Package ‘bmlm’

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Relationship between work stressors, work dissatisfaction, and relationship dissatisfaction.

Description


Usage
data(BLch9)

Format

A data frame with 2100 rows and 8 variables:

- id  ID of study participant
- time  Time
- fwkstrs  Number of work stressors
- fwkdis  Work dissatisfaction rating
- freldis  Relationship dissatisfaction
- x  Subject-mean deviated number of work stressors
- m  Subject-mean deviated work dissatisfaction rating
- y  Subject-mean deviated relationship dissatisfaction

Source

http://www.intensivelongitudinal.com/datasets.html

bmlm

bmlm: Easy estimation of Bayesian multilevel mediation models with Stan.

Description

See https://mvuorre.github.io/bmlm/ for a short tutorial.
isolate

Create isolated within- (and optionally between-) person variables.

Description

Creates variables that represent pure within- and between-person predictors.

Usage

isolate(d = NULL, by = NULL, value = NULL, z = FALSE, which = "within")

Arguments

d     A data.frame.
by    A vector of values in d by which the data is clustered. i.e. a vector of unique participant IDs.
value Names of columns in d to isolate. Multiple values can be given by value = c("var1", "var2", "var3")
z     Should the created values be standardized (defaults to FALSE).
which Which component to return. "within" (default) returns within-person deviations only; "between" returns between-person means only; "both" returns both.

Value

A data.frame with additional columns for the within- and between-person variables. The new columns are labelled _cw for centered-within and _cb for centered-between.

Author(s)

Matti Vuorre <mv2521@columbia.edu>

Examples

# Create within-person deviations of work stressors in BLch9.
data(BLch9)
BLch9 <- isolate(BLch9, by = "id", value = "fwkstrs")
head(BLch9)  # Now has new column for within-person work stressors.
Judgments of performance in a video game

Description

Data from an experiment where participants rated their performance in a video game in two conditions. (Experiment 1 in Metcalfe, Eich, & Castel, 2010; http://www.sciencedirect.com/science/article/pii/S0010027710001113).

Usage

data(MEC2010)

Format

A data frame with 344 rows and 4 variables:

- subj Subject id number.
- lag Lag condition (0 = no lag, 1 = 250ms lag).
- hr Hit rate.
- jop Judgment of Performance.

Source


multilevel mediation model

Estimate a multilevel mediation model

Description

Estimates a Bayesian multilevel mediation model using Stan.

Usage

mlm(d = NULL, id = "id", x = "x", m = "m", y = "y",
     priors = NULL, binary_y = FALSE, ...)

m1m

Estimate a multilevel mediation model

Description

Estimates a Bayesian multilevel mediation model using Stan.

Usage

mlm(d = NULL, id = "id", x = "x", m = "m", y = "y",
     priors = NULL, binary_y = FALSE, ...)

m1m
Arguments

d A data.frame or a data_frame.
id Column of participant IDs in data.
x Column of X values in data.
m Column of M values in data.
y Column of Y values in data.
priors A list of named values to be used as the prior scale parameters. See details.
binary_y Set to TRUE if y is binary and should be modelled with logistic regression. Defaults to FALSE (y treated as continuous.) This feature is experimental.
... Other optional parameters passed to rstan::stan().

Details

Draw samples from the joint posterior distribution of a multilevel mediation model using Stan.

Priors:
Users may pass a list of named values for the priors argument. The values will be used to define the scale parameter of the respective prior distributions. This list may specify some or all of the following parameters:

dy, dm Regression intercepts (for Y and M as outcomes, respectively.)
a, b, cp Regression slopes.
tau_x Varying effects SDs for above parameters (e.g replace x with a.)
lkj_shape Shape parameter for the LKJ prior.

See examples for specifying the following: Gaussian distributions with SD = 10 as priors for the intercepts, Gaussians with SD = 2 for the slopes, Half-Cauchy distributions with scale parameters 1 for the varying effects SDs, and an LKJ prior of 2.

Value

An object of S4 class stanfit, with all its available methods.

Author(s)

Matti Vuorre <mv2521@columbia.edu>

Examples

```r
# Not run:
# Run example from Bolger and Laurenceau (2013)
data(BLch9)
fit <- mlm(BLch9)
mlm_summary(fit)

### With priors
Priors <- list(dy = 10, dm = 10, a = 2, b = 2, cp = 2,
              tau_dy = 1, tau_dm = 1, tau_a = 1, tau_b = 1, tau_cp = 1,
```
mlm_pars_plot

lkj_shape = 2)
fit <- mlm(BLch9, priors = Priors)

## End(Not run)

---

**mlm_pars_plot**

*Plot estimated parameters of multilevel mediation model*

**Description**

Plot the model’s estimated parameters as histograms or a coefficient plot.

**Usage**

```r
mlm_pars_plot(mod = NULL, type = "hist", color = "black",
               p_shape = 15, p_size = 1.2, level = 0.95, nrow = 3,
               pars = c("a", "b", "cp", "covab", "me", "c", "pme"))
```

**Arguments**

- `mod`: A Stanfit model estimated with `mlm()`.
- `type`: Type of the plot, `hist`, `coef`, or `violin`.
- `color`: Color (and fill) for plots.
- `p_shape`: Shape of points for `coefplot`.
- `p_size`: Size of points for `coefplot`.
- `level`: X level for Credible Intervals. (Defaults to .95.)
- `nrow`: Number of rows for multiple histograms.
- `pars`: Which parameters to plot.

**Details**

The point estimate for the coefficient plot is the posterior mean.

**Value**

A ggplot2 object.

**Author(s)**

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**Description**

Plots a path diagram for an estimated multilevel mediation model.

**Usage**

```r
mlm_path_plot(mod = NULL, xlab = "X", ylab = "Y", mlab = "M", level = 0.95, random = TRUE, text = FALSE, id = NULL, digits = 2, ...)
```

**Arguments**

- `mod`: A Stanfit model estimated with `mlm()`.
- `xlab`: Label for X.
- `ylab`: Label for Y.
- `mlab`: Label for M.
- `level`: "Confidence" level for credible intervals. (Defaults to .95.)
- `random`: Should the "random" effects SDs be displayed? (Default = TRUE)
- `text`: Should additional parameter values be displayed? (Defaults to FALSE.)
- `id`: Plot an individual-level path diagram by specifying ID number.
- `digits`: Number of significant digits to show on graph. (Default = 2.)
- `...`: Other arguments passed on to `qgraph::qgraph()`.

**Details**

Plots a path diagram of the mediation model, with estimated parameter values and credible intervals. Can also be used to draw a template diagram of the mediation model by not specifying input to the `mod` argument.

To modify various settings of the underlying `qgraph` object, see `qgraph`.

**Value**

A `qgraph` object.

**Author(s)**

Matti Vuorre <mv2521@columbia.edu>

**Examples**

```r
# Draw a template path diagram of the mediation model
mlm_path_plot()
```
mlm_spaghetti_plot  
Plot fitted values of M and Y from multilevel mediation model

Description

Plot population-level fitted values and X values, for M and Y.

Usage

```r
mlm_spaghetti_plot(mod = NULL, d = NULL, id = "id", x = "x",  
m = "m", y = "y", level = 0.95, n = 12, binary_y = FALSE,  
mx = "fitted", fixed = TRUE, random = TRUE, h_jitter = 0,  
v_jitter = 0, bar_width = 0.2, bar_size = 0.75, n_samples = NA)
```

Arguments

- `mod`: A multilevel mediation model estimated with `mlm()`.
- `d`: A `data.frame` or a `data_frame` used in fitting model.
- `id`: Name of id variable (identifying subjects) in data (`d`).
- `x`: Name of X variable in data.
- `m`: Name of M variable in data.
- `y`: Name of Y variable in data.
- `level`: X level for Credible Intervals. (Defaults to .95.)
- `n`: Number of points along X to evaluate fitted values on. See details.
- `binary_y`: Set to TRUE if the outcome variable (Y) is 0/1.
- `mx`: Should the X axis of the M-Y figure be "fitted" values, or "data" values. Defaults to "fitted".
- `fixed`: Should the population-level ("fixed") fitted values be shown?
- `random`: Should the subject-level ("random") fitted values be shown?
- `h_jitter`: Horizontal jitter of points. Defaults to 0.
- `v_jitter`: Vertical jitter of points. Defaults to 0.
- `bar_width`: Width of the error bars. Defaults to 0.2.
- `bar_size`: Thickness of the error bars. Defaults to 0.75.
- `n_samples`: Number of MCMC samples to use in calculating fitted values. See details.

Details

If `n = 2`, the fitted values will be represented as points with X line with a Confidence Ribbon instead. If a very large model is fitted with a large number of MCMC iterations, the function might take a long time to run. In these cases, users can set `n_samples` to a smaller value (e.g. 1000), in which case the fitted values (and the CIs) will be based on a random subset of `n_samples` MCMC samples. The default value is NA, meaning that all MCMC samples are used.
mlm_summary

Value
A list of two ggplot2 objects.

Author(s)
Matti Vuorre <mv2521@columbia.edu>

Description
Prints the estimated parameters (numerical summaries of the marginal posterior distributions).

Usage
mlm_summary(mod = NULL, level = 0.95, pars = c("a", "b", "cp", "me", "c", "pme"), digits = 2)

Arguments
mod A stanfit object obtained from mlm()
level "Confidence" level; Defines the limits of the credible intervals. Defaults to .95 (i.e. displays 95% CIs.)
pars Parameters to summarize. Defaults to main average-level parameters. See Details for more information.
digits How many decimal points to display in the output. Defaults to 2.

Details
After estimating a model (drawing samples from the joint posterior probability distribution) with mlm(), show the estimated results by using mlm_summary(fit), where fit is an object containing the fitted model.

The function shows, for each parameter specified with pars, the posterior mean, and limits of the Credible Interval as specified by level. For example, level = .91 shows a 91% Credible Interval, which summarizes the central 91% mass of the marginal posterior distribution.

Parameters: By default, mlm() estimates and returns a large number of parameters, including the varying effects, and their associated standard deviations. However, mlm_summary() by default only displays a subset of the estimated parameters:

a Regression slope of the X -> M relationship.
b Regression slope of the M -> Y relationship.
cp Regression slope of the X -> Y relationship. (Direct effect.)
me Mediated effect ($a + b + \sigma_{a_j} b_j$).
c Total effect of X on Y. (cp + me)
pme Percent mediated effect.

The user may specify pars = NULL to display all estimated parameters. Other options include e.g. pars = "tau" to display the varying effects’ standard deviations. To display all the group-level parameters (also known as random effects) only, specify pars = "random". With this argument, mlm_summary() prints the following parameters:

- tau_a Standard deviation of subject-level a_j.s.
- tau_b Standard deviation of subject-level b_j.s.
- tau_cp Standard deviation of subject-level c_j.s.
- covab Estimated covariance of a_j and b_j.s.
- corrab Estimated correlation of a_j and b_j.s.

To learn more about the additional parameters, refer to the Stan code (cat(get_stancode(fit))).

Value

A data.frame summarizing the estimated multilevel mediation model:

- Parameter Name of parameter
- Mean Mean of parameter’s posterior distribution.
- Median Median of parameter’s posterior distribution.
- SE Standard deviation of parameter’s posterior distribution.
- ci_lwr The lower limit of Credible Intervals.
- ci_upr The upper limit of Credible Intervals.
- n_eff Number of efficient samples.
- Rhat Should be 1.00.

Author(s)

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