

Package ‘FinancialInstrument’

August 4, 2026

Type Package

Title Financial Instrument Modeling Infrastructure

Version 1.4.1

Description Provides infrastructure for defining, storing, and managing financial instrument metadata independently of market data sources. Models instrument identities, contract specifications, identifiers, and relationships among financial instruments, including currencies, equities, funds, bonds, futures, options, spreads, exchange rates, and synthetic instruments. Supports reusable instrument definitions for research, portfolio management, trading, and quantitative finance applications.

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URL <https://github.com/JustinMShea/FinancialInstrument>

BugReports <https://github.com/JustinMShea/FinancialInstrument/issues>

Depends R (>= 3.0.0), methods, quantmod (>= 0.4-3), zoo (>= 1.7-5),
xts (>= 0.10-0)

Imports TTR

Suggests foreach, XML (>= 3.96.1.1), tinytest, timeSeries

Encoding UTF-8

RoxygenNote 8.0.0

NeedsCompilation no

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Repository CRAN

Date/Publication 2026-08-04 14:00:20 UTC

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<code>.to_daily</code>	<i>Extract a single row from each day in an xts object</i>
------------------------	--

Description

Extract a single row from each day in an xts object

Usage

```
.to_daily(x, EOD_time = "15:00:00")
```

Arguments

<code>x</code>	xts object of sub-daily data.
<code>EOD_time</code>	time of day to use.

Value

xts object with daily scale.

Author(s)

Garrett See

See Also

`quantmod:::to.daily`, `quantmod:::to.period`

add.defined.by	<i>Add a source to the defined.by field of an instrument</i>
----------------	--

Description

Concatenate a string or strings (passed through dots) to the defined.by field of an instrument (separated by semi-colons). Any duplicates will be removed. See Details.

Usage

```
add.defined.by(primary_ids, ...)
```

Arguments

primary_ids	character vector of primary_ids of instruments
...	strings, or character vector, or semi-colon delimited string.

Details

If there is already a value for the defined.by attribute of the primary_id instrument, that string will be split on semi-colons and converted to a character vector. That will be combined with any new strings (in ...). The unique value of this new vector will then be converted into a semi-colon delimited string that will be assigned to the defined.by attribute of the primary_ids' instruments

Many functions that create or update instrument definitions will also add or update the value of the defined.by attribute of that instrument. If an instrument has been updated by more than one function, it's defined.by attribute will likely be a semi-colon delimited string (e.g. "TTR;yahoo").

Value

called for side-effect

Author(s)

Garrett See

See Also

[add.identifier](#), [instrument_attr](#)

Examples

```
## Not run:
update_instruments.TTR("GS")
getInstrument("GS")$defined.by #TTR
add.defined.by("GS", "gsee", "demo")
add.defined.by("GS", "gsee;demo") #same

## End(Not run)
```

add.identifier	<i>Add an identifier to an instrument</i>
----------------	---

Description

Add an identifier to an [instrument](#) unless the instrument already has that identifier.

Usage

```
add.identifier(primary_id, ...)
```

Arguments

primary_id	primary_id of an instrument
...	identifiers passed as regular named arguments.

Value

called for side-effect

Author(s)

Garrett See

See Also

[instrument_attr](#)

Examples

```
## Not run:
stock("XXX", currency("USD"))
add.identifier("XXX", yahoo="^XXX")
getInstrument("^XXX")
add.identifier("^XXX", "x3")
all.equal(getInstrument("x3"), getInstrument("XXX")) #TRUE

## End(Not run)
```

buildHierarchy	<i>Construct a hierarchy of instruments useful for aggregation</i>
----------------	--

Description

Construct a hierarchy of instruments useful for aggregation

Usage

```
buildHierarchy(primary_ids, ...)
```

Arguments

primary_ids	A character vector of instrument primary_ids to be included in the hierarchy list
...	character names of instrument attributes in top-down order.

Value

Constructs a data.frame that contains the list of assets in the first column and the category or factor for grouping at each level in the following columns

Author(s)

Peter Carl, Alexis Petit, Garrett See

See Also

[instrument.table](#)

Examples

```
## Not run:
# rm_instruments(keep.currencies=FALSE)
## Define some stocks
update_instruments.TTR(c("XOM", "IBM", "CVX", "WMT", "GE"), exchange="NYSE")

buildHierarchy(ls_instruments(), "type")
buildHierarchy(ls_stocks(), c("Name", "Sector"))
buildHierarchy(ls_stocks(), "Industry", "MarketCap")

## End(Not run)
```

buildRatio	<i>construct price ratios of 2 instruments</i>
------------	--

Description

Calculates time series of ratio of 2 instruments using available data. Returned object will be ratios calculated using Bids, Asks, and Mids, or Opens, Closes, and Adjusteds.

Usage

```
buildRatio(x, env = .GlobalEnv, silent = FALSE)
```

Arguments

x	vector of instrument names. e.g. c("SPY","DIA")
env	environment where xts data is stored
silent	silence warnings?

Details

x should be a vector of 2 instrument names. An attempt will be made to get the data for both instruments. If there are no xts data stored under either of the names, it will try to return prebuilt data with a call to [.get_rate](#).

If the data are not of the same frequency, or are not of the same type (OHLC, BBO, etc.) An attempt will be made to make them compatible. Preference is given to the first leg.

If the data in x[1] is daily or slower and the data in x[2] is intraday (e.g. if you give it daily OHLC and intraday Bid Ask Mid, it will use all of the OHLC columns of x[1] and only the the End of Day Mid price of the BAM object.

If the data in x[1] is intraday, and the data in x[2] is daily or slower, for each day, the previous closing value of x[2] will be filled forward with `na.locf`

Value

An xts object with columns of Bid, Ask, Mid OR Open, Close, Adjusted OR Price

Author(s)

Garrett See

See Also

[redenominate](#) [buildSpread](#) [fn_SpreadBuilder](#)

Examples

```
## Not run:
syms <- c("SPY", "DIA")
getSymbols(syms)
rat <- buildRatio(syms)
summary(rat)

## End(Not run)
```

buildSpread	<i>Construct a price/level series for pre-defined multi-leg spread instrument</i>
-------------	---

Description

Build price series for spreads, butterflies, or other synthetic instruments, using metadata of a previously defined synthetic instrument.

Usage

```
buildSpread(
  spread_id,
  Dates = NULL,
  onelot = TRUE,
  prefer = NULL,
  auto.assign = TRUE,
  env = .GlobalEnv
)

buildBasket(
  spread_id,
  Dates = NULL,
  onelot = TRUE,
  prefer = NULL,
  auto.assign = TRUE,
  env = .GlobalEnv
)
```

Arguments

spread_id	The name of the instrument that contains members and memberratio
Dates	Date range on which to subset. Also, if a member's data is not available via getSymbols will be called, and the values of the from and to arguments will be determined using .parseISO8601 on Dates.
onelot	Should the series be divided by the first leg's ratio?
prefer	Price column to use to build structure.

auto.assign	Assign the spread? If FALSE, the xts object will be returned.
env	Environment holding data for members as well as where spread data will be assigned.

Details

The spread and all legs must be defined instruments.

This function can build multileg spreads such as calendars, butterflies, condors, etc. However, the returned series will be univariate. It does not return multiple columns (e.g. 'Bid', 'Ask', 'Mid') like [fn_SpreadBuilder](#) does.

buildBasket is an alias

TODO: allow for multiplier (divisor) that is a vector.

Value

If auto.assign is FALSE, a univariate xts object. Otherwise, the xts object will be assigned to spread_id and the spread_id will be returned.

Note

this could also be used to build a basket or a strip by using only positive values in memberratio

Author(s)

Brian Peterson, Garrett See

See Also

[fn_SpreadBuilder](#) [spread](#) for instructions on defining the spread

Examples

```
## Not run:
currency("USD")
stock("SPY", "USD", 1)
stock("DIA", "USD", 1)
getSymbols(c("SPY", "DIA"))

spread("SPYDIA", "USD", c("SPY", "DIA"), c(1, -1)) #define it.
buildSpread('SPYDIA') #build it.
head(SPYDIA)

## End(Not run)
```

build_series_symbols *Construct a series of symbols based on root symbol and suffix letters*

Description

The columns needed by this version of the function are `primary_id` and `month_cycle`. `primary_id` should match the `primary_id` of the instrument describing the root contract. `month_cycle` should contain a comma delimited string describing the month sequence to use, e.g. "F, G, H, J, K, M, N, Q, U, V, X, Z" for all months using the standard futures letters, or "H, M, U, Z" for quarters, or "Mar, Jun, Sep, Dec" for quarters as three-letter month abbreviations, etc. The correct values will vary based on your data source.

Usage

```
build_series_symbols(roots, yearlist = c(0, 1))
```

Arguments

<code>roots</code>	data.frame containing at least columns <code>primary_id</code> and <code>month_cycle</code> , see Details
<code>yearlist</code>	vector of year suffixes to be applied, see Details

Details

TODO add more flexibility in input formats for roots

Value

A character vector containing the constructed series identifiers. Each identifier combines a root contract identifier, a contract-month code, and a year suffix.

Author(s)

Brian G. Peterson

See Also

[load.instruments](#)

build_spread_symbols *Build symbols for exchange guaranteed (calendar) spreads*

Description

The columns needed by this version of the function are `primary_id`, `month_cycle`, and `code` `contracts_ahead`.

Usage

```
build_spread_symbols(
  data = NULL,
  file = NULL,
  outputfile = NULL,
  start_date = Sys.Date()
)
```

Arguments

<code>data</code>	data.frame containing at least columns <code>primary_id</code> , <code>month_cycle</code> , and <code>contracts_ahead</code> , see Details
<code>file</code>	if not NULL, will read input data from the file named by this argument, in the same format as data, above
<code>outputfile</code>	if not NULL, will write output to this file as a CSV
<code>start_date</code>	date to start building from, of type Date or an ISO-8601 date string, defaults to Sys.Date

Details

`primary_id` should match the `primary_id` of the instrument describing the root contract.

`month_cycle` should contain a comma delimited string describing the month sequence to use, e.g. "F,G,H,J,K,M,N,Q,U,V,X,Z" for all months using the standard futures letters, or "H,M,U,Z" for quarters, or "Mar,Jun,Sep,Dec" for quarters as three-letter month abbreviations, etc. The correct values will vary based on your data source.

`contracts_ahead` should contain a comma-delimited string describing the cycle on which the guaranteed calendar spreads are to be constructed, e.g. '1' for one-month spreads, '1,3' for one and three month spreads, '1,6,12' for 1, 6, and 12 month spreads, etc. For quarterly symbols, the correct `contracts_ahead` may be something like '1,2,3' for quarterly, bi-annual, and annual spreads.

`active_months` is a numeric field indicating how many months including the month of the `start_date` the contract is available to trade. This number will be used as the upper limit for symbol generation.

If `type` is also specified, it should be a specific instrument type, e.g. 'future_series', 'option_series', 'guaranteed_spread' or 'calendar_spread'

One of `data` or `file` must be populated for input data.

Value

If 'outputfile' is 'NULL', a data frame with columns 'symbol' and 'type', containing the constructed spread identifiers and their instrument types. If 'outputfile' is supplied, the data frame is written to that CSV file and the function returns 'NULL' invisibly.

Author(s)

Ilya Kipnis <Ilya.Kipnis<at>gmail.com>

See Also

[load.instruments build_series_symbols](#)

C2M	<i>Month-to-Code and Code-to-Month</i>
-----	--

Description

Convert month code (used for futures contracts) to abbreviated month name, or convert abbreviated month name to month code

Usage

C2M(code)

M2C(month)

Arguments

- | | |
|-------|--|
| code | Month code: F, G, H, J, K, M, N , Q, U, V, X, or Z |
| month | Abbreviated month: jan, feb, mar, apr, may, jun, jul, aug, sep, oct, nov, or dec |

Value

corresponding code or month.

Author(s)

Garrett See

See Also

[MC2N](#)

Examples

```
C2M()  
C2M("M")  
C2M()[6]  
M2C()  
M2C("Sep")  
M2C()[9]
```

`CompareInstrumentFiles`*Compare Instrument Files*

Description

Compare the .instrument environments of two files

Usage

```
CompareInstrumentFiles(file1, file2, ...)
```

Arguments

<code>file1</code>	A file containing an instrument environment
<code>file2</code>	Another file containing an instrument environment. If not provided, <code>file1</code> will be compared against the currently loaded instrument environment.
<code>...</code>	Arguments to pass to all.equal.instrument

Details

This will load two instrument files (created by [saveInstruments](#)) and find the differences between them. In addition to returning a list of difference that are found, it will produce messages indicating the number of instruments that were added, the number of instruments that were removed, and the number of instruments that are different.

Value

A list that contains the names of all instruments that were added, the names of all instruments that were removed, and the changes to all instruments that were updated (per [all.equal.instrument](#)).

Author(s)

Garrett See

See Also

[saveInstruments](#), [all.equal.instrument](#)

Examples

```

example_dir <- tempfile("fi-compare-")
dir.create(example_dir)

backup_name <- "backup.RData"
file1_name <- "instruments1.RData"
file2_name <- "instruments2.RData"

backup_path <- file.path(example_dir, backup_name)
file1_path <- file.path(example_dir, file1_name)
file2_path <- file.path(example_dir, file2_name)

saveInstruments(backup_name, dir = example_dir)

tryCatch(
{
  stopifnot(file.exists(backup_path))

  rm_instruments(keep.currencies = FALSE)
  currency("USD")
  stock(c("SPY", "DIA", "GLD"), currency = "USD")
  saveInstruments(file1_name, dir = example_dir)

  stopifnot(file.exists(file1_path))

  rm_stocks("GLD")
  stock("QQQ", currency = "USD")
  instrument_attr(
    "SPY",
    "description",
    "S&P 500 ETF"
  )
  saveInstruments(file2_name, dir = example_dir)

  stopifnot(file.exists(file2_path))

  CompareInstrumentFiles(file1_path, file2_path)
},
finally = {
  if (file.exists(backup_path)) {
    reloadInstruments(backup_name, dir = example_dir)
  }

  unlink(example_dir, recursive = TRUE)
}
)

```

Description

currency metadata to be used by [load.instruments](#)

exchange_rate	<i>Constructor for spot exchange rate instruments</i>
---------------	---

Description

Currency symbols (like any symbol) may be any combination of alphanumeric characters, but the FX market has a convention that says that the first currency in a currency pair is the 'target' and the second currency in the symbol pair is the currency the rate ticks in. So 'EURUSD' can be read as 'USD per 1 EUR'.

Usage

```
exchange_rate(
    primary_id = NULL,
    currency = NULL,
    counter_currency = NULL,
    tick_size = 0.01,
    identifiers = NULL,
    assign_i = TRUE,
    overwrite = TRUE,
    ...
)
```

Arguments

primary_id	string identifier, usually expressed as a currency pair 'USDYEN' or 'EURGBP'
currency	string identifying the currency the exchange rate ticks in
counter_currency	string identifying the currency which the rate uses as the base 'per 1' multiplier
tick_size	minimum price change
identifiers	named list of any other identifiers that should also be stored for this instrument
assign_i	TRUE/FALSE. Should the instrument be assigned in the .instrument environment? (Default TRUE)
overwrite	TRUE by default. If FALSE, an error will be thrown if there is already an instrument defined with the same primary_id.
...	any other passthru parameters

Details

In FinancialInstrument the currency of the instrument should be the currency that the spot rate ticks in, so it will typically be the second currency listed in the symbol.

Thanks to Garrett See for helping sort out the inconsistencies in different naming and calculating conventions.

Value

When 'assign_i = TRUE', a character vector containing the 'primary_id' values of the exchange-rate instruments assigned to the registry. When 'assign_i = FALSE', an exchange-rate instrument object is returned for scalar input, or a list of such objects for vectorized input.

References

<https://www.investopedia.com/terms/b/basecurrency.asp>

expires	<i>Extract the correct expires value from an instrument</i>
---------	---

Description

Currently, there are methods for instrument, spread, character, and xts

Usage

```
expires(x, ...)
```

Arguments

x	instrument or name of instrument
...	arguments to be passed to methods

Details

Will return either the last expiration date before a given Date, or the first expiration date after a given Date (if expired==FALSE).

If an `instrument` contains a value for expires that does not include a day (e.g. "2012-03"), or if the expires value is estimated from a `future_series` primary_id, it will be assumed that the instrument expires on the first of the month (i.e. if the expires value of an instrument were "2012-03", or if there were no expires value but the suffix_id were "H12", the value returned would be "2012-03-01"). Note that most non-energy future_series expire after the first of the month indicated by their suffix_id and most energy products expire in the month prior to their suffix_id month.

Value

an expiration Date

Author(s)

Garrett See

See Also

`expires.instrument`, `expires.character`, `sort_ids`
`getInstrument` and `buildHierarchy` to see actual values stored in instrument

Examples

```
instr <- instrument("F00_U1", currency=currency("USD"), multiplier=1,
                    expires=c("2001-09-01", "2011-09-01", "2021-09-01"),
                    assign_i=FALSE)

#Last value of expires that's not after Sys.Date
expires(instr)
# First value of expires that hasn't already passed.
expires(instr, expired=FALSE)
# last value that's not after 2011-01-01
expires(instr, Date="2011-01-01")
# first value that's not before 2011-01-01
expires(instr, Date="2011-01-01", expired=FALSE)

## expires.character
expires("F00_U1") # warning that F00_U1 is not defined
instrument("F00_U1", currency=currency("USD"), multiplier=1,
           expires=c("2001-09-01", "2011-09-01", "2021-09-01"),
           assign_i=TRUE)
expires("F00_U1")
```

find.instrument

Find the primary_ids of instruments that contain certain strings

Description

Uses regular expression matching to find [instruments](#)

Usage

```
find.instrument(
  text,
  where = "anywhere",
  Symbols = ls_instruments(),
  ignore.case = TRUE,
  exclude = NULL,
  ...
)
```

Arguments

text	character string containing a regular expression. This is used by grep (see also) as the pattern argument.
where	if “anywhere” all levels/attributes of the instruments will be searched. Otherwise, where can be used to specify in which levels/attributes to look. (e.g. c("name", "description") would only look for text in those 2 places.
Symbols	the character ids of instruments to be searched. All are are searched by default.

`ignore.case` passed to [grep](#); if FALSE, the pattern matching is case sensitive and if TRUE, case is ignored during matching.

`exclude` character vector of names of levels/attributes that should not be searched.

`...` other arguments to pass through to [grep](#)

Value

character vector of `primary_ids` of instruments that contain the sought after text.

Author(s)

Garrett See

See Also

[buildHierarchy](#), [instrument.table](#), [regex](#)

Examples

```

backup_file <- tempfile(fileext = ".RData")
saveInstruments(backup_file)

tryCatch(
  {
    rm_instruments(keep.currencies = FALSE)

    currency(c("USD", "EUR"))
    stock("SPY", "USD", description = "S&P 500 ETF")
    stock("DIA", "USD", description = "DJIA ETF")
    stock(
      c("AA", "AXP", "BA", "BAC", "CAT"),
      "USD",
      members.of = "DJIA"
    )
    stock("BMW", "EUR")

    find.instrument("ETF")
    find.instrument("DJIA")
    find.instrument("DJIA", where = "members.of")
    find.instrument("USD")
    find.instrument("EUR", Symbols = ls_stocks())
  },
  finally = {
    reloadInstruments(backup_file)
    unlink(backup_file)
  }
)

```

FindCommonInstrumentAttributes

Find attributes that more than one instrument have in common

Description

Find attributes that more than one instrument have in common

Usage

```
FindCommonInstrumentAttributes(Symbols, ...)
```

Arguments

Symbols	character vector of primary_ids of instruments
...	arguments to pass to getInstrument

Value

character vector of names of attributes that all Symbols' instruments have in common

Note

I really do not like the name of this function, so if it survives, its name may change

Author(s)

gsee

fn_SpreadBuilder

Calculate prices of a spread from 2 instruments.

Description

Given 2 products, calculate spread values for as many columns as practicable.

Usage

```
fn_SpreadBuilder(
  prod1,
  prod2,
  ratio = 1,
  currency = "USD",
  from = NULL,
  to = NULL,
  session_times = NULL,
```

```

    notional = TRUE,
    unique_method = c("make.index.unique", "duplicated", "least.liq", "price.change"),
    silent = FALSE,
    auto.assign = TRUE,
    env = .GlobalEnv,
    ...
)

```

Arguments

prod1	chr name of instrument that will be the 1st leg of a 2 leg spread (Can also be xts data for first product)
prod2	chr name of instrument that will be the 2nd leg of a 2 leg spread (Can also be xts data for second product)
ratio	Hedge ratio. Can be a single number, or a vector of same length as data.
currency	chr name of currency denomination of the spread
from	from Date to pass through to getSymbols if needed.
to	to Date to pass through to getSymbols if needed.
session_times	ISO-8601 time subset for the session time, in GMT, in the format 'T08:00/T14:59'
notional	TRUE/FALSE. Should the prices be multiplied by contract multipliers before calculating the spread?
unique_method	method for making the time series unique
silent	silence warnings? (FALSE by default)
auto.assign	If TRUE (the default) the constructed spread will be stored in symbol created with make_spread_id . instrument metadata will also be created and stored with the same primary_id.
env	If prod1 and prod2 are character, this is where to get the data. Also, if auto.assign is TRUE this is the environment in which to store the data (.GlobalEnv by default)
...	other arguments to pass to getSymbols and/or make_spread_id

Details

prod1 and prod2 can be the names of instruments, or the xts objects themselves. Alternatively, prod2 can be omitted, and a vector of 2 instrument names can be given to prod1. See the last example for this usage.

If prod1 and prod2 are names (not xts data), it will try to get data for prod1 and prod2 from env (.GlobalEnv by default). If it cannot find the data, it will get it with a call to getSymbols. Prices are multiplied by multipliers and exchange rates to get notional values in the currency specified. The second leg's notional values are multiplied by ratio. Then the difference is taken between the notionals of leg1 and the new values for leg2.

'make.index.unique' uses the xts function make.index.unique 'least.liq' subsets the spread time series, by using the timestamps of the leg that has the fewest rows. 'duplicated' removes any duplicate indexes. 'price.change' only return rows where there was a price change in the Bid, Mid or Ask Price of the spread.

Value

an xts object with Bid, Ask, Mid columns, or Open, Close, Adjusted columns, or Open, Close columns. or Price column.

Note

requires quantmod

Author(s)

Lance Levenson, Brian Peterson, Garrett See

See Also

[buildSpread](#) [synthetic.instrument](#) [formatSpreadPrice](#) [buildRatio](#)

Examples

```
## Not run:
currency("USD")
stock("SPY", "USD")
stock("DIA", "USD")
getSymbols(c("SPY", "DIA"))

#can call with names of instrument/xts objects
fSB <- fn_SpreadBuilder("SPY","DIA")
fSB2 <- fn_SpreadBuilder(SPY,DIA) # or you can pass xts objects

#assuming you first somehow calculated the ratio to be a constant 1.1
fSB3 <- fn_SpreadBuilder("SPY","DIA",1.1)
head(fSB)

# Call fn_SpreadBuilder with vector of 2 instrument names
# in 1 arg instead of using both prod1 and prod2.
fSB4 <- fn_SpreadBuilder(c("SPY","DIA"))
#download data and plot the closing values of a spread in one line
chartSeries(Cl(fn_SpreadBuilder(getSymbols(c("SPY","DIA")),auto.assign=FALSE)))

## End(Not run)
```

formatSpreadPrice	<i>format the price of a synthetic instrument</i>
-------------------	---

Description

Divides the notional spread price by the spread multiplier and rounds prices to the nearest tick_size.

Usage

```
formatSpreadPrice(x, multiplier = 1, tick_size = 0.01)
```

Arguments

x	xts price series
multiplier	numeric multiplier (e.g. 1000 for crack spread to get from \$ to \$/bbl)
tick_size	minimum price change of the spread

Value

price series of same length as x

Author(s)

Garrett See

See Also

[buildSpread](#), [fn_SpreadBuilder](#)

format_id	<i>format an id</i>
-----------	---------------------

Description

convert the primary_id or suffix_id of an instrument to a different format. Primarily intended for [future_series](#) instruments.

Usage

```
format_id(id, format = NULL, parse = c("id", "suffix"), sep = "_", ...)
```

Arguments

id	character. the id to be reformatted. Can be either a primary_id or a suffix_id
format	character string indicating how the id should be formatted. See Details.
parse	character name of parsing method to use: "id" or "suffix"
sep	character that will separate root_id and suffix_id of output if calling with parse="id"
...	parameters to pass to the parsing function

Details

Formats for the suffix_id include 'CY', 'CYY', and 'CYYYY' where C is the month code and Y is numeric. 'MMMY', 'MMMY', 'MMMY' where MMM is an uppercase month abbreviation. '1xCY', '1xCYY', '1xCYYYY' for single-stock-futures.

There are currently only 2 formats available for [option_series](#): 'opt2' and 'opt4' where opt2 uses a 2 digit year and opt4 uses a 4 digit year.

Value

character id of the appropriate format

Author(s)

Garrett See

See Also

[parse_id](#), [parse_suffix](#), [M2C](#), [month_cycle2numeric](#)

Examples

```
format_id('U1', format='MMYY', parse='suffix')
format_id('ES_JUN2011', format='CYY', parse='id')
format_id("SPY_20110826P129", "opt2")
#several at once
id3 <- c('VX_aug1', 'ES_U1', 'VX_U11')
format_id(id3, 'MMYY')
format_id(id3, 'CYY')
format_id(id3, 'CY', sep="")
```

future_series

Constructors for series contracts

Description

Constructors for series contracts on instruments such as options and futures

Usage

```
future_series(
  primary_id,
  root_id = NULL,
  suffix_id = NULL,
  first_traded = NULL,
  expires = NULL,
  identifiers = NULL,
  assign_i = TRUE,
  overwrite = TRUE,
  ...
)
```

```
option_series(
  primary_id,
  root_id = NULL,
  suffix_id = NULL,
  first_traded = NULL,
```

```

    expires = NULL,
    callput = c("call", "put"),
    strike = NULL,
    identifiers = NULL,
    assign_i = TRUE,
    overwrite = TRUE,
    ...
)

bond_series(
  primary_id,
  suffix_id,
  ...,
  first_traded = NULL,
  maturity = NULL,
  identifiers = NULL,
  payment_schedule = NULL,
  assign_i = TRUE
)

```

Arguments

primary_id	String describing the unique ID for the instrument. May be a vector for future_series and option_series
root_id	String product code or underlying_id, usually something like 'ES' or 'CL' for futures, or the underlying stock symbol (maybe preceded with a dot) for equity options.
suffix_id	String suffix that should be associated with the series, usually something like 'Z9' or 'Mar10' denoting expiration and year.
first_traded	String coercible to Date for first trading day.
expires	String coercible to Date for expiration date
identifiers	Named list of any other identifiers that should also be stored for this instrument.
assign_i	TRUE/FALSE. Should the instrument be assigned in the .instrument environment?
overwrite	TRUE/FALSE. If FALSE, only first_traded and expires will be updated.
...	any other passthru parameters
callput	Right of option; call or put
strike	Strike price of option
maturity	String coercible to Date for maturity date of bond series.
payment_schedule	Not currently being implemented

Details

The root instrument (e.g. the future or option) must be defined first.

In custom parameters for these series contracts, we have often found it useful to store attributes such as local roll-on and roll-off dates (rolling not on the `first_listed` or `expires`).

For `future_series` and `option_series` you may either provide a `primary_id` (or vector of `primary_ids`), OR both a `root_id` and `suffix_id`.

Note that the code for `bond` and `bond_series` has not been updated recently and may not support all the features supported for `option_series` and `future_series`. Patches welcome.

Value

For `'future_series()'` and `'option_series()'`, a character vector of assigned `'primary_id'` values when `'assign_i = TRUE'`, or an instrument object for scalar input and a list of instrument objects for vectorized input when `'assign_i = FALSE'`. `'bond_series()'` returns the result of creating or updating the bond-series instrument; this is normally the assigned identifier for a newly created series.

Examples

```
currency("USD")
future("ES","USD",multiplier=50, tick_size=0.25)
future_series('ES_U1')
future_series(root_id='ES',suffix_id='Z11')
stock('SPY','USD')
option('.SPY','USD',multiplier=100,underlying_id='SPY')
#can use either .SPY or SPY for the root_id.
#it will find the one that is option specs.
option_series('SPY_110917C125', expires='2011-09-16')
option_series(root_id='SPY',suffix_id='111022P125')
option_series(root_id='.SPY',suffix_id='111119C130')
#multiple series instruments at once.
future_series(c("ES_H12","ES_M12"))
option_series(c("SPY_110917C115","SPY_110917P115"))
```

getInstrument

Primary accessor function for getting objects of class 'instrument'

Description

This function will search the `.instrument` environment for objects of class type, using first the `primary_id` and then any identifiers to locate the instrument. Finally, it will try adding 1 and then 2 dots to the beginning of the `primary_id` to see if an instrument was stored there to avoid naming conflicts.

Usage

```
getInstrument(x, Dates = NULL, silent = FALSE, type = "instrument")
```

Arguments

x	String identifier of instrument to retrieve
Dates	date range to retrieve 'as of', may not currently be implemented
silent	if TRUE, will not warn on failure, default FALSE
type	class of object to look for. See Details

Details

`future` and `option` objects may have a `primary_id` that begins with 1 or 2 dots (in order to avoid naming conflicts). For example, the root specs for options (or futures) on the stock with ticker "SPY" may be stored with a `primary_id` of "SPY", ".SPY", or "..SPY". `getInstrument` will try using each possible `primary_id` until it finds an instrument of the appropriate type

Value

An object inheriting from the requested instrument class when a matching instrument is found. Returns `FALSE` when no matching instrument is found.

Examples

```
option('..VX', multiplier=100,
      underlying_id=future('VX', multiplier=1000,
                          underlying_id=synthetic('VIX', currency("USD"))))
)
```

```
getInstrument("VIX")
getInstrument('VX') #returns the future
getInstrument("VX", type='option')
getInstrument('..VX') #finds the option
```

getSymbols.FI

getSymbols method for loading data from split files

Description

This function should probably get folded back into `getSymbols.rda` in `quantmod`.

Usage

```
getSymbols.FI(
  Symbols,
  from = getOption("getSymbols.FI.from", "2010-01-01"),
  to = getOption("getSymbols.FI.to", Sys.Date()),
  ...,
  dir = getOption("getSymbols.FI.dir", ""),
  return.class = getOption("getSymbols.FI.return.class", "xts"),
```

```

    extension = getOption("getSymbols.FI.extension", "rda"),
    split_method = getOption("getSymbols.FI.split_method", c("days", "common")),
    use_identifier = getOption("getSymbols.FI.use_identifier", NA),
    date_format = getOption("getSymbols.FI.date_format"),
    verbose = getOption("getSymbols.FI.verbose", TRUE),
    days_to_omit = getOption("getSymbols.FI.days_to_omit", c("Saturday", "Sunday")),
    indexTZ = getOption("getSymbols.FI.indexTZ", NA)
)

```

Arguments

<code>Symbols</code>	a character vector specifying the names of each symbol to be loaded
<code>from</code>	Retrieve data no earlier than this date. Default '2010-01-01'.
<code>to</code>	Retrieve data through this date. Default <code>Sys.Date()</code> .
<code>...</code>	any other passthru parameters
<code>dir</code>	if not specified in <code>getSymbolLookup</code> , directory string to use. default ""
<code>return.class</code>	only "xts" is currently supported
<code>extension</code>	file extension, default "rda"
<code>split_method</code>	string specifying the method used to split the files, currently 'days' or 'common', see setSymbolLookup.FI
<code>use_identifier</code>	optional. identifier used to construct the <code>primary_id</code> of the instrument. If you use this, you must have previously defined the instrument
<code>date_format</code>	format as per the strptime , see Details
<code>verbose</code>	TRUE/FALSE
<code>days_to_omit</code>	character vector of names of weekdays that should not be loaded. Default is <code>c("Saturday", "Sunday")</code> . Use NULL to attempt to load data for all days of the week.
<code>indexTZ</code>	valid TZ string. (e.g. "America/Chicago" or "America/New_York") See indexTZ .

Details

Meant to be called internally by [getSymbols](#) .

The symbol lookup table will most likely be loaded by [setSymbolLookup.FI](#)

If `date_format` is NULL (the Default), we will assume an ISO date as changed by [make.names](#), for example, 2010-12-01 would be assumed to be a file containing 2010.12.01

If `indexTZ` is provided, the data will be converted to that timezone

If `auto.assign` is FALSE, `Symbols` should be of length 1. Otherwise, [getSymbols](#) will give you an error that says "must use `auto.assign=TRUE` for multiple Symbols requests" However, if you were to call `getSymbols.FI` directly (which is *NOT* recommended) with `auto.assign=FALSE` and more than one Symbol, a list would be returned.

Argument matching for this function is as follows. If the user provides a value for an argument, that value will be used. If the user did not provide a value for an argument, but there is a value for that argument for the given Symbol in the Symbol Lookup Table (see [setSymbolLookup.FI](#)), that value will be used. Otherwise, the formal defaults will be used.

Value

If `'auto.assign = TRUE'`, a character vector containing the names of the objects assigned to `'env'`.
 If `'auto.assign = FALSE'`, an `'xts'` object is returned for one requested symbol and a named list is returned for multiple symbols. Returns `'NULL'` when no data are found.

See Also

[saveSymbols.days](#) [instrument](#) [setSymbolLookup.FI](#) [loadInstruments](#) [getSymbols](#)

Examples

```
example_dir <- tempfile("fi-symbol-data-")
dir.create(example_dir)

data_env <- new.env()

data_env$FI_EXAMPLE <- xts::xts(
  cbind(
    Close = c(100, 101, 102, 101),
    Volume = c(1000, 1200, 900, 1100)
  ),
  order.by = as.Date("2020-01-01") + 0:3
)

tryCatch(
  {
    saveSymbols.common(
      Symbols = "FI_EXAMPLE",
      base_dir = example_dir,
      env = data_env
    )

    loaded_data <- getSymbols.FI(
      Symbols = "FI_EXAMPLE",
      dir = example_dir,
      split_method = "common",
      auto.assign = FALSE,
      verbose = FALSE
    )

    stopifnot(
      xts::is.xts(loaded_data),
      NROW(loaded_data) == 4L,
      identical(
        colnames(loaded_data),
        c("Close", "Volume")
      )
    )

    loaded_data
  },
  finally = {
```

```
        unlink(example_dir, recursive = TRUE)
    }
}
```

instrument

instrument class constructors

Description

All 'currency' instruments must be defined before instruments of other types may be defined.

Usage

```
instrument(
  primary_id,
  ...,
  currency,
  multiplier,
  tick_size = NULL,
  identifiers = NULL,
  type = NULL,
  assign_i = FALSE,
  overwrite = TRUE
)
```

```
stock(
  primary_id,
  currency = NULL,
  multiplier = 1,
  tick_size = 0.01,
  identifiers = NULL,
  assign_i = TRUE,
  overwrite = TRUE,
  ...
)
```

```
fund(
  primary_id,
  currency = NULL,
  multiplier = 1,
  tick_size = 0.01,
  identifiers = NULL,
  assign_i = TRUE,
  overwrite = TRUE,
  ...
)
```

```
future(
  primary_id,
  currency,
  multiplier,
  tick_size = NULL,
  identifiers = NULL,
  assign_i = TRUE,
  overwrite = TRUE,
  ...,
  underlying_id = NULL
)
```

```
option(
  primary_id,
  currency,
  multiplier,
  tick_size = NULL,
  identifiers = NULL,
  assign_i = TRUE,
  overwrite = TRUE,
  ...,
  underlying_id = NULL
)
```

```
currency(primary_id, identifiers = NULL, assign_i = TRUE, ...)
```

```
bond(
  primary_id,
  currency,
  multiplier,
  tick_size = NULL,
  identifiers = NULL,
  assign_i = TRUE,
  overwrite = TRUE,
  ...
)
```

Arguments

<code>primary_id</code>	String describing the unique ID for the instrument. Most of the wrappers allow this to be a vector.
<code>...</code>	Any other passthru parameters, including
<code>currency</code>	String describing the currency ID of an object of type currency
<code>multiplier</code>	Numeric multiplier to apply to the price in the instrument to get to notional value.
<code>tick_size</code>	The tick increment of the instrument price in it's trading venue, as numeric quantity (e.g. 1/8 is .125)

identifiers	Named list of any other identifiers that should also be stored for this instrument
type	instrument type to be appended to the class definition, typically not set by user
assign_i	TRUE/FALSE. Should the instrument be assigned to the <code>.instrument</code> environment? Default is FALSE for instrument, TRUE for wrappers.
overwrite	TRUE/FALSE. Should existing instruments with the same <code>primary_id</code> be overwritten? Default is TRUE. If FALSE, an error will be thrown and the instrument will not be created.
underlying_id	For derivatives, the identifier of the instrument that this one is derived from, may be NULL for cash settled instruments

Details

In ... you may pass any other arbitrary instrument fields that will be used to create 'custom' fields. S3 classes in R are basically lists with a class attribute. We use this to our advantage to allow us to set arbitrary fields.

`identifiers` should be a named list to specify other identifiers beyond the `primary_id`. Please note that whenever possible, these should still be unique. Perhaps Bloomberg, Reuters-X.RIC, CUSIP, etc. `getInstrument` will return the first (and only the first) match that it finds, starting with the `primary_id`, and then searching the `primary_ids` of all instruments for each of the identifiers. Note that when a large number of instruments are defined, it is faster to find instruments by `primary_id` than by `identifiers` because it looks for `primary_ids` first.

The `primary_id` will be coerced within reason to a valid R variable name by using `make.names`. We also remove any leading '1' digit (a simple workaround to account for issues with the Reuters API). If you are defining an instrument that is not a currency, with a `primary_id` that already belongs to a currency, a new `primary_id` will be created using `make.names`. For example, `stock("USD", currency("USD"))`, would create a stock with a `primary_id` of "USD.1" instead of overwriting the currency.

Please use some care to choose your primary identifiers so that R won't complain. If you have better regular expression code, we'd be happy to include it.

Identifiers will also try to be discovered as regular named arguments passed in via ... We currently match any of the following: "CUSIP", "SEDOL", "ISIN", "OSI", "Bloomberg", "Reuters", "X.RIC", "CQG", "TT", "Yahoo". Others may be specified using a named list of identifiers, as described above.

`assign_i` will use `assign` to place the constructed instrument class object into the `.instrument` environment. Most of the special type-specific constructors will use `assign_i=TRUE` internally. Calling with `assign_i=FALSE`, or not specifying it, will return an object and will *not* store it. Use this option either to wrap calls to `instrument` prior to further processing (and presumably assignment) or to test your parameters before assignment.

If `overwrite=FALSE` is used, an error will be thrown if any `primary_ids` are already in use.

As of version 0.10.0, the `.instrument` environment is located at the top level of the package. i.e. `.instrument`.

`future` and `option` are used to define the contract specs of a series of instruments. The `primary_id` for these can begin with 1 or 2 dots if you need to avoid overwriting another instrument. For example, if you have a stock with 'SPY' as the `primary_id`, you could use `'.SPY'` as the `primary_id` of the option specs, and `'..SPY'` as the `primary_id` of the single stock future specs. (or vice versa)

You can (optionally) provide a `src` argument in which case, it will be used in a call to `setSymbolLookup`.

Value

When 'assign_i = TRUE', a character vector containing the 'primary_id' values of the instruments assigned to the instrument registry. When 'assign_i = FALSE', an instrument object is returned for scalar input; vectorized constructors return a list of instrument objects.

See Also

[currency](#), [exchange_rate](#), [option_series](#), [future_series](#), [spread](#), [load.instruments](#)

instrument.auto

Create an instrument based on name alone

Description

Given a name, this function will attempt to create an instrument of the appropriate type.

Usage

```
instrument.auto(
  primary_id,
  currency = NULL,
  multiplier = 1,
  silent = FALSE,
  default_type = "unknown",
  root = NULL,
  assign_i = TRUE,
  ...
)
```

Arguments

primary_id	character primary identifier of instrument to be created
currency	character name of currency that instrument will be denominated in. Default="USD"
multiplier	numeric product multiplier
silent	TRUE/FALSE. silence warnings?
default_type	What type of instrument to make if it is not clear from the primary_id. ("stock", "future", etc.) Default is NULL.
root	character string to pass to parse_id to be used as the root_id for easier/more accurate parsing.
assign_i	TRUE/FALSE. Should the instrument be assigned in the .instrument environment?
...	other passthrough parameters

Details

If currency is not already defined, it will be defined (unless it is not 3 uppercase characters). The default value for currency is “USD”. If you do not provide a value for currency, “USD” will be defined and used to create the instrument.

If primary_id is 6 uppercase letters and default_type is not provided, it will be assumed that it is the primary_id of an [exchange_rate](#), in which case, the 1st and 2nd half of primary_id will be defined as [currencys](#) if not the names of already defined [instruments](#). If the primary_id begins with a “^” it will be assumed that it is a yahoo symbol and that the instrument is an index (synthetic), and the ‘src’ will be set to “yahoo”. (see [setSymbolLookup](#))

If it is not clear from the primary_id what type of instrument to create, an instrument of type default_type will be created (which is ‘NULL’ by default). This will happen when primary_id is that of a [stock](#), [future](#), [option](#), or [bond](#). This may also happen if primary_id is that of a [future_series](#) or [option_series](#) but the corresponding future or option cannot be found. In this case, the instrument type would be default_type, but a lot of things would be filled in as if it were a valid series instrument (e.g. ‘expires’, ‘strike’, ‘suffix_id’, etc.)

Value

Primarily called for its side-effect, but will return the name of the instrument that was created

Note

This is not intended to be used to create instruments of type stock, future, option, or bond although it may be updated in the future.

Author(s)

Garrett See

Examples

```
instrument.auto("CL_H1.U1")
getInstrument("CL_H1.U1") #guaranteed_spread

instrument.auto("ES_H1.YM_H1")
getInstrument("ES_H1.YM_H1") #synthetic

currency(c("USD", "EUR"))
instrument.auto("EURUSD")
getInstrument("EURUSD") #made an exchange_rate

instrument.auto("VX_H11") #no root future defined yet!
getInstrument("VX_H11") #couldn't find future, didnt make future_series
future("VX", "USD", 1000, underlying_id=synthetic("SPX", "USD")) #make the root
instrument.auto("VX_H11") #and try again
getInstrument("VX_H11") #made a future_series
```

instrument.table	Create data.frame with attributes of all instruments
------------------	--

Description

A wrapper for [buildHierarchy](#), that defaults to returning all attributes. By default it looks for the instrument with the most attribute levels, and uses those attributes for columns. If you would prefer to use the attribute levels of a given instrument to build the columns, use `attrs.of`.

Usage

```
instrument.table(symbols = NULL, exclude = NULL, attrs.of = NULL)
```

Arguments

symbols	A vector of instrument names to include
exclude	A vector of names of attributes that should not be included in the returned data.frame
attrs.of	name of a FinancialInstrument instrument. Returned data.frame columns will be the attributes of instrument.

Details

if there are some attributes that you do not want to be included in the returned data.frame, specify them with `exclude`.

Value

data.frame

Author(s)

Garrett See

See Also

[buildHierarchy](#), [instrument](#)

Examples

```
## Not run:
currency('USD')
stock('GM', 'USD', exchange='NYSE')
stock('XOM', 'USD', description='Exxon Mobil')
instrument.table()
#Usually, currencies will not have as many attribute levels
#as other instruments, so you may want to exclude them from the table.
it <- instrument.table(exclude="USD|GM", attrs.of = "XOM") #columns created based on XOM instrument
```

```
#it <- instrument.table(exclude=c('USD','GM'), attrs.of = "XOM") #same thing
it <- instrument.table(exclude='tick_size|description|exchange')

## End(Not run)
```

instrument_attr	<i>Add or change an attribute of an instrument</i>
-----------------	--

Description

This function will add or overwrite the data stored in the specified slot of the specified instrument.

Usage

```
instrument_attr(primary_id, attr, value, ...)
```

Arguments

primary_id	primary_id of the instrument that will be updated
attr	Name of the slot that will be added or changed
value	What to assign to the attr slot of the primary_id instrument
...	arguments to pass to getInstrument. For example, type could be provided to allow for primary_id to be an identifier that is shared by more than one instrument (of different types)

Details

If the attr you are trying to change is the “primary_id,” the instrument will be renamed. (A copy of the instrument will be stored by the name of value and the old instrument will be removed.) If the attr you are changing is “type”, the instrument will be reclassified with that type. If attr is “src”, value will be used in a call to setSymbolLookup. Other checks are in place to make sure that “currency” remains a [currency](#) object and that “multiplier” and “tick_size” can only be changed to reasonable values.

If attr is “identifiers” and value is NULL, identifiers will be set to list(). If value is not a list, [add.identifier](#) will be called with value. [add.identifier](#) will convert value to a list and append it to the current identifiers

Value

called for side-effect

Note

You can remove an attribute/level from an instrument by calling this function with value=NULL

Examples

```
## Not run:
currency("USD")
stock("SPY", "USD")
instrument_attr("USD", "description", "U.S. Dollar")
instrument_attr("SPY", "description", "An ETF")
getInstrument("USD")
getInstrument("SPY")

#Call with value=NULL to remove an attribute
instrument_attr("SPY", "description", NULL)
getInstrument("SPY")

instrument_attr("SPY", "primary_id", "SPX") #move/rename it
instrument_attr("SPX", "type", "synthetic") #re-class
instrument_attr("SPX", "src", list(src='yahoo', name='^GSPC')) #setSymbolLookup
getSymbols("SPX") #knows where to look because the last line setSymbolLookup
getInstrument("SPX")

## End(Not run)
```

is.currency

class test for object supposedly of type 'currency'

Description

class test for object supposedly of type 'currency'

Usage

```
is.currency(x)
```

Arguments

x object to test for type

Value

A single logical value indicating whether 'x' inherits from class '"currency"'.

is.currency.name	<i>check each element of a character vector to see if it is either the primary_id or an identifier of a currency</i>
------------------	--

Description

check each element of a character vector to see if it is either the primary_id or an identifier of a [currency](#)

Usage

```
is.currency.name(x)
```

Arguments

x	character vector
---	------------------

Value

A logical vector indicating whether each element of 'x' identifies a defined currency instrument. Non-character input returns 'FALSE'.

is.instrument	<i>class test for object supposedly of type 'instrument'</i>
---------------	--

Description

class test for object supposedly of type 'instrument'

Usage

```
is.instrument(x)
```

Arguments

x	object to test for type
---	-------------------------

Value

A single logical value indicating whether 'x' inherits from class '"instrument"'.

<code>is.instrument.name</code>	<i>check each element of a character vector to see if it is either the primary_id or an identifier of an <code>instrument</code></i>
---------------------------------	--

Description

check each element of a character vector to see if it is either the `primary_id` or an identifier of an `instrument`

Usage

```
is.instrument.name(x)
```

Arguments

<code>x</code>	character vector
----------------	------------------

Value

logical vector

<code>load.instruments</code>	<i>Load instrument metadata into the <code>.instrument</code> environment</i>
-------------------------------	---

Description

This function will load instrument metadata (data about the data) either from a file specified by the `file` argument or from a `data.frame` specified by the `metadata` argument.

Usage

```
load.instruments(
  file = NULL,
  ...,
  metadata = NULL,
  id_col = 1,
  default_type = "stock",
  identifier_cols = NULL,
  overwrite = TRUE
)
```

Arguments

file	string identifying file to load, default NULL, see Details
...	any other passthru parameters
metadata	optional, data.frame containing metadata, default NULL, see Details
id_col	numeric column containing id if primary_id isn't defined, default 1
default_type	character string to use as instrument type fallback, see Details
identifier_cols	character vector of field names to be passed as identifiers, see Details
overwrite	TRUE/FALSE. See instrument .

Details

The function will attempt to make reasonable assumptions about what you're trying to do, but this isn't magic.

You will typically need to specify the type of instrument to be loaded, failure to do so will generate a Warning and default_type will be used.

You will need to specify a primary_id, or define a id_col that contains the data to be used as the primary_id of the instrument.

You will need to specify a currency, unless the instrument type is 'currency'

Use the identifier_cols argument to specify which fields (if any) in the CSV are to be passed to [instrument](#) as the identifiers argument

Typically, columns will exist for multiplier and tick_size.

Any other columns necessary to define the specified instrument type will also be required to avoid fatal Errors.

Additional columns will be processed, either as additional identifiers for recognized identifier names, or as custom fields. See [instrument](#) for more information on custom fields.

Value

'NULL' invisibly. Called for the side effect of creating instrument definitions in the package instrument registry.

See Also

[loadInstruments](#), [instrument](#), [setSymbolLookup.FI](#), [getSymbols](#), [getSymbols.FI](#)

Examples

```
example_ids <- c(
  "FI_EXAMPLE_A",
  "FI_EXAMPLE_B"
)

had_usd <- is.currency.name("USD")
```

```

tryCatch(
  {
    if (!had_usd) {
      currency("USD")
    }

    metadata <- data.frame(
      primary_id = example_ids,
      type = c("stock", "stock"),
      currency = c("USD", "USD"),
      description = c(
        "Example instrument A",
        "Example instrument B"
      ),
      stringsAsFactors = FALSE
    )

    load.instruments(metadata = metadata)

    getInstrument("FI_EXAMPLE_A")
    getInstrument("FI_EXAMPLE_B")
  },
  finally = {
    rm_instruments(example_ids)

    if (!had_usd) {
      rm_currencies("USD")
    }
  }
)

```

ls_by_currency

List instruments by currency denomination

Description

Returns the names of instruments denominated in one or more specified currencies.

Usage

```
ls_by_currency(currency, pattern = NULL, match = TRUE, show.currencies = FALSE)
```

```
rm_by_currency(x, currency, keep.currencies = TRUE)
```

```
ls_USD(pattern = NULL, match = TRUE, show.currencies = FALSE)
```

```
ls_AUD(pattern = NULL, match = TRUE, show.currencies = FALSE)
```

```

ls_GBP(pattern = NULL, match = TRUE, show.currencies = FALSE)
ls_CAD(pattern = NULL, match = TRUE, show.currencies = FALSE)
ls_EUR(pattern = NULL, match = TRUE, show.currencies = FALSE)
ls_JPY(pattern = NULL, match = TRUE, show.currencies = FALSE)
ls_CHF(pattern = NULL, match = TRUE, show.currencies = FALSE)
ls_HKD(pattern = NULL, match = TRUE, show.currencies = FALSE)
ls_SEK(pattern = NULL, match = TRUE, show.currencies = FALSE)
ls_NZD(pattern = NULL, match = TRUE, show.currencies = FALSE)

```

Arguments

currency	Character vector containing the names of currencies.
pattern	An optional regular expression. Only instrument names matching ‘pattern’ are returned.
match	Logical. Should ‘pattern’ be matched exactly?
show.currencies	Logical. Should currency instruments themselves be included in the returned names?
x	Character vector of instrument names to remove. If missing, all instruments denominated in ‘currency’ are selected.
keep.currencies	Logical. If ‘TRUE’, retain the currency instruments themselves.

Value

A character vector containing instrument names denominated in the requested currencies, or ‘NULL’ when no matching instruments are found.

Author(s)

Garrett See

See Also

[ls_instruments()], [ls_currencies()], [rm_instruments()], [rm_currencies()], [instrument()]

Examples

```

example_dir <- tempfile("fi-currency-")
dir.create(example_dir)

backup_name <- "backup.RData"

```

```

backup_path <- file.path(example_dir, backup_name)

saveInstruments(backup_name, dir = example_dir)

tryCatch(
  {
    rm_instruments(keep.currencies = FALSE)

    currency(c("USD", "CAD", "GBP"))
    stock(c("CM", "CNQ"), currency = "CAD")
    stock(c("BARC", "BET"), currency = "GBP")
    stock(c("DIA", "SPY"), currency = "USD")

    ls_by_currency("CAD")
    ls_by_currency("GBP")
    ls_USD()
    ls_CAD()

    rm_by_currency(currency = "CAD")
  },
  finally = {
    if (file.exists(backup_path)) {
      reloadInstruments(
        backup_name,
        dir = example_dir
      )
    }

    unlink(example_dir, recursive = TRUE)
  }
)

```

ls_by_expiry

list or remove instruments by expiration date

Description

show names of or remove instruments that expire on a given date

Usage

```
ls_by_expiry(expiry, pattern = NULL, match = TRUE)
```

```
rm_by_expiry(x, expiry)
```

Arguments

expiry	expiration date that should correspond to the ‘expires’ field of an instrument
pattern	an optional regular expression. Only names matching ‘pattern’ are returned.
match	exact match of pattern?
x	what to remove

Details

ls_by_expiry will find instruments that have a field named either “expiry” or “expires” with a value that matches expiry.

Value

ls_by_expiry gives a vector of names of instruments that expire on the given expiry. rm_by_expiry is called for its side-effect.

Author(s)

Garrett See

See Also

[ls_instruments](#), [ls_options](#), [ls_calls](#), [ls_puts](#), [ls_futures](#), [ls_derivatives](#)

Examples

```
## Not run:
ls_by_expiry('20110917')
ls_by_expiry('20110917',ls_options())

## End(Not run)
```

ls_expiries	<i>show unique expiration dates of instruments</i>
-------------	--

Description

show unique expiration dates of instruments

Usage

```
ls_expiries(
  pattern = NULL,
  match = TRUE,
  underlying_id = NULL,
  type = "derivative"
)
```

```
ls_expires(
  pattern = NULL,
  match = TRUE,
  underlying_id = NULL,
  type = "derivative"
)
```

Arguments

pattern	optional regular expression.
match	exact match?
underlying_id	chr name of underlying or vector of underlying_ids. If NULL, all underlyings will be used
type	chr string name of class that instruments to be returned must inherit.

Details

ls_expires is an alias. (plural of expires?)

type is currently only implemented for 'derivative', 'future', 'option', 'call' and 'put' internally, a call is made to the appropriate ls_ function.

Value

named chr vector with length of unique expiration dates of derivatives of class type and having an underlying_id of underlying_id if given.

Note

This should be updated to deal with dates instead of character strings

Author(s)

Garrett

See Also

ls_instruments_by for things like e.g. ls_instruments_by('expires','20110916'), ls_instruments, ls_derivatives, ls_options, ls_calls, buildHierarchy, instrument.table

Examples

```
## Not run:
option_series.yahoo('SPY')
option_series.yahoo('DIA',NULL)
ls_expiries()

## End(Not run)
```

ls_instruments	<i>List or Remove instrument objects</i>
----------------	--

Description

display the names of or delete instruments, stocks, options, futures, currencies, bonds, funds, spreads, guaranteed_spreads, synthetics, derivatives, or non-derivatives.

Usage

```
ls_instruments(pattern = NULL, match = TRUE, verbose = TRUE)

ls_stocks(pattern = NULL, match = TRUE)

ls_options(pattern = NULL, match = TRUE, include.series = TRUE)

ls_option_series(pattern = NULL, match = TRUE)

ls_futures(pattern = NULL, match = TRUE, include.series = TRUE)

ls_future_series(pattern = NULL, match = TRUE)

ls_currencies(pattern = NULL, match = TRUE, includeFX = FALSE)

ls_non_currencies(pattern = NULL, match = TRUE, includeFX = TRUE)

ls_exchange_rates(pattern = NULL, match = TRUE)

ls_FX(pattern = NULL, match = TRUE)

ls_bonds(pattern = NULL, match = TRUE)

ls_funds(pattern = NULL, match = TRUE)

ls_spreads(pattern = NULL, match = TRUE)

ls_guaranteed_spreads(pattern = NULL, match = TRUE)

ls_synthetics(pattern = NULL, match = TRUE)

ls_ICS(pattern = NULL, match = TRUE)

ls_ICS_roots(pattern = NULL, match = TRUE)

ls_derivatives(pattern = NULL, match = TRUE)

ls_non_derivatives(pattern = NULL, match = TRUE)
```

```
ls_calls(pattern = NULL, match = TRUE)
ls_puts(pattern = NULL, match = TRUE)
rm_instruments(x, keep.currencies = TRUE)
rm_stocks(x)
rm_options(x)
rm_option_series(x)
rm_futures(x)
rm_future_series(x)
rm_currencies(x)
rm_exchange_rates(x)
rm_FX(x)
rm_bonds(x)
rm_funds(x)
rm_spreads(x)
rm_synthetic(x)
rm_derivatives(x)
rm_non_derivatives(x, keep.currencies = TRUE)
```

Arguments

pattern	an optional regular expression. Only names matching ‘pattern’ are returned.
match	return only exact matches?
verbose	be verbose?
include.series	should future_series or option_series instruments be included.
includeFX	should exchange_rates be included in ls_non_currencies results
x	what to remove. if not supplied all instruments of relevant class will be removed. For ls_defined.by x is the string describing how the instrument was defined.
keep.currencies	If TRUE, currencies will not be deleted.

Details

ls functions return the names of all the instruments of the class implied by the function name. rm functions remove the instruments of the class implied by the function name

rm_instruments and rm_non_derivatives will not delete currencies unless the keep.currencies argument is FALSE.

For the rm functions, x can be a vector of instrument names, or nothing. If x is missing, all instruments of the relevant type will be removed.

It can be useful to nest these functions to get things like futures denominated in USD.

Value

ls functions return vector of character strings corresponding to instruments of requested type rm functions are called for side-effect

Author(s)

Garrett See

See Also

ls_instruments_by, ls_by_currency, ls_by_expiry, ls, rm, instrument, stock, future, option, currency, FinancialInstrument::sort_ids

Examples

```
rm_instruments(keep.currencies=FALSE) #remove everything from .instrument

# First, create some instruments
currency(c("USD", "EUR", "JPY"))
#stocks
stock(c("S", "SE", "SEE", "SPY"), 'USD')
synthetic("SPX", "USD", src=list(src='yahoo', name='^GSPC'))
#derivatives
option('.SPY', 'USD', multiplier=100, underlying_id='SPY')
option_series(root_id="SPY", expires='2011-06-18', callput='put', strike=130)
option_series(root_id="SPY", expires='2011-09-17', callput='put', strike=130)
option_series(root_id="SPY", expires='2011-06-18', callput='call', strike=130)
future('ES', 'USD', multiplier=50, expires='2011-09-16', underlying_id="SPX")
option('.ES', 'USD', multiplier=1, expires='2011-06', strike=1350, right='C', underlying_id='ES')

# Now, the examples
ls_instruments() #all instruments
ls_instruments("SE") #only the one stock
ls_instruments("S", match=FALSE) #anything with "S" in name

ls_currencies()
ls_stocks()
ls_options()
ls_futures()
ls_derivatives()
```

```

ls_puts()
ls_non_derivatives()
ls_by_expiry('20110618',ls_puts()) #put options that expire on Jun 18th, 2011
ls_puts(ls_by_expiry('20110618'))

rm_options('SPY_110618C130')
rm_futures()
ls_instruments()
rm_instruments('EUR', keep.currencies=FALSE) #remove the currency
rm_currencies('JPY') #or remove currency like this
ls_currencies()
ls_instruments()

rm_instruments() #remove all but currencies
rm_currencies()

```

ls_instruments_by	<i>Subset names of instruments</i>
-------------------	------------------------------------

Description

list names of instruments that have an attribute that matches some value

Usage

```
ls_instruments_by(what, value, in.slot = NULL, pattern = NULL, match = TRUE)
```

Arguments

what	What attribute? (e.g. “currency”, “type”, “strike”, etc.)
value	What value must the attribute have? (e.g. “EUR”, “option”, 100, etc.). If missing or NULL, the names of all instruments that have a what slot will be returned
in.slot	If the attribute you are looking for is stored inside another slot, this is the name of that slot. (usually "IB")
pattern	only return instruments with pattern in the name
match	should pattern match names exactly?

Details

list instruments that have a given attribute level with a given value.

Value

chr vector of instrument names

Author(s)

Garrett See

See Also

buildHierarchy, instrument.table, ls_instruments

Examples

```
## Not run:
stock(c("GOOG", "INTC"), currency("USD"))
synthetic("SnP", "USD", src=list(name='^GSPC', src='yahoo'))
ls_instruments_by('type', 'stock')
ls_instruments_by("name", NULL, in.slot='src')
ls_instruments_by('src', NULL)

## End(Not run)
```

ls_strikes	<i>show strike prices of defined options</i>
------------	--

Description

list the strike prices of previously defined options.

Usage

```
ls_strikes(pattern = NULL)
```

Arguments

pattern an optional regular expression. Only names matching 'pattern' are returned.

Details

If no option names are supplied, the strike prices of all defined options will be returned

Value

vector of strike prices

Author(s)

Garrett See

See Also

ls_options, ls_calls, ls_puts ls_instruments_by ls_underlyings

Examples

```
## Not run:
option_series.yahoo('SPY')
ls_strikes(ls_options('SPY'))

## End(Not run)
```

ls_underlyings	<i>show names of underlyings</i>
----------------	----------------------------------

Description

shows names that are stored in the underlying_id slot of derivative instruments

Usage

```
ls_underlyings(pattern = NULL, match = TRUE)
```

Arguments

pattern	an optional regular expression. Only names matching ‘pattern’ are returned.
match	require exact match?

Details

first calls ls_derivatives, then looks for unique underlying_ids. If no derivatives have been defined, nothing will be returned.

Value

chr vector of names of unique underlying_ids

Author(s)

Garrett See

See Also

ls_instruments_by, ls_derivatives, ls_options, ls_futures

Examples

```
## Not run:
ls_underlyings()

## End(Not run)
```

make_spread_id	<i>Construct a primary_id for a spread instrument from the primary_ids of its members</i>
----------------	---

Description

Construct a primary_id for a spread instrument from the primary_ids of its members

Usage

```
make_spread_id(x, root = NULL, format = NULL, sep = "_")
```

Arguments

x	character vector of member primary_ids
root	Optional character string of root_id to use.
format	String indicating how to format the suffix_ids of the spread. If NULL (the default), or FALSE, no formatting will be done. See format_id for other accepted values for format
sep	character string to separate root_id and suffix_id

Value

character string that can be used as a primary_id for a [spread](#) instrument

Author(s)

Garrett See

See Also

[spread](#), [build_spread_symbols](#), [build_series_symbols](#)

Examples

```
ids <- c('VX_aug1', 'VX_U11')
make_spread_id(ids, format='CY')
make_spread_id(ids, format=FALSE)
make_spread_id(c("VIX_JAN11", "VIX_FEB11"), root='VX', format='CY')
```

month_cycle2numeric *coerce month_cycle to a numeric vector*

Description

This will convert month codes or month names to numeric months.

Usage

```
month_cycle2numeric(...)
```

```
MC2N(...)
```

Arguments

... the expiration months of a [future](#). See examples.

Details

Input can be a vector, comma-delimited string, or multiple strings. All inputs should be similar. Do not mix month names, codes and numbers in the same call.

MC2N is an alias

Value

numeric vector

Author(s)

Garrett See

See Also

[M2C](#), [C2M](#), [next.future_id](#) [future](#)

Examples

```
MC2N("H,M,U,Z") # from single string
MC2N(c("H","M","U","Z")) # from single vector
MC2N("h", "M", "u", "Z") # from multiple strings
MC2N(c("F","G"), "H", c("X","Z")) # from multiple vectors
month_cycle2numeric("Mar,jun,SEP,dEc")
month_cycle2numeric("Mar", "jun", "SEP", "dEc")
MC2N("March,june,sep,decem")
MC2N("March, june, sep, decem") #spaces between commas are ok
month_cycle2numeric("3,6,9,12")
month_cycle2numeric(seq(3,12,3))
```

next.future_id	<i>Get the primary_id of the next-to-expire (previously expiring) future_series instrument</i>
----------------	--

Description

Using [parse_id](#), this will figure out where in the month_cycle that id belongs. Then, it will use the next (previous) month in month_cycle to construct the id of the next-to-expire contract.

Usage

```
next.future_id(id, month_cycle = seq(3, 12, 3), root = NULL, format = NULL)
```

```
prev.future_id(id, month_cycle = seq(3, 12, 3), root = NULL, format = NULL)
```

Arguments

id	character string primary_id of a future_series instrument
month_cycle	months in which contracts expire. numeric or month codes. See Details.
root	root_id. usually only used if there is no underscore in the id. See Details.
format	how you would like the returned id to be formatted. If NULL, it will match the format of id. See Details.

Details

month_cycle can be a numeric vector (corresponding to the months in which contracts expire), or it can be a vector of month codes, a vector of month abbreviations, or a comma-delimited string of month codes or abbreviations, in which case an attempt will be made to convert it to a numeric vector. by passing it through [month_cycle2numeric](#)

root is primarily used when you have an id that does not have an underscore, in which case, providing root will make splitting the id into primary_id and suffix_id easier and more accurate. root can also be used if you want the returned id to be on a different future than the id you passed in (when used this way, format should also be used).

By default, (when called with format=NULL) the returned id will be of the same format as the id that was passed in. The format of the returned id can be specified with the format argument. See [format_id](#) for supported values of format

Value

character

Author(s)

Garrett See

See Also

[format_id](#) for supported values of format. [month_cycle2numeric](#)

Examples

```
next.future_id("ES_Z1", "H,M,U,Z", format=NULL)
next.future_id("VIXAUG11", 1:12, root='VIX', format=NULL)
next.future_id("YM_Q11", seq(3,12,3)) #gives a warning about 'Q' not being part of month_cycle
```

Notionalize	<i>Convert price series to/from notional value</i>
-------------	--

Description

Notionalize multiplies all prices by the contract multiplier Denotionalize divides all prices by the contract multiplier

Usage

```
Notionalize(x, name, env = .GlobalEnv)

Denotionalize(x, name, env = .GlobalEnv)
```

Arguments

x	an xts object, or an object that is coercible to xts
name	primary_id of the instrument that has the multiplier; usually the same as the name of x
env	environment. where to find x if only its name is provided

Details

The mulitplier is only applied to columns with prices. A column is considered to be a price column if its name contains “Open”, “High”, “Low”, “Close”, “Bid”, “Ask”, “Trade”, “Mid”, or “Price” and does not contain “Size”, “Sz”, “Volume”, “Qty”, “Quantity”, “OpInt”, “OpenInterest” (not case-sensitive)

Value

an object of the same class as x

Author(s)

Garrett See

Examples

```
## Not run:
source("http://tinyurl.com/download-tblox")
getSymbols("CL", src='tblox')
define_futures.tblox()
tail(Notionalize(CL, "CL"))
tail(Denotionalize(Notionalize(CL), "CL"))

## End(Not run)
```

option_series.yahoo	<i>Constructor for series of options using yahoo data</i>
---------------------	---

Description

Defines a chain or several chains of options by looking up necessary info from yahoo.

Usage

```
option_series.yahoo(
  symbol,
  Exp,
  currency = "USD",
  multiplier = 100,
  first_traded = NULL,
  tick_size = NULL,
  overwrite = TRUE
)
```

Arguments

symbol	character vector of ticker symbols of the underlying instruments (Currently, should only be stock tickers)
Exp	Expiration date or dates to be passed to getOptionChain
currency	currency of underlying and options
multiplier	contract multiplier. Usually 100 for stock options
first_traded	first date that contracts are tradeable. Probably not applicable if defining several chains.
tick_size	minimum price change of options.
overwrite	if an instrument already exists, should it be overwritten?

Details

If Exp is missing it will define only the nearby options. If Exp is NULL it will define all options

If first_traded and/or tick_size should not be the same for all options being defined, they should be left NULL and defined outside of this function.

Value

Called for side-effect. The instrument that is created and stored will inherit option_series, option, and instrument classes.

Note

Has only been tested with stock options. The options' currency should be the same as the underlying's.

Author(s)

Garrett See

References

Yahoo Finance at "finance.yahoo.com"

See Also

[option_series](#), [option](#), [instrument](#), [getOptionChain](#)

Examples

```
option_series.yahoo('SPY') #only nearby calls and puts
option_series.yahoo('DIA', Exp=NULL) #all chains
ls_instruments()
```

parse_id

Parse a primary_id

Description

Extract/infer descriptive information about an instrument from its name.

Usage

```
parse_id(x, silent = TRUE, root = NULL)
```

Arguments

x	the id to be parsed (e.g. 'ES_U11', 'SPY_111217C130')
silent	silence warnings?
root	character name of instrument root_id. Optionally provide this to make parsing easier.

Details

This function is primarily intended to be used on the names of [future_series](#) and [option_series](#) instruments, and it will work best if the id has an underscore in it that separates the root_id from the suffix_id. (However, it should be able to handle most ids even if the underscore is missing). After splitting x into a root_id and suffix_id, the suffix_id is passed to [parse_suffix](#) (see also) for further processing.

TODO: add support for bond_series.

Value

a list of class 'id.list' containing 'root' and 'suffix' as well as what is returned from [parse_suffix](#) (type, month, year, strike, right, cm, cc, format)

Note

this function will identify x as an [exchange_rate](#) only if it is 6 characters long and made up of 2 previously defined [currency](#) instruments.

Author(s)

Garrett See

See Also

[parse_suffix](#)

Examples

```
parse_id("ES_Z11")
parse_id("CLZ1")
parse_id("SPY_111217C130")
```

parse_suffix	<i>parse a suffix_id</i>
--------------	--------------------------

Description

extract information from the suffix_id of an instrument

Usage

```
parse_suffix(x, silent = TRUE)
```

Arguments

- x the suffix_id to be parsed
- silent silence warnings? (warning will usually be about inferring a 4 digit year from a 1 or 2 digit year)

Details

These would be recognized as a Sep 2011 outright futures contract: U1, U11, SEP1, SEP11, U2011, Sep2011, SEP2011

These would be recognized as a call with a strike of 122.5 that expires Sep 17, 2011: 110917C122.5, 20110917C122.5, 110917C00122500, 20110917C00122500

These would be recognized as Sep 2011 single stock futures: 1CU1, 1CU11, 1CSEP11, 1DU1 (dividend protected)

These would be recognized as Adjusted futures: cm.30 (30 day constant maturity future), cc.OI (continuous contract rolled when Open Interest rolls), cc.Vol (continuous contract roll when Volume rolls), cc.Exp.1 (continuous contract rolled 1 day before Expiration)

Synthetics and spreads:

SPY.DIA -> type == synthetic;

U1.Z1 or U11.Z11 -> type == "calendar", "spread"; month == 'SEP', year == 2011

U1.0302 -> type == "ICS", "spread"; month == 'SEP', year == 2011

110917C125.110917P125 -> type == option_spread, spread

Value

an object of class 'suffix.list' which is a list containing 'type' of instrument, 'month' of expiration, 'year' of expiration, 'strike' price of option, 'right' of option ("C" or "P"), 'cm' (maturity in days of a constant maturity contract), 'cc' (method for calculating a continuous contract), 'format' (string that indicates the format of the unparsed id).

Author(s)

Garrett See

See Also

[parse_id](#), [format_id](#)

Examples

```
parse_suffix("U11")
parse_suffix("110917C125")
```

redenominate

Redenominate (change the base of) an instrument

Description

Redenominate (change the base of) an instrument

Usage

```
redenominate(  
  x,  
  new_base = "USD",  
  old_base = NULL,  
  EOD_time = "15:00:00",  
  env = .GlobalEnv,  
  silent = FALSE  
)
```

Arguments

x	can be either an xts object or the name of an instrument.
new_base	change the denomination to this; usually a currency.
old_base	what is the current denomination?
EOD_time	If data need to be converted to daily, this is the time of day to take the observation.
env	environment that holds the data
silent	silence warnings?

Details

If `old_base` is not provided, `x` must be the name of an instrument (or an object with the name of a defined instrument) so that the currency attribute of the instrument can be used. Otherwise, `old_base` must be provided.

If you want to convert to JPY something that is denominated in EUR, you must have data for the EURJPY (or JPYEUR) exchange rate. If you don't have data for EURJPY, but you do have data for EURUSD and USDJPY, you could redenominate to USD, then redenominate to EUR, but this function is not yet smart enough to do that for you.

See the help for `buildRatio` also.

Value

xts object, with as many columns as practicable, that represents the value of an instrument in a different currency (base).

Note

this does not yet define any instruments or assign anything.

Author(s)

Garrett See

See Also

[buildRatio](#)

Examples

```
## Not run:
require(quantmod)
EURUSD <- getSymbols("EURUSD=x",src='yahoo',auto.assign=FALSE)
GLD <- getSymbols("GLD", src='yahoo', auto.assign=FALSE)
GLD.EUR <- redenominate(GLD,"EUR","USD") #can call with xts object

currency("USD")
stock("GLD","USD")
GLD.EUR <- redenominate('GLD','EUR') #can also call with instrument name

## End(Not run)
```

root_contracts	<i>future metadata to be used by load.instruments</i>
----------------	---

Description

future metadata to be used by [load.instruments](#)

saveInstruments	<i>Save and Load all instrument definitions</i>
-----------------	---

Description

Saves (loads) the .instrument environment to (from) disk.

Usage

```
saveInstruments(file_name = "MyInstruments", dir = "", compress = "gzip")

loadInstruments(file_name = "MyInstruments", dir = "")

reloadInstruments(file_name = "MyInstruments", dir = "")
```

Arguments

file_name	name of file. e.g. "MyInstruments.RData". As an experimental feature, a list or environment can be passed to file_name.
dir	Directory of file (defaults to current working directory. ie. "")
compress	argument passed to save , default is "gzip"

Details

After you have defined some instruments, you can use `saveInstruments` to save the entire `.instrument` environment to disk.

`loadInstruments` will read a file that contains instruments and add those instrument definitions to your `.instrument` environment. `reloadInstruments` will remove all instruments in the current `.instrument` environment before loading instruments from disk.

The `file_name` should have a file extension of “RData”, “rda”, “R”, or “txt”. If the `file_name` does not end with one of those, “RData” will be appended to the `file_name`.

If the file extension is “R” or “txt”, `saveInstruments` will create a text file of R code that can be [sourced](#) to load instruments back into the `.instrument` environment.

Value

Called for side-effect

Author(s)

Garrett See

See Also

`save`, `load`, `load.instrument`, `define_stocks`, `define_futures`, `define_options` (`option_series.yahoo`)

Examples

```
backup_file <- tempfile(fileext = ".RData")
output_dir <- tempfile("fi-save-test-")
dir.create(output_dir)

saveInstruments(backup_file)

tryCatch(
{
  rm_instruments(keep.currencies = FALSE)

  currency("USD")
  stock("SPY", currency = "USD")

  saveInstruments(
    "test-instruments.R",
    dir = output_dir
  )

  rm_instruments(keep.currencies = FALSE)

  source(
    file.path(output_dir, "test-instruments.R")
  )

  stopifnot(is.instrument.name("SPY"))
```

```

    stopifnot(getInstrument("SPY")$currency == "USD")
  },
  finally = {
    reloadInstruments(backup_file)
    unlink(backup_file)
    unlink(output_dir, recursive = TRUE)
  }
)

```

saveSymbols.days	<i>Save data to disk</i>
------------------	--------------------------

Description

Save data to disk the way that `getSymbols.FI` expects it to be saved.

Usage

```

saveSymbols.days(Symbols, base_dir = "", extension = "rda", env = .GlobalEnv)

saveSymbols.common(Symbols, base_dir = "", extension = "rda", env = .GlobalEnv)

```

Arguments

<code>Symbols</code>	character vector of names of objects to be saved
<code>base_dir</code>	character. directory in which to store data.
<code>extension</code>	file extension ("rda")
<code>env</code>	environment that holds the data to be saved (.GlobalEnv by default)

Details

If they do not already exist, subdirectories will be created for each of the `Symbols`. `saveSymbols.common` will save a single 'rda' file for each of the `Symbols` in that symbol's subdirectory. `saveSymbols.days` will split the data up into days and save a separate 'rda' file for each day in that symbol's subdirectory.

Value

called for side-effect.

See Also

[getSymbols.FI](#)

Examples

```
example_dir <- tempfile("fi-symbol-data-")
dir.create(example_dir)

example_env <- new.env()

example_env$SPY <- xts::xts(
  matrix(
    1:8,
    ncol = 2L,
    dimnames = list(
      NULL,
      c("Close", "Volume")
    )
  ),
  order.by = as.Date("2020-01-01") + 0:3
)

tryCatch(
  {
    saveSymbols.common(
      "SPY",
      base_dir = example_dir,
      env = example_env
    )

    list.files(
      example_dir,
      recursive = TRUE
    )
  },
  finally = {
    unlink(example_dir, recursive = TRUE)
  }
)
```

setSymbolLookup.FI	<i>Set quantmod-style SymbolLookup for instruments</i>
--------------------	--

Description

This function exists to tell [getSymbols](#) where to look for your repository of market data.

Usage

```
setSymbolLookup.FI(
  base_dir,
  Symbols,
```

```

    ...,
    split_method = c("days", "common"),
    storage_method = "rda",
    use_identifier = "primary_id",
    extension = "rda",
    src = "FI"
)

```

Arguments

base_dir	string specifying the base directory where data is stored, see Details
Symbols	character vector of names of instruments for which to setSymbolLookup
...	any other passthru parameters
split_method	string specifying the method files are split, currently 'days' or 'common', see Details
storage_method	currently only 'rda', but we will eventually support 'indexing' at least, and maybe others
use_identifier	string identifying which column should be use to construct the primary_id of the instrument, default 'primary_id'
extension	file extension, default "rda"
src	which getSymbols sub-type to use, default getSymbols.FI by setting 'FI'

Details

The `base_dir` parameter *must* be set or the function will fail. This will vary by your local environment and operating system. For mixed-OS environments, we recommend doing some OS-detection and setting the network share to your data to a common location by operating system. For example, all Windows machines may use "M:/" and all *nix-style (linux, Mac) machines may use "/mnt/mktdata/".

The `split_method` currently allows either 'days' or 'common', and expects the file or files to be in sub-directories named for the symbol. In high frequency data, it is standard practice to split the data by days, which is why that option is the default.

Value

No meaningful return value. Called for the side effect of updating the 'quantmod' symbol lookup table for the requested instruments.

See Also

[getSymbols.FI](#), [instrument_attr](#), [load.instruments](#), [loadInstruments](#), [setSymbolLookup](#)

sort_ids	<i>sort primary_ids of instruments</i>
----------	--

Description

Primarily intended for use on the primary_ids of [future_series](#) instruments. This will sort ids by expiration. All ids that do not contain month and year information will be sorted alphabetically (separately) and appended to the end of the other sorted ids.

Usage

```
sort_ids(ids, ...)
```

Arguments

ids	character vector of ids
...	arguments to pass through to parse_id

Details

If an instrument is defined, and has a date in its 'expires' field, that date will be used as the expiration date. Otherwise, it is assumed that the contract expires on the first day of its expiration month. This means that if some products are defined and other products that expire in the same month are not defined, the ones that are not defined will come first in the vector of sorted ids.

Value

sorted character vector of the same length as ids

Author(s)

Garrett See

See Also

[parse_id](#)

Examples

```
## Not run:
ids <- c("ES_U11", 'GLD', 'SPY', "YM_Jun11", 'DIA', 'VX_V10')
sort_ids(ids)

## End(Not run)
```

synthetic	<i>synthetic instrument constructors</i>
-----------	--

Description

define spreads, guaranteed_spreads, butterflies, and other synthetic instruments

Usage

```
synthetic(
  primary_id = NULL,
  currency = NULL,
  multiplier = 1,
  identifiers = NULL,
  assign_i = TRUE,
  overwrite = TRUE,
  ...,
  members = NULL,
  type = "synthetic"
)

synthetic.instrument(
  primary_id,
  currency,
  members,
  memberratio,
  ...,
  multiplier = 1,
  tick_size = NULL,
  identifiers = NULL,
  assign_i = TRUE,
  type = c("synthetic.instrument", "synthetic")
)

spread(
  primary_id = NULL,
  currency = NULL,
  members,
  memberratio,
  tick_size = NULL,
  ...,
  multiplier = 1,
  identifiers = NULL,
  assign_i = TRUE
)

butterfly(
```

```

    primary_id = NULL,
    currency = NULL,
    members,
    tick_size = NULL,
    identifiers = NULL,
    assign_i = TRUE,
    ...
)

guaranteed_spread(
  primary_id = NULL,
  currency = NULL,
  root_id = NULL,
  suffix_id = NULL,
  members = NULL,
  memberratio = c(1, -1),
  ...,
  multiplier = NULL,
  identifiers = NULL,
  assign_i = TRUE,
  tick_size = NULL
)

ICS_root(
  primary_id,
  currency = NULL,
  members,
  multiplier = NULL,
  identifiers = NULL,
  assign_i = TRUE,
  overwrite = TRUE,
  tick_size = NULL,
  ...
)

ICS(primary_id, assign_i = TRUE, identifiers = NULL, ...)

```

Arguments

<code>primary_id</code>	chr string of primary identifier of instrument to be defined.
<code>currency</code>	chr string name of currency denomination
<code>multiplier</code>	multiplier of the spread (1 / divisor for price weighted baskets)
<code>identifiers</code>	identifiers
<code>assign_i</code>	TRUE/FALSE. Should the instrument be assigned in the .instrument environment?
<code>overwrite</code>	if FALSE and an instrument with the same <code>primary_id</code> is already defined, an error will be thrown and no instruments will be created.

...	any other passthrough parameters
members	vector of <code>primary_ids</code> of member instruments
type	type of instrument; wrappers do not require this.
memberratio	vector of weights for each leg. negative numbers for selling.
tick_size	minimum price change of the spread
root_id	instrument identifier for the root contract, default NULL
suffix_id	identifiers for the member contract suffixes, default NULL, will be split as <code>members</code> , see Details

Details

Simple derivatives like [option](#) or [future](#) contracts typically have one underlying instrument. While properties like strike and expiration vary for these derivative contracts or series, the underlying is well understood.

More complex derivatives are typically modeled as baskets of underlying products, and are typically traded over-the-counter or as proprietary in-house products.

The general synthetic function is intended to be extended to support these arbitrary baskets of assets.

`spread` `guaranteed_spread` and `butterfly` are wrappers for `synthetic.instrument`. `synthetic.instrument` will make a call to `synthetic` to create the final instrument.

The `suffix_id` parameter of wrapper functions such as `guaranteed_spread` is presumed to be a string describing the members. It will be [strsplit](#) using the regex `"[-;:_\\.]"` to create the members vector, and potentially combined with a `root_id`.

Most wrappers will build `primary_id` if it is NULL, either by combining `root_id` and `suffix_id`, or by passing members in a call to [make_spread_id](#)

ICS will build an Intercommodity Spread. Although the expiration date and ratio may change, the members of a given ICS will not change. Therefore, `ICS_root` can be used to hold the members of an Intercommodity Spread. If an `ICS_root` has not been defined, then `members` will be a required argument for ICS

We welcome assistance from others to model more complex OTC derivatives such as swap products.

Value

called for side effect. stores an instrument in `.instrument` environment

Author(s)

Brian Peterson, Garrett See

See Also

`instrument`, `future`, `option_series.yahoo`

Examples

```
## Not run:
stock('SPY', 'USD', 1)
stock('DIA', 'USD', 1)
spread('SPY.DIA', 'USD', c('SPY', 'DIA'), c(1, -1))

## End(Not run)
```

to_secBATV	<i>Convert tick data to one-second data</i>
------------	---

Description

This is like taking a snapshot of the market at the end of every second, except the volume over the second is summed.

Usage

```
to_secBATV(x)

alltick2sec(
  getdir = getOption("FinancialInstrument.tickdir", NULL),
  savedir = getOption("FinancialInstrument.secdir", NULL),
  Symbols = NULL,
  overwrite = FALSE,
  verbose = FALSE
)
```

Arguments

x	the xts series to convert to 1 minute BATV
getdir	Directory containing tick data. If omitted, the value of <code>getOption("FinancialInstrument.tickdir")</code> is used.
savedir	Directory in which converted data will be saved. If omitted, the value of <code>getOption("FinancialInstrument.secdir")</code> is used.
Symbols	Character vector naming instruments to convert. If NULL, all entries in <code>getdir</code> are considered.
overwrite	Logical. If a destination file already exists, should it be overwritten?
verbose	Logical. If TRUE, display progress messages.

Details

From tick data with columns: "Price", "Volume", "Bid.Price", "Bid.Size", "Ask.Price", "Ask.Size", to data of one second frequency with columns "Bid.Price", "Bid.Size", "Ask.Price", "Ask.Size", "Trade.Price", and "Volume"

The primary purpose of these functions is to reduce the amount of data on disk so that it will take less time to load the data into memory.

If there are no trades or bid/ask price updates in a given second, we will not make a row for that timestamp. If there were no trades, but the bid or ask price changed, then we `_will_` have a row but the Volume and Trade.Price will be NA.

If there are multiple trades in the same second, Volume will be the sum of the volume, but only the last trade price in that second will be printed. Similarly, if there is a trade, and then later in the same second, there is a bid/ask update, the last Bid/Ask Price/Size will be used.

`alltick2sec` is used to convert the data of several files from tick to one second frequency data.

Value

`to_secBATV` returns an xts object of one second frequency. `alltick2sec` returns a list of files that were converted.

Note

`to_secBATV` is used by the `TRTH_BackFill.R` script in the `inst/parser` directory of the `FinancialInstrument` package. These functions are specific to data created by that script and are not intended for more general use.

Author(s)

gsee

Examples

```
## Not run:
getSymbols("CLU1")
system.time(xsec <- to_secBATV(CLU1))
convert.log <- alltick2sec(
  getdir = "path/to/tick-data",
  savedir = "path/to/second-data",
  verbose = TRUE
)

## End(Not run)
```

`update_instruments.instrument`

Update instruments with metadata from another instrument.

Description

Update instruments with metadata from another instrument.

Usage

```
update_instruments.instrument(
  Symbols,
  source_id,
  create.new = FALSE,
  ignore = "identifiers",
  assign_i = TRUE
)
```

Arguments

<code>Symbols</code>	character vector of <code>primary_ids</code> or other instrument identifiers. of instruments to be updated. Alternatively, <code>Symbols</code> can be an instrument or list of instruments.
<code>source_id</code>	The <code>primary_id</code> (or other identifier) of an instrument, or an instrument. The <code>source_id</code> instrument will be used to update the metadata of <code>Symbols</code> ' instruments.
<code>create.new</code>	If <code>FALSE</code> (Default), only attributes that exist but have empty values will be updated. If <code>TRUE</code> , new attributes will be created if <code>source_id</code> has them, but the <code>Symbols</code> do not.
<code>ignore</code>	vector of names of instrument attributes that should not be copied to the updated instruments.
<code>assign_i</code>	<code>TRUE/FALSE</code> . If <code>TRUE</code> , the updated instruments will be assigned back into the instrument environment. If <code>FALSE</code> , a list of updated instruments will be returned

Details

By default, only attributes that have a value of `""` will be given a new value.

If `create.new` is `TRUE`, then if there are attributes in `source_id` that are not in the `Symbols`' instrument, those attributes will be copied to the updated instruments unless they are in `ignore`.

Value

if `isTRUE(assign_i)` a vector of `primary_ids` of the instruments that were upated. Otherwise, a list of updated instrument objects.

Note

one way to overwrite attributes of one instrument with those of another is to first set equal to `""` those attributes that you want to overwrite, then use `update_instruments.instrument` to copy the attributes.

Author(s)

Garrett See

See Also

[update_instruments.yahoo, all.equal.instrument](#)

Examples

```
## Not run:
#rm_instruments()
currency("USD")
synthetic("SPX", "USD", identifiers=list(yahoo="GSPC"),
          tick_size=0.01,
          liquidHours="T08:30:00/T15:00:00",
          extraField='something else',
          assign_i=TRUE)
stock("SPY", "USD", liquidHours="", assign_i=TRUE)
all.equal(getInstrument("SPX"), getInstrument("SPY"))
getInstrument("SPY")
## update SPY metadata based on the metadata of SPX
## Only attributes that == "" are updated by default
update_instruments.instrument("SPY", "SPX", assign_i=FALSE) #liquidHours
update_instruments.instrument("SPY", "SPX", create.new=TRUE,
                              ignore=c("identifiers", "type"),
                              assign_i=FALSE)
# Although you probably do NOT want to, this will
# copy everything new -- including identifiers and type!
update_instruments.instrument("SPY", "SPX", create.new=TRUE, ignore=NULL,
                              assign_i=FALSE)

## End(Not run)
```

update_instruments.iShares

update iShares and SPDR ETF metadata

Description

This will update previously defined iShares or SPDR ETF instruments. Both functions will add attributes for “Name”, and “FundFamily” (“iShares” or “SPDR”). `update_instruments.iShares` will also add an attribute for “MgmtFees”

Usage

```
update_instruments.iShares(Symbols, silent = FALSE)
```

```
update_instruments.SPDR(Symbols, silent = FALSE)
```

Arguments

Symbols	character vector of iShares ETF ticker symbols. If not specified, <code>unique(c(ls_funds(), ls_stocks()))</code> will be used.
silent	silence the warning that no iShares are defined?

Value

called for side-effect

Note

update_instruments.SPDR will probably NOT work on Windows because in the call to download.file it uses method=curl since it has to download from an https URL scheme.

Author(s)

Garrett See

References

<http://us.ishares.com/home.htm>, https://www.ssga.com/de/en_gb/intermediary

See Also

update_instruments.yahoo, update_instruments.TTR, twsInstrument::update_instruments.IB, update_instruments.instrument, [update_instruments.morningstar](#), [update_instruments.masterDATA](#)

Examples

```
## Not run:
stock("IWC", currency("USD"))
update_instruments.iShares("IWC")
getInstrument("IWC")

Symbols <- stock(c("SPY", "JNK"), currency("USD"))
update_instruments.SPDR(Symbols)
buildHierarchy(c("SPY", "JNK"), "Name")

## End(Not run)
```

```
update_instruments.masterDATA
```

Update instrument metadata for ETFs

Description

Uses the masterDATA.com list of ETFs and ETNs to update previously defined instruments.

Usage

```
update_instruments.masterDATA(Symbols, silent = FALSE)
```

```
update_instruments.md(Symbols, silent = FALSE)
```

Arguments

Symbols	character vector of Symbols of ETFs
silent	silence warnings?

Details

update_instruments.md is an alias.

MasterDATA classifies each ETF into one of six Fund.Types. From their website:

US Equity ETF: All constituents trade on a US exchange. Both ProShares and Rydex sponsor ETFs with the objective of achieving the performance (or a multiple of the performance) of several major US stock indexes. These ETFs currently are included in this category despite the fact that their constituent lists are generally not limited to US stocks.

Global Equity ETF: One or more of the constituents do not trade on a US Exchange.

Fixed Income ETF: The constituent list contains government and / or corporate debt instruments. ETFs with this classification will not be considered for inclusion in MasterDATA's index / ETF compilation list.

Commodity Based ETF: This classification of ETF has no constituents but is structured to reflect the valuation of a commodity such as gold, silver, oil or interest rates. ETFs with this classification will not be considered for inclusion in MasterDATA's index / ETF compilation list.

Exchange Traded Notes: A type of unsecured, unsubordinated debt security that was first issued by Barclays Bank PLC. The purpose of ETNs is to create a type of security that combines both the aspects of bonds and exchange traded funds (ETF). Similar to ETFs, ETNs are traded on a major exchange.

Value

called for side-effect. Each ETF that is updated will be given instrument attributes of "Name" and "Fund.Type"

Author(s)

Garrett See

References

<http://masterDATA.com> (http://www.masterdata.com/helpfiles/ETF_List_Downloads/AllTypes.csv)

See Also

[update_instruments.yahoo](#), [update_instruments.instrument](#)

Examples

```
## Not run:
stock(s <- c("SPY", "DIA"), currency("USD"))
update_instruments.masterDATA(s)
buildHierarchy(s, "Name", "Fund.Type", "defined.by")

## End(Not run)
```

update_instruments.morningstar

Update instrument metadata for ETFs

Description

Currently, this only updates ETFs. It will add “msName” and “msCategory” attributes to the instruments. (ms for morningstar)

Usage

```
update_instruments.morningstar(Symbols, silent = FALSE)
```

```
update_instruments.ms(Symbols, silent = FALSE)
```

Arguments

Symbols	character vector of Symbols of ETFs
silent	silence warnings?

Value

called for side-effect.

Author(s)

Garrett See

References

<http://www.morningstar.com>

See Also

[update_instruments.yahoo](#), [update_instruments.TTR](#) [update_instruments.iShares](#)

update_instruments.yahoo

updates instrument metadata with data from yahoo

Description

Adds/updates information in instrument with data downloaded from yahoo

Usage

```
update_instruments.yahoo(Symbols = c("stocks", "all"), verbose = FALSE)
```

```
update_instruments.TTR(
  Symbols = c("stocks", "all"),
  exchange = c("AMEX", "NASDAQ", "NYSE"),
  silent = FALSE
)
```

Arguments

Symbols	can be a vector of instrument names, or, can be 'all' or 'stocks' or, for update_instruments.TTR, can be NULL in which case all stocks found with stockSymbols will be defined
verbose	be verbose?
exchange	character vector of names of exchanges. Used in 'TTR' method. Can be "AMEX", "NASDAQ", or "NYSE"
silent	silence warnings?

Details

Although these functions are intended to update the metadata of previously defined instruments, update_instruments.TTR will define the stocks if they do not already exist.

update_instruments.TTR is only to be used on U.S. stocks denominated in USD.

Value

called for side-effect

Author(s)

Garrett See

References

Yahoo! Finance "finance.yahoo.com" and YahooQuote

See Also

[update_instruments.instrument](#), [update_instruments.morningstar](#), [update_instruments.masterDATA](#), [stockSymbols](#), [stock](#)

Examples

```
## Not run:
stock('GS',currency('USD'))
update_instruments.yahoo('GS')
getInstrument('GS')
update_instruments.TTR('GS')
getInstrument('GS')

## End(Not run)
```

volep	<i>generate endpoints for volume bars</i>
-------	---

Description

generate endpoints for volume bars

Usage

```
volep(x, units)
```

Arguments

- x time series containing 'Volume' column
- units volume sum to mark for bars

Value

An integer vector containing row positions where cumulative volume crosses successive multiples of 'units'. These positions may be used as endpoints for constructing volume bars.

Author(s)

Joshua Ulrich

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