Package 'SPreg'

January 20, 2025

Type Package

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

Version 1.0

Date 2019-03-12

Author DongHyuk Lee, Samiran Sinha

Maintainer DongHyuk Lee <leedhyuk@gmail.com>

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 Sami-
ran Sinha (2019+) <doi:10.1080/00949655.2019.1590579>.

License GPL-3

NeedsCompilation no

Repository CRAN

Date/Publication 2019-03-16 07:54:05 UTC

Contents

1

---

skewProbit   *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

```
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 penaly 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 disscussion 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

Identifiability and bias reduction in the skew-probit model for a binary response. *To appear in Journal of Statistical Computation and Simulation.*

Examples

```
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)

## 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)
```

---

skewProbit.fit   *Fitting Binary Regression with a Skew-Probit Link Function*

Description

It is the default fitting method for `skewProbit`.

Usage

```
skewProbit.fit(y, x, penalty = "Jeffrey", initial = NULL,
cvtCov = TRUE, delta0 = 3, level = 0.95)
```

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 penaly 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 cotaining 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

Identifiability and bias reduction in the skew-probit model for a binary response. *To appear in Journal of Statistical Computation and Simulation*.

Examples

```
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 <- skewProbit.fit(y, x, penalty = "Jeffrey", cvtCov = FALSE)
mod2 <- skewProbit.fit(y, x, penalty = "Naive", cvtCov = FALSE)
mod3 <- skewProbit.fit(y, x, penalty = "Cauchy", cvtCov = FALSE)
mod1$coef
mod2$coef
mod3$coef


## End(Not run)
```

Index