Package 'xtreg2way'

August 11, 2020

Type Package

Title Feasible Estimation of the Two-Way Fixed Effect Model

Version 1.0.0

Description Implemented is an algorithm to estimate the two-way fixed effect linear model.
The coefficients of interest are computed using the residuals from the
projection of all variables on the two sets of fixed effects. Our algorithm
has three desirable features. First, it manages memory and computational
resources efficiently which speeds up the computation of the estimates.
Second, it allows the researcher to estimate multiple specifications
using the same set of fixed effects at a very low computational cost.
Third, the asymptotic variance of the parameters of interest can be
consistently estimated using standard routines on the residualized data.
Somaini P., Wolak F. A. (2016) <doi:10.1515/jem-2014-0008>
Arellano, M. (1987) <https://ideas.repec.org/a/bla/obuest/v49y1987i4p431-34.html>.

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URL https://github.com/paulosomaini/xtreg2way

Encoding UTF-8

LazyData true

Imports pracma, Matrix, stats, MASS

RoxygenNote 7.1.1

Suggests knitr, rmarkdown, testthat

VignetteBuilder knitr

NeedsCompilation no

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R topics documented:

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avar   *Asymptotic variance of Estimator*

Description

avar calculated the asymptotic variance of the regression estimation

Usage

```
avar(X, e, group = NULL, J = NULL)
```

Arguments

X	A matrix or vector of independent variable(s)
e	The residuals from the regression
group	(optional) The cluster identifier (hhid from `projdummies`)
J	(optional) This is assumed to be X'X, and can be input if pre-calculated

Value

A matrix of the covariates

Examples

```
hhid <- c("a","b","c","a","b","c" ,"a","b","c" ,"a","b","c" ,"a","b","c")
tid <- c("1","1" ,"1" ,"2","2" ,"3","3","3" ,"4","4","5" ,"5","6","6" ,"6")
w <- rep(1, 15)
x1 <- rnorm(15, mean=50, sd=10)
x2 <- rnorm(15, mean=50, sd=10)
y <- x1 + rnorm(15, mean=50, sd=10)

struc <- projdummies(hhid, tid, w)
projvar_list <- projvar(x1, struc)
x1p <- projvar_list$var
projvar_list <- projvar(x2, struc)
x2p <- projvar_list$var
```

```
projvar_list <- projvar(y, struc)
yp <- projvar_list$var

reg <- regress1(yp, data.frame(x1p,x2p))
matCov <- avar(data.frame(x1p, x2p), reg$res, struc$hhid, reg$XX)
```

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ids_with_multiple_obs	ids_with_multiple_obs *returns a vector of values that occur multiple times*

Description

ids_with_multiple_obs returns a vector of values that occur multiple times

Usage

```
ids_with_multiple_obs(id)
```

Arguments

id	A vector of dummy indicators

Value

A vector of repeated values

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nonredundant	*Nonredundant*

Description

nonredundant flags for redundant dummy levels

Usage

```
nonredundant(iid, tid, w)
```

Arguments

iid	A vector of group dummy indicators
tid	A vector of time dummy indicators
w	A vector of non-negative weights

Value

A list will be returned with the following named values: flag - Are there redundant dummy levels?
nr - a listing of

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projdummies   *Projection Dummies*

Description

`projdummies` returns necessary matrices to project variables on fixed effect dummies. The input parameters all need to be of the same length.

Usage

```
projdummies(hhid, tid, w)
```

Arguments

hhid   A vector of individual effect identifiers

tid   A vector of time effect identifiers

w   A vector of weights for each observation

Value

A list will be returned with necessary matrices to project upon. If the time effect has more levels, the matrices B, C, invDD, and invDDDH will be returned If the individual effect has more levels, the matrices A, B, invHH and invHHDH will be returned

hhid and tid as factors will always be returned, as well as the original weights w that are passed.

Examples

```
hhid <- c("a","b","c","a","b","c" ,"a","b","c" ,"a","b","c" ,"a","b","c")
tid <- c("1","1" ,"1" ,"2","2" ,"3","3","3" ,"4","4","5" ,"5","6","6" ,"6")
w <- rep(1, 15)
projdummies(hhid, tid, w)
```

---

 projvar   *Project Variables*

Description

`projvar` uses the matrices from `projdummies` to project a variable. In practice, all dependent and independent variables must be project for the two way regression

Usage

```
projvar(var, struc)
```

Arguments

var	A vector of a single variable
struc	The output of `projdummies`, containing matrices necessary to project

Value

A list will be returned with the following named values: var - the projected variable delta, tau - intermediate variables

Examples

```
hhid <- c("a","b","c","a","b","c" ,"a","b","c" ,"a","b","c" ,"a","b","c")
tid <- c("1","1" ,"1" ,"2","2" ,"3","3","3" ,"4","4","5" ,"5","6","6" ,"6")
w <- rep(1, 15)
x1 <- rnorm(15, mean=50, sd=10)

struc <- projdummies(hhid, tid, w)
x1p <- projvar(x1, struc)
```

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regress1	*Regression*

Description

`regress1` performs an OLS regression based on the projected variables y and X.

Usage

```
regress1(y, X)
```

Arguments

y	The dependent variable
X	A matrix or vector of independent variable(s)

Value

A list which contains X'X, the returned coefficients beta, and residuals res

Examples

```
hhid <- c("a","b","c","a","b","c" ,"a","b","c" ,"a","b","c" ,"a","b","c")
tid <- c("1","1" ,"1" ,"2","2" ,"3","3","3" ,"4","4","5" ,"5","6","6" ,"6")
w <- rep(1, 15)
x1 <- rnorm(15, mean=50, sd=10)
x2 <- rnorm(15, mean=50, sd=10)
y <- x1 + rnorm(15, mean=50, sd=10)
```

```
struc <- projdummies(hhid, tid, w)
projvar_list <- projvar(x1, struc)
x1p <- projvar_list$var
projvar_list <- projvar(x2, struc)
x2p <- projvar_list$var
projvar_list <- projvar(y, struc)
yp <- projvar_list$var

reg <- regress1(yp, data.frame(x1p,x2p))
```

`where_id_with_single_obs`

> `where_id_with_single_obs` *returns a true/false vector, Does this dummy occur multiple times?*

Description

`where_id_with_single_obs` returns a true/false vector, Does this dummy occur multiple times?

Usage

```
where_id_with_single_obs(id)
```

Arguments

id   A vector of dummy indicators

Value

A true/false vector

`xtreg2way`   *Estimation of Two Way Fixed Effects Model*

Description

`xtreg2way` estimates a 2-way fixed effect model absorbing the two set of dummies and reports standard errors.

Usage

```
xtreg2way(y, ...)

## S3 method for class 'formula'
xtreg2way(
  formula,
  data,
  iid = NULL,
  tid = NULL,
  w = NULL,
  struc = NULL,
  se = "",
  noise = "",
  ...
)

## Default S3 method:
xtreg2way(
  y,
  X,
  iid = NULL,
  tid = NULL,
  w = NULL,
  struc = NULL,
  se = "",
  noise = "",
  ...
)
```

Arguments

y	Either a numeric of data, or a formula
...	Other parameters, based on method used
formula	Model specifications
data	A dataframe with labels from the formula y
iid	(optional) The group ID, size N-by-1 - not needed if `struc` is provided
tid	(optional) The time ID, size N-by-1 - not needed if `struc` is provided
w	(optional) The vector of weights, size N-by-1. If omitted, w will be set to 1 for all observations
struc	(optional) This list contains the results from the first step of the algorithm. To save computational time, you can rerun the algorithm on different columns by providing this struc.
se	(optional) This indicates standard error estimate to be calculcated. Possible values include: se=="0" : standard errors assuming homoscedasticity and no within group correlation or serial correlation. se=="1" : standard errors proposed by Arellano (1987) robust to heteroscedasticity and serial correlation. se=="2" :

standard errors robust to heteroscedasticity but assumes no correlation within group or serial correlation. se=="11" : Arellano standard errors with a degree of freedom correction performed by Stata xtreg, fe. If se is omitted or set to [] then it is set to 1 and the Arellano (1987) estimator is computed.

noise   (optional) If noise is set to "1", then results are displayed

X   A matrix of data

Value

betaHat (K-by-1) vector of estimated coefficients

aVarHat (K-by-K) estimate of the matrix of variances and covariance of the estimator.

y (N-by-1) the residual of the projection of y on the two sets of dummies.

X (N-by-K) the residual of the projection of each column of X on the two sets of dummies.

struc (list) results of the first step of the algorithm.

Methods (by class)

- formula: This function ingests a formula as the first argument, and requires data as a data.frame
- default: Default Method

Examples

```
hhid <- c("a","b","c","a","b","c" ,"a","b","c" ,"a","b","c" ,"a","b","c")
tid <- c("1","1" ,"1" ,"2","2" ,"3","3","3" ,"4","4","5" ,"5","6","6" ,"6")
w <- rep(1, 15)
x1 <- rnorm(15, mean=50, sd=10)
x2 <- rnorm(15, mean=50, sd=10)
y <- x1 + rnorm(15, mean=50, sd=10)
#The most basic way to use this function
output <- xtreg2way(y, x1, hhid, tid, w, se="2", noise="1")
#You can rerun faster with different columns using output$struc
output2 <- xtreg2way(y, data.frame(x1,x2), struc=output$struc)
#Or you can use a formula and specify data=
output3 <- xtreg2way(y~x1+x2, data=data.frame(x1,x2,y), iid=hhid, tid=tid, w=w,
                      se="2", noise="1")
```

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