

LIMOS – LightGBM Interval Merton's

One-period-portfolio Selection

Liang-Ching Lin,^{*1} Hao-Chien Huang¹ and Sz-Wei Charng¹

¹Department of Statistics and Institute of Data Science, National Cheng Kung University, Tainan, Taiwan.

Abstract

The modern portfolio theory can assist us in allocating wealth to risky and risk-free assets reasonably well by using some statistical methods. In this study, we will focus on evolving Merton's portfolio problem. Instead of the conventional parameter estimations based on only the closing prices, we include the opening, high, low, and closing prices to enlarge the database as much as possible to make the parameter estimations much more accurate. Furthermore, the covariances are estimated using the bivariate symbolic interval-valued variables under a copula function. In addition, we use LightGBM to predict the transaction directions in which the prices and many statistics are included in the features. In real data analysis, we demonstrate the usefulness of combining the aforementioned methods by showing the portfolio profits of selecting 10 stocks in 2018 and 2019. The results particularly show the superiority of the proposed strategy over the conventional method: the profits can be transformed from negative profit to positive profit and have around 60% to 95% annually.

Keywords: LightGBM; Merton's portfolio problem; Symbolic interval-valued estimation.