Package ‘surveyplanning’

May 3, 2019

Type Package
Title Survey Planning Tools
Version 3.0
Date 2019-03-25
Depends R (>= 3.0.0)
Imports data.table (>= 1.11.4), laeken, stats
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Description Tools for sample survey planning, including sample size calculation, estimation of expected precision for the estimates of totals, and calculation of optimal sample size allocation.
License GPL (>= 2)
Encoding UTF-8
Repository CRAN
URL https://csblatvia.github.io/surveyplanning/
BugReports https://github.com/CSBLatvia/surveyplanning/issues/
NeedsCompilation yes
LazyData true
RoxygenNote 6.1.1
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Date/Publication 2019-05-03 21:50:59 UTC

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**dom_optimal_allocation**

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**Optimal sample size allocation**

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**Description**

The function computes optimal sample size allocation over strata and domain for population.

**Usage**

```r
dom_optimal_allocation(id, Dom, H, Y, Rh = NULL, deffh = NULL,
                        indicator, sup_w, sup_cv, min_size = 3, correction_before = FALSE,
                        dataset = NULL)
```

**Arguments**

- **id**
  Variable for unit ID codes. One dimensional object convertible to one-column `data.table` or variable name as character, column number.

- **Dom**
  Optional variables used to define population domains. If supplied, values are calculated for each domain. An object convertible to `data.table` or variable names as character vector, column numbers.

- **H**
  The unit stratum variable. One dimensional object convertible to one-column `data.table` or variable name as character, column number.

- **Y**
  Variable of interest. Object convertible to `data.table` or variable names as character, column numbers.

- **Rh**
  The expected response rate in each stratum (optional). If not defined, it is assumed to be 1 in each stratum (full-response). Object convertible to one-column `data.table`, variable name as character, or column number.

- **deffh**
  The expected design effect for the estimate of variable (optional). If not defined, it is assumed to be 1 for each variable in each stratum. If is defined, then variables is defined the same arrangement as `Yh`. Object convertible to `data.table`, variable name as character vector, or column numbers.

- **indicator**
  Variable for detection fully surveyed units. Object convertible to `data.table` or variable names as character, column numbers.

- **sup_w**
  Variable for weight limit in domain of stratum. Object convertible to `data.table` or variable names as character, column numbers.
**dom_optimal_allocation**

**sup_cv**
Variable for maximum coefficient of variation (CV) in percentage for domain. Object convertible to data.table or variable names as character, column numbers.

**min_size**
A numeric value for sample size.

**correction_before**
by default FALSE; correction of sample size is made before ending, if true, correction of sample size is made at the end.

**dataset**
Optional survey data object convertible to data.table with one row for each stratum.

**Value**
A list with eights data objects:

**data**
An object as data.table, with variables: id - variable with unit ID codes, Dom - optional variables used to define population domains, H - the unit stratum variable, Y - variable of interest, Rh - the expected response rate in each stratum, deffh - the expected design effect, indicator - variable for full surveys, sup_w - variable for weight limit in domain of stratum, sup_cv - Variable for maximum coefficient of variation, poph - population size, nh - sample size.

**nh_larger_then_Nh**
An object as data.table, with variables: H - the stratum variable, nh - sample size, poph - population size.

**dom_strata_size**
An object as data.table, with variables: H - the unit stratum variable, Dom - optional variables used to define population domains, sup_w - variable for weight limit in domain of stratum, poph - population size, nh - sample size, sample100 - sample size for fully surveyed units, design_weights - design weights.

**dom_size**
An object as data.table, with variables: Dom - optional variables used to define population domains, poph - population size, nh - sample size, sample100 - sample size for fully surveyed units, design_weights - design weights.

**size**
An object as data.table, with variables: poph - population size,
nh - sample size,
sample100 - sample size for fully surveyed units.

\textbf{dom\_strata\_expected\_precision}

An object as data.table, with variables:
H - stratum,
variable - the name of variable of interest,
estim - total value,
deffh - the expected design effect,
s2h - population variance $S^2$,

\textbf{dom\_expected\_precision}

An object as data.table, with variables:
Dom - domain,
variable - the name of variable of interest,
poph - population size,

\textbf{total\_expected\_precision}

An object as data.table, with variables:
variable - the name of variable of interest,
poph - population size,

See Also
expsize, optsize, prop_dom_optimal_allocation

Examples
library(laeken)
library(data.table)
data(ses)
data <- data.table(ses)
Description

The function computes minimum sample size for each stratum to achieve defined precision (CV) for the estimates of totals in each stratum. The calculation takes into account expected totals, population variance, expected response rate and design effect in each stratum.

Usage

expsize(Yh, H, s2h, poph, Rh = NULL, deffh = NULL, CVh, dataset = NULL)

Arguments

Yh
The expected totals for variables of interest in each stratum. Object convertible to data.table, variable names as character vector, or column numbers.

H
The stratum variable. One dimensional object convertible to one-column data.table, variable name as character, or column number.

s2h
The expected population variance $S^2$ for variables of interest in each stratum. Object convertible to data.table, variable name as character vector, or column numbers.

poph
Population size in each stratum. One dimensional object convertible to one-column data.table, variable name as character, or column number.

Rh
The expected response rate in each stratum (optional). If not defined, it is assumed to be 1 in each stratum (full-response). Object convertible to one-column data.table, variable name as character, or column number.

deffh
The expected design effect for the estimates of totals (optional). If not defined, it is assumed to be 1 for each variable in each stratum. Object convertible to data.table, variable name as character vector, or column numbers.
CVh  Coefficient of variation (in percentage) to be achieved for each stratum. One dimensional object convertible to one-column data.table, variable name as character, or column number.

dataset  Optional survey data object convertible to data.table with one row for each stratum.

Value
A data.table is returned by the function, with variables:
- H - stratum,
- variable - the name of variable of interest,
- estim - total value,
- deffh - the expected design effect,
- s2h - population variance $S^2$,
- CVh - the expected coefficient of variation,
- Rh - the expected response rate,
- poph - population size,
- nh - minimal sample size to achieve defined precision (CV).

See Also
expvar, optsize, MoE_P

Examples
library(data.table)
data <- data.table(H = 1:3, Yh = 10 * 1:3,
                    Yh1 = 10 * 4:6, s2h = 10 * runif(3),
                    s2h2 = 10 * runif(3), CVh = rep(4.9,3),
                    poph = 8 * 1:3, Rh = rep(1,3),
                    deffh = rep(2,3), deffh2 = rep(3,3))

size <- expsize(Yh = c("Yh", "Yh1"), H = "H",
                 s2h = c("s2h", "s2h2"), poph = "poph",
                 Rh = "Rh", deffh = c("deffh", "deffh2"),
                 CVh = "CVh", dataset = data)

size
Usage

expvar(Yh, Zh = NULL, H, s2h, nh, poph, Rh = NULL, deffh = NULL,
       Dom = NULL, dataset = NULL)

Arguments

Yh

The expected totals for variables of interest in each stratum. Object convertible
to `data.table`, variable names as character vector, or column numbers.

Zh

Optional variables of denominator for the expected ratio estimation in each stra-
tum. Object convertible to `data.table`, variable names as character vector, or column numbers.

H

The stratum variable. One dimensional object convertible to one-column `data.table`,
variable name as character, or column number.

s2h

The expected population variance $S^2$ for variables of interest in each stratum.
Variables is defined the same arrangement as Yh. Object convertible to `data.table`,
variable name as character vector, or column numbers.

nh

Sample size in each stratum. One dimensional object convertible to one-column `data.table`,
variable name as character, or column number.

poph

Population size in each stratum. One dimensional object convertible to one-
column `data.table`, variable name as character, or column number.

Rh

The expected response rate in each stratum (optional). If not defined, it is as-
sumed to be 1 in each stratum (full-response). Object convertible to one-column `data.table`,
variable name as character, or column number.

deffh

The expected design effect for the estimates of totals (optional). If not defined,
it is assumed to be 1 for each variable in each stratum. If is defined, then vari-
ables is defined the same arrangement as Yh. Object convertible to `data.table`,
variable name as character vector, or column numbers.

Dom

Optional variables used to define population domains. Only domains as unions
of strata can be defined. If supplied, estimated precision is calculated for each
domain. An object convertible to `data.table`, variable names as character vec-
tor, or column numbers.

dataset

Optional survey data object convertible to `data.table` with one row for each
stratum.

Value

A list with three data objects:

resultH

An object as `data.table`, with variables:
H - stratum,
variableY - the name of variable of interest,
variableZ - the name of optional variable of denominator for the expected ratio estimation,
estim - total value,
deffh - the expected design effect,
s2h - population variance $S^2$. 

nh - sample size,
Rh - the expected response rate,
poph - population size,
nrh - expected number of respondents,
var - expected variance,
se - expected standard error,
cv - expected coefficient of variance.

resultDom
An object as data.table, with variables:
Dom - domain,
variableY - the name of variable of interest,
variableZ - the name of optional variable of denominator for the expected ratio estimation,
poph - the population size,
hh - sample size,
nrh - expected number of respondents,
estim - total value,
var - the expected variance,
se - the expected standard error,
cv - the expected coefficient of variance.

result
An object as data.table, with variables:
variableY - the name of variable of interest,
variableZ - the name of optional variable of denominator for the expected ratio estimation,
poph - the population size,
hh - sample size,
nrh - expected number of respondents,
estim - total value,
var - the expected variance,
se - the expected standard error,
cv - the expected coefficient of variance.

See Also
expvar, optsize

Examples
library(data.table)
data <- data.table(H = 1:3, Yh = 10 * 1:3,
   Yh1 = 10 * 4.6, s2h = 10 * runif(3),
   s2h2 = 10 * runif(3), nh = rep(4 * 1:3),
   poph = 8 * 1:3, Rh = rep(1, 3),
   deffh = rep(2, 3), deffh2 = rep(3, 3))

vars <- expvar(Yh = c("Yh", "Yh1"), H = "H",
   s2h = c("s2h", "s2h2"),
   nh = "nh", poph = "poph",
   Rh = "Rh", deffh = c("deffh", "deffh2"),
   dataset = data)
The function computes minimal proportion for the given relative margin of error. The calculation takes into sample size, population size, margin of error, expected response rate and design effect.

Usage

\[
\text{min\_count}(n, \text{pop}, \text{RMoE}, \text{confidence} = 0.95, R = 1, \text{deff\_sam} = 1, \text{deff\_est} = 1)
\]

Arguments

- \(n\): The expected sample size.
- \(\text{pop}\): Population size.
- \(\text{RMoE}\): The expected relative margin of error.
- \(\text{confidence}\): Optional positive value for confidence interval. This variable by default is 0.95.
- \(R\): The expected response rate (optional). If not defined, it is assumed to be 1 (full-response).
- \(\text{deff\_sam}\): The expected design effect of sample design for the estimates (optional). If not defined, it is assumed to be 1.
- \(\text{deff\_est}\): The estimated design effect of estimator for the estimates (optional). If not defined, it is assumed to be 1.

Value

The estimate of minimal count of respondents for the given relative margin of error.

See Also

- \text{expvar}, \text{optsize}, \text{MoE\_P}

Examples

\[
\text{min\_count}(n = 15e3, \text{pop} = 2e6, \text{RMoE} = 0.1)
\]

\[
\#
\text{Not run:}
\text{library(data.table)}
\text{min\_count}(n = c(10e3, 15e3, 20e3), \text{pop} = 2e6, 0.1)
\]

\[
n \leftarrow \text{seq}(10e3, 30e3, \text{length.out} = 11)
\text{# n \leftarrow \text{sort(c(n, 22691))}}
\]
min_prop

n

RMoE <- seq(.02, .2, length.out = 10)
RMoE
dt <- data.table(n = rep(n, each = length(RMoE)), RMoE = RMoE)
dt[, Y := min_count(n = n, pop = 2.1e6, RMoE = RMoE, R = 1) / 1e3]
dt

## End(Not run)

**min_prop**  
*Minimal proportion for the given relative margin of error*

**Description**

The function computes minimal proportion for the given relative margin of error. The calculation takes into sample size, population size, margin of error, expected response rate and design effect.

**Usage**

```r
min_prop(n, pop, RMoE, confidence = 0.95, R = 1, deff_sam = 1, deff_est = 1)
```

**Arguments**

- `n`  
The expected sample size.
- `pop`  
Population size.
- `RMoE`  
The expected relative margin of error.
- `confidence`  
Optional positive value for confidence interval. This variable by default is 0.95.
- `R`  
The expected response rate (optional). If not defined, it is assumed to be 1 (full-response).
- `deff_sam`  
The expected design effect of sample design for the estimates (optional). If not defined, it is assumed to be 1.
- `deff_est`  
The estimated design effect of estimator for the estimates (optional). If not defined, it is assumed to be 1.

**Value**

The estimate of minimal proportion for the given relative margin of error.

**See Also**

`expvar`, `optsize`, `MoE_P`
**MoE_P**

**Examples**

```
min_prop(n = 100, pop = 1000, RMoE = 0.1)
```

---

**MoE_P**

*Margin of error for proportion*

---

**Description**

The function computes margin of error for proportion. The calculation takes into proportion, expected response rate and design effect.

**Usage**

```
MoE_P(P = 0.5, n, pop, confidence = 0.95, R = 1, deff_Sam = 1, deff_est = 1)
```

**Arguments**

- `P` : The expected proportion for variable of interest.
- `n` : The expected sample size.
- `pop` : Population size.
- `R` : The expected response rate (optional). If not defined, it is assumed to be 1 (full-response).
- `deff_Sam` : The expected design effect of sample design for the estimates (optional). If not defined, it is assumed to be 1.
- `deff_est` : The estimated design effect of estimator for the estimates (optional). If not defined, it is assumed to be 1.
- `confidence` : Optional positive value for confidence interval. This variable by default is 0.95.

**Value**

The estimate of margin of error for proportion.

**See Also**

`expvar, optsize, MoE_Y`
The function computes margin of error for count. The calculation takes into proportion, expected response rate and design effect.

Usage

```r
MoE_Y(P = 0.5, n = n, pop = pop)
```

Arguments

- **P**: The expected proportion for variable of interest.
- **n**: The expected sample size.
- **pop**: Population size.
- **confidence**: Optional positive value for confidence interval. This variable by default is 0.95.
- **R**: The expected response rate (optional). If not defined, it is assumed to be 1 (full-response).
- **deff_sam**: The expected design effect of sample design for the estimates (optional). If not defined, it is assumed to be 1.
- **deff_est**: The estimated design effect of estimator for the estimates (optional). If not defined, it is assumed to be 1.

Value

The estimate of margin of error for count.

See Also

`expvar`, `optsize`, `MoE_P`
Examples

```r
library(data.table)
n <- 100
pop <- 1000
MoE_Y(P = 0.5, n = n, pop = pop)
DT <- data.table(P = seq(0, 1, 0.01))
DT[, Y := round(pop * P)]
DT[, AMoE := MoE_Y(P, n = 100, pop = 1000)]
DT[Y > 0, RMoE := AMoE / Y]
DT
```

optsize

Optimal sample size allocation

Description

The function computes optimal sample size allocation over strata.

Usage

```r
optsize(H, n, poph, s2h = NULL, Rh = NULL, deffh = NULL,
fullsampleh = NULL, dataset = NULL)
```

Arguments

- **H**
  - The stratum variable. One dimensional object convertible to one-column data.table, variable name as character, or column number.
- **n**
  - Total sample size. One dimensional object with length one.
- **poph**
  - Population size in each stratum. One dimensional object convertible to one-column data.table, variable name as character, or column number.
- **s2h**
  - The expected population variance \( S^2 \) for variables of interest in each stratum (optional). If not defined, it is assumed to be 1 in each stratum. Object convertible to data.table, variable name as character vector, or column numbers.
- **Rh**
  - The expected response rate in each stratum (optional). If not defined, it is assumed to be 1 in each stratum (full-response). Object convertible to one-column data.table, variable name as character vector, or column number.
- **deffh**
  - The expected design effect for the estimate of variable (optional). If not defined, it is assumed to be 1 for each variable in each stratum. If is defined, then variables is defined the same arrangement as Yh. Object convertible to data.table, variable name as character vector, or column numbers.
- **fullsampleh**
  - Variable for detection fully surveyed stratum (optional). If not defined, it is assumed to be 1 in each stratum (full-response). Object convertible to one-column data.table, variable name as character, or column number.
- **dataset**
  - Optional survey data object convertible to data.table with one row for each stratum.
prop_dom_optimal_allocation

**Value**

An object as data.table, with variables:
- H - stratum,
- variable - the name of variable for population variance $S^2$,
- s2h - population variance $S^2$,
- Rh - the expected response rate,
- deffh - the expected design effect,
- poph - population size,
- deffh - design effect,
- fullsampleh - full sample indicator,
- nh - sample size.

**Details**

If $s2h$ and $Rh$ is not defined, the sample allocation will be calculated as proportional allocation (proportional to the population size). If $Rh$ is not defined, the sample allocation will be calculated as Neyman allocation.

**See Also**

`expsize`, `dom_optimal_allocation`

**Examples**

```r
library(data.table)
data <- data.table(H = 1:3,
s2h = 10 * runif(3),
s2h2 = 10 * runif(3),
poph = 8 * 1:3,
Rh = rep(1, 3),
 dd = c(1, 1, 1))

vars <- optsize(H = "H",
s2h = c("s2h", "s2h2"),
 n = 10, poph = "poph",
Rh = "Rh",
fullsampleh = NULL,
dataset = data)

vars
```

---

**prop_dom_optimal_allocation**

*Optimal sample size allocation for proportion*

**Description**

The function computes optimal sample size allocation over strata and domain for proportion.
Usage

prop.dom.optimal_allocation(H, Dom, pop = NULL, R = NULL,
  deff = NULL, se_max = 0.5, prop = 0.5, min_size = 3, step = 1,
  unit_level = TRUE, dataset = NULL)

Arguments

H
  The stratum variable. One dimensional object convertible to one-column data.table
  or variable name as character, column number.

Dom
  Variables used to define population domains. An object convertible to data.table
  or variable names as character vector, column numbers.

pop
  The population size in each stratum.

R
  The expected response rate in each stratum (optional). If not defined, it is as-
  sumed to be 1 in each stratum (full-response). Object convertible to one-column
  data.table, variable name as character, or column number.

deff
  The expected design effect for the estimate of variable (optional). If not defined,
  it is assumed to be 1 for each variable in each stratum. If is defined, then vari-
  ables is defined the same arrangement as y. Object convertible to data.table,
  variable name as character vector, or column numbers.

se_max
  Variable for maximum standard error (se) in domain.

prop
  The expected ratio proportion.

min_size
  An numeric value for minimal sample size.

step
  A value for pace.

unit_level
  A logical value, if dataset is prepared for unit level then value TRUE, oth-
  erwise FALSE.

dataset
  Optional aggregated survey data object convertible to data.table with one row
  for each stratum.

Value

A list with two data objects:

datah
  An object as data.table, with variables:
  H - the unit stratum variable,
  Dom - variables used to define population domains,
  poph - the population size in each stratum,
  RH - the expected response rate in each stratum,
  deffH - the expected design effect,
  s2h - variance in domain of stratum,
  sup_cv - Variable for maximum coefficient of variation,
  poph - population size,
  nh - sample size.

aggr.Dom
  An object as data.table, with variables:
  Dom - optional variables used to define population domains,
  pop.Dom - population size,
sample_size_Dom - optional variables used to define population domains,
sample_size - optional variables used to define population domains,
pop - sample size

See Also

expsize, optsize, dom_optimal_allocation

Examples

library(data.table)
library(laeken)
data(eusilc)
eusilc <- data.table(eusilc)
dataset <- eusilc[, .(poph = sum(db090)), by = c("db040")]
dataset[, , dom := "1"]
res <- prop_dom_optimal_allocation(H = "db040", Dom = "dom",
  pop = "poph", R = NULL,
  deff = NULL, se_max = 0.5,
  prop = 0.5, min_size = 3,
  step = 1, unit_level = FALSE,
  dataset = dataset)

round2 Rounding numbers

Description

The function rounds the values in its first argument to the specified number of decimal places (default 0).

Usage

round2(x, n)

Arguments

x a numeric vector.
n integer indicating the number of decimal places.

Value

Rounded value

See Also

expsize, dom_optimal_allocation
Examples

dar <- 100 * runif(3)
dar
round2(dar, 1)

---

**s2**

*Population variance*

Description

The function to estimate population variance $S^2$.

Usage

`s2(y, w = NULL)`

Arguments

- `y` Study variable.
- `w` Survey weight (optional). If not defined, it is assumed to be 1 for each element.

Value

Population variance $S^2$ or the estimate of population variance $s^2$.

Details

If `w` is not defined, the result is equal to the result of the function `var`.

Examples

`s2(1:10)
`s2(1:10, rep(1:2, each = 5))
all.equal(s2(1:10), var(1:10))`
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