An Empirical Study of Optimal Combination of Algorithms for Prediction-Based Portfolio Optimization Model using Machine Learning over Covid-19 Period

RESULTS & DISCUSSION

This research develops a quantitative trading system with machine learning and mathematical models which earns over 10 times better performance than Hang Seng Index in both pre covid and covid periods, and it is found that the portfolio builded up with algorithms in covid period has higher return with higher risk. Apart from academic findings, all the codes developed in this research will be open source on GitHub and helpful for further research and industry usage

RESEARCH DESIGN

Quantitative Trading System

Ta et al. (2018) summarised a quantitative trading system: using the alpha model, risk model and transaction cost model to construct the portfolio and then form the execution model. This research uses the last 10-year-stock-price and technical indicators from over 64 stocks given by FUTU API to build four experiment time ranges for back-testing: all 10-year time, covid time (2-year), pre covid time (8-year) and pre covid test time (2-year)

Stock Prediction

A variety of stock prediction machine learning algorithms are used: linear regression, decision tree regression, random forest regression, support vector machine (linear, poly, rbf) and LSTM Neural Network. The R2 score, mean absolute error and predicted price are used to validate the prediction model and select stocks

Portfolio Optimization

The selected stocks under each period and prediction model are constructed into a portfolio, and then optimized with several algorithms: Equal-Weighted, Mean-Variance, Hierarchical Risk Parity and K-Mean based Mean-Variance. The Sharpe ratios and cumulative returns are used to compare different portfolios and Hang Seng Index

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