Package ‘plot3logit’

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Type Package

Title Ternary Plots for Trinomial Regression Models

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URL https://www.flaviosanti.it/software/plot3logit

BugReports https://github.com/f-santi/plot3logit

Description An implementation of the ternary plot for interpreting regression coefficients of trinomial regression models, as proposed in Santi, Dickson and Espa (2019) <doi:10.1080/00031305.2018.1442368>. Ternary plots can be drawn using either 'ggtern' package (based on 'ggplot2') or 'Ternary' package (based on standard graphics).

Depends R (>= 3.1), ggtern (>= 3.1.0), Ternary (>= 1.0.1)

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Description

An implementation of the ternary plot for interpreting regression coefficients of trinomial regression models, as proposed in Santi, Dickson and Espa (2019).

Details

The package permits the covariate effects of trinomial regression models to be represented graphically by means of a ternary plot. The aim of the plots is helping the interpretation of regression coefficients in terms of the effects that a change in regressors’ values has on the probability distribution of the dependent variable. Such changes may involve either a single regressor, or a group of them (composite changes), and the package permits both cases to be represented in a user-friendly way. Theoretical and methodological details are illustrated and discussed in Santi, Dickson and Espa (2019).

The package can read the results of both categorical and ordinal trinomial logit regression fitted by various functions (see the next section) and creates a field3logit object which may be represented by means of functions gg3logit and stat_3logit.

The plot3logit package inherits graphical classes and methods from the package ggtern (Hamilton 2018) which, in turn, is based on the ggplot2 package (Wickham 2016).

Graphical representation based on standard graphics is made available through the package Ternary (Smith 2017) by functions plot3logit and TernaryField, and in particular by the plot method of field3logit objects.

Compatibility

Function field3logit of package plot3logit can read trinomial regression estimates from the output of the following functions:

- multinom of package nnet (logit regression);
- polr of package MASS (ordinal logit regression);
- mlogit of package mlogit (logit regression).

Moreover, explicit matrix of regression coefficients can be passed to field3logit. See examples and function field3logit for further details.
plot3logit-package

References


See Also

`field3logit`, `gg3logit`, `TernaryField`.

Examples

data(cross_1year)

# Read from "nnet::multinom"
library(nnet)
mod0 <- multinom(employment_sit ~ gender + finalgrade, data = cross_1year)
field0 <- field3logit(mod0, 'genderFemale')
gg3logit(field0) + stat_3logit()

# Read from "MASS::polr"
library(MASS)
mydata <- cross_1year
mydata$finalgrade <- factor(mydata$finalgrade,
    c('Low', 'Average', 'High'), ordered = TRUE)
mod1 <- polr(finalgrade ~ gender + irregularity, data = mydata)
field1 <- field3logit(mod1, 'genderFemale')
gg3logit(field1) + stat_3logit()

# Read from "mlogit::mlogit"
library(mlogit)
mydata <- mlogit.data(cross_1year, choice = 'employment_sit', shape = 'wide')
mod2 <- mlogit(employment_sit ~ 0 | gender + finalgrade, data = mydata)
field2 <- field3logit(mod2, 'genderFemale')
gg3logit(field2) + stat_3logit()

# Read from matrix
M <- matrix(c(-2.05, 0.46, -2.46, 0.37), nrow = 2)ownames(M) <- c('Employed', 'genderFemale')
attr(M, 'labs') <- c('Employed', 'Unemployed', 'Trainee')
field3 <- field3logit(M, c(0, 1))
gg3logit(field3) + stat_3logit()
field3logit

Description

data.frame with 3282 cross-sectional observations of 7 variables about employment condition of master's students one year after graduation. Data refer to students graduated at the University of Trento (Italy) between 2009 and 2013.

Format

data.frame with 3282 observations of 7 variables:

- employment_sit - employment situation, a factor with three levels: Employed, Unemployed, Trainee.
- gender - gender, a factor with two levels: Male, Female.
- finalgrade - final grade degree, a factor with three levels: Low, Average, High.
- duration - duration of studies, a factor with three levels: Short, Average, Long.
- social_class - social class, a factor with five levels: Working class, White-collar workers, Lower middle class, Upper middle class, Unclassified.
- irregularity - irregularity indicator of student’s studies, a factor with three levels: Low, Average, High.
- hsscore - high school final score, a numeric between 60 and 100.

References


field3logit

Computation of the vector field

Description

field3logit computes the vector field associated to a change in regressor values (which may involve more than one regressor) of a trinomial logit model either fitted by some multinomial regression function or explicitly specified.

plot3logit and plot method draw the ternary plot using standard graphics methods provided by package Ternary. See function gg3logit for plotting through the package ggtern based on the grammar of graphics.
Usage

```r
field3logit(model, delta, label = "<empty>", p0 = NULL, alpha = NULL,
ncurves = 8, narrows = Inf, edge = 0.01)
```

```r
plot3logit(model, delta, label = "<empty>", p0 = NULL, alpha = NULL,
ncurves = 8, narrows = Inf, edge = 0.01, ...)
```

```r
## S3 method for class 'field3logit'
print(x, ...)
```

```r
## S3 method for class 'field3logit'
plot(x, ..., add = FALSE, length = 0.05)
```

```r
## S3 method for class 'field3logit'
as.data.frame(x, ..., wide = TRUE)
```

```r
## S3 method for class 'field3logit'
fortify(model, data, ...)
```

Arguments

- `model` either a fitted trinomial model or a matrix of regressor coefficients. See section *Compatibility* and examples of *plot3logit-package*.
- `delta` the change in the values of covariates to be represented. This could be either a numeric vector, the name of a covariate (passed either as a character or an expression), or a mathematical expression involving one or more than one covariates (passed either as a character or an expression). See details and examples.
- `label` label to be used for identifying the field when multiple fields are plotted. See *multifield3logit*.
- `p0` list of starting points (ternary coordinates) of the curves of the field. If not specified, `field3logit` automatically compute ncurves candidate points so that arrows are evenly distributed over the ternary plot area. See Examples.
- `alpha` numeric vector of length two where constants $\alpha^{(1)}$ and $\alpha^{(2)}$ are stored (only for ordinal models), as defined in Equation (7) of Santi, Dickson and Espa (2019).
- `ncurves` number of curves of the field to be computed. In case of ordinal models, this parameter is ineffective, as only one curve can be drawn. The parameter is ineffective also in case that argument p0 is set.
- `narrows` maximum number of arrows to be drawn per curve.
- `edge` minimum distance between each arrow (or point) and the edge of the ternary plot.
- `...` other arguments passed to or from other methods.
- `x` object of class `field3logit`.
- `add` logical argument which specifies whether the field should be added to an existing plot (`add = TRUE`) or a new ternary plot should be drawn (`add = FALSE`).
length  length of the edges of the arrow head (in inches).
wide it allows to choose whether as.data.frame should return a data.frame object
in wide (default) or long form.
data not used. Argument included only for interface compatibility with the generic
fortify.

Details
Argument delta could be passed in one of the following formats:
• explicitly, as a numeric vector corresponding to the change $\Delta x \in R^k$ in regressors values
  $x \in R^k$;
• implicitly, as a character of the name of the covariate to be considered. In this case, vector
  $\Delta x \in R^k$ is computed for a unit change of the specified covariate;
• as a mathematical expression (passed as an expression or a character object) involving
  one or more than one covariates. This allows one to analyse the effects of composite covariate
  changes through an easy-to-write and easy-to-read code without having to cope with explicit
  numerical specification of vector $\Delta x \in R^k$.

See examples for comparing all three methods.

Value
S3 object of class field3logit structured as a named list.

References
Santi F., M. M. Dickson, G. Espa (2019) "A graphical tool for interpreting regression coeffi-
cients of trinomial logit models", The American Statistician, 73(2), pp. 200-207. doi: 10.1080/
00031305.2018.1442368

See Also
multifield3logit, gg3logit.

Examples
data(cross_1year)

# Model fit
mod0 <- nnet::multinom(employment_sit ~ finalgrade + irregularity + hsscore,
cross_1year)
mod0

# Assessing the effect of "finalgradeHigh" (explicit notation)
field0 <- field3logit(mod0, c(0, 0, 1, 0, 0, 0))
gg3logit(field0) + stat_3logit()

# Assessing the effect of "finalgradeHigh" (implicit notation)
field0 <- field3logit(mod0, 'finalgradeHigh')
gg3logit(field0) + stat_3logit()

# Assessing the combined effect of "finalgradeHigh" and
# a decrease of "hsscore" by 10
field0 <- field3logit(mod0, 'finalgradeHigh - 10 * hsscore')
gg3logit(field0) + stat_3logit()

---

gg3logit

Create a new gg3logit

Description

`gg3logit` initializes a `ggplot` object through `ggtern`. If a fortified `field3logit` or a `multifield3logit` object is passed as argument data to `gg3logit`, the labels of the ternary plot are automatically. The same happens if a `field3logit` or a `multifield3logit` object is passed; in that case, `gg3logit` preliminarily invoke the `fortify` method.

Usage

`gg3logit(data = NULL, mapping = aes(), ...)`

Arguments

data: a `field3logit` or a `multifield3logit` object. If not specified, must be supplied in each layer added to the plot.

mapping: list of aesthetic mappings to use for plot. If not specified, must be supplied in each layer added to the plot. Note that mappings x, y and z are not required: they will be overwritten if specified (see examples).

...: additional arguments passed through to `ggtern`.

See Also

Other 'gg' functions: `multifield3logit`, `stat_3logit`

Examples

data(cross_1year)

mod0 <- nnet::multinom(employment_sit ~ gender + finalgrade, data = cross_1year)
field0 <- field3logit(mod0, 'genderFemale')
gg3logit(field0) + stat_3logit()
**multifield3logit**  

*Multiple trilogit fields*

**Description**

Methods of S3 class `multifield3logit` handle multiple `field3logit` objects simultaneously and permit new `multifield3logit` object to be easily created by means of the sum operator `+`. The `fortify` method of `multifield3logit` permits multiple `field3logit` objects to be easily handled by `gg3logit` and `ggtern`-based functions and methods. See Examples.

**Usage**

```r
multifield3logit(x, ...)  
## S3 method for class 'field3logit'
  x + y  
## S3 method for class 'multifield3logit'
  print(x, maxitems = 10, ...)
## S3 method for class 'multifield3logit'
  fortify(model, data, ...)
```

**Arguments**

- `x, y`  
  object of class `field3logit` or `multifield3logit`.
- `...`  
  other arguments passed to or from other methods.
- `maxitems`  
  maximum number of items to be enumerated when an object of class `multifield3logit` is printed.
- `model`  
  either a fitted trinomial model or a matrix of regressor coefficients. See section `Compatibility` and examples of `plot3logit-package`.
- `data`  
  not used. Argument included only for interface compatibility with the generic `fortify`.

**Value**

S3 object of class `multifield3logit` structured as a named list.

**See Also**

- `field3logit`
- Other ‘gg’ functions: `gg3logit`, `stat_3logit`
Examples

data(cross_1year)
mod0 <- nnet::multinom(employment_sit ~ ., data = cross_1year)
mod0

field_Sdur <- field3logit(mod0, 'durationShort',
    label = 'Short duration')
field_Hfgr <- field3logit(mod0, 'finalgradeHigh',
    label = 'High final grade')

gg3logit(field_Sdur + field_Hfgr) +
    stat_3logit() +
    facet_wrap(~ label)

refpoint <- list(c(0.7, 0.15, 0.15))

field_Sdur <- field3logit(mod0, 'durationShort',
    label = 'Short duration', p0 = refpoint, narrows = 1)
field_Ldur <- field3logit(mod0, 'durationLong',
    label = 'Long duration', p0 = refpoint, narrows = 1)
field_Hfgr <- field3logit(mod0, 'finalgradeHigh',
    label = 'High final grade', p0 = refpoint, narrows = 1)
field_Lfgr <- field3logit(mod0, 'finalgradeLow',
    label = 'Low final grade', p0 = refpoint, narrows = 1)

mfields <- field_Sdur + field_Ldur + field_Lfgr + field_Hfgr
mfields

gg3logit(mfields) +
    stat_3logit(aes(colour = label)) +
    theme_zoom_L(0.45)

---

stat_3logit Add a field to a gg3logit plot

Description

stat_3logit add a field to a gg3logit plot.

Usage

stat_3logit(mapping = aes(), data = NULL, geom = "segment",
    position = "identity", show.legend = NA, inherit.aes = TRUE,
    arrow. = arrow(length = unit(0.2, "cm")), ...)
Arguments

mapping  list of aesthetic mappings to use for plot. **Note that** mappings x, y and z are **not** required: they will be overwritten if specified (see examples).

data   a field3logit or a multifield3logit object.

geom   The geometric object to use display the data

position   Position adjustment, either as a string, or the result of a call to a position adjustment function.

show.legend   logical. Should this layer be included in the legends? NA, the default, includes if any aesthetics are mapped. FALSE never includes, and TRUE always includes. It can also be a named logical vector to finely select the aesthetics to display.

inherit.aes   If FALSE, overrides the default aesthetics, rather than combining with them. This is most useful for helper functions that define both data and aesthetics and shouldn’t inherit behaviour from the default plot specification, e.g. borders().

arrow.specification for arrow heads, as created by function arrow of package grid.

... Other arguments passed on to layer(). These are often aesthetics, used to set an aesthetic to a fixed value, like colour = “red” or size = 3. They may also be parameters to the paired geom/stat.

See Also

Other ‘gg’ functions: gg3logit, multifield3logit

Examples

data(cross_1year)

mod0 <- nnet::multinom(employment_sit ~ gender + finalgrade, data = cross_1year)
field0 <- field3logit(mod0, 'genderFemale')

gg3logit(field0) + stat_3logit()

Examples

data(cross_1year)

mod0 <- nnet::multinom(employment_sit ~ gender + finalgrade, data = cross_1year)
field0 <- field3logit(mod0, 'genderFemale')

gg3logit(field0) + stat_3logit()

Data(cross_1year)

mod0 <- nnet::multinom(employment_sit ~ gender + finalgrade, data = cross_1year)
field0 <- field3logit(mod0, 'genderFemale')

gg3logit(field0) + stat_3logit()

Examples

data(cross_1year)

mod0 <- nnet::multinom(employment_sit ~ gender + finalgrade, data = cross_1year)
field0 <- field3logit(mod0, 'genderFemale')

gg3logit(field0) + stat_3logit()

Data(cross_1year)

mod0 <- nnet::multinom(employment_sit ~ gender + finalgrade, data = cross_1year)
field0 <- field3logit(mod0, 'genderFemale')

gg3logit(field0) + stat_3logit()
Arguments

field object of class field3logit as returned by field3logit.

... graphical parameters such as xpd and the line characteristics lend, ljoin and lmitre: see par.

length length of the edges of the arrow head (in inches).

Value

Argument field is invisibly returned.

See Also

field3logit.

Examples

library(nnet)
data(cross_1year)

mod0 <- nnet::multinom(employment_sit ~ gender + finalgrade, data = cross_1year)
field0 <- field3logit(mod0, 'genderFemale')

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