

Package 'RTL'

June 17, 2022

Type Package

Title Risk Tool Library - Trading, Risk, 'Analytics' for Commodities

Version 1.2.0

Date 2022-06-17

Description A toolkit for Commodities 'analytics', risk management and trading professionals. Includes functions for API calls to 'Morningstar Commodities' and 'Genscape'.

License MIT + file LICENSE

URL <https://github.com/risktoollib/RTL>

Depends R (>= 4.0)

Imports dplyr, ggplot2, httr, jsonlite, lubridate, magrittr, plotly, purrr, RCurl, readr, rlang, stringr, tibble, tidyr, timetk, tsibble, xts, zoo, glue, Rcpp, lifecycle,

Suggests testthat (>= 3.0.0), covr, lpSolve, PerformanceAnalytics, rgdal, rugarch, tidyquant, feasts, fabletools, MASS

Encoding UTF-8

LazyData true

LazyDataCompression xz

RoxygenNote 7.2.0

Config/testthat/edition 3

LinkingTo Rcpp

NeedsCompilation yes

Author Philippe Cote [aut, cre],
Nima Safaian [aut]

Maintainer Philippe Cote <pcote@ualberta.ca>

Repository CRAN

Date/Publication 2022-06-17 16:40:03 UTC

R topics documented:

bond	3
cancrudeassays	4
cancrudeassayssum	4
cancrudeprices	5
chart_eia_sd	5
chart_eia_steo	6
chart_fwd_curves	7
chart_pairs	8
chart_PerfSummary	8
chart_spreads	9
chart_zscore	11
CRReuro	12
crudeassaysBP	13
crudeassaysXOM	13
crudes	13
dflong	14
dfwide	14
distdescplot	15
efficientFrontier	15
eia2tidy	16
eiaStocks	17
eiaStorageCap	18
eurodollar	18
expiry_table	19
fitOU	19
fizdiffs	20
fx fwd	20
garch	21
getCurve	21
getGenscapePipeOil	23
getGenscapeStorageOil	24
getGIS	25
getPrice	26
getPrices	29
holidaysOil	30
npv	30
planets	31
promptBeta	32
ref.opt.inputs	33
ref.opt.outputs	33
refineryLP	33
returns	34
rolladjust	35
simGBM	35
simMultivariates	36
simOU	37

simOUJ	38
simOUt	39
spot2futConvergence	40
spot2futCurve	41
spy	41
swapCOM	42
swapFutWeight	43
swapInfo	44
swapIRS	45
tickers_eia	46
tradeCycle	47
tradeHubs	47
tradeprocess	47
tradeStats	48
tsQuotes	48
usSwapCurves	49
usSwapCurvesPar	49
wtiSwap	49
Index	50

 bond

Bond pricing

Description

Compute bond price, cash flow table and duration

Usage

```
bond(ytm = 0.05, C = 0.05, T2M = 1, m = 2, output = "price")
```

Arguments

ytm	Yield to Maturity
C	Coupon rate per annum
T2M	Time to maturity in years
m	Periods per year for coupon payments e.g semi-annual = 2.
output	"price", "df" or "duration"

Value

Price, cash flows data frame and/or duration

Author(s)

Philippe Cote

Examples

```
bond(ytm = 0.05, C = 0.05, T2M = 1, m = 2, output = "price")  
bond(ytm = 0.05, C = 0.05, T2M = 1, m = 2, output = "df")  
bond(ytm = 0.05, C = 0.05, T2M = 1, m = 2, output = "duration")
```

cancrudeassays	<i>Data for Canadian crude assays reported by Crude Monitor</i>
----------------	---

Description

Data set with historical Canadian Crude Assays.

Usage

```
cancrudeassays
```

Format

data frame

Source

<https://crudemonitor.ca/>

cancrudeassayssum	<i>Summarized data for Canadian crude assays</i>
-------------------	--

Description

Data set with historical Canadian Crude Assays Statistics.

Usage

```
cancrudeassayssum
```

Format

data frame

Source

<https://crudemonitor.ca/>

cancrudeprices	<i>Randomized data for Canadian crude pricing.</i>
----------------	--

Description

Randomized data of Canadian Crude monthly prices versus WTI Calendar Month Average.

Usage

```
cancrudeprices
```

Format

```
data frame
```

chart_eia_sd	<i>EIA weekly Supply Demand information by product group</i>
--------------	--

Description

Given a product group extracts all information to create SD Balances.

Usage

```
chart_eia_sd(
  market = "mogas",
  key = "your EIA.gov API key",
  from = "2011-01-01",
  legend.pos = list(x = 0.4, y = 0.53),
  output = "chart"
)
```

Arguments

market	"mogas", "dist", "jet" or "resid".
key	Your private EIA API token.
from	Date as character "2020-07-01". Default to all dates available.
legend.pos	Defaults to list(x = 0.4, y = 0.53)
output	"chart" for plotly object or "data" for dataframe.

Value

A plotly object or a dataframe

Author(s)

Philippe Cote

Examples

```
## Not run:
chart_eia_sd(key = key, market = "mogas")

## End(Not run)
```

chart_eia_steo

EIA Short Term Energy Outlook

Description

Extract data and either plots or renders dataframe.

Usage

```
chart_eia_steo(
  market = "globalOil",
  key = "your EIA.gov API key",
  from = "2018-07-01",
  fig.title = "EIA STEO Global Liquids SD Balance",
  fig.units = "million barrels per day",
  legend.pos = list(x = 0.4, y = 0.53),
  output = "chart"
)
```

Arguments

market	"globalOil" only currently implemented.
key	Your private EIA API token.
from	Date as character "2020-07-01". Default to all dates available.
fig.title	Defaults to "EIA STEO Global Liquids SD Balance".
fig.units	Defaults to "million barrels per day"
legend.pos	Defaults to list(x = 0.4, y = 0.53)
output	"chart" for plotly object or "data" for dataframe.

Value

A plotly object or a dataframe

Author(s)

Philippe Cote

Examples

```
## Not run:  
chart_eia_steo(key = EIAkey, market = "globalOil")  
  
## End(Not run)
```

chart_fwd_curves *Plots historical forward curves*

Description

Returns a plot of forward curves through time

Usage

```
chart_fwd_curves(df = dfwide, cmdty = "cmewti", weekly = TRUE, ...)
```

Arguments

df	Wide dataframe with date column and multiple series columns (multivariate)
cmdty	Futures contract code in expiry_table object: unique(expiry_table\$cmdty)
weekly	Defaults to TRUE for weekly forward curves
...	other graphical parameters

Value

plot of forward curves through time

Author(s)

Philippe Cote

Examples

```
df <- dfwide %>%  
  dplyr::select(date, dplyr::starts_with("CL")) %>%  
  tidyr::drop_na()  
chart_fwd_curves(  
  df = df, cmdty = "cmewti", weekly = TRUE,  
  main = "WTI Forward Curves", ylab = "$ per bbl", xlab = "", cex = 2  
)
```

chart_pairs *Pairwise scatter plots for timeseries*

Description

Plots pairwise scatter plots with the time dimension. Useful when exploring structural changes in timeseries properties for modeling.

Usage

```
chart_pairs(df = df, title = "Time Series Pairs Plot")
```

Arguments

df	Wide data frame
title	Chart title

Value

A plotly object

Author(s)

Philippe Cote

Examples

```
df <- dfwide %>%  
  dplyr::select(date, CL01, NG01, HO01, RB01) %>%  
  tidyr::drop_na()  
chart_pairs(df = df, title = "example")
```

chart_PerfSummary *Cumulative performance and drawdown summary.*

Description

Multi Asset Display of Cumulative Performance and Drawdowns

Usage

```
chart_PerfSummary(  
  ret = ret,  
  geometric = TRUE,  
  main = "Cumulative Returns and Drawdowns",  
  linesize = 1.25  
)
```


Arguments

ret	Wide dataframe univariate or multivariate of percentage returns.
geometric	Use geometric returns TRUE or FALSE.
main	Chart title.
linesize	Size of lines in chart and legend.

Value

Cumulative performance and drawdown charts.

Author(s)

Philippe Cote

Examples

```
ret <- data.frame(
  date = seq.Date(Sys.Date() - 60, Sys.Date(), 1),
  CL01 = rnorm(61, 0, .01), RB01 = rnorm(61, 0, 0.02)
)
chart_PerfSummary(ret = ret,
  geometric = TRUE,
  main = "Cumulative Returns and Drawdowns",
  linesize = 1.25)
```

chart_spreads

Futures contract spreads comparison across years

Description

Plots specific contract pairs across years with time being days from expiry.

Usage

```
chart_spreads(
  cpairs = cpairs,
  daysFromExpiry = 200,
  from = "2012-01-01",
  conversion = c(1, 1),
  feed = "CME_NymexFutures_EOD",
  iuser = "x@xyz.com",
  ipassword = "pass",
  title = "March/April ULSD Nymex Spreads",
  yaxis = "$ per bbl",
  output = "chart"
)
```

Arguments

cpairs	Data frame of contract pairs - see example.
daysFromExpiry	Number of days (numeric) from expiry to compute spreads.
from	From date as character string
conversion	Defaults to c(1,1) first and second contracts. 42 from \$ per gallons to bbls.
feed	Morningstar Feed Table.
iuser	Morningstar user name as character - sourced locally in examples.
ipassword	Morningstar user password as character - sourced locally in examples.
title	Title for chart.
yaxis	y-axis label.
output	"chart" for plotly object or "data" for dataframe.

Value

A plotly object or a dataframe

Author(s)

Philippe Cote

Examples

```
## Not run:
cpairs <- dplyr::tibble(
  year = c("2014", "2019", "2020"),
  first = c("@H04H", "@H09H", "@H00H"),
  second = c("@CL4J", "@CL9J", "@CL0J")
)
chart_spreads(
  cpairs = cpairs, daysFromExpiry = 200, from = "2012-01-01",
  conversion = c(42, 1), feed = "CME_NymexFutures_EOD",
  iuser = "x@xyz.com", ipassword = "pass",
  title = "March/April ULSD Nymex Spreads",
  yaxis = "$ per bbl",
  output = "data"
)

## End(Not run)
```

chart_zscore	<i>Z-Score applied to seasonal data divergence</i>
--------------	--

Description

Supports analytics and display of seasonal data. Z-Score is computed on residuals conditional on their seasonal period. Beware that most seasonal charts in industry e.g. (NG Storage) is not de-trended so results once you apply an STL decomposition will vary from the unadjusted seasonal plot.

Usage

```
chart_zscore(
  df = df,
  title = "NG Storage Z Score",
  per = "yearweek",
  output = "zscore",
  chart = "seasons"
)
```

Arguments

df	Long data frame with columns series, date and value
title	Default is a blank space returning the unique value in df\$series.
per	Frequency of seasonality "yearweek" (DEFAULT). "yearmonth", "yearquarter"
output	"stl" for STL decomposition chart, "stats" for STL fitted statistics. "res" for STL fitted data. "zscore" for residuals Z-score, "seasonal" for standard seasonal chart.
chart	"seasons" for feasts::gg_season() (DEFAULT) "series" for feasts::gg_subseries()

Value

Time series of STL decomposition residuals Z-Scores, or standard seasonal chart with feast package.

Author(s)

Philippe Cote

Examples

```
## Not run:
df <- eiaStocks %>% dplyr::filter(series == "NGLower48")
title <- "NGLower48"
chart_zscore(df = df, title = " ", per = "yearweek", output = "stl", chart = "seasons")
chart_zscore(df = df, title = " ", per = "yearweek", output = "stats", chart = "seasons")
chart_zscore(df = df, title = " ", per = "yearweek", output = "res", chart = "seasons")
```

```

chart_zscore(df = df, title = " ", per = "yearweek", output = "zscore", chart = "seasons")
chart_zscore(df = df, title = " ", per = "yearweek", output = "seasonal", chart = "seasons")

## End(Not run)

```

CRReuro

Cox-Ross-Rubinstein binomial option model

Description

European option binomial model on a stock without dividends. For academic purpose only. Use `fOptions::CRRBinomialTreeOptions` for real-life usage.

Usage

```
CRReuro(S, X, sigma, r, T2M, N, type)
```

Arguments

S	Stock price.
X	Strike price.
sigma	Implied volatility e.g. 0.20
r	Risk-free rate.
T2M	Time to maturity in years
N	Number of time steps. Internally $dt = T2M/N$.
type	"call" or "put"

Value

List of asset price tree, option value tree and option price.

Author(s)

Philippe Cote

Examples

```
CRReuro(S = 100, X = 100, sigma = 0.2, r = 0.1, T2M = 1, N = 5, type = "call")
```

crudeassaysBP	<i>Data for BP crude assays</i>
---------------	---------------------------------

Description

Crude Assays from BP.

Usage

crudeassaysBP

Format

data frame

crudeassaysXOM	<i>Data for ExxonMobil crude assays</i>
----------------	---

Description

Crude Assays from ExxonMobil.

Usage

crudeassaysXOM

Format

data frame

crudes	<i>Data for crude assays of 50+ types of crude oil.</i>
--------	---

Description

Crude oil qualities.

Usage

crudes

Format

data frame

Source

Canadian Crude Monitor and BP Crude Assays

dflong

Data for commodity prices in a long dataframe format

Description

Futures settlement data set.

Usage

dflong

Format

data frame

Source

Morningstar Commodities

dfwide

Data for commodity prices in a wide dataframe format

Description

Futures settlement data set.

Usage

dfwide

Format

data frame

Source

Morningstar Commodities

`distdescplot`*Summary of distribution properties of a timeseries*

Description

Provides a summary of returns distribution

Usage

```
distdescplot(x = x)
```

Arguments

`x` Wide dataframe with date column and single series (univariate).

Value

Multiple plots describing the distribution.

Author(s)

Philippe Cote

Examples

```
x <- dplyr::tibble(  
  date = seq.Date(Sys.Date() - 1000, Sys.Date(), 1),  
  CL01 = c(rnorm(501, 0, 0.02), rnorm(500, 0, 0.01))  
)  
distdescplot(x = x)
```

`efficientFrontier`*Markowitz Efficient Frontier*

Description

Generates random portfolio weights statistics based on absolute returns.

Usage

```
efficientFrontier(  
  nsims = 5000,  
  x = RTL::fizdiffs %>% dplyr::select(date, dplyr::contains("WCS")),  
  expectedReturns = NULL  
)
```

Arguments

nsims	Number of portfolio simulations. Defaults to 5000
x	List as provided by output of <code>RTL::simMultivariates()</code> .
expectedReturns	Defaults to NULL using periodic returns means.

Details**Commodities:**

Unlike traditional portfolio management, in commodities many transactions are with derivatives (futures and swaps) and have zero or low initial investments.

Return types:

This function is used for commodities where returns are dollars per units for real assets e.g. storage tanks, pipelines...Here we measure directly the periodic return in dollars per contract unit.

Empirical Finance:

I would encourage you to pick a commodity futures contract of your choice and draw a scatter plot of price level versus the daily dollar per unit change as measure of risk. As a trading analyst or risk manager, then ask yourself about the implications of using log returns that you then re-apply to current forward curve level to arrive at a dollar risk measure per units instead of measuring directly risk in dollars per unit.

Value

List of portfolios and chart of efficient frontier

Author(s)

Philippe Cote

Examples

```
x = RTL::fizdiffs %>% dplyr::select(date, dplyr::contains("WCS"))
efficientFrontier(nsims = 10, x = x, expectedReturns = NULL)
efficientFrontier(nsims = 10, x = x, expectedReturns = c(0.5,0.8,0.9))
```

eia2tidy

EIA API call with tidy output

Description

Extracts data from the Energy Information Administration (EIA) API to tibble format with optional custom series name. Makes a clean wrapper for use with purrr for multiple series extraction. Query Browser at <https://www.eia.gov/opendata/qb.php>.

Usage

```
eia2tidy(ticker, key, name = " ")
```

Arguments

ticker	EIA series name.
key	Your private EIA API token as character "yourapikey".
name	Name you want to give the series. Defaults to ticker if set to " "

Value

A tibble object with class date for weekly, monthly, quarterly or annual data and class POSIXct for hourly.

Author(s)

Philippe Cote

Examples

```
## Not run:
# Single Series
RTL::eia2tidy(ticker = "PET.MCRFPTX2.M", key = "yourapikey", name = "TexasProd")
# Multiple Series
eia_df <- tibble::tribble(
  ~ticker, ~name,
  "PET.W_EPC0_SAX_YCUOK_MBBL.W", "CrudeCushing",
  "NG.NW2_EPG0_SWO_R48_BCF.W", "NGLower48"
) %>%
  dplyr::mutate(key = "EIAkey") %>%
  dplyr::mutate(df = purrr::pmap(list(ticker, key, name), .f = RTL::eia2tidy)) %>%
  dplyr::select(df) %>%
  tidyr::unnest(df)

## End(Not run)
```

eiaStocks

Data for EIA weekly stocks

Description

EIA weekly crude, NG, ULSD and RBOB stocks.

Usage

```
eiaStocks
```

Format

data frame

eiaStorageCap	<i>Data for working storage capacity in the US</i>
---------------	--

Description

EIA working storage capacity in kbs except NG in bcf.

Usage

eiaStorageCap

Format

data frame

eurodollar	<i>Data for Eurodollar futures contracts</i>
------------	--

Description

ED futures contract for December 2024

Usage

eurodollar

Format

data frame

Source

Morningstar

expiry_table	<i>Metadata for expiry of common commodity futures contract.</i>
--------------	--

Description

This dataframe provides detailed information on major futures contracts specifications pertaining to last settlement, notices and delivery dates. It also provides tickers in some data service.

Usage

```
expiry_table
```

Format

```
data frame
```

fitOU	<i>Fits a Ornstein–Uhlenbeck process to a dataset</i>
-------	---

Description

Parameter estimation for Ornstein–Uhlenbeck process

Usage

```
fitOU(spread)
```

Arguments

```
spread          Spread time series.
```

Value

List of alpha, mu and sigma estimates

Author(s)

Philippe Cote

Examples

```
spread <- simOU(mu = 5, theta = .5, sigma = 0.2, T = 5, dt = 1 / 250)
fitOU(spread)
```

fizdiffs	<i>Randomized data of physical crude differentials</i>
----------	--

Description

Randomized data set for education purpose of selected physical crude differentials to WTI.

Usage

fizdiffs

Format

data frame

fxfwd	<i>Data for USDCAD FX forward rates</i>
-------	---

Description

USDCAD 1-year and 5-year forward points

Usage

fxfwd

Format

data frame

Source

Morningstar

garch	<i>Wrapper for a Garch(1,1) returning either a plot or data.</i>
-------	--

Description

Computes annualised Garch(1,1) volatilities using fGarch package.

Usage

```
garch(x = x, out = TRUE)
```

Arguments

x	Wide dataframe with date column and single series (univariate).
out	"chart" to return chart, "data" to return data or "fit" for garch fit output

Value

plot.xts object or xts series

Author(s)

Philippe Cote

Examples

```
## Not run:
x <- dflong %>% dplyr::filter(series == "CL01")
x <- returns(df = x, retType = "rel", period.return = 1, spread = TRUE)
x <- rolladjust(x = x, commodityname = c("cmewti"), rolltype = c("Last.Trade"))
summary(garch(x = x, out = "fit"))
garch(x = x, out = "chart")
garch(x = x, out = "data")

## End(Not run)
```

getCurve	<i>Morningstar Commodities API forward curves</i>
----------	---

Description

Returns forward curves from Morningstar API. See below for current feeds supported. You need your own credentials with Morningstar.

Usage

```

getCurve(
  feed = "Crb_Futures_Price_Volume_And_Open_Interest",
  contract = "CL",
  date = "2020-08-10",
  fields = c("Open, High, Low, Close"),
  iuser = "x@xyz.com",
  ipassword = "pass"
)

```

Arguments

feed	Morningstar Feed Table e.g "Crb_Futures_Price_Volume_And_Open_Interest".
contract	Morningstar contract root e.g. "CL" for CME WTI and "BG" for ICE Brent.
date	From date as character string.
fields	Defaults to c("Open, High, Low, Close").
iuser	Morningstar user name as character - sourced locally in examples.
ipassword	Morningstar user password as character - sourced locally in examples.

Value

wide data frame

Current Feeds Supported

- Crb_Futures_Price_Volume_And_Open_Interest
- CME_NymexFuturesIntraday_EOD
- ICE_EuroFutures and ICE_EuroFutures_continuous

Author(s)

Philippe Cote

Examples

```

## Not run:
# CME WTI Futures
getCurve(
  feed = "Crb_Futures_Price_Volume_And_Open_Interest", contract = "CL",
  date = "2020-07-13", fields = c("Open, High, Low, Close"),
  iuser = "x@xyz.com", ipassword = "pass"
)

getCurve(
  feed = "Crb_Futures_Price_Volume_And_Open_Interest", contract = "BG",
  date = "2020-07-13", fields = c("Open, High, Low, Close"),
  iuser = "x@xyz.com", ipassword = "pass"
)

```

```

getCurve(
  feed = "LME_ClosingPriceDelayed", contract = "AHD",
  date = "2021-06-25", fields = c("Last_Price"),
  iuser = "x@xyz.com", ipassword = "pass"
)

## End(Not run)

```

getGenscapePipeOil *Genscape API call for oil pipelines*

Description

Returns oil pipeline flows in barrels per day data from Genscape API. You need your own credentials. Refer to API documentation for argument values. It is assumed if you use this function that you know the pipelines you need to extract to build supply demand balances. Use the online API to identify the pipeline IDs. <https://developer.genscape.com/docs/services/oil-transportation/operations/GetPipelineFlowValues>

Usage

```

getGenscapePipeOil(
  frequency = "daily",
  regions = "Canada",
  pipelineIDs = c(97),
  revision = "revised",
  limit = 5000,
  offset = 0,
  startDate = "2015-01-01",
  endDate = as.character(Sys.Date()),
  apikey = "yourapikey"
)

```

Arguments

frequency	"daily" DEFAULT.
regions	See API webpage. Multiple values separated by commas e.g. "Canada", "Gulf-Coast").
pipelineIDs	See API webpage. c(98,54...) for specific pipes.
revision	See API webpage.
limit	See API webpage. Max 5000
offset	See API webpage.
startDate	"yyyy-mm-dd" as character string
endDate	"yyyy-mm-dd" as character string
apikey	Your API key as a character string.

Value

wide data frame

Author(s)

Philippe Cote

Examples

```
## Not run:
getGenscapePipeOil(
  frequency = "daily", regions = "Canada", pipelineIDs = c(97),
  revision = "revised", limit = 5000, offset = 0,
  startDate = "2015-01-01", endDate = as.character(Sys.Date()),
  apikey = "yourapikey"
)

## End(Not run)
```

getGenscapeStorageOil *Genscape API call for oil storage*

Description

Returns oil storage data from Genscape API. You need your own credentials. Refer to API documentation for argument values. <https://developer.genscape.com/docs/services/oil-storage/operations/StorageVolumeByOwnerGet>

Usage

```
getGenscapeStorageOil(
  feed = "owner-volumes",
  regions = "Canada",
  products = "Crude",
  revision = "revised",
  limit = 5000,
  offset = 0,
  startDate = "2011-01-01",
  endDate = as.character(Sys.Date()),
  apikey = "yourapikey"
)
```

Arguments

feed	"owner-volumes" DEFAULT or "tank-volumes"
regions	See API webpage. Multiple values separated by commas e.g. "Canada, Cushing").

products	See API webpage. Multiple values separated by commas e.g. "Crude, JetFuel").
revision	See API webpage.
limit	See API webpage. Max 5000
offset	See API webpage.
startDate	"yyyy-mm-dd" as character string
endDate	"yyyy-mm-dd" as character string
apikey	Your API key as a character string.

Value

wide data frame

Author(s)

Philippe Cote

Examples

```
## Not run:
# where yourapikey = "yourapikey".
getGenscapeStorageOil(
  feed = "owner-volumes", regions = "Canada", products = "Crude",
  revision = "revised", limit = 5000, offset = 0,
  startDate = "2011-01-01", endDate = "2020-11-01", apikey = yourapikey
)

## End(Not run)
```

getGIS

Extract and convert GIS data from a URL

Description

Returns a SpatialPointsDataFrame from a shapefile URL. @section Examples with EIA and Government of Alberta

- from https://www.eia.gov/maps/layer_info-m.php :
- `crudepipelines <- getGIS(url = "https://www.eia.gov/maps/map_data/CrudeOil_Pipelines_US_EIA.zip")`
- `refineries <- getGIS(url = "https://www.eia.gov/maps/map_data/Petroleum_Refineries_US_EIA.zip")`
- from <https://gis.energy.gov.ab.ca/Geoview/OSPNG>
- `AB <- getGIS(url = "https://gis.energy.gov.ab.ca/GeoviewData/OS_Agreements_Shape.zip")`

Usage

```
getGIS(  
  url = "https://gis.energy.gov.ab.ca/GeoviewData/OS_Agreements_Shape.zip"  
)
```

Arguments

url URL of the zipped shapefile

Value

SpatialPointsDataFrame

Author(s)

Philippe Cote

Examples

```
## Not run:  
getGIS(url = "https://gis.energy.gov.ab.ca/GeoviewData/OS_Agreements_Shape.zip")  
  
## End(Not run)
```

getPrice

Morningstar Commodities API single call

Description

Returns data from Morningstar API. See below for current feeds supported. You need your own credentials with Morningstar. In examples sourced locally.

Usage

```
getPrice(  
  feed = "CME_NymexFutures_EOD",  
  contract = "@CL21Z",  
  from = "2020-09-01",  
  iuser = "x@xyz.com",  
  ipassword = "pass"  
)
```

Arguments

feed	Morningstar Feed Table.
contract	Morningstar key.
from	From date as character string
iuser	Morningstar user name as character - sourced locally in examples.
ipassword	Morningstar user password as character - sourced locally in examples.

Value

wide data frame

Current Feeds Supported

- CME_CbotFuturesEOD and CME_CbotFuturesEOD_continuous
- CME_NymexFutures_EOD and CME_NymexFutures_EOD_continuous
- CME_NymexOptions_EOD
- CME_CmeFutures_EOD and CME_CmeFutures_EOD_continuous
- CME_Comex_FuturesSettlement_EOD and CME_Comex_FuturesSettlement_EOD_continuous
- LME_AskBidPrices_Delayed
- SHFE_FuturesSettlement_RT
- ICE_EuroFutures and ICE_EuroFutures_continuous
- ICE_NybotCoffeeSugarCocoaFutures and ICE_NybotCoffeeSugarCocoaFutures_continuous
- CME_STLCPC_Futures
- CFTC_CommitmentsOfTradersCombined. Requires multiple keys. Separate them by a space e.g. "N10 06765A NYME 01".
- Morningstar_FX_Forwards. Requires multiple keys. Separate them by a space e.g. "USD-CAD 2M".
- ERCOT_LmpsByResourceNodeAndElectricalBus.
- PJM_Rt_Hourly_Lmp.
- AESO_ForecastAndActualPoolPrice.

Author(s)

Philippe Cote

Examples

```
## Not run:
getPrice(
  feed = "CME_NymexFutures_EOD", contract = "@CL21Z",
  from = "2019-08-26", iuser = username, ipassword = password
)
getPrice(
  feed = "CME_NymexFutures_EOD_continuous", contract = "CL_006_Month",
```

```
    from = "2019-08-26", iuser = username, ipassword = password
)
getPrice(
    feed = "CME_NymexOptions_EOD", contract = "@L021ZP4000",
    from = "2020-03-15", iuser = username, ipassword = password
)
getPrice(
    feed = "CME_CbotFuturesEOD", contract = "C0Z",
    from = "2019-08-26", iuser = username, ipassword = password
)
getPrice(
    feed = "CME_CbotFuturesEOD_continuous", contract = "ZB_001_Month",
    from = "2019-08-26", iuser = username, ipassword = password
)
getPrice(
    feed = "CME_CmeFutures_EOD_continuous", contract = "HE_006_Month",
    from = "2019-08-26", iuser = username, ipassword = password
)
getPrice(
    feed = "Morningstar_FX_Forwards", contract = "USDCAD 2M",
    from = "2019-08-26", iuser = username, ipassword = password
)
getPrice(
    feed = "CME_CmeFutures_EOD", contract = "LH0N",
    from = "2019-08-26", iuser = username, ipassword = password
)
getPrice(
    feed = "CME_CmeFutures_EOD_continuous", contract = "HE_006_Month",
    from = "2019-08-26", iuser = username, ipassword = password
)
getPrice(
    feed = "ICE_EuroFutures", contract = "BRN0Z",
    from = "2019-08-26", iuser = username, ipassword = password
)
getPrice(
    feed = "ICE_EuroFutures_continuous", contract = "BRN_001_Month",
    from = "2019-08-26", iuser = username, ipassword = password
)
getPrice(
    feed = "ICE_NybotCoffeeSugarCocoaFutures", contract = "SB21H",
    from = "2019-08-26", iuser = username, ipassword = password
)
getPrice(
    feed = "ICE_NybotCoffeeSugarCocoaFutures_continuous", contract = "SF_001_Month",
    from = "2019-08-26", iuser = username, ipassword = password
)
getPrice(
    feed = "AESO_ForecastAndActualPoolPrice", contract = "Forecast_Pool_Price",
    from = "2021-04-01", iuser = username, ipassword = password
)
getPrice(
    feed = "LME_MonthlyDelayed_Derived", contract = "AHD 2021-12-01 2021-12-31",
    from = "2021-04-01", iuser = username, ipassword = password
```

```
)
## End(Not run)
```

getPrices

Morningstar Commodities API multiple calls

Description

Multiple Morningstar API calls using getPrice functions. Refer to getPrices() for list of currently supported data feeds.

Usage

```
getPrices(
  feed = "CME_NymexFutures_EOD",
  contracts = c("CL9Z", "CL0F", "CL0M"),
  from = "2019-01-01",
  iuser = "x@xyz.com",
  ipassword = "pass"
)
```

Arguments

feed	Morningstar Feed Table
contracts	Symbols vector
from	From date as character string
iuser	Morningstar user name as character - sourced locally in examples.
ipassword	Morningstar user password as character - sourced locally in examples.

Value

wide data frame

Author(s)

Philippe Cote

Examples

```
## Not run:
getPrices(
  feed = "CME_NymexFutures_EOD", contracts = c("@CL0Z", "@CL1F", "@CL21H", "@CL21Z"),
  from = "2020-01-01", iuser = username, ipassword = password
)

## End(Not run)
```

holidaysOil	<i>Metadata for NYMEX and ICE holiday calendars</i>
-------------	---

Description

Holiday calendars for NYMEX and ICE Brent

Usage

```
holidaysOil
```

Format

data frame

npv	<i>NPV</i>
-----	------------

Description

Computes NPV with discount factor interpolation. This function is used for teaching NPV and NPV at Risk and needs to be customized.

Usage

```
npv(
  init.cost = -375,
  C = 50,
  cf.freq = 0.25,
  TV = 250,
  T2M = 2,
  disc.factors = us.df,
  BreakEven = FALSE,
  BE.yield = 0.01
)
```

Arguments

init.cost	Initial investment cost
C	Periodic cash flow
cf.freq	Cash flow frequency in year fraction e.g. quarterly = 0.25
TV	Terminal Value
T2M	Time to Maturity in years
disc.factors	Data frame of discount factors using ir.df.us() function.
BreakEven	TRUE when using a flat discount rate assumption.
BE.yield	Set the flat IR rate when BreakEven = TRUE.

Value

List of NPV and NPV Data frame

Author(s)

Philippe Cote

Examples

```
npv(  
  init.cost = -375, C = 50, cf.freq = .5, TV = 250, T2M = 2,  
  disc.factors = RTL::usSwapCurves, BreakEven = FALSE, BE.yield = .0399  
)$npv  
npv(  
  init.cost = -375, C = 50, cf.freq = .5, TV = 250, T2M = 2,  
  disc.factors = RTL::usSwapCurves, BreakEven = FALSE, BE.yield = .0399  
)$df
```

planets

Data for IR compounding exercises

Description

Planet metrics from NASA

Usage

planets

Format

data frame

Source

<https://nssdc.gsfc.nasa.gov/planetary/factsheet/index.html>

promptBeta	<i>Computes betas of futures contracts with respect to the 1st line contract</i>
------------	--

Description

Returns betas of futures contracts versus front futures contract.

Usage

```
promptBeta(x = x, period = "all", betatype = "all", output = "chart")
```

Arguments

x	Wide dataframe with date column and multiple series columns (multivariate).
period	"all" or numeric period of time in last n periods as character eg "100".
betatype	"all" "bull" "bear".
output	"betas" or "chart"

Value

betas data frame or plotly chart of betas

Author(s)

Philippe Cote

Examples

```
## Not run:
x <- dflong %>% dplyr::filter(grepl("CL", series))
x <- x %>%
  dplyr::mutate(series = readr::parse_number(series)) %>%
  dplyr::group_by(series)
x <- RTL::returns(df = x, retType = "abs", period.return = 1, spread = TRUE)
x <- RTL::rolladjust(x = x, commodityname = c("cmewti"), rolltype = c("Last.Trade"))
x <- x %>% dplyr::filter(!grepl("2020-04-20|2020-04-21", date))
promptBeta(x = x, period = "all", betatype = "all", output = "chart")
promptBeta(x = x, period = "all", betatype = "all", output = "betas")
promptBeta(x = x, period = "100", betatype = "all", output = "betas")

## End(Not run)
```

ref.opt.inputs	<i>Metadata for teaching refinery optimization using a LP model - INPUTS</i>
----------------	--

Description

Simple refinery input to be used in running LP modeling for education purposes.

Usage

ref.opt.inputs

Format

data frame

ref.opt.outputs	<i>Metadata for teaching refinery optimization using a LP model - OUTPUTS</i>
-----------------	---

Description

Simple refinery outputs and constraints to be used in running LP modeling for education purposes.

Usage

ref.opt.outputs

Format

data frame

refineryLP	<i>LP model for refinery optimization</i>
------------	---

Description

Plain vanilla refinery optimization LP model.

Usage

refineryLP(crudes = ref.opt.inputs, products = ref.opt.outputs)

Arguments

crudes Data frame of crude inputs
 products Data frame of product outputs and max outputs.

Value

Optimal crude slate and profits

Author(s)

Philippe Cote

Examples

```
refineryLP(crudes = ref.opt.inputs, products = ref.opt.outputs)
```

returns *Compute absolute, relative or log returns.*

Description

Computes periodic returns from a dataframe ordered by date

Usage

```
returns(df = dflong, retType = "abs", period.return = 1, spread = FALSE)
```

Arguments

df Long dataframe with colnames = c("date", "value", "series")
 retType "abs" for absolute, "rel" for relative, or "log" for log returns.
 period.return Number of rows over which to compute returns.
 spread TRUE if you want to spread into a long dataframe.

Value

A dataframe object of returns.

Author(s)

Philippe Cote

Examples

```
x <- dflong %>% dplyr::filter(grepl("CL01", series))
returns(df = x, retType = "abs", period.return = 1, spread = TRUE)
```

rolladjust	<i>Adjusts daily returns for futures contracts roll</i>
------------	---

Description

Returns a xts price or return object adjusted for contract roll. The methodology used to adjust returns is to remove the daily returns on the day after expiry and for prices to adjust historical rolling front month contracts by the size of the roll at each expiry. This is conducive to quantitative trading strategies as it reflects the PL of a financial trader.

Usage

```
rolladjust(x, commodityname = c("cmewti"), rolltype = c("Last.Trade"), ...)
```

Arguments

x	A df of returns.
commodityname	Name of commodity in expiry_table: unique(expiry_table\$cmdty) or "cmecan" for WCW
rolltype	Type of contract roll: "Last.Trade" or "First.Notice".
...	Other parms

Value

Roll-adjusted xts object of returns

Author(s)

Philippe Cote

Examples

```
ret <- dplyr::tibble(date = seq.Date(Sys.Date() - 60, Sys.Date(), 1), CL01 = rnorm(61, 0, 1))
rolladjust(x = ret, commodityname = c("cmewti"), rolltype = c("Last.Trade"))
```

simGBM	<i>GBM process simulation</i>
--------	-------------------------------

Description

Simulates a Geometric Brownian Motion process

Usage

```
simGBM(  
  nsims = 1,  
  S0 = 10,  
  drift = 0,  
  sigma = 0.2,  
  T2M = 1,  
  dt = 1/12,  
  vec = TRUE  
)
```

Arguments

nsims	number of simulations. Defaults to 1
S0	Spot price at t=0
drift	Drift term in percentage
sigma	Standard deviation
T2M	Maturity in years
dt	Time step in period e.g. 1/250 = 1 business day.
vec	Vectorized implementation. Defaults to TRUE

Value

A tibble of simulated values

Author(s)

Philippe Cote

Examples

```
simGBM(nsims = 2, S0 = 10, drift = 0, sigma = 0.2, T2M = 1, dt = 1 / 12, vec = TRUE)
```

simMultivariates	<i>Multivariate Normal from historical dataset</i>
------------------	--

Description

Generates multivariate random epsilons using absolute returns.

Usage

```
simMultivariates(nsims = 10, x, s0 = NULL)
```

Arguments

nsims	Number of simulations. Defaults to 10
x	Wide data frame of prices with date as first column.
s0	Vector of starting value for each variables. Defaults to NULL with zero.

Value

List of means, sds, covariance matrix, correlation matrix and simulated values

Author(s)

Philippe Cote

Examples

```
simMultivariates(nsims = 10, x = RTL::fizdiffs, s0 = NULL)
```

simOU	<i>OU process simulation</i>
-------	------------------------------

Description

Simulates a Ornstein–Uhlenbeck process

Usage

```
simOU(
  nsims = 2,
  S0 = 5,
  mu = 5,
  theta = 0.5,
  sigma = 0.2,
  T2M = 1,
  dt = 1/12,
  epsilon = NULL
)
```

Arguments

nsims	number of simulations. Defaults to 2
S0	S at t=0
mu	Mean reversion level
theta	Mean reversion speed
sigma	Standard deviation
T2M	Maturity in years

dt Time step size e.g. $1/250 = 1$ business day.
 epsilon Defaults to NULL function generates its own. OPTIONAL: Array of epsilons for nsims = 1, if you want to feed your own e.g. in a multivariate context.

Value

A numeric vector of simulated values

Author(s)

Philippe Cote

Examples

```
simOU(nsims = 5, S0 = 5, mu = 5, theta = .5, sigma = 0.2, T2M = 1, dt = 1 / 12, epsilon = NULL)
simOU(nsims = 1, S0 = 5, mu = 5, theta = .5, sigma = 0.2, T2M = 1, dt = 1 / 12,
epsilon = matrix(rnorm(12,0,sqrt(1/12))))
simOU(nsims = 2, S0 = 5, mu = 5, theta = .5, sigma = 0.2, T2M = 1, dt = 1 / 12,
epsilon = replicate(2,rnorm(12,0,sqrt(1/12))))
```

simOUJ

OUJ process simulation

Description

Simulates a Ornstein–Uhlenbeck process with Jumps

Usage

```
simOUJ(
  nsims = 2,
  S0 = 5,
  mu = 5,
  theta = 10,
  sigma = 0.2,
  jump_prob = 0.05,
  jump_avesize = 2,
  jump_stdv = 0.05,
  T2M = 1,
  dt = 1/250
)
```

Arguments

nsims number of simulations. Defaults to 2
 S0 S at t=0
 mu Mean reversion level

theta	Mean reversion speed
sigma	Standard deviation
jump_prob	Probability of jumps
jump_avesize	Average size of jumps
jump_stdv	Standard deviation of jump average size
T2M	Maturity in years
dt	Time step size e.g. 1/250 = 1 business day.

Value

A numeric vector of simulated values

Author(s)

Philippe Cote

Examples

```
simOUJ(nsims = 2, S0 = 5, mu = 5, theta = .5, sigma = 0.2,
jump_prob = 0.05, jump_avesize = 3, jump_stdv = 0.05,
T2M = 1, dt = 1 / 12)
```

simOUt

OU process simulation

Description

Simulates a Ornstein–Uhlenbeck process with mu as a function of time

Usage

```
simOUt(
  nsims = 2,
  S0 = 0,
  mu = dplyr::tibble(t = 0:20, mr = c(rep(2, 7), rep(4, 14))),
  theta = 12,
  sigma = 0.2,
  T2M = 1,
  dt = 1/12
)
```

Arguments

nsims	number of simulations. Defaults to 2
S0	S at t=0
mu	data frame of mean reversion level as a function of time
theta	Mean reversion speed
sigma	Standard deviation
T2M	Maturity in years
dt	Time step size e.g. 1/250 = 1 business day.

Value

A numeric vector of simulated values

Author(s)

Philippe Cote

Examples

```
mu = dplyr::tibble(t = 0:20, mr = c(rep(2,7), rep(4,14)))  
simOut(nsims = 2, S0 = 5, mu = mu, theta = .5, sigma = 0.2, T2M = 1, dt = 1 / 12)
```

spot2futConvergence *Data for spot to futures convergence - historical data*

Description

Cash and futures

Usage

```
spot2futConvergence
```

Format

data frame

Source

Morningstar, EIA

spot2futCurve

Data for spot to futures convergence - forward curve

Description

Forward Curve

Usage

spot2futCurve

Format

data frame

Source

Morningstar, EIA

spy

Sample SPY ETF data set

Description

Stock price and returns for SPY

Usage

spy

Format

data frame

Source

Yahoo Finance

 swapCOM

Commodity Calendar Month Average Swaps

Description

Commodity swap pricing from exchange settlement

Usage

```
swapCOM(
  futures = futs,
  futuresNames = c("CL0M", "CL0N"),
  pricingDates = c("2020-05-01", "2020-05-30"),
  contract = "cmewti",
  exchange = "nymex"
)
```

Arguments

futures	Wide data frame of futures prices for the given swap pricing dates
futuresNames	Tickers of relevant futures contracts
pricingDates	Vector of start and end pricing dates as character. See example.
contract	Contract code in data(expiry_table). sort(unique(expiry_table\$cmdty)) for options.
exchange	Exchange code in data(holidaysOil). Currently only "nymex" and "ice" supported.

Value

Data frame of historical swap prices.

Author(s)

Philippe Cote

Examples

```
## Not run:
c <- paste0("CL0", c("M", "N", "Q"))
futs <- getPrices(
  feed = "CME_NymexFutures_EOD", contracts = c, from = "2019-08-26",
  iuser = username, ipassword = password
)
swapCOM(
  futures = futs, futuresNames = c("CL0M", "CL0N"),
  pricingDates = c("2020-05-01", "2020-05-30"), contract = "cmewti", exchange = "nymex"
)
```

```
## End(Not run)
```

swapFutWeight	<i>Commodity Calendar Month Average Swap futures weights</i>
---------------	--

Description

Returns the percentage weight of the future in Calendar Month Average swaps

Usage

```
swapFutWeight(
  Month = "2020-09-01",
  contract = "cmewti",
  exchange = "nymex",
  output = "first.fut.weight"
)
```

Arguments

Month	First calendar day of the month.
contract	Contract code in data(expiry_table). sort(unique(expiry_table\$comdty)) for options.
exchange	Exchange code in data(holidaysOil). Currently only "nymex" and "ice" supported.
output	Either "numDaysFut1", "numDaysFut2" or "first.fut.weight"

Value

What you defined in outputs. If first.fut.weight, to compute swap 1 - first.fut.weight = % applied to 2nd line contract.

Author(s)

Philippe Cote

Examples

```
swapFutWeight(
  Month = "2020-09-01",
  contract = "cmewti", exchange = "nymex", output = "first.fut.weight"
)
```

 swapInfo

Commodity Swap details to learn their pricing

Description

Returns dataframe required to price a WTI averaging instrument based on first line settlements.

Usage

```
swapInfo(
  date = "2020-05-06",
  feeds = dplyr::tibble(feed = c("Crb_Futures_Price_Volume_And_Open_Interest",
    "CME_NymexFutures_EOD_continuous"), ticker = c("CL", "CL_001_Month")),
  contract = "cmewti",
  exchange = "nymex",
  iuser = "x@xyz.com",
  ipassword = "pass",
  output = "all"
)
```

Arguments

date	Character date as of which you want to extract daily settlement and forward values.
feeds	Feeds for Morningstar getCurve() and getPrice().
contract	Contract code in data(expiry_table). sort(unique(expiry_table\$cmdty)) for options.
exchange	Exchange code in data(holidaysOil). Defaults to "nymex".
iuser	Morningstar user name as character - sourced locally in examples.
ipassword	Morningstar user password as character - sourced locally in examples.
output	"chart" or "all"

Value

Plot or a list of data frame and plot if output = "all".

Author(s)

Philippe Cote

Examples

```
## Not run:
feeds <- dplyr::tibble(
  feed = c(
    "Crb_Futures_Price_Volume_And_Open_Interest",
    "CME_NymexFutures_EOD_continuous"
  ),
  ticker = c("CL", "CL_001_Month")
)
swapInfo(
  date = "2020-05-06", feeds = feeds, contract = "cmewti", exchange = "nymex",
  iuser = "x@xyz.com", ipassword = "pass", output = "all"
)

## End(Not run)
```

 swapIRS

Interest Rate Swap

Description

Computes the mark to market of an IRS

Usage

```
swapIRS(
  trade.date = lubridate::today(),
  eff.date = lubridate::today() + 2,
  mat.date = lubridate::today() + 2 + lubridate::years(2),
  notional = 1e+06,
  PayRec = "Rec",
  fixed.rate = 0.05,
  float.curve = usSwapCurves,
  reset.freq = 3,
  disc.curve = usSwapCurves,
  convention = c("act", 360),
  bus.calendar = "NY",
  output = "price"
)
```

Arguments

trade.date	Date object. Defaults to today().
eff.date	Date object. Defaults to today() + 2 days.
mat.date	Date object. Defaults to today() + 2 years.
notional	Numeric value of notional. Defaults to 1,000,000.

PayRec	"Pay" or "Rec" fixed.
fixed.rate	Numeric fixed interest rate. Defaults to 0.05.
float.curve	List of interest rate curves. Defaults to data("usSwapCurves").
reset.freq	Numeric where 1 = "monthly", 3 = quarterly, 6 = Semi annual 12 = yearly.
disc.curve	List of interest rate curves. Defaults to data("usSwapCurves").
convention	Vector of convention e.g. c("act",360) c(30,360),...
bus.calendar	Banking day calendar. Not implemented.
output	"price" for swap price or "all" for price, cash flow data frame, duration.

Value

List of swap price, cash flow data frame, duration.

Author(s)

Philippe Cote

Examples

```
data("usSwapCurves")
swapIRS(
  trade.date = as.Date("2020-01-04"), eff.date = as.Date("2020-01-06"),
  mat.date = as.Date("2022-01-06"), notional = 1000000,
  PayRec = "Rec", fixed.rate = 0.05, float.curve = usSwapCurves, reset.freq = 3,
  disc.curve = usSwapCurves, convention = c("act", 360),
  bus.calendar = "NY", output = "all"
)
```

tickers_eia

Metadata of key EIA tickers grouped by products.

Description

Supports automated upload of EIA data through its API by categories. Data frame organized by Supply Demand categories and products.

Usage

tickers_eia

Format

data frame

tradeCycle	<i>Data for Canadian and US physical crude trading calendars</i>
------------	--

Description

Crude Trading Trade Cycles

Usage

tradeCycle

Format

data frame

tradeHubs	<i>GIS Data for Crude Oil Trading Hubs</i>
-----------	--

Description

Trading Hubs

Usage

tradeHubs

Format

data frame

tradeprocess	<i>Data for teaching the various ways to monetize a market call.</i>
--------------	--

Description

Data set for explaining the various ways to monetize a market view.

Usage

tradeprocess

Format

data frame

tradeStats	<i>Risk-reward statistics for quant trading</i>
------------	---

Description

Compute list of risk reward metrics

Usage

```
tradeStats(x, Rf = 0)
```

Arguments

x	Univariate xts object of returns OR dataframe with date and return variables.
Rf	Risk-free rate

Value

List of risk/reward metrics.

Author(s)

Philippe Cote

Examples

```
library(PerformanceAnalytics)
tradeStats(x = RTL::spy, Rf = 0)
```

tsQuotes	<i>Interest Rate Curve Data for RQuantlib .</i>
----------	---

Description

USD IR curve input for RQuantlib::DiscountCurve

Usage

```
tsQuotes
```

Format

data frame

usSwapCurves	<i>Data for US interest rate discounting using zero rates curve.</i>
--------------	--

Description

USD IR Discount, Forward and Zero curves from RQuantlib::DiscountCurve

Usage

usSwapCurves

Format

List #' @source Morningstar and FRED

usSwapCurvesPar	<i>Data for US interest rate discounting using zero rates parallel curve.</i>
-----------------	---

Description

USD IR Discount, Forward and Zero curves from RQuantlib::DiscountCurve - Parallel toy data set

Usage

usSwapCurvesPar

Format

data frame

wtiSwap	<i>Data for WTI Calendar Month Average Swap pricing</i>
---------	---

Description

WTI Crude futures

Usage

wtiSwap

Format

data frame

Source

Morningstar

Index

* datasets

- cancrudeassays, 4
 - cancrudeassayssum, 4
 - cancrudeprices, 5
 - crudeassaysBP, 13
 - crudeassaysXOM, 13
 - crudes, 13
 - dflong, 14
 - dfwide, 14
 - eiaStocks, 17
 - eiaStorageCap, 18
 - eurodollar, 18
 - expiry_table, 19
 - fizdiffs, 20
 - fxfwd, 20
 - holidaysOil, 30
 - planets, 31
 - ref.opt.inputs, 33
 - ref.opt.outputs, 33
 - spot2futConvergence, 40
 - spot2futCurve, 41
 - spy, 41
 - tickers_eia, 46
 - tradeCycle, 47
 - tradeHubs, 47
 - tradeprocess, 47
 - tsQuotes, 48
 - usSwapCurves, 49
 - usSwapCurvesPar, 49
 - wtiSwap, 49
- bond, 3
- cancrudeassays, 4
 - cancrudeassayssum, 4
 - cancrudeprices, 5
 - chart_eia_sd, 5
 - chart_eia_steo, 6
 - chart_fwd_curves, 7
 - chart_pairs, 8
 - chart_PerfSummary, 8
 - chart_spreads, 9
 - chart_zscore, 11
 - CRReuro, 12
 - crudeassaysBP, 13
 - crudeassaysXOM, 13
 - crudes, 13
 - dflong, 14
 - dfwide, 14
 - distdescplot, 15
 - efficientFrontier, 15
 - eia2tidy, 16
 - eiaStocks, 17
 - eiaStorageCap, 18
 - eurodollar, 18
 - expiry_table, 19
 - fitOU, 19
 - fizdiffs, 20
 - fxfwd, 20
 - garch, 21
 - getCurve, 21
 - getGenscapePipeOil, 23
 - getGenscapeStorageOil, 24
 - getGIS, 25
 - getPrice, 26
 - getPrices, 29
 - holidaysOil, 30
 - npv, 30
 - planets, 31
 - promptBeta, 32
 - ref.opt.inputs, 33
 - ref.opt.outputs, 33
 - refineryLP, 33

returns, [34](#)
rolladjust, [35](#)

simGBM, [35](#)
simMultivariates, [36](#)
simOU, [37](#)
simOUJ, [38](#)
simOUt, [39](#)
spot2futConvergence, [40](#)
spot2futCurve, [41](#)
spy, [41](#)
swapCOM, [42](#)
swapFutWeight, [43](#)
swapInfo, [44](#)
swapIRS, [45](#)

tickers_eia, [46](#)
tradeCycle, [47](#)
tradeHubs, [47](#)
tradeprocess, [47](#)
tradeStats, [48](#)
tsQuotes, [48](#)

usSwapCurves, [49](#)
usSwapCurvesPar, [49](#)

wtiSwap, [49](#)