Package 'iNZightTS'

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Type Package

Title Time Series for 'iNZight'

Version 2.0.4

Depends R (>= 4.1)

Imports colorspace, dplyr (>= 1.1.0), forcats, ggplot2, ggtext, ggtime
(>= 0.2.0), glue, graphics, grDevices, grid, patchwork, rlang,
stats, tidyr, utils, tsibble, fable, fabletools, feasts,
evaluate, lubridate, stringr, tibble, urca

Suggests covr, testthat

Description
Provides a collection of functions for working with time series data, including functions for draw-
ing, decomposing, and forecasting. Includes capabilities to compare multiple series and fit both ad-
ditive and multiplicative models. Used by 'iNZight', a graphical user interface providing easy ex-
ploration and visualisation of data for students of statistics, available in both desktop and on-
line versions. Holt (1957) <doi:10.1016/j.ijforecast.2003.09.015>, Win-
ters (1960) <doi:10.1287/mnsc.6.3.324>, Cleveland, Cleveland, & Terpen-
ning (1990) ``STL: A Seasonal-Trend Decomposition Procedure Based on Loess''.

BugReports https://github.com/iNZightVIT/iNZightTS/issues

Contact inzight_support@stat.auckland.ac.nz

URL https://inzight.nz

LazyData true

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iNZightTS-package   *Time Series Data Analysis*

Description

The iNZightTS package provides some simple analysis tools for exploring time series data. It is used in the iNZight software.

Author(s)

Tom Elliott (previously: Marco Kuper, Simon Potter, and David Banks)

See Also

[inzightts](#)

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decomp	*Decompose a time series object*

Description

Decomposes a time series represented by an `inz_ts` object into its seasonal, trend, and remainder components using the specified smoothing method.

Usage

```
decomp(
  x,
  var = NULL,
  sm_model = c("stl"),
  mult_fit = FALSE,
  model_range = NULL,
  ...
)

## S3 method for class 'inz_dcmp'
plot(
  x,
  recompose.progress = c(0, 0),
  recompose = any(recompose.progress > 0),
  ylab = NULL,
  title = NULL,
  colour = c("#1B9E46", "#45a8ff", "orangered"),
  ...
)
```

Arguments

x	An 'inz_dcmp' object representing the decomposed time series.
var	A character vector of length one, or `NULL`.
sm_model	The smoothing method to be used. Currently on "stl" is available.
mult_fit	If `TRUE`, a multiplicative model is used; otherwise, an additive model is used by default.
model_range	The range of data to be decomposed by the model. It can be specified as dates or years. If part of `model_range` lies outside the range of the data, the exceeding proportion is ignored.
...	Additional arguments (ignored).
recompose.progress	
	A numeric vector of length 2, controlling the display of recomposition progress when 'recompose' is 'TRUE'. The first component shows the progress for the seasonal component (0 to 1), and the second component tracks the number of observations recomposed so far.

recompose	Logical indicating whether the recomposition should be displayed or not.
ylab	The label for the y-axis of the plot.
title	The title for the plot.
colour	A vector of three colors specifying the colors for the trend, seasonal, and residuals components, respectively.

Value

An `inz_dcmp` object, which is a sub-class of `dable`, representing the decomposed components of the time series.

References

R. B. Cleveland, W. S. Cleveland, J.E. McRae, and I. Terpenning (1990) STL: A Seasonal-Trend Decomposition Procedure Based on Loess. Journal of Official Statistics, 6, 3iV73.

See Also

[dable](#)

Examples

```
ts <- inzightts(visitorsQ)
d <- decomp(ts)

## Not run:
plot(d)

## End(Not run)
```

---

ggplotable   *Preliminary check for a plotly::ggplotly() call*

Description

Check if a plot generated by iNZightTS can be passed to plotly::ggplotly().

Usage

```
ggplotable(x)
```

Arguments

| x | a `ggplot` object produced by iNZightTS |

Value

a `logical`

See Also

[ggplotly](#)

Examples

```
x <- inzightts(visitorsQ)
## Not run:
ggplotable(plot(x))
ggplotable(plot(x, names(x)[-1]))

## End(Not run)
```

| inzightts | *Coerce data to an inzightts (time-series) object* |

Description

The function `inzightts` creates temporal data frames for use in iNZight. Unlike `ts` objects, these are tsibble objects that enable temporal data wrangling, adapting to tidy data principles, which are both data- and model-oriented.

Usage

```
inzightts(x, ...)

## S3 method for class 'character'
inzightts(x, stringsAsFactors = TRUE, as.is = TRUE, ...)

## S3 method for class 'data.frame'
inzightts(
  x,
  var = NULL,
  index = NULL,
  key = NULL,
  start = NULL,
  end = NULL,
  freq = NULL,
  ...
)

## S3 method for class 'ts'
inzightts(x, var_name = NULL, pivot_longer = FALSE, ...)

## S3 method for class 'tbl_ts'
inzightts(x, ...)
```

Arguments

x	A `data.frame`, `ts`, tsibble, or path.
...	Additional arguments to be passed to or from methods.
stringsAsFactors	
	See `read.csv`
as.is	See `read.csv`
var	The column number or name in `data` representing the observations used in the actual time series.
index	The column number or name in `data` containing the time variable.
key	The variable(s) that uniquely determine time indices.
start	The time of the first observation. It can be a single number or a vector of two integers representing a natural time unit and a (1-based) number of samples into the time unit.
end	The time of the last observation, specified in the same way as `start`.
freq	The number of observations per unit of time.
var_name	The new name for the variable column of the univariate time series, applicable only if x is not an `mts` object.
pivot_longer	Logical; set to `TRUE` to transform data to a "longer" form, otherwise keep the current form. Applicable only if x is an `mts` object.

Details

If a `ts` object is used to create the inzightts object, all the domain information is extracted from that object.

The `index` parameter should be a `character`, `Date`, `yearweek`, `yearmonth`, or `yearquarter` object.

If `index` is a `character`, the function recognizes the following time variable formats without case sensitivity:

- "(Y)yyyy": annually data, e.g., "(Y)1991"
- "(Y)yyyyMmm": monthly data, e.g., "(Y)1991M01"
- "(Y)yyyyQqq": quarterly data, e.g., "(Y)1991Q01"
- "(Y)yyyyWww": weekly data with yearly seasonality, e.g., "(Y)1991W01"
- "(Y)yyyyDdd": daily data with yearly seasonality, e.g., "(Y)1991D01"
- "WwwDdd": daily data with weekly seasonality, e.g., "W01D01"
- "DddHhh": hourly data with daily seasonality, e.g., "D01H01"

The length of digits of each time unit could be flexible, and spaces between the time unit are allowed.

In case `data` is a data.frame or path to a `.csv` file, and `start` is omitted, the starting date and the `freq` are extracted from the column that includes the time information. This column is either named "Time" or is the first column. If end is omitted, all of the data will be used for the time-series.

Value

An inzightts (inz_ts) object, a sub-class of tsibble, which includes the index variable, temporal variable, and, if applicable, relevant keys.

See Also

[tsibble](), [as_tsibble]() and [new_tsibble]()

Examples

```
# create from a ts object
z <- inzightts(UKgas)
## Not run:
plot(z)

## End(Not run)

# create from a data.frame
x <- inzightts(
    data.frame(Return = rnorm(100), Time = 1900:1999),
    var = "Return"
)
# or specify a time column
x <- inzightts(
    data.frame(Return = rnorm(100), Year = 1900:1999),
    var = "Return", index = "Year"
)

# create from a data.frame with modified time frame
y <- inzightts(
    data.frame(Return = rnorm(100)),
    start = c(1990, 1), end = c(1993, 5), freq = 12, var = 1
)
## Not run:
plot(y)

## End(Not run)
```

---

log_if	*Apply logarithmic transformation*

Description

Log-transforms the input x if mult_fit is TRUE; otherwise, returns the original input x unchanged.

Usage

```
log_if(x, mult_fit)
```

Arguments

x	A numeric vector to be transformed.
mult_fit	Logical; set to TRUE to apply logarithmic transformation, and FALSE to keep the original input.

Value

A `numeric` vector after applying the logarithmic transformation (if `mult_fit` = TRUE); otherwise, it returns the original input.

See Also

[new_transformation](#)

Examples

```
x <- runif(1e4, 1, 100)
all.equal(log_if(x, TRUE), log(x))
all.equal(log_if(x, FALSE), x)
```

---

plot.inz_ts   *Draw a simple time series plot*

Description

Draws a plot of a given inzightts (inz_ts) object with the trend superimposed.

Usage

```
## S3 method for class 'inz_ts'
plot(
  x,
  var = NULL,
  xlab = NULL,
  ylab = NULL,
  title = NULL,
  xlim = NULL,
  aspect = NULL,
  compare = TRUE,
  pal = NULL,
  smoother = TRUE,
  sm_model = "stl",
  t = 0,
  mult_fit = FALSE,
  emphasise = NULL,
  non_emph_opacity = 0.2,
```

```
    show_iso_obs = TRUE,
    iso_obs_size = 1,
    seasonal_adjustment = FALSE,
    ...
)
```

Arguments

x	An `inzightts` (`inz_ts`) object representing the time series.
var	A character vector specifying the variable(s) to be plotted, or set to `NULL`.
xlab	A title for the x-axis of the plot.
ylab	A title for the y-axis of the plot.
title	A title for the graph.
xlim	Axis limits, specified as dates or years.
aspect	The aspect ratio of the plot; it will be about `aspect` times wider than it is high.
compare	Logical; set to `TRUE` to plot the key levels in a single plot.
pal	(Only if a categorical variable is passed to `var`): The colour palette for the categorical plot. The palette vector should be in the same order per the rows of `tsibble::key_data(x)`.
smoother	Logical; if `TRUE`, the smoother will be drawn.
sm_model	The smoothing method to be used.
t	The smoothing parameter (between 0 and 100).
mult_fit	Logical; set to `TRUE` for a multiplicative model, or `FALSE` for the default additive model.
emphasise	Integer vector to specify the key level(s) to focus in the plot. The integer maps to the specific key level(s) corresponding to the ith row of `tsibble::key_data(x)`.
non_emph_opacity	
	Numeric. If `(0, 1]`, this argument determines the opacity of the series other than the focused one(s) (to highlight the focused series). If `non_emph_opacity = 0`, the plot draws the focused series in its own scales.
show_iso_obs	Logical; set to `TRUE` to plot isolated observations between time series gaps (if any).
iso_obs_size	Numeric; scaling the size of isolated observations, if `show_iso_obs = TRUE` and they exist.
seasonal_adjustment	
	Logical; set to `TRUE` to show the seasonally adjusted time series (i.e., removed the estimated seasonal effects as determined by STL decomoposition; see `decomp()`).
...	Additional arguments (ignored).

Value

A time series plot (constructed with ggplot2) is returned, which can be added to if desired.

See Also

key_data

Examples

```
t <- inzightts(visitorsQ, var = c(2, 4))

## Not run:
plot(t)
plot(t, var = names(t)[-1])
plot(t, var = "Japan")
plot(t, mult_fit = TRUE)

## End(Not run)
```

---

predict.inz_ts   *Forecast future observations*

Description

Generates future predictions of the time series from an inzightts object. The output object includes predicted means, prediction intervals, raw data, and fitted values.

Usage

```
## S3 method for class 'inz_ts'
predict(
  object,
  var = NULL,
  h = 8,
  mult_fit = FALSE,
  pred_model = "auto",
  confint_width = 0.95,
  model_range = NULL,
  ...
)

## S3 method for class 'inz_frct'
plot(x, t_range = NULL, xlab = NULL, ylab = NULL, title = NULL, ...)
```

Arguments

object	An inzightts object representing the time series.
var	A character vector specifying the variable(s) to forecast, or set to NULL to forecast all variables.

h	The forecast horizon, either the number of observations to predict, or a character string specifying the time interval to predict (e.g., "2 years").
mult_fit	Logical; set to TRUE for a multiplicative model, or FALSE for the default additive model.
pred_model	The name of a fable model function or "auto".
confint_width	A decimal representing the width of the prediction interval.
model_range	The range of data to be used for fitting forecasts, specified as dates or years.
...	Additional arguments (ignored).
x	An inz_frct object containing the forecasts.
t_range	The range of data to be plotted, specified as dates or years.
xlab	A title for the x-axis of the plot.
ylab	A title for the y-axis of the plot.
title	A title for the graph.

Value

An inz_frct object containing the forecasts.

See Also

fable-package

Examples

```
t <- inzightts(visitorsQ, var = c(2, 4))
## The following two examples are equivalent
pred <- predict(t, names(t)[-1], h = "2 years")
pred <- predict(t, names(t)[-1], h = 8)

## Not run:
plot(pred)

## End(Not run)
```

---

seaice	*Sea Ice*

Description

A dataset containing sea ice measurements from 1990 to 2011.

Usage

```
seaice
```

Format

A data frame with 265 rows and 3 variables:

Time The time variable

Arctic Sea ice measurement for the Arctic

Antarctica Sea ice measurement for Antarctica

---

seasonplot *Plot seasonal subseries from a time series*

Description

This function plots the seasonal components of a time series together with the estimated seasonal effects of that series.

Usage

```
seasonplot(x, ...)
```

Arguments

x	An 'inzightts' ('inz_ts') object representing the time series.
...	Further arguments to be passed onto specific methods and the 'gg_season' function.

Details

The resulting window will contain two plots. On the left, every seasonal subseries of the time series is plotted. On the right will be the average seasonal effect of the series.

Value

A 'patchwork' object of seasonal plots.

See Also

gg_season

Examples

```
## Not run:
seasonplot(inzightts(visitorsQ))

## End(Not run)
```

---

subseries *Seasonal Subseries Plots for inzightts*

Description

Time series subseries plot by seasonal period

Usage

```
subseries(
  x,
  var = NULL,
  show_mean = TRUE,
  xlab = NULL,
  ylab = NULL,
  title = NULL
)
```

Arguments

x	A time series object represented by an inz_ts or tbl_ts object.
var	A character vector specifying the variable(s) to be plotted, or set to NULL to plot all variables.
show_mean	Logical; set to FALSE to exclude the mean line from the plot.
xlab	A title for the x-axis of the plot.
ylab	A title for the y-axis of the plot.
title	A title for the graph.

Details

Plots seasonal subseries of a time series represented by an inz_ts or tbl_ts object. Each subseries represents one seasonal period.

Value

A ggplot object of the seasonal subseries plot.

See Also

gg_subseries

Examples

```
t <- inzightts(visitorsQ)
## Not run:
subseries(t)

## End(Not run)
```

---

summary.inz_frct   *Summarise iNZightTS forecasts*

Description

Summary method for objects of class inz_frct.

Usage

```
## S3 method for class 'inz_frct'
summary(object, var = NULL, ...)

## S3 method for class 'summary_inz_frct'
print(x, show_details = FALSE, ...)
```

Arguments

object	An inz_frct object representing the forecasts.
var	A character vector specifying the variable to summarize, or set to NULL to summarize all variables.
...	Additional arguments (ignored).
x	A 'summary_inz_frct' object containing forecast summaries.
show_details	Logical; set to 'TRUE' to show model details only when 'pred_model' is an "ARIMA" model.

Value

A summary_inz_frct object containing the first few forecast observations, the forecasting model used, and its details (such as call, coefficients, and goodness of fit statistics).

See Also

[predict.inz_ts](#)

Examples

```
ts <- inzightts(visitorsQ, var = 2:5)
p <- predict(ts, "Japan")
s <- summary(p, "Japan")
s
print(s, show_details = TRUE)
```

---

visitorsA2   *Visitors (annual)*

Description

A dataset containing annual visitor numbers for several countries.

Usage

```
visitorsA2
```

Format

A data frame with 13 rows and 5 variables:

Time The time variable (year)

Australia Visitor counts for Australia

China..People.s.Republic.of Visitor counts for China

Japan Visitor counts for Japan

United.Kingdom Visitor counts for the UK

---

visitorsM2   *Visitors (monthly)*

Description

A dataset containing monthly visitor numbers for several countries.

Usage

```
visitorsM2
```

Format

A data frame with 164 rows and 5 variables:

Time The time variable (year/month)

Australia Visitor counts for Australia

China..People.s.Republic.of Visitor counts for China

Japan Visitor counts for Japan

United.Kingdom Visitor counts for the UK

---

visitorsQ   *Visitors (quarterly)*

Description

A dataset containing quarterly visitor numbers for several countries.

Usage

```
visitorsQ
```

Format

A data frame with 54 rows and 5 variables:

Date The time variable (year/quarter)

Australia Visitor counts for Australia

China..People.s.Republic.of Visitor counts for China

Japan Visitor counts for Japan

United.Kingdom Visitor counts for the UK

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