Introduction to Algorithmic Trading

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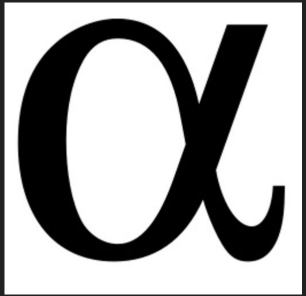
Algonell

Research

- Algorithms for Optimal Bayesian Networks
  - http://www.sciencedirect.com/science/article/pii/S1877050916318816
- Trend Classification
- ZigZag indicators
- Sample Data:
  - https://www.kaggle.com/algonell/eurusd-h4

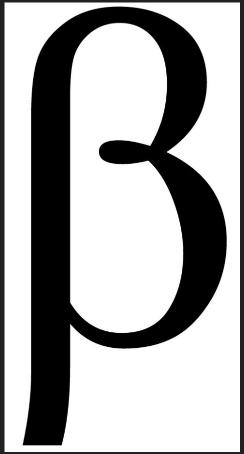
Goal

- Present to you some frameworks and tools
- Show you a simple Numer.ai submission
- Show you a simple trading algorithm in Quantopian
- Make you passionate about building alphas

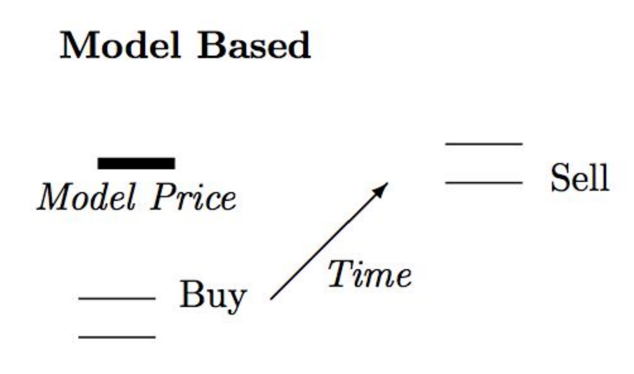


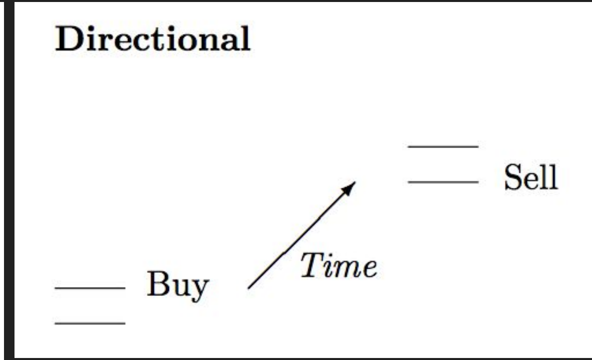
Algorithmic Trading

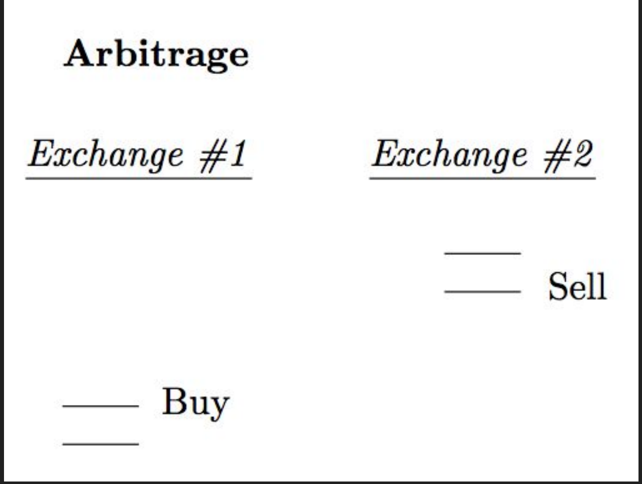
- Automated execution of trading algorithms
- You can invest in some index
- Or you can try to beat the index (alpha)
- Alpha - a trading strategy/model
- High vs. Low Frequency Trading
- Technical / Fundamental / Fusion

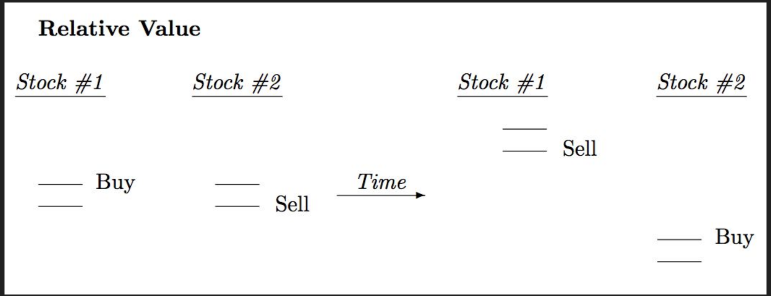


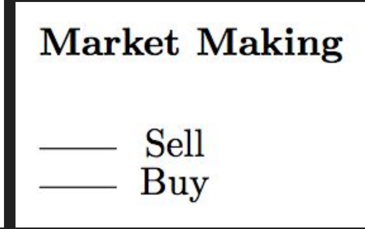
Alpha Sources

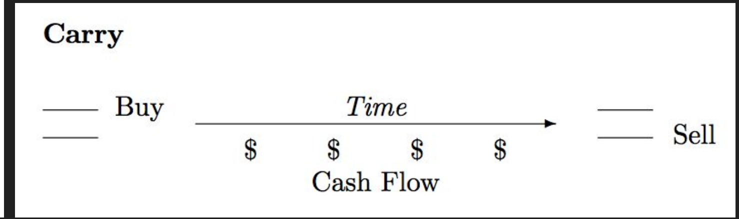












Data

- ['datetime', 'open', 'high', 'low', 'close', 'volume', 'adj close']
- Yahoo Finance
  - Anything (except FX), daily
- Quandl
  - Anything, daily
  - Paid subscriptions
- MetaTrader 5
  - FX, CFD, indices
  - M5, M15, …, MN1
- Quantopian
  - Proprietary, no downloads
  - Anything (except FX), daily

Tools

- Pandas
  - Originally developed by AQR
  - Data retrieval, pct_change, shift, cumsum etc.
- TA-LIB
  - Technical indicators
- Zipline
  - Strategy backtesting
- Pyfolio
  - Strategy evaluation
- Alphalens
  - Alpha factors evaluation

Quantopian

- PAAS - research, develop and backtest alphas
- Largest Quant community nowadays
- Ongoing contests (6 months round)
- Opportunity to get fund allocations
- Connect your IB paper trading/real accounts

Numer.ai

- Hedge fund of Data Scientists
- Kind of a Kaggle
- Uses meta model for BTC trading
- Ongoing competition, weekly rounds, clean data
- You get paid BTC if your models generalize well
- You get Numeraire if you are persistent
- Better models are better for everyone
- They claim that 10K$ earnings today, will be millions in a couple of years

Examples

- Numer.ai - simple submission notebook
- Quantopian - simple trading algorithm with Machine Learning
- GitHub:
    - https://github.com/algonell/PyData

The Real Deal

- Start with simple data
- Develop some alphas, good systems are simple and robust
- Backtest & optimize it (out of sample)
- Compare your performance to some benchmark (SPY, DXY)
- Paper trade it
- Live trade it with small amounts
- Grow your risk
- Repeat this flow
- It’s NP, but successful traders are the oracles
- It takes years to master

Resources: Trading

- Investment Management by University of Geneva
  - https://www.coursera.org/specializations/investment-management
- Chat With Traders
  - https://chatwithtraders.com/
- Invstr
  - https://invstr.com/
- Baby Pips
  - http://www.babypips.com/
- Investopedia
  - http://www.investopedia.com/

Resources: Quantitative Finance

- Computational Investment by Georgia Tech
  - https://www.coursera.org/learn/computational-investing
  - https://www.udacity.com/course/machine-learning-for-trading--ud501
- Max Dama's paper
  - https://www.quantopian.com/posts/max-dama-on-automated-trading-pdf
- Quantopian
  - https://www.quantopian.com
- Numer.ai
  - https://numer.ai/
- QuantStart
  - https://www.quantstart.com/

Resources: Tools

- Yahoo Finance - historical data download
  - https://finance.yahoo.com/quote/FB/history?p=FB
- Quandl - historical data API
  - https://www.quandl.com/data/ECB/EURUSD-EUR-vs-USD-Foreign-Exchange-Reference-Rate
- MetaTrader 5
  - https://www.metatrader5.com/en
- TA-LIB
  - https://github.com/mrjbq7/ta-lib
- Zipline
  - http://www.zipline.io/
- Pyfolio
  - https://github.com/quantopian/pyfolio

That’s all Folks!

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