Package 'sfa'

February 20, 2015

Version 1.0-1

Date 2014-01-05

Title Stochastic Frontier Analysis

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Description Stochastic Frontier Analysis
introduced by Aigner, Lovell and Schmidt (1976)
and Battese and Coelli (1992, 1995).

License GPL-2

NeedsCompilation no

Repository CRAN

Date/Publication 2014-01-06 17:18:52

R topics documented:

sfa-package *Fitting stochastic frontier analysis models*

Description

sfa is used to fit stochastic frontier analysis models.

Details

Package:	sfa
Type:	Package
Version:	0.1-0
Date:	2010-08-09
License:	GPL-2

The package implements stochastic frontier analysis models as introduced by Aigner et al. (1977) and Battese and Coelli (1992, 1995).

Author(s)

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References

Aigner, D. and Lovell, C.A.K. and Schmidt, P. (1977). Formulation and estimation of stochastic frontier production function models. *Journal of Econometrics* **6**, 21–37. Battese, G.E. and Coelli, T.J. (1992). Frontier production functions, technical efficiency and panel data: with application to paddy farmers in India. *Journal of productivity analysis* **3**, 153–169. Battese, G.E. and Coelli, T.J. (1995). A model for technical inefficiency effects in a stochastic frontier production function for panel data. *Empirical economics* **20**, 325–332. Jondrow, J. and Lovell, C.A.K. and Materov, I.S. and Schmidt, P. (1982). On the estimation of technical inefficiency in the stochastic frontier production function model. *Journal of Econometrics* **19**, 233–238.

dgp *Sample data generating process*

Description

Sample data generating process

Usage

```
dgp(n, b, intercept = TRUE, sc = -1)
```

Arguments

`n`	sample size
`b`	parameter vector
`intercept`	logical, TRUE includes intercept
`sc`	form of the frontier model, -1 for cost frontier model, 1 for production frontier model

Value

list

See Also

`sfa`, `rnorm`, `runif`, `abs`

`eff` *generic function*

Description

generic function to create efficiencies

Usage

```
eff(object, ...)
```

Arguments

`object`	a sfa model
`...`	ignored

Value

The form of the value returned by efficiencies depends on the class of its argument. See the documentation of the particular methods for details of what is produced by that method.

See Also

`eff.sfa`

LogLik — *The negative log likelihood function of the SFA*

Description

The negative log likelihood function is used for estimating the parameters. It varies depending on the distribution of the inefficence term u. `L_hNV` is used by halfnormal distribution of u. `L_exp` is used by exponential distribution of u. `L_trunc` is used by truncated normal distribution of u. `L_trunc_mufest` is used by truncated normal distribution of u and constant mu.

Usage

```
L_hNV(p, y = y, X = X, sc = sc)
L_exp(p, y = y, X = X, sc = sc)
L_trunc(p, y = y, X = X, sc = sc)
L_trunc_mufest(p, mu = mu, y = y, X = X, sc = sc)
```

Arguments

`p`	vector with the parameters to estimate
`y`	response
`X`	design matrix of the covariables
`sc`	specifies the form of the frontier model (-1 = cost, 1 = production)
`mu`	if known, the parameter mu

Value

returns the value of the log likelihood function

See Also

`sfa`

methods.sfa — *Methods for displaying information about stochastic frontier analysis models*

Description

`coef.sfa` is used to display the fitted coefficients. `print.sfa` is used to display some information about the fitted SFA. `predict.sfa` is used to predict (new) data with the fitted SFA model. `fitted.sfa` is used to predict the original data with the fitted SFA model. `logLik.sfa` is used to display the value of the log likelihood function. `residuals.sfa` is used to return the residuals of the fitted SFA model. `summary.sfa` is used to calculate the summary result of the SFA. `print.summary.sfa` is used display the summary result of the SFA. `eff.sfa` is used to return the efficiencies of the SFA.

Usage

```
## S3 method for class 'sfa'
coef(object, ...)
## S3 method for class 'sfa'
print(x, ...)
## S3 method for class 'sfa'
predict(object, newdata = NULL, intercept = NULL, ...)
## S3 method for class 'sfa'
fitted(object, ...)
## S3 method for class 'sfa'
logLik(object, ...)
## S3 method for class 'sfa'
residuals(object, ...)
## S3 method for class 'sfa'
summary(object, ...)
## S3 method for class 'sfa'
 print.summary(x, ...)
## S3 method for class 'sfa'
 eff(object, ...)
```

Arguments

x	an object of class sfa
object	an object of class sfa
newdata	a data frame. If `newdata = NULL` then original data will be used.
intercept	boolean or `NULL`. If `intercept = NULL` then the function uses the same intercept options as specified in sfa.
...	ignored.

Examples

```
set.seed(225)
daten <- dgp(n = 100, b = c(1, 2), sc = -1)
test <- sfa(y ~ x, data = daten)
coef(test)
print(test)
predict(test)
fitted(test)
logLik(test)
residuals(test)
summary(test)
eff(test)
```

sfa *Fitting stochastic frontier analysis models*

Description

sfa is used to fit stochastic frontier analysis models.

Usage

```
sfa(formula, data = NULL, intercept = TRUE, fun = "hnormal",
pars = NULL, par_mu = NULL, form = "cost", method = "BFGS", ...)
```

Arguments

formula	an object of class formula (or one that can be coerced to that class): a symbolic description of the model to be fitted.
data	a data frame.
intercept	logical. If true the model includes intercept.
fun	specifies the distribution for the inefficency term u as half-normal ("hnormal"), exponential ("exp"), or truncated-normal ("tnormal").
pars	initial values for the parameters to be estimated.
par_mu	value for mu in the normal-/truncated-normal case. If mu is known.
form	specifies the form of the frontier model as "cost" or "production".
method	the method to be used. See optim for more details.
...	ignored.

Value

sfa returns an object of class sfa:

y	response
x	covariables
X	design matrix
coef	coefficients
sigmau2	sigmau2
sigmav2	sigmav2
mu	mu of the truncated-normal distribution (Only if fun = tnormal)
par_mu	NULL if mu is not estimated
logLik	value of the log likelihood function
maxlik	log likelihood function
fun	distribution of the inefficiency term u
sc	specifies the form of the frontier model (-1 = cost, 1 = production)
hess	a symmetric matrix giving an estimate of the Hessian at the solution found (See optim)
ols	the linear model for the LR-test

Examples

```
set.seed(225)
daten <- dgp(n = 100, b = c(1, 2), sc = -1)
test <- sfa(y ~ x, data = daten)
```

`te.eff.sfa` *technical efficiencies of sfa objects*

Description

returns the technical efficiencies of sfa objects

Usage

```
te.eff.sfa(object, ...)
```

Arguments

`object`	object of class sfa
`...`	ignored

Value

returns the technical efficiencies of each observation

See Also

`eff.sfa`, `te.eff.sfa`

`u.sfa` *Inffiiencies of a sfa-object*

Description

returns the absolute inefficiencies of a sfa-object.

Usage

```
u.sfa(object, ...)
```

Arguments

`object`	an object of class sfa
`...`	ignored

Value

returns the absolute inefficiencies of each observation

See Also

eff.sfa, te.eff.sfa

Index