

Package ‘saeHB.unit’

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Type Package

Title Basic Unit Level Model using Hierarchical Bayesian Approach

Version 0.1.0

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Description Small area estimation unit level models (Battese-Harter-Fuller model) with a Bayesian Hierarchical approach. See also Rao & Molina (2015, ISBN:978-1-118-73578-7) and Battese et al. (1988) <doi:10.1080/01621459.1988.10478561>.

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URL <https://github.com/Alfrzlp/saeHB.unit>

BugReports <https://github.com/Alfrzlp/saeHB.unit/issues>

Encoding UTF-8

LazyData true

Imports cli, coda, dplyr, graphics, methods, rjags, stats

RoxygenNote 7.2.0

Depends R (>= 3.60)

SystemRequirements JAGS (<http://mcmc-jags.sourceforge.net>)

NeedsCompilation no

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Repository CRAN

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autoplot	<i>Create a complete ggplot appropriate to a particular data type</i>
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Description

autoplot() uses ggplot2 to draw a particular plot for an object of a particular class in a single command. This defines the S3 generic that other classes and packages can extend.

Usage

```
autoplot(object, ...)
```

Arguments

- object an object, whose class will determine the behaviour of autoplot
- ... other arguments passed to specific methods

Value

a ggplot object

See Also

[autolayer\(\)](#), [ggplot\(\)](#) and [fortify\(\)](#)

autoplot.sae hb	<i>Autoplot</i>
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Description

Autoplot

Usage

```
## S3 method for class 'sae hb'  
autoplot(object, ...)
```

Arguments

- object HB model
- ... other argument

Value

plot

Examples

```
library(dplyr)

Xarea <- cornsoybeanmeans %>%
  dplyr::select(
    County = CountyIndex,
    CornPix = MeanCornPixPerSeg,
    SoyBeansPix = MeanSoyBeansPixPerSeg
  )

corn_model <- hb_unit(
  CornHec ~ SoyBeansPix + CornPix,
  data_unit = cornsoybean,
  data_area = Xarea,
  domain = "County",
  iter.update = 20,
  plot = FALSE
)
autoplot(corn_model)
```

cornsoybean

*Corn and soy beans survey and satellite data in 12 counties in Iowa***Description**

Survey and satellite data for corn and soy beans in 12 Iowa counties, obtained from the 1978 June Enumerative Survey of the U.S. Department of Agriculture and from land observatory satellites (LANDSAT) during the 1978 growing season.

Usage

cornsoybean

Format

A data frame with 37 observations on the following 5 variables.

County: numeric county code.

CornHec: reported hectares of corn from the survey.

SoyBeansHec: reported hectares of soy beans from the survey.

CornPix: number of pixels of corn in sample segment within county, from satellite data.

SoyBeansPix: number of pixels of soy beans in sample segment within county, from satellite data.

Details

cornsoybean

Source

Battese, G.E., Harter, R.M. and Fuller, W.A. (1988). An Error-Components Model for Prediction of County Crop Areas Using Survey and Satellite Data. Journal of the American Statistical Association 83, 28-36.

cornsoybeanmeans	<i>Corn and soy beans mean number of pixels per segment for 12 counties in Iowa.</i>
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Description

County means of number of pixels per segment of corn and soy beans, from satellite data, for 12 counties in Iowa. Population size, sample size and means of auxiliary variables in data set [cornsoybean](#).

Usage

cornsoybeanmeans

Format

A data frame with 12 observations on the following 6 variables.

CountyIndex: numeric county code.

CountyName: name of the county.

SampSegments: number of sample segments in the county (sample size).

PopnSegments: number of population segments in the county (population size).

MeanCornPixPerSeg: mean number of corn pixels per segment in the county.

MeanSoyBeansPixPerSeg: mean number of soy beans pixels per segment in the county.

Details

cornsoybeanmeans

Source

Battese, G.E., Harter, R.M. and Fuller, W.A. (1988). An Error-Components Model for Prediction of County Crop Areas Using Survey and Satellite Data. Journal of the American Statistical Association 83, 28-36.

dummy_area	<i>dummy_area</i>
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Description

dummy data

Usage

dummy_area

Format

A data frame with 30 observations on the following 4 variables.

domain: domain code

x1: x1

x2: x2

parameter: true value of y

Details

dummy_area

dummy_unit	<i>dummy_unit</i>
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Description

dummy data

Usage

dummy_unit

Format

A data frame with 1000 observations on the following 4 variables.

domain: domain code

y_di: direct estimate of y

x1: x1

x2: x2

Details

dummy_unit

hb_unit	<i>Basic Unit Level Model (Battese-Harter-Fuller model) using Hierarchical Bayesian Approach</i>
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Description

This function gives the Hierarchical Bayesian (HB) based on a basic unit level model (Battese-Harter-Fuller model).

Usage

```
hb_unit(
  formula,
  data_unit,
  data_area,
  domain,
  iter.update = 3,
  iter.mcmc = 10000,
  coef,
  var.coef,
  thin = 3,
  burn.in = 2000,
  tau.u = 1,
  seed = 1,
  quiet = TRUE,
  plot = TRUE
)
```

Arguments

formula	an object of class formula that contains a description of the model to be fitted. The variables included in the formula must be contained in the data.
data_unit	data frame containing the variables named in formula and domain.
data_area	data frame containing the variables named in formula and domain. Each remaining column contains the population means of each of the p auxiliary variables for the D domains.
domain	Character or formula for domain column names in unit data data_unit and area data data_area. (example : "County" or ~County)
iter.update	Number of updates with default 3
iter.mcmc	Number of total iterations per chain with default 10000
coef	a vector contains prior initial value of Coefficient of Regression Model for fixed effect with default vector of 0 with the length of the number of regression coefficients
var.coef	a vector contains prior initial value of variance of Coefficient of Regression Model with default vector of 1 with the length of the number of regression coefficients

thin	Thinning rate, must be a positive integer with default 2
burn.in	Number of iterations to discard at the beginning with default 2000
tau.u	Prior initial value of inverse of Variance of area random effect with default 1
seed	number used to initialize a pseudorandom number generator (default seed = 1). The random number generator method used is "base::Wichmann-Hill".
quiet	if TRUE, then messages generated during compilation will be suppressed (default TRUE).
plot	if TRUE, the autocorrelation, trace, and density plots will be generated (default TRUE).

Value

The function returns a list with the following objects : Estimation Est, random effect variance refVar, beta coefficient Coefficient and MCMC result result_mcmc

References

1. Battese, G. E., Harter, R. M., & Fuller, W. A. (1988). An error-components model for prediction of county crop areas using survey and satellite data. *Journal of the American Statistical Association*, 83(401), 28-36.
2. Rao, J. N., & Molina, I. (2015). *Small area estimation*. John Wiley & Sons.

Examples

```
library(dplyr)

Xarea <- cornsoybeanmeans %>%
  dplyr::select(
    County = CountyIndex,
    CornPix = MeanCornPixPerSeg,
    SoyBeansPix = MeanSoyBeansPixPerSeg
  )

corn_model <- hb_unit(
  CornHec ~ SoyBeansPix + CornPix,
  data_unit = cornsoybean,
  data_area = Xarea,
  domain = "County",
  iter.update = 20
)
```

summary.saeHB	<i>Summary sae HB model</i>
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Description

Summary sae HB model

Usage

```
## S3 method for class 'saeHB'  
summary(object, ...)
```

Arguments

object	sae HB model
...	further arguments passed to or from other methods.

Value

The function return a data.frame of beta coefficient from HB model.

Examples

```
library(dplyr)  
  
Xarea <- cornsoybeanmeans %>%  
  dplyr::select(  
    County = CountyIndex,  
    CornPix = MeanCornPixPerSeg,  
    SoyBeansPix = MeanSoyBeansPixPerSeg  
  )  
  
corn_model <- hb_unit(  
  CornHec ~ SoyBeansPix + CornPix,  
  data_unit = cornsoybean,  
  data_area = Xarea,  
  domain = "County",  
  iter.update = 20  
)  
  
summary(corn_model)
```


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