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FLPS-package

Fully latent principal stratification

Description

The FLPS package conducts Bayesian analysis for fully latent principal stratification via rstan.

Details

The 'flps' package.

Author(s)

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References


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flps_plot

Make plots related to FLPS models

Description

Make plots related to FLPS models

Usage

flps_plot(object, type = "latent")
**Arguments**

<table>
<thead>
<tr>
<th>object</th>
<th>a flps object</th>
</tr>
</thead>
<tbody>
<tr>
<td>type</td>
<td>a character indicating the type of plots</td>
</tr>
</tbody>
</table>

**Value**

A `ggplot` object that can be further customized using the `ggplot2` package.

---

**Description**

`makeInpData` is a function for generating a data based on the given information.

**Usage**

```r
makeInpData(
  N, R2Y, R2eta, omega, tau0, tau1, betaL, betaY,
  linear = TRUE, ydist = "n", lambda, nitem, nfac = 1,
  lvmodel, fcovmat, item.missing = TRUE, misspec = FALSE,
  cov.res = 0, relsize = 0.6
)
```

**Arguments**

<table>
<thead>
<tr>
<th>N</th>
<th>a numeric indicating sample size.</th>
</tr>
</thead>
<tbody>
<tr>
<td>R2Y</td>
<td>a numeric indicating predictive power of covariates.</td>
</tr>
<tr>
<td>R2eta</td>
<td>a numeric indicating Predictive power of latent variable</td>
</tr>
<tr>
<td>omega</td>
<td>a numeric indicating the size of effect of latent factor on the outcome.</td>
</tr>
</tbody>
</table>
makeInpData

tau0  a numeric indicating the size of difference in the outcome between the treatment and the control.
tau1  a numeric indicating the principal effect
betaL a numeric vector indicating the effects of covariates on the latent factor
betaY a numeric vector indicating the effects of covariates on the outcome
linear a logical whether the relationship between the outcome and covariates is linear (default is TRUE).
ydist a character indicating the outcome distribution (default is n).
lambda a numeric indicating the mean of Worked problems/person. (extent to which covariates predict eta).
nitem a numeric indicating the number of maximum measurement items given to students.
nfac a numeric indicating the number of latent factors
lvmodel a character specifying a type of latent variable model.
fcovmat a matrix indicating the variance-covariance matrix of latent factors when nfac > 1
item.missing a logical to make the measurement item data missing for the control group (default is TRUE).
misspec a logical to allow cross-loadings across latent factors when nfac > 1 (default is FALSE).
cov.res a logical to allow for residual correlations (only for CFA model) (default is 0).
relsize a numeric indicating the degree to which the latent factor explain the variances of continuous items (only for CFA model) (default is 0.6).

Value
a list containing all the data related to population values and running FLPS.

Examples

sdat <- makeInpData(
N = 200,  # sample size
R2Y = 0.2,  # r^2 of outcome
R2eta = 0.5,  # r^2 of eta by one covariates
omega = 0.2,  # the effect of eta
tau0 = 0.13,  # direct effect
tau1 = -0.06,  # interaction effect between Z and eta
betaL = 0.2,
betaY = 0.4,
lambda = 0.8,  # the proportion of administered items
nitem = 10,  # the total number of items
nfac = 1,  # the number of latent factors
lvmodel = '2pl' )
makeSimData

Generate Fully Latent Principal Stratification data for simulation

Description

makeInpData is a function for generating a data based on the given information.

Usage

makeSimData(
    N,
    R2Y,
    R2eta,
    omega,
    tau0,
    tau1,
    betaL,
    betaY,
    linear = TRUE,
    ydist = "n",
    lambda,
    nitem,
    nfac,
    lvmodel,
    fcovmat,
    item.missing = TRUE,
    misspec = FALSE,
    cov.res = 0,
    relsize = 0.6
)

Arguments

N  a numeric indicating sample size.
R2Y a numeric indicating predictive power of covariates.
R2eta a numeric indicating Predictive power of latent variable
omega a numeric indicating the size of effect of latent factor on the outcome.
tau0 a numeric indicating the size of difference in the outcome between the treatment and the control.
tau1 a numeric indicating the principal effect
betaL a numeric vector indicating the effects of covariates on the latent factor
betaY a numeric vector indicating the effects of covariates on the outcome
linear a logical whether the relationship between the outcome and covariates is linear (default is TRUE).
modelBuilder

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ydist</td>
<td>a character indicating the outcome distribution (default is ( n )).</td>
</tr>
<tr>
<td>lambda</td>
<td>a numeric indicating the mean of Worked problems/person. (extent to which covariates predict ( \eta )).</td>
</tr>
<tr>
<td>nitem</td>
<td>a numeric indicating the number of maximum measurement items given to students.</td>
</tr>
<tr>
<td>nfac</td>
<td>a numeric indicating the number of latent factors</td>
</tr>
<tr>
<td>lvmodel</td>
<td>a character specifying a type of latent variable model.</td>
</tr>
<tr>
<td>fcovmat</td>
<td>a matrix indicating the variance-covariance matrix of latent factors when nfac &gt; 1</td>
</tr>
<tr>
<td>item.missing</td>
<td>a logical to make the measurement item data missing for the control group (default is TRUE).</td>
</tr>
<tr>
<td>misspec</td>
<td>a logical to allow cross-loadings across latent factors when nfac &gt; 1 (default is FALSE).</td>
</tr>
<tr>
<td>cov.res</td>
<td>a logical to allow for residual correlations (only for CFA model) (default is 0).</td>
</tr>
<tr>
<td>relsize</td>
<td>a numeric indicating the degree to which the latent factor explain the variances of continuous items (only for CFA model) (default is 0.6).</td>
</tr>
</tbody>
</table>

Value

a list containing all the data related to population values and running FLPS.

Examples

```r
sdat <- makeSimData(
N = 200, # sample size
R2Y = 0.2, # r^2 of outcome
R2eta = 0.5, # r^2 of \( \eta \) by one covariates
omega = 0.2, # the effect of \( \eta \)
tau0 = 0.13, # direct effect
tau1 = -0.06, # interaction effect between \( Z \) and \( \eta \)
betaL = 0.2,
betaY = 0.4,
lambda = 0.8, # the proportion of administered items
nitem = 10, # the total number of items
nfac = 1, # the number of latent factors
lvmodel = '2pl')
```

---

**modelBuilder**

Generate compiled Stan object to facilitate the analysis

**Description**

Generate compiled Stan object to facilitate the analysis
Usage

```
modelBuilder(type = "all")
```

Arguments

- **type**: a character indicating the type of FLPS model. The default is `NULL` to compile all available Stan syntax (`'all'` does the same thing).

Value

There’s no return, but the compiled objects are saved in the package root directory.

---

### plot.flps

**Plot**

Usage

```
## S3 method for class 'flps'
plot(x, type = NULL, pars = c("tau0", "tau1"), ...)
```

Arguments

- **x**: an object of class `flps`
- **type**: a string for the type of plot
- **pars**: a character vector indicating the target parameters
- **...**: additional options for future development

Value

A `ggplot` object that can be further customized using the `ggplot2` package.
### print.flps

**Print results**

**Description**

Print results

**Usage**

```r
## S3 method for class 'flps'
print(x, ...)  
```

**Arguments**

- `x` an object of class `flps`
- `...` additional options for future development

**Value**

Results of FLPS model are printed via the `rstan` package.

### runFLPS

**Conduct fully latent principal stratification**

**Description**

Conduct fully latent principal stratification

**Usage**

```r
runFLPS(
  inp_data = NULL,
  custom_data = NULL,
  custom_stan = NULL,
  outcome = NULL,
  group = NULL,
  covariate = NULL,
  lv_model = NULL,
  lv_type = NULL,
  priors_input = NULL,
  stan_options = list(),
  ...
)
```
Arguments

- `inp_data` A matrix or a data frame
- `custom_data` A list. should be provided with `custom_stan`.
- `custom_stan` A string. should be provided with `custom_data`.
- `outcome` A character indicating the name of an outcome variable
- `group` A character indicating the name of a treatment/control group variable
- `covariate` A character indicating the names of covariate variables
- `lv_model` A description of the latent variable model, which is similar to the `lavaan` model syntax.
  - `=~` : Specify the association between factors and indicators (e.g., F1 =~ v1 + v2 + v3).
  - `+` : Specify a series of indicators
- `lv_type` A character indicating the type of latent variable models
- `priors_input` A list of priors. Otherwise, the default priors are used (N(0, 5). It takes three parameter names including `tau0`, `tau1`, and `omega`, which are the difference between groups, the principal effects, and the effect of latent factors on the outcome. If added, the length of `tau1` and `omega` must be matched with the number of factors. Examples of How to specify priors as follows:
  - `list(tau0 = c(0, 1), tau1 = c(0.5, 1))`: The first element is the mean and the second is the variance of normal priors.
  - `list(tau1 = list(c(0.5, 1), c(-0.4, 1))`: If there’s two factors.
- `stan_options` A list containing `rstan::stan()` options, using `name = value`.
- `...` Additional arguments for latent variable models information (e.g., `nclass = 2`).

Value

an object of class `flps` which contains a `stanfit` object.

call argument calls

`inp_data` A given data frame

`flps_model` a Stan syntax used in `rstan::stan()`

`flps_data` a list of data used in `rstan::stan()`

`flps_fit` `stanfit`

time a numeric of timing

See Also

[rstan::stan()]
Examples

```r
inp_data <- flps::makeInpData(
  N = 200,
  R2Y = 0.2,
  R2eta = 0.5,
  omega = 0.2,
  tau0 = 0.23,
  tau1 = -0.16,
  betaL = 0.1,
  betaY = 0.2,
  lambda = 0.8,
  nitem = 10,
  nfac = 1,
  lvmodel = 'rasch')

res <- runFLPS(
  inp_data = inp_data,
  outcome = 'Y',
  group = 'Z',
  covariate = c('X1'),
  lv_type = 'rasch',
  lv_model = 'F =~ v1 + v2 + v3 + v4 + v5 + v6 + v7 + v8 + v9 + v10',
  stan_options = list(iter = 1000, warmup = 500, cores = 1, chains = 2)
)
```

Summary of FLPS model are printed via the `rstan` package.

summary.flps

---

**Description**

Summarize the results

**Usage**

```r
## S3 method for class 'flps'
summary(object, type = "all", ...)
```

**Arguments**

- `object`: an object of class `flps`
- `type`: a string for the part of FLPS model
- `...`: additional options for future development

**Value**

Summary of FLPS model are printed via the `rstan` package.
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