Package ‘lmmot’

May 10, 2017

Type Package
Title Multiple Ordinal Tobit (MOT) Model
Version 0.1.4
Date 2017-05-10
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Description Fit right censored Multiple Ordinal Tobit (MOT) model.
License GPL-3
Depends maxLik, MASS
RoxygenNote 5.0.1
NeedsCompilation no
Repository CRAN
Date/Publication 2017-05-10 15:37:47 UTC

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**Description**

Fit right censored Multiple Ordinal Tobit (MOT) model.

**Usage**

```r
lmmot(formula, data = sys.frame(sys.parent()), threshold, stdEr = "fisher", 
...)
```

**Arguments**

- `formula`: Object of class formula describing the model.
- `data`: Optional data frame or environment containing the variables in the model.
- `threshold`: Vector of thresholds in the model.
- `stdEr`: Method for standard error estimation. Use "fisher" for estimation using the inverse of the Fisher information matrix or "hessian" for estimation using the Hessian matrix.
- `...`: Further arguments passed to the maximum likelihood estimation function `maxLik`.

**Details**

Fit right censored Multiple Ordinal Tobit (MOT) model. The model is a right censored Tobit model with multiple ordinal categories for latent values above the threshold, the threshold is therefore replaced by a threshold vector.

For the latent variable a linear model with independent and identically distributed non-systematic and homoscedastic errors is assumed.

If the threshold is of length 1, the model is equivalent to the standard right censored Tobit model. The data is fitted with the Maximum Likelihood method.

**Value**

`lmmot` object: `maxLik` object with additional fields:

- `censoring`: Number of observations in the censoring intervals.
- `fisherInfo`: Fisher information matrix.
- `stdEr`: Standard errors for estimated coefficients.
- `tval`: Value for t statistic in Wald test.
- `pval`: p-value in Wald test.
- `fitted.values`: Fitted values of the estimated model.
- `residuals`: Residuals of the estimated model.
motFisher

Author(s)

Marvin N. Wright

See Also

lm maxLik

Examples

# Random data for x
N <- 100
x <- rnorm(N, 25, 10)

# Simulate data for latent variable ystar with simple linear model
beta_0 <- 60
beta_1 <- 1
sigma <- 8
ystar <- beta_0 + beta_1*x + rnorm(N, 0, sigma)

# Simulate censoring for observed variable y
y <- ystar
y[y >= 100] <- 100
y[(y >= 90) & (y < 100)] <- 90
y[(y >= 80) & (y < 90)] <- 80

# MOT regression with observed variable y
mot.fit <- lmmot(y ~ x, threshold = c(80, 90, 100))

# Show details
summary(mot.fit)

# Compare real data with model fit
plot(x, ystar)
abline(coefficients(mot.fit)[1:2])

Description

Fisher information matrix for right censored Multiple Ordinal Tobit (MOT) model.

Usage

motFisher(param, xx, tau)
Arguments

- `param`: parameter vector: `(beta_0, beta_1, ..., beta_m, sigma)`. 
- `xx`: design matrix of the model. 
- `tau`: threshold vector from `tau_1` to `tau_K`.

Value

- Fisher information matrix, summarized over all observations.

Author(s)

Marvin Wright

See Also

- `lmmot`

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**motGradient**

*Gradient of log-Likelihood for mot model*

**Description**

Gradient of log-Likelihood for right censored Multiple Ordinal Tobit (MOT) model.

**Usage**

`motGradient(param, xx, y, tau)`

**Arguments**

- `param`: parameter vector: `(beta_0, beta_1, ..., beta_m, sigma)`. 
- `xx`: design matrix of the model. 
- `y`: observation vector. 
- `tau`: threshold vector from `tau_1` to `tau_K`.

Value

- Gradient of log-likelihood, vector with all observations.

Author(s)

Marvin Wright

See Also

- `lmmot`
motHessian

Hessian matrix of log-Likelihood for mot model

Description
Hessian matrix of log-Likelihood for right censored Multiple Ordinal Tobit (MOT) model.

Usage
motHessian(param, xx, y, tau)

Arguments
- param: parameter vector: (beta_0, beta_1, ..., beta_m, sigma).
- xx: design matrix of the model.
- y: observation vector.
- tau: threshold vector from tau_1 to tau_K.

Value
hessian matrix, summarized over all observations.

Author(s)
Marvin Wright

See Also
lmmot

motLogLik

log-likelihood for mot model

Description
Log-Likelihood for multiple ordinal right censored Multiple Ordinal Tobit (MOT) model.

Usage
motLogLik(param, xx, y, tau)
Arguments

param parameter vector: (beta_0, beta_1, ..., beta_m, sigma).
xx design matrix of the model.
y observation vector.
tau threshold vector from tau_1 to tau_K.

Value
log-likelihood, vector with all observations.

Author(s)
Marvin Wright

See Also
lmmot

Description
Print lmmot object.

Usage

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

Arguments

x lmmot object to print.
digits number of decimal digits to print.
... further arguments passed to or from other methods.

Author(s)
Marvin Wright

See Also
lmmot
summary.lmmot

Summary if lmmot object

**Description**
Print details about lmmot object.

**Usage**
```r
## S3 method for class 'lmmot'
summary(object, digits = max(3,getOption("digits") - 3), ...)
```

**Arguments**
- `object`: lmmot object to print.
- `digits`: number of decimal digits to print.
- `...`: further arguments passed to or from other methods.

**Author(s)**
Marvin Wright

**See Also**
- `lm.lmmot`
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