Fintech Final Project

Trading Strategy for SPY

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Introduction

- Data Set : https://finance.yahoo.com/quote/SPY/history?p=SPY
- Start from 1993.1.29 to 2017.12.27

Program Demonstration

- Environment: Mac OS Sierra 10.12.6
- Language & Version: Python 3.6.2
- Packages:
  - argparse
  - numpy >= 1.13.1
  - talib >= 0.4.10
  - matplotlib >= 2.0.2 (optional)
- Installation `brew install python3` `pip3 install [package_name]`
- Program Usage
  - Files: `Indicators.py`, `Utilities.py`, `myStrategy.py`
  - Execute: `python3 myStrategy.py`
  - Coding Example:

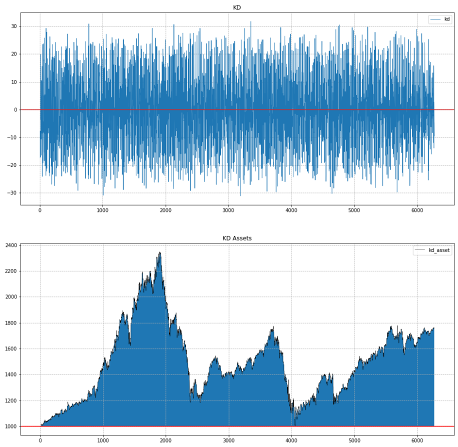
```
import pandas as pd
pastData = pd.read_csv('SPY.csv')
from myStrategy import myStrategy
action = myStrategy(pastData)
```

Baseline Methods

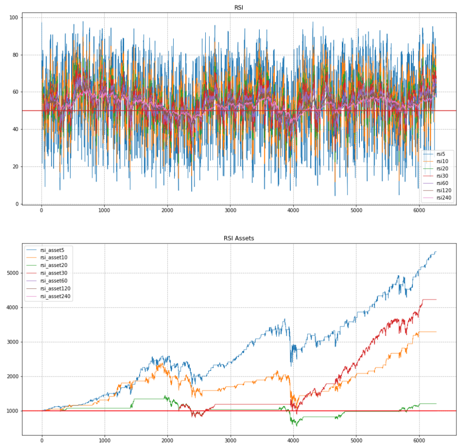
Moving Average (MA)

Exponential Moving Average (EMA)

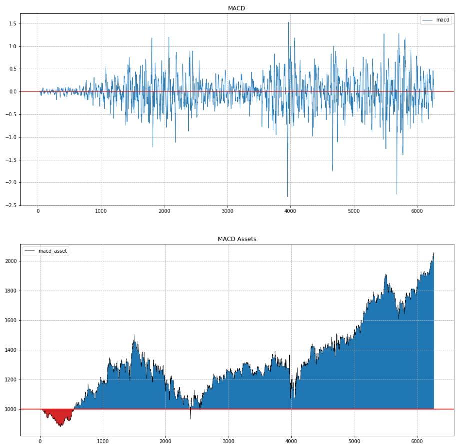
Stochastic Oscillator (KD)



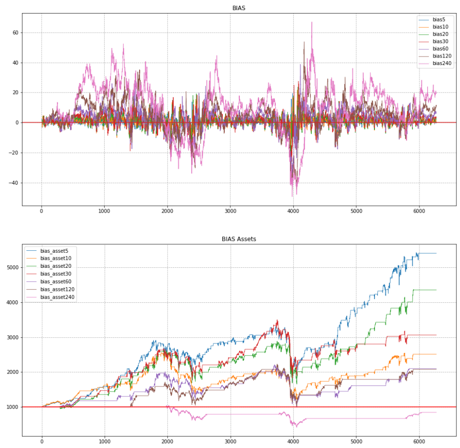
Relative Strength Index (RSI)



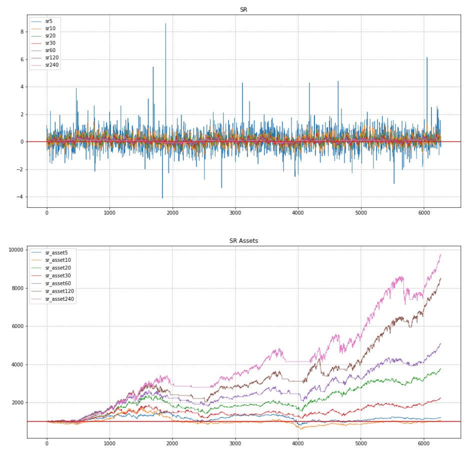
MA Convergence / Divergence (MACD)



Rate of Change (BIAS)



Sharpe Ratio (SR)



Note:
1. Upper graph is the value of indicators.
2. Bottom graph is the asset histories.
3. Some indicators have different periods.

Analysis

- Initial capital: 1000
- Start investment at different day, ending at 2017.12.27
- Some indicators have no different periods.
  - Start at first day (1993.1.29)

start = 0, all data, initial capital = 1000								
Type	Threshold \ Period	5	10	20	30	60	120	240
MA	0	660.24	903.62	991.69	1234.83	1589.51	1750.56	2225.70
EMA	0	699.37	1054.96	977.68	1241.93	1791.67	1931.61	1957.39
KD	0	1095.87						
RSI	70, 30	1720.90	1738.01	1163.66	3541.36	1000.00	1000.00	1000.00
MACD	0	1627.03						
BIAS	± 1 std	1775.49	1278.41	1871.93	1016.37	1054.59	1007.40	1087.05
SR	± 0.001	881.70	1003.70	1763.97	1379.82	1878.37	2330.18	2038.81

  - Start at last 400-th day (2016.5.26)

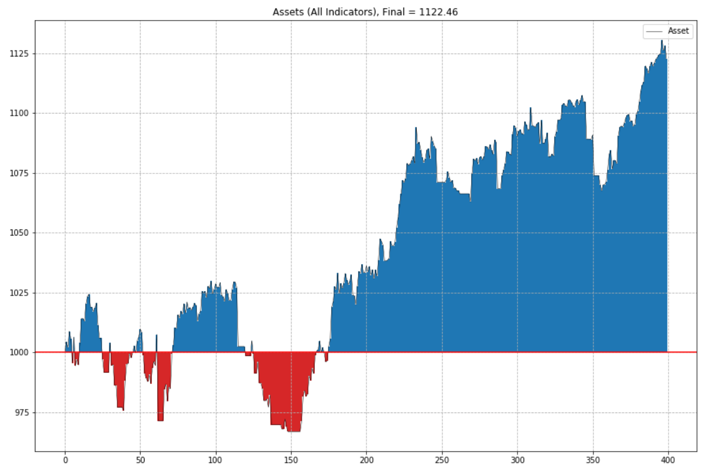
start = -400:, all data, initial capital = 1000								
Type	Threshold \ Period	5	10	20	30	60	120	240
MA	0	1004.33	994.10	1025.13	1053.44	1137.41	1247.45	1260.10
EMA	0	1056.53	1037.35	1058.85	1081.74	1185.66	1248.93	1260.10
KD	0	1051.40						
RSI	70, 30	1223.17	1117.37	1000.00	1000.00	1000.00	1000.00	1000.00
MACD	0	1128.12						
BIAS	± 1 std	1072.63	1069.14	1085.42	1000.00	1000.00	1000.00	1000.00
SR	± 0.001	1013.91	1085.93	1101.67	1158.72	1233.56	1264.19	1234.72

  - Start at last 120-th day (2017.7.7)

start = -120:, all data, initial capital = 1000								
Type	Threshold \ Period	5	10	20	30	60	120	240
MA	0	996.24	997.04	1003.47	1020.84	1058.68	1075.72	1075.72
EMA	0	996.87	1012.93	1016.83	1018.55	1065.42	1075.72	1075.72
KD	0	990.66						
RSI	70, 30	1054.20	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00
MACD	0	1035.50						
BIAS	± 1 std	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00
SR	± 0.001	1019.08	1027.04	1028.60	1047.11	1075.72	1075.72	1075.72

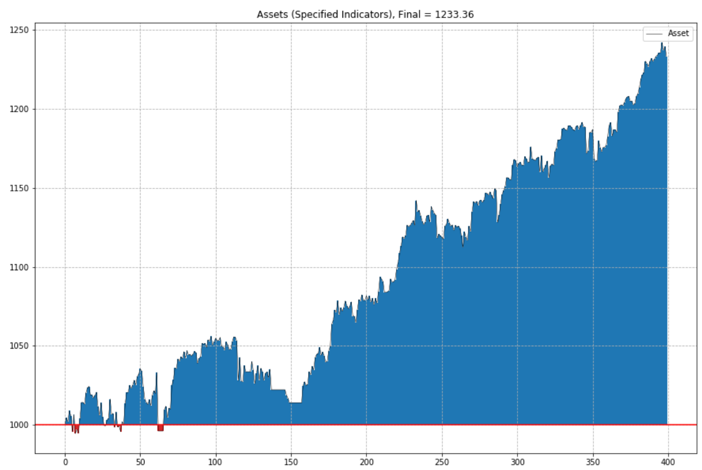
Experiments

- Ensemble all indicators (in Analysis), initial capital = 1000, starting from last 400-th day.



Final Earn = 122.46

- Select some indicators, initial capital = 1000, starting from last 400-th day.
    - EMA60, EMA120, EMA240
    - RSI5, RSI10
    - MACD
    - BIAS5, BIAS10
    - SR30, SR60, SR120, SR240



Final Earn = 233.36

Conclusions

- Some indicators are not worth referencing.
    - MA & EMA with period ≤ 20
    - KD
    - BIAS > 30
    - RSI > 30
- There is no perfect indicators that always have correct action (sell / buy) advice.