

Title: Deep Q-learning Trading Algorithm

Area of Interest: Reinforcement Learning

Project Team: Shen Gao (shengao)

Description:

- Quantitative investing has become the new norm in today's financial markets. As someone who had spent the last 6 years in finance, I'd like to explore a deep learning approach to the traditional portfolio trading.
- The main challenge of this project is the nature of financial data and the vast number of sources for noises. The financial market is known to be difficult to predict. For this project, some evidence that Q-learning could improve investment outcome and reduce risk would be considered a success.
- I'm planning on using a collection of data sources: Yahoo Finance API for public stock time series, WRDS for company financials and forecasts, Quandl for any supplemental data. I will not collect any data on my own.
- I'm planning on using LSTM for time series forecasting of relevant asset prices (public stocks, bonds, selected commodities and currencies) and style factors (such as volatility, price momentum, value, size, or the Fama-French factors) and use a Q-learning mechanism for investment decisions (buy/hold/sell for certain asset or styles). I think there are plenty of LSTM implementations. For the Q-learner, I will reference some existing repos ([https://github.com/kh-kim/stock\\_market\\_reinforcement\\_learning](https://github.com/kh-kim/stock_market_reinforcement_learning)) and modify the policy and reward based on my investment framework.
- From preliminary literature review, I will primarily reference this paper: <http://csit.riit.tsinghua.edu.cn/mediawiki/images/5/5f/Dtq.pdf>
- I will build a back-tester showing monetary reward over the data period. The results will be examined in both model performance such as fit to data and cross validation/test performance, and also backtest results in dollar amounts. For benchmarking purposes, I will use two base strategies for portfolio performance comparison, one with simple buy and hold strategy and the other the S&P 500 index fund.