Online Forex Portfolio Selection with Python

Tianshu Zhang, Jingjue Wei, Xinyang Hou, Zhenyao Jiang, Dixing Xu, Supervised by Dr Jinjun Liang

Department of Mathematical of Science, Xi'an Jiaotong Liverpool University

Abstract

In this project, we are trying to compare a variety of foreign exchange portfolio-trading strategies. We utilize python as a main tool to translate these algorithms into machine language and scrape data between 2015 and 2016 on OANDA to do backtest. Trading strategies are classified into three categories： follow the winner, follow the loser and the others common methods. The results illustrate that algorithms belonging to the same category tend to perform similarly, and the final value of algorithms of 'follow the loser' are higher than other methods.

Work Flow

Literature Review: choose representative algorithms

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Fetch data from OANDA

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Convert trading algorithms to backtest engine

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Debugging

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Backtest

- Tools Employed: Python, Git, OANDA

Introduction to Classifications:

Follow-the-Winner approach, tries to increase the relative weights of more successful experts/stocks, often based on their historical performance.

Follow-the-Loser approach is characterized by transferring the wealth from winners to losers. The underlying assumption is *mean reversion*, which means that the good (poor)-performing assets will perform poor (good) in the following periods.

Other approaches consist of *Pattern-Matching* based method, which tries to build a portfolio based on some sampled similar historical patterns with no explicit weights transfer directions and benchmarks.,

Classifications	Algorithms
Follow-the-Winner	Universal Portfolios (UP) Exponential Gradient (EG) Online Newton Step Algorithm (ONS)
Follow-the-Loser	Anti-Correlation olps (Anticor) Passive Aggressive Mean Reversion (PAMR) Online Moving Average Reversion (OLMAR) Weighted Moving Average Passive Aggressive Algorithm (WMAMR)
Others	The Uniform Buy and Hold (UBAH) M0

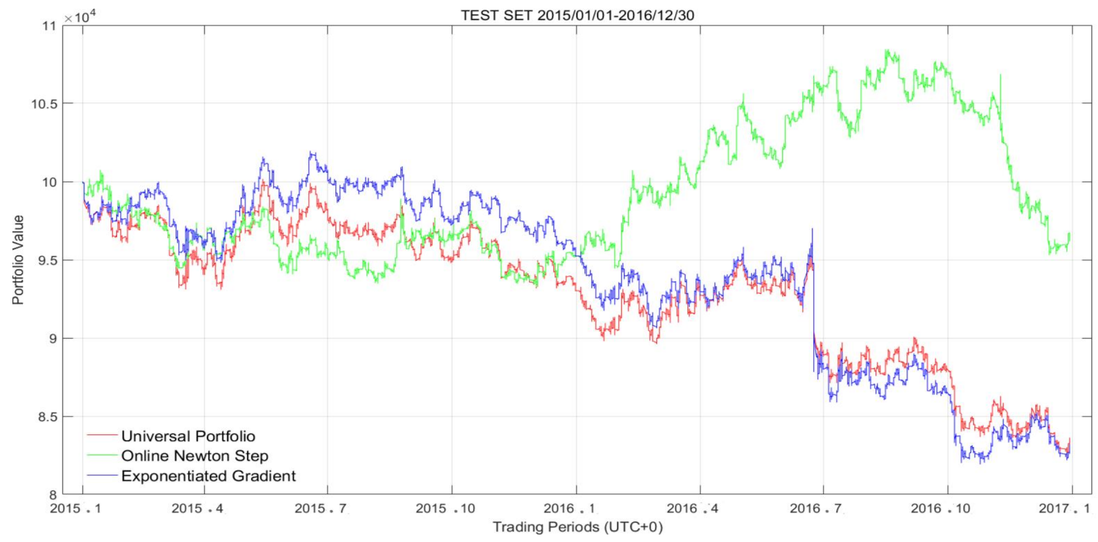
Introduction to strategies

- *Universal Portfolios*： assign the capital to a single class of base experts, let the experts run, and finally pool their wealth.
- *Exponential Gradient:* to track the stock with the best performance in last period but keep the new portfolio close to the previous portfolio.
- *Anti-Correlation*: assumes that market follows the mean reversion principle. It statistically makes bet on the consistency of positive lagged cross-correlation and negative auto-correlation.
- *Passive Aggressive Mean Reversion*: if the expected return based on last price relative is larger than a threshold, the loss will linearly increase; otherwise, the loss is zero.
- *Online Moving Average Reversion:* Observing that PAMR and CWMR assume *single-period* mean reversion, which causes one failure case on real, a *multiple-period* mean reversion is defined to exploit the multiple-period mean reversion.
- *Uniform Buy and Hold*: simply equally spreading the total fund into the preselected assets and holding them without making any purchases or selling until the end.

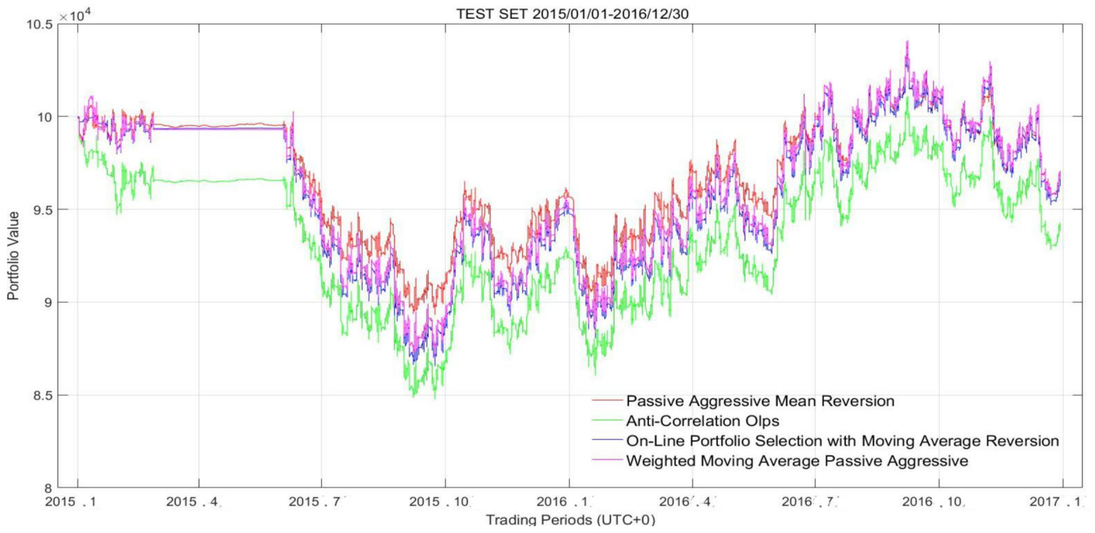
SURF Summer Undergraduate Research Fellowship

Trade Experiment

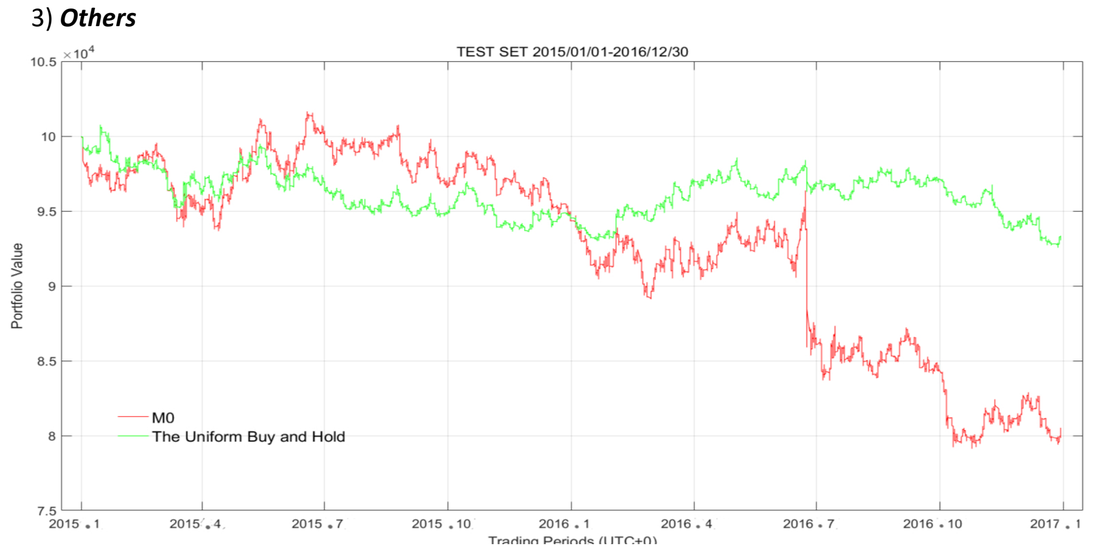
- Backtest Performance for each category



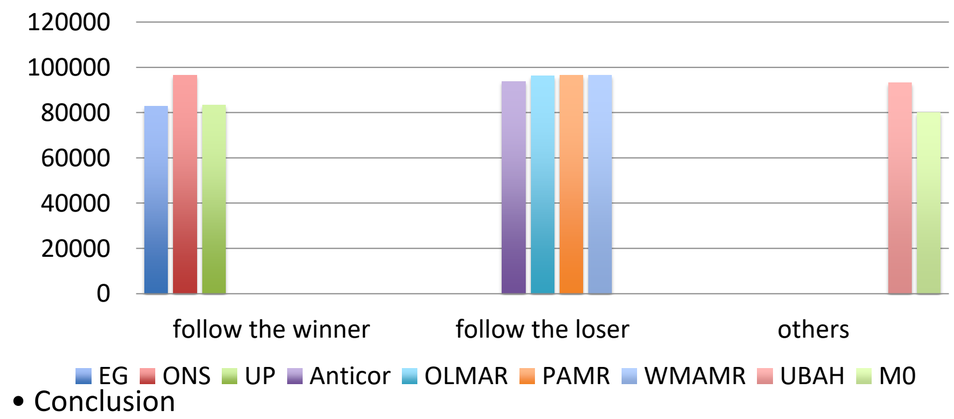
2) ***Follow-the-Loser***



3) ***Others***



- Overall Backtest Performance (final portfolio values)



- Conclusion

The bar chart illustrates that the backtest performance for 'follow the loser' tends to be the best among three categories. Online Newton Step Algorithm also works well though it belongs to 'follow the winner' category.
From the line graphs we can know that algorithms for 'follow the winner' were profitable in the initial period , but they have lost money since June in 2016,except Online Newton Step Algorithm. The situation was similar for M0 method, which might result from fluctuation in exchange rate caused by Brexit. On the contrary, figures for algorithms in 'follow the loser' group started to increase at that time.

Limmitation and Further Improvement

In addition to the conclusion drawn before, there are some further conclusions can be drawn. According to the charts presented, all of the algorithms end in a final portfolio value less than the original one (less than 100,000). There might be several reasons including (1) in real trading there will be 3 to 5 pips of the spread instead of 0.03% of commission fee in the backtest, (2) the triggers of these strategies do not adapt well to the modest price fluctuation of exchange rates comparing to other assets like stock, which means a very high commission fee will be paid in every transaction while the profit made is not enough to compensate it, (3) the Brexit did give the forex market a huge influence which automatic trading strategies are not able to take into consideration.