Package 'convey'

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Title Income Concentration Analysis with Complex Survey Samples

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URL https://www.convey-r.org/

BugReports https://github.com/ajdamico/convey/issues

Description Variance estimation on indicators of income concentration and poverty using complex sample survey designs. Wrapper around the 'survey' package.

Depends R (>= 4.0.0)

Imports survey (>= 4.2-1), methods

License GPL-3

Suggests testthat, knitr, rmarkdown, vardpoor, laeken, DBI, RSQLite

RoxygenNote 7.3.2

NeedsCompilation no

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Repository CRAN

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Contents

`contrastinf` *Generalized linearization of a smooth function of survey statistics*

Description

Generalized linearization of a smooth function of survey statistics

Usage

```
contrastinf(exprlist, infunlist)
```

Arguments

`exprlist`	a call
`infunlist`	a list of lists, each having two components: value - the estimate value and lin - the linearized variable

Details

The call must use function that `deriv` knows how to differentiate. It allows to compute the linearized variable of a complex indicator from the linearized variables of simpler component variables, avoiding the formal derivatives calculations.

Value

a list with two components: values - the estimate value and lin - the linearized variable

Author(s)

Djalma Pessoa, Guilherme Jacob, and Anthony Damico

References

Guillaume Osier (2009). Variance estimation for complex indicators of poverty and inequality. *Journal of the European Survey Research Association*, Vol.3, No.3, pp. 167-195, ISSN 1864-3361, URL https://ojs.ub.uni-konstanz.de/srm/article/view/369.

See Also

svyqsr

Examples

```
library(survey)
library(laeken)
data(eusilc) ; names( eusilc ) <- tolower( names( eusilc ) )

# linearized design
des_eusilc <- svydesign( ids = ~rb030 , strata = ~db040 ,  weights = ~rb050 , data = eusilc )
des_eusilc <- convey_prep(des_eusilc)

w <- weights(des_eusilc)

# ratio linearization
T1 = list(value = sum(w*eusilc$eqincome) , lin = eusilc$eqincome )
T2 = list(value = sum(w), lin = rep (1, nrow(eusilc)) )
list_all <- list( T1 = T1, T2 = T2)
lin_R = contrastinf (quote(T1/T2), list_all)

# estimate of the variable eqincome mean
lin_R$value
# se estimate of the variable eqincome mean
SE(svytotal(lin_R$lin, des_eusilc))
# to check, use
svymean (~eqincome, des_eusilc)

# quintile share ratio (qsr) linearization
S20 <- svyisq(~ eqincome, design = des_eusilc, .20, linearized = TRUE)
S20_val <- coef (S20); attributes (S20_val) <- NULL
S20_lin <- attr(S20 , "linearized" )
S80 <- svyisq(~ eqincome, design = des_eusilc, .80, linearized = TRUE)
S80_val <- coef (S80); attributes (S80_val) <- NULL
S80_lin <- attr(S80 , "linearized" )
SU <- list (value = S80_val, lin = S80_lin )
SI <- list (value = S20_val, lin = S20_lin )
TOT <- list(value = sum( w * eusilc$eqincome) , lin = eusilc$eqincome )
list_all <- list (TOT = TOT, SI = SI, SU = SU )
lin_QSR <- contrastinf( quote((TOT-SU)/SI), list_all)

# estimate of the qsr
```

```
lin_QSR$value
# se estimate of the qsr:
SE(svytotal(lin_QSR$lin, des_eusilc))
# to check, use
svyqsr(~eqincome, des_eusilc )
# proportion of income below the quantile .20
list_all <- list (TOT = TOT, SI = SI )
lin_Lor <- contrastinf( quote(SI/TOT), list_all)
# estimate of the proportion of income below the quantile .20
lin_Lor$value
# se estimate
SE(svytotal(lin_Lor$lin,des_eusilc))
```

`convey_prep` *prepare svydesign and svyrep.design objects for the convey package*

Description

sets the population of reference for poverty threshold estimation (needed for convey functions that use a global poverty threshold) within the design. this function generally should be run immediately after the full design object creation with `svydesign` or `svrepdesign`

Usage

```
convey_prep(design)
```

Arguments

`design`	a survey design object of the library survey.

Details

functions in the convey package that use a global poverty threshold require the complete (pre-subsetted) design in order to calculate variances correctly. this function stores the full design object as a separate attribute so that functions from the `survey` package such as `subset` and `svyby` do not disrupt the calculation of error terms.

Value

the same survey object with a `full_design` attribute as the storage space for the unsubsetted survey design

Author(s)

Djalma Pessoa, Anthony Damico, and Guilherme Jacob

Examples

```
library(survey)
library(laeken)
data(eusilc) ; names( eusilc ) <- tolower( names( eusilc ) )

# linearized design: convey_prep must be run as soon as the linearized design has been created
des_eusilc <- svydesign( ids = ~rb030 , strata = ~db040 ,  weights = ~rb050 , data = eusilc )
des_eusilc <- convey_prep( des_eusilc )
# now this linearized design object is ready for analysis!

# # # CORRECT usage example # # #
des_eusilc <- svydesign( ids = ~rb030 , strata = ~db040 ,  weights = ~rb050 , data = eusilc )
des_eusilc <- convey_prep( des_eusilc )
sub_eusilc <- subset( des_eusilc , age > 20 )
# since convey_prep() was run immediately after creating the design
# this will calculate the variance accurately
SE( svyarpt( ~ eqincome , sub_eusilc ) )
# # # end of CORRECT usage example # # #

# # # INCORRECT usage example # # #
des_eusilc <- svydesign( ids = ~rb030 , strata = ~db040 ,  weights = ~rb050 , data = eusilc )
sub_eusilc <- subset( des_eusilc , age > 20 )
sub_eusilc <- convey_prep( sub_eusilc )
# since convey_prep() was not run immediately after creating the design
# this will make the variance wrong
SE( svyarpt( ~ eqincome , sub_eusilc ) )
# # # end of INCORRECT usage example # # #
```

---

densfun *Estimate the derivative of the cdf function using kernel estimator*

Description

computes the derivative of a function in a point using kernel estimation

Usage

```
densfun(formula, design, x, h = NULL, FUN = "F", na.rm = FALSE, ...)
```

Arguments

formula	a formula specifying the income variable
design	a design object of class survey.design from the survey library.
x	the point where the derivative is calculated
h	value of the bandwidth based on the whole sample
FUN	if F estimates the derivative of the cdf function; if big_s estimates the derivative of total in the tails of the distribution

na.rm	Should cases with missing values be dropped?
...	future expansion

Value

the value of the derivative at x

Author(s)

Djalma Pessoa and Anthony Damico

Examples

```
library(laeken)
data(eusilc) ; names( eusilc ) <- tolower( names( eusilc ) )
library(survey)
des_eusilc <- svydesign(ids = ~rb030, strata =~db040,  weights = ~rb050, data = eusilc)
des_eusilc <- convey_prep( des_eusilc )
densfun (~eqincome, design=des_eusilc, 10000, FUN="F" )
# linearized design using a variable with missings
densfun ( ~ py010n , design = des_eusilc, 10000, FUN="F" )
densfun ( ~ py010n , design = des_eusilc , 10000,FUN="F", na.rm = TRUE )
```

---

h_fun *Computes the bandwidth needed to compute the derivative of the cdf function*

Description

Using the whole sample, computes the bandwith used to get the linearized variable

Usage

```
h_fun(incvar, w)
```

Arguments

incvar	income variable used in the estimation of the indicators
w	vector of design weights

Value

value of the bandwidth

Author(s)

Djalma Pessoa, Guilherme Jacob, and Anthony Damico

icdf *Linearization of the cumulative distribution function (cdf) of a variable*

Description

Computes the linearized variable of the cdf function in a point.

Usage

```
icdf(formula, design, x, na.rm = FALSE, ...)
```

Arguments

formula	a formula specifying the income variable
design	a design object of class survey.design or class svyrep.design from the survey library.
x	the point where the cdf is calculated
na.rm	Should cases with missing values be dropped?
...	future expansion

Value

Object of class "cvystat", which are vectors with a "var" attribute giving the variance and a "statistic" attribute giving the name of the statistic.

Author(s)

Djalma Pessoa and Anthony Damico

References

Guillaume Osier (2009). Variance estimation for complex indicators of poverty and inequality. *Journal of the European Survey Research Association*, Vol.3, No.3, pp. 167-195, ISSN 1864-3361, URL https://ojs.ub.uni-konstanz.de/srm/article/view/369. Jean-Claude Deville (1999). Variance estimation for complex statistics and estimators: linearization and residual techniques. Survey Methodology, 25, 193-203, URL https://www150.statcan.gc.ca/n1/en/catalogue/12-001-X19990024882.

See Also

svyarpr

Examples

```
library(laeken)
data(eusilc) ; names( eusilc ) <- tolower( names( eusilc ) )
library(survey)
des_eusilc <- svydesign(ids = ~rb030, strata =~db040,  weights = ~rb050, data = eusilc)
des_eusilc <- convey_prep( des_eusilc )
icdf(~eqincome, design=des_eusilc, 10000 )
# linearized design using a variable with missings
icdf( ~ py010n , design = des_eusilc, 10000 )
icdf( ~ py010n , design = des_eusilc , 10000, na.rm = TRUE )
```

---

svyarpr *At-risk-of-poverty rate*

Description

Estimate the proportion of persons with income below the at-risk-of-poverty threshold.

Usage

```
svyarpr(formula, design, ...)

## S3 method for class 'survey.design'
svyarpr(formula, design, quantiles = 0.5, percent = 0.6, na.rm = FALSE, ...)

## S3 method for class 'svyrep.design'
svyarpr(formula, design, quantiles = 0.5, percent = 0.6, na.rm = FALSE, ...)

## S3 method for class 'DBIsvydesign'
svyarpr(formula, design, ...)
```

Arguments

formula	a formula specifying the income variable
design	a design object of class survey.design or class svyrep.design from the survey library.
...	arguments passed on to ‘svyarpt‘
quantiles	income quantile, usually .50 (median)
percent	fraction of the quantile, usually .60
na.rm	Should cases with missing values be dropped?

Details

you must run the convey_prep function on your survey design object immediately after creating it with the svydesign or svrepdesign function.

Value

Object of class "cvystat", which are vectors with a "var" attribute giving the variance and a "statistic" attribute giving the name of the statistic.

Author(s)

Djalma Pessoa and Anthony Damico

References

Guillaume Osier (2009). Variance estimation for complex indicators of poverty and inequality. *Journal of the European Survey Research Association*, Vol.3, No.3, pp. 167-195, ISSN 1864-3361, URL https://ojs.ub.uni-konstanz.de/srm/article/view/369.

Jean-Claude Deville (1999). Variance estimation for complex statistics and estimators: linearization and residual techniques. Survey Methodology, 25, 193-203, URL https://www150.statcan.gc.ca/n1/en/catalogue/12-001-X19990024882.

See Also

svyarpt

Examples

```
library(survey)
library(laeken)
data(eusilc) ; names( eusilc ) <- tolower( names( eusilc ) )

# linearized design
des_eusilc <- svydesign( ids = ~rb030 , strata = ~db040 ,  weights = ~rb050 , data = eusilc )
des_eusilc <- convey_prep( des_eusilc )

svyarpr( ~eqincome , design = des_eusilc )

# replicate-weighted design
des_eusilc_rep <- as.svrepdesign( des_eusilc , type = "bootstrap" )
des_eusilc_rep <- convey_prep( des_eusilc_rep )

svyarpr( ~eqincome , design = des_eusilc_rep )

## Not run:

# linearized design using a variable with missings
svyarpr( ~ py010n , design = des_eusilc )
svyarpr( ~ py010n , design = des_eusilc , na.rm = TRUE )
# replicate-weighted design using a variable with missings
svyarpr( ~ py010n , design = des_eusilc_rep )
svyarpr( ~ py010n , design = des_eusilc_rep , na.rm = TRUE )

# database-backed design
library(RSQLite)
library(DBI)
```

```
dbfile <- tempfile()
conn <- dbConnect( RSQLite::SQLite() , dbfile )
dbWriteTable( conn , 'eusilc' , eusilc )

dbd_eusilc <-
svydesign(
ids = ~rb030 ,
strata = ~db040 ,
weights = ~rb050 ,
data="eusilc",
dbname=dbfile,
dbtype="SQLite"
)

dbd_eusilc <- convey_prep( dbd_eusilc )

svyarpr( ~ eqincome , design = dbd_eusilc )

dbRemoveTable( conn , 'eusilc' )

dbDisconnect( conn , shutdown = TRUE )


## End(Not run)
```

---

svyarpt *At-risk-of-poverty threshold*

Description

The standard definition is to use 60% of the median income.

Usage

```
svyarpt(formula, design, ...)

## S3 method for class 'survey.design'
svyarpt(formula, design, quantiles = 0.5, percent = 0.6, na.rm = FALSE, ...)

## S3 method for class 'svyrep.design'
svyarpt(formula, design, quantiles = 0.5, percent = 0.6, na.rm = FALSE, ...)

## S3 method for class 'DBIsvydesign'
svyarpt(formula, design, ...)
```

Arguments

formula	a formula specifying the income variable

design	a design object of class survey.design or class svyrep.design from the survey library.
...	arguments passed on to 'survey::oldsvyquantile'
quantiles	income quantile quantiles, usually .50 (median)
percent	fraction of the quantile, usually .60
na.rm	Should cases with missing values be dropped?

Details

you must run the convey_prep function on your survey design object immediately after creating it with the svydesign or svrepdesign function.

Value

Object of class "cvystat", which are vectors with a "var" attribute giving the variance and a "statistic" attribute giving the name of the statistic.

Author(s)

Djalma Pessoa and Anthony Damico

References

Guillaume Osier (2009). Variance estimation for complex indicators of poverty and inequality. *Journal of the European Survey Research Association*, Vol.3, No.3, pp. 167-195, ISSN 1864-3361, URL https://ojs.ub.uni-konstanz.de/srm/article/view/369.

Jean-Claude Deville (1999). Variance estimation for complex statistics and estimators: linearization and residual techniques. Survey Methodology, 25, 193-203, URL https://www150.statcan.gc.ca/n1/en/catalogue/12-001-X19990024882.

See Also

svyarpr

Examples

```
library(survey)
library(laeken)
data(eusilc) ; names( eusilc ) <- tolower( names( eusilc ) )

# linearized design

des_eusilc <- svydesign( ids = ~rb030 , strata = ~db040 ,  weights = ~rb050 , data = eusilc )
des_eusilc <- convey_prep( des_eusilc )
svyarpt( ~eqincome , design = des_eusilc )

# replicate-weighted design
des_eusilc_rep <- as.svrepdesign( des_eusilc , type = "bootstrap" )
des_eusilc_rep <- convey_prep( des_eusilc_rep )
```

```
svyarpt( ~eqincome , design = des_eusilc_rep )

## Not run:

# linearized design using a variable with missings
svyarpt( ~ py010n , design = des_eusilc )
svyarpt( ~ py010n , design = des_eusilc , na.rm = TRUE )
# replicate-weighted design using a variable with missings
svyarpt( ~ py010n , design = des_eusilc_rep )
svyarpt( ~ py010n , design = des_eusilc_rep , na.rm = TRUE )


# database-backed design
library(RSQLite)
library(DBI)
dbfile <- tempfile()
conn <- dbConnect( RSQLite::SQLite() , dbfile )
dbWriteTable( conn , 'eusilc' , eusilc )

dbd_eusilc <-
svydesign(
ids = ~rb030 ,
strata = ~db040 ,
weights = ~rb050 ,
data="eusilc",
dbname=dbfile,
dbtype="SQLite"
)

dbd_eusilc <- convey_prep( dbd_eusilc )

svyarpt( ~ eqincome , design = dbd_eusilc )

dbRemoveTable( conn , 'eusilc' )

dbDisconnect( conn , shutdown = TRUE )


## End(Not run)
```

---

svyatk *Atkinson index*

Description

Estimate the Atkinson index, an inequality measure

Usage

```
svyatk(formula, design, ...)

## S3 method for class 'survey.design'
svyatk(
  formula,
  design,
  epsilon = 1,
  na.rm = FALSE,
  deff = FALSE,
  linearized = FALSE,
  influence = FALSE,
  ...
)

## S3 method for class 'svyrep.design'
svyatk(
  formula,
  design,
  epsilon = 1,
  na.rm = FALSE,
  deff = FALSE,
  linearized = FALSE,
  return.replicates = FALSE,
  ...
)

## S3 method for class 'DBIsvydesign'
svyatk(formula, design, ...)
```

Arguments

formula	a formula specifying the income variable
design	a design object of class survey.design or class svyrep.design from the survey library.
...	future expansion
epsilon	a parameter that determines the sensivity towards inequality in the bottom of the distribution. Defaults to epsilon = 1.
na.rm	Should cases with missing values be dropped?
deff	Return the design effect (see survey::svymean)
linearized	Should a matrix of linearized variables be returned
influence	Should a matrix of (weighted) influence functions be returned? (for compatibility with svyby)
return.replicates	Return the replicate estimates?

Details

you must run the convey_prep function on your survey design object immediately after creating it with the svydesign or svrepdesign function.

Value

Object of class "cvystat", which are vectors with a "var" attribute giving the variance and a "statistic" attribute giving the name of the statistic.

Author(s)

Guilherme Jacob, Djalma Pessoa and Anthony Damico

References

Matti Langel (2012). Measuring inequality in finite population sampling. PhD thesis: Universite de Neuchatel, URL https://doc.rero.ch/record/29204/files/00002252.pdf.

Martin Biewen and Stephen Jenkins (2002). Estimation of Generalized Entropy and Atkinson Inequality Indices from Complex Survey Data. *DIW Discussion Papers*, No.345, URL https://www.diw.de/documents/publikationen/73/diw_01.c.40394.de/dp345.pdf.

See Also

svygei

Examples

```
library(survey)
library(laeken)
data(eusilc) ; names( eusilc ) <- tolower( names( eusilc ) )

# linearized design
des_eusilc <- svydesign( ids = ~rb030 , strata = ~db040 ,  weights = ~rb050 , data = eusilc )
des_eusilc <- convey_prep(des_eusilc)

# replicate-weighted design
des_eusilc_rep <- as.svrepdesign( des_eusilc , type = "bootstrap" )
des_eusilc_rep <- convey_prep(des_eusilc_rep)


# subset all designs to positive income and non-missing records only
des_eusilc_pos_inc <- subset( des_eusilc , eqincome > 0 )
des_eusilc_rep_pos_inc <- subset( des_eusilc_rep , eqincome > 0 )


# linearized design
svyatk( ~eqincome , des_eusilc_pos_inc, epsilon = .5 )
svyatk( ~eqincome , des_eusilc_pos_inc )
svyatk( ~eqincome , des_eusilc_pos_inc, epsilon = 2 )

# replicate-weighted design
```

```
svyatk( ~eqincome , des_eusilc_rep_pos_inc, epsilon = .5 )
svyatk( ~eqincome , des_eusilc_rep_pos_inc )
svyatk( ~eqincome , des_eusilc_rep_pos_inc, epsilon = 2 )


# subsetting
svyatk( ~eqincome , subset(des_eusilc_pos_inc, db040 == "Styria"), epsilon = .5 )
svyatk( ~eqincome , subset(des_eusilc_pos_inc, db040 == "Styria") )
svyatk( ~eqincome , subset(des_eusilc_pos_inc, db040 == "Styria"), epsilon = 2 )

svyatk( ~eqincome , subset(des_eusilc_rep_pos_inc, db040 == "Styria"), epsilon = .5 )
svyatk( ~eqincome , subset(des_eusilc_rep_pos_inc, db040 == "Styria") )
svyatk( ~eqincome , subset(des_eusilc_rep_pos_inc, db040 == "Styria"), epsilon = 2 )

## Not run:

# linearized design using a variable with missings (but subsetted to remove negatives)
svyatk( ~py010n , subset(des_eusilc, py010n > 0 | is.na(py010n)), epsilon = .5 )
svyatk( ~py010n , subset(des_eusilc, py010n > 0 | is.na(py010n)), epsilon = .5 , na.rm=TRUE )

# replicate-weighted design using a variable with missings (but subsetted to remove negatives)
svyatk( ~py010n , subset(des_eusilc_rep, py010n > 0 | is.na(py010n)), epsilon = .5 )
svyatk( ~py010n , subset(des_eusilc_rep, py010n > 0 | is.na(py010n)), epsilon = .5 , na.rm=TRUE )


# database-backed design
library(RSQLite)
library(DBI)
dbfile <- tempfile()
conn <- dbConnect( RSQLite::SQLite() , dbfile )
dbWriteTable( conn , 'eusilc' , eusilc )

dbd_eusilc <-
svydesign(
ids = ~rb030 ,
strata = ~db040 ,
weights = ~rb050 ,
data="eusilc",
dbname=dbfile,
dbtype="SQLite"
)

dbd_eusilc <- convey_prep( dbd_eusilc )


# subset all designs to positive income and non-missing records only
dbd_eusilc_pos_inc <- subset( dbd_eusilc , eqincome > 0 )


# database-backed linearized design
svyatk( ~eqincome , dbd_eusilc_pos_inc, epsilon = .5 )
svyatk( ~eqincome , dbd_eusilc_pos_inc )
svyatk( ~eqincome , dbd_eusilc_pos_inc, epsilon = 2 )
```

```
svyatk( ~eqincome , subset(dbd_eusilc_pos_inc, db040 == "Styria"), epsilon = .5 )
svyatk( ~eqincome , subset(dbd_eusilc_pos_inc, db040 == "Styria") )
svyatk( ~eqincome , subset(dbd_eusilc_pos_inc, db040 == "Styria"), epsilon = 2 )

# database-backed linearized design using a variable with missings
# (but subsetted to remove negatives)
svyatk( ~py010n , subset(dbd_eusilc, py010n > 0 | is.na(py010n)), epsilon = .5 )
svyatk( ~py010n , subset(dbd_eusilc, py010n > 0 | is.na(py010n)), epsilon = .5 , na.rm=TRUE )


dbRemoveTable( conn , 'eusilc' )

dbDisconnect( conn , shutdown = TRUE )


## End(Not run)
```

---

svyfgt *FGT measure of poverty*

Description

Estimate the FGT measure.

Usage

```
svyfgt(formula, design, ...)

## S3 method for class 'survey.design'
svyfgt(
  formula,
  design,
  g,
  type_thresh = "abs",
  abs_thresh = NULL,
  percent = 0.6,
  quantiles = 0.5,
  na.rm = FALSE,
  thresh = FALSE,
  deff = FALSE,
  linearized = FALSE,
  influence = FALSE,
  ...
)

## S3 method for class 'svyrep.design'
```

```
svyfgt(
  formula,
  design,
  g,
  type_thresh = "abs",
  abs_thresh = NULL,
  percent = 0.6,
  quantiles = 0.5,
  na.rm = FALSE,
  thresh = FALSE,
  deff = FALSE,
  linearized = FALSE,
  return.replicates = FALSE,
  ...
)

## S3 method for class 'DBIsvydesign'
svyfgt(formula, design, ...)
```

Arguments

formula	a formula specifying the income variable
design	a design object of class survey.design or class svyrep.design from the survey library.
...	passed to svyarpr and svyarpt
g	If g=0 estimates the headcount ratio; If g=1 estimates the average normalised poverty gap, and if g=2 estimates the average squared normalised poverty gap
type_thresh	type of poverty threshold. If "abs" the threshold is fixed and given the value of abs_thresh; if "relq" it is given by percent times the quantile; if "relm" it is percent times the mean.
abs_thresh	poverty threshold value if type_thresh is "abs"
percent	the multiple of the the quantile or mean used in the poverty threshold definition
quantiles	the quantile used used in the poverty threshold definition
na.rm	Should cases with missing values be dropped?
thresh	return the poverty threshold value
deff	Return the design effect (see survey::svymean)
linearized	Should a matrix of linearized variables be returned?
influence	Should a matrix of (weighted) influence functions be returned? (for compatibility with svyby). Not implemented yet for linearized designs.
return.replicates	Return the replicate estimates?

Details

you must run the convey_prep function on your survey design object immediately after creating it with the svydesign or svrepdesign function.

The FGT poverty measures have three special cases. When g = 0, the FGT measure is the headcount poverty rate, assigning the same "poverty-weight" to all persons below the poverty line. When g = 1, it becomes the poverty gap ratio, a measure which accounts for the intensity of income shortfall among the poor. When g = 2. it becomes the squared poverty gap ratio, a measure that also accounts for inequality of poverty intesity across the poor. The g is a poverty sensitivity parameter, adding more weight to people with greater income shortfalls as it increases.

Value

Object of class "cvystat", which are vectors with a "var" attribute giving the variance and a "statistic" attribute giving the name of the statistic.

Author(s)

Djalma Pessoa, Anthony Damico, and Guilherme Jacob

References

James Foster, Joel Greer and Erik Thorbecke (1984). A class of decomposable poverty measures. *Econometrica*, Vol.52, No.3, pp. 761-766.

Y.G. Berger and C. J. Skinner (2003), Variance estimation for a low income proportion. *Journal of the Royal Statistical Society: Series C (Applied Statistics)*, Vol. 52, No. 4, pp. 457-468. DOI doi:10.1111/14679876.00417

Buhong Zheng (2001). Statistical inference for poverty measures with relative poverty lines. *Journal of Econometrics*, Vol. 101, pp. 337-356.

Guillaume Osier (2009). Variance estimation for complex indicators of poverty and inequality. *Journal of the European Survey Research Association*, Vol.3, No.3, pp. 167-195, ISSN 1864-3361, URL https://ojs.ub.uni-konstanz.de/srm/article/view/369.

Jean-Claude Deville (1999). Variance estimation for complex statistics and estimators: linearization and residual techniques. Survey Methodology, 25, 193-203, URL https://www150.statcan.gc.ca/n1/en/catalogue/12-001-X19990024882.

See Also

svyarpt

Examples

```
library(survey)
library(laeken)
data(eusilc) ; names( eusilc ) <- tolower( names( eusilc ) )

# linearized design

des_eusilc <- svydesign( ids = ~rb030 , strata = ~db040 ,  weights = ~rb050 , data = eusilc )
```

```
des_eusilc <- convey_prep( des_eusilc )

# replicate-weighted design
des_eusilc_rep <- as.svrepdesign( des_eusilc , type = "bootstrap" )
des_eusilc_rep <- convey_prep( des_eusilc_rep )

# headcount ratio, poverty threshold fixed
svyfgt(~eqincome, des_eusilc, g=0,  abs_thresh=10000)
# poverty gap index, poverty threshold fixed
svyfgt(~eqincome, des_eusilc, g=1,  abs_thresh=10000)
# headcount ratio, poverty threshold equal to arpt
svyfgt(~eqincome, des_eusilc, g=0, type_thresh= "relq" , thresh = TRUE)
# poverty gap index, poverty threshold equal to arpt
svyfgt(~eqincome, des_eusilc, g=1, type_thresh= "relq", thresh = TRUE)
# headcount ratio, poverty threshold equal to .6 times the mean
svyfgt(~eqincome, des_eusilc, g=0, type_thresh= "relm", thresh = TRUE)
# poverty gap index, poverty threshold equal to 0.6 times the mean
svyfgt(~eqincome, des_eusilc, g=1, type_thresh= "relm" , thresh = TRUE)

#  using svrep.design:
# headcount ratio, poverty threshold fixed
svyfgt(~eqincome, des_eusilc_rep, g=0,  abs_thresh=10000)
# poverty gap index, poverty threshold fixed
svyfgt(~eqincome, des_eusilc, g=1,  abs_thresh=10000)
# headcount ratio, poverty threshold equal to arpt
svyfgt(~eqincome, des_eusilc_rep, g=0, type_thresh= "relq" , thresh = TRUE)
# poverty gap index, poverty threshold equal to arpt
svyfgt(~eqincome, des_eusilc, g=1, type_thresh= "relq", thresh = TRUE)
# headcount ratio, poverty threshold equal to .6 times the mean
svyfgt(~eqincome, des_eusilc_rep, g=0, type_thresh= "relm" , thresh = TRUE)
# poverty gap index, poverty threshold equal to 0.6 times the mean
svyfgt(~eqincome, des_eusilc_rep, g=1, type_thresh= "relm", thresh = TRUE)

## Not run:

# database-backed design
library(RSQLite)
library(DBI)
dbfile <- tempfile()
conn <- dbConnect( RSQLite::SQLite() , dbfile )
dbWriteTable( conn , 'eusilc' , eusilc )

dbd_eusilc <-
svydesign(
ids = ~rb030 ,
strata = ~db040 ,
weights = ~rb050 ,
data="eusilc",
dbname=dbfile,
dbtype="SQLite"
)
```

```
dbd_eusilc <- convey_prep( dbd_eusilc )

# headcount ratio, poverty threshold fixed
svyfgt(~eqincome, dbd_eusilc, g=0, abs_thresh=10000)
# poverty gap index, poverty threshold fixed
svyfgt(~eqincome, dbd_eusilc, g=1, abs_thresh=10000)
# headcount ratio, poverty threshold equal to arpt
svyfgt(~eqincome, dbd_eusilc, g=0, type_thresh= "relq", thresh = TRUE)
# poverty gap index, poverty threshold equal to arpt
svyfgt(~eqincome, dbd_eusilc, g=1, type_thresh= "relq")
# headcount ratio, poverty threshold equal to .6 times the mean
svyfgt(~eqincome, dbd_eusilc, g=0, type_thresh= "relm")
# poverty gap index, poverty threshold equal to 0.6 times the mean
svyfgt(~eqincome, dbd_eusilc, g=1, type_thresh= "relm")

dbRemoveTable( conn , 'eusilc' )

dbDisconnect( conn , shutdown = TRUE )


## End(Not run)
```

---

svyfgtdec *FGT indices decomposition*

Description

Estimate the Foster et al. (1984) poverty class and its components

Usage

```
svyfgtdec(formula, design, ...)

## S3 method for class 'survey.design'
svyfgtdec(
  formula,
  design,
  g,
  type_thresh = "abs",
  abs_thresh = NULL,
  percent = 0.6,
  quantiles = 0.5,
  na.rm = FALSE,
  thresh = FALSE,
  ...
)

## S3 method for class 'svyrep.design'
```

```
svyfgtdec(
  formula,
  design,
  g,
  type_thresh = "abs",
  abs_thresh = NULL,
  percent = 0.6,
  quantiles = 0.5,
  na.rm = FALSE,
  thresh = FALSE,
  return.replicates = FALSE,
  ...
)

## S3 method for class 'DBIsvydesign'
svyfgtdec(formula, design, ...)
```

Arguments

formula	a formula specifying the income variable
design	a design object of class survey.design or class svyrep.design from the survey library.
...	additional arguments. Currently not used.
g	If g=2 estimates the average squared normalised poverty gap. This function is defined for g >= 2 only,
type_thresh	type of poverty threshold. If "abs" the threshold is fixed and given the value of abs_thresh; if "relq" it is given by percent times the quantile; if "relm" it is percent times the mean.
abs_thresh	poverty threshold value if type_thresh is "abs"
percent	the multiple of the the quantile or mean used in the poverty threshold definition
quantiles	the quantile used used in the poverty threshold definition
na.rm	Should cases with missing values be dropped?
thresh	return the poverty threshold value
return.replicates	Return the replicate estimates?

Details

you must run the convey_prep function on your survey design object immediately after creating it with the svydesign or svrepdesign function.

Value

Object of class "cvydstat", with estimates for the FGT(g), FGT(0), FGT(1), income gap ratio and GEI(income gaps; epsilon = g) with a "var" attribute giving the variance-covariance matrix. A "statistic" attribute giving the name of the statistic.

Author(s)

Guilherme Jacob, Djalma Pessoa and Anthony Damico

References

Oihana Aristondo, Cassilda Lasso De La vega and Ana Urrutia (2010). A new multiplicative decomposition for the Foster-Greer-Thorbecke poverty indices. *Bulletin of Economic Research*, Vol.62, No.3, pp. 259-267. University of Wisconsin. <doi:10.1111/j.1467-8586.2009.00320.x>

James Foster, Joel Greer and Erik Thorbecke (1984). A class of decomposable poverty measures. *Econometrica*, Vol.52, No.3, pp. 761-766.

Guillaume Osier (2009). Variance estimation for complex indicators of poverty and inequality. *Journal of the European Survey Research Association*, Vol.3, No.3, pp. 167-195, ISSN 1864-3361, URL https://ojs.ub.uni-konstanz.de/srm/article/view/369.

Jean-Claude Deville (1999). Variance estimation for complex statistics and estimators: linearization and residual techniques. Survey Methodology, 25, 193-203, URL https://www150.statcan.gc.ca/n1/en/catalogue/12-001-X19990024882.

See Also

svyfgt, svyfgt, svyfgt

Examples

```
library(survey)
library(laeken)
data(eusilc) ; names( eusilc ) <- tolower( names( eusilc ) )

# linearized design

des_eusilc <- svydesign( ids = ~rb030 , strata = ~db040 ,  weights = ~rb050 , data = eusilc )
des_eusilc <- convey_prep( des_eusilc )

# replicate-weighted design
des_eusilc_rep <- as.svrepdesign( des_eusilc , type = "bootstrap" )
des_eusilc_rep <- convey_prep( des_eusilc_rep )

# absolute poverty threshold
svyfgtdec(~eqincome, des_eusilc, g=2, abs_thresh=10000)
# poverty threshold equal to arpt
svyfgtdec(~eqincome, des_eusilc, g=2, type_thresh= "relq" , thresh = TRUE)
# poverty threshold equal to 0.6 times the mean
svyfgtdec(~eqincome, des_eusilc, g=2, type_thresh= "relm" , thresh = TRUE)

# using svrep.design:
# absolute poverty threshold
svyfgtdec(~eqincome, des_eusilc_rep, g=2, abs_thresh=10000)
# poverty threshold equal to arpt
svyfgtdec(~eqincome, des_eusilc_rep, g=2, type_thresh= "relq" , thresh = TRUE)
# poverty threshold equal to 0.6 times the mean
svyfgtdec(~eqincome, des_eusilc_rep, g=2, type_thresh= "relm" , thresh = TRUE)
```

```
## Not run:

# database-backed design
library(RSQLite)
library(DBI)
dbfile <- tempfile()
conn <- dbConnect( RSQLite::SQLite() , dbfile )
dbWriteTable( conn , 'eusilc' , eusilc )

dbd_eusilc <-
svydesign(
ids = ~rb030 ,
strata = ~db040 ,
weights = ~rb050 ,
data="eusilc",
dbname=dbfile,
dbtype="SQLite"
)


dbd_eusilc <- convey_prep( dbd_eusilc )


# absolute poverty threshold
svyfgtdec(~eqincome, dbd_eusilc, g=2, abs_thresh=10000)
# poverty threshold equal to arpt
svyfgtdec(~eqincome, dbd_eusilc, g=2, type_thresh= "relq" , thresh = TRUE)
# poverty threshold equal to 0.6 times the mean
svyfgtdec(~eqincome, dbd_eusilc, g=2, type_thresh= "relm" , thresh = TRUE)

dbRemoveTable( conn , 'eusilc' )

dbDisconnect( conn , shutdown = TRUE )


## End(Not run)
```

---

svygei *Generalized entropy index*

Description

Estimate the generalized entropy index, a measure of inequality

Usage

```
svygei(formula, design, ...)
```

```
## S3 method for class 'survey.design'
svygei(
  formula,
  design,
  epsilon = 1,
  na.rm = FALSE,
  deff = FALSE,
  linearized = FALSE,
  influence = FALSE,
  ...
)

## S3 method for class 'svyrep.design'
svygei(
  formula,
  design,
  epsilon = 1,
  na.rm = FALSE,
  deff = FALSE,
  linearized = FALSE,
  return.replicates = FALSE,
  ...
)

## S3 method for class 'DBIsvydesign'
svygei(formula, design, ...)
```

Arguments

formula	a formula specifying the income variable
design	a design object of class survey.design or class svyrep.design from the survey library.
...	future expansion
epsilon	a parameter that determines the sensivity towards inequality in the top of the distribution. Defaults to epsilon = 1.
na.rm	Should cases with missing values be dropped?
deff	Return the design effect (see survey::svymean)
linearized	Should a matrix of linearized variables be returned
influence	Should a matrix of (weighted) influence functions be returned? (for compatibility with svyby)
return.replicates	Return the replicate estimates?

Details

you must run the convey_prep function on your survey design object immediately after creating it with the svydesign or svrepdesign function.

This measure only allows for strictly positive variables.

Value

Object of class "cvystat", which are vectors with a "var" attribute giving the variance and a "statistic" attribute giving the name of the statistic.

Author(s)

Guilherme Jacob, Djalma Pessoa and Anthony Damico

References

Matti Langel (2012). Measuring inequality in finite population sampling. PhD thesis: Universite de Neuchatel, URL https://doc.rero.ch/record/29204/files/00002252.pdf.

Martin Biewen and Stephen Jenkins (2002). Estimation of Generalized Entropy and Atkinson Inequality Indices from Complex Survey Data. *DIW Discussion Papers*, No.345, URL https://www.diw.de/documents/publikationen/73/diw_01.c.40394.de/dp345.pdf.

See Also

svyatk

Examples

```
library(survey)
library(laeken)
data(eusilc) ; names( eusilc ) <- tolower( names( eusilc ) )

# linearized design
des_eusilc <- svydesign( ids = ~rb030 , strata = ~db040 ,  weights = ~rb050 , data = eusilc )
des_eusilc <- convey_prep(des_eusilc)

# replicate-weighted design
des_eusilc_rep <- as.svrepdesign( des_eusilc , type = "bootstrap" )
des_eusilc_rep <- convey_prep(des_eusilc_rep)

# linearized design
svygei( ~eqincome , subset(des_eusilc, eqincome > 0), epsilon = 0 )
svygei( ~eqincome , subset(des_eusilc, eqincome > 0), epsilon = .5 )
svygei( ~eqincome , subset(des_eusilc, eqincome > 0), epsilon = 1 )
svygei( ~eqincome , subset(des_eusilc, eqincome > 0), epsilon = 2 )

# replicate-weighted design
svygei( ~eqincome , subset(des_eusilc_rep, eqincome > 0), epsilon = 0 )
svygei( ~eqincome , subset(des_eusilc_rep, eqincome > 0), epsilon = .5 )
svygei( ~eqincome , subset(des_eusilc_rep, eqincome > 0), epsilon = 1 )
svygei( ~eqincome , subset(des_eusilc_rep, eqincome > 0), epsilon = 2 )

## Not run:
```

```
# linearized design using a variable with missings
svygei( ~py010n , subset(des_eusilc, py010n > 0 | is.na(py010n) ), epsilon = 0 )
svygei( ~py010n , subset(des_eusilc, py010n > 0 | is.na(py010n) ), epsilon = 0, na.rm = TRUE )
svygei( ~py010n , subset(des_eusilc, py010n > 0 | is.na(py010n) ), epsilon = .5 )
svygei( ~py010n , subset(des_eusilc, py010n > 0 | is.na(py010n) ), epsilon = .5, na.rm = TRUE )
svygei( ~py010n , subset(des_eusilc, py010n > 0 | is.na(py010n) ), epsilon = 1 )
svygei( ~py010n , subset(des_eusilc, py010n > 0 | is.na(py010n) ), epsilon = 1, na.rm = TRUE )
svygei( ~py010n , subset(des_eusilc, py010n > 0 | is.na(py010n) ), epsilon = 2 )
svygei( ~py010n , subset(des_eusilc, py010n > 0 | is.na(py010n) ), epsilon = 2, na.rm = TRUE )

# replicate-weighted design using a variable with missings
svygei( ~py010n , subset(des_eusilc_rep, py010n > 0 | is.na(py010n) ), epsilon = 0 )
svygei( ~py010n , subset(des_eusilc_rep, py010n > 0 | is.na(py010n) ), epsilon = 0, na.rm = TRUE )
svygei( ~py010n , subset(des_eusilc_rep, py010n > 0 | is.na(py010n) ), epsilon = .5 )
svygei( ~py010n , subset(des_eusilc_rep, py010n > 0 | is.na(py010n) ), epsilon = .5, na.rm = TRUE )
svygei( ~py010n , subset(des_eusilc_rep, py010n > 0 | is.na(py010n) ), epsilon = 1 )
svygei( ~py010n , subset(des_eusilc_rep, py010n > 0 | is.na(py010n) ), epsilon = 1, na.rm = TRUE )
svygei( ~py010n , subset(des_eusilc_rep, py010n > 0 | is.na(py010n) ), epsilon = 2 )
svygei( ~py010n , subset(des_eusilc_rep, py010n > 0 | is.na(py010n) ), epsilon = 2, na.rm = TRUE )

# database-backed design
library(RSQLite)
library(DBI)
dbfile <- tempfile()
conn <- dbConnect( RSQLite::SQLite() , dbfile )
dbWriteTable( conn , 'eusilc' , eusilc )

dbd_eusilc <-
svydesign(
ids = ~rb030 ,
strata = ~db040 ,
weights = ~rb050 ,
data="eusilc",
dbname=dbfile,
dbtype="SQLite"
)

dbd_eusilc <- convey_prep( dbd_eusilc )

# database-backed linearized design
svygei( ~eqincome , subset(dbd_eusilc, eqincome > 0), epsilon = 0 )
svygei( ~eqincome , dbd_eusilc, epsilon = .5 )
svygei( ~eqincome , subset(dbd_eusilc, eqincome > 0), epsilon = 1 )
svygei( ~eqincome , dbd_eusilc, epsilon = 2 )

# database-backed linearized design using a variable with missings
svygei( ~py010n , subset(dbd_eusilc, py010n > 0 | is.na(py010n) ), epsilon = 0 )
svygei( ~py010n , subset(dbd_eusilc, py010n > 0 | is.na(py010n) ), epsilon = 0, na.rm = TRUE )
svygei( ~py010n , dbd_eusilc, epsilon = .5 )
svygei( ~py010n , dbd_eusilc, epsilon = .5, na.rm = TRUE )
svygei( ~py010n , subset(dbd_eusilc, py010n > 0 | is.na(py010n) ), epsilon = 1 )
svygei( ~py010n , subset(dbd_eusilc, py010n > 0 | is.na(py010n) ), epsilon = 1, na.rm = TRUE )
svygei( ~py010n , dbd_eusilc, epsilon = 2 )
```

```
svygei( ~py010n , dbd_eusilc, epsilon = 2, na.rm = TRUE )

dbRemoveTable( conn , 'eusilc' )

dbDisconnect( conn , shutdown = TRUE )


## End(Not run)
```

---

svygeidec *Generalized Entropy Index Decomposition*

Description

Estimates the group decomposition of the generalized entropy index

Usage

```
svygeidec(formula, subgroup, design, ...)

## S3 method for class 'survey.design'
svygeidec(
  formula,
  subgroup,
  design,
  epsilon = 1,
  na.rm = FALSE,
  deff = FALSE,
  linearized = FALSE,
  influence = FALSE,
  ...
)

## S3 method for class 'svyrep.design'
svygeidec(
  formula,
  subgroup,
  design,
  epsilon = 1,
  na.rm = FALSE,
  deff = FALSE,
  linearized = FALSE,
  return.replicates = FALSE,
  ...
)

## S3 method for class 'DBIsvydesign'
svygeidec(formula, subgroup, design, ...)
```

Arguments

formula	a formula specifying the income variable
subgroup	a formula specifying the group variable
design	a design object of class survey.design or class svyrep.design from the survey library.
...	future expansion
epsilon	a parameter that determines the sensivity towards inequality in the top of the distribution. Defaults to epsilon = 1.
na.rm	Should cases with missing values be dropped? Observations containing missing values in income or group variables will be dropped.
deff	Return the design effect (see survey::svymean)
linearized	Should a matrix of linearized variables be returned
influence	Should a matrix of (weighted) influence functions be returned? (for compatibility with svyby)
return.replicates	Return the replicate estimates?

Details

you must run the convey_prep function on your survey design object immediately after creating it with the svydesign or svrepdesign function.

This measure only allows for strictly positive variables.

Value

Object of class "cvydstat", which are vectors with a "var" attribute giving the variance-covariance matrix and a "statistic" attribute giving the name of the statistic.

Author(s)

Guilherme Jacob, Djalma Pessoa and Anthony Damico

References

Anthony F. Shorrocks (1984). Inequality decomposition groups population subgroups. *Econometrica*, v. 52, n. 6, 1984, pp. 1369-1385. DOI doi:10.2307/1913511.

Martin Biewen and Stephen Jenkins (2002). Estimation of Generalized Entropy and Atkinson Inequality Indices from Complex Survey Data. *DIW Discussion Papers*, No.345, URL https://www.diw.de/documents/publikationen/73/diw_01.c.40394.de/dp345.pdf.

See Also

svygei

Examples

```
library(survey)
library(laeken)
data(eusilc) ; names( eusilc ) <- tolower( names( eusilc ) )

# linearized design
des_eusilc <- svydesign( ids = ~rb030 , strata = ~db040 ,  weights = ~rb050 , data = eusilc )
des_eusilc <- convey_prep(des_eusilc)

# replicate-weighted design
des_eusilc_rep <- as.svrepdesign( des_eusilc , type = "bootstrap" )
des_eusilc_rep <- convey_prep(des_eusilc_rep)

# linearized design
svygeidec( ~eqincome , ~rb090 , subset( des_eusilc, eqincome > 0 ) , epsilon = 0 )
svygeidec( ~eqincome , ~rb090 , subset( des_eusilc, eqincome > 0 ) , epsilon = .5 )
svygeidec( ~eqincome , ~rb090 , subset( des_eusilc, eqincome > 0 ) , epsilon = 1 )
svygeidec( ~eqincome , ~rb090 , subset( des_eusilc, eqincome > 0 ) , epsilon = 2 )

# replicate-weighted design
svygeidec( ~eqincome , ~rb090 , subset( des_eusilc_rep, eqincome > 0 ) , epsilon = 0 )
svygeidec( ~eqincome , ~rb090 , subset( des_eusilc_rep, eqincome > 0 ) , epsilon = .5 )
svygeidec( ~eqincome , ~rb090 , subset( des_eusilc_rep, eqincome > 0 ) , epsilon = 1 )
svygeidec( ~eqincome , ~rb090 , subset( des_eusilc_rep, eqincome > 0 ) , epsilon = 2 )

## Not run:

# linearized design using a variable with missings
sub_des_eusilc <- subset(des_eusilc, py010n > 0 | is.na(py010n) )
svygeidec( ~py010n , ~rb090 , sub_des_eusilc , epsilon = 0 )
svygeidec( ~py010n , ~rb090 , sub_des_eusilc , epsilon = 0, na.rm = TRUE )
svygeidec( ~py010n , ~rb090 , sub_des_eusilc , epsilon = 1 )
svygeidec( ~py010n , ~rb090 , sub_des_eusilc , epsilon = 1, na.rm = TRUE )

# replicate-weighted design using a variable with missings
sub_des_eusilc_rep <- subset(des_eusilc_rep, py010n > 0 | is.na(py010n) )
svygeidec( ~py010n , ~rb090 , sub_des_eusilc_rep , epsilon = 0 )
svygeidec( ~py010n , ~rb090 , sub_des_eusilc_rep , epsilon = 0, na.rm = TRUE )
svygeidec( ~py010n , ~rb090 , sub_des_eusilc_rep , epsilon = 1 )
svygeidec( ~py010n , ~rb090 , sub_des_eusilc_rep , epsilon = 1, na.rm = TRUE )

# database-backed design
library(RSQLite)
library(DBI)
dbfile <- tempfile()
conn <- dbConnect( RSQLite::SQLite() , dbfile )
dbWriteTable( conn , 'eusilc' , eusilc )

dbd_eusilc <-
svydesign(
ids = ~rb030 ,
strata = ~db040 ,
```

```
weights = ~rb050 ,
data="eusilc",
dbname=dbfile,
dbtype="SQLite"
)

dbd_eusilc <- convey_prep( dbd_eusilc )

# database-backed linearized design
svygeidec( ~eqincome , ~rb090 , subset(dbd_eusilc, eqincome > 0) , epsilon = 0 )
svygeidec( ~eqincome , ~rb090 , subset(dbd_eusilc, eqincome > 0) , epsilon = .5 )
svygeidec( ~eqincome , ~rb090 , subset(dbd_eusilc, eqincome > 0) , epsilon = 1 )
svygeidec( ~eqincome , ~rb090 , subset(dbd_eusilc, eqincome > 0) , epsilon = 2 )

# database-backed linearized design using a variable with missings
sub_dbd_eusilc <- subset(dbd_eusilc, py010n > 0 | is.na(py010n) )
svygeidec( ~py010n , ~rb090 , sub_dbd_eusilc , epsilon = 0 )
svygeidec( ~py010n , ~rb090 , sub_dbd_eusilc , epsilon = 0, na.rm = TRUE )
svygeidec( ~py010n , ~rb090 , sub_dbd_eusilc , epsilon = .5 )
svygeidec( ~py010n , ~rb090 , sub_dbd_eusilc , epsilon = .5, na.rm = TRUE )
svygeidec( ~py010n , ~rb090 , sub_dbd_eusilc , epsilon = 1 )
svygeidec( ~py010n , ~rb090 , sub_dbd_eusilc , epsilon = 1, na.rm = TRUE )
svygeidec( ~py010n , ~rb090 , sub_dbd_eusilc , epsilon = 2 )
svygeidec( ~py010n , ~rb090 , sub_dbd_eusilc , epsilon = 2, na.rm = TRUE )

dbRemoveTable( conn , 'eusilc' )

dbDisconnect( conn , shutdown = TRUE )


## End(Not run)
```

---

svygini *Gini coefficient*

Description

Estimate the Gini coefficient, an inequality measure

Usage

```
svygini(formula, design, ...)

## S3 method for class 'survey.design'
svygini(
  formula,
  design,
  na.rm = FALSE,
  deff = FALSE,
```

```
  linearized = FALSE,
  influence = FALSE,
  ...
)

## S3 method for class 'svyrep.design'
svygini(
  formula,
  design,
  na.rm = FALSE,
  deff = FALSE,
  linearized = FALSE,
  return.replicates = FALSE,
  ...
)

## S3 method for class 'DBIsvydesign'
svygini(formula, design, ...)
```

Arguments

formula	a formula specifying the income variable
design	a design object of class survey.design or class svyrep.design from the survey library.
...	future expansion
na.rm	Should cases with missing values be dropped?
deff	Return the design effect (see survey::svymean)
linearized	Should a matrix of linearized variables be returned
influence	Should a matrix of (weighted) influence functions be returned? (for compatibility with svyby)
return.replicates	Return the replicate estimates?

Details

you must run the convey_prep function on your survey design object immediately after creating it with the svydesign or svrepdesign function.

Value

Object of class "cvystat", which are vectors with a "var" attribute giving the variance and a "statistic" attribute giving the name of the statistic.

Author(s)

Djalma Pessoa, Guilherme Jacob, and Anthony Damico

References

Guillaume Osier (2009). Variance estimation for complex indicators of poverty and inequality. *Journal of the European Survey Research Association*, Vol.3, No.3, pp. 167-195, ISSN 1864-3361, URL https://ojs.ub.uni-konstanz.de/srm/article/view/369.

Jean-Claude Deville (1999). Variance estimation for complex statistics and estimators: linearization and residual techniques. Survey Methodology, 25, 193-203, URL https://www150.statcan.gc.ca/n1/en/catalogue/12-001-X19990024882.

See Also

svyarpr

Examples

```
library(survey)
library(laeken)
data(eusilc) ; names( eusilc ) <- tolower( names( eusilc ) )

# linearized design
des_eusilc <- svydesign( ids = ~rb030 , strata = ~db040 ,  weights = ~rb050 , data = eusilc )
des_eusilc <- convey_prep(des_eusilc)

svygini( ~eqincome , design = des_eusilc )

# replicate-weighted design
des_eusilc_rep <- as.svrepdesign( des_eusilc , type = "bootstrap" )
des_eusilc_rep <- convey_prep(des_eusilc_rep)

svygini( ~eqincome , design = des_eusilc_rep )

## Not run:

# linearized design using a variable with missings
svygini( ~ py010n , design = des_eusilc )
svygini( ~ py010n , design = des_eusilc , na.rm = TRUE )
# replicate-weighted design using a variable with missings
svygini( ~ py010n , design = des_eusilc_rep )
svygini( ~ py010n , design = des_eusilc_rep , na.rm = TRUE )

# database-backed design
library(RSQLite)
library(DBI)
dbfile <- tempfile()
conn <- dbConnect( RSQLite::SQLite() , dbfile )
dbWriteTable( conn , 'eusilc' , eusilc )

dbd_eusilc <-
svydesign(
ids = ~rb030 ,
strata = ~db040 ,
weights = ~rb050 ,
```

```
data="eusilc",
dbname=dbfile,
dbtype="SQLite"
)

dbd_eusilc <- convey_prep( dbd_eusilc )

svygini( ~ eqincome , design = dbd_eusilc )

dbRemoveTable( conn , 'eusilc' )

dbDisconnect( conn , shutdown = TRUE )


## End(Not run)
```

---

svygpg *Linearization of the gender pay (wage) gap*

Description

Estimate the difference between the average gross hourly earnings of men and women expressed as a percentage of the average gross hourly earnings of men.

Usage

```
svygpg(formula, design, ...)

## S3 method for class 'survey.design'
svygpg(formula, design, sex, na.rm = FALSE, ...)

## S3 method for class 'svyrep.design'
svygpg(formula, design, sex, na.rm = FALSE, ...)

## S3 method for class 'DBIsvydesign'
svygpg(formula, design, sex, ...)
```

Arguments

formula	a formula specifying the gross hourly earnings variable
design	a design object of class survey.design or class svyrep.design from the survey library.
...	future expansion
sex	formula with a factor with labels 'male' and 'female'
na.rm	Should cases with missing values be dropped?

Details

you must run the convey_prep function on your survey design object immediately after creating it with the svydesign or svrepdesign function.

Value

Object of class "cvystat", which are vectors with a "var" attribute giving the variance and a "statistic" attribute giving the name of the statistic.

Author(s)

Djalma Pessoa and Anthony Damico

References

Guillaume Osier (2009). Variance estimation for complex indicators of poverty and inequality. *Journal of the European Survey Research Association*, Vol.3, No.3, pp. 167-195, ISSN 1864-3361, URL https://ojs.ub.uni-konstanz.de/srm/article/view/369.

Jean-Claude Deville (1999). Variance estimation for complex statistics and estimators: linearization and residual techniques. Survey Methodology, 25, 193-203, URL https://www150.statcan.gc.ca/n1/en/catalogue/12-001-X19990024882.

See Also

svyarpt

Examples

```
library(laeken)
library(survey)
data(ses)
names( ses ) <- gsub( "size" , "size_" , tolower( names( ses ) ) )
des_ses <- svydesign(id=~1, weights=~weights, data=ses)
des_ses <- convey_prep(des_ses)

# linearized design
svygpg(~earningshour, des_ses, ~sex)
# replicate-weighted design
des_ses_rep <-  as.svrepdesign( des_ses , type = "bootstrap" )
des_ses_rep <- convey_prep(des_ses_rep)

svygpg(~earningshour, des_ses_rep, ~sex)

## Not run:

# database-backed design
library(RSQLite)
library(DBI)
dbfile <- tempfile()
conn <- dbConnect( RSQLite::SQLite() , dbfile )
dbWriteTable( conn , 'ses' , ses )
```

```
dbd_ses <- svydesign(id=~1, weights=~weights, data="ses", dbname=dbfile, dbtype="SQLite")
dbd_ses <- convey_prep( dbd_ses )

svygpg(formula=~earningshour, design=dbd_ses, sex= ~sex)

dbRemoveTable( conn , 'ses' )


## End(Not run)
```

---

svyiqalpha *Linearization of a variable quantile*

Description

Computes the linearized variable of a quantile of variable.

Usage

```
svyiqalpha(formula, design, ...)

## S3 method for class 'survey.design'
svyiqalpha(formula, design, alpha, na.rm = FALSE, ...)

## S3 method for class 'svyrep.design'
svyiqalpha(formula, design, alpha, na.rm = FALSE, ...)

## S3 method for class 'DBIsvydesign'
svyiqalpha(formula, design, ...)
```

Arguments

formula	a formula specifying the income variable
design	a design object of class survey.design or class svyrep.design from the survey library.
...	arguments passed on to 'survey::oldsvyquantile'
alpha	the order of the quantile
na.rm	Should cases with missing values be dropped?

Details

you must run the convey_prep function on your survey design object immediately after creating it with the svydesign or svrepdesign function.

Value

Object of class "cvystat", which are vectors with a "var" attribute giving the variance and a "statistic" attribute giving the name of the statistic.

Author(s)

Djalma Pessoa and Anthony Damico

References

Guillaume Osier (2009). Variance estimation for complex indicators of poverty and inequality. *Journal of the European Survey Research Association*, Vol.3, No.3, pp. 167-195, ISSN 1864-3361, URL https://ojs.ub.uni-konstanz.de/srm/article/view/369.

Jean-Claude Deville (1999). Variance estimation for complex statistics and estimators: linearization and residual techniques. Survey Methodology, 25, 193-203, URL https://www150.statcan.gc.ca/n1/en/catalogue/12-001-X19990024882.

See Also

svyarpr

Examples

```
library(laeken)
data(eusilc) ; names( eusilc ) <- tolower( names( eusilc ) )
library(survey)
# linearized design
des_eusilc <- svydesign( ids = ~rb030 , strata = ~db040 ,  weights = ~rb050 , data = eusilc )
des_eusilc <- convey_prep(des_eusilc)

svyiqalpha( ~eqincome , design = des_eusilc, .50 )

# replicate-weighted design
des_eusilc_rep <- as.svrepdesign( des_eusilc , type = "bootstrap" )
des_eusilc_rep <- convey_prep(des_eusilc_rep)

svyiqalpha( ~eqincome , design = des_eusilc_rep, .50 )

## Not run:

# linearized design using a variable with missings
svyiqalpha( ~ py010n , design = des_eusilc, .50 )
svyiqalpha( ~ py010n , design = des_eusilc , .50, na.rm = TRUE )
# replicate-weighted design using a variable with missings
svyiqalpha( ~ py010n , design = des_eusilc_rep, .50 )
svyiqalpha( ~ py010n , design = des_eusilc_rep ,.50, na.rm = TRUE )

# database-backed design
library(RSQLite)
library(DBI)
dbfile <- tempfile()
```

```
conn <- dbConnect( RSQLite::SQLite() , dbfile )
dbWriteTable( conn , 'eusilc' , eusilc )

dbd_eusilc <-
svydesign(
ids = ~rb030 ,
strata = ~db040 ,
weights = ~rb050 ,
data="eusilc",
dbname=dbfile,
dbtype="SQLite"
)

dbd_eusilc <- convey_prep( dbd_eusilc )

svyiqalpha( ~ eqincome , design = dbd_eusilc, .50 )

dbRemoveTable( conn , 'eusilc' )

dbDisconnect( conn , shutdown = TRUE )


## End(Not run)
```

---

svyisq *Linearization of the total below a quantile*

Description

Computes the linearized variable of the total in the lower tail of the distribution of a variable.

Usage

```
svyisq(formula, design, ...)

## S3 method for class 'survey.design'
svyisq(
  formula,
  design,
  alpha,
  quantile = FALSE,
  upper = FALSE,
  na.rm = FALSE,
  deff = FALSE,
  linearized = FALSE,
  influence = FALSE,
  ...
)
```

```
## S3 method for class 'svyrep.design'
svyisq(
  formula,
  design,
  alpha,
  quantile = FALSE,
  upper = FALSE,
  na.rm = FALSE,
  deff = FALSE,
  linearized = FALSE,
  return.replicates = FALSE,
  ...
)

## S3 method for class 'DBIsvydesign'
svyisq(formula, design, ...)
```

Arguments

formula	a formula specifying the income variable
design	a design object of class survey.design or class svyrep.design from the survey library.
...	arguments passed on to 'survey::oldsvyquantile'
alpha	the order of the quantile
quantile	return the upper bound of the lower tail
upper	return the total in the total in the upper tail. Defaults to FALSE.
na.rm	Should cases with missing values be dropped?
deff	Return the design effect (see survey::svymean)
linearized	Should a matrix of linearized variables be returned
influence	Should a matrix of (weighted) influence functions be returned? (for compatibility with svyby)
return.replicates	Return the replicate estimates?

Details

you must run the convey_prep function on your survey design object immediately after creating it with the svydesign or svrepdesign function.

Value

Object of class "cvystat", which are vectors with a "var" attribute giving the variance and a "statistic" attribute giving the name of the statistic.

Author(s)

Djalma Pessoa, Guilherme Jacob, and Anthony Damico

References

Guillaume Osier (2009). Variance estimation for complex indicators of poverty and inequality. *Journal of the European Survey Research Association*, Vol.3, No.3, pp. 167-195, ISSN 1864-3361, URL https://ojs.ub.uni-konstanz.de/srm/article/view/369.

Jean-Claude Deville (1999). Variance estimation for complex statistics and estimators: linearization and residual techniques. Survey Methodology, 25, 193-203, URL https://www150.statcan.gc.ca/n1/en/catalogue/12-001-X19990024882.

See Also

svyarpr

Examples

```
library(laeken)
data(eusilc) ; names( eusilc ) <- tolower( names( eusilc ) )
library(survey)
des_eusilc <- svydesign(ids = ~rb030, strata =~db040,  weights = ~rb050, data = eusilc)
des_eusilc <- convey_prep(des_eusilc)
svyisq(~eqincome, design=des_eusilc,.20 , quantile = TRUE)

# replicate-weighted design
des_eusilc_rep <- as.svrepdesign( des_eusilc , type = "bootstrap" )
des_eusilc_rep <- convey_prep(des_eusilc_rep)

svyisq( ~eqincome , design = des_eusilc_rep, .20 , quantile = TRUE )

## Not run:

# linearized design using a variable with missings
svyisq( ~ py010n , design = des_eusilc, .20 )
svyisq( ~ py010n , design = des_eusilc , .20, na.rm = TRUE )
# replicate-weighted design using a variable with missings
svyisq( ~ py010n , design = des_eusilc_rep, .20 )
svyisq( ~ py010n , design = des_eusilc_rep , .20,  na.rm = TRUE )

# database-backed design
library(RSQLite)
library(DBI)
dbfile <- tempfile()
conn <- dbConnect( RSQLite::SQLite() , dbfile )
dbWriteTable( conn , 'eusilc' , eusilc )

dbd_eusilc <-
svydesign(
ids = ~rb030 ,
strata = ~db040 ,
```

```
weights = ~rb050 ,
data="eusilc",
dbname=dbfile,
dbtype="SQLite"
)

dbd_eusilc <- convey_prep( dbd_eusilc )

svyisq( ~ eqincome , design = dbd_eusilc, .20 )

dbRemoveTable( conn , 'eusilc' )

dbDisconnect( conn , shutdown = TRUE )


## End(Not run)
```

---

svyjdiv *J-divergence measure*

Description

Estimate the J-divergence measure, an entropy-based measure of inequality

Usage

```
svyjdiv(formula, design, ...)

## S3 method for class 'survey.design'
svyjdiv(
  formula,
  design,
  na.rm = FALSE,
  deff = FALSE,
  linearized = FALSE,
  influence = FALSE,
  ...
)

## S3 method for class 'svyrep.design'
svyjdiv(
  formula,
  design,
  na.rm = FALSE,
  deff = FALSE,
  linearized = FALSE,
  return.replicates = FALSE,
```

```
  ...
)

## S3 method for class 'DBIsvydesign'
svyjdiv(formula, design, ...)
```

Arguments

formula	a formula specifying the income variable
design	a design object of class survey.design or class svyrep.design from the survey library.
...	future expansion
na.rm	Should cases with missing values be dropped?
deff	Return the design effect (see survey::svymean)
linearized	Should a matrix of linearized variables be returned
influence	Should a matrix of (weighted) influence functions be returned? (for compatibility with svyby)
return.replicates	Return the replicate estimates?

Details

you must run the convey_prep function on your survey design object immediately after creating it with the svydesign or svrepdesign function.

This measure only allows for strictly positive variables.

Value

Object of class "cvystat", which are vectors with a "var" attribute giving the variance and a "statistic" attribute giving the name of the statistic.

Author(s)

Guilherme Jacob, Djalma Pessoa, and Anthony Damico

References

Nicholas Rohde (2016). J-divergence measurements of economic inequality. J. R. Statist. Soc. A, v. 179, Part 3 (2016), pp. 847-870. DOI doi:10.1111/rssa.12153.

Martin Biewen and Stephen Jenkins (2002). Estimation of Generalized Entropy and Atkinson Inequality Indices from Complex Survey Data. *DIW Discussion Papers*, No.345, URL https://www.diw.de/documents/publikationen/73/diw_01.c.40394.de/dp345.pdf.

See Also

svygei

Examples

```
library(survey)
library(laeken)
data(eusilc) ; names( eusilc ) <- tolower( names( eusilc ) )

# linearized design
des_eusilc <- svydesign( ids = ~rb030 , strata = ~db040 ,  weights = ~rb050 , data = eusilc )
des_eusilc <- convey_prep(des_eusilc)

svyjdiv( ~eqincome , design = subset( des_eusilc , eqincome > 0 ) )

# replicate-weighted design
des_eusilc_rep <- as.svrepdesign( des_eusilc , type = "bootstrap" )
des_eusilc_rep <- convey_prep(des_eusilc_rep)

svyjdiv( ~eqincome , design = subset( des_eusilc_rep , eqincome > 0 ) )

## Not run:

# linearized design using a variable with missings
svyjdiv( ~py010n , design = subset( des_eusilc , py010n > 0 | is.na( py010n ) ) )
svyjdiv( ~py010n , design = subset( des_eusilc , py010n > 0 | is.na( py010n ) ), na.rm = TRUE )
# replicate-weighted design using a variable with missings
svyjdiv( ~py010n , design = subset( des_eusilc_rep , py010n > 0 | is.na( py010n ) ) )
svyjdiv( ~py010n , design = subset( des_eusilc_rep , py010n > 0 | is.na( py010n ) ) , na.rm = TRUE )

# database-backed design
library(RSQLite)
library(DBI)
dbfile <- tempfile()
conn <- dbConnect( RSQLite::SQLite() , dbfile )
dbWriteTable( conn , 'eusilc' , eusilc )

dbd_eusilc <-
svydesign(
ids = ~rb030 ,
strata = ~db040 ,
weights = ~rb050 ,
data="eusilc",
dbname=dbfile,
dbtype="SQLite"
)

dbd_eusilc <- convey_prep( dbd_eusilc )

svyjdiv( ~eqincome , design = subset( dbd_eusilc , eqincome > 0 ) )

dbRemoveTable( conn , 'eusilc' )

dbDisconnect( conn , shutdown = TRUE )
```

```
## End(Not run)
```

---

svyjdivdec *J-Divergence Decomposition*

Description

Estimates the group decomposition of the generalized entropy index

Usage

```
svyjdivdec(formula, subgroup, design, ...)

## S3 method for class 'survey.design'
svyjdivdec(
  formula,
  subgroup,
  design,
  na.rm = FALSE,
  deff = FALSE,
  linearized = FALSE,
  influence = FALSE,
  ...
)

## S3 method for class 'svyrep.design'
svyjdivdec(
  formula,
  subgroup,
  design,
  na.rm = FALSE,
  deff = FALSE,
  linearized = FALSE,
  return.replicates = FALSE,
  ...
)

## S3 method for class 'DBIsvydesign'
svyjdivdec(formula, subgroup, design, ...)
```

Arguments

formula	a formula specifying the income variable
subgroup	a formula specifying the group variable
design	a design object of class survey.design or class svyrep.design from the survey library.

...	future expansion
na.rm	Should cases with missing values be dropped? Observations containing missing values in income or group variables will be dropped.
deff	Return the design effect (see survey::svymean)
linearized	Should a matrix of linearized variables be returned
influence	Should a matrix of (weighted) influence functions be returned? (for compatibility with svyby)
return.replicates	Return the replicate estimates?

Details

you must run the convey_prep function on your survey design object immediately after creating it with the svydesign or svrepdesign function.

This measure only allows for strictly positive variables.

Value

Object of class "cvydstat", which are vectors with a "var" attribute giving the variance-covariance matrix and a "statistic" attribute giving the name of the statistic.

Author(s)

Guilherme Jacob, Djalma Pessoa, and Anthony Damico

References

Anthony F. Shorrocks (1984). Inequality decomposition by population subgroups. *Econometrica*, v. 52, n. 6, 1984, pp. 1369-1385. DOI doi:10.2307/1913511.

Nicholas Rohde (2016). J-divergence measurements of economic inequality. J. R. Statist. Soc. A, v. 179, Part 3 (2016), pp. 847-870. DOI doi:10.1111/rssa.12153.

Martin Biewen and Stephen Jenkins (2002). Estimation of Generalized Entropy and Atkinson Inequality Indices from Complex Survey Data. *DIW Discussion Papers*, No.345, URL https://www.diw.de/documents/publikationen/73/diw_01.c.40394.de/dp345.pdf.

See Also

svyjdiv

Examples

```
library(survey)
library(laeken)
data(eusilc) ; names( eusilc ) <- tolower( names( eusilc ) )

# linearized design
des_eusilc <- svydesign( ids = ~rb030 , strata = ~db040 ,  weights = ~rb050 , data = eusilc )
des_eusilc <- convey_prep(des_eusilc)
```

```
# replicate-weighted design
des_eusilc_rep <- as.svrepdesign( des_eusilc , type = "bootstrap" )
des_eusilc_rep <- convey_prep(des_eusilc_rep)

# linearized design
svyjdivdec( ~eqincome , ~rb090 , subset(des_eusilc, eqincome > 0) )

# replicate-weighted design
svyjdivdec( ~eqincome , ~rb090 , subset(des_eusilc_rep, eqincome > 0) )

## Not run:

# linearized design using a variable with missings
sub_des_eusilc <- subset(des_eusilc, py010n > 0 | is.na(py010n) )
svyjdivdec( ~py010n , ~rb090 , sub_des_eusilc )
svyjdivdec( ~py010n , ~rb090 , sub_des_eusilc , na.rm = TRUE )

# replicate-weighted design using a variable with missings
sub_des_eusilc_rep <- subset(des_eusilc_rep, py010n > 0 | is.na(py010n) )
svyjdivdec( ~py010n , ~rb090 , sub_des_eusilc_rep )
svyjdivdec( ~py010n , ~rb090 , sub_des_eusilc_rep , na.rm = TRUE )

# database-backed design
library(RSQLite)
library(DBI)
dbfile <- tempfile()
conn <- dbConnect( RSQLite::SQLite() , dbfile )
dbWriteTable( conn , 'eusilc' , eusilc )

dbd_eusilc <-
svydesign(
ids = ~rb030 ,
strata = ~db040 ,
weights = ~rb050 ,
data="eusilc",
dbname=dbfile,
dbtype="SQLite"
)

dbd_eusilc <- convey_prep( dbd_eusilc )

# database-backed linearized design
svyjdivdec( ~eqincome , ~rb090 , subset(dbd_eusilc, eqincome > 0) )

# database-backed linearized design using a variable with missings
sub_dbd_eusilc <- subset(dbd_eusilc, py010n > 0 | is.na(py010n) )
svyjdivdec( ~py010n , ~rb090 , sub_dbd_eusilc )
svyjdivdec( ~py010n , ~rb090 , sub_dbd_eusilc , na.rm = TRUE )

dbRemoveTable( conn , 'eusilc' )

dbDisconnect( conn , shutdown = TRUE )
```

```
## End(Not run)
```

---

svylorenz *Lorenz curve*

Description

Estimate the Lorenz curve, an inequality graph

Usage

```
svylorenz(formula, design, ...)

## S3 method for class 'survey.design'
svylorenz(
  formula,
  design,
  quantiles = seq(0, 1, 0.1),
  empirical = FALSE,
  plot = TRUE,
  add = FALSE,
  curve.col = "red",
  ci = TRUE,
  alpha = 0.05,
  na.rm = FALSE,
  deff = FALSE,
  linearized = FALSE,
  influence = FALSE,
  ...
)

## S3 method for class 'svyrep.design'
svylorenz(
  formula,
  design,
  quantiles = seq(0, 1, 0.1),
  empirical = FALSE,
  plot = TRUE,
  add = FALSE,
  curve.col = "red",
  ci = TRUE,
  alpha = 0.05,
  na.rm = FALSE,
  deff = FALSE,
```

```
  linearized = FALSE,
  return.replicates = FALSE,
  ...
)

## S3 method for class 'DBIsvydesign'
svylorenz(formula, design, ...)
```

Arguments

formula	a formula specifying the income variable
design	a design object of class survey.design or class svyrep.design from the survey library.
...	additional arguments passed to plot methods
quantiles	a sequence of probabilities that defines the quantiles sum to be calculated
empirical	Should an empirical Lorenz curve be estimated as well? Defaults to FALSE.
plot	Should the Lorenz curve be plotted? Defaults to TRUE.
add	Should a new curve be plotted on the current graph?
curve.col	a string defining the color of the curve.
ci	Should the confidence interval be plotted? Defaults to TRUE.
alpha	a number that especifies de confidence level for the graph.
na.rm	Should cases with missing values be dropped? Defaults to FALSE.
deff	Return the design effect (see survey::svymean)
linearized	Should a matrix of linearized variables be returned
influence	Should a matrix of (weighted) influence functions be returned? (for compatibility with svyby)
return.replicates	Return the replicate estimates?

Details

you must run the convey_prep function on your survey design object immediately after creating it with the svydesign or svrepdesign function.

Notice that the 'empirical' curve is observation-based and is the one actually used to calculate the Gini index. On the other hand, the quantile-based curve is used to estimate the shares, SEs and confidence intervals.

This way, as the number of quantiles of the quantile-based function increases, the quantile-based curve approaccches the observation-based curve.

Value

Object of class "survey::oldsvyquantile", which are vectors with a "quantiles" attribute giving the proportion of income below that quantile, and a "SE" attribute giving the standard errors of the estimates.

Author(s)

Guilherme Jacob, Djalma Pessoa and Anthony Damico

References

Milorad Kovacevic and David Binder (1997). Variance Estimation for Measures of Income Inequality and Polarization - The Estimating Equations Approach. *Journal of Official Statistics*, Vol.13, No.1, 1997. pp. 41 58. URL https://www.scb.se/contentassets/ca21efb41fee47d293bbee5bf7be7fb3/variance-estimation-for-measures-of-income-inequality-and-polarization---the-estimating-equations-pdf.

Shlomo Yitzhaki and Robert Lerman (1989). Improving the accuracy of estimates of Gini coefficients. *Journal of Econometrics*, Vol.42(1), pp. 43-47, September.

Matti Langel (2012). *Measuring inequality in finite population sampling*. PhD thesis. URL http://doc.rero.ch/record/29204.

See Also

oldsvyquantile

Examples

```
library(survey)
library(laeken)
data(eusilc) ; names( eusilc ) <- tolower( names( eusilc ) )

# linearized design
des_eusilc <- svydesign( ids = ~rb030 , strata = ~db040 ,  weights = ~rb050 , data = eusilc )
des_eusilc <- convey_prep( des_eusilc )
svylorenz( ~eqincome , des_eusilc, seq(0,1,.05), alpha = .01 )

# replicate-weighted design
des_eusilc_rep <- as.svrepdesign( des_eusilc , type = "bootstrap" )
des_eusilc_rep <- convey_prep( des_eusilc_rep )

svylorenz( ~eqincome , des_eusilc_rep, seq(0,1,.05), alpha = .01 )

## Not run:

# linearized design using a variable with missings
svylorenz( ~py010n , des_eusilc, seq(0,1,.05), alpha = .01 )
svylorenz( ~py010n , des_eusilc, seq(0,1,.05), alpha = .01, na.rm = TRUE )
# demonstration of `curve.col=` and `add=` parameters
svylorenz( ~eqincome , des_eusilc, seq(0,1,.05), alpha = .05 , add = TRUE , curve.col = 'green' )
# replicate-weighted design using a variable with missings
svylorenz( ~py010n , des_eusilc_rep, seq(0,1,.05), alpha = .01 )
svylorenz( ~py010n , des_eusilc_rep, seq(0,1,.05), alpha = .01, na.rm = TRUE )



# database-backed design
```

```
library(RSQLite)
library(DBI)
dbfile <- tempfile()
conn <- dbConnect( RSQLite::SQLite() , dbfile )
dbWriteTable( conn , 'eusilc' , eusilc )

dbd_eusilc <-
svydesign(
ids = ~rb030 ,
strata = ~db040 ,
weights = ~rb050 ,
data="eusilc",
dbname=dbfile,
dbtype="SQLite"
)

dbd_eusilc <- convey_prep( dbd_eusilc )

svylorenz( ~eqincome , dbd_eusilc, seq(0,1,.05), alpha = .01 )

# highlithing the difference between the quantile-based curve and the empirical version:
svylorenz( ~eqincome , dbd_eusilc, seq(0,1,.5), empirical = TRUE, ci = FALSE, curve.col = "green" )
svylorenz( ~eqincome , dbd_eusilc, seq(0,1,.5), alpha = .01, add = TRUE )
legend( "topleft", c("Quantile-based", "Empirical"), lwd = c(1,1), col = c("red", "green"))
# as the number of quantiles increases, the difference between the curves gets smaller
svylorenz( ~eqincome , dbd_eusilc, seq(0,1,.01), empirical = TRUE, ci = FALSE, curve.col = "green" )
svylorenz( ~eqincome , dbd_eusilc, seq(0,1,.01), alpha = .01, add = TRUE )
legend( "topleft", c("Quantile-based", "Empirical"), lwd = c(1,1), col = c("red", "green"))

dbRemoveTable( conn , 'eusilc' )

dbDisconnect( conn , shutdown = TRUE )


## End(Not run)
```

---

svypoormed *Relative median poverty gap*

Description

Estimate the median of incomes less than the at-risk-of-poverty threshold (arpt).

Usage

```
svypoormed(formula, design, ...)

## S3 method for class 'survey.design'
svypoormed(formula, design, quantiles = 0.5, percent = 0.6, na.rm = FALSE, ...)
```

```
## S3 method for class 'svyrep.design'
svypoormed(formula, design, quantiles = 0.5, percent = 0.6, na.rm = FALSE, ...)

## S3 method for class 'DBIsvydesign'
svypoormed(formula, design, ...)
```

Arguments

formula	a formula specifying the income variable
design	a design object of class survey.design or class svyrep.design from the survey library.
...	arguments passed on to 'survey::oldsvyquantile'
quantiles	income quantile, usually .5 (median)
percent	fraction of the quantile, usually .60
na.rm	Should cases with missing values be dropped?

Details

you must run the convey_prep function on your survey design object immediately after creating it with the svydesign or svrepdesign function.

Value

Object of class "cvystat", which are vectors with a "var" attribute giving the variance and a "statistic" attribute giving the name of the statistic.

Author(s)

Djalma Pessoa and Anthony Damico

References

Guillaume Osier (2009). Variance estimation for complex indicators of poverty and inequality. *Journal of the European Survey Research Association*, Vol.3, No.3, pp. 167-195, ISSN 1864-3361, URL https://ojs.ub.uni-konstanz.de/srm/article/view/369.

Jean-Claude Deville (1999). Variance estimation for complex statistics and estimators: linearization and residual techniques. Survey Methodology, 25, 193-203, URL https://www150.statcan.gc.ca/n1/en/catalogue/12-001-X19990024882.

See Also

svyarpt

Examples

```
library(survey)
library(laeken)
data(eusilc) ; names( eusilc ) <- tolower( names( eusilc ) )

# linearized design
des_eusilc <- svydesign( ids = ~rb030 , strata = ~db040 ,  weights = ~rb050 , data = eusilc )
des_eusilc <- convey_prep( des_eusilc )

svypoormed( ~eqincome , design = des_eusilc )

# replicate-weighted design
des_eusilc_rep <- as.svrepdesign( des_eusilc , type = "bootstrap" )
des_eusilc_rep <- convey_prep( des_eusilc_rep )

svypoormed( ~eqincome , design = des_eusilc_rep )

## Not run:

# linearized design using a variable with missings
svypoormed( ~ py010n , design = des_eusilc )
svypoormed( ~ py010n , design = des_eusilc , na.rm = TRUE )
# replicate-weighted design using a variable with missings
svypoormed( ~ py010n , design = des_eusilc_rep )
svypoormed( ~ py010n , design = des_eusilc_rep , na.rm = TRUE )

# database-backed design
library(RSQLite)
library(DBI)
dbfile <- tempfile()
conn <- dbConnect( RSQLite::SQLite() , dbfile )
dbWriteTable( conn , 'eusilc' , eusilc )

dbd_eusilc <-
svydesign(
ids = ~rb030 ,
strata = ~db040 ,
weights = ~rb050 ,
data="eusilc",
dbname=dbfile,
dbtype="SQLite"
)

dbd_eusilc <- convey_prep( dbd_eusilc )

svypoormed( ~ eqincome , design = dbd_eusilc )

dbRemoveTable( conn , 'eusilc' )

dbDisconnect( conn , shutdown = TRUE )
```

```
## End(Not run)
```

---

svyqsr *Quintile Share Ratio*

Description

Estimate ratio of the total income received by the highest earners to the total income received by lowest earners, defaulting to 20

Usage

```
svyqsr(formula, design, ...)

## S3 method for class 'survey.design'
svyqsr(
  formula,
  design,
  alpha1 = 0.2,
  alpha2 = (1 - alpha1),
  na.rm = FALSE,
  upper_quant = FALSE,
  lower_quant = FALSE,
  upper_tot = FALSE,
  lower_tot = FALSE,
  deff = FALSE,
  linearized = FALSE,
  influence = FALSE,
  ...
)

## S3 method for class 'svyrep.design'
svyqsr(
  formula,
  design,
  alpha1 = 0.2,
  alpha2 = (1 - alpha1),
  na.rm = FALSE,
  upper_quant = FALSE,
  lower_quant = FALSE,
  upper_tot = FALSE,
  lower_tot = FALSE,
  deff = FALSE,
  linearized = FALSE,
  return.replicates = FALSE,
  ...
```

```
)

## S3 method for class 'DBIsvydesign'
svyqsr(formula, design, ...)
```

Arguments

formula	a formula specifying the income variable
design	a design object of class survey.design or class svyrep.design from the survey library.
...	future expansion
alpha1	order of the lower quintile
alpha2	order of the upper quintile
na.rm	Should cases with missing values be dropped?
upper_quant	return the lower bound of highest earners
lower_quant	return the upper bound of lowest earners
upper_tot	return the highest earners total
lower_tot	return the lowest earners total
deff	Return the design effect (see survey::svymean)
linearized	Should a matrix of linearized variables be returned
influence	Should a matrix of (weighted) influence functions be returned? (for compatibility with svyby)
return.replicates	Return the replicate estimates?

Details

you must run the convey_prep function on your survey design object immediately after creating it with the svydesign or svrepdesign function.

Value

Object of class "cvystat", which are vectors with a "var" attribute giving the variance and a "statistic" attribute giving the name of the statistic.

Author(s)

Djalma Pessoa and Anthony Damico

References

Guillaume Osier (2009). Variance estimation for complex indicators of poverty and inequality. *Journal of the European Survey Research Association*, Vol.3, No.3, pp. 167-195, ISSN 1864-3361, URL https://ojs.ub.uni-konstanz.de/srm/article/view/369.

Jean-Claude Deville (1999). Variance estimation for complex statistics and estimators: linearization and residual techniques. Survey Methodology, 25, 193-203, URL https://www150.statcan.gc.ca/n1/en/catalogue/12-001-X19990024882.

See Also

svyarpt

Examples

```
library(survey)
library(laeken)
data(eusilc) ; names( eusilc ) <- tolower( names( eusilc ) )

# linearized design
des_eusilc <- svydesign( ids = ~rb030 , strata = ~db040 ,  weights = ~rb050 , data = eusilc )
des_eusilc <- convey_prep( des_eusilc )

svyqsr( ~eqincome , design = des_eusilc, upper_tot = TRUE, lower_tot = TRUE )

# replicate-weighted design
des_eusilc_rep <- as.svrepdesign( des_eusilc , type = "bootstrap" )
des_eusilc_rep <- convey_prep( des_eusilc_rep )

svyqsr( ~eqincome , design = des_eusilc_rep, upper_tot = TRUE, lower_tot = TRUE )

## Not run:

# linearized design using a variable with missings
svyqsr( ~ db090 , design = des_eusilc )
svyqsr( ~ db090 , design = des_eusilc , na.rm = TRUE )
# replicate-weighted design using a variable with missings
svyqsr( ~ db090 , design = des_eusilc_rep )
svyqsr( ~ db090 , design = des_eusilc_rep , na.rm = TRUE )

# database-backed design
library(RSQLite)
library(DBI)
dbfile <- tempfile()
conn <- dbConnect( RSQLite::SQLite() , dbfile )
dbWriteTable( conn , 'eusilc' , eusilc )

dbd_eusilc <-
svydesign(
ids = ~rb030 ,
strata = ~db040 ,
weights = ~rb050 ,
data="eusilc",
dbname=dbfile,
dbtype="SQLite"
)

dbd_eusilc <- convey_prep( dbd_eusilc )

svyqsr( ~ eqincome , design = dbd_eusilc )

dbRemoveTable( conn , 'eusilc' )
```

```
dbDisconnect( conn , shutdown = TRUE )


## End(Not run)
```

---

svyrich *Richness measures*

Description

Estimate Peichl, Schaefer and Scheicher (2010) richness measures.

Usage

```
svyrich(formula, design, ...)

## S3 method for class 'survey.design'
svyrich(
  formula,
  design,
  type_measure,
  g,
  type_thresh = "abs",
  abs_thresh = NULL,
  percent = 1.5,
  quantiles = 0.5,
  thresh = FALSE,
  na.rm = FALSE,
  deff = FALSE,
  linearized = FALSE,
  ...
)

## S3 method for class 'svyrep.design'
svyrich(
  formula,
  design,
  type_measure,
  g,
  type_thresh = "abs",
  abs_thresh = NULL,
  percent = 1.5,
  quantiles = 0.5,
  thresh = FALSE,
  na.rm = FALSE,
```

```
  deff = FALSE,
  linearized = FALSE,
  return.replicates = FALSE,
  ...
)

## S3 method for class 'DBIsvydesign'
svyrich(formula, design, ...)
```

Arguments

formula	a formula specifying the income variable
design	a design object of class survey.design or class svyrep.design from the survey library.
...	passed to svyarpt
type_measure	A string "Cha", "FGTT1" or "FGTT2" defining the richness measure.
g	Richness preference parameter.
type_thresh	type of richness threshold. If "abs" the threshold is fixed and given the value of abs_thresh; if "relq" it is given by percent times the quantile; if "relm" it is percent times the mean.
abs_thresh	richness threshold value if type_thresh is "abs"
percent	the multiple of the quantile or mean used in the richness threshold definition. Defaults to percent = 1.5; i.e., 1.5 times the quantile or mean.
quantiles	the quantile used used in the richness threshold definition. Defaults to quantiles = .5, the median.
thresh	return the richness threshold value
na.rm	Should cases with missing values be dropped?
deff	Return the design effect (see survey::svymean)
linearized	Should a matrix of linearized variables be returned
return.replicates	Return the replicate estimates?

Details

you must run the convey_prep function on your survey design object immediately after creating it with the svydesign or svrepdesign function.

Value

Object of class "cvystat", which are vectors with a "var" attribute giving the variance and a "statistic" attribute giving the name of the statistic.

Author(s)

Guilherme Jacob, Djalma Pessoa and Anthony Damico

References

Michal Brzezinski (2014). Statistical Inference for Richness Measures. *Applied Economics*, Vol. 46, No. 14, pp. 1599-1608, DOI doi:10.1080/00036846.2014.880106.

Andreas Peichl, Thilo Schaefer, and Christoph Scheicher (2010). Measuring richness and poverty: A micro data application to Europe and Germany. *Review of Income and Wealth*, Vol. 56, No.3, pp. 597-619.

Guillaume Osier (2009). Variance estimation for complex indicators of poverty and inequality. *Journal of the European Survey Research Association*, Vol.3, No.3, pp. 167-195, ISSN 1864-3361, URL https://ojs.ub.uni-konstanz.de/srm/article/view/369.

See Also

svyfgt

Examples

```
library(survey)
library(laeken)
data(eusilc) ; names( eusilc ) <- tolower( names( eusilc ) )

# linearized design

des_eusilc <- svydesign( ids = ~rb030 , strata = ~db040 ,  weights = ~rb050 , data = eusilc )
des_eusilc <- convey_prep( des_eusilc )

# replicate-weighted design
des_eusilc_rep <- as.svrepdesign( des_eusilc , type = "bootstrap" )
des_eusilc_rep <- convey_prep( des_eusilc_rep )

# concave Chakravarty richness measure
# higher g= parameters tend toward headcount ratio, richness threshold fixed
svyrich(~eqincome, des_eusilc, type_measure = "Cha" , g=3,  abs_thresh=30000)
# g=1 parameter computes the richness gap index, richness threshold fixed
svyrich(~eqincome, des_eusilc, type_measure = "Cha" , g=1,  abs_thresh=30000)
# higher g= parameters tend toward headcount ratio, richness threshold equal to the median
svyrich(~eqincome, des_eusilc, type_measure = "Cha" , g=3, type_thresh= "relq" )
# g=1 parameter computes the richness gap index, richness threshold equal to the median
svyrich(~eqincome, des_eusilc, type_measure = "Cha" , g=1, type_thresh= "relq" )
# higher g= parameters tend toward headcount ratio, richness threshold equal to the mean
svyrich(~eqincome, des_eusilc, type_measure = "Cha" , g=3, type_thresh= "relm" )
# g=1 parameter computes the richness gap index, richness threshold equal to the mean
svyrich(~eqincome, des_eusilc, type_measure = "Cha" , g=1, type_thresh= "relm" )

#  using svrep.design:
# higher g= parameters tend toward headcount ratio, richness threshold fixed
svyrich(~eqincome, des_eusilc_rep, type_measure = "Cha" , g=3, abs_thresh=30000 )
# g=1 parameter computes the richness gap index, richness threshold fixed
svyrich(~eqincome, des_eusilc_rep, type_measure = "Cha" , g=1, abs_thresh=30000 )
# higher g= parameters tend toward headcount ratio, richness threshold equal to the median
svyrich(~eqincome, des_eusilc_rep, type_measure = "Cha" , g=3, type_thresh= "relq" )
# g=1 parameter computes the richness gap index, richness threshold equal to the median
```

```
svyrich(~eqincome, des_eusilc_rep, type_measure = "Cha" , g=1, type_thresh= "relq" )
# higher g= parameters tend toward headcount ratio, richness threshold equal to the mean
svyrich(~eqincome, des_eusilc_rep, type_measure = "Cha" , g=3, type_thresh= "relm" )
# g=1 parameter computes the richness gap index, richness threshold equal to the mean
svyrich(~eqincome, des_eusilc_rep, type_measure = "Cha" , g=1, type_thresh= "relm" )

## Not run:

# database-backed design
library(RSQLite)
library(DBI)
dbfile <- tempfile()
conn <- dbConnect( RSQLite::SQLite() , dbfile )
dbWriteTable( conn , 'eusilc' , eusilc )

dbd_eusilc <-
svydesign(
ids = ~rb030 ,
strata = ~db040 ,
weights = ~rb050 ,
data="eusilc",
dbname=dbfile,
dbtype="SQLite"
)


dbd_eusilc <- convey_prep( dbd_eusilc )

# higher g= parameters tend toward headcount ratio, richness threshold fixed
svyrich(~eqincome, dbd_eusilc, type_measure = "Cha" , g=3, abs_thresh=30000 )
# g=1 parameter computes the richness gap index, richness threshold fixed
svyrich(~eqincome, dbd_eusilc, type_measure = "Cha" , g=1, abs_thresh=30000 )
# higher g= parameters tend toward headcount ratio, richness threshold equal to the median
svyrich(~eqincome, dbd_eusilc, type_measure = "Cha" , g=3, type_thresh= "relq" )
# g=1 parameter computes the richness gap index, richness threshold equal to the median
svyrich(~eqincome, dbd_eusilc, type_measure = "Cha" , g=1, type_thresh= "relq" )
# higher g= parameters tend toward headcount ratio, richness threshold equal to the mean
svyrich(~eqincome, dbd_eusilc, type_measure = "Cha" , g=3, type_thresh= "relm" )
# g=1 parameter computes the richness gap index, richness threshold equal to the mean
svyrich(~eqincome, dbd_eusilc, type_measure = "Cha" , g=1, type_thresh= "relm" )

dbRemoveTable( conn , 'eusilc' )

dbDisconnect( conn , shutdown = TRUE )


## End(Not run)
```

---

svyrmir *Relative median income ratio*

Description

Estimate the ratio between the median income of people with age above 65 and the median income of people with age below 65.

Usage

```
svyrmir(formula, design, ...)

## S3 method for class 'survey.design'
svyrmir(
  formula,
  design,
  age,
  agelim = 65,
  quantiles = 0.5,
  na.rm = FALSE,
  med_old = FALSE,
  med_young = FALSE,
  ...
)

## S3 method for class 'svyrep.design'
svyrmir(
  formula,
  design,
  age,
  agelim = 65,
  quantiles = 0.5,
  na.rm = FALSE,
  med_old = FALSE,
  med_young = FALSE,
  ...
)

## S3 method for class 'DBIsvydesign'
svyrmir(formula, design, age, ...)
```

Arguments

formula	a formula specifying the income variable
design	a design object of class survey.design or class svyrep.design from the survey library.
...	arguments passed on to 'survey::oldsvyquantile'
age	formula defining the variable age
agelim	the age cutpoint, the default is 65
quantiles	income quantile, usually .5 (median)
na.rm	Should cases with missing values be dropped?

med_old	return the median income of people older than agelim
med_young	return the median income of people younger than agelim

Details

you must run the convey_prep function on your survey design object immediately after creating it with the svydesign or svrepdesign function.

Value

Object of class "cvystat", which are vectors with a "var" attribute giving the variance and a "statistic" attribute giving the name of the statistic.

Author(s)

Djalma Pessoa and Anthony Damico

References

Guillaume Osier (2009). Variance estimation for complex indicators of poverty and inequality. *Journal of the European Survey Research Association*, Vol.3, No.3, pp. 167-195, ISSN 1864-3361, URL https://ojs.ub.uni-konstanz.de/srm/article/view/369.

Jean-Claude Deville (1999). Variance estimation for complex statistics and estimators: linearization and residual techniques. Survey Methodology, 25, 193-203, URL https://www150.statcan.gc.ca/n1/en/catalogue/12-001-X19990024882.

See Also

svyarpt

Examples

```
library(survey)
library(laeken)
data(eusilc) ; names( eusilc ) <- tolower( names( eusilc ) )

# missing completely at random, missingness rate = .20
ind_miss <- rbinom(nrow(eusilc), 1, .20 )
eusilc$eqincome_miss <- eusilc$eqincome
is.na(eusilc$eqincome_miss)<- ind_miss==1

# linearized design
des_eusilc <- svydesign( ids = ~rb030 , strata = ~db040 ,  weights = ~rb050 , data = eusilc )
des_eusilc <- convey_prep(des_eusilc)

svyrmir( ~eqincome , design = des_eusilc , age = ~age, med_old = TRUE )

# replicate-weighted design
des_eusilc_rep <- as.svrepdesign( des_eusilc , type = "bootstrap" )
des_eusilc_rep <- convey_prep(des_eusilc_rep)
```

```
svyrmir( ~eqincome , design = des_eusilc_rep, age= ~age, med_old = TRUE )

## Not run:

# linearized design using a variable with missings
svyrmir( ~ eqincome_miss , design = des_eusilc,age= ~age)
svyrmir( ~ eqincome_miss , design = des_eusilc , age= ~age, na.rm = TRUE )
# replicate-weighted design using a variable with missings
svyrmir( ~ eqincome_miss , design = des_eusilc_rep,age= ~age )
svyrmir( ~ eqincome_miss , design = des_eusilc_rep ,age= ~age, na.rm = TRUE )

# database-backed design
library(RSQLite)
library(DBI)
dbfile <- tempfile()
conn <- dbConnect( RSQLite::SQLite() , dbfile )
dbWriteTable( conn , 'eusilc' , eusilc )

dbd_eusilc <-
svydesign(
ids = ~rb030 ,
strata = ~db040 ,
weights = ~rb050 ,
data="eusilc",
dbname=dbfile,
dbtype="SQLite"
)

dbd_eusilc <- convey_prep( dbd_eusilc )

svyrmir( ~eqincome , design = dbd_eusilc , age = ~age )

dbRemoveTable( conn , 'eusilc' )

dbDisconnect( conn , shutdown = TRUE )


## End(Not run)
```

---

svyrmpg *Relative median poverty gap*

Description

Estimate the difference between the at-risk-of-poverty threshold (`arpt`) and the median of incomes less than the `arpt` relative to the `arpt`.

Usage

```
svyrmpg(formula, design, ...)

## S3 method for class 'survey.design'
svyrmpg(
  formula,
  design,
  quantiles = 0.5,
  percent = 0.6,
  na.rm = FALSE,
  thresh = FALSE,
  poor_median = FALSE,
  ...
)

## S3 method for class 'svyrep.design'
svyrmpg(
  formula,
  design,
  quantiles = 0.5,
  percent = 0.6,
  na.rm = FALSE,
  thresh = FALSE,
  poor_median = FALSE,
  ...
)

## S3 method for class 'DBIsvydesign'
svyrmpg(formula, design, ...)
```

Arguments

formula	a formula specifying the income variable
design	a design object of class survey.design or class svyrep.design from the survey library.
...	future expansion
quantiles	income quantile, usually .5 (median)
percent	fraction of the quantile, usually .60
na.rm	Should cases with missing values be dropped?
thresh	return the poverty poverty threshold
poor_median	return the median income of poor people

Details

you must run the convey_prep function on your survey design object immediately after creating it with the svydesign or svrepdesign function.

Value

Object of class "cvystat", which are vectors with a "var" attribute giving the variance and a "statistic" attribute giving the name of the statistic.

Author(s)

Djalma Pessoa and Anthony Damico

References

Guillaume Osier (2009). Variance estimation for complex indicators of poverty and inequality. *Journal of the European Survey Research Association*, Vol.3, No.3, pp. 167-195, ISSN 1864-3361, URL https://ojs.ub.uni-konstanz.de/srm/article/view/369.

Jean-Claude Deville (1999). Variance estimation for complex statistics and estimators: linearization and residual techniques. Survey Methodology, 25, 193-203, URL https://www150.statcan.gc.ca/n1/en/catalogue/12-001-X19990024882.

See Also

svyarpt

Examples

```
library(survey)
library(laeken)
data(eusilc) ; names( eusilc ) <- tolower( names( eusilc ) )

# linearized design
des_eusilc <- svydesign( ids = ~rb030 , strata = ~db040 ,  weights = ~rb050 , data = eusilc )
des_eusilc <- convey_prep( des_eusilc )

svyrmpg( ~eqincome , design = des_eusilc, thresh = TRUE )

# replicate-weighted design
des_eusilc_rep <- as.svrepdesign( des_eusilc , type = "bootstrap" )
des_eusilc_rep <- convey_prep( des_eusilc_rep )

svyrmpg( ~eqincome , design = des_eusilc_rep, thresh = TRUE )

## Not run:

# linearized design using a variable with missings
svyrmpg( ~ py010n , design = des_eusilc )
svyrmpg( ~ py010n , design = des_eusilc , na.rm = TRUE )
# replicate-weighted design using a variable with missings
svyrmpg( ~ py010n , design = des_eusilc_rep )
svyrmpg( ~ py010n , design = des_eusilc_rep , na.rm = TRUE )

# database-backed design
library(RSQLite)
library(DBI)
```

```
dbfile <- tempfile()
conn <- dbConnect( RSQLite::SQLite() , dbfile )
dbWriteTable( conn , 'eusilc' , eusilc )

dbd_eusilc <-
svydesign(
ids = ~rb030 ,
strata = ~db040 ,
weights = ~rb050 ,
data="eusilc",
dbname=dbfile,
dbtype="SQLite"
)

dbd_eusilc <- convey_prep( dbd_eusilc )

svyrmpg( ~ eqincome , design = dbd_eusilc )

dbRemoveTable( conn , 'eusilc' )

dbDisconnect( conn , shutdown = TRUE )


## End(Not run)
```

---

svywatts *Watts measure of poverty*

Description

Estimate the Watts measure for the cases: `alpha=0` headcount ratio and `alpha=1` poverty gap index.

Usage

```
svywatts(formula, design, ...)

## S3 method for class 'survey.design'
svywatts(
  formula,
  design,
  type_thresh = "abs",
  abs_thresh = NULL,
  percent = 0.6,
  quantiles = 0.5,
  thresh = FALSE,
  na.rm = FALSE,
  deff = FALSE,
  linearized = FALSE,
```

```
  influence = FALSE,
  ...
)

## S3 method for class 'svyrep.design'
svywatts(
  formula,
  design,
  type_thresh = "abs",
  abs_thresh = NULL,
  percent = 0.6,
  quantiles = 0.5,
  thresh = FALSE,
  na.rm = FALSE,
  deff = FALSE,
  linearized = FALSE,
  return.replicates = FALSE,
  ...
)

## S3 method for class 'DBIsvydesign'
svywatts(formula, design, ...)
```

Arguments

formula	a formula specifying the income variable
design	a design object of class survey.design or class svyrep.design from the survey library.
...	passed to svyarpr and svyarpt
type_thresh	type of poverty threshold. If "abs" the threshold is fixed and given the value of abs_thresh; if "relq" it is given by percent times the quantile; if "relm" it is percent times the mean.
abs_thresh	poverty threshold value if type_thresh is "abs"
percent	the multiple of the the quantile or mean used in the poverty threshold definition
quantiles	the quantile used used in the poverty threshold definition
thresh	return the poverty threshold value
na.rm	Should cases with missing values be dropped?
deff	Return the design effect (see survey::svymean)
linearized	Should a matrix of linearized variables be returned
influence	Should a matrix of (weighted) influence functions be returned? (for compatibility with svyby). Not implemented yet for linearized designs.
return.replicates	Return the replicate estimates?

Details

you must run the convey_prep function on your survey design object immediately after creating it with the svydesign or svrepdesign function.

For the svywatts and svywattsdec functions, zeroes and negative numbers in the analysis domain cause an error because of the logarithm function in the definition of this poverty measure. However, zeroes and negative values in the full survey design that are outside of the domain of analysis are valid to calculate the poverty threshold because zeroes and negatives are not a problem for computing quantiles (used when type_thresh = "relq") or means (used when type_thresh = "relm") . Missing values are treated differently. NA values anywhere in the full survey design (not only the subset, or the domain of analysis) will cause these quantiles and means to return NA results. To ignore NA values throughout, set na.rm = TRUE.

Value

Object of class "cvystat", which are vectors with a "var" attribute giving the variance and a "statistic" attribute giving the name of the statistic.

Author(s)

Guilherme Jacob, Djalma Pessoa, and Anthony Damico

References

Harold W. Watts (1968). An economic definition of poverty. *Institute For Research on Poverty Discussion Papers*, n.5. University of Wisconsin. URL https://www.irp.wisc.edu/publications/dps/pdfs/dp568.pdf.

Buhong Zheng (2001). Statistical inference for poverty measures with relative poverty lines. *Journal of Econometrics*, Vol. 101, pp. 337-356.

Vijay Verma and Gianni Betti (2011). Taylor linearization sampling errors and design effects for poverty measures and other complex statistics. *Journal Of Applied Statistics*, Vol.38, No.8, pp. 1549-1576, DOI doi:10.1080/02664763.2010.515674.

Anthony B. Atkinson (1987). On the measurement of poverty. *Econometrica*, Vol.55, No.4, (Jul., 1987), pp. 749-764, DOI doi:10.2307/1911028.

Guillaume Osier (2009). Variance estimation for complex indicators of poverty and inequality. *Journal of the European Survey Research Association*, Vol.3, No.3, pp. 167-195, ISSN 1864-3361, URL https://ojs.ub.uni-konstanz.de/srm/article/view/369.

Jean-Claude Deville (1999). Variance estimation for complex statistics and estimators: linearization and residual techniques. Survey Methodology, 25, 193-203, URL https://www150.statcan.gc.ca/n1/en/catalogue/12-001-X19990024882.

See Also

svyarpt

Examples

```
library(survey)
library(laeken)
data(eusilc) ; names( eusilc ) <- tolower( names( eusilc ) )

# linearized design

des_eusilc <- svydesign( ids = ~rb030 , strata = ~db040 ,  weights = ~rb050 , data = eusilc )
des_eusilc <- convey_prep( des_eusilc )

# replicate-weighted design
des_eusilc_rep <- as.svrepdesign( des_eusilc , type = "bootstrap" )
des_eusilc_rep <- convey_prep( des_eusilc_rep )

# filter positive incomes
des_eusilc <- subset( des_eusilc , eqincome > 0 )
des_eusilc_rep <- subset( des_eusilc_rep , eqincome > 0 )

# poverty threshold fixed
svywatts(~eqincome, des_eusilc ,  abs_thresh=10000)
# poverty threshold equal to arpt
svywatts(~eqincome, des_eusilc , type_thresh= "relq", thresh = TRUE)
# poverty threshold equal to 0.6 times the mean
svywatts(~eqincome, des_eusilc , type_thresh= "relm" , thresh = TRUE)
# using svrep.design:
# poverty threshold fixed
svywatts(~eqincome, des_eusilc_rep  ,  abs_thresh=10000)
# poverty threshold equal to arpt
svywatts(~eqincome, des_eusilc_rep  , type_thresh= "relq", thresh = TRUE)
# poverty threshold equal to 0.6 times the mean
svywatts(~eqincome, des_eusilc_rep  , type_thresh= "relm" , thresh = TRUE)

## Not run:

# database-backed design
library(RSQLite)
library(DBI)
dbfile <- tempfile()
conn <- dbConnect( RSQLite::SQLite() , dbfile )
dbWriteTable( conn , 'eusilc' , eusilc )

dbd_eusilc <-
svydesign(
ids = ~rb030 ,
strata = ~db040 ,
weights = ~rb050 ,
data="eusilc",
dbname=dbfile,
dbtype="SQLite"
)

dbd_eusilc <- convey_prep( dbd_eusilc )
```

```
# filter positive incomes
dbd_eusilc <- subset( dbd_eusilc , eqincome > 0 )

# poverty threshold fixed
svywatts(~eqincome, dbd_eusilc ,  abs_thresh=10000)
# poverty threshold equal to arpt
svywatts(~eqincome, dbd_eusilc , type_thresh= "relq", thresh = TRUE)
# poverty threshold equal to 0.6 times the mean
svywatts(~eqincome, dbd_eusilc , type_thresh= "relm" , thresh = TRUE)

dbRemoveTable( conn , 'eusilc' )

dbDisconnect( conn , shutdown = TRUE )


## End(Not run)
```

---

svywattsdec *Watts poverty index decomposition*

Description

Estimate the Watts (1968) poverty measure and its components

Usage

```
svywattsdec(formula, design, ...)

## S3 method for class 'survey.design'
svywattsdec(
  formula,
  design,
  type_thresh = "abs",
  abs_thresh = NULL,
  percent = 0.6,
  quantiles = 0.5,
  na.rm = FALSE,
  thresh = FALSE,
  ...
)

## S3 method for class 'svyrep.design'
svywattsdec(
  formula,
  design,
  type_thresh = "abs",
```

```
  abs_thresh = NULL,
  percent = 0.6,
  quantiles = 0.5,
  na.rm = FALSE,
  thresh = FALSE,
  return.replicates = FALSE,
  ...
)

## S3 method for class 'DBIsvydesign'
svywattsdec(formula, design, ...)
```

Arguments

formula	a formula specifying the income variable
design	a design object of class survey.design or class svyrep.design from the survey library.
...	additional arguments. Currently not used.
type_thresh	type of poverty threshold. If "abs" the threshold is fixed and given the value of abs_thresh; if "relq" it is given by percent times the quantile; if "relm" it is percent times the mean.
abs_thresh	poverty threshold value if type_thresh is "abs"
percent	the multiple of the the quantile or mean used in the poverty threshold definition
quantiles	the quantile used used in the poverty threshold definition
na.rm	Should cases with missing values be dropped?
thresh	return the poverty threshold value
return.replicates	Return the replicate estimates?

Details

you must run the convey_prep function on your survey design object immediately after creating it with the svydesign or svrepdesign function.

For the svywatts and svywattsdec functions, zeroes and negative numbers in the analysis domain cause an error because of the logarithm function in the definition of this poverty measure. However, zeroes and negative values in the full survey design that are outside of the domain of analysis are valid to calculate the poverty threshold because zeroes and negatives are not a problem for computing quantiles (used when type_thresh = "relq") or means (used when type_thresh = "relm") . Missing values are treated differently. NA values anywhere in the full survey design (not only the subset, or the domain of analysis) will cause these quantiles and means to return NA results. To ignore NA values throughout, set na.rm = TRUE.

Value

Object of class "cvydstat", with estimates for the Watts index, FGT(0), Watts Poverty Gap Ratio, and Theil(poor incomes) with a "var" attribute giving the variance-covariance matrix. A "statistic" attribute giving the name of the statistic.

Author(s)

Guilherme Jacob, Djalma Pessoa, and Anthony Damico

References

McKinley L. Blackburn (1989). Poverty measurement: an index related to a Theil measure of inequality. *Journal of Business & Economic Statistics*, Vol.7, No.4, pp. 475-481, DOI doi:10.1080/07350015.1989.10509760.

Satya R. Chakravarty, Joseph Deutsch and Jacques Silber (2008). On the Watts multidimensional poverty index and its decomposition. *World Development*, Vol.36, No.6, pp.1067-1077.

Harold W. Watts (1968). An economic definition of poverty. *Institute For Research on Poverty Discussion Papers*, n.5. University of Wisconsin. URL https://www.irp.wisc.edu/publications/dps/pdfs/dp568.pdf.

Guillaume Osier (2009). Variance estimation for complex indicators of poverty and inequality. *Journal of the European Survey Research Association*, Vol.3, No.3, pp. 167-195, ISSN 1864-3361, URL https://ojs.ub.uni-konstanz.de/srm/article/view/369.

Jean-Claude Deville (1999). Variance estimation for complex statistics and estimators: linearization and residual techniques. Survey Methodology, 25, 193-203, URL https://www150.statcan.gc.ca/n1/en/catalogue/12-001-X19990024882.

See Also

svywatts,svyfgt,svyfgt

Examples

```
library(survey)
library(laeken)
data(eusilc) ; names( eusilc ) <- tolower( names( eusilc ) )

# linearized design
des_eusilc <- svydesign( ids = ~rb030 , strata = ~db040 ,  weights = ~rb050 , data = eusilc )
des_eusilc <- convey_prep( des_eusilc )

# replicate-weighted design
des_eusilc_rep <- as.svrepdesign( des_eusilc , type = "bootstrap" )
des_eusilc_rep <- convey_prep( des_eusilc_rep )

# filter positive incomes
des_eusilc <- subset( des_eusilc , eqincome > 0 )
des_eusilc_rep <- subset( des_eusilc_rep , eqincome > 0 )

# absolute poverty threshold
svywattsdec(~eqincome, des_eusilc, abs_thresh=10000)
# poverty threshold equal to arpt
svywattsdec(~eqincome, des_eusilc, type_thresh= "relq" , thresh = TRUE)
# poverty threshold equal to 0.6 times the mean
svywattsdec(~eqincome, des_eusilc, type_thresh= "relm" , thresh = TRUE)
```

```
#  using svrep.design:
# absolute poverty threshold
svywattsdec(~eqincome, des_eusilc_rep, abs_thresh=10000)
# poverty threshold equal to arpt
svywattsdec(~eqincome, des_eusilc_rep, type_thresh= "relq" , thresh = TRUE)
# poverty threshold equal to 0.6 times the mean
svywattsdec(~eqincome, des_eusilc_rep, type_thresh= "relm" , thresh = TRUE)

## Not run:

# database-backed design
library(RSQLite)
library(DBI)
dbfile <- tempfile()
conn <- dbConnect( RSQLite::SQLite() , dbfile )
dbWriteTable( conn , 'eusilc' , eusilc )

dbd_eusilc <-
svydesign(
ids = ~rb030 ,
strata = ~db040 ,
weights = ~rb050 ,
data="eusilc",
dbname=dbfile,
dbtype="SQLite"
)

dbd_eusilc <- convey_prep( dbd_eusilc )
dbd_eusilc <- subset( dbd_eusilc , eqincome > 0 )

# absolute poverty threshold
svywattsdec(~eqincome, dbd_eusilc, abs_thresh=10000)
# poverty threshold equal to arpt
svywattsdec(~eqincome, dbd_eusilc, type_thresh= "relq" , thresh = TRUE)
# poverty threshold equal to 0.6 times the mean
svywattsdec(~eqincome, dbd_eusilc, type_thresh= "relm" , thresh = TRUE)

dbRemoveTable( conn , 'eusilc' )

dbDisconnect( conn , shutdown = TRUE )


## End(Not run)
```

---

svyzenga *Zenga index*

Description

Estimate the Zenga index, a measure of inequality

Usage

```
svyzenga(formula, design, ...)

## S3 method for class 'survey.design'
svyzenga(
  formula,
  design,
  na.rm = FALSE,
  deff = FALSE,
  linearized = FALSE,
  influence = FALSE,
  ...
)

## S3 method for class 'svyrep.design'
svyzenga(
  formula,
  design,
  na.rm = FALSE,
  deff = FALSE,
  linearized = FALSE,
  return.replicates = FALSE,
  ...
)

## S3 method for class 'DBIsvydesign'
svyzenga(formula, design, ...)
```

Arguments

formula	a formula specifying the income variable
design	a design object of class survey.design or class svyrep.design from the survey library.
...	future expansion
na.rm	Should cases with missing values be dropped?
deff	Return the design effect (see survey::svymean)
linearized	Should a matrix of linearized variables be returned
influence	Should a matrix of (weighted) influence functions be returned? (for compatibility with svyby)
return.replicates	Return the replicate estimates?

Details

you must run the convey_prep function on your survey design object immediately after creating it with the svydesign or svrepdesign function.

Value

Object of class "cvystat", which are vectors with a "var" attribute giving the variance and a "statistic" attribute giving the name of the statistic.

Author(s)

Djalma Pessoa, Guilherme Jacob, and Anthony Damico

References

Lucio Barabesi, Giancarlo Diana and Pier Francesco Perri (2016). Linearization of inequality indices in the design-based framework. Statistics, 50(5), 1161-1172. DOI doi:10.1080/02331888.2015.1135924.

Matti Langel and Yves Tille (2012). Inference by linearization for Zenga's new inequality index: a comparison with the Gini index. Metrika, 75, 1093-1110. DOI doi:10.1007/s0018401103691.

Matti Langel (2012). Measuring inequality in finite population sampling. PhD thesis: Universite de Neuchatel, URL https://doc.rero.ch/record/29204/files/00002252.pdf.

See Also

svygini

Examples

```
library(survey)
library(laeken)
data(eusilc) ; names( eusilc ) <- tolower( names( eusilc ) )

# linearized design
des_eusilc <- svydesign( ids = ~rb030 , strata = ~db040 ,  weights = ~rb050 , data = eusilc )
des_eusilc <- convey_prep(des_eusilc)

svyzenga( ~eqincome , design = des_eusilc )

# replicate-weighted design
des_eusilc_rep <- as.svrepdesign( des_eusilc , type = "bootstrap" )
des_eusilc_rep <- convey_prep(des_eusilc_rep)

svyzenga( ~eqincome , design = des_eusilc_rep )

## Not run:

# linearized design using a variable with missings
svyzenga( ~ py010n , design = des_eusilc )
svyzenga( ~ py010n , design = des_eusilc , na.rm = TRUE )
# replicate-weighted design using a variable with missings
svyzenga( ~ py010n , design = des_eusilc_rep )
svyzenga( ~ py010n , design = des_eusilc_rep , na.rm = TRUE )

# database-backed design
library(RSQLite)
```

```
library(DBI)
dbfile <- tempfile()
conn <- dbConnect( RSQLite::SQLite() , dbfile )
dbWriteTable( conn , 'eusilc' , eusilc )

dbd_eusilc <-
svydesign(
ids = ~rb030 ,
strata = ~db040 ,
weights = ~rb050 ,
data="eusilc",
dbname=dbfile,
dbtype="SQLite"
)

dbd_eusilc <- convey_prep( dbd_eusilc )

svyzenga( ~ eqincome , design = dbd_eusilc )

dbRemoveTable( conn , 'eusilc' )

dbDisconnect( conn , shutdown = TRUE )


## End(Not run)
```

Index