Package 'rwa'

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Type Package

Title Perform a Relative Weights Analysis

Version 0.1.0

Description Perform a Relative Weights Analysis (RWA) (a.k.a. Key Drivers Analysis) as per the method described in Tonidandel & LeBreton (2015) <DOI:10.1007/s10869-014-9351-z>, with its original roots in Johnson (2000) <DOI:10.1207/S15327906MBR3501_1>. In essence, RWA decomposes the total variance predicted in a regression model into weights that accurately reflect the proportional contribution of the predictor variables, which addresses the issue of multicollinearity. In typical scenarios, RWA returns similar results to Shapley regression, but with a significant advantage on computational performance.

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Encoding UTF-8

URL https://martinctc.github.io/rwa/, https://github.com/martinctc/rwa

BugReports https://github.com/martinctc/rwa/issues

RoxygenNote 7.3.2

Imports dplyr, magrittr, stats, tidyr, ggplot2, boot, purrr, utils

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Contents

`plot_rwa` *Plot the rescaled importance values from the output of* `rwa()`

Description

Pass the output of `rwa()` and plot a bar chart of the rescaled importance values. Signs are always calculated and taken into account, which is equivalent to setting the `applysigns` argument to `TRUE` in `rwa()`.

Usage

```
plot_rwa(rwa)
```

Arguments

`rwa`	Direct list output from `rwa()`.

Examples

```
library(ggplot2)
# Use a smaller sample for faster execution
diamonds_small <- diamonds[sample(nrow(diamonds), 1000), ]
diamonds_small %>%
  rwa(outcome = "price",
      predictors = c("depth","carat", "x", "y", "z"),
      applysigns = TRUE) %>%
  plot_rwa()
```

`remove_all_na_cols` *Remove any columns where all the values are missing*

Description

Pass a data frame and returns a version where all columns made up of entirely missing values are removed.

Usage

```
remove_all_na_cols(df)
```

Arguments

df	Data frame to be passed through.

Details

This is used within `rwa()`.

`rwa` *Create a Relative Weights Analysis (RWA)*

Description

This function creates a Relative Weights Analysis (RWA) and returns a list of outputs. RWA provides a heuristic method for estimating the relative weight of predictor variables in multiple regression, which involves creating a multiple regression with on a set of transformed predictors which are orthogonal to each other but maximally related to the original set of predictors. `rwa()` is optimised for dplyr pipes and shows positive / negative signs for weights.

Usage

```
rwa(
  df,
  outcome,
  predictors,
  applysigns = FALSE,
  sort = TRUE,
  bootstrap = FALSE,
  n_bootstrap = 1000,
  conf_level = 0.95,
  focal = NULL,
  comprehensive = FALSE,
  include_rescaled_ci = FALSE
)
```

Arguments

df	Data frame or tibble to be passed through.
outcome	Outcome variable, to be specified as a string or bare input. Must be a numeric variable.
predictors	Predictor variable(s), to be specified as a vector of string(s) or bare input(s). All variables must be numeric.

applysigns	Logical value specifying whether to show an estimate that applies the sign. Defaults to FALSE.
sort	Logical value specifying whether to sort results by rescaled relative weights in descending order. Defaults to TRUE.
bootstrap	Logical value specifying whether to calculate bootstrap confidence intervals. Defaults to FALSE.
n_bootstrap	Number of bootstrap samples to use when bootstrap = TRUE. Defaults to 1000.
conf_level	Confidence level for bootstrap intervals. Defaults to 0.95.
focal	Focal variable for bootstrap comparisons (optional).
comprehensive	Whether to run comprehensive bootstrap analysis including random variable and focal comparisons.
include_rescaled_ci	Logical value specifying whether to include confidence intervals for rescaled weights. Defaults to FALSE due to compositional data constraints. Use with caution.

Details

rwa() produces raw relative weight values (epsilons) as well as rescaled weights (scaled as a percentage of predictable variance) for every predictor in the model. Signs are added to the weights when the applysigns argument is set to TRUE. See https://www.scotttonidandel.com/rwa-web for the original implementation that inspired this package.

Value

rwa() returns a list of outputs, as follows:

- predictors: character vector of names of the predictor variables used.
- rsquare: the rsquare value of the regression model.
- result: the final output of the importance metrics (sorted by Rescaled.RelWeight in descending order by default).
  - The Rescaled.RelWeight column sums up to 100.
  - The Sign column indicates whether a predictor is positively or negatively correlated with the outcome.
  - When bootstrap = TRUE, includes confidence interval columns for raw weights.
  - Rescaled weight CIs are available via include_rescaled_ci = TRUE but not recommended for inference.
- n: indicates the number of observations used in the analysis.
- bootstrap: bootstrap results (only present when bootstrap = TRUE), containing:
  - ci_results: confidence intervals for weights
  - boot_object: raw bootstrap object for advanced analysis
  - n_bootstrap: number of bootstrap samples used
- lambda:
- RXX: Correlation matrix of all the predictor variables against each other.
- RXY: Correlation values of the predictor variables against the outcome variable.

Examples

```
library(ggplot2)
# Basic RWA (results sorted by default)
rwa(diamonds,"price",c("depth","carat"))

# RWA without sorting (preserves original predictor order)
rwa(diamonds,"price",c("depth","carat"), sort = FALSE)


# For faster examples, use a subset of data for bootstrap
diamonds_small <- diamonds[sample(nrow(diamonds), 1000), ]

# RWA with bootstrap confidence intervals (raw weights only)
rwa(diamonds_small,"price",c("depth","carat"), bootstrap = TRUE, n_bootstrap = 100)

# Include rescaled weight CIs (use with caution for inference)
rwa(diamonds_small,"price",c("depth","carat"), bootstrap = TRUE,
    include_rescaled_ci = TRUE, n_bootstrap = 100)

# Comprehensive bootstrap analysis with focal variable
result <- rwa(diamonds_small,"price",c("depth","carat","table"),
              bootstrap = TRUE, comprehensive = TRUE, focal = "carat",
              n_bootstrap = 100)
# View confidence intervals
result$bootstrap$ci_results
```

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