Predicting Relative Performance of Sector Exchange Traded Funds Using Machine Learning

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Abstract: Machine learning has been used in many areas today. It thrives at reviewing large volumes of data and identifying patterns and trends that might not be apparent to a human. Given the huge potential benefit and the amount of data available in the financial market, it is not surprising to see machine learning applied to various financial products. While future prices of financial securities are extremely difficult to forecast, we study them from a different angle. Instead of trying to forecast future prices, we apply machine learning algorithms to predict the direction of future price movement, in particular, whether a sector Exchange Traded Fund (ETF) would outperform or underperform the market in the next week or in the next month. We apply several machine learning algorithms for this prediction. The algorithms are Linear Discriminant Analysis (LDA), k-Nearest Neighbors (KNN), Decision Tree (DT), Gaussian Naive Bayes (GNB), and Neural Networks (NN). We show that these machine learning algorithms, most notably GNB and NN, have some predictive power in forecasting out-performance and under-performance out of sample. We also try to explore whether it is possible to utilize the predictions from these algorithms to outperform the buy-and-hold strategy of the S&P 500 index. The trading strategy to explore out-performance predictions does not perform very well, but the trading strategy to explore under-performance predictions can earn higher returns than simply holding the S&P 500 index out of sample.

Keywords: machine learning, ETF prediction, dynamic trading, asset allocation

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