ChiPy - Quantiacs

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About Quantiacs

Our mission is to democratize quantitative finance

We connect your trading algorithms with capital and you get to pocket 10% of the performance fees.

- We provide open source toolboxes for Matlab/Octave and Python
- Free market data: The stocks of the S&P 500 index and 49 US Futures
- A platform to market your trading strategy

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Quantitative trading concepts and styles

- Fundamental analysis
- Sentiment analysis
- News
- Market mechanics
- Technical analysis

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Technical Analysis

Methodology for forecasting the direction of prices through the study of past market data, primarily price and volume

TA uses market indicators of many sorts, most of which are mathematical transformations of price

Core beliefs

- A fundamental principle of TA is that a market's price reflects all relevant information
- Technical analysts believe that investors collectively repeat the behavior of the investors that preceded

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The Toolbox

A framework to develop and test quantitative trading strategies

- In two languages with the same functionality: Matlab/Octave and Python
- It supports the full arsenal of both languages
- Free and open source
- Tweak it, adapt it to your needs and use it in any way you want
- Perform standardized backtests to make results comparable

We have built it for you, please let us know what you‘re missing

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Trading System

A trading system is a Matlab/Octave or Python function with a specific template

```
def myTradingsystem(DATE, OPEN, HIGH, LOW, CLOSE, settings):
    (…trading systems logic…)
    return positions, settings
```

The arguments can be selected

DATE … vector of dates in the format YYYYMMDD
OPEN, HIGH, LOW, CLOSE … matrices with a column per market and a row per day.
settings … struct with the settings of the simulation

The return values need to be

positions … allocation of the available capital to the markets
settings … struct with the settings of the simulation

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Settings

Use settings to define

- What markets do you want to trade?
- How much data do you need for your trading system?
- Do you want to save some of the data for an out of sample test?
- What is your transaction cost assumption (a.ka. slippage & comission)?

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Settings – Python code

Code

```
def mySettings():
    settings[markets] = ['CASH', 'F_ES', 'F_SI', 'F_YM’
    ]
    settings[‘slippage’] = 0.05
    settings[‘budget’] = 1000000
    settings[‘samplebegin’] = ‘19900101’
    settings[‘sampleend’] = ‘20161231’
    settings[‘lookback’] = 504
```

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Backtest mechanics

Your TS is called for each (trading) day of the specified backtesting period with the most recent market data as input, and it computes a percent allocation p for the next trading day as output.

The arguments are data matrices of size [nMarkets x settings.lookback] with the most recent market data availalbe at time t. The oldest market data is in row 1, the most recent in the last row of the data matrix.

You can use the full arsenal of Matlab/Octave and Python to compute the positions for the next period.

p > 0 … a long position

p < 0 … a short position

p = 0 … no position

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Run a backtest and submit

Matlab/Octave

```
runts('somets')
submit('somets','mySystemName')
```

Python

```
import quantiacsToolbox
returnDict = quantiacsToolbox.runts('somets.py')
quantiacsToolbox.submit('somets.py','mySystemName')
```

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Load market data

Matlab/Octave

```
dataStruct = loaddata(getSettings('trendfollowing'));
```

Python

```
import quantiacsToolbox as qt
dataDict=qt.loadData(['F_ES'], ['DATE', 'CLOSE'])
```

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RSI – Relative Strength index

Formula

$$closeMom(t) = CLOSE(t) - CLOSE(t-1)$$

$$up(t) = \begin{cases} 1 & \dots \ if\ closeMom(t) \geq 0 \\ 0 & \dots \ otherwise \end{cases}$$

$$down(t) = \begin{cases} 1 & \dots \ if\ closeMom(t) < 0 \\ 0 & \dots \ otherwise \end{cases}$$

$$meanUp(t, period) = \frac{1}{period} \sum_{t}^{i=t-period+1} up(i)$$

$$meanDown(t, period) = \frac{1}{period} \sum_{t}^{i=t-period+1} down(i)$$

$$RSI(t, period) = 100 - \frac{100}{1 + \frac{meanUp(t, period)}{meanDown(t, period)}}$$

$t \dots index\ of\ the\ trading\ day \qquad period \dots number\ of\ days\ to\ compute\ the\ RSI$

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RSI plot

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ATR – Average True Range

Formula

$$TR(t) = \max(HIGH(t) - LOW(t), |HIGH(t) - CLOSE(t-1)|, |LOW(t) - CLOSE(t-1)|)$$

$$ATR(t, period) = \frac{1}{period} \sum_{t}^{i=t-period+1} TR(i)$$

$t \ldots index\ of\ the\ trading\ day \qquad period \ldots number\ of\ days\ to\ compute\ the\ ATR$

$$VolaRatio(t, period) = \frac{ATR(t, period)}{CLOSE(t)}$$

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Building a TS

Live development/evaluation of a trading strategy….

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How good is a trading system?

There is no universal number that tells you everything about a trading system

There are a lot of things to consider like

- Performance
- Volatility
- Alpha
- Drawdowns
- Correlations

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Sharpe Ratio

The Sharpe Ratio is a popular performance to volatility ratio. The Formula:

$$returns_i = \frac{e_i - e_{i-1}}{e_{i-1}}$$

$$\mathrm{i} = \{2,3,\ldots,\mathrm{t}\}, \qquad t = \text{number of tradingdays}$$

$$e \text{ is the } portfolio \text{ equity curve of the } Tradingsystem$$

$$volaYearly = \sqrt{252} * std(returns);$$

$$index_i = \prod_{i=2}^{t}(1 + returns_i)$$

$$returnDaily = e^{\frac{\ln(index_t)}{t}}$$

$$returnYearly = returnDaily^{252} - 1$$

$$SharpeRatio = \frac{\mathrm{returnYearly}}{\mathrm{volaYearly}}$$

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Sharpe Ratio

Formula

$$closeMom(t) = CLOSE(t) - CLOSE(t-1)$$

$$avgMom(t, period) = \frac{1}{period} \sum_{t}^{i=t-period+1} closeMom(i)$$

$$stdMom(t, period) = \sqrt{\frac{1}{period} \sum_{t}^{i=t-period+1} \left(closeMom(i) - avgMom(t, period)\right)^2}$$

$$SR(t, period) = \frac{avgMom(t, period)}{stdMom(t, period)} * \sqrt{252}$$

$t \ldots index\ of\ the\ trading\ day \qquad period \ldots number\ of\ days\ to\ compute\ the\ SR$

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Good practice and pitfalls

Overfitting is the natural enemy of quantitative trading

- It’s easy to fit the known past with enough parameters. Limit the number of your parameters.
- Stability. How does your model react when you change some of the Parameters by 10%
- Save some of the data for an out of sample test

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Q&A

Thanks for attending!

Put your skills into practice join our Q5 competition!

The best three futures trading systems submitted to our platform before March 31, 2016 get guaranteed investments of

$ 1,000,000

$ 750,000

$ 500,000

and you get to pocket 10% of the profits.

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