

Package ‘rtrend’

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Title Trend Estimating Tools

Description The traditional linear regression trend, Modified Mann-Kendall (MK) non-parameter trend and bootstrap trend are included in this package. Linear regression trend is rewritten by '.lm.fit'. MK trend is rewritten by 'Rcpp'. Finally, those functions are about 10 times faster than previous version in R.

Reference:

Hamed, K. H., & Rao, A. R. (1998). A modified Mann-Kendall trend test for autocorrelated data. *Journal of hydrology*, 204(1-4), 182-196.

<[doi:10.1016/S0022-1694\(97\)00125-X](https://doi.org/10.1016/S0022-1694(97)00125-X)>.

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LinkingTo Rcpp, RcppArmadillo

Imports Rcpp, fftwtools, boot, magrittr, matrixStats, ggplot2

Suggests covr, testthat (>= 3.0.0)

URL <https://github.com/rpkgs/rtrend>

BugReports <https://github.com/rpkgs/rtrend/issues>

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mkTrend_r	<i>Modified Mann Kendall</i>
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Description

If valid observations ≤ 5 , NA will be returned.

Usage

```
mkTrend_r(x, ci = 0.95, IsPlot = FALSE)
```

```
mkTrend(y, x = seq_along(y), ci = 0.95, IsPlot = FALSE)
```

Arguments

x	numeric vector
ci	critical value of autocorrelation
IsPlot	boolean
y	numeric vector

Details

mkTrend is 4-fold faster with `.lm.fit`.

Value

- Z_0 : The original (non corrected) Mann-Kendall test Z statistic.
- $pval_0$: The original (non corrected) Mann-Kendall test p-value
- Z : The new Z statistic after applying the correction
- $pval$: Corrected p-value after accounting for serial autocorrelation $N/n*s$ Value of the correction factor, representing the quotient of the number of samples N divided by the effective sample size $n*s$
- slp : Sen slope, The slope of the (linear) trend according to Sen test

Note

slp is significant, if $pval < \alpha$.

Author(s)

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References

Hipel, K.W. and McLeod, A.I. (1994), *Time Series Modelling of Water Resources and Environmental Systems*. New York: Elsevier Science.

Libiseller, C. and Grimvall, A., (2002), Performance of partial Mann-Kendall tests for trend detection in the presence of covariates. *Environmetrics* 13, 71–84, doi: [10.1002/env.507](https://doi.org/10.1002/env.507).

See Also

fume::mktrend and trend::mk.test

Examples

```
x <- c(4.81, 4.17, 4.41, 3.59, 5.87, 3.83, 6.03, 4.89, 4.32, 4.69)
r <- mkTrend(x)
r_cpp <- mkTrend(x, IsPlot = TRUE)
```

 movmean

movmean

Description

NA and Inf values in the y will be ignored automatically.

Usage

```
movmean(y, halfwin = 1L, SG_style = FALSE, w = NULL)
```

```
movmean2(y, win_left = 1L, win_right = 0L, w = NULL)
```

```
movmean_2d(mat, win_left = 3L, win_right = 0L)
```

Arguments

y	A numeric vector.
halfwin	Integer, half of moving window size
SG_style	If true, head and tail values will be in the style of SG (more weights on the center point), else traditional moving mean style.
w	Corresponding weights of y, with the same length.
win_left, win_right	windows size in the left and right
mat	numeric matrix

Examples

```
x <- 1:100
x[50] <- NA; x[80] <- Inf
s1 <- movmean(x, 2, SG_style = TRUE)
s2 <- movmean(x, 2, SG_style = FALSE)
movmean2(c(4, 8, 6, -1, -2, -3, -1), 2, 0)
movmean2(c(4, 8, NA, -1, -2, Inf, -1), 2, 0)
```

slope

slope

Description

- slope : linear regression slope
- slope_p : linear regression slope and p-value
- slope_mk : mann kendall Sen's slope and p-value
- slope_boot: bootstrap slope and p-value

Usage

```
slope(y, x)
```

```
slope_p(y, x, fast = TRUE)
```

```
slope_mk(x)
```

```
slope_boot(y, slope_FUN = slope, times = 100, alpha = 0.1, seed)
```

Arguments

y	vector of observations of length n, or a matrix with n rows.
x	vector of predictor of length n, or a matrix with n rows.
fast	Boolean. If true, <code>stats::lm.fit()</code> will be used, which is 10x faster than <code>stats::lm()</code> .
slope_FUN	one of <code>slope()</code> , <code>slope_p()</code> , <code>slope_mk()</code>
times	The number of bootstrap replicates.
alpha	significant level, default 0.1
seed	a single value, interpreted as an integer, or NULL (see 'Details').

Value

slope and p-value are returned. For slope_boot, slope is estimated in many times. The lower, mean, upper and standard deviation (sd) are returned.

Examples

```
y <- c(4.81, 4.17, 4.41, 3.59, 5.87, 3.83, 6.03, 4.89, 4.32, 4.69)
r   <- slope(y)
r_p <- slope_p(y)
r_mk <- slope_mk(y)
r_boot <- slope_boot(y)
```

smooth_wSG

Weighted Savitzky-Golay

Description

NA and Inf values in the y has been ignored automatically.

Usage

```
smooth_wSG(y, halfwin = 1L, d = 1L, w = NULL)
```

```
smooth_SG(y, halfwin = 1L, d = 1L)
```

Arguments

y	colvec
halfwin	halfwin of Savitzky-Golay
d	polynomial of degree. When d = 1, it becomes moving average.
w	colvec of weight

Examples

```
y <- c(1, 3, 2, 5, 6, 8, 10, 1)
w <- seq_along(y)/length(y)

halfwin = 2
d = 2
s1 <- smooth_wSG(y, halfwin, d, w)
s2 <- smooth_SG(y, halfwin, d)
```

stat_mk	<i>stat_mk</i>
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Description

stat_mk

Usage

```
stat_mk(
  mapping = NULL,
  data = NULL,
  geom = "line",
  position = "identity",
  na.rm = FALSE,
  show.legend = NA,
  inherit.aes = TRUE,
  ...
)
```

Arguments

mapping	Set of aesthetic mappings created by aes() or aes_() . If specified and <code>inherit.aes = TRUE</code> (the default), it is combined with the default mapping at the top level of the plot. You must supply mapping if there is no plot mapping.
data	<p>The data to be displayed in this layer. There are three options:</p> <p>If <code>NULL</code>, the default, the data is inherited from the plot data as specified in the call to ggplot().</p> <p>A <code>data.frame</code>, or other object, will override the plot data. All objects will be fortified to produce a data frame. See fortify() for which variables will be created.</p> <p>A function will be called with a single argument, the plot data. The return value must be a <code>data.frame</code>, and will be used as the layer data. A function can be created from a formula (e.g. <code>~ head(.x, 10)</code>).</p>
geom	Use to override the default connection between geom_smooth() and stat_smooth() .
position	Position adjustment, either as a string, or the result of a call to a position adjustment function.
na.rm	If <code>FALSE</code> , the default, missing values are removed with a warning. If <code>TRUE</code> , missing values are silently removed.
show.legend	logical. Should this layer be included in the legends? <code>NA</code> , the default, includes if any aesthetics are mapped. <code>FALSE</code> never includes, and <code>TRUE</code> always includes. It can also be a named logical vector to finely select the aesthetics to display.
inherit.aes	If <code>FALSE</code> , overrides the default aesthetics, rather than combining with them. This is most useful for helper functions that define both data and aesthetics and shouldn't inherit behaviour from the default plot specification, e.g. borders() .

... Other arguments passed on to `layer()`. These are often aesthetics, used to set an aesthetic to a fixed value, like `colour = "red"` or `size = 3`. They may also be parameters to the paired geom/stat.

Value

No return. This function is used to calculate data for ggplot2 geom_*, just like `ggplot2::stat_smooth()`.

Examples

```
library(ggplot2)

ggplot(mpg, aes(displ, hwy, colour = drv)) +
  geom_point() +
  stat_mk()
```

summary_lm

summary_lm

Description

summary method for class ".lm.fit".. It's 200 times faster than traditional lm.

Usage

```
summary_lm(obj, ...)
```

Arguments

obj Object returned by `.lm.fit`.
 ... ignored

Value

a p x 4 matrix with columns for the estimated coefficient, its standard error, t-statistic and corresponding (two-sided) p-value. Aliased coefficients are omitted.

Examples

```
set.seed(129)
n <- 100
p <- 2
X <- matrix(rnorm(n * p), n, p) # no intercept!
y <- rnorm(n)

obj <- .lm.fit (x = cbind(1, X), y = y)
info <- summary_lm(obj)
```

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