

# Package ‘PartCensReg’

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**Type** Package

**Title** Estimation and Diagnostics for Partially Linear Censored  
Regression Models Based on Heavy-Tailed Distributions

**Version** 1.39

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**Imports** ssym, optimx, Matrix

**Suggests** SMNCensReg, AER

**Description** It estimates the parameters of a partially linear regression censored model via maximum penalized likelihood through of ECME algorithm. The model belong to the semiparametric class, that including a parametric and nonparametric component. The error term considered belongs to the scale-mixture of normal (SMN) distribution, that includes well-known heavy tails distributions as the Student-t distribution, among others. To examine the performance of the fitted model, case-deletion and local influence techniques are provided to show its robust aspect against outlying and influential observations. This work is based in Ferreira, C. S., & Paula, G. A. (2017) <doi:10.1080/02664763.2016.1267124> but considering the SMN family.

**License** GPL (>= 2)

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PartCensReg-package     *Estimation and Diagnostics for Partially Linear Censored Regression Models Based on Heavy-Tailed Distributions*

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## Description

It estimates the parameters of a partially linear regression censored model via maximum penalized likelihood through of ECME algorithm. The model belong to the semiparametric class, that including a parametric and nonparametric component. The error term considered belongs to the scale-mixture of normal (SMN) distribution, that includes well-known heavy tails distributions as the Student-t distribution, among others. To examine the performance of the fitted model, case-deletion and local influence techniques are provided to show its robust aspect against outlying and influential observations. This work is based in Ferreira, C. S., & Paula, G. A. (2017) <doi:10.1080/02664763.2016.1267124> but considering the SMN family.

## References

- Ferreira, C. S., & Paula, G. A. (2017). Estimation and diagnostic for skew-normal partially linear models. *Journal of Applied Statistics*, 44(16), 3033-3053.
- Ibache-Pulgar, G., Paula, G. A., & Cysneiros, F. J. A. (2013). Semiparametric additive models under symmetric distributions. *Test*, 22(1), 103-121.
- Ibache-Pulgar, G., & Paula, G. A. (2011). Local influence for Student-t partially linear models. *Computational Statistics & Data Analysis*, 55(3), 1462-1478.

## See Also

[CensReg.SMN](#)

## Examples

```
dtawage = get(data(PSID1976,package = "AER"))
y = dtawage$wage
cc = c(rep(0,428),rep(1,325))
tt = dtawage$exper
x = cbind(dtawage$education,dtawage$age, dtawage$hhours, dtawage$hwage, dtawage$tax,
dtawage$youngkids, dtawage$oldkids)

#Normal case by default with only 10 iterations
PCR.default1 = Cens.SMN.PCR(x=x, y=y, c=cc, cens="left",tt =tt,iter.max = 10,Diagnostic = FALSE)

## Not run:
#This may take few minutes
#Normal case by default with full (200) iterations
PCR.default2 = Cens.SMN.PCR(x=x, y=y, c=cc, cens="left",tt =tt)

#contaminated normal case
PCR.CN = Cens.SMN.PCR(x=x, y=y, c=cc, cens="left",tt =tt,type="NormalC",
nu = c(0.1,0.1),iter.max = 100)
```

```
## End(Not run)
```

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Cens.SMN.PCR	<i>Estimation and diagnostics for partially linear censored regression models</i>
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### Description

Return the MPL estimates obtained through of ECME algorithm for partially linear regression models with censored data under scale-mixture of normal (SMN) distributions (some members are the normal, Student-t, slash and contaminated normal distribution). The types of censoring considered are left and right. Graphics for diagnostic analysis such as case-deletion and local influence techniques are provided to show its robust aspect against outlying and influential observations.

### Usage

```
Cens.SMN.PCR(x, y, c, cens = "left", tt, nu = NULL, error = 10^-6, iter.max = 200,
type = "Normal", alpha.FIX = TRUE, nu.FIX = TRUE, alpha.in = 10^-3, k = 1,
Diagnostic = TRUE, a = 2)
```

### Arguments

x	Matrix or vector of covariates.
y	Vector of responses.
c	Vector of censoring indicators. For each observation: 1 if censored and 0 if non-censored.
cens	'left' for left censoring and 'right' for righth censoring.
tt	Vector of values of a continuous covariate for the nonparametric component of the model.
nu	Initial value of the parameter of the SMN family. In the case of the Student-t and slash is a scalar, in the contaminated normal is a vector bidimensional.
error	The convergence maximum error. By default = $10^{-6}$ .
iter.max	The maximum number of iterations of the ECME algorithm. By default = 200.
type	Represents the type of distribution to be used in fitting: 'Normal' for normal, 'T' for Student-t, 'Slash' for slash and 'NormalC' for contaminated normal distribution respectively. By default = 'Normal'
alpha.FIX	TRUE or FALSE. Indicate if smoothing parameter will be estimated. By default = TRUE.
nu.FIX	TRUE or FALSE. Indicate if $\nu$ will be estimated. By default = TRUE.
alpha.in	Initial value of smoothing parameter.
k	For the local influence in explanatory variable perturbation, indicates the $k$ -th explanatory variable (assumed continuous) of the design matrix $X$ to be perturbed.

Diagnostic	TRUE or FALSE. Indicates if diagnostic graph should be built for the fitted model (index plot in local influence). By default = TRUE.
a	The value for $a$ considered in the benchmark value for the index plot in local influence: $M(0)_l > \bar{M}(0) + a * SM(0)$ .

### Details

We consider a partial linear model which belongs to the class of semiparametric regression models with vector of response  $Y = (Y_1, \dots, Y_n)$  and with errors  $\epsilon_i$  which are independent and identically distributed according to a SMN distribution. To be more precise,

$$Y_i = x_i^T \beta + n_i^T f + \epsilon_i,$$

for  $i = 1, \dots, n$ , where  $f = (f(t_1^0), \dots, f(t_r^n))^T$  is an  $rx1$  vector with  $t_1^0, \dots, t_r^n$  being the distinct and ordered values of  $t_i$ ;  $n_i$  is a  $rx1$  vector of incidence whose  $s$ -th element equals the indicator function  $I(t_i = t_s^0)$  for  $s = 1, \dots, r$ .

### Value

beta	ECME estimates for the parametric component.
sigma2	ECME estimates for the scale parameter.
Alpha	If <code>alpha.FIX = FALSE</code> , it returns the estimated value of the smoothing parameter, else returns the initial value assigned in <code>alpha.in</code> .
AIC	AIC criteria for model selection.
ff	ECME estimates for the nonparametric component.
yest	Predicted values of the model.
loglik	Value of the log-likelihood under the fitted model.
iter	Number of iterations of the ECME algorithm.
nu	If <code>nu.FIX = FALSE</code> , it returns the estimated value of $\nu$ parameter, else returns the initial value assigned in <code>nu</code> .
MI	Observed information matrix.
D	A list of objects for diagnostic analysis that contains: the Hessian matrix ( <code>Hessian</code> ), values for generalized Cook's distance ( <code>GD1</code> ) and the values of the conformal normal curvature for the following perturbation schemes: Case-weight ( <code>Curvature_W</code> ), scale ( <code>Curvature_S</code> ), explanatory variable ( <code>Curvature_E</code> ) and response variable ( <code>Curvature_R</code> ).

### Warning

For the contaminated normal case, if `nu` parameters were close to the bounds, i.e., close to 0 or 1, computational problems could arise.

**Note**

When `alpha.FIX = FALSE` the algorithm may take a long time to converge. The package estimates the value  $\nu$  in each iteration taking as an estimate the argument that maximizes the actual marginal log-likelihood function, already evaluated in the estimates of  $\beta$  and  $\sigma^2$ . The diagnostic analysis is performed considering the estimated final value of  $\theta$  obtained in the last iteration of the ECME algorithm.

**Author(s)**

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**References**

- Ferreira, C. S., & Paula, G. A. (2017). Estimation and diagnostic for skew-normal partially linear models. *Journal of Applied Statistics*, 44(16), 3033-3053.
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**See Also**

[CensReg.SMN](#)

**Examples**

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nu = c(0.1,0.1),iter.max = 100)

## End(Not run)
```

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