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February 12, 2024

IBridgePy

Algorithmic Trading with IBKR and Backtesting Using IBridgePy

Dr. Hui Liu
Founder & CEO, Creator
Running River Investment LLC &
IBridgePy

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As with all investments, your capital is at risk

Algorithmic Trading in Python and Backtesting Using IBridgePy

Dr. Hui Liu
https://www.linkedin.com/in/hui-liu-18356a14/
San Jose, CA, United States

IBKR webinar on Feb 12th 2024

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Contents

- Introduction about algorithmic trading and IBridgePy
- Get historical data
- Place a market order
- Build a simple buy-low-sell-high strategy
- Backtest using IBKR data
- Manage multiple IBKR accounts using IBridgePy

Algorithmic trading

Algorithmic trading is a method of executing orders using automated pre-programmed trading instructions, accounting for variables such as time, price, and volume, to send the orders out to the market over time.

Benefits of algo trading

- Less pressure
- Less human errors
- More free time
- Potential gains

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Python choices

	Pros(advantages)	Cons(disadvantages)
Web-based trading platforms	● Huge data ● No installation ● Backtest	● NO PRIVACY ● Coding limitations ● Limited trading products
Low-level python wrappers	● Live trade ● Basic functions	● Hard to learn ● No backtest ● No support
Backtesting engines	● Backtest features ● Great community	● No live trading ● Limited trading products
Native API from brokers	● Live trade ● Some supports	● Hard to learn ● No backtest
Self-hosted solutions (IBridgePy)	● PRIVACY ● Easy to use ● Backtest and live	● Backtest needs data from providers ● a dedicated computer

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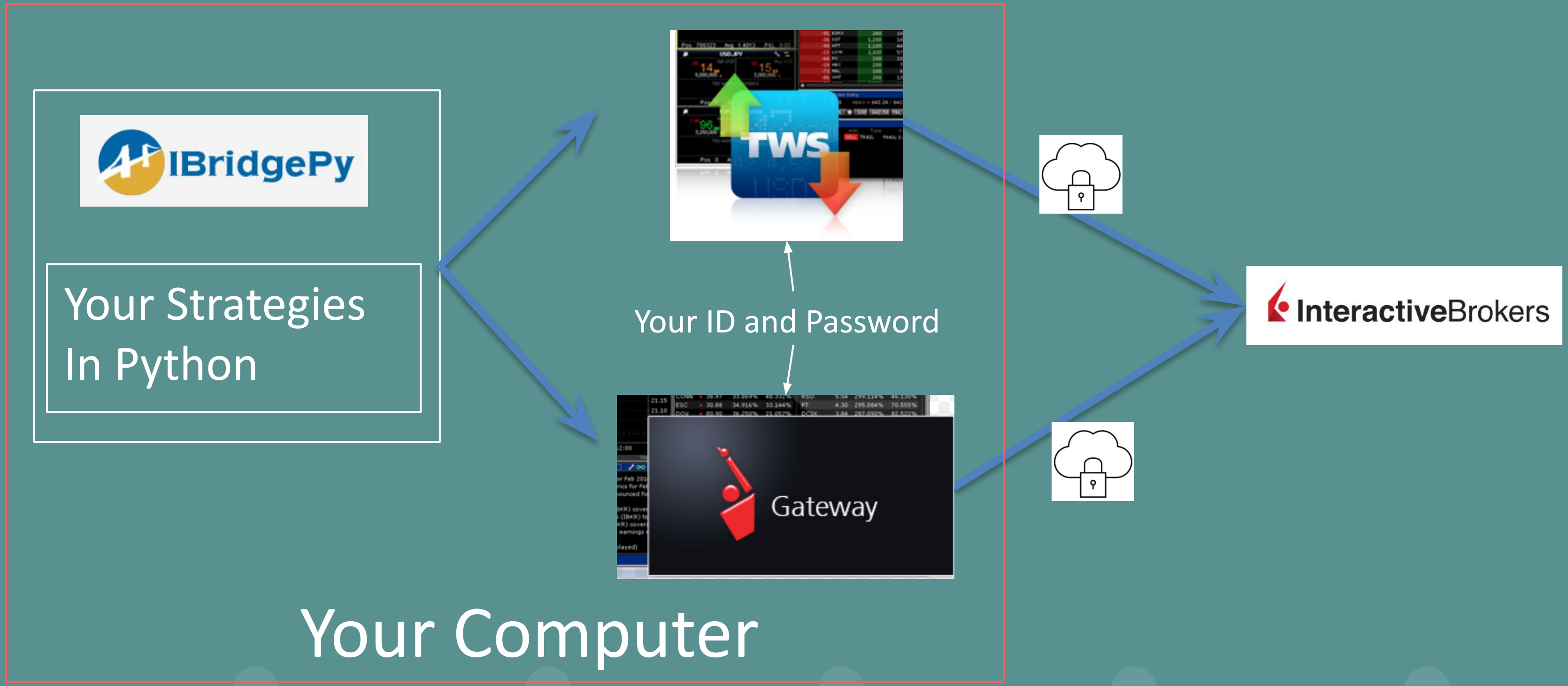


Your Strategies In Python

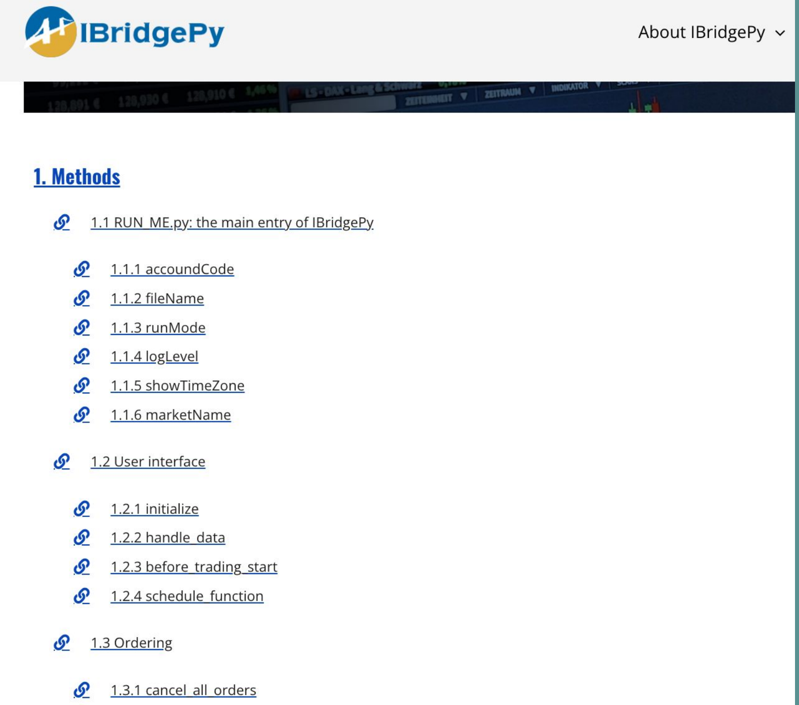
Your ID and Password

Your Computer

IBridgePy cornerstones

- Get historical data
- Retrieve account information
- Place orders

Learn more from https://ibridgepy.com/documentation/



1. Methods

- 1.1 RUN_ME.py: the main entry of IBridgePy
  - 1.1.1 accoundCode
  - 1.1.2 fileName
  - 1.1.3 runMode
  - 1.1.4 logLevel
  - 1.1.5 showTimeZone
  - 1.1.6 marketName
- 1.2 User interface
  - 1.2.1 initialize
  - 1.2.2 handle_data
  - 1.2.3 before_trading_start
  - 1.2.4 schedule_function
- 1.3 Ordering
  - 1.3.1 cancel_all_orders

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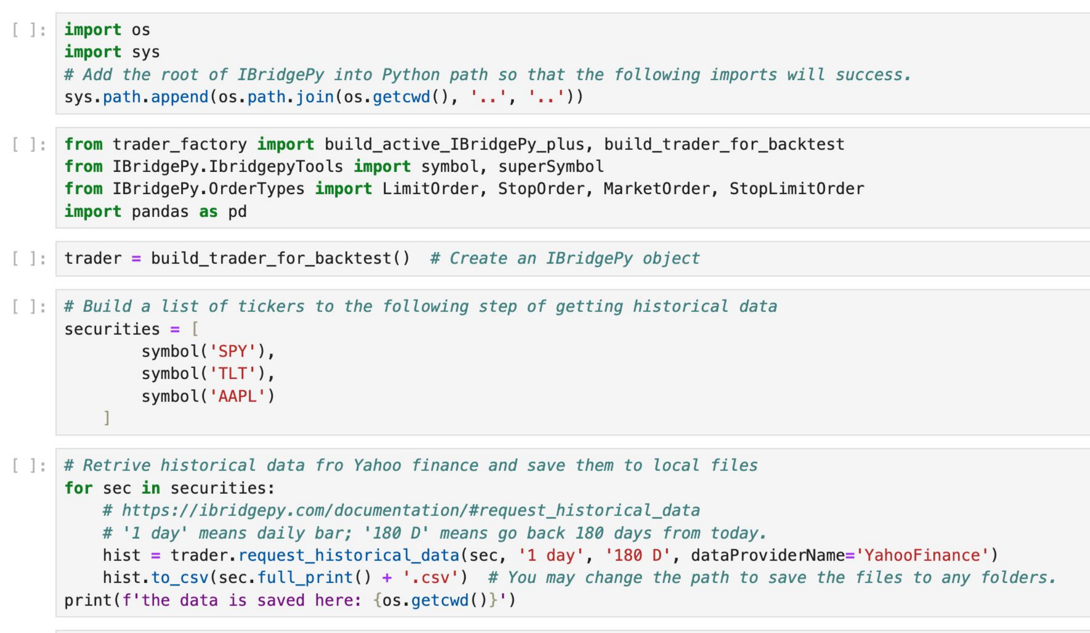
Get historical data

From Yahoo finance get_hist_from_yahoo_finance.ipynb



```
import os
import sys
# Add the root of IBridgePy into Python path so that the following imports will success.
sys.path.append(os.path.join(os.getcwd(), '..', '..'))
```

```
from trader_factory import build_active_IBridgePy_plus, build_trader_for_backtest
from IBridgePy.IbridgepyTools import symbol, superSymbol
from IBridgePy.OrderTypes import LimitOrder, StopOrder, MarketOrder, StopLimitOrder
import pandas as pd
```

```
trader = build_trader_for_backtest()  # Create an IBridgePy object
```

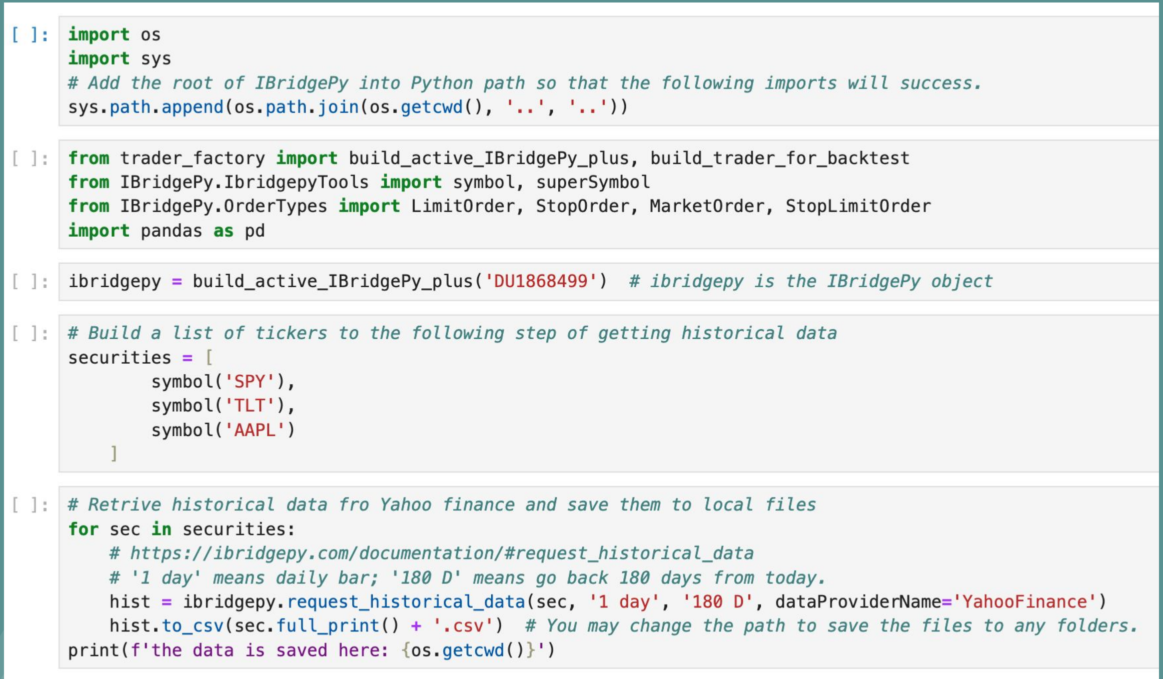
```
# Build a list of tickers to the following step of getting historical data
securities = [
        symbol('SPY'),
        symbol('TLT'),
        symbol('AAPL')
    ]
```

```
# Retrive historical data fro Yahoo finance and save them to local files
for sec in securities:
    # https://ibridgepy.com/documentation/#request_historical_data
    # '1 day' means daily bar; '180 D' means go back 180 days from today.
    hist = trader.request_historical_data(sec, '1 day', '180 D', dataProviderName='YahooFinance')
    hist.to_csv(sec.full_print() + '.csv')  # You may change the path to save the files to any folders.
print(f'the data is saved here: {os.getcwd()}')
```

Get historical data

From IBKR get_hist_from_IBKR.ipynb

- Run TWS or Gateway
- IBKR account
- Data package from IBKR

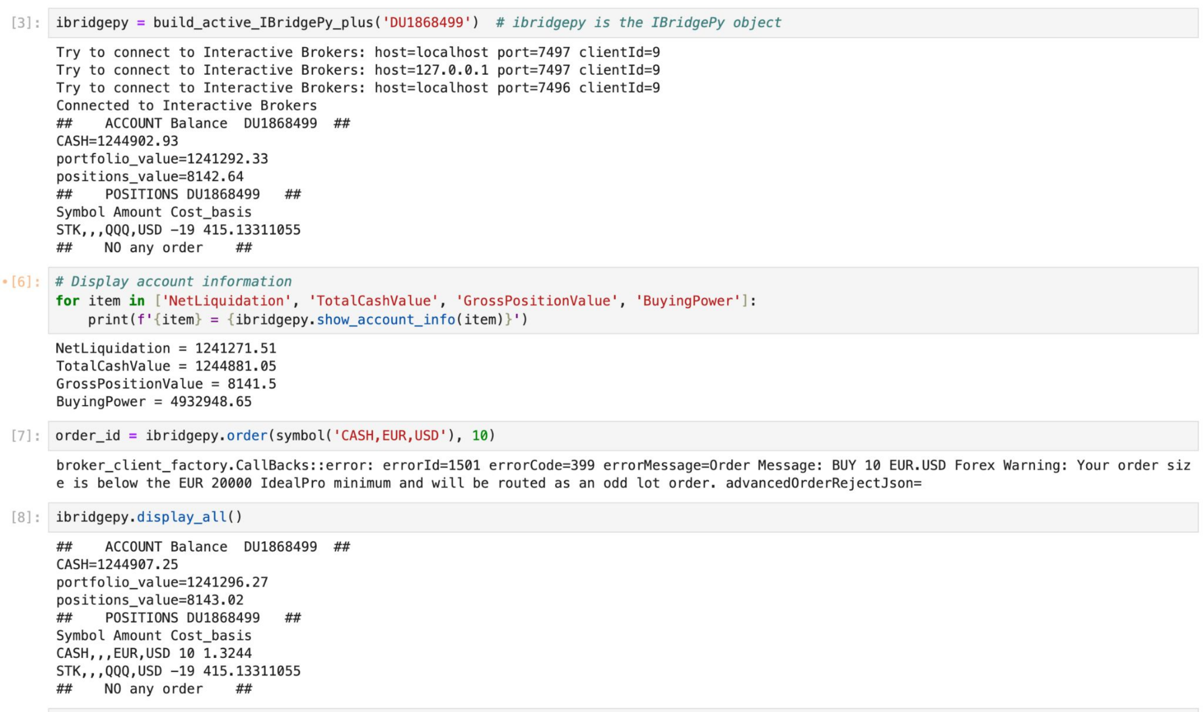


```
[ ]: import os
     import sys
     # Add the root of IBridgePy into Python path so that the following imports will success.
     sys.path.append(os.path.join(os.getcwd(), '..', '..'))

[ ]: from trader_factory import build_active_IBridgePy_plus, build_trader_for_backtest
     from IBridgePy.IbridgepyTools import symbol, superSymbol
     from IBridgePy.OrderTypes import LimitOrder, StopOrder, MarketOrder, StopLimitOrder
     import pandas as pd

[ ]: ibridgepy = build_active_IBridgePy_plus('DU1868499')  # ibridgepy is the IBridgePy object

[ ]: # Build a list of tickers to the following step of getting historical data
     securities = [
             symbol('SPY'),
             symbol('TLT'),
             symbol('AAPL')
         ]

[ ]: # Retrive historical data fro Yahoo finance and save them to local files
     for sec in securities:
         # https://ibridgepy.com/documentation/#request_historical_data
         # '1 day' means daily bar; '180 D' means go back 180 days from today.
         hist = ibridgepy.request_historical_data(sec, '1 day', '180 D', dataProviderName='YahooFinance')
         hist.to_csv(sec.full_print() + '.csv')  # You may change the path to save the files to any folders.
     print(f'the data is saved here: {os.getcwd()}')
```

Acc info and place order

From IBKR get_account_info_and_place_order.ipynb

- Run TWS or Gateway
- IBKR account
- Data package from IBKR



```
[3]: ibridgepy = build_active_IBridgePy_plus('DU1868499')  # ibridgepy is the IBridgePy object

     Try to connect to Interactive Brokers: host=localhost port=7497 clientId=9
     Try to connect to Interactive Brokers: host=127.0.0.1 port=7497 clientId=9
     Try to connect to Interactive Brokers: host=localhost port=7496 clientId=9
     Connected to Interactive Brokers
     ##    ACCOUNT Balance  DU1868499  ##
     CASH=1244902.93
     portfolio_value=1241292.33
     positions_value=8142.64
     ##    POSITIONS DU1868499   ##
     Symbol Amount Cost_basis
     STK,,,QQQ,USD -19 415.13311055
     ##    NO any order    ##

•[6]: # Display account information
     for item in ['NetLiquidation', 'TotalCashValue', 'GrossPositionValue', 'BuyingPower']:
         print(f'{item} = {ibridgepy.show_account_info(item)}')

     NetLiquidation = 1241271.51
     TotalCashValue = 1244881.05
     GrossPositionValue = 8141.5
     BuyingPower = 4932948.65

[7]: order_id = ibridgepy.order(symbol('CASH,EUR,USD'), 10)

     broker_client_factory.CallBacks::error: errorId=1501 errorCode=399 errorMessage=Order Message: BUY 10 EUR.USD Forex Warning: Your order siz
     e is below the EUR 20000 IdealPro minimum and will be routed as an odd lot order. advancedOrderRejectJson=

[8]: ibridgepy.display_all()

     ##    ACCOUNT Balance  DU1868499  ##
     CASH=1244907.25
     portfolio_value=1241296.27
     positions_value=8143.02
     ##    POSITIONS DU1868499   ##
     Symbol Amount Cost_basis
     CASH,,,EUR,USD 10 1.3244
     STK,,,QQQ,USD -19 415.13311055
     ##    NO any order    ##
```

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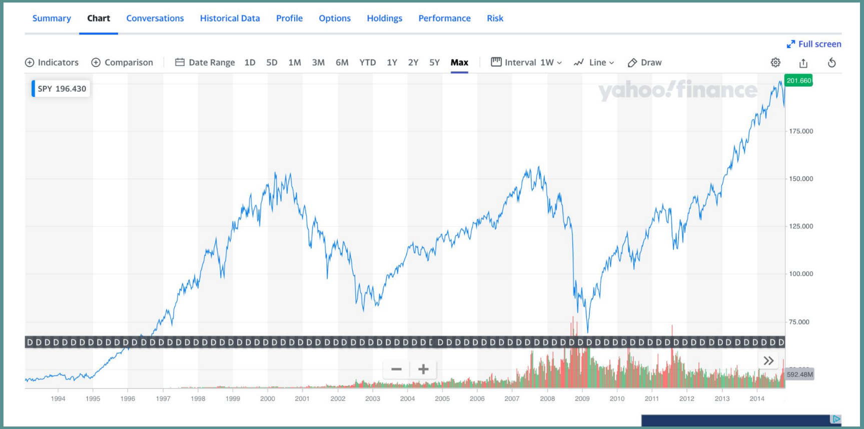
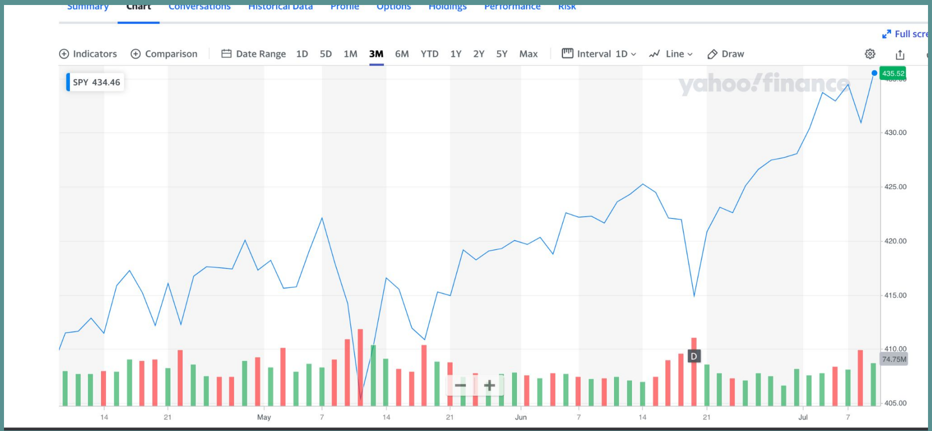
Come up a trading idea



Good trend in long term



Swing in short term

My example strategy: If the price drops from yesterday, I place “Buy” order. Otherwise, don’t hold any positions. Do you think it is a profitable strategy?

Disclosure:
Any trading symbols, entities or investment products displayed are for illustrative purposes only and are not intended to portray recommendations. Past performance is not necessarily indicative of future results.

Build a machine learning model

Real time demo: buy_low_sell_high_model.ipynb

- Retrieve historical data
- Prepare data
- Build a machine learning model
- Visualize

Build a trading robot

```
def initialize(context):                                          # This function run only once at the beginning
    context.security = symbol(“SPY”)                              # Define a security, SP500 ETF
    schedule_function(buy_low_sell_high,                          # Schedule a time to run another function buy_low_sell_high
            date_rule=date_rules.every_day(),                     # The function of buy_low_sell_high is triggered every trading day
            time_rule=time_rules.market_close(minutes=1))         # at 15:59PM EST, one minute before the market close

def buy_low_sell_high(context, data):                             # The logic of buy low sell high are made in this function
    hist = request_historical_data(context.security, ”1 day”, “2 D”)  # Retrieve historical data, daily bars, go back 2 trading days
    close_yesterday = hist[“close”][-2]
    close_today = hist[“close”][-1]
    if close_today > close_yesterday:
        order_target_percent(context.security, 0.0)               # Sell off all SPY positions if any
    else:
        order_target_percent(context.security, 1.0)               # Buy SPY use 100% of portfolio
```

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Backtest

- Use historical data directly from IBKR
- Use any 3rd party data providers
- Backtest minute-by-minute, even second-by-second
- Speed up!

More details on https://ibridgepy.com/tutorials/

Backtest

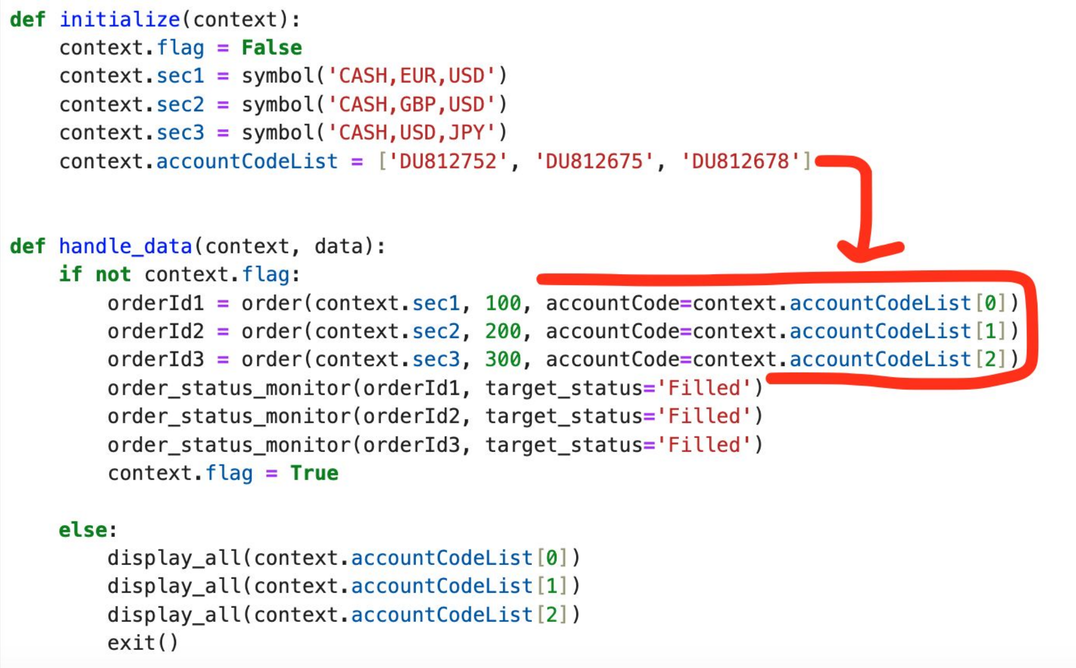
Real time demo: TEST_ME.ipynb

- Choose a strategy py file
- Pick a startTime and endTime for backtesting
- Confirm data provider

Live trade

- No code change at all !
- RUN_ME.py

Manage multiple IBKR accounts



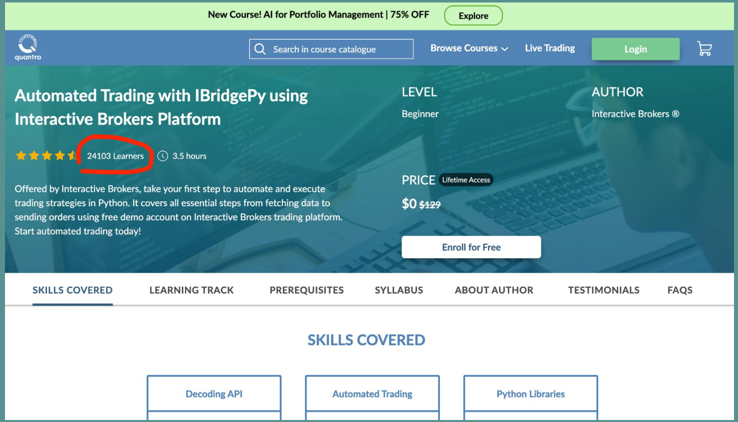
```python
def initialize(context):
    context.flag = False
    context.sec1 = symbol('CASH,EUR,USD')
    context.sec2 = symbol('CASH,GBP,USD')
    context.sec3 = symbol('CASH,USD,JPY')
    context.accountCodeList = ['DU812752', 'DU812675', 'DU812678']


def handle_data(context, data):
    if not context.flag:
        orderId1 = order(context.sec1, 100, accountCode=context.accountCodeList[0])
        orderId2 = order(context.sec2, 200, accountCode=context.accountCodeList[1])
        orderId3 = order(context.sec3, 300, accountCode=context.accountCodeList[2])
        order_status_monitor(orderId1, target_status='Filled')
        order_status_monitor(orderId2, target_status='Filled')
        order_status_monitor(orderId3, target_status='Filled')
        context.flag = True

    else:
        display_all(context.accountCodeList[0])
        display_all(context.accountCodeList[1])
        display_all(context.accountCodeList[2])
        exit()
```

Courses about Algo Trading

Free course about IBridgePy



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