.etregrob

Print Function for summary.etregrob

Description
Print a summary.etregrob object

Usage
## S3 method for class 'summary.etregrob'
print(x, digits = 4, ...)

Arguments
x Object of class summary.etregrob returned by a summary function
digits number of nonzero digits after comma
... currently not used

Author(s)
Mikhail Zhelonkin

print.summary.heckit5rob

Print Function for summary.heckit5rob

Description
Print a summary.heckit5rob object

Usage
## S3 method for class 'summary.heckit5rob'
print(x, digits = 4, ...)

Arguments
x Object of class summary.heckit5rob returned by a summary function
digits number of nonzero digits after comma
... currently not used
print.summary.heckitrob

Arguments

x Object of class summary.heckitrob returned by a summary function
digits number of nonzero digits after comma
... currently not used

Author(s)

Mikhail Zhelonkin, Marc G. Genton, Elvezio Ronchetti

PsiMest

Score Function of the Mallows M-Estimator

Description

Score function of the Mallows-type M-estimator.

Usage

PsiMest(x, y, beta, sigma, t.c, weight)
Arguments

- **x**: vector of exogenous variables
- **y**: scalar endogenous variable
- **beta**: parameter vector
- **sigma**: std.error
- **t.c**: tuning constant of Huber Psi-function
- **weight**: scalar weight on the exogenous variables

Details

Can be used to compute the influence function of the estimator. Also can be used to approximate the bias of the estimator.

Value

- score of the Psi-function

Author(s)

Mikhail Zhelonkin, Marc G. Genton, Elvezio Ronchetti

References


---

residuals.etregrob Residuals of Robust Endogenous Treatment Model Fit

Description

Calculate the residuals of the endogenous treatment model using robust fit.

Usage

```r
## S3 method for class 'etregrob'
residuals(object, ...)
```

Arguments

- **object**: object of class "etregrob"
- **...**: currently not used

Value

- numeric vector of residuals.
Author(s)
Mikhail Zhelonkin

See Also
etregrob

Description
Calculate the residuals of the sample selection model using robust fit.

Usage
## S3 method for class 'heckit5rob'
residuals(object, ...)

Arguments
object object of class "heckitrob" or object of class "heckit5rob"
... currently not used

Details
In case of truncated selection model one vector of residuals is returned. In case of switching regression model a list containing two vectors corresponding to two regimes is returned.

Value
The numeric vector(s) of the residuals.

Author(s)
Mikhail Zhelonkin, Marc G. Genton, Elvezio Ronchetti

See Also
heckitrob; heckit5rob
Description

Calculate the residuals of the sample selection model using robust fit.

Usage

## S3 method for class 'heckitrob'
residuals(object, ...)

Arguments

object object of class "heckitrob" or object of class "heckit5rob"
...
currently not used

Details

In case of truncated selection model one vector of residuals is returned. In case of switching regression model a list containing two vectors corresponding to two regimes is returned.

Value

vector(s) of residuals.

Author(s)

Mikhail Zhelonkin, Marc G. Genton, Elvezio Ronchetti

See Also

heckitrob; heckit5rob

---

ssmrob Robust Sample Selection Model

Description

Compute robust two-stage estimates of truncated selection model (Tobit-2) and switching regression model (Tobit-5).

Usage

ssmrob(selection, outcome, data, control = heckitrob.control())
Arguments

- **selection**
  - formula, the selection equation

- **outcome**
  - formula(s), the outcome equation(s)

- **data**
  - an optional data frame containing the variables in the model. If not found in data, the variables are taken from `environment(formula)`, typically the environment from which `ssmrob` is called.

- **control**
  - a list of parameters for controlling the fitting process

Details

Outcome equation may be a simple formula for the case of Heckman selection model, or a list of two formulas for the case of switching regressions.

Value

Object of class "heckitrob" or object of class "heckit5rob".

Author(s)

Mikhail Zhelonkin, Marc G. Genton, Elvezio Ronchetti

References


See Also

- `heckitrob`
- `heckit5rob`

Examples

```r
# sample selection model (Tobit-2)
# Zhelonkin, Genton, Ronchetti (2016): page 823
data(MEPS2001)
selectEq <- dambexp ~ age + female + educ + blhisp + totchr + ins
outcomeEq <- lnambx ~ age + female + educ + blhisp + totchr + ins
meps.fit <- ssmrob(selectEq, outcomeEq, data = MEPS2001, control = heckitrob.control(tcc = 3.2))
summary(meps.fit)

# switching regressions example (Tobit-5)
## Not run:
library(mvtnorm)
```
set.seed(2)
N <- 5000
beta1 <- c(0, 1.0, 1.0, 0.75)
beta21 <- c(0, 1.5, 1.0, 0.5)
beta22 <- c(1, -1.5, 1.0, 0.5)
covm <- diag(3)
covm[lower.tri(covm)] <- c(0.75, 0.5, 0.25)
covm[upper.tri(covm)] <- covm[lower.tri(covm)]
eps <- rmvnorm(N, rep(0, 3), covm)
x1 <- rmvnorm(N, mean=c(0, -1, 1), sigma=diag(c(1, 0.5, 1)))
x21 <- x1
x22 <- x1
x21[, 3] <- rnorm(N, 1, 1)
x22[, 3] <- rnorm(N, 1, 1)
y1 <- ifelse(x1beta1 + eps[, 1] > 0, 1, 0)
y2 <- ifelse(y1 > 0.5, x21beta21 + eps[, 2],
x22beta22 + eps[, 3])
srsim.fit <- ssmrob(y1 ~ x1, list(y2 ~ x21, y2 ~ x22),
control = heckitrob.control(weights.x1 = "hat", weights.x2 = "covMcd"))
summary(srsim.fit)

## End(Not run)

### summary.etregrob

#### Summarizing Robust Fits of Endogenous Treatment Models

**Description**

Summarizes robust fit of endogenous treatment models.

**Usage**

```r
## S3 method for class 'etregrob'
summary(object, ...)  
```

**Arguments**

- `object`  
  object of class "etregrob"

- `...`  
  currently not used

**Value**

object of class "summary.etregrob"

**Author(s)**

Mikhail Zhelonkin
See Also

etregrob

Description

Summarize robust fit of Heckman selection model.

Usage

## S3 method for class 'heckitrob'
summary(object, ...)

Arguments

object object of class "heckitrob" or "heckit5rob"

... currently not used

Value

object of class "summary.heckitrob" or object of class "summary.heckit5rob"

Author(s)

Mikhail Zhelonkin, Marc G. Genton, Elvezio Ronchetti

See Also

heckitrob; heckit5rob; heck2steprobVcov; heck5twosteprobVcov
Arguments

object : object of class "heckitrob" or "heckit5rob"

... : currently not used

Value

object of class "summary.heckitrob" or object of class "summary.heckit5rob"

Author(s)

Mikhail Zhelonkin, Marc G. Genton, Elvezio Ronchetti

See Also

heckitrob; heckit5rob; heck2steprobVcov; heck5twosteprobVcov

---

v cov . etregrob

Extract Asymptotic Variance Covariance Matrix

Description

Extracts the variance covariance matrix of the robust endogenous treatment model fit

Usage

## S3 method for class 'etregrob'
v cov(object, ...)

Arguments

object : object of class "etregrob"

... : currently not used

Value

Variance covariance matrix of the second stage. Variance covariance matrix of the selection stage can be extracted using the v cov function for the probit estimator, e.g. v cov(etregrob. object$stage1).

Author(s)

Mikhail Zhelonkin

See Also

etreg2steprobVcov
vcov.heckit5rob

Extract Asymptotic Variance Covariance Matrix

Description
Extract the variance covariance matrix of the robust sample selection model fit

Usage
## S3 method for class 'heckit5rob'
vcov(object, ...)

Arguments
object [object of class "heckitrob" or object of class "heckit5rob"]
... [currently not used]

Value
Variance covariance matrix of the second stage. Variance covariance matrix of the selection stage
can be extracted using the vcov function for the probit estimator, e.g. vcov(heckitrob.object$stage1).

Author(s)
Mikhail Zhelonkin, Marc G. Genton, Elvezio Ronchetti

See Also
heck2steprobVcov
Value

Variance covariance matrix of the second stage. Variance covariance matrix of the selection stage can be extracted using the vcov function for the probit estimator, e.g. vcov(heckitrob.object$stage1).

Author(s)

Mikhail Zhelonkin, Marc G. Genton, Elvezio Ronchetti

See Also

heck2steprobVcov

descrip

Description

Auxiliary function. Computation of the leverage weights based on robust Mahalanobis distance. For computation of location and scatter the MCD method is used.

Usage

x2weight.covMcd(xMat)

Arguments

xMat matrix of explanatory variables

Value

vector of weights

Author(s)

Mikhail Zhelonkin, Marc G. Genton, Elvezio Ronchetti

See Also

cov.rob
x2weight.robCov

Robustness Weights

Description

Auxiliary function. Computation of the leverage weights based on robust Mahalanobis distance. For computation of location and scatter the MVE method is used.

Usage

x2weight.robCov(xMat)

Arguments

xMat : matrix of explanatory variables

Value

vector of weights

Author(s)

Mikhail Zhelonkin, Marc G. Genton, Elvezio Ronchetti

See Also

cov.rob
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