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 multi-collinearity. 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

Suggests knitr, rmarkdown, testthat (>= 3.0.0), rlang, spelling

VignetteBuilder knitr

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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()
```

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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()`.

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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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