

Package ‘iNZightTS’

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Type Package

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Suggests testthat, covr

Description

Provides a collection of functions for working with time series data, including functions for drawing, decomposing, and forecasting. Includes capabilities to compare multiple series and fit both additive and multiplicative models. Used by 'iNZight', a graphical user interface providing easy exploration and visualisation of data for students of statistics, available in both desktop and online versions. Holt (1957) <doi:10.1016/j.ijforecast.2003.09.015>, Winters (1960) <doi:10.1287/mnsc.6.3.324>, Cleveland, Cleveland, & Terpenning (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://www.stat.auckland.ac.nz/~wild/iNZight/>

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Author Tom Elliott [aut, cre] (<<https://orcid.org/0000-0002-7815-6318>>),
Junjie Zeng [aut],
Simon Potter [aut],
David Banks [aut],
Marco Kuper [aut],
Dongning Zhang [ctb]

Maintainer Tom Elliott <tom.elliott@auckland.ac.nz>

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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

iNZight

compareplot	<i>Comparison plot - deprecated</i>
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Description

Comparison plot - deprecated

Usage

```
compareplot(x, ...)
```

Arguments

x	an iNZightTS object
...	additional arguments passed to 'plot()'

Value

No return value, called for the side effect of drawing a plot.

decompose	<i>Decompose a time series object</i>
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Description

Decompose a time series object

Usage

```
decompose(  
  obj,  
  multiplicative = FALSE,  
  t = 10,  
  model.lim = NULL,  
  data.name = NULL,  
  ...  
)  
  
## S3 method for class 'inzdecomp'  
plot(  
  x,  
  recompose.progress = c(0, 0),  
  recompose = any(recompose.progress > 0),  
  ylab = x$currVar,  
  xlab = "Date",
```

```

    title = NULL,
    xlim = c(NA, NA),
    colour = c("#1B9E46", "#45a8ff", "orangered"),
    ...
  )

```

Arguments

<code>obj</code>	an <code>iNZightTS</code> object
<code>multiplicative</code>	fit a multiplicative time series model?
<code>t</code>	the smoothing parameter
<code>model.lim</code>	limits for the time series model
<code>data.name</code>	the name of the data
<code>...</code>	additional arguments (ignored)
<code>x</code>	an <code>inzdecomp</code> object (from <code>decompose(ts)</code>)
<code>recompose.progress</code>	if <code>recompose</code> is <code>TRUE</code> , this shows how much to show (for animation!). Length 2 numeric: the first is 0 for seasonal, and 1 for residual; second component is how many observations have been recomposed so far
<code>recompose</code>	logical as to whether the recomposition is shown or not
<code>ylab</code>	the label for the y axis
<code>xlab</code>	the label for the x axis
<code>title</code>	the title for the plot
<code>xlim</code>	the x axis limits
<code>colour</code>	vector of three colours for trend, seasonal, and residuals, respectively

Value

an `inzdecomp` object (this is the original object with an additional `decompVars` component)
 Invisibly returns the original decomposition object. Mainly called to plot the decomposition.

Methods (by generic)

- `plot`: Plot a time series decomposition

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.

Examples

```

t <- iNZightTS(visitorsQ)
decomp.ts <- decompose(t, data.name = "Visitors")
plot(decomp.ts)

```

decompositionplot	<i>Plot a Time Series Decomposition</i>
-------------------	---

Description

Decomposes a time series into trend, seasonal and residual components using loess.

Usage

```
decompositionplot(...)
```

Arguments

... additional arguments, ignored

Details

If the frequency is greater than 1, the components are found using the [stl](#) function with `s.window` set to TRUE (effectively replacing smoothing by taking the mean). If the frequency is 1, the trend component is found directly by using [loess](#) and the residuals are the difference between trend and actual values. The trend, seasonal and residual components are plotted on the same scale allowing for easy visual analysis.

Value

The original `iNZightTS` object with an item `decompVars` appended, containing results from the decomposition.

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, 31V73.

See Also

[stl](#), [loess](#), [iNZightTS](#)

forecastplot	<i>Forecast plot - DEPRECATED</i>
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Description

Plot a raw time series together with it's fitted curve and add forecasts and prediction intervals to the end.

Usage

```
forecastplot(x, ...)
```

Arguments

x	iNZightTS object
...	additional arguments passed on

Details

The predictions and prediction intervals are the result of models fitted by the Holt-Winters method. The amount of predicted observations is calculated by $2 * \text{freq}$, where `freq` is the frequency of the time series object.

Value

Called for the side effect of drawing a plot. The constructed `ggplot` object is returned invisibly.

iNZightTS	<i>iNZightTS (Time-Series) Objects</i>
-----------	--

Description

The function `iNZightTS` is used to create time-series objects used in `iNZight`.

Usage

```
iNZightTS(
  data,
  start = 1,
  end,
  freq = 1,
  var = 2,
  time.col = grep("time", names(data), ignore.case = TRUE)[1],
  ...
)
```

Arguments

<code>data</code>	a <code>data.frame</code> containing time information and observation or a path to a <code>.csv</code> file with such information or a <code>ts</code> object
<code>start</code>	the time of the first observation. Either a single number or a vector of two integers, which specify a natural time unit and a (1-based) number of samples into the time unit
<code>end</code>	the time of the last observation, specified in the same way as <code>start</code>
<code>freq</code>	the number of observations per unit of time
<code>var</code>	the column number or name for the observations used from <code>data</code> in the actual time series
<code>time.col</code>	which column contains the time variable
<code>...</code>	additional information passed to <code>read.csv()</code> and used when <code>data</code> is a path
<code>ignore.case</code>	logical, ignore the case?

Details

The function `iNZightTS` is used to create time-series objects. Unlike `ts` objects, these are lists containing information about the time-series as well as the data and the time-series (`ts` object) itself.

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

The function recognises the following time variable formatS without case sensitive:

- "(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 allowing space between the time unit

In case of `data` being a `data.frame` or path to a `.csv` file and `start` being omitted, the starting date and the `freq` is 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

a `iNZightTS` object. If multiple variables are requested, the `iNZightMTS` class is added to the result. The result object contains the original data as a time series object, as well as information on the series start, end, and frequency.

See Also

[ts](#), [print.iNZightTS](#),

Examples

```
# create from a ts object
z <- iNZightTS(UKgas)
plot(z)

# 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", time.col = "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)
plot(y)
```

multiseries

Compare multiple time series - DEPRECATED

Description

Compare multiple time series - DEPRECATED

Usage

```
multiseries(x, ...)
```

Arguments

x	iNZightMTS object containing data
...	Further arguments to be passed to ‘plot()’

Value

No return value, called for the side effect of drawing a plot.

plot.iNZightMTS *Plot multiple time series*

Description

Plot a multiple time series object to compare several series

Usage

```
## S3 method for class 'iNZightMTS'
plot(
  x,
  compare = TRUE,
  multiplicative = FALSE,
  ylab = "Value",
  xlab = "Date",
  title = "%var",
  t = 10,
  smoother = TRUE,
  aspect = 2,
  xlim = c(NA, NA),
  model.lim = NULL,
  ...
)
```

Arguments

x	Multiple time series object
compare	logical, if true, the series will be graphed in a single plot; otherwise graphed in individual rows
multiplicative	logical, if TRUE multiplicative series will be used; otherwise additive
ylab	y axis label
xlab	x axis label
title	the title for the plot
t	smoothing parameter
smoother	logical, if TRUE the smoother will be drawn
aspect	aspect ratio (width:height) for the time series
xlim	limits to control how much of series is shown
model.lim	time limits to use for modelling
...	additional arguments

Value

No return value, called for the side effect of drawing a plot.

Author(s)

Tom Elliott

Examples

```
tm <- iNZightTS(visitorsQ, var = 2:5)
plot(tm)
plot(tm, compare = FALSE)
```

plot.iNZightTS *Draw a simple time series plot*

Description

Draws a plot of a given iNZightTS object with the trend superimposed.

Usage

```
## S3 method for class 'iNZightTS'
plot(
  x,
  multiplicative = FALSE,
  ylab = obj$currVar,
  xlab = "Date",
  title = "%var",
  animate = FALSE,
  t = 10,
  smoother = TRUE,
  aspect = 3,
  plot = TRUE,
  col = ifelse(forecast > 0, "#0e8c07", "red"),
  xlim = c(NA, NA),
  model.lim = NULL,
  forecast = 0,
  ...
)
```

Arguments

x	an iNZightTS object
multiplicative	logical. If TRUE, a multiplicative model is used, otherwise an additive model is used by default.
ylab	a title for the y axis
xlab	a title for the x axis
title	a title for the graph

animate	logical, if true the graph is animated
t	smoothing parameter
smoother	logical, if TRUE the smoother will be drawn
aspect	the aspect ratio of the plot; it will be about ASPECT times wider than it is high
plot	logical, if FALSE, the graph isn't drawn
col	the colour of the smoothed trend line
xlim	axis limits, specified as dates
model.lim	limits of the series to use for modelling/forecast
forecast	numeric, how many observations ahead to forecast (default is 0, no forecast)
...	additional arguments (not used)

Details

If animate is set to TRUE, a scatterplot of all points in the time series will appear followed by slowly drawn lines connecting the points, simulating the drawing of a time series by hand.

Value

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

Forecast

The predictions and prediction intervals are the result of models fitted by the Holt-Winters method. The amount of predicted observations is specified by the value of 'forecast'.

References

C.C Holt (1957) Forecasting seasonals and trends by exponentially weighted moving averages, ONR Research Memorandum, Carnegie Institute 52.

P.R Winters (1960) Forecasting sales by exponentially weighted moving averages, *Management Science* **6**, 324–342.

Examples

```
t <- iNZightTS(visitorsQ)
plot(t)

# Forecast plot (8 quarterly forecasts):
plot(t, forecast = 8)
```

pred	<i>Get forecast prediction values</i>
------	---------------------------------------

Description

Get forecast prediction values

Usage

```
pred(x)
```

Arguments

x the forecast object (a plot with predictions)

Value

a time series forecasts object

print.iNZightTS	<i>Print an iNZightTS object</i>
-----------------	----------------------------------

Description

Print method for iNZightTS (time series) objects.

Usage

```
## S3 method for class 'iNZightTS'
print(x, full = FALSE, ...)
```

Arguments

x the iNZightTS object to be printed
 full whether to print all the underlying data
 ... Unused arguments. Only here for consistency with the base S3 method.

Details

The full argument controls whether to print all the data from which the iNZightTS object has been created. The default is set to FALSE and only the head() of the data will be printed.

Value

No return value, called for side effect.

See Also

[print](#), [iNZightTS](#)

Examples

```
iNZightTS(UKgas)
```

rawplot	<i>Time series plot - depreciated</i>
---------	---------------------------------------

Description

Time series plot - depreciated

Usage

```
rawplot(...)
```

Arguments

... arguments passed to 'plot' method

Value

Called to draw a plot. Invisibly returns a ggplot object.

recompose	<i>Recompose a decomposed time series</i>
-----------	---

Description

Recompose a time series object, with optional animation.

Usage

```
recompose(...)
```

Arguments

... additional arguments, ignored

Value

the recomposed series

Author(s)

iNZight

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(obj, ...)
```

Arguments

`obj` an iNZightTS object

`...` Further arguments to be passed onto specific methods.

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

No return value, called for the side effect of drawing a plot.

See Also[iNZightTS](#)**Examples**

```
ts <- iNZightTS(visitorsQ)
seasonplot(ts)
```

visitorsA2	<i>Visitors (annual)</i>
------------	--------------------------

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	<i>Visitors (monthly)</i>
------------	---------------------------

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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