Package 'SPreg'

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

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NeedsCompilation no

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Contents

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)
```

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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)
```

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