Package ‘hett’

October 13, 2022

Version 0.3-3
Date 2020-10-09
Title Heteroscedastic t-Regression
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Depends R (>= 2.0.0), MASS, lattice
Description Functions for the fitting and summarizing of heteroscedastic t-regression.
License GPL (>= 2)
NeedsCompilation no
Repository CRAN
Date/Publication 2020-10-13 10:50:02 UTC

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mm

Excess returns for Martin Marietta company

Description

Data from the Martin Marietta company collected over a period of 5 years on a monthly basis
Usage
data(mm)

Format
A data frame with 60 observations on the following 4 variables.

date the month the data was collected
am.can a numeric vector
m.marietta excess returns from the Martin Marietta company
CRSP an index for the excess rate returns for the New York stock exchange

Source

Examples

data(mm, package = "hett")
attach(mm)
plot(CRSP, m.marietta)
lines(CRSP, fitted(lm(m.marietta ~ CRSP)), lty = 2)

rent Rent for Land PLanted to Alfalfa

Description
Dataset collected in 1977 from Minnesota to study the variation in land rented for growing alfalfa

Usage
data(rent)

Format
A data frame with 67 observations on the following 5 variables.

Rent a numeric vector average rent per acre.
AllRent a numeric vector describing average rent paid for all tillable land.
Cows a numeric vector describing the density of dairy cows (number per square mile).
Pasture a numeric vector describing the proportion of farmland used as pasture.
Liming a factor with levels No if no liming is required to grow alfalfa and Yes if it does.
summary.tlm

Source


Examples

library(lattice)
data(rent, package = "hett")
attach(rent)
xyplot(log(Rent/AllRent) ~ sqrt(Cows), groups = Liming, panel = panel.superpose)

summary.tlm

summary method for class "tlm"

Description

Summarizes the heteroscedastic t regression object

Usage

## S3 method for class 'tlm'
summary(object, correlation = FALSE, ...)
## S3 method for class 'summary.tlm'
print(x, ...)

Arguments

object heteroscedastic t regression object called from tlm()
x an object of class "summary.tlm" containing the values below
correlation should the calculation of the parameter correlation matrix be supressed. If the fit includes a location and a scale formula then both correlation matrices are printed. The default is FALSE.
...
arguments passed to or from other methods

Details

The table summary produced by this function should be used with caution. A more appropriate test between nested models is to use the score statistic function tscore.

Value

a list containing the following components:

loc.summary an object containing a list of objects that summarize the location model
scale.summary an object containing a list of objects that summarize the scale model
tlm

Maximum likelihood estimation for heteroscedastic t regression

Description

Fits a heteroscedastic t regression to given data for known and unknown degrees of freedom.

Usage

tlm(lform, sform = ~ 1, data = NULL, subset = NULL, contrasts =
   NULL, na.action = na.fail, start = NULL, control = tlm.control(...),
   obs = FALSE, estDof = FALSE, ... )

## S3 method for class 'tlm'
print(x, ...)

Author(s)

Julian Taylor

See Also

tsum, tlm

Examples

data(mm, package = "hett")
attach(mm)
## fit a model with heteroscedasticity and estimating the degrees of freedom

tfit2 <- tlm(m.marietta ~ CRSP, ~ CRSP, data = mm, start = list(dof =
   3), estDof = TRUE)
summary(tfit2)
**Arguments**

- **x**: an object of class "tlm"
- **1form**: a formula of the type `response ~ terms`, where `terms` can be of the form, for example, `first + second` or `first*second`(see `lm` for details)
- **sform**: a formula of the type `~ terms`, where `terms` can be of the form, for example, `first + second` or `first*second`(see `lm` for details).
- **data**: the data in the form of a `data.frame` where the column names can be matched to the variable names supplied in 1form and sform
- **subset**: numerical vector to subset the data argument
- **contrasts**: set of contrasts for the location model (see `contrasts.arg` for details)
- **na.action**: the action to proceed with in the event of NA’s in the response. Currently NA’s are not allowed and therefore na.fail is the sole argument.
- **start**: is a list of possibly four named components, ("beta", "lambda", "dof", "omega"), for the location, scale, degrees of freedom parameters and random scale effects respectively. Each component must be of the appropriate length.
- **control**: is an argument to a function that maintains the control of the algorithm. The `tlm.control()` function contains the arguments, epsilon to determine how small the relative difference of likelihoods should be for convergence (default is 1e-07), maxit to determine the maximum iterations required (default = 50), trace if the user requires printing of estimates etc. as algorithm runs (default = FALSE), verboseLev to determine the amount of verbose printing to the screen as the algorithm runs (verboseLev = 1 displays location scale and dof estimates and the likelihood, verboseLev = 2 displays all of 1 plus the random scale effects)
- **obs**: should the location parameters be calculated using the observed or expected information(default = FALSE). (Note: using the observed information does not calculate the appropriate standard errors, see DETAILS)
- **estDof**: should the degrees of freedom parameter be estimated or not. If FALSE then the value given for dof in the start argument will be the fixed value used for the algorithm. If TRUE then the value given for dof in the start argument supplies an initial value only.
- ***...***: arguments passed to tlm.control() or to the print method

**Details**

When the degrees of freedom is unknown the code uses the non-linear optimiser `nlm`. If the response (and therefore the errors) is tending toward a Gaussian this optimisation will still converge but with very high degrees of freedom.

To obtain the appropriate standard errors from summary the user must specify the argument `obs = F` to ensure that the location parameter is calculated using the expected information.

**Value**

a list containing the following components:
loc.fit an object containing the estimated location parameters and other elements associated with the location parameter model
scale.fit an object containing the estimated scale parameters and other elements associated with the scale parameter model
random the random scale effects
dof fixed or estimated degrees of freedom
dofse the standard error associated with the degrees of freedom
iter the number of iterations of the algorithm
logLik the maximised log-likelihood
dftime the time taken for the algorithm to converge

Background

The theoretical background for this function can be found in Taylor and Verbyla (2004).

Author(s)

Julian Taylor

References


See Also

summary.tlm

Examples

data(mm, package = "hett")
attach(mm)

## fit a model with no heteroscedasticity and fixed degrees of freedom
tfit <- tlm(m.marietta ~ CRSP, data = mm, start = list(dof = 3))

## fit a model with heteroscedasticity and fixed degrees of freedom
tfit1 <- tlm(m.marietta ~ CRSP, ~ CRSP, data = mm, start = list(dof = 3))

## fit a model with heteroscedasticity and estimating the degrees of freedom
tfit2 <- tlm(m.marietta ~ CRSP, ~ CRSP, data = mm, start = list(dof = 3), estDof = TRUE)
tlm.control

Auxiliary for Controlling tlm Fitting

Description

Auxiliary function for fitting tlm model. Generally only used when calling tlm

Usage

tlm.control(epsilon = 1e-07, maxit = 50, trace = FALSE, verboseLev = 1)

Arguments

- **epsilon** positive convergence tolerance value. The iterations converge when [newlik - oldlik] < epsilon/2
- **maxit** integer giving the maximum iterations allowable for the routine
- **trace** logical. If TRUE output is printed to the screen during each iteration
- **verboseLev** integer. If 1 then print according to trace. If 2 then print random scale effects also.

Value

A list with the argument as values

Author(s)

Julian Taylor

See Also

tlm

Examples

data(mm, package = "hett")
attach(mm)

## change the maximum amount of iterations for the algorithm

fit1 <- tlm(m.marietta ~ CRSP, ~ 1, data = mm, start = list(dof = 3),
estDoF = TRUE, control = tlm.control(maxit = 100))
**tscore**  
*Score test for heteroscedastic t models*

**Description**

Provides a score test for the location and scale parameters of the heteroscedastic t regression model.

**Usage**

```r
 tscore(..., data = NULL, scale = FALSE)
```

**Arguments**

- `...`: Any number of arguments containing nested model fits from `t1m()` (see Details)
- `data`: the data used to fit the models involved
- `scale`: logical. If TRUE the scale model is tested

**Details**

The user must supply nested models that test, either, the scale or the location component of the model. The model objects must be nested from left to right. Currently there are no traps if the arguments are not given in this order.

The models must also have either, all fixed degrees of freedom or estimated degrees of freedom.

**Value**

Output containing the hypothesis, the score statistic, degrees of freedom for the test and the p-value are printed to the screen.

**Author(s)**

Julian Taylor

**References**


**See Also**

`t1m`
Examples

data(mm, package = "hett")
attach(mm)
tfit1 <- tlm(m.marietta ~ CRSP, ~ 1, data = mm, start = list(dof = 3),
estDof = TRUE)
tfit2 <- tlm(m.marietta ~ CRSP, ~ CRSP, data = mm, start = list(dof = 3), estDof = TRUE)
tscore(tfit1, tfit2, data = mm, scale = TRUE)

tsum

Summary function for the scale or location component of a heteroscedastic t model

Description

Summarizes the location or scale components of a heteroscedastic t model

Usage

tsum(object, dispersion = NULL, correlation = FALSE,
symbolic.cor = FALSE, ...)

## S3 method for class 'tsum'
print(x, digits = max(3, getOption("digits") - 3), symbolic.cor =
x$symbolic.cor, signif.stars = getOption("show.signif.stars"),
scale = TRUE, ...)

Arguments

object

either the location or scale object created by fitting a heteroscedastic t object with tlm

x

an object of class "tsum"
dispersion

1 if summarizing the location model; 2 if summarizing the scale model (see Details)
correlation

logical; if TRUE, the correlation matrix of the estimated parameters is returned and printed.
digits

the number of significant digits to be printed.
symbolic.cor

logical. If TRUE, print the correlations in a symbolic form (see ‘symnum’) rather than as numbers.
signif.stars

logical. if TRUE, "significance stars" are printed for each coefficient.
scale

logical. If TRUE then the dispersion is known in advance (2), and is printed accordingly.
...

further arguments passed to or from other methods.
Details

The argument supplied to dispersion must be either 1 (location model) or 2 (scale model). The reason for this is because the fitting of the model has already scaled the covariance matrix for the location coefficients. Hence the scaled and unscaled versions of covariance matrix for the location model are identical.

This function will not be generally called by the user as it will only summarize the location or scale model but not both. Instead the user should refer to summary.tlm to print a summary of both models.

Value

tsum returns an object of class "tsum", a list with components

call the component from object
df.residual the component from object
coefficients the matrix of coefficients, standard errors, z-values and p-values
dispersion the supplied dispersion argument
df a 2-vector of the rank of the model and the number of residual degrees of freedom
cov.unscaled the unscaled (dispersion = 1) estimated covariance matrix of the estimated coefficients
cov.scaled ditto, scaled by dispersion
correlation (only if correlation is true.) The estimated correlations of the estimated coefficients
symbolic.cor (only if correlation is true.) The value of the argument symbolic.cor

Author(s)

Julian Taylor

See Also

summary.tlm, tlm

Examples

data(mm, package = "hett")
attach(mm)
tfit <- tlm(m.marietta ~ CRSP, ~ CRSP, data = mm, start = list(dof = 3),
estDof = TRUE)
tsum(tfit$loc.fit, dispersion = 1)
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