Package ‘factormodel’

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Title Factor Model Estimation Using Proxy Variables

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Suggests knitr, rmarkdown

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Author Yujung Hwang [aut, cre] (<https://orcid.org/0000-0002-8136-8987>)

Maintainer Yujung Hwang <yujungghwang@gmail.com>

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Description

This function estimates a linear factor model using continuous variables. The linear factor model to estimate has the following form: \( \text{proxy} = \text{intercept} + \text{factorloading} \times (\text{latent variable}) + \text{measurement error} \) The measurement error is assumed to follow a Normal distribution with a mean zero and a variance, which needs to be estimated.

Usage

cproxyme(dat, anchor = 1, weights = NULL)

Arguments

dat A proxy variable data frame list.
anchor This is a column index of an anchoring proxy variable. Default is 1. That is, the code will use the first column in dat data frame as an anchoring variable.
weights An optional weight vector

Value

Returns a list of 3 components:

- **alpha0** This is a vector of intercepts in a linear factor model. The k-th entry is the intercept of k-th proxy variable factor model.
- **alpha1** This is a vector of factor loadings. The k-th entry is the factor loading of k-th proxy variable. The factor loading of anchoring variable is normalized to 1.
- **varnu** This is a vector of variances of measurement errors in proxy variables. The k-th entry is the variance of k-th proxy measurement error. The measurement error is assumed to follow a Normal distribution with mean 0.
- **mtheta** This is a mean of the latent variable. It is equal to the mean of the anchoring proxy variable.
- **vartheta** This is a variance of the latent variable.

Author(s)

Yujung Hwang, <yujungghwang@gmail.com>

References


**Examples**

```r
dat1 <- data.frame(proxy1=c(1,2,3), proxy2=c(0.1,0.3,0.6), proxy3=c(2,3,5))
cproxyme(dat=dat1, anchor=1)
## you can specify weights
ncproxyme(dat=dat1, anchor=1, weights=c(0.1,0.5,0.4))
```

**Description**

This function estimates measurement stochastic matrices of discrete proxy variables.

**Usage**

```r
dproxyme(
  dat,
  sbar = 2,
  initvar = 1,
  initvec = NULL,
  seed = 210313,
  tol = 0.005,
  maxiter = 200,
  miniter = 10,
  minobs = 100,
  maxiter2 = 1000,
  trace = FALSE,
  weights = NULL
)
```

**Arguments**

- `dat`: A proxy variable data frame list.
- `sbar`: A number of discrete types. Default is 2.
- `initvar`: A column index of a proxy variable to initialize the EM algorithm. Default is 1. That is, the proxy variable in the first column of "dat" is used for initialization.
- `initvec`: This vector defines how to group the initvar to initialize the EM algorithm.
- `seed`: Seed. Default is 210313 (birthday of this package).
- `tol`: A tolerance for EM algorithm. Default is 0.005.
- `maxiter`: A maximum number of iterations for EM algorithm. Default is 200.
- `miniter`: A minimum number of iterations for EM algorithm. Default is 10.
- `minobs`: Compute likelihood of a proxy variable only if there are more than "minobs" observations. Default is 100.
maximum number of iterations for "multinom". Default is 1000.

Whether to trace EM algorithm progress. Default is FALSE.

An optional weight vector

Value

Returns a list of 5 components:

M_param This is a list of estimated measurement (stochastic) matrices. The k-th matrix is a measurement matrix of a proxy variable saved in the kth column of dat data frame (or matrix). The ij-th element in a measurement matrix is the conditional probability of observing j-th (largest) proxy response value conditional on that the latent type is i.

M_param_col This is a list of column labels of ‘M_param’ matrices

M_param_row This is a list of row labels of ‘M_param’ matrices. It is simply c(1:sbar).

Mparam This is a list of multinominal logit coefficients which were used to compute ‘M_param’ matrices. These coefficients are useful to compute the likelihood of proxy responses.

typeprob This is a type probability matrix of size N-by-sbar. The ij-th entry of this matrix gives the probability of observation i to have type j.

Author(s)

Yujung Hwang, <yujungghwang@gmail.com>

References


Examples

dat1 <- data.frame(proxy1=c(1,2,3),proxy2=c(2,3,4),proxy3=c(4,3,2))
## default minimum num of obs to run an EM algorithm is 10
dproxyme(dat=dat1,sbar=2,initvar=1,minobs=3)
## you can specify weights
  dproxyme(dat=dat1,sbar=2,initvar=1,minobs=3,weights=c(0.1,0.5,0.4))
**makeDummy**

**Description**

This function is to make dummy variables using a discrete variable.

**Usage**

```r
makeDummy(tZ)
```

**Arguments**

- `tZ`: An input vector

**Value**

Returns `dZ`, a matrix of size `length(tZ)`-by-`card(tZ)`:

The `ij`-th element in `dZ` is 1 if `tZ[i]` is equal to the `j`-th largest value of `tZ`. And the `ij`-th element in `DZ` is 0 otherwise. The row sum of `dZ` must be 1 by construction.

**Author(s)**

Yujung Hwang, <yujungghwang@gmail.com>

**Examples**

```r
makeDummy(c(1,2,3))
```

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**weighted.cov**

**Description**

This function is to compute an unbiased sample weighted covariance. The function uses only pairwise complete observations.

**Usage**

```r
weighted.cov(x, y, w = NULL)
```

**Arguments**

- `x`: An input vector to compute a covariance, `cov(x,y)`
- `y`: An input vector to compute a covariance, `cov(x,y)`
- `w`: A weight vector
Value

Returns an unbiased sample weighted covariance

Author(s)

Yujung Hwang, <yujungghwang@gmail.com>

Examples

# If you do not specify weights,  
# it returns the usual unweighted sample covariance 
weighted.cov(x=c(1,3,5), y=c(2,3,1)) 

weighted.cov(x=c(1,3,5), y=c(2,3,1), w=c(0.1,0.5,0.4))

---

weighted.var weighted.var

Description

This function is to compute an unbiased sample weighted variance.

Usage

weighted.var(x, w = NULL)

Arguments

x A vector to compute a variance, var(x) 
w A weight vector

Value

Returns an unbiased sample weighted variance

Author(s)

Yujung Hwang, <yujungghwang@gmail.com>

Examples

## If you do not specify weights,  
## it returns the usual unweighted sample variance 
weighted.var(x=c(1,3,5))

weighted.var(x=c(1,3,5), w=c(0.1,0.5,0.4))
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