

# Package ‘oddsratio’

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**Title** Odds Ratio Calculation for GAM(M)s & GLM(M)s

**Version** 2.0.2

**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

**Suggests** gam, knitr, MASS, rmarkdown, testthat

**VignetteBuilder** knitr

**Encoding** UTF-8

**LazyData** true

**RoxygenNote** 7.3.2

**NeedsCompilation** no

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insert_or	<i>Insert odds ratios of GAM(M)s into smoothing function</i>
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## Description

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

## Usage

```
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 `data.frame` 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
    Whether to print a shaded rectangle between the vertical lines.
arrow
    Whether to print arrows above the inserted values.
values
    Whether to print predictor value information nearby the inserted vertical lines.
values_xloc
    x-axis location/shift of values relative to their vertical line. Default to 2\% of
    x-axis range.
or_yloc, values_yloc
    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
    Axis placement options of inserted arrows. Relative to respective axis ranges.

```

## Details

The idea behind this function is to add calculated odds ratios 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 iterative calling the function (see examples).

Right now the function only accepts inputs from `or_gam()` objects with `slice = FALSE`. If you want to insert multiple odds ratio values, call the function multiple times.

## Value

`ggplot2::ggplot`

## See Also

`plot_gam()`, `or_gam()`

## Examples

```

library(oddsratio)
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)
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,
    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*


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## Description

This function calculates odds ratio(s) for specific increment steps of GAM(M) models. 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

<code>data</code>	The data used for model fitting.
<code>model</code>	A fitted GAM(M).
<code>pred</code>	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	Percentage number to split the predictor distribution into. A value of 10 would split the predictor distribution by 10\ Only needed if slice = TRUE.
slice	Whether to calculate odds ratios for fixed increment steps over the whole predictor distribution. See percentage for setting the increment values.
ci	Currently fixed to 95\ Currently supported functions: <a href="#">mgcv::gam</a> , <a href="#">mgcv::gamm</a> , <a href="#">gam::gam</a> . For <a href="#">mgcv::gamm</a> , the model input of <a href="#">or_gam</a> needs to be the gam output (e.g. <code>fit_gam\$gam</code> ).

### 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

### See Also

[or\\_glm\(\)](#) [plot\\_gam\(\)](#) [insert\\_or\(\)](#)

### Examples

```
library(oddsratio)
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	Increment values of each predictor given in a named list.
ci	Which confidence 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 `MASS::glmPQL()` does not return confident intervals due to its penalizing behavior.

Currently supported functions: [stats::glm](#), [MASS::glmPQL](#)

## Value

A data frame with five columns:

predictor	Predictor name(s)
oddsratio	Calculated odds ratio(s)
ci_low	Lower confident interval of odds ratio
ci_high	Higher confident interval of odds ratio
increment	Increment of the predictor(s)

## See Also

[or\\_gam\(\)](#)

**Examples**

```
## Example with glm()
library(oddsratio)
# 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 GAM(M) Smoothing Function*


---

**Description**

Plots the smoothing function of GAM(M) predictors via ggplot2

**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	Predictor name.
col_line	Smoothing function line color.
ci_line_col	Confident interval line color.
ci_line_type	Linetype of confidence interval.
ci_fill	Fill color of area between smoothing function and its confidence interval lines.
ci_alpha	Opacity value of confidence interval.
ci_line_size, sm_fun_size	Line sizes.
title	Plot title.
xlab	x-axis title.
ylab	y-axis title.
limits_y	y-axis limits.
breaks_y	y-axis breaks. Values are handed over to a seq call, e.g. seq(-6, 6, 2).

### See Also

[or\\_gam\(\)](#) [insert\\_or\(\)](#)

### Examples

```

library(oddsratio)
library(mgcv)
fit_gam <- mgcv::gam(y ~ s(x0) + s(I(x1^2)) + s(x2) + offset(x3) + x4,
  data = data_gam
)

plot_gam(fit_gam, pred = "x2", title = "Predictor 'x2'")

```

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