Package ‘SPreg’

Type Package

Title Bias Reduction in the Skew-Probit Model for a Binary Response

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Depends R (>= 3.0)

Imports sn, ucminf

Description Provides a function for the estimation of parameters in a binary regression with the skew-probit link function. Naive MLE, Jeffrey type of prior and Cauchy prior type of penalization are implemented, as described in DongHyuk Lee and Samiran Sinha (2019+) <doi:10.1080/00949655.2019.1590579>.

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**Fitting Binary Regression with a Skew-Probit Link Function**

**Description**

This function fits a binary regression with a skew-probit link function. Naive MLE, Jeffrey’s prior and Cauchy prior type of penalization are implemented to find estimates.

**Usage**

```r
skewProbit(formula, data = list(), penalty = "Jeffrey", initial = NULL, cvtCov = TRUE, delta0 = 3, level = 0.95)
```

**Arguments**

- `formula`: an object of class "formula" as in `lm`, `glm`
- `data`: an optional data frame, list or environment containing the variables in the model as in `lm`, `glm`
- `penalty`: type of penalty function. Default option is "Jeffrey". "Cauchy" will give estimates with Cauchy prior penalty function. "Naive" will give ML estimates.
- `initial`: a logical value. If specified, it will be used for the initial value of numerical optimization.
- `cvtCov`: a logical value. If it is true, then all numerical values will be standardized to have mean zero and unit standard deviation.
- `delta0`: an initial guess of skewness parameter.
- `level`: a confidence level. Default value is 0.95.

**Details**

This function uses `ucminf` package for optimization. Also package `sn` is necessary. A detailed discussion can be found in the reference below.

**Value**

An object of class `skewProbit` is returned with

- `coefficients`: A named vector of coefficients
- `stderr`: Standard errors of coefficients
- `zscore`: Z-scores of coefficients
- `pval`: p-values of coefficients
- `lower`: Lower limits of confidence intervals
- `upper`: Upper limits of confidence intervals
Author(s)
DongHyuk Lee, Samiran Sinha

References

Examples

```r
library(sn)
library(ucminf)

n <- 500
b0 <- 0.34
delta <- 4
b1 <- 1
b2 <- -0.7

set.seed(1234)
x1 <- runif(n, -2, 2)
x2 <- rnorm(n, sd = sqrt(4/3))
etta <- as.numeric(b0 + b1*x1 + b2*x2)
p <- psn(eta, alpha = delta)
y <- rbinom(n, 1, p)

## Not run:
dat <- data.frame(y, x1 = x1, x2 = x2)
mod1 <- skewProbit(y ~ x1 + x2, data = dat, penalty = "Jeffrey", cvtCov = FALSE, level = 0.95)
mod2 <- skewProbit(y ~ x1 + x2, data = dat, penalty = "Naive", cvtCov = FALSE, level = 0.95)
mod3 <- skewProbit(y ~ x1 + x2, data = dat, penalty = "Cauchy", cvtCov = FALSE, level = 0.95)
summary(mod1)
summary(mod2)
summary(mod3)

## End(Not run)
```
Arguments

y  a design matrix of dimension n*p
x  a vector of response of length n
penalty  type of penalty function. Default option is "Jeffrey". "Cauchy" will give estimates with Cauchy prior penalty function. "Naive" will give ML estimates.
initial  a logical value. If specified, it will be used for the initial value of numerical optimization.
cvtCov  a logical value. If it is true, then all numerical values will be standardized to have mean zero and unit standard deviation.
delta0  an initial guess of skewness parameter.
level  a confidence level. Default value is 0.95.

Value

A list containing the following components:

coefficients  A named vector of coefficients
stderr  Standard errors of coefficients
zscore  Z-scores of coefficients
pval  p-values of coefficients
lower  Lower limits of confidence intervals
upper  Upper limits of confidence intervals

Author(s)

DongHyuk Lee, Samiran Sinha

References


Examples

```r
library(sn)
library(ucminf)
n <- 500
b0 <- 0.34
delta <- 4
b1 <- 1
b2 <- -0.7
set.seed(1234)
x1 <- runif(n, -2, 2)
x2 <- rnorm(n, sd = sqrt(4/3))
```
eta <- as.numeric(b0 + b1*x1 + b2*x2)
p <- psn(eta, alpha = delta)
y <- rbinom(n, 1, p)

x <- cbind(1, x1, x2)
## Not run:
mod1 <- skewprobitNfit(y, x, penalty = "Jeffrey", cvtCov = FALSE)
mod2 <- skewprobitNfit(y, x, penalty = "Naive", cvtCov = FALSE)
mod3 <- skewprobitNfit(y, x, penalty = "Cauchy", cvtCov = FALSE)
mod1$coef
mod2$coef
mod3$coef

## End(Not run)
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