Nomura's Joint Research Papers with Preferred Networks Selected by AAAI and AAMAS

Tokyo, December 21, 2020—Nomura Holdings, Inc. and Nomura Asset Management Co., Ltd., the core company within the Asset Management Division of Nomura Group, today announced that some of the findings of their joint research with Preferred Networks, Inc. (PFN) on investment methods have been selected by prestigious AI academic conferences AAAI (Association for the Advancement of Artificial Intelligence) and AAMAS[1] (International Conference on Autonomous Agents and Multiagent Systems).

The three companies have been conducting research on advanced investment methods since October 2019. Nomura aims to leverage the findings of this joint research to launch a fund.

The asset management industry has been actively pursuing research on new investment methods using machine learning and data science. Despite the tremendous amount of research presented at academic conferences each year, very few of these methods have been implemented in the asset management business. To improve investment performance, it is critical that investment methods provide practical solutions in addition to being cutting edge.

Nomura Group has for many years developed various quantitative methods to address investment business issues based on its knowledge of financial engineering and data science. PFN develops practical applications using machine learning, deep learning and other advanced technologies to help solve issues specific to various industries, such as automated driving and cancer treatment.

To provide clients with more investment opportunities and added value, Nomura has started discussions with PFN towards creating a fund that makes full use of AI and other technologies, including the results of their joint research.

Reference
1. Abstract from AAAI submission
Title: *Deep Portfolio Optimization via Distributional Prediction of Residual Factors*

Recent developments in deep learning techniques have motivated intensive research on machine learning-aided stock trading strategies. However, since the financial markets have a highly non-stationary nature hindering the application of typical data-hungry machine learning methods, leveraging financial inductive biases is important to ensure better sample efficiency and robustness. In this study, we propose a novel method of constructing a portfolio based on predicting the distribution of a financial quantity called residual factors, which is known to be generally useful for hedging the risk exposure to common market factors.

---

[1] *AAAI and AAMAS receive submissions from distinguished AI researchers from world-renowned universities and research institutions each year, and have a very high standard for accepting submissions. Presentations at these conferences by Japanese financial institutions are rare, demonstrating the academic merit of Nomura's joint research with PFN. Paper submitted to AAMAS was accepted as Full Paper.*

The key technical ingredients are twofold. First, we introduce a computationally efficient extraction method for the residual information, which can be easily combined with various prediction algorithms. Second, we propose a novel neural network architecture that allows us to incorporate widely acknowledged financial inductive biases such as amplitude invariance and time-scale invariance. We demonstrate the efficacy of our method on U.S. and Japanese stock market data. Through ablation experiments, we also verify that each individual technique contributes to improving the performance of trading strategies. We anticipate our techniques may have wide applications for various financial problems.

2. Abstract from AAMAS submission
Title: *Trader-Company Method: A Metaheuristics for Interpretable Stock Price Prediction*

Investors try to predict returns of financial assets to make successful investment. Many quantitative analysts have used machine learning-based methods to find unknown profitable market rules from large amounts of market data. However, there are several challenges in financial markets hindering practical applications of machine learning-based models. First, in financial markets, there is no single model that can consistently make accurate predictions because traders in markets quickly adapt to newly available information. Instead, there are a number of ephemeral and partially correct models called "alpha factors." Second, since financial markets are highly uncertain, ensuring interpretability of prediction models is quite important to make reliable trading strategies.

To overcome these challenges, we propose the Trader-Company method, a novel evolutionary model that mimics the roles of a financial institution and traders belonging to it. Our method predicts future stock returns by aggregating suggestions from multiple weak learners called Traders. A Trader holds a collection of simple mathematical formulae, each of which represents a candidate of an alpha factor and would be interpretable for real-world investors. The aggregation algorithm, called a Company, maintains multiple Traders. By randomly generating new Traders and retraining them, Companies can efficiently find financially meaningful formulae whilst avoiding overfitting to a transient state of the market. We show the effectiveness of our method by conducting experiments on real market data.

———————————————— ends ————————————————