

Package ‘rtws’

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Title R api to Interactive brokers TWS

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Description This package provides access to the Interactive Brokers (IB) TWS API directly from R. It uses the formal Python api maintained by IB to emulate asynchronous threaded Python processes on the single-thread R platform.

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R topics documented:

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Description

The `rtws` package provides an interface for accessing Interactive Brokers' TWS API from R. Powered by the `reticulate` package, `rtws` runs IB's Python API in a multi-threaded Python environment and facilitates asynchronous communication with IB's servers.

Developed primarily for private use, the package implements only a subset of the functions and callbacks available in the official Python API. However, its structure has been designed to allow for easy extension.

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Details

Installation

- Step 1: Download and Install the Package

Download the package's `tar.gz` file and install it in R:

```
> install.packages("rtws.nn.nn.nnn.tar.gz", repos=NULL)
```

- Step 2: Install `reticulate`

Ensure the `reticulate` package is installed in R. If not, install it using:

```
> install.packages("reticulate")
```

or, as root directly from package management

```
$apt install r-cran-reticulate
```

- Step 3: Install Python and IB Python API

Make sure Python 3 and `pip3` are installed on your system. On most server platforms, these are pre-installed. If not, refer to the `reticulate` documentation for troubleshooting.

Next, download and install the official IB Python API from Interactive Brokers API. You can download it from <https://interactivebrokers.github.io/>. Follow the steps for installation.

You will also need to configure your TWS settings, such as port, trusted IP addresses, and API permissions. Detailed instructions are available at <https://www.interactivebrokers.com/campus/ibkr-api-page/twsapi-doc/#tws-settings>

- Step 4: Initialize the System

To initialize the system, load the library and connect:

```
> library(rtws)
> install_rtws()
> conn(host = "x.x.x.x", port = 0000L, clientId = 19L, verbose = 1)
```

Here, host is the IP address of the machine running TWS, and port is the one configured in TWS settings. If successful, rtws will return:
Connection ready with oid [int]

Architecture

The library offers three main categories of functions:

Blocking API functions Blocking functions return requested data immediately. These are suitable for requests involving static information, where asynchronous operations offer little benefit. Examples include:

- `reqIds`
- `searchSymbols`
- `accountUpdates`
- `contractDetails`
- `historicalData`
- `L2Exchanges`

non-blocking API functions Non-blocking functions leverage asynchronous data exchanges, running the Python API in the background as a thread (similar to a daemon). Data from callbacks is buffered and can be accessed explicitly. Non-blocking functions include:

- `realTimeBars`
- `mktData`
- `placeOrder`
- `openOrders`
- `execReport`

To retrieve buffered data, use:

- `read.nb`

Remember that requests persist until explicitly canceled. To prevent overflow, always cancel non-blocking requests and clean up with `read.nb` after cancellation.

Object preparation functions These functions create Python objects required for API calls but do not directly interact with TWS.

- `cntr`
- `ordr`
- `efltr`
- `pprint`
- `py2list`

accountUpdates	<i>request account status</i> — blocking
----------------	---

Description

Request curennt account and securities portfolio status

Usage

```
accountUpdates(acct)
```

Arguments

acct	character account name
------	------------------------

Value

returns a list with a) detailed account status and b) the account's securities portfolio positions.

Examples

```
## Not run:
acc <- accountUpdates("<account number or alias>")

## End(Not run)
```

contractDetails	<i>get contract details</i> — blocking
-----------------	---

Description

request contract details with sparse data request delivery of contract and associated information

This function can be used to look for all contacts that fulfill certain min criteria as suitable contracts. Operates on a list of contracts, too.

Usage

```
contractDetails(cnt)
```

Arguments

cnt	a contract object
-----	-------------------

Value

a nested list with contract attributes, contract details and the contract as Python object for contract.details result object. Contracts can be extracted using cntrd2cntr on this.

Examples

```
## Not run:
# one contract returned
c1 <- cntr(symbol="ES", localSymbol="ESH5", exchange = "CME", secType="FUT")
cd

# multiple contracts returned
c2 <- cntr(symbol="BAYN", secType="STK", exchange="SMART")
cd

## End(Not run)
```

histogram-data	<i>Request/ cancel histogram data</i>
----------------	---------------------------------------

Description

'histogramData' requests, 'cancelHistogramdata' cancels histogram data for a contractz

Usage

```
histogramData(cnt, useRTH = FALSE, period = "3 days")
```

Arguments

cnt	a contract object
useRTH	show bars within regular trading hours only
period	character period for hitogram

Details

tbd

Value

called for side-effect of triggering histogram callback

Examples

```
## Not run:
cc = cntr(symbol="EUR", currency="USD", secType="CASH", exchange="IDEALPRO")
rq <- histogramData(cc, period = "2 days")

read.nb(src="histogramData")

## End(Not run)
```

historicalData	<i>get historical market data</i> — blocking
----------------	---

Description

request historic market data used to obtain historic market data for a security
historic data is returned as bar data (open, high, low, close) plus counter of how many transactions occurred during the bar period. The bar width, duration are defined by the user within the limitations of the account used at IB.

Usage

```
historicalData(  
  cnt,  
  endDateTime = "",  
  durationStr = "10 D",  
  barSizeSetting = "1 hour",  
  whatToShow = "TRADES",  
  useRTH = "0"  
)
```

Arguments

cnt	a contract object
endDateTime	the time and date as (yyymmdd hh:mm:ss) up to when historic data should be delivered. Defaults to "", meaning up to now.
durationStr	a string specifying the duration from first to last bar, e.g. "3 M" for three months
barSizeSetting	the width of a single bar, starting with one sec "1 sec"
whatToShow	which data to return, e.g. "TRADES", "MIDPOINT", "BID", ...
useRTH	should data for regular trading hours only be returned (True, default)

Details

Some comments on the arguments for this request: endDateTime expects a character formatted "YYYYmmdd HH:MM:SS". durationStr consists of a integer number, then then one of: S (Second(s), D (Day(s)), W (Week(s)), M (Month(s)), Y (Year(s)) for example "8 W" for eight weeks. barSizeSettings accepts the following values:

1, 5, 10, 15, 30	secs
1, 2, 3, 5, 10, 15, 20, 30	mins
1, 2, 3, 4, 8	hrs
1	days
1	weeks
1	months

Value

returns data frame with the time series

Examples

```
## Not run:

c1 <- cntr(symbol="ES", localSymbol="ESH5", exchange = "CME", secType="FUT")
hd <- historicalData(c1)
hd

## End(Not run)
```

install-and-connect *setup rtws environment*

Description

install_rtws' creates a python environment with API functions that can called from R. \cr connstarts threads and disconnects threads from TWS and stops them.

Usage

```
install_rtws(py_env = "rtws")

conn(host = NULL, port = NULL, clientId = NULL, verbose = NULL)

disconn()
```

Arguments

py_env	Python virtual env, defaults to "rtws". It is not recommended to change the parameter.
host	server on which tws is running, default home
port	port number of tws host, default 7891L
clientId	Client Id for Tws, default 145L
verbose	verbose level

Details

install_rtws creates a python environment accessible from R with reticulate. Prepares the environment by importing necessary modules, especially the official IB API, and sources the rtws scripts providing the core functionality. Needs to be called just once after the rtwd library has been loaded. conn starts a background API thread and connects the thread to TWS. disconn disconnects threads from TWS and stops them.

Value

called for their side-effects

L2Exchanges	<i>mktDepthExchanges</i> — blocking
-------------	--

Description

list all exchanges for which level 2 permissions exist

Usage

```
L2Exchanges()
```

Details

immediately returns a list of exchanges and corresponding security types, on which user has level 2 market debth data permissions

Value

a list of exchanges and security types

mkt-tick-data	<i>Request tick data and cancel tick-data subscriptions</i> — non-blocking
---------------	---

Description

mktData requests a subscription to tick data, 'cancelMktData' cancels a subscription

Usage

```
mktData(cnt, genTickTypes = "", snapshot = F)
```

```
cancelMktData(reqids)
```

Arguments

cnt	a contract object
genTickTypes	optional list of one or more additional generic ticks
snapshot	• only one-time current data for security (no cancelMktData required)
reqids	request ids to cancel

Details

mktData requests tick data for a single instrument. However, often more than one security needs to be monitored. This can be achieved by successively calling this function, see examples. cancelMktData accepts a list of reqids.

Value

dataframe with ticks and matching reqId

Examples

```
## Not run:
c1  = cntr(symbol="AAPL",exchange="SMART",secType="STK",currency="USD")
## snapshot
rq <- mktData(c1, "snapshot")
Sys.sleep(1)
snap <- read.nb(rq = rq)

## multiple securities
## Since the call is non-blocking, it returns immediately. Calling `read.nb`
## at any later point in time will return the accumulated ticks as `data.frame`.
## Note that reqids and contracts have the same ordering, thus each reqId
## references a one contract. The resulting data.frame therefore includes a column
## with the reqIds allowing to map the contract to the data.

c2  = cntr(symbol="EUR",currency="USD",secType="CASH",exchange="IDEALPRO")
reqids <- lapply(list(c1,c2), mktData)
Sys.sleep(5)
cancelMktData(reqids)
ticks <- read.nb(unlist(reqids))

## End(Not run)
```

object-generation *functions to handle python objects*

Description

cntr allows setting up a contract object

- Any contract attribute may be given as a named argument (see details). Please refer to IB TWS Api documentation for more information.
- Typically minimum requirements for a valid contract are symbol, the exchange and the secType. There are however no guarantees. `ordr` create an order object manually
- This function creates an order object from scratch. `ordr` accepts any order attributes, which should be given as named arguments.
- The set of possible attributes of the order object is huge and not listed here. A minimal set of attributes is presented in the details section. `efltr` defines an executionFilter object that is required for `execReports` requests.

Usage

cntr(...)

ordr(...)

efltr(...)

Arguments

... named attributes of the object

Details

A Contract can be defined by the following attributes that need to be named parameters. Often symbol or localSymbol, exchange and secType are sufficient.

- character conId
- character symbol
- character secType
- character lastTradeDateOrContractMonth
- float strike
- character right
- character multiplier
- character exchange
- character primaryExchange
- character currency
- character localSymbol
- character tradingClass
- character includeExpired
- character secIdType
- character secId
- character description
- character issuerId

Alternatively, contractDetails can be used to get all matching contracts.

The IB order object has more than 150 attributes, which cannot be listed here. To read more about the API order object please refer to IB's documentation. However, here is the minimal set of attributes to submit an order:

- self.orderId required
- self.clientId optional
- self.action BUY or SELL
- self.totalQuantity float, usually integer

- self.orderType MKT,LMT,STP,...
- self.lmtPrice limit price
- self.auxPrice when order type expects more than one price
- self.tif Time in Force (DAY, GTC, etc.))

Please also note, that only a tiny part of the order functionality has been tested. Be extremely careful when using more complex trades or combos in a live trading account.

Execution data can be filtered along the following criteria:

- ClientId int The API client which placed the order.
- AcctCode string The account to which the order was allocated to.
- Time string Time from which the executions will be returned `yyyymmdd hh:mm:ss` Only those executions reported after the specified time will be returned.
- Symbol string The instrument's symbol.
- SecType string The Contract's security's type (i.e. STK
- Exchange string The exchange at which the execution was produced.
- Side string The Contract's side (BUY or SELL)

Value

`cntr` returns a contract object

`ordr` returns an order object

`efltr` returns an executionFilter object

Examples

```
## Not run:
c1 = cntr(symbol="AAPL",exchange="SMART",secType="STK",currency="USD")
c2 = cntr(symbol="EUR",currency="USD",secType="CASH",exchange="IDEALPRO")
c3 = cntr(localSymbol = "ESZ4", exchange = "CME", secType="FUT")

## End(Not run)

## Not run:
oid <- reqIds()
ord <- ordr(orderId=oid,action="BUY",totalQuantity=7L,orderType="MKT",transmit = T)

## End(Not run)
```

order-management	<i>placing, cancelling, updating and reporting orders</i>
------------------	---

Description

placeOrder submits an order to a specified exchange or changes a submitted order — **non-blocking**

cancelOrder discards an open order — **non-blocking**

openOrder gives an overview of currently open orders — **non blocking**

execReport reports executed orders, commissions and more — **non-blocking**

Usage

```
placeOrder(orderId, cnt, ord)
```

```
cancelOrder(orderId)
```

```
openOrders()
```

```
execReport(efltr)
```

Arguments

orderId	is a unique identifier to track for callbacks
cnt	contract object defining the instrument and exchange
ord	order object detailing the order parameters
efltr	executionFilter object

Details

placeOrder submits a specific order to an exchange. After submission the callback 'open order' and 'order status' send status information until the order has been filled, canceled or not accepted. The order status can be accessed with read.nb. placeOrder is also used to change an open order. 'cancelOrder' discards an open order.

openOrder requests information about open orders in the same way that placeOrder through the callbacks 'open order' and 'order status'.

execReport creates a report of executed orders differentiated along the criteria defined in the efltr object that is given to the function as argument.

placeOrder, cancelOrder, openOrder are called for their side-effects only.

execReport, completedOrders returns (potentially) filtered list of executed orders.

pprint	<i>pretty print python objects</i>
--------	------------------------------------

Description

pretty print python objects

Usage

```
pprint(l, v = 0)
```

Arguments

l	python object
v	nested level (internal)

Value

pretty printed python object

py2list	<i>convert python object to list</i>
---------	--------------------------------------

Description

basically just for order

Usage

```
py2list(l)
```

Arguments

l	python object
---	---------------

Value

python object as list

read.nb	<i>callback data from non-blocking requests</i> — non-blocking
---------	---

Description

Retrieves queued callback data written by callbacks after non-blocking requests. If src is provided, data is transformed to a more readable and processable format specific for each request.

Usage

```
read.nb(rq = NULL, src = NULL)
```

Arguments

rq	reqId to use for filter queue data. Not differentiated by rq if NULL.
src	text field denoting the request for which to transform. Not differentiating if NULL.

Value

returns accumulated data that was produced by callbacks.

Examples

```
## Not run:
cnt <- cntr(symbol="NVDA",exchange="SMART",secType="STK",currency="USD")

rid <- realTimeBars(cnt)
Sys.sleep(8)
cancelRealTimeBars(rid)
v1 <- read.nb(src="realTimeBars")

rid <- realTimeBars(cnt)
Sys.sleep(8)
cancelRealTimeBars(rid)
v2 <- read.nb(rq=rid)

## End(Not run)
```

realtime-bars

*Request/ cancel five second live bar data — non-blocking***Description**

Request/cancel live 5 sec bar data subscription

Usage

```
realTimeBars(cnt, barSize = 5L, whatToShow = "TRADES", useRTH = "0")
cancelRealTimeBars(reqids)
```

Arguments

cnt	contract object
barSize	for future use; currently only 5sec bars are accepted
whatToShow	whatToShow, e.g. "TRADES", "MIDPOINT", "ASK", ...
useRTH	show bars within regular trading hours only
reqids	request IDs from subscription

Details

realTimeBars requests live bar data for a contract while cancelRealTimeBars stops the subscription.

Value

realTimeBars returns the reqId, which is needed to cancel the request later.

Examples

```
## Not run:
cnt <- cntr(symbol="NVDA", exchange="SMART", secType="STK", currency="USD")

rid <- realTimeBars(cnt)
Sys.sleep(8)
v1 <- read.nb(src="realTimeBars")
Sys.sleep(8)
cancelRealTimeBars(rid)
v2 <- read.nb(src="realTimeBars")

## End(Not run)
```

reqIds	<i>reqIds - request new order id</i> — blocking
--------	--

Description

Returns the session spanning valid order Id. This is persistent in TWS. Required to identify and dispatch callbacks.

Usage

```
reqIds()
```

Details

the orderIds persist in the TWS system. While it would be straightforward to say, increment the order id after execution when there is a one client submitting orders, it becomes complicated to ensure appropriate new orderIDs on one client only. Do not confuse reqIds with reqId, the latter requests a requestId to track the callbacks on the client side. reqIds delivers the next valid requestId

Value

valid order ID

searchSymbols	<i>searchSymbols - find symbol and name</i> — blocking
---------------	---

Description

searching for contracts

Usage

```
searchSymbols(searchText)
```

Arguments

searchText	search text
------------	-------------

Details

the search looks into IB's hosts fields of symbol, localSymbol, longName and returns each matching contract

Value

"a list with all contracts that match based on 'symbol', 'localSymbol', 'longname' search results

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