Package ‘maSAE’

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maSAE-package

Description

an S4 implementation of the unbiased extension of the model-assisted' synthetic-regression estimator proposed by Mandallaz (2013), Mandallaz et al. (2013) and Mandallaz (2014). It yields smaller variances than the standard bias correction, the generalised regression estimator.

Details

This package provides Mandallaz' extended synthetic-regression estimator for two- and three-phase sampling designs with or without clustering. See vignette('maSAE', package = 'maSAE') and demo('maSAE', package = 'maSAE') for introductions, "class?maSAE::saeObj" and "?maSAE::predict" for help on the main feature.

Note

Model-assisted estimators use models to improve the efficiency (i.e. reduce prediction error compared to design-based estimators) but need not assume them to be correct as in the model-based approach, which is advantageous in official statistics.

References


See Also

There are a couple packages for model-based small area estimation, see sae, rsaef, hbsae and JoSAE.
Examples

```r
## Not run: vignette('maSAE', package = 'maSAE')
## Not run: demo('design', package = 'maSAE')
## Not run: demo('maSAE', package = 'maSAE')
```

**Description**

Calculate small area predictions and their variances.

**Usage**

```r
predict(object, ...)
```

## S4 method for signature 'sadObj'
```r
predict(object)
```

## S4 method for signature 'saeObj'
```r
predict(object)
```

**Arguments**

- `object` a model object for which prediction is desired.
- `...` Arguments to be passed to methods.

**Details**

Based on the structure of the `saeObj` given, `predict` decides, which predictor to use:

- If a `smallAreaMeans-data.frame` covering all fixed effects is given, the exhaustive estimator \( \hat{Y}_{G,\text{ synth}} \) is calculated.
- If a `smallAreaMeans-data.frame` not covering all fixed effects is given, the partially exhaustive estimator \( \hat{Y}_{G,\text{ greg}} \) is calculated.
- If no `smallAreaMeans-data.frame` but `s1` is given, the three-phase estimator \( \hat{Y}_{G,\text{ g3reg}} \) is calculated.
- If neither `smallAreaMeans` nor `s1` are given, the non-exhaustive estimator \( \hat{Y}_{G,\text{ psynth}} \) is calculated.
- If a clustering variable is given, the cluster sampling design equivalents of the above estimators are used.

**Value**

A data frame containing predictions and variances for each small area, `attr(..., 'references')` gives information on the literature used, `attr(...$prediction, 'reference')` and `attr(...$variance, 'reference')` specify these.
Methods

signature(object = saeObj) Calculate predictions and variances according to the auxiliary information given, see Details above.

signature(object = sadObj) Calculate design-based predictions and variances.

See Also
demo('maSAE')

Examples

library('maSAE')
## design-based estimation
## load data
data('s2')
## create object
saeO <- saobj(data = s2, f = y ~ NULL | g)
## design-based estimation for all small areas given by g
predict(saeO)

## model-assisted estimation
## load s1 data
data('s1'); str(s1)
## add sample indicators to s2
s2$s1 <- s2$s2 <- TRUE
## add sample indicators to s1
s1$s1 <- TRUE
s1$s2 <- FALSE
## prepare s1 data
eval(parse(text=paste('s1$, setdiff(names(s2), names(s1)), ' <- NA', sep = '')))
## union s1 and s2 data
s12 <- rbind(s1, s2)
## create object
saeO <- saobj(data = s12, f = y ~x1 + x2 + x3 | g, s2 = 's2')
## small area estimation
p <- predict(saeO)
## print p and view its attributes set by predict()
p;
str(p)
cat(sep = '\n', attr(p, 'references')[2])
attributes(p$prediction)
attributes(p$variance)

---

s0 Example s0 data set.

Description

Artificial null phase sampling data used for examples in the maSAE package.
Usage

data(s0)

Format

A data frame with 9008 observations on the following 5 variables.

Details

clustid  See "?maSAE::s2"
x1  See "?maSAE::s2"
x2  See "?maSAE::s2"
x3  See "?maSAE::s2"
inclusion  See "?maSAE::s2"
g  See "?maSAE::s2"

---

Example s1 data set.

Description

Artifical first phase sampling data used for examples in the maSAE package.

Usage

data(s1)

Format

A data frame with 786 observations on the following 5 variables.

Details

clustid  See "?maSAE::s2"
x1  See "?maSAE::s2"
x2  See "?maSAE::s2"
x3  See "?maSAE::s2"
inclusion  See "?maSAE::s2"
g  See "?maSAE::s2"
s2

Example s2 data set.

Description
Artificial second phase sampling data used for examples in the maSAE package.

Usage
data(s2)

Format
A data frame with 206 observations on the following 7 variables.

Details

- clustid: index giving the clusters.
- x1: a potential fixed effect.
- x2: another potential fixed effect.
- x3: yet another potential fixed effect.
- inclusion: a logical vector indicating whether or not to include the current observation. All TRUE.
- y: the predictand

sadObj-class

Class "sadObj"

Description
a class for design-based estimation only

Details
See "saeObj". The fixed effects part of f has to be NULL: design-based estimation knows no fixed effects.

Slots
data: See "saeObj".
f: See "saeObj".
cluster: See "saeObj".
include: See "saeObj".
Extends

Class "savObj", directly.

Objects from the Class

Objects can be created by calls of the form `new("sadobj", ...)` or via the constructor function "?maSAE::saObj".

Methods

`predict`

Note

the slots are described in "class?maSAE::saeobj", since this is the main class of the package.

See Also

"saeObj" "?maSAE::saObj"

Examples

`showClass("sadObj")`

---

saeObj-class  Class "saeObj"

Description

the class for small area estimation, the one you're probably looking for.

Details

`cluster` optionally gives the name of a variable in slot `data` from which the cluster information for clustered sample designs is to be read. See Manadallaz 2013, p. 445 for Details.

`include` optionally gives the name of a variable in slot `data` from which the inclusion indicator for cluster points is to be read. See Manadallaz 2013, p. 445 for Details on $I_f$.

Also see the Details for `predict`.

Slots

`smallAreaMeans` An optional "data.frame" giving the true means of fixed effects for the small areas. Must have a column with the random effect defining the small areas in slot `data`.

`s1` An optional "character" string giving the name of a variable in slot `data` indicating that an observation (a row in slot `data`) belongs to subset 1.
s2 An optional "character" string giving the name of a variable in slot data indicating that an observation (a row in slot data) belongs to subset 2.

data Object of class "data.frame" to use for prediction, typically consisting of a predictand and one or more predictors (zero or more fixed effects and one random effect defining the small areas). See Details for optional clustering variable and/or inclusion indicator.

f Object of class "formula" a linear mixed effects model formula.

cluster An optional "character" string giving the name of the clustering variable in slot data.

include An optional "character" string giving the name of the inclusion indicator in slot data.

Extends

Class "saObj", directly.

Objects from the Class

Objects can be created by calls of the form new("saeObj", ...) or via the constructor function "?maSAE::saobj" (recommended).

Methods

predict

References


See Also

"?stats::formula","class?maSAE::saobj","class?maSAE::saeObj","?maSAE::saObj" and "?maSAE::predict"

Examples

showClass("saeObj")

---

**saObj**

An ui-constructor for classes sadObj and saeObj

**Description**

simple wrapper to new("sa[de]obj"). If missing, it adds an inclusion variable to data; it checks for missing in the clustering variable. Adds comments documenting changes made to the returned object.
savObj-class

Usage

```r
saobj(data, f, smallAreaMeans = NULL, s1 = NULL, s2 = NULL,
      cluster = NULL, include = NULL)
```

Arguments

- `data` See "saeObj".
- `f` a linear mixed effects formula, but see Value.
- `smallAreaMeans` See "saeObj".
- `s1` See "saeObj".
- `s2` See "saeObj".
- `cluster` See "saeObj".
- `include` See "saeObj".

Value

an object of class sadobj if `f` is of structure ‘x ~ NULL | g’, an object of class saeobj otherwise.

See Also

"saeObj", "sadobj".

Examples

```r
library('maSAE')
## load data
data('s2')
## create sadobj object
saeO <- saobj(data = s2, f = y ~ NULL | g)
## create saeobj object
s2$s2 <- TRUE
saeO <- saobj(data = s2, f = y ~x1 + x2 + x3 | g, s2 = 's2')
```

Description

Common slots for classes sadobj and saeobj.
Slots

- data See "saeObj".
- f See "saeObj".
- cluster See "saeObj".
- include See "saeObj".

Objects from the Class

A virtual Class: No objects may be created from it.

Note

the slots are described in "class?maSAE::saeObj", since this is the main class of the package.

See Also

"stats::formula","class?maSAE::sadObj" and "class?maSAE::saeObj".

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