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`add_forecast_dates` *Add NA values to the tail of a wide data.table*

Description

Add NA values to the tail of a wide data.table to be filled by forecasting routines

Usage

```
add_forecast_dates(
  dt,
  horizon = 1,
  frq = c("month", "week", "quarter", "year"),
  date_name = "ref_date"
)
```

Arguments

`dt`	data.table in wide format
`horizon`	number of periods to add at specified ‘frq‘
`frq`	frequency for aggregation, one of ‘"month"‘, ‘"week"‘, ‘"quarter"‘, or ‘"year"‘
`date_name`	name of date column

Value

NA-filled data.table in wide format

Examples

```
add_forecast_dates(fred[series_name == "gdp constant prices"],frq="quarter")
```

`agg_to_freq` *Aggregate long format data.table*

Description

Aggregate a data.table in long format to a specified frequency

Usage

```
agg_to_freq(
  dt_long,
  frq = c("month", "week", "quarter", "year"),
  date_name = "ref_date",
  id_name = "series_name",
  value_name = "value"
)
```

Arguments

`dt_long`	data.table in long format
`frq`	frequency for aggregation, one of ‘"month"‘, ‘"week"‘, ‘"quarter"‘, or ‘"year"‘
`date_name`	name of date column
`id_name`	name of id column
`value_name`	name of value column

Value

Aggregated data at specified frequency in long format

Examples

```
out <- agg_to_freq(fred[series_name == "gdp constant prices"], frq = "year")
```

agg_to_freq_wide *Aggregate data.table and return wide format*

Description

Aggregate a data.table to a specified frequency and return wide format data

Usage

```
agg_to_freq_wide(
  dt,
  date_name = "ref_date",
  frq = c("month", "week", "quarter", "year"),
  id_name = "series_name",
  value_name = "value",
  dt_is_wide = FALSE
)
```

Arguments

dt	data.table in long format
date_name	name of date column
frq	frequency for aggregation, one of ‘"month"‘, ‘"week"‘, ‘"quarter"‘, or ‘"year"‘
id_name	name of id column
value_name	name of value column
dt_is_wide	T/F, is input data ‘dt‘ in wide format

Value

Aggregated data at specificed frequency in wide format

Examples

```
out <- agg_to_freq_wide(fred,frq="quarter")
```

all_finite *Rows with only finite values*

Description

Return indexes of rows with only finite values

Usage

```
all_finite(Y)
```

Arguments

Y	matrix like data object

Value

Indexes of rows with with only finite values

Examples

```
X <- matrix(1,10,2)
X[3,1] <- NA
all_finite(X)
```

---

allNA *Are all elements 'NA'?*

Description

Return a logical indicating if all elements are 'NA'

Usage

```
allNA(x)
```

Arguments

x	data vector

Value

A logical variable indicating all elements are 'NA'

Examples

```
allNA(c(NA, NA, 1, NA)) ## FALSE
```

any_finite *Rows with finite values*

Description

Return indexes of rows with at least one finite value

Usage

```
any_finite(Y)
```

Arguments

Y	matrix like data object

Value

Indexes of rows with at least one finite value

Examples

```
X <- matrix(1,10,2)
X[3,] <- NA
any_finite(X)
```

can_seasonal *Can data be seasonally adjusted?*

Description

Return a logical indicating whether data at given dates can be seasonally adjusted using seas()

Usage

```
can_seasonal(dates)
```

Arguments

dates	dates

Value

A logical variable indicating whether data can be seasonally adjusted

Examples

```
can_seasonal(fred$ref_date[1:20]) ## TRUE
```

col_to_list *Convert columns to list*

Description

Return ‘Y‘ with each column as a list

Usage

```
col_to_list(Y)
```

Arguments

Y	matrix like data object

Value

Each column as a list

Examples

```
row_to_list(matrix(rnorm(20),10,2))
```

comp_form *Companion Form*

Description

Put the transition matrix ‘B‘ into companion form

Usage

```
comp_form(B)
```

Arguments

B	Transition matrix from a VAR model

Value

Companion matrix of the input matrix

Examples

```
comp_form(matrix(c(1:4), nrow = 2, byrow = TRUE)) ## matrix(c(4,-2,-3,1), nrow = 2, byrow = TRUE)
```

count_obs *Count observations*

Description

Return the number of finite observations in ‘x‘

Usage

```
count_obs(x)
```

Arguments

x	data vector

Value

The Number of observations

Examples

```
count_obs(c(1,3,5,7,9,NA)) # 5
```

day *Return the day of a Date value*

Description

Return the day of a Date value as an integer

Usage

```
day(date)
```

Arguments

date	date value formated as.Date()

Value

the day of the date (integer)

Examples

```
day(as.Date("2019-09-15")) ## 15
```

Diff *Difference data*

Description

Wrapper for ‘diff()‘ maintaining the same number of observations in ‘x‘

Usage

```
Diff(x, lag = 1)
```

Arguments

x	data
lag	number of lags to use

Value

Differenced data

Examples

```
Diff(c(100,50,100,20,100,110))
```

end_of_period *End of period date*

Description

Return the date of the last day of the period (week, month, quarter, year). Weekly dates are indexed to Friday.

Usage

```
end_of_period(dates, period = c("month", "week", "quarter", "year"), shift = 0)
```

Arguments

dates	Date values formatted as.Date()
period	One of ‘’month’‘, ‘’week’‘, ‘’quarter’‘, ‘’year’‘.
shift	Integer, shift date forward (positive values) or backwards (negative values) by the number of periods.

Value

Last day of period in as.Date() format

Examples

```
end_of_period(as.Date("2019-09-15")) ## 2019-09-30
```

---

end_of_year *End of Year*

Description

Find the end of year for a vector of dates

Usage

```
end_of_year(dates)
```

Arguments

dates	Transition matrix from a VAR model

Value

The last day of the year for the dates

Examples

```
end_of_year(as.Date("2019-09-15")) ## 2019-12-31
```

---

extract_basic_character *Extract characters*

Description

Extract character values from x excluding space and underscore

Usage

```
extract_basic_character(x)
```

Arguments

x	object containing character (and other) values

Value

Character values without space and underscore

Examples

```
extract_basic_character(c("this_1one", "abc123"))  ## c("thisone", "abc123)
```

extract_character *Extract character values*

Description

Extract character values from x including space and underscore

Usage

```
extract_character(x)
```

Arguments

x	object containing character values

Value

Character valus from the object

Examples

```
extract_character(c("this_1one", "abc123")) ## c("this_one", "abc")
```

extract_numeric *Extract numeric values*

Description

Extract numeric values from x

Usage

```
extract_numeric(x)
```

Arguments

x	object containing numeric (and other) values

Value

Numeric values from the object

Examples

```
extract_numeric(c("7+5", "abc123")) ## c(75, 123)
```

fill_forward *Fill Forward*

Description

Fill missing observations forward using the last finite observation

Usage

```
fill_forward(x)
```

Arguments

x	Transition matrix from a VAR model

Value

x with missing obs filled by forward value

Examples

```
fill_forward(c(1,2,NA,NA,3,NA,5)) ## 1 2 2 2 3 3 5
```

first_of_month *First of month*

Description

Return the first day of the month for each date in ‘dates‘

Usage

```
first_of_month(dates)
```

Arguments

dates	A sequence of dates in ‘as.Date()‘ format

Value

First day of the month

Examples

```
dates <- seq.Date(from = as.Date("2020-09-11"),
                  by = "day", length.out = 10)
first_of_month(dates)
```

first_of_quarter *First of Quarter*

Description

Find the first date in the quarter for a vector of dates

Usage

```
first_of_quarter(dates)
```

Arguments

dates	Transition matrix from a VAR model

Value

The first day of the quarter for the dates

Examples

```
first_of_quarter(as.Date("2019-9-15")) ## 2019-07-01
```

first_previous_quarter *First of previous quarter date*

Description

Return the date of the first day of the previous quarter

Usage

```
first_previous_quarter(date)
```

Arguments

date	date value formated as.Date()

Value

The first day of the previous quarter of the date

Examples

```
first_previous_quarter(as.Date("2019-09-15")) ## 2019-04-01
```

fred *Sample mixed frequency data from FRED*

Description

Sample mixed frequency data from FRED

Author(s)

Seth Leonard <seth@macroeconomicdata.com>

References

https://fred.stlouisfed.org/

fredlib *Library of metadata for mixed frequency dataset 'fred'*

Description

Library of metadata for mixed frequency dataset 'fred'

Author(s)

Seth Leonard <seth@macroeconomicdata.com>

References

https://fred.stlouisfed.org/

get_data_frq *Get frequency of data based on missing observations*

Description

Guess the frequency of a data series based on the pattern of missing observations

Usage

```
get_data_frq(x = NULL, dates)
```

Arguments

x	data, potentially with missing observations
dates	corresponding dates in 'as.Date()' format

Value

The frequency of the data

Examples

```
dates <- as.Date(c("2020-1-1", "2020-1-15", "2020-2-1",
                   "2020-2-15", "2020-3-1", "2020-3-15", "2020-4-1"))
get_data_frq(c(1,NA,2,NA,3,NA,4), dates) ## "month"
```

---

get_from_list *Get from list*

Description

Retrieve object ‘what‘ from ‘lst‘

Usage

```
get_from_list(lst, what)
```

Arguments

lst	list
what	object to retrieve (by name or index)

Value

Element of the list indicated

Examples

```
get_from_list(list("a" = "alpha", "b" = c(1,2,3)), "a") # "alpha"
```

---

index_by_friday *Find the Friday in a given week*

Description

Find the Friday in a given week from a sequence of Dates Vectors should be in as.Date() format

Usage

```
index_by_friday(dates)
```

Arguments

dates	vector of dates

Value

The date of the Friday in the week of the given date

Examples

```
dates <- seq.Date(from = as.Date("2020-09-21"),
                  by = "week", length.out = 10)
fridays <- index_by_friday(dates)
weekdays(fridays)
```

`is_in` *Find element of this_in that*

Description

Find element of this_in that, ie 'this_in

Usage

```
is_in(that, this_in)
```

Arguments

`that`	first object
`this_in`	second object

Value

Logical variables indicating whether the element exists in both objects

Examples

```
that <- seq.Date(from = as.Date("2020-09-15"), by = "day", length.out = 10)
this_in <- seq.Date(from = as.Date("2020-09-11"), by = "day", length.out = 10)
is_in(that, this_in)
```

last_in_month *Last date in the month*

Description

Return the latest date in each month for the values in ‘dates‘

Usage

```
last_in_month(dates)
```

Arguments

dates	A sequence of dates in ‘as.Date()‘ format

Value

Last day of each month

Examples

```
dates <- seq.Date(from = as.Date("2020-09-11"),
                  by = "day", length.out = 10)
last_in_month(dates)
```

last_in_quarter *Last date in the week*

Description

Return the latest date in the quarter fop the values in ‘dates‘

Usage

```
last_in_quarter(dates)
```

Arguments

dates	A sequence of dates in ‘as.Date()‘ format

Value

Last day of the quarter

Examples

```
dates <- seq.Date(from = as.Date("2020-09-11"),
                  by = "day", length.out = 10)
last_in_quarter(dates)
```

last_in_week *Last date in the week*

Description

Return the latest date in each week for the values in ‘dates‘

Usage

```
last_in_week(dates)
```

Arguments

dates	A sequence of dates in ‘as.Date()‘ format

Value

Last day of each week

Examples

```
dates <- seq.Date(from = as.Date("2020-09-21"),
                  by = "day", length.out = 10)
last_in_week(dates)
```

last_in_year *Last date in the year*

Description

Return the latest date in each year for the values in ‘dates‘

Usage

```
last_in_year(dates)
```

Arguments

dates	A sequence of dates in ‘as.Date()‘ format

Value

Last day of the year

Examples

```
dates <- seq.Date(from = as.Date("2020-09-11"),
                  by = "day", length.out = 10)
last_in_year(dates)
```

last_obs *Last observation*

Description

Return the last finite observation of ‘x‘

Usage

```
last_obs(x)
```

Arguments

x	data potentially with non-finite values

Value

The last finite observation

Examples

```
last_obs(c(NA,1,2,3,NA,5,NA,7,NA,NA)) ## 7
```

limit_character *Limit Characters*

Description

limit the number of characters in a string and remove spacial characters (will not drop numbers)

Usage

```
limit_character(x, limit = 100)
```

Arguments

x	object containing character values
limit	maximum number of characters to return

Value

Character values within the limit

Examples

```
limit_character("a%b+&cd!efghij",limit = 3)  ## "abc"
```

long_run_var *Long Run Variance of a VAR*

Description

Find the long run variance of a VAR using the transition equation 'A' and shocks to observations 'Q'

Usage

```
long_run_var(A, Q, m, p)
```

Arguments

A	Transition matrix from a VAR model in companion form
Q	Covariance of shocks
m	Number of series in the VAR
p	Number of lags in the VAR

Value

The variance matrix

Examples

```
long_run_var(comp_form(matrix(c(.2,.1,.1,.2,0,0,0,0), 2, 4)),
             matrix(c(1,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0),4,4),2, 2)
```

match_index *Match index values*

Description

Match index values of this to that

Usage

```
match_index(this, that)
```

Arguments

this	first object
that	second object

Value

A list of indexes indicating the elements that are matched to each other

Examples

```
match_index(c(1,2,3),c(2,3,4)) ## $that_idx: 1 2; $this_idx: 2 3
```

---

match_ts_dates *Match dates between two timeseries*

Description

Find values in ‘new_ts‘ that correspond to dates in ‘old_ts‘

Usage

```
match_ts_dates(old_ts, new_ts)
```

Arguments

old_ts	timeseries data
new_ts	timeseries data

Value

Timeseries data in which ‘new_ts‘ corresponds to ‘old_ts‘

Examples

```
old_ts <- ts(c(1,2,3,4), start=c(2020,1), end=c(2020,4), frequency=4)
new_ts <- ts(c(5,6,3,4), start=c(2019,4), end=c(2020,3), frequency=4)
match_ts_dates(old_ts, new_ts)
```

---

mean_na *Return the mean*

Description

Return the mean of ‘x‘. If no observations, return ‘NA‘. This is a workaround for the fact that in data.table, ‘:= mean(x, na.rm = TRUE)‘ will return ‘NaN‘ where there are no observations

Usage

```
mean_na(x)
```

Arguments

x	data potentially with non-finite values

Value

Mean of the input

Examples

```
mean_na(c(1,2,3,7,9,NA)) ## 4.4
```

---

month_days *Number of days in a given month*

Description

Get the number of days in a month given the year and month

Usage

```
month_days(year, month)
```

Arguments

year	integer year value
month	integer month value

Value

The number of days in the month (integer)

Examples

```
month_days(2021,9) ## 30

month_days(2020,2) ## 29
```

number_finite *Number of finite values in a column*

Description

Return the number of finite values in a column of Y

Usage

```
number_finite(Y)
```

Arguments

Y	matrix like data object

Value

The number of finite values per column

Examples

```
X <- matrix(1,10,2)
X[3,1] <- NA
number_finite(X)
```

numdum *Dummies for Numeric Data*

Description

Create dummy variables for unique numeric values in ‘x‘

Usage

```
numdum(x)
```

Arguments

x	Numeric vector

Value

Dummy variables for each unique value in the data

Examples

```
numdum(c(3,3,5,3,4,3,5,4,4,5)) ## dummies for each of 3, 4, and 5
```

pct_chng *Percent change*

Description

Calculate the percent change in ‘y‘ from one period to the next

Usage

```
pct_chng(y, lag = 1)
```

Arguments

y	data
lag	number of periods for percent change

Value

The percentage change among the lag period

Examples

```
pct_chng(c(100,50,100,20,100,110))
```

pct_response *Percent of responses at a given frequency*

Description

Return the percent of responses to categorical answers at a specified frequency

Usage

```
pct_response(
  dt,
  col_name = NULL,
  by = c("month", "quarter", "week"),
  date_name = "ref_date"
)
```

Arguments

dt	data table of responses
col_name	name of column containing responses
by	frequency of response aggregation, one of ‘"month"‘, ‘"quarter"‘, ‘"week"‘
date_name	name of column containing dates

Value

The percent of responses at the frequency

Examples

```
dt <- data.frame("ref_date" = seq.Date(as.Date("2000-01-01"), length.out = 100, by = "week"),
                 "response" = c(rep("yes", 20), rep("no",50),rep("yes",30)))
out <- pct_response(dt, col_name = "response")
```

`process` *Process Data*

Description

Process data to ensure stationarity in long format for time series modeling

Usage

```
process(
  dt,
  lib,
  detrend = TRUE,
  center = TRUE,
  scale = TRUE,
  as_of = NULL,
  date_name = "ref_date",
  id_name = "series_name",
  value_name = "value",
  pub_date_name = NULL,
  ignore_numeric_names = TRUE,
  silent = FALSE
)
```

Arguments

`dt`	Data in long format.
`lib`	Library with instructions regarding how to process data; see details.
`detrend`	T/F should data be detrended (see details)?
`center`	T/F should data be centered (i.e. de-meaned)?
`scale`	T/F should data be scaled (i.e. variance 1)?
`as_of`	"As of" date at which to censor observations for backesting. This requires ‘pub_date_name‘ is specified.
`date_name`	Name of data column in the data.
`id_name`	Name of ID column in the data.
`value_name`	Name of value column in the data

pub_date_name Name of publication date column in the data; required if 'as_of' specified.

ignore_numeric_names
T/F ignore numeric values in matching series names in 'dt' to series names in 'lib'. This is required for data aggregated using 'process_MF()', as lags of LHS and RHS data are tagged 0 for contemporaneous data, 1 for one lag, 2 for 2 lags, etc. Ignoring these tags insures processing from 'lib' is correctly identified.

silent T/F, supress warnings?

Details

Process data can be used to transform data to insure stationarity and to censor data for backtesting. Directions for processing each file come from the data.table 'lib'. This table must include the columns 'series_name', 'take_logs', and 'take_diffs'. Unique series may also be identified by a combination of 'country' and 'series_name'. Optional columns include 'needs_SA' for series that need seasonal adjustment, 'detrend' for removing low frequency trends (nowcasting only; detrend should not be used for long horizon forecasts), 'center' to de-mean the data, and 'scale' to scale the data. If the argument to 'process_wide()' of 'detrend', 'center', or 'scale' is 'FALSE', the operation will not be performed. If 'TRUE', the function will check for the column of the same name in 'lib'. If the column exists, T/F entries from this column are used to determine which series to transform. If the column does not exist, all series will be transformed.

Value

data.table of processed values in long format.

Examples

```
dt <- process(fred, fredlib)

LHS <- fred[series_name == "gdp constant prices"]
RHS <- fred[series_name != "gdp constant prices"]
dtQ <- process_MF(LHS, RHS)
dt_processed <- process(dtQ, fredlib)
```

---

process_MF *Process mixed frequency*

Description

Process mixed frequency data for nowcasting applications by identifying the missing observations in the contemporaneous data and replicating this pattern of missing observations in the historical data prior to aggregation. This allows the incorporation of all available information into the model while still using uniform frequency models to actually generate predictions, and can thus be applied to a wide array of econometrics and machine learning applications.

Usage

```
process_MF(
  LHS,
  RHS,
  LHS_lags = 1,
  RHS_lags = 1,
  as_of = NULL,
  frq = c("auto", "week", "month", "quarter", "year"),
  date_name = "ref_date",
  id_name = "series_name",
  value_name = "value",
  pub_date_name = "pub_date",
  return_dt = TRUE
)
```

Arguments

LHS	Left hand side data in long format. May include multiple LHS variables, but LHS variance MUST have the same frequency.
RHS	Right hand side data in long format at any frequency.
LHS_lags	Number of lags of LHS variables to include in output.
RHS_lags	Number of lags of RHS variables to include in output (may be 0, indicating contemporaneous values only).
as_of	Backtesting the model "as of" this date; requires that 'pub_date' is specified in the data
frq	Frequency of LHS data, one of 'week', 'month', 'quarter', 'year'. If not specified, the function will attempt to automatically identify the frequency.
date_name	Name of date column in data.
id_name	Name of ID column in the data.
value_name	Name of value column in the data.
pub_date_name	Name of publication date in the data.
return_dt	T/F, should the function return a 'data.table'? IF FALSE the function will return matrix data.

Details

Right hand side data will always include observations contemporaneous with LHS data. Use 'RHS_lags' to add lags of RHS data to the output, and 'LHS_lags' to add lags of LHS data to the output. By default the function will return data in long format designed to be used with the 'dateutils' function 'process()'. Specifying 'return_dt = FALSE' will return LHS variables in the matrix 'Y', RHS variables in the matrix 'X', and corresponding dates (by index) in the date vector 'dates'.

Value

data.table in long format (unless 'return_dt = FALSE'). Variables ending in '0' are contemporaneous, ending in '1' are at one lag, '2' at two lags, etc.

Examples

```
LHS <- fred[series_name == "gdp constant prices"]
RHS <- fred[series_name != "gdp constant prices"]
dt <- process_MF(LHS, RHS)
```

`process_wide` *Process Wide Format Data*

Description

Process data in wide format for time series modeling

Usage

```
process_wide(
  dt_wide,
  lib,
  detrend = TRUE,
  center = TRUE,
  scale = TRUE,
  date_name = "ref_date",
  ignore_numeric_names = TRUE,
  silent = FALSE
)
```

Arguments

`dt_wide`	Data in wide format.
`lib`	Library with instructions regarding how to process data; see details.
`detrend`	T/F should data be detrended (see details)?
`center`	T/F should data be centered (i.e. de-meaned)?
`scale`	T/F should data be scaled (i.e. variance 1)?
`date_name`	Name of data column in the data.
`ignore_numeric_names`	T/F ignore numeric values in matching series names in ‘dt‘ to series names in ‘lib‘. This is required for data aggregated using ‘process_MF()‘, as lags of LHS and RHS data are tagged 0 for contemporaneous data, 1 for one lag, 2 for 2 lags, etc. Ignoring these tags insures processing from ‘lib‘ is correctly identified.
`silent`	T/F, supress warnings?

Details

'process_wide()' can be used to transform wide data to insure stationarity. Censoring by pub_date requires long format. Directions for processing each file come from the data.table 'lib'. This table must include the columns 'series_name', 'take_logs', and 'take_diffs'. Unique series may also be identified by a combination of 'country' and 'series_name'. Optional columns include 'needs_SA' for series that need seasonal adjustment, 'detrend' for removing low frequency trends (nowcasting only; 'detrend' should not be used for long horizon forecasts), 'center' to de-mean the data, and 'scale' to scale the data. If the argument to 'process_wide()' of 'detrend', 'center', or 'scale' is 'FALSE', the operation will not be performed. If 'TRUE', the function will check for the column of the same name in 'lib'. If the column exists, T/F entries from this column are used to determine which series to transform. If the column does not exist, all series will be transformed.

Value

data.table of processed data

Examples

```
LHS <- fred[series_name == "gdp constant prices"]
RHS <- fred[series_name != "gdp constant prices"]
dtQ <- process_MF(LHS, RHS)
dt_wide <- data.table::dcast(dtQ, ref_date ~ series_name, value.var = "value")
dt_processed <- process_wide(dt_wide, fredlib)
```

---

rollmax *Rolling Max*

Description

Find the rolling maximum in 'x' with span 'n'

Usage

```
rollmax(x, n)
```

Arguments

x	Numeric vector
n	Integer span

Value

The maximum value of 'x' with span 'n'

Examples

```
rollmax(c(1,2,3), 2) ## c(2,3,3)
```

`rollmean` *Rolling mean*

Description

Take the rolling mean of ‘x‘ over ‘n‘ elements

Usage

```
rollmean(x, n)
```

Arguments

`x`	data vector
`n`	span of rolling mean

Value

Rolling mean of the input

Examples

```
rollmean(c(1,2,3),2) ## NA, 1.5, 2.5
```

`rollmin` *Rolling Min*

Description

Find the rolling minimum in ‘x‘ with span ‘n‘

Usage

```
rollmin(x, n)
```

Arguments

`x`	Numeric vector
`n`	Integer span

Value

The minimum value of ‘x‘ with span ‘n‘

Examples

```
rollmin(c(1,2,3),2) ## c(1,1,2)
```

row_to_list *Convert rows to list*

Description

Return ‘Y‘ with each row as a list

Usage

```
row_to_list(Y)
```

Arguments

Y	matrix like data object

Value

Each row as a list

Examples

```
row_to_list(matrix(rnorm(20),10,2))
```

run_sa *Seasonally adjust data using seas()*

Description

Seasonaly adjust monthly or quarterly data using X-13 SEATS via seas()

Usage

```
run_sa(x, dates, x11 = FALSE, transfunc = c("none", "auto", "log"))
```

Arguments

x	data
dates	dates corresponding to data ’x’
x11	T/F, use x11 as opposed to X-13 SEATS
transfunc	Data transformation, one of ‘none‘ for no transformation, ‘auto‘ for automatic detection, or ‘log‘ for log transformation

Value

A list with ‘adj_fact‘ containing seasonal factors and ‘sa_final‘ containing seasonally adjusted data.

Examples

```
x <- fred[series_name == "gdp constant prices", value]
dates <- fred[series_name == "gdp constant prices", ref_date ]
run_sa(x, dates, transfunc = "log")
```

---

sd_na *Return the standard deviation*

Description

Return the standard deviation of ‘x‘. If no observations, return ‘NA‘. This is a workaround for the fact that in data.table, ‘:= sd(x, na.rm = TRUE)‘ will return ‘NaN‘ where there are no observations

Usage

```
sd_na(x)
```

Arguments

x	data potentially with non-finite values

Value

Standard deviation of the input

Examples

```
sd_na(c(1,2,3,NA)) ## 1
```

---

seas_df_long *Seasonally adjust long format data using seas()*

Description

Seasonaly adjust multiple monthly or quarterly series in long format using X-13 SEATS via seas()

Usage

```
seas_df_long(
  df,
  sa_names,
  x11 = FALSE,
  transfunc = "none",
  series_names = "series_name",
  value_var = "value",
  date_var = "ref_date"
)
```

Arguments

df	long format dataframe
sa_names	names of series to seasonally adjust
x11	T/F, use x11 as opposed to X-13 SEATS
transfunc	Data transformation, one of 'none' for no transformation, 'auto' for automatic detection, or 'log' for log transformation
series_names	name of column containing series names
value_var	name of column containing values
date_var	name of column containing dates

Value

A list with data.frames 'sa_factors' containing seasonal factors and 'values_sa' containing seasonally adjusted data.

Examples

```
seas_df_long(fred[series_name == "gdp constant prices"], sa_names="value")
```

---

seas_df_wide *Seasonally adjust wide format data using seas()*

Description

Seasonaly adjust multiple monthly or quarterly series in wide format using X-13 SEATS via seas()

Usage

```
seas_df_wide(df, sa_cols, x11 = FALSE, transfunc = "none")
```

Arguments

df	wide format dataframe
sa_cols	names or column indexes of series to seasonally adjust
x11	T/F, use x11 as opposed to X-13 SEATS
transfunc	Data transformation, one of 'none' for no transformation, 'auto' for automatic detection, or 'log' for log transformation

Value

A list with data.frames 'sa_factors' containing seasonal factors and 'values_sa' containing seasonally adjusted data.

Examples

```
seas_df_wide(fred[series_name == "gdp constant prices"], sa_cols="value")
```

spline_fill *Spline fill missing observations*

Description

Spline fill missing observations from the first observation to the last, leaving NA observations in the head and tail

Usage

```
spline_fill(x)
```

Arguments

x	data with missing observations

Value

data with interpolated missing observations, except at head and tail, which remain NA

Examples

```
spline_fill_trend(c(NA,1,2,3,NA,5)) ## NA 1 2 3 4 5
```

spline_fill_trend *Spline fill missing observations*

Description

Spline fill missing observations, designed for filling low frequency trend estimates

Usage

```
spline_fill_trend(x)
```

Arguments

x	data with missing observations

Value

data with interpolated missing observations

Examples

```
spline_fill_trend(c(1,2,3,NA,5)) ## 1 2 3 4 5
```

stack_obs *Stack time series observations in VAR format*

Description

Stack time series observations in VAR format over series for p lags

Usage

```
stack_obs(Dat, p)
```

Arguments

Dat	Data in a format convertable to a matrix
p	number of lags, integer value

Value

stacked time series obs with p lags

Examples

```
mat <- matrix(rnorm(100),50,2)
Z <- stack_obs(mat, 2) ## stack the dataset `mat` with two lags
## Note: one "lag" will just return the original dataset.
```

sum_na *Return the sum*

Description

Return the sum of ‘x‘. If no observations, return ‘NA‘. This is a workaround for the fact that in data.table, ‘:= sum()‘ will return ‘NaN‘ where there are no observations

Usage

```
sum_na(x)
```

Arguments

x	data potentially with non-finite values

Value

Sum of the input

Examples

```
sum_na(c(1,2,3,NA)) # 6
```

to_ts *Tabular data to ts() format*

Description

transform data in 'x' corresponding to dates in 'dates' to ts() format

Usage

```
to_ts(x, dates)
```

Arguments

x	data
dates	dates

Value

data in ts() format

Examples

```
x <- c(1,2,3,4)
dates <- as.Date(c("2020-1-1","2020-2-1","2020-3-1","2020-4-1"))
to_ts(x, dates)
```

total_response *Number of of responses at a given frequency*

Description

Return the total number of responses to categorical answers at a specified frequency

Usage

```
total_response(
  dt,
  col_name = NULL,
  by = c("month", "quarter", "week"),
  date_name = "ref_date"
)
```

Arguments

dt	data table of responses
col_name	name of column containing responses
by	frequency of response aggregation, one of ‘"month"‘, ‘"quarter"‘, ‘"week"‘
date_name	name of column containing dates

Value

The number of responses at the frequency

Examples

```
dt <- data.frame("ref_date" = seq.Date(as.Date("2000-01-01"), length.out = 100, by = "week"),
                 "response" = c(rep("yes", 20), rep("no",50),rep("yes",30)))
out <- total_response(dt, col_name = "response")
```

---

try_detrend *Remove low frequency trends from data*

Description

Estimate low frequency trends via loess regression and remove them. If the function errors, return x (i.e. no trend)

Usage

```
try_detrend(x, outlier_rm = TRUE, span = 0.6)
```

Arguments

x	data
outlier_rm	T/F, remove outliers to estimate trends?
span	span for the loess regression

Value

Data with trends removed

Examples

```
try_detrend(c(1,3,6,7,9,11,14,15,17,18))
```

try_sa *Seasonally adjust data using seas()*

Description

Seasonaly adjust monthly or quarterly data using X-13 SEATS via seas()

Usage

```
try_sa(x, dates, x11 = FALSE, transfunc = "none", series_name = NULL)
```

Arguments

x	data
dates	dates corresponding to data 'x'
x11	T/F, use x11 as opposed to X-13 SEATS
transfunc	Data transformation, one of 'none' for no transformation, 'auto' for automatic detection, or 'log' for log transformation
series_name	Include series name to print out if failure (for lapply() applications)

Value

A list with 'adj_fact' containing seasonal factors and 'sa_final' containing seasonally adjusted data. If seasonal adjsutment failed 'adj_fact' will contain zeros and 'sa_final' will contain the original data.

Examples

```
x <- fred[series_name == "gdp constant prices", value]
dates <- fred[series_name == "gdp constant prices", ref_date ]
try_sa(x, dates, transfunc = "log")
```

try_trend *Estimate low frequnecy trends*

Description

Estimate low frequency trends via loess regression. If the function errors, return zeros (i.e. no trend)

Usage

```
try_trend(x, outlier_rm = TRUE, span = 0.6)
```

Arguments

x	data
outlier_rm	T/F, remove outliers to estimate trends?
span	span for the loess regression

Value

Estimated trend in the data

Examples

```
try_trend(c(1,3,6,7,9,11,14,15,17,18))
```

---

ts_to_df *ts() data to a dataframe*

Description

Transform monthly or quarterly ts() data to a dataframe

Usage

```
ts_to_df(x, end_period = TRUE)
```

Arguments

x	ts() format data which is either monthly or quarterly
end_period	T/F, for monthly or quarterly data, should dates be indexed to the end of the period?

Value

Data in dataframe format

Examples

```
x <- ts(c(1,2,3,4), start=c(2020,1), end=c(2020,4), frequency=4)
ts_to_df(x)
```

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