Package 'saeHB.ZIB'

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Type Package

Title Small Area Estimation under ZIB Distribution using Hierarchical Bayesian

Version 0.1.0

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Description Provides function for area level of small area estimation using hierarchical Bayesian (HB) method with Zero-Inflated Binomial (ZIB) distribution for variables of interest. Some dataset produced by a data generation are also provided. The 'rjags' package is employed to obtain parameter estimates. Model-based estimators involves the HB estimators which include the mean and the variation of mean. For references, see Wiley (2013) <doi:10.1111/cdoe.12044>.

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Encoding UTF-8

LazyData true

RoxygenNote 7.1.2

URL https://github.com/rizqinaR/saeHB.ZIB

BugReports https://github.com/rizqinaR/saeHB.ZIB/issues

Imports stringr, coda, rjags, stats, grDevices, graphics

Suggests rmarkdown, knitr

VignetteBuilder knitr

Depends R (>= 2.10)

NeedsCompilation no

Repository CRAN

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R topics documented:

`dataZIB` *Sample Data for Small Area Estimation using Hierarchical Bayesian Method under Zero-Inflated Binomial Distribution*

Description

Dataset to simulate Small Area Estimation using Hierarchical Bayesian Method under Zero-Inflated Binomial distribution

This data is generated by these following steps:

1. Generate sampling random area effect u.Z and u.nZ with $(u.Z\ N(0,1))$ and $(u.nZ\ N(0,1))$. The auxilary variabels are generated by Uniform distribution with $(x1\ U(0,1))$ and $(x2\ U(0,1))$. The coefficient parameters $\alpha 0, \alpha 1, \alpha 2, \beta 0, \beta 1, \beta 2$ are set as 0.
2. Calculate $logit(p) = \alpha 0 + \alpha 1 * x1 + \alpha 2 * x2 + u.Z$ and $logit(\pi) = \beta 0 + \beta 1 * x1 + \beta 2 * x2 + u.nZ$
3. Generate number of sample with $n.samp\ U(10, 30)$
4. Generate $delta\ bernoulli(p)$ and $y_star\ binomial(s, \pi)$
5. calculate $y = delta * y_star$
6. Calculate variance of direct estimates (vardir) with $var(y) = (1-p) * s * pi * (1-\pi * (1-p * s))$
7. Auxilary variables x1, x2, direct estimation (y), vardir, and s are combined in a dataframe called dataZIB

Usage

```
data(dataZIB)
```

Format

A data frame with 64 observations on the following 4 variables:

y Direct Estimation of y

x1 Auxiliary variable of x1

x2 Auxiliary variable of x2

vardir sampling variance of y

n.samp number of sample

dataZIB.ns — *Sample Data for Small Area Estimation using Hierarchical Bayesian Method under Zero-Inflated Binomial Distribution*

Description

Dataset to simulate Small Area Estimation using Hierarchical Bayesian Method under Zero-Inflated Binomial distribution with non-sampled areas

This data contains NA values that indicates no sampled at one or more small areas. It uses the dataZIB.ns with the direct estimates and the related variances in 3 small areas are missing.

Usage

```
data(dataZIB.ns)
```

Format

A data frame with 30 rows and 4 variables :

y Direct Estimation of y

x1 Auxiliary variable of x1

x2 Auxiliary variable of x2

vardir sampling variance of y

n.samp number of sample

ziBinomial — *Small Area Estimation using Hierarchical Bayesian under Zero Inflated Binomial Distribution*

Description

This function is implemented to variable of interest (y) that assumed to be a Zero Inflated Binomial Distribution. The range of data is $(0 < y < \infty)$. This model can be used to handle overdispersion and excess zero in data.

Usage

```
ziBinomial(
  formula,
  n.samp,
  iter.update = 3,
  iter.mcmc = 10000,
  coef.nonzero,
  var.coef.nonzero,
```

```
  coef.zero,
  var.coef.zero,
  thin = 2,
  burn.in = 2000,
  tau.u.nZ = 1,
  tau.u.Z = 1,
  data
)
```

Arguments

formula	Formula that describe the fitted model
n.samp	Number of sample in each area
iter.update	Number of updates with default 3
iter.mcmc	Number of total iterations per chain with default 2000
coef.nonzero	Optional argument for mean on coefficient's prior distribution or β's prior distribution which value is non-zero
var.coef.nonzero	Optional argument for the variances of the prior distribution of the model coefficients (β)
coef.zero	Optional argument for mean on coefficient's prior distribution or α's prior distribution which value is non-zero
var.coef.zero	Optional argument for the variances of the prior distribution of the model coefficients (α)
thin	Thinning rate, must be a positive integer with default 1
burn.in	Number of iterations to discard at the beginning with default 1000
tau.u.nZ	Variance of random effect area for non-zero of variable interest (y) with default 1
tau.u.Z	Variance of random effect area for zero of variable interest (y) with default 1
data	The data frame

Value

This function returns a list of the following objects:

Est	A vector with the values of Small Area mean Estimates using Hierarchical bayesian method
refVar	Estimated random effect variances
coefficient	A dataframe with the estimated model coefficient
plot_alpha	Trace, Density, Autocorrelation Function Plot of MCMC samples
plot_beta	Trace, Density, Autocorrelation Function Plot of MCMC samples

Examples

```
#Compute Fitted Model
 y ~ x1 +x2

# For data without any nonsampled area
# Load Dataset
  data(dataZIB)
  saeHB.ZIB <- ziBinomial(formula = y~x1+x2, iter.update=3, iter.mcmc = 1000,
                burn.in = 200,data = dataZIB)
#the setting of iter.update, iter.mcmc, and burn.in in this example
#is considered to make the example execution time be faster.
#Result
saeHB.ZIB$Est                                    #Small Area mean Estimates
saeHB.ZIB$sd                               #Standard deviation of Small Area Mean Estimates
saeHB.ZIB$refVar                                 #refVar
saeHB.ZIB$coefficient                            #coefficient
#Load Library 'coda' to execute the plot
#autocorr.plot(saeHB.ZIB$plot[[3]]) is used to  #ACF Plot for alpha
#autocorr.plot(saeHB.ZIB$plot[[3]]) is used to  #ACF Plot for alpha
#plot(saeHB.ZIB$plot_alpha[[3]]) is used to     #Dencity and trace plot for alpha
#plot(saeHB.ZIB$plot_beta[[3]]) is used to      #Dencity and trace plot for beta
```

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