Momentum Strategies with L1 Filter

Li Longxin (Andrew)

Purpose of Project

Recently, there are growing demands of estimating underlying trends in an identifiable manner. The Hodrick-Prescott (H-P) was known as L_2 penalized filter which will filter out the noise signal by using the sum of squares, which will produce a curve-like signal. these curve-like signals are not the idea outputs that should have detective patterns for further signal processing. Unlike the traditional Hodrick-Prescott (H-P) filtering, the proposed L_1 trend filtering method substitutes the sum of absolute values (L_1 norm) for the sum of squared values, which estimates drifts in a linear pattern. Conclusively, this project aims to use L_1 penalty condition to purify noisy high-frequency signals for a linearly recognizable pattern.

To prioritize the tasks, the project has been divided into 4 parts for implementations. The first part is to review the whole concepts of the paper — "Momentum Strategies with L1 Filter" and figure out the approach for implementation. Next step is to build up a GitHub repository to manage the codes for purifying the signal and construct some auxiliary functions including visualization and simulation modules. The L1 filter then will be implemented to the real and simulated dataset for testing the robustness and effectiveness by back-testing. The final procedure will be finding the potential improvements for the proposed framework.

For now, the repository has been created at following address:

https://github.com/lkqllx/High-Frequency-Signal-Filtering.git

where some modules have already been created for further implementation. Note that there is one 2330.csv file (2330.TW Market) besides the given HK market data (0005.HK and 0700.HK). Repository can be forked by command below:

git clone https://github.com/lkqllx/High-Frequency-Signal-Filtering.git

Project Timeline

Part	Responsibilities	Time
Preliminary Research	 Read the paper and capture main concepts Provide project oversight and guidance Find possible approaches for implementations 	Week 1 ~ Week 2 (Sept.05 ~ Sept.13)
Preparation	 Commits project resources Build up project repository Construct the framework including creation of auxiliary modules Write ReadMe in the repository 	Week 3 ~ Week 4 (Sept.14 ~ Sept.28)
Implementation	 Build a module – Filter for different filters (L1 and HP) Initiate a back-testing framework to test the purified signal's performance in terms of return and Sharpe Back-test and compare different filters performance and recap the corresponding advantage and disadvantage for varying scenarios Summarize a table to record what is the choice of filter under various situation 	Week 5 ~ Week 10 (Sept.29 ~ Nov.11)
Further Work	Figure out what is possible substitute for L1 filter to compensate its intrinsic drawback	Week 11 ~ Week 12 (Nov.12 ~ Nov.20)