ORIE 5270 Project Proposal

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Machine Learning in High Frequency Trading

During the past year of our program, we have learned a lot about the traditional factor models and portfolio optimization. Those areas mainly deal with daily data instead of intraday data. With the BBO quote data and trade data at hand, it would be really interesting if we try some high frequency trading algorithms. Machine Learning has been applied a lot in the field of high frequency trading especially in optimized trade execution and price movement prediction areas.

- Optimized Trade Execution
  This is a problem of buying or selling a specified volume of shares with minimal cost of money in a specified period of time. Some paper like *Reinforcement learning for optimized trade execution* [1] and *Reinforcement learning for optimized trade execution* [2] have applied Reinforcement Learning techniques in this kind of problems.

- Price Movement Prediction
  We can also use intra day data to train machine learning algorithms and discover the patterns within a day. There are also some paper that are interesting [3] and [4]

In this project, I will implement one algorithm or model developed by others about applying machine learning in high frequency trading in one of the field above. The basic idea of this project is to use the intraday data to build some machine learning algorithms and learn some new machine learning techniques and see some application of machine learning in high frequency trading.

References

[1] Yuriy Nevmyvaka, Yi Feng, and Michael Kearns. Reinforcement learning for optimized trade execution. In *Proceedings of the 23rd international conference on Machine learning*, pages 673–680. ACM, 2006.

[2] Dieter Hendricks and Diane Wilcox. A reinforcement learning extension to the almgren-chriss framework for optimal trade execution. In *2014 IEEE Conference on Computational Intelligence for Financial Engineering & Economics (CIFEr)*.

[3] Travis Felker, Vadim Mazalov, and Stephen M Watt. Distance-based high-frequency trading. *Procedia Computer Science*, 29:2055–2064, 2014.

[4] Francesco Bertoluzzo and Marco Corazza. Testing different reinforcement learning configurations for financial trading: Introduction and applications. *Procedia Economics and Finance*, 3:68–77, 2012.

[5] Michael Kearns and Yuriy Nevmyvaka. Machine learning for market microstructure and high frequency trading. *High Frequency Trading: New Realities for Traders, Markets, and Regulators*, 2013.