Package ‘oddsratio’

June 13, 2019

Title Odds Ratio Calculation for GAM(M)s & GLM(M)s
Version 2.0.0
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Description Simplified odds ratio calculation of GAM(M)s & GLM(M)s. Provides structured output (data frame) of all predictors and their corresponding odds ratios and confident intervals for further analyses. It helps to avoid false references of predictors and increments by specifying these parameters in a list instead of using `exp(coef(model))` (standard approach of odds ratio calculation for GLMs) which just returns a plain numeric output. For GAM(M)s, odds ratio calculation is highly simplified with this package since it takes care of the multiple `predict()` calls of the chosen predictor while holding other predictors constant. Also, this package allows odds ratio calculation of percentage steps across the whole predictor distribution range for GAM(M)s. In both cases, confident intervals are returned additionally. Calculated odds ratio of GAM(M)s can be inserted into the smooth function plot.

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URL https://github.com/pat-s/oddsratio

BugReports https://github.com/pat-s/oddsratio/issues

Depends R (>= 3.0.0)
Imports ggplot2 (>= 3.0.0), mgcv, stats, stringr, tibble
Suggests cowplot, gam, grid, gtable, knitr, MASS, rmarkdown, scales, testthat

VignetteBuilder knitr

ByteCompile true

Encoding UTF-8

LazyData true

RoxygenNote 6.1.1

NeedsCompilation no
**insert_or**

**Description**

This function inserts calculated odds ratios of GAM(M)s into a plot of a GAM(M) smoothing function.

**Usage**

```r
insert_or(plot_object = NULL, or_object = NULL, line_col = "red", line_size = 1.2, line_type = "solid", line_alpha = 1, text_alpha = 1, text_size = 4, text_col = "black", rect_alpha = 0.5, rect_col = NULL, rect = FALSE, arrow = TRUE, values = TRUE, values_yloc = 0, values_xloc = NULL, or_yloc = 0, arrow_length = NULL, arrow_yloc = NULL, arrow_col = NULL, arrow_xloc_r = NULL, arrow_xloc_l = NULL)
```

**Arguments**

- `plot_object`: A ggplot object from `plot_gam`.
- `or_object`: A tibble as returned from `or_gam`.
- `line_col`, `line_alpha`, `line_type`, `line_size`
  Aesthetics of vertical lines.
- `text_col`, `text_alpha`, `text_size`
  Aesthetics of inserted values.
- `rect_col`, `rect_alpha`
  Aesthetics of shaded rectangle.
- `rect`: Logical. Whether to print a shaded rectangle between the vertical lines.
- `arrow`: Logical. Whether to print arrows above the inserted values. Default to TRUE.
insert_or

values Logical. Whether to print predictor value information nearby the inserted vertical lines. Default to TRUE.
values_xloc Numeric. X-axis location/shift of values relative to their vertical line. Default to 2% of x-axis range.
or_yloc, values_yloc Numeric. Specifies y-location of inserted odds ratio / values. Relative to plotted y-axis range. A positive/negative value will place the the text higher/lower.
arrow_xloc_r, arrow_xloc_l, arrow_yloc, arrow_length, arrow_col Numeric. Axis placement options of inserted arrows. Relative to respective axis ranges.

Details
The idea behind this function is to add calculated odds ratio of fitted GAM models (or_gam) into a plot showing the smooth function (plot_gam) of the chosen predictor for which the odds ratio was calculated for. Multiple insertions can be made by iteratively calling the function (see examples).
Right now the function does only accept results of or_gam with slice = FALSE. If you want to insert multiple odds ratio you have to do it iteratively.

Value
Returns a ggplot plotting object

Author(s)
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See Also
plot_gam
or_gam

Examples
# load data (Source: ?mgcv::gam) and fit model
library(mgcv)
fit_gam <- gam(y ~ s(x0) + s(I(x1^2)) + s(x2) + offset(x3) + x4, data = data_gam) # fit model

# create input objects (plot + odds ratios)
library(oddsratio)
plot_object <- plot_gam(fit_gam, pred = "x2", title = "Predictor 'x2'")
or_object1 <- or_gam(
  data = data_gam, model = fit_gam,
  pred = "x2", values = c(0.099, 0.198)
)

# insert first odds ratios to plot
plot_object <- insert_or(plot_object, or_object1,
  or_yloc = 3,
or_gam

values_xloc = 0.04, line_size = 0.5, 
line_type = "dotdash", text_size = 6, 
values_yloc = 0.5, arrow_col = "red"
)

# calculate second odds ratio
or_object2 <- or_gam(
data = data_gam, model = fit_gam, pred = "x2", 
values = c(0.4, 0.6)
)

# add or_object2 into plot
insert_or(plot_object, or_object2,
or_yloc = 2.1, values_yloc = 2, 
line_col = "green4", text_col = "black", 
rect_col = "green4", rect_alpha = 0.2, 
line_alpha = 1, line_type = "dashed", 
arrow_xloc_r = 0.01, arrow_xloc_l = -0.01, 
arrow_length = 0.01, rect = TRUE
)

---

or_gam  

Calculate odds ratios of Generalized Additive (Mixed) Models

Description

This function calculates odds ratio(s) for specific increment steps of a GAM(M)s. Odds ratios can also be calculated for continuous percentage increment steps across the whole predictor distribution using slice = TRUE.

Usage

or_gam(data = NULL, model = NULL, pred = NULL, values = NULL, 
percentage = NULL, slice = FALSE, CI = NULL)

Arguments

data The data used for model fitting.
model A fitted GAM(M).
pred Character. Predictor name for which to calculate the odds ratio.
values Numeric vector of length two. Predictor values to estimate odds ratio from. Function is written to use the first provided value as the "lower" one, i.e. calculating the odds ratio 'from value1 to value2'. Only used if slice = FALSE.
percentage Numeric. Percentage number to split the predictor distribution into. A value of 10 would split the predictor distribution by 10% intervals. Only needed if slice = TRUE.
or_gam

- **slice**: Logical. Default = FALSE. Whether to calculate odds ratios for fixed increment steps over the whole predictor distribution. See percentage for setting the increment values.

- **CI**: Numeric. Currently fixed to 95% confidence interval level (2.5% - 97.5%). It should not be changed in a function call!

**Details**

Currently supported functions: `mgcv::gam`, `mgcv::gamm`, `gam::gam`. For `mgcv::gamm`, the model input of `or_gam` needs to be the `gam` output (e.g. `fit_gam$gam`).

**Value**

A data frame with (up to) eight columns. `perc1` and `perc2` are only returned if `slice = TRUE`:

- **predictor**: Predictor name
- **value1**: First value of odds ratio calculation
- **value2**: Second value of odds ratio calculation
- **perc1**: Percentage value of `value1`
- **perc2**: Percentage value of `value2`
- **oddsratio**: Calculated odds ratio(s)
- **CI_low**: Lower (2.5%) confident interval of odds ratio
- **CI_high**: Higher (97.5%) confident interval of odds ratio

**Author(s)**

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**See Also**

- `or_glm`
- `plot_gam`
- `insert_or`

**Examples**

```r
# load data (Source: ?mgcv::gam) and fit model
library(mgcv)
fit_gam <- gam(y ~ s(x0) + s(I(x1^2)) + s(x2) +
               offset(x3) + x4, data = data_gam) # fit model

# Calculate OR for specific increment step of continuous variable or_gam(
  data = data_gam, model = fit_gam, pred = "x2",
  values = c(0.099, 0.198)
)

## Calculate OR for change of indicator variable
```
or_gam(
  data = data_gam, model = fit_gam, pred = "x4",
  values = c("B", "D")
)

## Calculate ORs for percentage increments of predictor distribution
## (here: 20%)
or_gam(
  data = data_gam, model = fit_gam, pred = "x2",
  percentage = 20, slice = TRUE
)

---

or_glm  

Calculate odds ratios of Generalized Linear (Mixed) Models

Description

This function calculates odds ratio(s) for specific increment steps of GLMs.

Usage

or_glm(data, model, incr, CI = 0.95)

Arguments

data  
The data used for model fitting.

model  
A fitted GLM(M).

incr  
List. Increment values of each predictor.

CI  
numeric. Which confident interval to calculate. Must be between 0 and 1. Default to 0.95

Details

CI_low and CI_high are only calculated for GLM models because glmmPQL does not return confident intervals due to its penalizing behavior.

Currently supported functions: glm, glmmPQL

Value

A data frame with five columns:

  predictor  
  oddsratio  
  CI_low  
  CI_high  
  increment

  Predictor name(s)
  Calculated odds ratio(s)
  Lower confident interval of odds ratio
  Higher confident interval of odds ratio
  Increment of the predictor(s)
**plot_gam**

**Author(s)**

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**See Also**

or_gam

**Examples**

```r
## Example with glm()
# load data (source: http://www.ats.ucla.edu/stat/r/dae/logit.htm) and
# fit model
fit_glm <- glm(admit ~ gre + gpa + rank,
               data = data_glm,
               family = "binomial"
) # fit model

# Calculate OR for specific increment step of continuous variable
or_glm(data = data_glm, model = fit_glm, incr = list(gre = 380, gpa = 5))

# Calculate OR and change the confidence interval level
or_glm(
  data = data_glm, model = fit_glm,
  incr = list(gre = 380, gpa = 5), CI = .70
)

## Example with MASS:glmPQL()
# load data
library(MASS)
data(bacteria)
fit_glmPQL <- glmPQL(y ~ trt + week,
                    random = ~ 1 | ID,
                    family = binomial, data = bacteria,
                    verbose = FALSE)

# Apply function
or_glm(data = bacteria, model = fit_glmPQL, incr = list(week = 5))
```

---

**plot_gam**  
*Plot smoothing functions of GAM(M) models*

**Description**

This function plots the smoothing function of selected GAM(M) models using the ggplot2 plotting system.
Usage

plot_gam(model = NULL, pred = NULL, col_line = "blue",
    ci_line_col = "black", ci_line_type = "dashed", ci_fill = "grey",
    ci_alpha = 0.4, ci_line_size = 0.8, sm_fun_size = 1.1,
    title = NULL, xlab = NULL, ylab = NULL, limits_y = NULL,
    breaks_y = NULL)

Arguments

model A fitted model of class gam.
pred The predictor of the fitted model to plot the smooth function of.
col_line Character. Sets color for smoothing function. Default to "blue".
ci_line_col Character. Sets color for confident interval line of smoothing function. Default to "black".
ci_line_type Character. Sets linetype of confident interval line of smoothing function. Default to "dashed".
ci_fill Character. Fill color of area between smoothing function and its confident inter-
    val lines.
ci_alpha Numeric (range: 0-1). Opacity value of confidence interval shading.
ci_line_size, sm_fun_size Line sizes.
title Character. Plot title.
xlab Character. X-axis title.
ylab Character. Y-axis title.
limits_y Numeric of length two. Sets y-axis limits.
breaks_y Numeric of length three. Sets y-axis breaks. See seq. Values need to be given in
    a seq call, e.g. seq(-6, 6, 2).

Author(s)

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See Also

plot_gam
or_gam
insert_or

Examples

# load data (Source: ?mgcv::gam) and fit model
library(mgcv)
fit_gam <- mgcv::gam(y ~ s(x0) + s(I(x1^2)) + s(x2) + offset(x3) + x4,
    data = data_gam)
library(oddsratio)
plot_gam(fit_gam, pred = "x2", title = "Predictor 'x2'")
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