Extreme Stock Returns and Machine Learning

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Note: this is a possible research project with an external collaborator, so that I will do it without any partner from the class.

Research Idea and Motivation

Finance Practitioners, especially those who engage in risk management, are concerned with extreme stock returns: jackpot returns and crashes, defined as unexpected individual stock returns that are higher than 10% and lower than -10%, respectively. Accurately predicting jackpots and crashes facilitates risk management practice as well as equity investment.

Previous finance literature focuses on exploring jackpots and crashes as explanatory variables. Conrad et al. (2014) find that investors prefer stocks with higher probability of jackpots. Bali et al. (2011) find that extreme positive returns in the past month are negatively and significantly related to the expected cross-sectional stock returns.

We hypothesize that the extreme return may correlate to some key metrics of the stock. Using machine learning algorithms may find the underlying link between the historical data and the extreme return.

Dataset and Models

We will obtain daily stock return data and stock volume, bid-ask spread, and short interest ratio data from the Center for Research in Security Prices database (CRSP). We will explore the accuracy of multiple machine learning algorithms, including LASSO, Random Forests, Neural Network, etc., in predicting extreme stock returns. To our best knowledge, we are the first to predict extreme stock returns using machine learning algorithms. Sklearn and Pytorch will be used to train the models. We will also test over-sampling on the data due to the scarcity of extreme events.

Timeline

Oct. 12-Oct. 20: data collection and preprocessing

Oct. 20-Oct. 30: preliminary testing on small sample sets and simple models

Nov. 1-Nov. 20: model training and tuning

Nov. 20-Dec. 9: analyze results and write the report

Dec. 10: submission

References:

Bali, T. G., N. Cakici, R. F. Whitelaw, Maxing out: Stocks as lotteries and the cross-section of expected returns, Journal of Financial Economics, Volume 99, Issue 2, 2011, Pages 427-446.

Conrad, J., N. Kapadia, and Y. Xing, Death and jackpot: Why do individual investors hold overpriced stocks?, Journal of Financial Economics, Volume 113, Issue 3, 2014, Pages 455-475.