Package 'bayesZIB'

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Type Package

Title Bayesian Zero-Inflated Bernoulli Regression Model

Version 0.0.2

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Description Fits a Bayesian zero-inflated Bernoulli regression model handling (potentially) different covariates for the zero-inflated and non zero-inflated parts. See Moriña D, Puig P, Navarro A. (2020) <arXiv:2105.00700>.

License GPL (>= 2)

Biarch true

Depends R (>= 3.4.0)

Imports methods, Rcpp (>= 0.12.0), rstan (>= 2.18.1), ggplot2

LinkingTo BH (>= 1.66.0), Rcpp (>= 0.12.0), RcppEigen (>= 0.3.3.3.0), rstan (>= 2.18.1), StanHeaders (>= 2.18.0)

RoxygenNote 7.0.2

NeedsCompilation yes

SystemRequirements GNU make

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R topics documented:

bayesZIB-package *Bayesian zero-inflated Bernoulli regression model*

Description

This package fits a Bayesian Bernoulli zero-inflated regression model handling different covariates for the zero-inflated and non zero-inflated parts.

Details

Package:	bayesZIB
Type:	Package
Version:	0.0.2
Date:	2021-5-12
License:	GPL version 2 or newer
LazyLoad:	yes

The package implements a new Bayesian Bernoulli zero-inflated. This model is able to distinguish between two sources of zeroes (structural and non-structural) on the basis of a Bayesian framework, using `rstan`. All the convergence and goodness-of-fit tests from `rstan` are available.

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See Also

`bayesZIB`

Examples

```
set.seed(1234)
x <- rbinom(20, 1, 0.4)   # Structural zeroes
y <- rbinom(20, 1, 0.7*x) # Non-structural zeroes
fit <- bayesZIB(y~1|1, priors=list(c(0,0.5), c(0.5,1)))
print(fit$fit, pars=c("theta", "beta"))
```

bayesZIB *Bayesian Bernoulli zero-inflated regression model.*

Description

Fit Bernoulli zero-inflated regression models in a Bayesian framework.

Usage

```
bayesZIB(formula, data, priors=NULL, chains=3, iter=2000,
         adapt_delta=0.8, max_treedepth=10, verbose=FALSE,
         cores=getOption("mc.cores", 1L))
```

Arguments

formula	symbolic description of the model, see details.
data	arguments controlling formula processing via model.frame.
priors	list with two elements specifying the limits of the uniform priors for w and p respectively. It is NULL by default but should be defined if there are no covariates.
chains	a positive integer specifying the number of Markov chains. The default is 3.
iter	a positive integer specifying the number of iterations for each chain (including warmup). The default is 2000.
adapt_delta	for the No-U-Turn Sampler (NUTS), the variant of Hamiltonian Monte Carlo used used by rstan, adapt_delta is the target average proposal acceptance probability for adaptation. double, between 0 and 1, defaults to 0.8.
max_treedepth	maximum depth parameter. Positive integer, defaults to 10. When the maximum allowed tree depth is reached it indicates that NUTS is terminating prematurely to avoid excessively long execution time.
verbose	TRUE or FALSE: flag indicating whether to print intermediate output from Stan on the console, which might be helpful for model debugging.
cores	number of cores to use when executing the chains in parallel, which defaults to 1 but according to the Stan documentation it is recommended to set the mc.cores option to be as many processors as the hardware and RAM allow (up to the number of chains).

Details

Zero-inflated models are two-component mixture models combining a point mass at zero with a proper count distribution. Thus, there are two sources of zeros: zeros may come from both the point mass and from the Bernoulli component. For modeling the unobserved state (zero vs. Bernoulli), a binary model is used that captures the probability of zero inflation. in the simplest case only with an intercept but potentially containing regressors. For this zero-inflation model, a binomial model with an appropriate link function is used.

The formula can be used to specify both components of the model: If a formula of type y ~ x1 + x2 is supplied, then the same regressors are employed in both components. This is equivalent to y ~ x1

`+ x2 | x1 + x2`. Of course, a different set of regressors could be specified for the Bernoulli and zero-inflation component, e.g., `y ~ x1 + x2 | z1 + z2 + z3` giving the logistic regression model `y ~ x1 + x2` conditional on (`|`) the zero-inflation model `y ~ z1 + z2 + z3`. A simple inflation model where all zero counts have the same probability of belonging to the zero component can by specified by the formula `y ~ x1 + x2 | 1`.

Value

An object of class "bayesZIB", i.e., a list with components including

`Call`	text string with the original call to the function
`x`	design matrix for the zero-inflated part
`z`	design matrix for the non zero-inflated part
`fit`	an object of S4 class `stanfit` if there are covariates or a named list with `iter` draws from the posterior distribution of `w` and `p`.

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See Also

`bayesZIB-package`

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