

Package ‘CompositeRegressionEstimation’

April 23, 2020

Type Package

Title X

Version 1.0

Date 2020-04-23

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Imports ggplot2,
abind,
optimx,
Matrix,
Hmisc,
MASS,
filehash

Suggests

Description Data

Remotes DanielBonnery/TensorDB

Depends TensorDB,
sampling,
abind,
optimx,
Hmisc,
MASS,
filehash

License GPL (>= 2)

LazyLoad yes

LazyData true

RoxygenNote 7.0.2

R topics documented:

AK [2](#)

AK_est	5
CoeffS2	5
CoeffYF	6
CoeffYF.matrix	6
composite	7
CPS_AK	9
CPS_AK_coeff.array.fl	9
CPS_AK_est	10
CPS_A_e	10
CPS_A_u	11
CPS_K_e	11
CPS_K_u	11
CPS_Xplus_array	12
CPS_Xplus_matrix	12
CPS_X_array	13
CPS_X_matrix	13
douuble	14
empirical.var	14
factorisedf	15
MR	15
varAK3	17
varAK3diff	17
varAK3diffrat	18
varAK3rat	19
var_lin	19
W.ak	20
WS	21

Index	22
--------------	-----------

AK	<i>AK Estimator (recursive version)</i>
----	---

Description

Consider a sequence of monthly samples $(S_m)_{m \in \{1, \dots, M\}}$. In the CPS, a sample S_m is the union of 8 rotation groups: $S_m = S_{m,1} \cup S_{m,2} \cup S_{m,3} \cup S_{m,4} \cup S_{m,5} \cup S_{m,6} \cup S_{m,7} \cup S_{m,8}$, where two consecutive samples are always such that $S_{m,2} = S_{m-1,1}$, $S_{m,3} = S_{m-1,2}$, $S_{m,4} = S_{m-1,3}$, $S_{m,6} = S_{m-1,5}$, $S_{m,7} = S_{m-1,6}$, $S_{m,8} = S_{m-1,7}$, and one year appart samples are always such that $S_{m,5} = S_{m-12,1}$, $S_{m,6} = S_{m-12,2}$, $S_{m,7} = S_{m-12,3}$, $S_{m,8} = S_{m-12,4}$.

The subsamples $S_{m,g}$ are called rotation groups, and rotation patterns different than the CPS rotation pattern are possible.

For each individual k of the sample m , one observes the employment status $Y_{k,m}$ (A binary variable) of individual k at time m , and the survey weight $w_{k,m}$, as well as its "rotation group".

The AK composite estimator is defined in "CPS Technical Paper (2006), [section 10-11]":

For $m = 1$, $\hat{t}_{Y,1} = \sum_{k \in S_1} w_{k,m} Y_{k,m}$.

For $m \geq 2$,

$$\hat{t}_{Y,m} = (1 - K) \times \left(\sum_{k \in S_m} w_{k,m} Y_{k,m} \right) + K \times (\hat{t}_{Y,m-1} + \Delta_m) + A \times \hat{\beta}_m$$

where

$$\Delta_m = \eta_0 \times \sum_{k \in S_m \cap S_{m-1}} (w_{k,m} Y_{k,m} - w_{k,m-1} Y_{k,m-1})$$

and

$$\hat{\beta}_m = \left(\sum_{k \notin S_m \cap S_{m-1}} w_{k,m} Y_{k,m} \right) - \eta_1 \times \left(\sum_{k \in S_m \cap S_{m-1}} w_{k,m} Y_{k,m} \right)$$

For the CPS, η_0 is the ratio between the number of rotation groups in the sample and the number of overlapping rotation groups between two month, which is a constant $\eta_0 = 4/3$; η_1 is the ratio between the number of non overlapping rotation groups the number of overlapping rotation groups between two month, which is a constant of $1/3$.

In the case of the CPS, the rotation group one sample unit belongs to in a particular month is a function of the number of times it has been selected before, including this month, and so the rotation group of an individual in a particular month is called the "month in sample" variable.

For the CPS, in month m the overlap $S_{m-1} \cap S_m$ correspond to the individuals in the sample S_m with a value of month in sample equal to 2,3,4, 6,7 or 8. The overlap $S_{m-1} \cap S_m$ correspond to the individuals in the sample S_m with a value of month in sample equal to 2,3,4, 6,7 or 8. as well as individuals in the sample S_{m-1} with a value of month in sample equal to 1,2,3, 5,6 or 7. When parametrising the function, the choice would be group₁=c(1:3,5:7) and group₀=c(2:4,6:8).

Computing the estimators recursively is not very efficient. At the end, we get a linear combinaison of month in sample estimates The functions AK3, and WSrg computes the linear combination directly and more efficiently.

Usage

```
AK(
  list.tables,
  w,
  list.y,
  id = NULL,
  groupvar = NULL,
  groups_1 = NULL,
  groups0 = NULL,
  A = 0,
  K = 0,
  dft0.y = NULL,
  eta0 = 0,
  eta1 = 0
)
```

Arguments

<code>list.tables</code>	a list of tables
<code>w</code>	a character string: name of the weights variable (should be the same in all tables)
<code>list.y</code>	a vector of variable names
<code>id</code>	a character string: name of the identifier variable (should be the same in all tables)
<code>groupvar</code>	a character string: name of the rotation group variable (should be the same in all tables)
<code>groups_1</code>	a character string:
<code>groups0</code>	if <code>groupvar</code> is not null, a vector of possible values for <code>L[[groupvar]]</code>
<code>eta0</code>	a numeric value
<code>eta1</code>	a numeric value

Details

the function is based on the more general function `CompositeRegressionEstimation::composite`

References

“CPS Technical Paper (2006). Design and Methodology of the Current Population Survey. Technical Report 66, U.S. Census Bureau.”, “Gurney, M. and Daly, J. F. (1965). A multivariate approach to estimation in periodic sample surveys. In Proceedings of the Social Statistics Section, American Statistical Association, volume 242, page 257.”

See Also

`CompositeRegressionEstimation::composite`

Examples

```
library(dataCPS)
data(cps200501,cps200502,cps200503,cps200504,
     cps200505,package="dataCPS")
list.tables<-list(cps200501,cps200502,cps200503,cps200504,
                  cps200505)
w="pwsswgt";id=c("hrhhid","pulineno");groupvar=NULL;list.y="pemlr";dft0.y=NULL;
groups_1=NULL;groups0=NULL;Coef=c(alpha_1=0,alpha0=1,beta_1=0,beta0=0,gamma_1=0)
AK(list.tables,w=w,list.y="pemlr",id=id,groupvar=groupvar)
##With the default choice of parameters for \code{A},\code{K},\code{eta0},\code{eta1} the composite is equal to th
WS(list.tables = list.tables,weight = w,list.y = list.y)
## Example of use of a group variable.
w="pwsswgt";id=NULL;groupvar="hrmis";list.y="pemlr";dft0.y=NULL;
groups_1=c(1:3,5:7);groups0=c(2:4,6:8);Coef=c(alpha0=1,alpha_1=0,beta_1=0,beta0=0,gamma_1=0)
AK(list.tables,w=w,list.y="pemlr",id=id,groupvar="hrmis")
```

AK_est	<i>AK estimation on array of month in sample estimates</i>
--------	--

Description

AK estimation on array of month in sample estimates

Usage

```
AK_est(Y, S = c(2:4, 6:8), a, k)
```

Arguments

Y	an array of dimensions
S	a vector of integers, subvector of
a	a numeric value
k	a numeric value

Value

an array

CoeffS2	<i>Compute the coefficients for Multivariate Blue</i>
---------	---

Description

Compute the coefficients for Multivariate Blue

Usage

```
CoeffS2(nmonth)
```

Arguments

Sigma	a p x p matrix
X	an n x p matrix
Xplus:	a general inverse of X

Value

the coefficients matrix W such that WY is the best unbiased linear estimator of β where $E[Y]=X\beta$

Examples

```
A=array(rnorm(prod(2:5)),2:5);M=a2m(A,2);dim(A);dim(M);dim(a2m(A))
```

CoeffYF	<i>Compute Yansaneh-Fuller coefficient for CPS, matrix version</i>
---------	--

Description

Compute Yansaneh-Fuller coefficient for CPS, matrix version

Usage

```
CoeffYF(Sigma, nmonth = dim(Sigma)[[1]])
```

Arguments

Sigma a Variance covariance array

Value

a matrix.

Examples

```
CoeffYF(var())
```

CoeffYF.matrix	<i>Compute the coefficients for Multivariate Blue</i>
----------------	---

Description

Compute the coefficients for Multivariate Blue

Usage

```
CoeffYF.matrix(Sigma, X, Xplus = MASS::ginv(X))
```

Arguments

Sigma a p x p matrix
X an n x p matrix
Xplus: a general inverse of X

Value

the coefficients matrix W such that WY is the best unbiased linear estimator of β where $E[Y]=X\beta$

Examples

```
A=array(rnorm(prod(2:5)),2:5);M=a2m(A,2);dim(A);dim(M);dim(a2m(A))
```

composite	<i>Linear Composite Estimator from overlap and non overlapping consecutive subsamples direct totals</i>
-----------	---

Description

Consider a sequence of monthly samples $(S_m)_{m \in \{1, \dots, M\}}$. For each individual k of the sample m , one observes the employment status $Y_{k,m}$ (A binary variable) of individual k at time m , and the survey weight $w_{k,m}$. The following program allows to compute recursively for $m = 1, \dots, M$ the Census composite estimator of the total of $Y_{.,m}$ with coefficients defined recursively as follows:

For $m = 1$, $\hat{t}_{Y.,1} = \sum_{k \in S_1} w_{k,1} Y_{k,1}$.

For $m \geq 2$,

$$\hat{t}_{Y.,m} = \begin{bmatrix} \hat{t}_{Y.,m-1} \\ \sum_{k \in S_m} w_{k,m} Y_{k,m} \\ \sum_{k \in S_{m-1} \cap S_m} w_{k,m-1} Y_{k,m-1} \\ \sum_{k \in S_{m-1} \cap S_m} w_{k,m} Y_{k,m} \\ \sum_{k \in S_m \setminus S_{m-1}} w_{k,m} Y_{k,m} \end{bmatrix}^T \times \begin{bmatrix} \alpha_{(-1)} \\ \alpha_0 \\ \beta_{(-1)} \\ \beta_0 \\ \gamma_0 \end{bmatrix}$$

This function computes the estimators for given values of α, β, γ .

An example of use of such estimate is the Census Bureau AK estimator: it is a special case of this estimator, with the values of α, β, γ that are given as a function of two parameters A and K:

$$\begin{bmatrix} \alpha_{(-1)} \\ \alpha_0 \\ \beta_{(-1)} \\ \beta_0 \\ \gamma_0 \end{bmatrix} = \begin{bmatrix} K \\ 1 - K \\ -4K/3 \\ (4K - A)/3 \\ A \end{bmatrix}$$

for more references, please refer to the function `CompositeRegressionEstimation::AK`.

See "CPS Technical Paper (2006). Design and Methodology of the Current Population Survey. Technical Report 66, U.S. Census Bureau."

$$\begin{aligned} \hat{t}_{Y.,m} = & K \times \hat{t}_{Y.,m-1} \\ & + (1 - K) \times \sum_{k \in S_m} w_{k,m} Y_{k,m} \\ & + (-4K/3) \times \sum_{k \in S_{m-1} \cap S_m} w_{k,m-1} Y_{k,m-1} \\ & + (4K - A)/3 \times \sum_{k \in S_{m-1} \cap S_m} w_{k,m} Y_{k,m} \\ & + A \times \sum_{k \in S_m \setminus S_{m-1}} w_{k,m} Y_{k,m} \end{aligned}$$

Computing the estimators recursively is not very efficient. At the end, we get a linear combinaison of month in sample estimates. The functions `AK3`, and `WSrg` computes the linear combination directly and more efficiently.

For the CPS, in month m the overlap $S_{m-1} \cap S_m$ correspond to the individuals in the sample S_m with a value of month in sample equal to 2,3,4, 6,7 or 8. The overlap $S_{m-1} \cap S_m$ correspond to the individuals in the sample S_m with a value of month in sample equal to 2,3,4, 6,7 or 8. as well as individuals in the sample S_{m-1} with a value of month in sample equal to 1,2,3, 5,6 or 7. When parametrising the function, the choice would be `group_1=c(1:3, 5:7)` and `group0=c(2:4, 6:8)`.

Usage

```
composite(
  list.tables,
  w,
  list.y,
  id = NULL,
  groupvar = NULL,
  groups_1 = NULL,
  groups0 = NULL,
  Coef = c(alpha_1 = 0, alpha0 = 1, beta_1 = 0, beta0 = 0, gamma0 = 0),
  dft0.y = NULL
)
```

Arguments

<code>list.tables</code>	a list of tables
<code>w</code>	a character string: name of the weights variable (should be the same in all tables)
<code>list.y</code>	a vector of variable names
<code>id</code>	a character string: name of the identifier variable (should be the same in all tables)
<code>groupvar</code>	a character string: name of the rotation group variable (should be the same in all tables)
<code>groups_1</code>	a character string:
<code>groups0</code>	if <code>groupvar</code> is not null, a vector of possible values for <code>L[[groupvar]]</code>

See Also

`CompositeRegressionEstimation::AK`

Examples

```
library(dataCPS)
data(cps200501, cps200502, cps200503, cps200504,
     cps200505, package="dataCPS")
list.tables<-list(cps200501, cps200502, cps200503, cps200504,
                  cps200505)
w="pwsswgt";id=c("hrhhid","pulineno");groupvar=NULL;list.y="pemlr";dft0.y=NULL;
groups_1=NULL;groups0=NULL;Coef=c(alpha_1=0,alpha0=1,beta_1=0,beta0=0,gamma0=0)
composite(list.tables,w=w,list.y="pemlr",id=id,groupvar=groupvar)
##With the default choice of parameters for \code{Coef}, the composite is equal to the direct estimator: we check
WS(list.tables = list.tables,weight = w,list.y = list.y)
## Example of use of a group variable.
w="pwsswgt";id=NULL;groupvar="hrmis";list.y="pemlr";dft0.y=NULL;
groups_1=c(1:3,5:7);groups0=c(2:4,6:8);Coef=c(alpha0=1,alpha_1=0,beta_1=0,beta0=0,gamma0=0)
composite(list.tables,w=w,list.y="pemlr",id=id,groupvar=groupvar)
```


CPS_AK

*Gives A,K coefficient for unemployed used by the Census***Description**

Gives A,K coefficient for unemployed used by the Census

Usage

```
CPS_AK()
```

Value

The vector `c(a1=CPS_A_u(),a2=CPS_A_e(),a3=0,k1=CPS_K_u(),k2=CPS_K_e(),k3=0)`

```
CPS_AK_coeff.array.fl
```

Empirical variance of a collection of arrays.

Description

Empirical variance of a collection of arrays.

Usage

```
CPS_AK_coeff.array.fl(
  nmonth,
  ak = list(c(a_1 = 0, a_2 = 0, a_3 = 0, k_1 = 0, k_2 = 0, k_3 = 0)),
  simplify = TRUE,
  statuslabel = c("0", "1", "_1")
)
```

Arguments

<code>nmonth</code>	a strictly positive integer
<code>ak</code> ,	a list of numeric vectors of length 6.
<code>simplify</code>	a boolean
<code>statuslabel</code>	: a character vector of dimension 3 indicating the label for unemployed, employed, not in the labor force.

Examples

```
CPS_AK_coeff.array.fl()
```

CPS_AK_est	<i>Gives the variance of the AK estimators from the A,K coefficients and the variance covariance matrix of the month in sample estimates</i>
------------	--

Description

Gives the variance of the AK estimators from the A,K coefficients and the variance covariance matrix of the month in sample estimates

Usage

```
CPS_AK_est(
  mistotals,
  coeff = CPS_AK_coeff.array.fl(dim(mistotals)[1], ak, simplify = FALSE),
  ak = CPS_AK()
)
```

Arguments

mistotals	An array of dimension nmonth x 8 x 3. mistotals[i,j,k] is the month in sample direct estimate for month i, month in sample j rotation group, and variable k.
coeff	An array of coefficients $W[ak,y2,m2,y1,mis1,m1]$ such that AK estimate for coefficients ak, month m2 and employment status y2 is $\sum(W[ak,y2,m2,,])*Y[.,]$ where mistotals[y1,mis1,m1] is direct estimate on mis mis1 for emp stat y1 at month m1.
ak:	an ak coefficients vector or a list of ak coefficients.

Value

The variance of the AK estimators from the A,K coefficients and the variance covariance matrix .

Examples

```
varAK3(ak=c(a1=.3,a2=.4,a3=0,k1=.4,k2=.7,k3=0), Sigma=array(drop(stats::rWishart(1,df=3*10*8,diag(3*10*8))),rep
```

CPS_A_e	<i>Gives K coefficient for unemployed used by the Census</i>
---------	--

Description

Gives K coefficient for unemployed used by the Census

Usage

```
CPS_A_e()
```

Value

.4

CPS_A_u

Gives K coefficient for unemployed used by the Census

Description

Gives K coefficient for unemployed used by the Census

Usage

CPS_A_u()

Value

.3

CPS_K_e

Gives K coefficient for unemployed used by the Census

Description

Gives K coefficient for unemployed used by the Census

Usage

CPS_K_e()

Value

.7

CPS_K_u

Gives K coefficient for unemployed used by the Census

Description

Gives K coefficient for unemployed used by the Census

Usage

CPS_K_u()

Value

.4

CPS_Xplus_array	<i>Compute the Moore penrose general inverse of a the Yansaneh Fuller X matrix for CPS, array version</i>
-----------------	---

Description

Compute the Moore penrose general inverse of a the Yansaneh Fuller X matrix for CPS, array version

Usage

```
CPS_Xplus_array(X)
```

Arguments

nmonth	an integer
--------	------------

Value

a matrix.

Examples

```
CPS_Xplus_matrix(10)
```

CPS_Xplus_matrix	<i>Compute the Moore penrose general inverse of a the Yansaneh Fuller X matrix for CPS</i>
------------------	--

Description

Compute the Moore penrose general inverse of a the Yansaneh Fuller X matrix for CPS

Usage

```
CPS_Xplus_matrix(X)
```

Arguments

nmonth	an integer
--------	------------

Value

a matrix.

Examples

```
CPS_Xplus_matrix(10)
```

`CPS_X_array`*Compute Yansaneh-Fuller X matrix for CPS, array version*

Description

Compute Yansaneh-Fuller X matrix for CPS, array version

Usage

```
CPS_X_array(nmonth)
```

Arguments

`nmonth` an integer

Value

a matrix.

Examples

```
CPS_X_matrix(10)
```

`CPS_X_matrix`*Compute Yansaneh-Fuller X matrix for CPS*

Description

Compute Yansaneh-Fuller X matrix for CPS

Usage

```
CPS_X_matrix(nmonth)
```

Arguments

`nmonth` an integer

Value

a matrix.

Examples

```
CPS_X_matrix(10)
```

douuble	<i>Compute weighted sums</i>
---------	------------------------------

Description

Compute weighted sums

Usage

```
douuble(list.tables, w, id, y)
```

Arguments

- list.tables A list of dataframes, order matters.
- w either a real number or a character string indicating the name of the weight variable.
- id primary key of the tables, used to merge tables together.
- y a string indicating the name of a factor variable common to all tables of list.tables.

Value

a list of three arrays.

Examples

```
douuble(list.tables=lapply(1:10,function(x){cbind(id=1:nrow(Orange),Orange)[sample(nrow(Orange),30),]}),w="circumference",id="id",y="species")
```

empirical.var	<i>Empirical variance of a collection of arrays.</i>
---------------	--

Description

Empirical variance of a collection of arrays.

Usage

```
empirical.var(A, MARGIN, n)
```

Arguments

- A An array of dimension d_1 x ... d_p
- MARGIN a vector of integers
- n the array of dimension a_1 x ... x a_n $Y[i_1,...,i_n]=sum(W[i_1,...,i_n,...])$

Examples

```
empirical.var()
```

factorisedf	<i>Convert variables to numeric in dataframe.</i>
-------------	---

Description

Convert variables to numeric in dataframe.

Usage

```
factorisedf(dfr, list.y)
```

Arguments

- dfr A dataframe
- list.y character vector containing the names of the variables to be converted.

Value

a dataframe

Examples

```
factorisedf(Orange,names(Orange))
```

MR	<i>Regression Composite estimation</i>
----	--

Description

Regression Composite estimation

Usage

```
MR(  
  list.tables,  
  w,  
  id,  
  list.xMR = NULL,  
  list.x1 = NULL,  
  list.x2 = NULL,  
  list.y = NULL,  
  calibmethod = "linear",  
  Alpha = 0.75,  
  theta = 3/4,  
  list.dft.x2 = NULL,  
  dft0.xMR = NULL,
```

```

    mu0 = NULL,
    Singh = TRUE,
    dispweight = FALSE,
    analyse = FALSE
  )

```

Arguments

<code>list.tables</code>	A list of dataframes
<code>w</code>	either a real number or a character string indicating the name of the weight variable.
<code>id</code>	an identifier
<code>list.xMR</code>	list of variables used to compute proxy composite regression variable
<code>list.x1</code>	list of auxiliary variables used in the calibration, whose calibrated weighted total has to be equal to initially weighted total
<code>list.x2</code>	id list of auxiliary variables used in the calibration, whose calibrated weighted total has to be equal to initially weighted total
<code>Alpha</code>	a vector of alpha values. if <code>alpha="01"</code> , this will compute MR3
<code>theta</code>	a numerical value
<code>list.dft.x2</code>	id list of auxiliary variables used in the calibration, whose calibrated weighted total has to be equal to initially weighted total
<code>mu0</code>	a numerical value
<code>Singh</code>	a boolean
<code>dispweight</code>	a boolean
<code>analyse</code>	a boolean
<code>list.y:</code>	list of variables whose weighted sum needs to be computed. It can be factor or character variables.

Value

a dataframe.

Examples

```
MR(list.tables<-plyr::dply(CRE_data,.variables=~time),w="Sampling.weight",list.xMR="Status",id="Identifier",1
```

varAK3	<i>Gives the variance of the AK estimators from the A,K coefficients and the variance covariance matrix of the month in sample estimates</i>
--------	--

Description

Gives the variance of the AK estimators from the A,K coefficients and the variance covariance matrix of the month in sample estimates

Usage

```
varAK3(ak, Sigma)
```

Arguments

ak	A set of 3 A, K coefficients, of the form c(a1=.3,a2=.4,a3=0,k1=.4,k2=.7,k3=0).
Sigma	An array of dimension 3 x 8 (number of rotation groups) x number of months x 3 x 8 (number of rotation groups) x number of months.

Value

The variance of the AK estimators from the A,K coefficients and the variance covariance matrix .

Examples

```
varAK3(ak=c(a1=.3,a2=.4,a3=0,k1=.4,k2=.7,k3=0), Sigma=array(drop(stats::rWishart(1,df=3*10*8,diag(3*10*8))),rep(
```

varAK3diff	<i>Gives the variance of the consecutive differences of AK estimators from the A,K coefficients and the variance covariance matrix of the month in sample estimates</i>
------------	---

Description

Gives the variance of the consecutive differences of AK estimators from the A,K coefficients and the variance covariance matrix of the month in sample estimates

Usage

```
varAK3diff(ak, Sigma)
```

Arguments

ak	A set of 3 A, K coefficients, of the form c(a1=.3,a2=.4,a3=0,k1=.4,k2=.7,k3=0).
Sigma	An array of dimension 3 x 8 (number of rotation groups) x number of months x 3 x 8 (number of rotation groups) x number of months.

Value

The variance of the consecutive differences of the AK estimators from the A,K coefficients and the variance covariance matrix .

Examples

```
varAK3diff(ak=c(a1=.3,a2=.4,a3=0,k1=.4,k2=.7,k3=0), Sigma=array(drop(stats::rWishart(1,df=3*10*8,diag(3*10*8))
add(10, 1)
```

varAK3diff	<i>Gives the variance of the unemployment rate estimates derived from AK estimators from the A,K coefficients and the variance covariance matrix of the month in sample estimates</i>
------------	---

Description

Gives the variance of the unemployment rate estimates derived from AK estimators from the A,K coefficients and the variance covariance matrix of the month in sample estimates

Usage

```
varAK3diff(ak, Sigma, Scm, what = c(unemployed = "0", employed = "1"))
```

Arguments

- ak A set of 3 A, K coefficients, of the form c(a1=.3,a2=.4,a3=0,k1=.4,k2=.7,k3=0).
- Sigma An array of dimension 3 x 8 (number of rotation groups) x number of months x 3 x 8 (number of rotation groups) x number of months.
- Scm An array of dimension number of months x 3.

Value

The variance of the the unemployment rate estimates derived from the AK estimators from the A,K coefficients and the variance covariance matrix .

Examples

```
varAK3diff(ak=c(a1=.3,a2=.4,a3=0,k1=.4,k2=.7,k3=0), Sigma=array(drop(stats::rWishart(1,df=3*10*8,diag(3*10*8
```

varAK3rat	<i>Gives the variance of the unemployment rate estimates derived from AK estimators from the A,K coefficients and the variance covariance matrix of the month in sample estimates</i>
-----------	---

Description

Gives the variance of the unemployment rate estimates derived from AK estimators from the A,K coefficients and the variance covariance matrix of the month in sample estimates

Usage

```
varAK3rat(ak, Sigma, Scomppop, what = c(unemployed = "0", employed = "1"))
```

Arguments

ak	A set of 3 A, K coefficients, of the form $c(a1=.3, a2=.4, a3=0, k1=.4, k2=.7, k3=0)$.
Sigma	An array of dimension 3 x 8 (number of rotation groups) x number of months x 3 x 8 (number of rotation groups) x number of months.
Scomppop	An array of dimension number of months x 3.

Value

The variance of the the unemployment rate estimates derived from the AK estimators from the A,K coefficients and the variance covariance matrix .

Examples

```
varAK3rat(ak=c(a1=.3, a2=.4, a3=0, k1=.4, k2=.7, k3=0), Sigma=array(drop(stats::rWishart(1, df=3*10*8, diag(3*10*8))),
```

var_lin	<i>Gives the variance of an array Y that is a linear transformation AX of an array X from the coefficients of A and Sigma=Var[X]</i>
---------	--

Description

Gives the variance of an array Y that is a linear transformation AX of an array X from the coefficients of A and Sigma=Var[X]

Usage

```
var_lin(A, Sigma)
```

Arguments

Sigma	An array of dimension $b_1 \times \dots \times b_p \times b_1 \times \dots \times b_p$
coeff	An array of dimension $a_1 \times \dots \times a_n \times b_1 \times \dots \times b_p$

Value

The variance of the AK estimators from the A,K coefficients and the variance covariance matrix .

Examples

```
a=c(2,4);b=c(3,10,8);A<-array(rnorm(prod(a)*prod(b)),c(a,b));
dimnames(A)[1:2]<-lapply(a,function(x){letters[1:x]});names(dimnames(A))[1:2]<-c("d1","d2");
Sigma=array(drop(stats::rWishart(1,df=prod(b),diag(prod(b)))),rep(b,2));
var_lin(A,Sigma)
```

W.ak

general AK weights as a function of a and k parameters.

Description

general AK weights as a function of a and k parameters.

Usage

```
W.ak(nmonth, ngroups = 8, S = c(2:4, 6:8), a, k)
```

Arguments

nmonth	an integer, indicating number of months
ngroups	: number of groups
S	a vector of integers indicating the indices of the rotation group in the sample

Value

an array of AK coefficients $W[m2,m1,mis1]$ such that Ak estimate for month m2 is $\text{sum}(W[y2,,])*Y$ where $Y[m1,mis1]$ is direct estimate on mis mis1 for emp stat y1 at month m1.

WS	<i>Compute weighted sums</i>
----	------------------------------

Description

Compute weighted sums

Usage

```
WS(list.tables, weight = 1, list.y = NULL, sep = "_n")
```

Arguments

<code>list.tables</code>	A list of dataframes
<code>weight</code>	either a real number or a character string indicating the name of the weight variable.
<code>list.y:</code>	list of variables whose weighted sum needs to be computed. It can be factor or character variables.

Value

a dataframe.

Examples

```
WS(plyr::dply(CRE_data,.variables=~time),"Sampling.weight",c("Hobby","Status","State"));  
WS(plyr::dply(CRE_data,.variables=~time),"Sampling.weight",character(0));
```

Index

AK, [2](#)
AK_est, [5](#)

CoeffS2, [5](#)
CoeffYF, [6](#)
CoeffYF.matrix, [6](#)
composite, [7](#)
CPS_A_e, [10](#)
CPS_A_u, [11](#)
CPS_AK, [9](#)
CPS_AK_coeff.array.fl, [9](#)
CPS_AK_est, [10](#)
CPS_K_e, [11](#)
CPS_K_u, [11](#)
CPS_X_array, [13](#)
CPS_X_matrix, [13](#)
CPS_Xplus_array, [12](#)
CPS_Xplus_matrix, [12](#)

double, [14](#)

empirical.var, [14](#)

factorisedf, [15](#)

MR, [15](#)

var_lin, [19](#)
varAK3, [17](#)
varAK3diff, [17](#)
varAK3diffrat, [18](#)
varAK3rat, [19](#)

W.ak, [20](#)
WS, [21](#)