Package ‘EffectStars’

Type Package

Title Visualization of Categorical Response Models

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Depends VGAM

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Description Notice: The package EffectStars2 provides a more up-to-date implementation of effect stars! EffectStars provides functions to visualize regression models with categorical response. The effects of the variables are plotted with star plots in order to allow for an optical impression of the fitted model.

License GPL-2

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The data describe the food choice of alligators, they originate from a study of the Florida Game and Fresh Water Commission.

Usage
data(alligator)

Format
A data frame with 219 observations on the following 4 variables.

Food  Food type with levels bird, fish, invert, other and rep
Size  Size of the alligator with levels <2.3 and >2.3
Gender  Gender with levels female and male
Lake  Name of the lake with levels George, Hancock, Oklawaha and Trafford

Source
http://www.stat.ufl.edu/~aa/cda/sas/sas.html

References

Examples
```r
### Not run:
data(alligator)
star.nominal(Food ~ Size + Lake + Gender, data = alligator, nlines = 2)
### End(Not run)
```
Description

These data are drawn from the 1997-2001 British Election Panel Study (BEPS).

Usage

data(BEPS)

Format

A data frame with 1525 observations on the following 10 variables.

- **Europe**: An 11-point scale that measures respondents’ attitudes toward European integration. High scores represent eurosceptic sentiment.
- **Leader.Cons**: Assessment of the Conservative leader Hague, 1 to 5.
- **Leader_Labour**: Assessment of the Labour leader Blair, 1 to 5.
- **Leader_Liberals**: Assessment of the Liberals leader Kennedy, 1 to 5.
- **Vote**: Party Choice with levels Conservative, Labour and Liberal Democrat.
- **Age**: Age in years.
- **Gender**: Gender with levels female and male.
- **Political_Knowledge**: Knowledge of parties' positions on European integration, 0 to 3.
- **National_Economy**: Assessment of current national economic conditions, 1 to 5.
- **Household**: Assessment of current household economic conditions, 1 to 5.

Source

R package effects: BEPS

References

British Election Panel Study (BEPS)


Examples

```r
## Not run:
data(BEPS)

BEPS$Europe<-scale(BEPS$Europe)
BEPS$Age<-scale(BEPS$Age)
BEPS$Leader_Labour<-BEPS$Leader_Labour-BEPS$Leader_Cons
BEPS$Leader<-BEPS$Leader_Labour
```
BEPS$Leader_Liberals<-BEPS$Leader_Liberals-BEPS$Leader_Cons

star.nominal(Vote ~ Age + Household + National_Economy + Household + Leader + Europe + Political_Knowledge + Gender, data = BEPS, xij = list(Leader~Leader_Labour+Leader_Liberals), catstar = FALSE, symmetric = FALSE)

## End(Not run)

---

**coffee Coffee Brands**

**Description**

The data frame is part of a long-term panel about the choice of coffee brands in 2111 households. The explanatory variables either refer to the household as a whole or to the head of the household.

**Usage**

data(coffee)

**Format**

A data frame with 2111 observations on the following 8 variables.

- **education**: Educational level with levels `no highschool` and `highschool`
- **pricesensitivity**: Price sensitivity with levels `not sensitive` and `sensitive`
- **income**: Income with levels `< 2499` and `>= 2500`
- **sociallevel**: Social level with levels `high` and `low`
- **age**: Age with levels `< 49` and `>= 50`
- **brand**: Coffee Brand with levels `Jacobs, JacobsSpecial, Aldi, AldiSpecial, Eduscho, EduschoSpecial, Tchibo, TchiboSpecial` and `Others`
- **amount**: Amount of packs with levels `1` and `>= 2`
- **persons**: Number of persons in household

**Source**

[http://www.stat.uni-muenchen.de/service/datenarchiv/](http://www.stat.uni-muenchen.de/service/datenarchiv/)

**References**

Gesellschaft für Konsumforschung (GfK)
Examples

```r
## Not run:
data(coffee)

star.nominal(Brand ~ Amount + Age + SocialLevel + Income + Persons +
             PriceSensitivity + Education, coffee, cex.cat = 0.5, cex.labels = 0.8)

## End(Not run)
```

Description

The package **EffectStars2** provides a more up-to-date implementation of effect stars!

The package provides functions that visualize categorical regression models. Included models are the multinomial logit model, the sequential logit model and the cumulative logit model. The exponentials of the effects of the predictors are plotted as star plots showing the strengths of the effects. In addition p-values for the effect of predictors are given. Various data sets and examples are provided. The plots should in general be exported to file formats like pdf, ps or png to receive the optimal display. Plotting in R devices may not provide the optimal results.

For further details see `star.nominal`, `star.sequential` and `star.cumulative`.

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References


See Also

`star.nominal`, `star.sequential`, `star.cumulative`
**Description**

The data set contains data from the German Longitudinal Election Study. The Response Categories refer to the five dominant parties in Germany. The explanatory variables refer to the declarations of single voters.

**Usage**

data(election)

**Format**

A data frame with 816 observations on the following 30 variables.

- **Age** Standardized age of the voter
- **AgeOrig** Unstandardized age of the voter
- **Partychoice** Party Choice with levels CDU, SPD, FDP, Greens and Left Party
- **Gender** Gender with levels female and male
- **West** Regional provenance (West-Germany or East-Germany) with levels east and west
- **Union** Member of a Union with levels no member and member
- **Highschool** Educational level with levels no highschool and highschool
- **Unemployment** Unemployment with levels not unemployed and unemployed
- **Pol.Interest** Political Interest with levels very interested and less interested
- **Democracy** Satisfaction with the functioning of democracy with levels satisfied and not satisfied
- **Religion** Religion with levels evangelical, catholic and other religion
- **Social_CDU** Difference in attitude towards the socioeconomic dimension of politics between respondent and CDU
- **Social_SPD** Difference in attitude towards the socioeconomic dimension of politics between respondent and SPD
- **Social_FDP** Difference in attitude towards the socioeconomic dimension of politics between respondent and FDP
- **Social_Greens** Difference in attitude towards the socioeconomic dimension of politics between respondent and the Greens
- **Social_Left** Difference in attitude towards the socioeconomic dimension of politics between respondent and the Left party
- **Immigration_CDU** Difference in attitude towards immigration of foreigners between respondent and CDU
- **Immigration_SPD** Difference in attitude towards immigration of foreigners between respondent and SPD
Immigration_FDP Difference in attitude towards immigration of foreigners between respondent and FDP

Immigration_Greens Difference in attitude towards immigration of foreigners between respondent and the Greens

Immigration_Left Difference in attitude towards immigration of foreigners between respondent and the Left party

Nuclear_CDU Difference in attitude towards nuclear energy between respondent and CDU

Nuclear_SPD Difference in attitude towards nuclear energy between respondent and SPD

Nuclear_FDP Difference in attitude towards nuclear energy between respondent and FDP

Nuclear_Greens Difference in attitude towards nuclear energy between respondent and the Greens

Nuclear_Left Difference in attitude towards nuclear energy between respondent and the Left party

Left_Right_CDU Difference in attitude towards the positioning on a political left-right scale between respondent and CDU

Left_Right_SPD Difference in attitude towards the positioning on a political left-right scale between respondent and SPD

Left_Right_FDP Difference in attitude towards the positioning on a political left-right scale between respondent and FDP

Left_Right_Greens Difference in attitude towards the positioning on a political left-right scale between respondent and the Greens

Left_Right_Left Difference in attitude towards the positioning on a political left-right scale between respondent and the Left party

References

German Longitudinal Election Study (GLES)

Examples

## Not run:
data(election)

# simple multinomial logit model
star.nominal(Partychoice ~ Age + Religion + Democracy + Pol.Interest +
  Unemployment + Highschool + Union + West + Gender, election)

# Use effect coding for the categorical predictor religion
star.nominal(Partychoice ~ Age + Religion + Democracy + Pol.Interest +
  Unemployment + Highschool + Union + West + Gender, election,
pred.coding = "effect")

# Use reference category "FDP" instead of symmetric side constraints
star.nominal(Partychoice ~ Age + Religion + Democracy + Pol.Interest +
  Unemployment + Highschool + Union + West + Gender, election,
  ref.level = 3, symmetric = FALSE)

# Use category-specific covariates, subtract values for reference
# category CDU
description

The data set originates from the Munich founder study. The data were collected on business founders who registered their new companies at the local chambers of commerce in Munich and surrounding administrative districts. The focus was on survival of firms measured in 7 categories, the first six represent failure in intervals of six months, the last category represents survival time beyond 36 months.

Usage

data(insolvency)

Format

A data frame with 1224 observations on the following 16 variables.

Insolvency Survival of firms in ordered categories with levels 1 < 2 < 3 < 4 < 5 < 6 < 7
Sector Economic Sector with levels industry, commerce and service industry
Legal Legal form with levels small trade, one man business, GmbH and GbR, KG, OHG
Location Location with levels residential area and business area
New_Foundation New Foundation or take-over with levels new foundation and take-over
Pecuniary_Reward Pecuniary reward with levels main and additional
Seed_Capital Seed capital with levels < 25000 and > 25000
Equity_capital Equity capital with levels no and yes
Debt_capital Debt capital with levels no and yes
Market Market with levels local and national
Clientele Clientele with levels wide spread and small
Degree Educational level with levels no A-levels and A-Levels
Gender Gender with levels female and male
Experience Professional experience with levels < 10 years and > 10 years
Employees Number of employees with levels 0 or 1 and > 2
Age Age of the founder at formation of the company

Source
Münchner Gründer Studie

References

Examples
## Not run:
data(Insolvency)

star.sequential(Insolvency ~ Sector + Legal + Pecuniary_Reward + Seed_Capital + Debt_Capital + Employees, Insolvency, test.glob = FALSE, globcircle = TRUE, dist.x = 1.3)

star.cumulative(Insolvency ~ Sector + Employees, Insolvency, select = 2:4)

## End(Not run)

<table>
<thead>
<tr>
<th>PID</th>
<th>Party Identification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Description
Subset of the 1996 American National Election Study.

Usage
data(election)
Format

A data frame with 944 observations on the following 6 variables.

TVnews  Days in the past week spent watching news on TV
PID    Party identification with levels Democrat, Independent and Republican
Income Income
Education Educational level with levels low (no college) and high (at least college)
Age    Age in years
Population Population of respondent’s location in 1000s of people

Source

R package faraway: nes96

Examples

```r
## Not run:
data(PID)
PIDS$TVnews <- scale(PIDS$TVnews)
PIDS$Income <- scale(PIDS$Income)
PIDS$Age <- scale(PIDS$Age)
PIDS$Population <- scale(PIDS$Population)

star.nominal(PID ~ TVnews + Income + Population + Age + Education, data = PID)

## End(Not run)
```

---

plebiscite  

Chilean Plebiscite

Description

The data origin from a survey refering to the plebiscite in Chile 1988. The chilean people had to decide, wether Augusto Pinochet would remain president for another ten years (voting yes) or if there would be presidential elections in 1989 (voting no).

Usage

data(plebiscite)
star.cumulative

Format
A data frame with 2431 observations on the following 7 variables.

Gender  Gender with levels female and male
Education  Educational level with levels low and high
SantiagoCity  Respondent from Santiago City with levels no and yes
Income  Monthly Income in Pesos
Population  Population size of respondent’s community
Age  Age in years
Vote  Response with levels Abstention, No, Undecided and Yes

Source
R package car: Chile

References
Personal communication from FLACSO/Chile.

Examples
```r
## Not run:
data(plebiscite)
plebiscite$Population <- scale(plebiscite$Population)
plebiscite$Age <- scale(plebiscite$Age)
plebiscite$Income <- scale(plebiscite$Income)

star.nominal(Vote ~ SantiagoCity + Population + Gender + Age + Education + Income, data = plebiscite)

## End(Not run)
```

star.cumulative  Effect stars for cumulative logit models

Description
The package EffectStars2 provides a more up-to-date implementation of effect stars!
The function computes and visualizes cumulative logit models. The computation is done with help of the package VGAM. The visualization is based on the function stars from the package graphics.
Usage

star.cumulative(formula, data, global = NULL, test.rel = TRUE, test.glob = FALSE, partial = FALSE, globcircle = FALSE, maxit = 100, scale = TRUE, nlines = NULL, select = NULL, dist.x = 1, dist.y = 1, dist.cov = 1, dist.cat = 1, xpd = TRUE, main = "", col.fill = "gray90", col.circle = "black", lwd.circle = 1, lty.circle = "longdash", col.global = "black", lwd.global = 1, lty.global = "dotdash", cex.labels = 1, cex.cat = 0.8, xlim = NULL, ylim = NULL)

Arguments

formula An object of class “formula”. Formula for the cumulative logit model to be fitted and visualized.
data An object of class “data.frame” containing the covariates used in formula.
global Numeric vector to choose a subset of predictors to be included with global coefficients. Default is to include all coefficients category-specific. Numbers refer to total amount of predictors, including intercept and dummy variables.
test.rel Provides a Likelihood-Ratio-Test to test the relevance of the explanatory covariates. The corresponding p-values will be printed as p-rel. test.rel=FALSE might save a lot of time. See also Details.
test.glob Provides a Likelihood-Ratio-Test to test if a covariate has to be included as a category-specific covariate (in contrast to being global). The corresponding p-values will be printed as p-global. test.glob=FALSE and globcircle=FALSE might save a lot of time. See also Details.
partial If partial=TRUE, partial proportional odds models with only one category-specific covariate are fitted. The resulting effects of the (sub)models are plotted. For further information see Details.
globcircle If TRUE, additional circles that represent the global effects of the covariates are plotted. test.glob=FALSE and globcircle=FALSE might save a lot of time.
maxit Maximal number of iterations to fit the cumulative logit model. See also vglm.control.
scale If TRUE, the stars are scaled to equal maximal ray length.
nlines If specified, nlines gives the number of lines in which the effect stars are plotted.
select Numeric vector to choose only a subset of the stars to be plotted. Default is to plot all stars. Numbers refer to total amount of predictors, including intercept and dummy variables.
dist.x Optional factor to increase/decrease distances between the centers of the stars on the x-axis. Values greater than 1 increase, values smaller than 1 decrease the distances.
dist.y Optional factor to increase/decrease distances between the centers of the stars on the y-axis. Values greater than 1 increase, values smaller than 1 decrease the distances.
dist.cov Optional factor to increase/decrease distances between the stars and the covariates labels above the stars. Values greater than 1 increase, values smaller than 1 decrease the distances.
Optional factor to increase/decrease distances between the stars and the category labels around the stars. Values greater than 1 increase, values smaller than 1 decrease the distances.

If FALSE, all plotting is clipped to the plot region, if TRUE, all plotting is clipped to the figure region, and if NA, all plotting is clipped to the device region. See also par.

An overall title for the plot. See also plot.

Color of background of the circle. See also col in par.

Color of margin of the circle. See also col in par.

Line width of the circle. See also lwd in par.

Line type of the circle. See also lty in par.

Color of margin of the global effects circle. See also col in par. Ignored, if globcircle = FALSE.

Line width of the global effects circle. See also lwd in par. Ignored, if globcircle = FALSE.

Line type of the global effects circle. See also lty in par. Ignored, if globcircle = FALSE.

Size of labels for covariates placed above the corresponding star. See also cex in par.

Size of labels for categories placed around the corresponding star. See also cex in par.

Optional specification of the x coordinates ranges. See also xlim in plot.window

Optional specification of the y coordinates ranges. See also ylim in plot.window

The underlying models are fitted with the function vglm from the package VGAM. The family argument for vglm is cumulative(parallel=FALSE).

The stars show the exponentials of the estimated coefficients. In cumulative logit models the exponential coefficients can be interpreted as odds. More precisely, the exponential $e^{\gamma r_j}$, $r = 1, \ldots, k-1$ represents the multiplicative effect of the covariate $j$ on the cumulative odds $\frac{P(Y \leq r|x)}{P(Y > r|x)}$ if $x_j$ increases by one unit.

In addition to the stars, we plot a circle that refers to the case where the coefficients of the corresponding star are zero. Therefore, the radii of these circles are always $exp(0) = 1$. If scale=TRUE, the stars are scaled so that they all have the same maximal ray length. In this case, the actual appearances of the circles differ, but they still refer to the no-effects case where all the coefficients are zero. Now the circles can be used to compare different stars based on their respective circles radii. The p-values beneath the covariate labels, which are given out if test.rel=TRUE, correspond to the distance between the circle and the star as a whole. They refer to a likelihood ratio test if all the coefficients from one covariate are zero (i.e. the variable is left out completely) and thus would lie exactly upon the circle.

The form of the circles can be modified by col.circle, lwd.circle and lty.circle.

By setting globcircle=TRUE, an additiona circle can be drawn. The radii now correspond to a model, where the respective covariate is not included category-specific but globally. Therefore,
the distance between this circle and the star as a whole corresponds to the p-value p-global that is
given if test.glob=TRUE.

Please note:

Regular fitting of cumulative logit models may fail because of the restrictions in the parameter
space that have to be considered. If partial=TRUE, (sub)models with only one category-specific
covariate, so-called partial proportional odds models, are fitted. Then at least estimates for every
coefficient should be available. If partial=TRUE, the resulting effects of these (sub)models are
plotted. It should be noted that in this case no coherent model is visualized. Also the p-values refer
to the various submodels. For partial=TRUE, the p-values p-rel and p-global refer to tests of the
corresponding partial proportional odds models against the proportional odds model.

It is strongly recommended to standardize metric covariates, display of effect stars can benefit
greatly as in general differences between the coefficients are increased.

Value

P-values are only available if the corresponding option is set TRUE.

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>odds</td>
<td>Odds or exponential coefficients of the cumulative logit model</td>
</tr>
<tr>
<td>coefficents</td>
<td>Coefficients of the cumulative logit model</td>
</tr>
<tr>
<td>se</td>
<td>Standard errors of the coefficients</td>
</tr>
<tr>
<td>p_rel</td>
<td>P-values of Likelihood-Ratio-Tests for the relevance of the explanatory covariates</td>
</tr>
<tr>
<td>p_global</td>
<td>P-values of Likelihood-Ratio-Tests whether the covariates need to be included category-specific</td>
</tr>
<tr>
<td>xlim</td>
<td>xlim values that were automatically produced. May be helpful if you want to specify your own xlim</td>
</tr>
<tr>
<td>ylim</td>
<td>ylim values that were automatically produced. May be helpful if you want to specify your own ylim</td>
</tr>
</tbody>
</table>

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References


See Also

star.sequential, star.nominal
Examples

### Not run:
```r
data(insolvency)

star.cumulative(Insolvency ~ Sector + Employees, insolvency, select = 2:4)
```

### End(Not run)

---

star.nominal  Effect stars for multinomial logit models

Description

The package EffectStars2 provides a more up-to-date implementation of effect stars!

The function computes and visualizes multinomial logit models. The computation is done with help of the package VGAM. The visualization is based on the function stars from the package graphics.

Usage

```r
star.nominal(formula, data, xij = NULL, conf.int = FALSE, symmetric = TRUE,
  pred.coding = "reference", printpvalues = TRUE, test.rel = TRUE, refLevel = 1,
  maxit = 100, scale = TRUE, nlines = NULL, select = NULL, catstar = TRUE,
  dist.x = 1, dist.y = 1, dist.cov = 1, dist.cat = 1, xpd = TRUE, main = "",
  lwd.stars = 1, col.fill = "gray90", col.circle = "black", lwd.circle = 1,
  lty.circle = "longdash", lty.conf = "dotted", cex.labels = 1, cex.cat = 0.8,
  xlim = NULL, ylim = NULL)
```

Arguments

- **formula**: An object of class “formula”. Formula for the multinomial logit model to be fitted and visualized.
- **data**: An object of class “data.frame” containing the covariates used in formula.
- **xij**: An object of class list, used if category-specific covariates are to be included. Every element is a formula referring to one of the category-specific covariates. For details see help for `xij` in `vglm.control` and the details below.
- **conf.int**: If TRUE, confidence intervals are drawn.
- **symmetric**: Which side constraint for the coefficients in the multinomial logit model shall be used for the plot? Default TRUE uses symmetric side constraints, FALSE uses the reference category specified by refLevel. If category-specific covariates are specified using `xij`, automatically symmetric = FALSE is set. Symmetric side constraints are not possible in the case of category-specific covariates.
| pred.coding | Which coding for categorical predictors with more than two categories is to be used? Default `pred.coding="reference"` uses the first category as reference category, the alternative `pred.coding="effect"` uses effect coding equivalent to symmetric side constraints. For `pred.coding="effect"` a star for every category is plotted, for `pred.coding="reference"` no star for the reference category is plotted. |
| printpvalues | If `TRUE`, p-values for the respective coefficients are printed besides the category labels. P-values are received by a Wald test. |
| test.rel | Provides a Likelihood-Ratio-Test to test the relevance of the explanatory covariates. The corresponding p-values will be printed behind the covariates labels. `test.rel=FALSE` might save a lot of time. |
| refLevel | Reference category for multinomial logit model. Ignored if `symmetric=TRUE`. See also `multinomials`. |
| maxit | Maximal number of iterations to fit the multinomial logit model. See also `vglm.control`. |
| scale | If `TRUE`, the stars are scaled to equal maximal ray length. |
| nlines | If specified, `nlines` gives the number of lines in which the effect stars are plotted. |
| select | Numeric vector to choose only a subset of the stars to be plotted. Default is to plot all stars. Numbers refer to total amount of predictors, including intercept and dummy variables. |
| catstar | A logical argument to specify if all category-specific effects in the model should be visualized with an additional star. Ignored if `xij=NULL`. |
| dist.x | Optional factor to increase/decrease distances between the centers of the stars on the x-axis. Values greater than 1 increase, values smaller than 1 decrease the distances. |
| dist.y | Optional factor to increase/decrease distances between the centers of the stars on the y-axis. Values greater than 1 increase, values smaller than 1 decrease the distances. |
| dist.cov | Optional factor to increase/decrease distances between the stars and the covariates labels above the stars. Values greater than 1 increase, values smaller than 1 decrease the distances. |
| dist.cat | Optional factor to increase/decrease distances between the stars and the category labels around the stars. Values greater than 1 increase, values smaller than 1 decrease the distances. |
| xpd | If `FALSE`, all plotting is clipped to the plot region, if `TRUE`, all plotting is clipped to the figure region, and if `NA`, all plotting is clipped to the device region. See also `par`. |
| main | An overall title for the plot. See also `plot`. |
| lwd.stars | Line width of the stars. See also `lwd` in `par`. |
| col.fill | Color of background of the circle. See also `col` in `par`. |
| col.circle | Color of margin of the circle. See also `col` in `par`. |
| lwd.circle | Line width of the circle. See also `lwd` in `par`. |
The underlying models are fitted with the function \texttt{vglm} from the package \texttt{VGAM}. The family argument for \texttt{vglm} is \texttt{multinomial(parallel=FALSE)}.

The stars show the exponentials of the estimated coefficients. In multinomial logit models the exponential coefficients can be interpreted as odds. More precisely, for the model with symmetric side constraints, the exponential $e^{\gamma_{rj}}$, $r = 1, \ldots, k$ represents the multiplicative effect of the covariate $j$ on the odds $\frac{P(Y=r|x)}{GM(x)}$ if $x_j$ increases by one unit and $GM(x)$ is the median response. For the model with reference category $k$, the exponential $e^{\gamma_{rj}}$, $r = 1, \ldots, k-1$ represents the multiplicative effect of the covariate $j$ on the odds $\frac{P(Y=r|x)}{P(Y=k|x)}$ if $x_j$ increases by one unit.

In addition to the stars, we plot a circle that refers to the case where the coefficients of the corresponding star are zero. Therefore, the radii of these circles are always $exp(0) = 1$. If \texttt{scale=TRUE}, the stars are scaled so that they all have the same maximal ray length. In this case, the actual appearances of the circles differ, but they still refer to the no-effects case where all the coefficients are zero. Now the circles can be used to compare different stars based on their respective circles radii. The distances between the rays of a star and the circle correspond to the p-values that are printed beneath the category levels if \texttt{printpvalues=TRUE}. The closer a star ray lies to the no–effects circle, the more the p-value is increased.

The p-values beneath the covariate labels, which are given if \texttt{test.rel=TRUE}, correspond to the distance between the circle and the star as a whole. They refer to a likelihood ratio test if all the coefficients from one covariate are zero (i.e. the variable is left out completely) and thus would lie exactly upon the circle.

The appearance of the circles can be modified by \texttt{col.circle}, \texttt{lwd.circle} and \texttt{lty.circle}.

The argument \texttt{xij} is important because it has to be used to include category-specific covariates. If its default \texttt{xij=NULL} is kept, an ordinary multinomial logit model without category-specific covariates is fitted. If category-specific covariates are to be included, attention has to be paid to the exact usage of \texttt{xij}. Our \texttt{xij} argument is identical to the \texttt{xij} argument used in the embedded \texttt{vglm} function. For details see also \texttt{vglm.control}. The data are thought to be present in a wide format, i.e. a category-specific covariate consists of $k$ columns. Before calling \texttt{star.nominal}, the values for the reference category (defined by \texttt{refLevel}) have to be subtracted from the values of the further categories. Additionally, the resulting variable for the first response category (but not the reference category) has to be duplicated. This duplicate should be denoted by an appropriate name for the category-specific variable, independent from the different response categories. It will be used as an assignment variable for the corresponding coefficient of the covariate and has to be
included in the formula. For every category-specific covariate, a formula has to be specified in the $x_{ij}$ argument. On the left hand side of that formula, the assignment variable has to be placed. On the right hand side, the variables containing the differences from the values for the reference category are written. So the left hand side of the formula contains k-1 terms. The order of these terms has to be chosen according to the order of the response categories, ignoring the reference category. Examples for effect stars for models with category-specific covariates are received by typing vignette("election") or vignette("plebiscite").

It is strongly recommended to standardize metric covariates, display of effect stars can benefit greatly as in general differences between the coefficients are increased.

**Value**

P-values are only available if the corresponding option is set **TRUE**. 
catspec and catspecse are only available if $x_{ij}$ is specified.

- **odds**: Odds or exponential coefficients of the multinomial logit model
- **coefficients**: Coefficients of the multinomial logit model
- **se**: Standard errors of the coefficients
- **pvalues**: P-values of Wald tests for the respective coefficients
- **catspec**: Coefficients for the category-specific covariates
- **catspecse**: Standard errors for the coefficients for the category-specific covariates
- **p_rel**: P-values of Likelihood-Ratio-Tests for the relevance of the explanatory covariates
- **xlim**: xlim values that were automatically produced. May be helpful if you want to specify your own xlim
- **ylim**: ylim values that were automatically produced. May be helpful if you want to specify your own ylim

**Author(s)**

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**References**


**See Also**

*star.sequential, star.cumulative*
star.sequential

Examples

## Not run:

```r
data(election)

# simple multinomial logit model
star.nominal(Partychoice ~ Age + Religion + Democracy + Pol.Interest +
  Unemployment + Highschool + Union + West + Gender, election)

# Use effect coding for the categorical predictor religion
star.nominal(Partychoice ~ Age + Religion + Democracy + Pol.Interest +
  Unemployment + Highschool + Union + West + Gender, election,
  pred.coding = "effect")

# Use reference category "FDP" instead of symmetric side constraints
star.nominal(Partychoice ~ Age + Religion + Democracy + Pol.Interest +
  Unemployment + Highschool + Union + West + Gender, election,
  refLevel = 3, symmetric = FALSE)

# Use category-specific covariates, subtract values for reference
# category CDU

election$Social <- election$Social_SPD
election$Immigration <- election$Immigration_SPD
election$Nuclear <- election$Nuclear_SPD
election$Left_Right <- election$Left_Right_SPD

star.nominal(Partychoice ~ Social + Immigration + Nuclear + Left_Right + Age +
  Religion + Democracy + Pol.Interest + Unemployment + Highschool + Union + West +
  Gender, data = election,
  xij = list(Social ~ Social_SPD + Social_FDP + Social_Greens + Social_Left,
             Immigration ~ Immigration_SPD + Immigration_FDP + Immigration_Greens + Immigration_Left,
             Nuclear ~ Nuclear_SPD + Nuclear_FDP + Nuclear_Greens + Nuclear_Left,
             Left_Right ~ Left_Right_SPD + Left_Right_FDP + Left_Right_Greens + Left_Right_Left),
  symmetric = FALSE)

## End(Not run)
```

---

star.sequential  
Effect stars for sequential logit models

Description

The package `EffectStars2` provides a more up-to-date implementation of effect stars!

The function computes and visualizes sequential logit models. The computation is done with help of the package `VGAM`. The visualization is based on the function `stars` from the package `graphics`. 

star.sequential

Usage

star.sequential(formula, data, global = NULL, test.rel = TRUE, test.glob = FALSE, globcircle = FALSE, maxit = 100, scale = TRUE, nlines = NULL, select = NULL, dist.x = 1, dist.y = 1, dist.cov = 1, dist.cat = 1, xpd = TRUE, main = "", col.fill = "gray90", col.circle = "black", lwd.circle = 1, lty.circle = "longdash", col.global = "black", lwd.global = 1, lty.global = "dotdash", cex.labels = 1, cex.cat = 0.8, xlim = NULL, ylim = NULL)

Arguments

formula An object of class “formula”. Formula for the sequential logit model to be fitted an visualized.
data An object of class “data.frame” containing the covariates used in formula.
global Numeric vector to choose a subset of predictors to be included with global coefficients. Default is to include all coefficients category-specific. Numbers refer to total amount of predictors, including intercept and dummy variables.
test.rel Provides a Likelihood-Ratio-Test to test the relevance of the explanatory covariates. The corresponding p-values will be printed as p-rel. test.rel=FALSE might save a lot of time.
test.glob Provides a Likelihood-Ratio-Test to test if a covariate has to be included as a category-specific covariate (in contrast to being global). The corresponding p-values will be printed as p-global. test.glob=FALSE and globcircle=FALSE might save a lot of time.
globcircle If TRUE, additional circles that represent the global effects of the covariates are plotted. test.glob=FALSE and globcircle=FALSE might save a lot of time.
maxit Maximal number of iterations to fit the sequential logit model. See also vglm.control.
scale If TRUE, the stars are scaled to equal maximal ray length.
nlines If specified, nlines gives the number of lines in which the effect stars are plotted.
select Numeric vector to choose only a subset of the stars to be plotted. Default is to plot all stars. Numbers refer to total amount of predictors, including intercept and dummy variables.
dist.x Optional factor to increase/decrease distances between the centers of the stars on the x-axis. Values greater than 1 increase, values smaller than 1 decrease the distances.
dist.y Optional factor to increase/decrease distances between the centers of the stars on the y-axis. Values greater than 1 increase, values smaller than 1 decrease the distances.
dist.cov Optional factor to increase/decrease distances between the stars and the covariates labels above the stars. Values greater than 1 increase, values smaller than 1 decrease the distances.
dist.cat Optional factor to increase/decrease distances between the stars and the category labels around the stars. Values greater than 1 increase, values smaller than 1 decrease the distances.
star.sequential

xpd If FALSE, all plotting is clipped to the plot region, if TRUE, all plotting is clipped to the figure region, and if NA, all plotting is clipped to the device region. See also par.
main An overall title for the plot. See also plot.
col.fill Color of background of the circle. See also col in par.
col.circle Color of margin of the circle. See also col in par.
lwd.circle Line width of the circle. See also lwd in par.
lty.circle Line type of the circle. See also lty in par.
col.global Color of margin of the global effects circle. See also col in par. Ignored, if globcircle = FALSE.
lwd.global Line width of the global effects circle. See also lwd in par. Ignored, if globcircle = FALSE.
lty.global Line type of the global effects circle. See also lty in par. Ignored, if globcircle = FALSE.
cex.labels Size of labels for covariates placed above the corresponding star. See also cex in par.
cex.cat Size of labels for categories placed around the corresponding star. See also cex in par.
xlim Optional specification of the x coordinates ranges. See also xlim in plot.window
ylim Optional specification of the y coordinates ranges. See also ylim in plot.window

details
The underlying models are fitted with the function vglm from the package VGAM. The family argument for vglm is sratio(parallel=FALSE).

The stars show the exponentials of the estimated coefficients. In sequential logit models the exponential coefficients can be interpreted as odds. More precisely, the exponential $e^{\gamma r j}$, $r=1,\ldots,k-1$ represents the multiplicative effect of the covariate $j$ on the continuation ratio odds $P(Y=r|x)/P(Y>r|x)$ if $x_j$ increases by one unit.

In addition to the stars, we plot a circle that refers to the case where the coefficients of the corresponding star are zero. Therefore, the radii of these circles are always $exp(0) = 1$. If scale=TRUE, the stars are scaled so that they all have the same maximal ray length. In this case, the actual appearances of the circles differ, but they still refer to the no-effects case where all the coefficients are zero. Now the circles can be used to compare different stars based on their respective circles radii. The p-values beneath the covariate labels, which are given out if test.rel=TRUE, correspond to the distance between the circle and the star as a whole. They refer to a likelihood ratio test if all the coefficients from one covariate are zero (i.e. the variable is left out completely) and thus would lie exactly upon the circle. The appearance of the circles can be modified by col.circle, lwd.circle and lty.circle.

By setting globcircle=TRUE, an additional circle can be drawn. The radii now correspond to a model, where the respective covariate is not included category-specific but globally. Therefore, the distance between this circle and the star as a whole corresponds to the p-value p-global that is given if test.glob=TRUE.
It is strongly recommended to standardize metric covariates, display of effect stars can benefit greatly as in general differences between the coefficients are increased.

**Value**

P-values are only available if the corresponding option is set `TRUE`.

- **odds**: Odds or exponential coefficients of the sequential logit model
- **coefficients**: Coefficients of the sequential logit model
- **se**: Standard errors of the coefficients
- **p_rel**: P-values of Likelihood-Ratio-Tests for the relevance of the explanatory covariates
- **p_global**: P-values of Likelihood-Ratio-Tests whether the covariates need to be included category-specific
- **xlim**: xlim values that were automatically produced. May be helpful if you want to specify your own xlim
- **ylim**: ylim values that were automatically produced. May be helpful if you want to specify your own ylim

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**References**


**See Also**

`star.nominal, star.cumulative`

**Examples**

```r
## Not run:
data(insolvency)

star.sequential(Insolvency ~ Sector + Legal + Pecuniary_Reward + Seed_Capital + Debt_Capital + Employees, insolvency, test.glob = FALSE, globcircle = TRUE, dist.x = 1.3)

## End(Not run)
```
womenlabour

| womenlabour | Canadian Women's Labour-Force Participation |

**Description**

The data are from a 1977 survey of the Canadian population.

**Usage**

```r
data(womenlabour)
```

**Format**

A data frame with 263 observations on the following 4 variables.

- **Participation**: Labour force participation with levels fulltime, not.work and parttime
- **IncomeHusband**: Husband's income in 1000 $
- **Children**: Presence of children in household with levels absent and present
- **Region**: Region with levels Atlantic, BC, Ontario, Prairie and Quebec

**Source**

R package car: *Womenlf*

**References**

*Social Change in Canada Project*. York Institute for Social Research.


**Examples**

```r
## Not run:
data(womenlabour)
womenlabour$IncomeHusband <- scale(womenlabour$IncomeHusband)

star.nominal(Participation ~ IncomeHusband + Children + Region, womenlabour)
## End(Not run)
```
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