Package ‘tframe’

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Title Time Frame Coding Kernel
Description A kernel of functions for programming
time series methods in a way that is relatively independently of the
representation of time. Also provides plotting, time windowing,
and some
other utility functions which are specifically intended for time series.
See the Guide distributed as a vignette, or ?tframe.Intro for more
details. (User utilities are in package tfplot.)

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Description

Programs for implementing an object oriented approach to handling different time representations.

Details

The tframe package provides a kernel of functions for programming time series methods in a way that makes them relatively independently of the representation of time. tframe is intended to make it easier to write code which can use any new/better time representations when they appear. It also provides plotting, time windowing, and some other utility functions which are specifically intended for time series. Functions that were in this package and are intended primarily to be called directly by users have been moved to tfplot: tfplot, difflog, percentChange and tsScan. See the help for more details and examples.

Tframe provides generic methods by which code can be developed without too much dependence on the representation of time (i.e. specific time series objects). This can make most code very robust with respect to other (and future) improved/different representations of time. However, details like putting the time axis label on a plot may require a method for the the specific time representation.

This package does not try to replace classes and methods associated with time representations such as ts, zoo, and its. Rather, it attempts to provide generic programming "wrappers" so that other programs do not need to look after the details of these different representations. For many time series programs the availability of a window method provided by those classes is the main method which is needed. However, the time attributes of calculated objects are often lost and programmers must re-assign time attributes to the resulting object if they are to be retained. Historically this was done with tsp, but this relies on a particular time representation and would not work for other representations. In order to address this, the tframe methods attempt to separate the time representation from the data and allow a statement

\[ \text{tframe}(x) \leftarrow \text{tframe}(y) \]

to make the time frame of \( x \) the same as that of \( y \), without the need to worry about what time representation is used in \( y \). In this assignment \( x \) and \( y \) need not be too similar (one might be a
univariate series while the other is a matrix or an array or list of spatial or panel time series data), as long as they are similar in the time dimension. For the case where \( \text{tsp}(x) \leftarrow \text{tsp}(y) \) would make sense, that is effectively what the above \texttt{tframe} assignment will do. For some existing code, most of the conversion to these more robust methods is accomplished simply by changing \texttt{tsp} to \texttt{"tframe"} and \texttt{nrow()} for a time series matrix to \texttt{Tobs()}.

The \texttt{tframe} assignment example above is accomplished by switching the dispatch so that it follows the classes of the \texttt{tframe} of \( y \), rather than the classes of \( x \), as would normally be done for the above kind of assignment. Doing this in a generic way allows for the possibility of future classes of time representation. This is different from the way that \texttt{zoo}, \texttt{its} and \texttt{ts} are implemented, in the sense that it is the \texttt{tframe} of the data which is assigned a class indicating the time representation, not the data object itself.

The most general (last) class of the \texttt{tframe} should be \texttt{tframe}. The method \texttt{is.tframe} checks if an object is a \texttt{tframe}, and the method \texttt{is.tframed} checks if an object has a \texttt{tframe}. In general, \texttt{tframe} methods act on the time frame (\texttt{tframe}) and \texttt{tframed} methods act on data which is \texttt{tframed}.

More specific methods can be defined for any special time representation. Methods are defined in this package for \texttt{ts}, \texttt{zoo}, and \texttt{its}, and defaults work for old style \texttt{tsp}, and may also work in some other cases. The \texttt{tframe}'s specific classes are called \texttt{tstframe}, \texttt{zootframe}, and \texttt{itstframe}, to prevent confusion using \texttt{inherit()}.

The main programming utilities are \texttt{tframe} and \texttt{tframe<-}. For additional details see the help for these and \texttt{tframe-package}.

The method \texttt{tfwindow} is used in this library and is typically just the same as \texttt{window}, but the new name has been used because of historical changes and bugs in \texttt{window}, and in order to support the argument \texttt{"warn"} to suppress messages (when objects are windowed unnecessarily).

One implication of a statement like \texttt{tframe(x) <- tframe(y)} is that the \texttt{tframe} should not indicate which \texttt{dim} of the data is the time dimension. In general this will have to be another attribute of the data. For older representations, the convention of using the first dimension for matrix data and the length for vector data, makes it unnecessary to specify.

The attribute \texttt{"seriesNames"} is also supported as a way to indicate the names of series in an object. This overlaps with the use of \texttt{"names"} and \texttt{"dimnames[[2]]"} used previously for series names in \texttt{S}, but seems necessary in order to have a more complete generic decomposition of the time dimension from the other dimensions.

Many of the functions in the library are not yet individually documented, however, the functions are all very short and can be examined easily. The code in the tests subdirectory provides a short set of tests and may serve as an example.

To implementing a new time representation, suppose it is called \texttt{zzz}, then the \texttt{tframe} attribute of an object using this time frame should have class \texttt{c("zzz", "tframe")}. (Note \texttt{zzz} should be different from the class of the object itself.) The most important methods which need to be implemented are \texttt{tframe.zzz()}, \texttt{start.zzz()}, \texttt{end.zzz()}, and \texttt{Tobs.zzz()}. While \texttt{frequency.zzz()} should not in theory be necessary, it makes porting code much easier. Other methods which may be needed are \texttt{time.zzz()}, \texttt{checktframeConsistent.zzz()}, \texttt{tfTruncate.zzz()}, \texttt{tfExpand.zzz()}, \texttt{earliestStartIndex.zzz()}, \texttt{earliestEndIndex.zzz()}, \texttt{latestStartIndex.zzz()}, \texttt{latestEndIndex.zzz()}.

See the help for more details and examples.

See Also

\texttt{tframe, tframed, tfwindow},
checktframeConsistent  Check for a Consistent tframe

Description

Check if tframe and a time series are consistent with one another.

Usage

```r
checktframeConsistent(tf, x)
```

Arguments

- `tf` A tframe
- `x` An object

Details

Check if the number of Tobs in the tframe corresponds to the number of observations in the time series.

Value

A logical scalar.

See Also

- `is.tframeTobs`

Examples

```r
z <- ts(rnorm(100), start=c(1982,1), frequency=12)
checktframeConsistent(tframe(z), rnorm(100))
```
earliestEnd

Start and End for Objects with Multiple Time Series

Description
Return start or end date (or index of the object) from multiple time series objects.

Usage

earliestEnd(x, ...)  
earliestEndIndex(x, ...)  
## Default S3 method:
earliestEndIndex(x, ...)  
## S3 method for class 'tframe'
earliestEndIndex(x, ...)  

earliestStart(x, ...)  
earliestStartIndex(x, ...)  
## Default S3 method:
earliestStartIndex(x, ...)  
## S3 method for class 'tframe'
earliestStartIndex(x, ...)  

latestEnd(x, ...)  
latestEndIndex(x, ...)  
## Default S3 method:
latestEndIndex(x, ...)  
## S3 method for class 'tframe'
latestEndIndex(x, ...)  

latestStart(x, ...)  
latestStartIndex(x, ...)  
## Default S3 method:
latestStartIndex(x, ...)  
## S3 method for class 'tframe'
latestStartIndex(x, ...)  

Arguments

x  
A tframe or tframed object.

...  
Additional tframe or tframed objects.

Details
These functions calculate the start and end of each object in the argument and return a result by comparing across objects. Thus, latestStart returns the start date of the object which starts latest and latestStartIndex returns the corresponding index of the object in the argument list.
nseries

Value
A date or index.

See Also
tframe tfwindow tfTruncate trimNA

Examples

```r
t1<-ts(c(1,2,3,4,5), start=c(1991,1))
t2<-ts(c(2,3,4,5,6,7,8), start=c(1992,1))
t3<-ts(c(NA,2,3,4,5), start=c(1991,1))

latestStart(t1,t2,t3)  # 1992 1 corresponding to the starting date of
                      # the object which starts latest (t2)
latestStart(t1,t3)     # both start in 1991 1 (NA's count as data)
latestStart(tbind(t1,t2,t3))  # tbind gives a single object starting in 1991 1
latestStart(t2, tbind(t1,t2,t3))

latestStartIndex(t1,t2,t3)  # position of t2 in the argument list
```

nseries

Number of Series

Description
Return the number of series.

Usage

```r
nseries(x)
```

## Default S3 method:
nseries(x)

Arguments

x A time series object.

Details
Generic method to return the number of series.

Value
An integer.

Examples

```r
nseries(tbind(rnorm(100,20,5)))
```
selectSeries

Extract a Subset of Series

Description

Extract a subset of series from a tframed object.

Usage

```r
selectSeries(x, series = seqN(nseries(x)))
```

Arguments

- `x` A tframed object.
- `series` The subset of series to retain.

Details

This is like `[ , , drop=FALSE]` but retains class, series name and tframe information. It also provides a methods which works with multivariate series which are not matrices (e.g. tfPADIData).

Value

A tframed object.

See Also

`seriesNames`

Examples

```r
z <- selectSeries(matrix(rnorm(1000), 100, 10), series=c(2, 5, 6))
```
seriesNames  

Names of Series in a time series object

Description

Extract or set names of series in a time series object.

Usage

seriesNames(x)

## Default S3 method:
seriesNames(x)

seriesNames(x) <- value

## Default S3 replacement method:
seriesNames(x) <- value

## S3 replacement method for class 'ts'
seriesNames(x) <- value

Arguments

x a time series object.

value names to be given to time series.

Value

The first usage returns a vector of strings with the series names. The assignment method makes names (a vector of strings) the series names of data.

See Also

tframed

Examples

z <- matrix(rnorm(100), 50, 2)
seriesNames(z) <- c("a", "b")
seriesNames(z)
splice

Splice Time Series

Description

Splice together (in time dimension) two time series objects. This function can also be used to overlay obj1 on obj2 (obj1 takes precedence). The time windows do not have to correspond.

Usage

splice(mat1, mat2, ...)

## Default S3 method:
splice(mat1, mat2, ...)

Arguments

mat1 A time series object.
mat2 A time series object.
... arguments to be passed to other methods (not used by the default method).

Details

Splice together two time series objects. The mat1 and mat2 objects should contain the same number of time series variables and be arranged in the same order. (e.g. - the first column of mat1 is spliced to the first column of mat2, etc.). If data is provided in both mat1 and mat2 for a given period then mat1 takes priority. The frequencies should be the same.

Value

A time series object

See Also

tfwindow, trimNA, tbind

Examples

splice(ts(matrix(rnorm(24), 24, 1), start=c(1980, 1), frequency=4),
       ts(matrix(rnorm(6), 6, 1), start=c(1986, 1), frequency=4))
**tbind**

**Bind Time Series**

**Description**

Bind together (in non-time dimension) two time series objects.

**Usage**

```
tbind(x, ..., pad.start=TRUE, pad.end=TRUE, warn=TRUE)
```

**Arguments**

- `x`: A time series object.
- `...`: Time series objects.
- `pad.start`: Logical indicating if the start should be truncated or padded with NAs to align time.
- `pad.end`: Logical indicating if the end should be truncated or padded with NAs to align time.
- `warn`: Logical indicating if warnings should be issued.

**Details**

Bind data as in cbind (or formerly tsmatrix) and align time dimension. The default action pads series with NA to time union. If pad.start and/or pad.end is FALSE and the intersection is empty then NULL is returned and a warning is issued if warn=TRUE.

**Value**

A time series object

**See Also**

`tbind, trimNA, splice`

**Examples**

```
tbind( ts(matrix(rnorm(24),24,1), start=c(1986,1), frequency=4),
       ts(matrix(rnorm(6), 6,1), start=c(1986,1), frequency=4))
```
testEqual  

**Compare Two Objects**

**Description**

Generic function to compare two objects. The methods return a logical value, TRUE if the objects are the same type and value and FALSE otherwise. The default compares array values but not attributes or class. Some descriptive information in the objects may be ignored.

**Usage**

\[
\text{testEqual(obj1L, obj2L, fuzz = 0)} \\
\text{## Default S3 method:} \\
\text{testEqual(obj1L, obj2L, fuzz = 1e-16)} \\
\text{## S3 method for class 'array'} \\
\text{testEqual(obj1L, obj2L, fuzz = 1e-16)} \\
\text{## S3 method for class 'list'} \\
\text{testEqual(obj1L, obj2L, fuzz = 1e-16)} \\
\text{## S3 method for class 'matrix'} \\
\text{testEqual(obj1L, obj2L, fuzz = 1e-16)} \\
\text{## S3 method for class 'numeric'} \\
\text{testEqual(obj1L, obj2L, fuzz = 1e-16)}
\]

**Arguments**

- **obj1L**, **obj2L**  
  Objects of the same class.
- **fuzz**  
  Differences less than fuzz are ignored.

**Details**

The functions for comparing numeric values used in the default method for this generic replacement.

**Value**

TRUE or FALSE.

**See Also**

testEqualFrames

**Examples**

testEqual(matrix(1:10,10,2), array(1:10, c(10,2)))
testEqual(matrix(1:10,10,1), 1:10)
testEqualtframes

Compare Two Time Frames

Description

Generic function to compare two time frames. The methods return a logical value, TRUE if the time frames are the same type and value and FALSE otherwise.

Usage

```r
testEqualtframes(tf1, tf2)
  ## Default S3 method:
testEqualtframes(tf1, tf2)
  ## S3 method for class 'stamped'
testEqualtframes(tf1, tf2)
```

Arguments

- `tf1`, `tf2` : Time frames of the same class.

Details

Time frames are compared. Time frames need to be of the same class (although it would be nice if they did not need to be).

Value

TRUE or FALSE

See Also

`testEqual`

Examples

```r
testEqualtframes(tframe(matrix(1:10, 10, 2)), tframe(array(1:10, c(10, 2))))
```
Expand a Tframe or Tframed Object.

Description

Expand a tframe or tframed object.

Usage

```
tfExpand(x, add.start = 0, add.end = 0)
## Default S3 method:
tfExpand(x, add.start = 0, add.end = 0)
## S3 method for class 'tframe'
tfExpand(x, add.start = 0, add.end = 0)
```

```
tfTruncate(x, start=NULL, end=NULL)
## Default S3 method:
tfTruncate(x, start=NULL, end=NULL)
## S3 method for class 'tframe'
tfTruncate(x, start=NULL, end=NULL)
```

Arguments

- **x**: A tframe or tframed object.
- **start**: an integer indicating the position at which the new tframe is to start.
- **end**: an integer indicating the position at which the new tframe is to end.
- **add.start**: an integer indicating the number of periods on the beginning.
- **add.end**: an integer indicating the number of periods on the end.

Details

These methods are like tfwindow but use position indicators (rather than dates) and work with a tframe or tframed data. Applied to a tframe they return an adjusted tframe. Applied to a tframed object they return an adjusted object with its adjusted tframe. They are low level utilities for other functions.

Value

A tframe or tframed object.

See Also

tfwindow tframed
Examples

```r
z <- ts(rnorm(100), start=c(1982,1), frequency=12)
Dz <- tframed(diff(z), tfTruncate(tframe(z), start=2))
tframe(Dz)
IDz <- tframed(cumsum(c(0, Dz)), tfExpand(tframe(Dz), add.start=1))
tframe(IDz)
tframe(tfTruncate(z, start=5))
```

---

# tfL

## Time Series Shifting and Differencing

### Description

Lag, shift forward, or difference a tframe or tframed object.

### Usage

```r
tfL(x, p=1)
```

Arguments

- `x` a tframed object.
- `lag` difference calculated relative to lag periods previous.
- `differences` order of differencing.
- `p` number of periods to shift or lag periods for differencing.
- `...` arguments to be passed to other methods.

### Details

tfL methods shift the time frame, or the time frame of the object, by p periods. (This might also be thought of as the exponent of the lag operator.) Positive p means shift the time frame forward and negative p means shift the time frame back. Shifting the time frame forward means the data at a point in time is the data from the previous point in time in the unshifted data, so the result corresponds to what is often called the lagged data. The default p (+1) means the start and end for the results are one period later. When applied to a data object, the default result is one lag of the data. This convention is not the same as that used for k in the function lag.
Note that the time frame of the data is shifted, but a vector or matrix representation of the data is unchanged. This means that operations on the data, such as +, -, *, and /, need to be time aware as, for example, operations on ts objects are. If the operations do not recognize the time framed aspect of the objects, then the operation will be performed with default methods that will probably have unintended results (see examples).

Differencing methods create a time frame or time framed object by differencing the number of times indicated by differences at a lagged number of periods indicated by lag. (Positive values of lag indicate number of periods back.) The default is take the difference from data one period previous. See \texttt{diff} for more details, but note that the result when applied to a time frame is a time frame, not a series.

\textbf{See Also}\n\texttt{diff, lag}

\textbf{Examples}\n\begin{verbatim}
z <- ts(rnorm(100), start=c(1982,1), frequency=12)
tfstart(z)
Tobs(z)
z <- diff(z)
tfstart(z)
Tobs(z)

ts(1:5) - tfl(ts(1:5))
(1:5) - tfl(1:5) # (1:5) this is not a tframed object, so minus is the default

ts(1:5) - tfl(ts(1:5), p=2)

z <- ts(1:10, start=c(1992,1), frequency=4)
z - tfl(z)

z <- ts(matrix(1:10,5,2), start=c(1992,1), frequency=4)
seriesNames(z) <- c("One", "Two")
z - tfl(z)
\end{verbatim}

\textbf{tfprint} \hspace{1em} \textit{Print Tframed Objects}\n
\textbf{Description}\n
Print tframe or tframed objects.

\textbf{Usage}\n\begin{verbatim}
tfprint(x, ...)
  ## Default S3 method:
tfprint(x, ...)
  ## S3 method for class 'tframe'
\end{verbatim}
tfprint(x, ...)  
    ## S3 method for class 'tframe'
print(x, ...)

Arguments

x      a tframe or tfamed object.
...

Arguments to be passed to other methods.

Details

tfprint prints data in a tfamed object while tframePrint prints the tframe. In many cases these are the same as print methods. However, tfprint tries to provide an alternate generic mechanism that is consistent with the tframe view of the data. This may not always be the preferred print method. Also, new classes of time series may define there own print methods in ways which use a different logic from the tframe library. Thus tfprint provides a way to program functions which use methods consistent with the tframe library logic.

Value

tfprint methods return the object invisibly.

Side Effects

An object is printed.

See Also

tframe tframed print

Examples

tfprint(ts(rnorm(100)))

Extract or Set a tframe

Description

Extract or set the tframe of an object.
Usage

\[
\text{as.tframe(\ldots)} \\
\text{as.tframed(x)} \\
\text{tf}(x) \\
\quad \# \text{ Default S3 method:} \\
\text{tf}(x) \\
\quad \# \text{ S3 method for class 'ts'} \\
\text{tf}(x) \\
\text{tf}(x) <- \text{value} \\
\text{tfSet(value, x)} \\
\quad \# \text{ Default S3 method:} \\
\text{tfSet(value, x)} \\
\quad \# \text{ S3 method for class 'list'} \\
\text{tfSet(value, x)} \\
\quad \# \text{ S3 method for class 'tstframe'} \\
\text{tfSet(value, x)} \\
\text{tf}(x, tf=NULL, names=NULL, \ldots) \\
\quad \# \text{ Default S3 method:} \\
\text{tf}(x, tf=NULL, names=NULL, start=NULL, end=NULL, \ldots) \\
\text{is.tframe(x)} \\
\text{is.tframed(x)}
\]

Arguments

- **x**: an object (to which a tframe is assigned in assignment methods).
- **value**: a tframe.
- **tf**: a tframe object or a tframed object from which a tframe is taken.
- **start**: provides simple way to specify a tframed time series similar to a ts object.
- **end**: provides simple way to specify a tframed time series similar to a ts object.
- **names**: optional vector of strings to specify new series names.
- **...**: arguments passed to default to construct a tframe (rather than extract one from x.) frequency might often be used if start or end are specified.

Details

The usage \text{tframe(x)} returns the tframe of a tframed object. The assignment \text{tframe(x) <- tfSet}, and \text{tframed set the tframe of an object. \text{as.tframe(\ldots)} constructs a tframe from ... is.tframe and is.tframed return logicals if the argument is a tframe or tframed object respectively. \text{as.tframed guarantees x has a tframe by assigning a default if x does not already have a tframe.}

The object of these functions is to be able to write code with \text{tframe(y) <- tframe(x), to assign the tframe attributes of x to y, without needing to handle details of the time representation and
without concern for the number of series in \( x \) and \( y \), which need not be the same. A check is made to ensure the number of periods in the data correspond with the number implied by the \( t \)frame.

There is an attempt to use the same time representation for \( y \) as \( x \) has (e.g. ts, zoo, its), but this cannot be guaranteed because \( y \) may not be representable using the \( x \) representation. For example, \( x \) might be an "mts" constructed with ts() whereas \( y \) is a list with some data structures. In this case, a "pure \( t \)frame" approach is used.

The pure \( t \)frame approach sets a "\( t \)frame" attribute in \( x \). This attribute has a class which indicates the time framing which is used. The the time frame information is often secondary, in the sense that it does not describe the object structure, but only provides some additional information which is useful for doing time based operations on the data, plotting, and printing the object. By putting this in an attribute, the objects class can be used for indicating other information about the structure of the object. For these pure \( t \)frame objects the default \( t \)frame and \( t \)frame<- will often be adequate. The generic/method approach allows for special case (like TSdata where the \( t \)frame information is not an attribute of the object, but rather an attribute of the data matrices which are elements of the object).

The generic/method approach also allows for (faking) \( t \)frame assignment and extraction with classes like zoo, its, ts, and others which may appear, that try to make the time description part of the object class. (Not a "\( t \)frame" approach.) The problem is to extract real \( t \)frames and also fake these other classes and old style tsp objects so they look like tfamed objects. Another approach would be to mutilate these objects and force them really to be tfamed objects (to have a \( t \)frame attribute), but that risks conflicting with other (non \( t \)frame) code which used the objects. This faking is accomplished by specific methods of the classes.

The \( t \)framed constructor is simply a shortcut for assigning the \( t \)frame (\( t \)frame(x) <- \( tf \)) and series names (seriesNames(x) <- names) to an object, but never assigns NULL values, so the result is guaranteed to be a \( t \)framed object. It is like ts but enables the \( t \)frame library's methods for handling time. If the \( tf \) argument is a \( t \)framed object rather than a \( t \)frame, then the \( t \)frame is extracted and used. If the names argument is not mode "character" of appropriate length, then seriesNames(names) is used. These make it simple to assign the time frame and names of one object to another by \( z <- t \)framed(x, \( tf=y \), names=y).

\( \text{is.tframed} \) returns TRUE if a \( t \)frame() can extract a \( t \)frame from the object. This is true for many objects which are not truly \( t \)framed (like ts objects), since \( t \)frame() tries fairly hard to build a \( t \)frame for the object.

\section{Value}

\subsection{Depends.}

\section{See Also}

\texttt{tfstart, tfend, tffrequency, Tobs, tftime, tfL}

\section{Examples}

\begin{verbatim}
z <- tframe(ts(rnorm(100), start=c(1982,1), frequency=12))
z
is.tframe(z)
zz <- tframed(matrix(rnorm(200), 100,2), tf=z)
is.tframed(zz)
\end{verbatim}
tfspan <- tframed(matrix(rnorm(200), 100, 2), tf=zz)
is.tframed(zzz)
tframe(zzz)

as.tframe(start=c(1992,1), end=c(1996,3), frequency=4)
Tobs(as.tframe(start=c(1992,1), end=c(1996,3), frequency=4))
end(as.tframe(start=c(1992,1), end=c(1996,3), frequency=4))

z <- tframed(rnorm(100), start=c(1982,1), frequency=12)

---

**tfspan**

**Time Span**

**Description**
Calculate Time Span of Objects.

**Usage**

tfspan(x, ...)

**Arguments**

- **x** a tframe or a tframed object.
- **...** other tframes or tframed objects.

**Details**
Calculate the time frame from the earliest start to latest end of all arguments.

**Value**
A tframe

**See Also**
tframe, tframed start end frequency Tobs time

**Examples**

z <- ts(rnorm(100), start=c(1982,1), frequency=12)
zz <- ts(rnorm(100), start=c(1992,1), frequency=12)
tfspan(z, zz)
**tfstart**

*Extract Time Frame Information*

**Description**

Functions for extracting time frame information.

**Usage**

```r
## S3 method for class 'tframed'
start(x, ...)
## S3 method for class 'tframe'
start(x, ...)
tfstart(x)
## Default S3 method:
tfstart(x)
## S3 method for class 'tstframe'
tfstart(x)

## S3 method for class 'tframed'
end(x, ...)
## S3 method for class 'tframe'
end(x, ...)
## S3 method for class 'tstframe'
tfend(x)
## Default S3 method:
tfend(x)

## S3 method for class 'tframed'
frequency(x, ...)
## S3 method for class 'tframe'
frequency(x, ...)
tffrequency(x)
## Default S3 method:
tffrequency(x)

Tobs(x)
## Default S3 method:
Tobs(x)
## S3 method for class 'tframed'
Tobs(x)
## S3 method for class 'tframe'
Tobs(x)
## S3 method for class 'stamped'
Tobs(x)
```
## S3 method for class 'tframed'

```r
time(x, ...)  # S3 method for class 'tframe'
time(x, ...)  # Default S3 method:
tftime(x)  # S3 method for class 'tframed'
time(x, ...)
```

### Arguments

- **x**: a tframe or a tframed object.
- **...**: arguments to be passed to other methods.

### Details

The methods `start` and `end` return the start or end date of a tframe or tframed object. Periods return the number of observations (time points). `frequency` returns the frequency of observation, typically the number of observations in a year for economic data, but possibly something else in other contexts. The concept of frequency is not very consistently defined for time series data, and the use of the frequency method should probably be avoided where possible. In practice it seems rarely necessary, but the method makes porting of older code much easier.

### Value

Depends

### See Also

`tframe`, `tframed` `start` `end` `frequency` `Tobs` `time` `lag` `diff`

### Examples

```r
z <- ts(rnorm(100), start=c(1982,1), frequency=12)
tfstart(z)
z <- tframed(matrix(rnorm(200), 100,2),
             tf=list(start=c(1982,1), frequency=12))
tfend(z)
Tobs(z)
time(z)
```
tfwindow

Truncate a Time Series

Description

Truncate a time series object to a time window.

Usage

```r
tfwindow(x, tf=NULL, start=tfstart(tf), end=tfend(tf), warn=TRUE)
## Default S3 method:
tfwindow(x, tf=NULL, start=tfstart(tf), end=tfend(tf), warn=TRUE)
## S3 method for class 'ts'
tfwindow(x, tf=NULL, start=tfstart(tf), end=tfend(tf), warn=TRUE)
## S3 method for class 'tframe'
tfwindow(x, tf=NULL, start=tfstart(tf), end=tfend(tf), warn=TRUE)
```

Arguments

- `x`: A time series object.
- `start`: A start date of a format compatible with the time series
- `end`: An end date of a format compatible with the time series
- `tf`: A tframe or tfframed object
- `warn`: A logical indicating if warning should be produced

Details

If `start` or `end` are omitted and `tf` is specified then the start or end is taken from the `tf` object. For `ts` class objects this function calls `window` but makes more effort to preserve `seriesNames` if `x` has them. It also supports the optional argument `warn` to suppress warning messages. Frequently it is convenient to write code which always truncates to a window without first checking if the data is already within the window. Since `window` produces a warning in this situation, the optional argument is frequently useful when `tfwindow` is used by other code. In Splus `tfwindow` also corrects for some bugs in older versions of `window`.

The method for windowing a `tframe` is a utility to be used by other programs and would not typically be called by a user.

Value

A time series object similar to `x`, but typically spanning a shorter time period.
trimNA

Trim NAs from Time Series

Examples

```r
z <- ts(matrix(rnorm(24), 24, 1), start=c(1980, 1), frequency=4)
zz <- tfwindow(z, start=c(1982, 2))
zzz <- matrix(rnorm(24), 24, 1)
tframe(zzz) <- tframe(z)
tfwindow(zzz, tf=tframe(zz))
```

Description

Trim NAs from the start and end of a time series object.

Usage

```r
trimNA(x, startNAs=TRUE, endNAs=TRUE)
## Default S3 method:
trimNA(x, startNAs=TRUE, endNAs=TRUE)
```

Arguments

- `x`: A time series matrix or an object of class TSdata.
- `startNAs`: If FALSE then beginning NAs are not trimmed.
- `endNAs`: If FALSE then ending NAs are not trimmed.

Details

Trim NAs from the ends of a time series object. Observations in a given period for all series are dropped if any one contains an NA.

Value

A time series object which is windowed to the subset of data which is not NAs (usually the available data).

Examples

```r
trimNA(ts(rbind(NA, matrix(1:20, 10, 2)), start=c(1980, 1), frequency=12))
```
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