Package ‘EffectLiteR’

March 26, 2022

Version 0.4-5
Date 2022-03-26
Title Average and Conditional Effects
Author Axel Mayer [aut, cre],
Lisa Dietzfelbinger [ctb]
Maintainer Axel Mayer <amayer2010@gmail.com>
Description Use structural equation modeling to estimate average and conditional effects of a treatment variable on an outcome variable, taking into account multiple continuous and categorical covariates.
Depends R (>= 3.5.0), lavaan (>= 0.6-8)
Imports methods, shiny (>= 1.5.0), foreign, ggplot2, nnet, survey, lavaan.survey, car
License GPL (>= 2)
Encoding UTF-8
LazyData yes
RoxygenNote 7.1.2
NeedsCompilation no
Repository CRAN
Date/Publication 2022-03-26 10:50:02 UTC

R topics documented:

autoSelectSubset .............................................. 2
computeAggregatedEffects .................................. 3
conditionalEffectsPlot ..................................... 3
effectLite ...................................................... 4
effectLiteGUI .................................................. 7
EffectLiteR ..................................................... 8
elrdata_categorical_items ................................. 8
autoSelectSubset

Autoselect Subset for Aggregated Effects

Description

Automatically selects a subset of the original dataset for computing specific aggregated effects. The subset is selected such that it is as close as possible to the user supplied newdata frame. The function uses exact matching for categorical covariates (and the treatment if specified) and matching based on the Mahalanobis distance for continuous covariates.

Usage

autoSelectSubset(obj, newdata, nsub = 10)

Arguments

obj Object of class effectlite.
newdata A data.frame with a single row, containing the same continuous and categorical covariates (and potentially the treatment variable) as used when fitting the EffectLiteR model in obj.
nsub Integer. How many data points should be used for matching the continuous covariates. Will be ignored if no values for continuous covariates are specified.

Value

Vector of integers indicating the rows to use for computing the aggregated effects. Can directly be used in computeAggregatedEffects

Examples

m1 <- effectLite(y="dv", z=c("z1"), k=c("k1"), x="x", control="control", data=example01, fixed.cell=TRUE, fixed.z=TRUE)
newdata <- data.frame(k1=NA, z1=1)
agg.subset <- autoSelectSubset(m1, newdata)
computeAggregatedEffects

*Compute Aggregated Effects*

**Description**

Computes aggregates of conditional effects for a subset of the original dataset based on a fitted EffectLiteR model.

**Usage**

```r
computeAggregatedEffects(obj, agg.subset)
```

**Arguments**

- `obj`: Object of class `effectlite`.
- `agg.subset`: Vector of integers indicating the row numbers of the original dataset for the subset used to compute the aggregated effect.

**Value**

Object of class "data.frame".

**Examples**

```r
m1 <- effectLite(y="dv", z=c("z1"), k=c("k1"), x="x", control="control", data=example01, fixed.cell=TRUE, fixed.z=TRUE)
newdata <- data.frame(k1=NA, z1=1)
agg.subset <- autoSelectSubset(m1, newdata)
computeAggregatedEffects(m1, agg.subset)
```

conditionalEffectsPlot

*Plot conditional effects*

**Description**

Can be used to make a conditional effects plot with an effect function on the y axis and a covariate on the x axis. `ggplot2` is used to create the plot.
Usage

conditionalEffectsPlot(
  obj,
  zsel = "id",
  gxsel = "g1",
  colour = "",
  show.ci = FALSE,
  regression = "default",
  regression.ci = FALSE
)

Arguments

obj                  Object of class effectlite obtained from fitting an effect model using effectLite
zsel                Name of a covariate (character string) plotted on the x-axis. If "id" (the default) the subject index is shown on the x-axis, where subjects in the data are enumerated as 1:nrow(data).
gxsel               Name of an effect function (character string) plotted on the y-axis.
colour              Name of a covariate (character string) used as colour variable in the plot.
show.ci             Logical. Should 95 percent confidence intervals around conditional effects be shown in the plot.
regression          Specifies if a regression line should be drawn. Can be one of c("default","smooth","linear","none")
regression.ci       Logical. Will be passed on to geom_smooth and specifies its se argument. Notice that the confidence interval shown by geom_smooth does not take uncertainty into account that comes from estimating the values of the conditional effects on the y axis.

Value

Object of class c("gg","ggplot").

Examples

m1 <- effectLite(y="dv", x="x", k="k1", z="z1", control="control", data=example01)
conditionalEffectsPlot(m1, zsel="z1", gxsel="g1", colour="k1")

effectLite  Estimate average and conditional effects

Description

This function is the main function of the package and can be used to estimate average and conditional effects of a treatment variable on an outcome variable, taking into account any number of continuous and categorical covariates. It automatically generates lavaan syntax for a multi-group structural equation model, runs the model using lavaan, and extracts various average and conditional effects of interest.
effectLite

Usage

effectLite(
  y,
  x,
  k = NULL,
  z = NULL,
  data,
  method = "sem",
  control = "default",
  measurement = character(),
  fixed.cell = "default",
  fixed.z = "default",
  missing = "default",
  se = "default",
  syntax.only = FALSE,
  interactions = "all",
  homoscedasticity = "default",
  test.stat = "default",
  propscore = NULL,
  ids = ~0,
  weights = NULL,
  add = character(),
  ...
)

Arguments

y Dependent variable (character string). Can be the name of a manifest variable
    or of a latent variable.

x Treatment variable (character string) treated as categorical variable.

k Vector of manifest variables treated as categorical covariates (character vector).

z Vector of continuous covariates (character vector). Names of both manifest and
    latent variables are allowed.

data A data frame.

method Can be one of c("sem","lm") and indicates which function is used to fit the
    model.

control Value of x that is used as control group. If "default", takes the first entry of
    as.factor(x).

measurement Measurement model. The measurement model is lavaan syntax (character string),
    that will be appended before the automatically generated lavaan input. It can be
    used to specify a measurement for a latent outcome variable and/or latent co-
    variates. See also the example and generateMeasurementModel.

fixed.cell logical. If FALSE, the group sizes are treated as stochastic rather than fixed. The
    default setting for method="sem" is FALSE and the default setting for method="lm"
    is TRUE.
fixed.z logical. If FALSE, the continuous covariates are treated as stochastic rather than fixed. The default setting for method="sem" is FALSE and the default setting for method="lm" is TRUE.

missing Missing data handling. Will be passed on to sem or ignored for method="lm".

se Type of standard errors. Will be passed on to sem or ignored for method="lm".

syntax.only logical. If TRUE, only syntax is returned and the model will not be estimated.

interactions character. Indicates the type of interaction. Can be one of "all" (all interactions), "2-way" (only two-way interactions), "X:K,X:Z" (only X:K and X:Z interactions), "X:K" (only X:K interactions), "X:Z" (only X:Z interactions), "none" (no treatment by covariate interactions, but potentially interactions between categorical and continuous covariates), or "no" (no interactions at all).

homoscedasticity logical. If TRUE, residual variances of the dependent variable are assumed to be homogeneous across cells. The default setting for method="sem" is FALSE and the default setting for method="lm" is TRUE.

test.stat character. Can be one of c("default", "Chisq", "Ftest") and indicates the statistic used for the hypothesis tests. The tests are either based on the large sample Chi-Squared statistic (Wald tests) or the finite sample F statistic with approximate F distribution. The default setting for method="sem" is "Chisq" and the default setting for method="lm" is "Ftest".

propscore Vector of covariates (character vector) that will be used to compute (multiple) propensity scores based on a multinomial regression without interactions. Alternatively, the user can specify a formula with the treatment variable as dependent variable for more control over the propensity score model.

ids Formula specifying cluster ID variables. Will be passed on to lavaan.survey. See svydesign for details.

weights Formula to specify sampling weights. Currently only one weight variable is supported. Will be passed on to lavaan.survey. See svydesign for details.

Note: Only use weights if you know what you are doing. For example, some conditional treatment effects may require different weights than average effects.

add Character string that will be pasted at the end of the generated lavaan syntax. Can for example be used to add additional (in-) equality constraints or to compute user-defined conditional effects.

... Further arguments passed to sem.

Value

Object of class effectLite.

References

### Examples

#### Example with one categorical covariate
```r
m1 <- effectLite(y="y", x="x", k="z", control="0", data=nonortho)
print(m1)
```

#### Example with one categorical and one continuous covariate
```r
m1 <- effectLite(y="dv", x="x", k=c("k1"), z=c("z1"), control="control", data=example01)
print(m1)
```

#### Example with latent outcome and latent covariate
```r
measurement <- "Var'
eta2 =~ 1*CPM12 + 1*CPM22
eta1 =~ 1*CPM11 + 1*CPM21
CPM11 + CPM12 ~ 0*1
CPM21 ~ c(m,m)*1
CPM22 ~ c(p,p)*1'

m1 <- effectLite(y="eta2", x="x", z=c("eta1"), control="0",
                  measurement=measurement, data=example02lv)
print(m1)
```

#### Not run:

#### Example with cluster variable and sampling weights
```r
m1 <- effectLite(y="y", x="x", z="z", fixed.cell=TRUE, control="0",
                  syntax.only=F, data=example_multilevel,
                  ids=~cid, weights=~weights)
print(m1)
```

#### End(Not run)

---

**effectLiteGUI**  
*Shiny interface for effectLite*

**Description**

This function calls a shiny interface for effectLite.

**Usage**

```r
effectLiteGUI(launch.browser = TRUE)
```

**Arguments**

- `launch.browser`  Option will be passed on to `runApp`
EffectLiteR

Description

Use structural equation modeling to estimate average and conditional effects of a treatment variable on an outcome variable, taking into account multiple continuous and categorical covariates.

elrdata_categorical_items

Dataset elrdata_categorical_items.

Description

A simulated dataset for testing measurement models with categorical items:

Format

A data frame with 10000 rows and 13 variables.

Details

• x. Treatment variable with values 0, 1.
• z11. indicator for covariate.
• z21. indicator for covariate.
• z31. indicator for covariate.
• z41. indicator for covariate.
• z51. indicator for covariate.
• y11. indicator for outcome.
• y21. indicator for outcome.
• y31. indicator for outcome.
• y41. indicator for outcome.
• y51. indicator for outcome.
• y61. indicator for outcome.
• y71. indicator for outcome.
elrdata_logreg

Dataset elrdata_logreg.

Description
A simulated dataset for testing logistic regression:

Format
A data frame with 10000 rows and 6 variables.

Details
• y. Outcome variable with values 0, 1.
• x. Treatment variable with values 0, 1.
• z1. continuous covariate.
• z2. continuous covariate.
• k1. categorical covariate.
• k2. categorical covariate.

elrEffectsGUI
Shiny interface for elrEffects

Description
This function calls a shiny interface for elrEffects.

Usage
elrEffectsGUI(launch.browser = TRUE)

Arguments
launch.browser Option will be passed on to runApp
elrPredict

Predict Conditional Effects

Description

Predicts conditional treatment effects based on a fitted EffectLiteR model.

Usage

elrPredict(obj, newdata = NULL, add.columns = "expected-outcomes")

Arguments

obj
Object of class effectlite.

newdata
An optional data.frame, containing the same continuous and categorical covariates as used when fitting the EffectLiteR model in obj. Only covariates (and neither the dependent variable nor indicators for latent variables) should be included.

add.columns
Used to request additional columns. Can be one or several of c("covariates", "modmat", "expected-outcomes", "prop-covariates").

Value

Object of class "data.frame".

Examples

m1 <- effectLite(y="dv", z=c("z1"), k=c("k1","kateg2"), x="x", control="control", data=example01)
newdata <- data.frame(k1="male", kateg2="1", z1=2)
elrPredict(m1, newdata)

elrReadData

Read Data File

Description

Tries to determine the format of the data by the file ending and chooses the appropriate function to read data. Currently supports .csv, .dat, .txt, .sav, and .xpt and calls read.csv, read.csv2, read.table, read.spss, read.xport accordingly. The default values for arguments depend on the function used to read data.
Usage

```r
elrReadData(
  file,
  name = NULL,
  header = "default",
  sep = "default",
  dec = "default",
  use.value.labels = "default",
  na.strings = "NA"
)
```

Arguments

- **file**: Name of the file to read.
- **name**: Pure file name (without path to file) to read. If `file` includes a lengthy path name with many special characters, specifying this argument in addition to `file` may help the function to find the file ending.
- **header**: See `read.table`.
- **sep**: See `read.table`.
- **dec**: See `read.table`.
- **use.value.labels**: See `read.spss`.
- **na.strings**: See `read.spss`.

Value

Object of class "data.frame".

---

**example01**

Dataset example01.

---

Description

A simulated dataset. The variables are:

Format

A data frame with 2000 rows and 7 variables.

Details

- `x`: Treatment variable with values control, treat1, and treat2.
- `k1`: Categorical covariate with values male and female.
- `kateg2`: Categorical covariate with values 1 and 2.
- `z1-z3`: Continuous covariates.
- `dv`: Continuous dependent variable.
example02lv  
*Dataset example02lv.*

**Description**

A simulated dataset with latent variables. The variables are:

**Format**

A data frame with 300 rows and 6 variables.

**Details**

- CPM11. First indicator of latent covariate.
- CPM12. First indicator of latent outcome.
- CPM22. Second indicator of latent outcome.
- x. Dichotomous treatment variable with values 0 (control), and 1 (treatment).
- k. Categorical covariate with values first, second, and third.

example_multilevel  
*Dataset example_multilevel.*

**Description**

A simulated dataset with a cluster ID and sampling weights to test multilevel options. The variables are:

**Format**

A data frame with 800 rows and 7 variables.

**Details**

- y. Continuous dependent variable.
- x. Treatment variable with values 0, 1.
- z. Continuous covariate.
- xz. Product of x and z.
- cid. Cluster ID.
- weights. Sampling weights.
- iptw. Classic inverse probability of treatment weights based on a logistic regression of x on z. Use with care (only for average effects).
generateMeasurementModel

Generate measurement model

Description

This function automatically generates lavaan syntax for the measurement model for a call to effectLite. It is currently also used in the shiny interface.

Usage

generateMeasurementModel(
  names = NULL,
  indicators,
  ncells,
  model = NULL,
  data = NULL
)

Arguments

names A vector of character strings with names of latent variables. If not specified, names(indicators) is used.

indicators A list of vectors of character strings to specify indicators of latent variables (see example).

ncells Number of groups/cells.

model A vector of character strings of the same length as names. It is used to specify the type of measurement model for each of the latent variables. Each element can be one of c("default", "parallel", "tau-equi", "tau-cong", "tau-equi-categorical", "tau-cong-categorical") indicating whether a parallel, essentially tau-equivalent, or tau-congeneric measurement model is used and whether the items are categorical or not. If "default", the function tries to guess a reasonable measurement model: Congeneric for latent variables with three or more indicators, essentially tau-equivalent for latent variables with less than three indicators and for latent variables with cross-loadings (e.g., method factors), and parallel for single-indicator latent variables. If NULL, "default" is assumed for all latent variables.

data A data set that includes the indicator variables. It is required only for categorical indicators to detect the number of categories.

Examples

## Example with three latent variables
names <- c("eta", "xi1", "xi2")
indicators <- list("eta" = c("y1", "y2", "y3"),
  "xi1" = c("z1", "z2"),
  "xi2" = c("z12", "z22", "z32", "z42"))
ncells = 6
model = c("parallel","tau-equi","tau-cong")
cat(generateMeasurementModel(names, indicators, ncells, model))

## Example with method factor
names <- c("eta","xi","mf")
indicators <- list("eta" = c("y12","y22"),
                   "xi" = c("y11","y21"),
                   "mf" = c("y12","y22"))
ncells = 2
cat(generateMeasurementModel(names, indicators, ncells))

## Example with categorical items
names <- c("eta","xi")
indicators <- list("eta" = paste0("y",1:7,1),
                   "xi" = paste0("z",1:5,1))
ncells = 2
model = c("tau-equi-categorical","tau-cong-categorical")
cat(generateMeasurementModel(names, indicators, ncells, model,
                              data=elrdata_categorical_items))

MDRS2016  
Description
The simulated dataset with latent variables used in Mayer, Dietzfelbinger, Rosseel, and Steyer (2016). The variables are:

Format
A data frame with 1000 rows and 10 variables.

Details
- y11. First indicator of latent covariate (pretest mental health).
- y31. Third indicator of latent covariate (pretest mental health).
- y12. First indicator of latent outcome (posttest mental health).
- y22. Second indicator of latent outcome (posttest mental health).
- y32. Third indicator of latent outcome (posttest mental health).
- x. Categorical treatment variable with values 0 (wait list control group), 1 (conventional therapy), and 2 (innovative therapy).
- k. Categorical covariate with values 0 (male) and 1 (female).
- lx1. Binary indicator for conventional therapy (X=1).
- lx2. Binary indicator for innovative therapy (X=2).
**Dataset nonortho.**

**Description**
A simulated dataset. The variables are:

**Format**
A data frame with 500 rows and 3 variables

**Details**
- y. Continuous dependent variable depression.
- x. Treatment variable with values 0 (control), 1 (treat1), and 2 (treat2).
- z. Categorical covariate with values 0 (low neediness), 1 (medium neediness) and 2 (high neediness).

**Dataset sophonet_data_simulated.**

**Description**
A simulated dataset based on the SOPHONET-study (Leichsenring et al., 2013). The variables are:

**Format**
A data frame with 328 rows and 24 variables.

**Details**
- lsas.a.t2
- lsas.v.t2
- lsas.a.t1
- lsas.v.t1
- bdi.t1.i1
- bdi.t1.i2
- bdi.t1.i3
- ecr.anx.t1.i1
- ecr.anx.t1.i2
- ecr.anx.t1.i3
• ecr.avoi.t1.i1
• ecr.avoi.t1.i2
• ecr.avoi.t1.i3
• tpq.ha.i1
• tpq.ha.i2
• tpq.ha.i3
• tosca.shame.t1.i1
• tosca.shame.t1.i2
• fskn.se.t1.i1
• fskn.se.t1.i2
• comorbid
• iip.lov
• iip.dom tb

References

Index

* datasets
  elrdata_categorical_items, 8
  elrdata_logreg, 9
  example01, 11
  example02lv, 12
  example_multilevel, 12
  MDRS2016, 14
  nonortho, 15
  sophonet_data_simulated, 15

autoSelectSubset, 2

computeAggregatedEffects, 2, 3
conditionalEffectsPlot, 3

effectLite, 4, 4, 13
effectLiteGUI, 7
EffectLiteR, 8
elrdata_categorical_items, 8
elrdata_logreg, 9
elrEffectsGUI, 9
elrPredict, 10
elrReadData, 10
example01, 11
example02lv, 12
example_multilevel, 12
generateMeasurementModel, 5, 13
geom_smooth, 4

lavaan.survey, 6

MDRS2016, 14

nonortho, 15

read.csv, 10
read.csv2, 10
read.spss, 10, 11
read.table, 10, 11
read.xport, 10

runApp, 7, 9

sem, 6
sophonet_data_simulated, 15
svydesign, 6