Modern Portfolio Theory based on the Interval-Valued Variables

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Abstract

Modern portfolio theory formalizes and extends the idea of diversification in investing, which states that owning different kinds of financial assets is less risky than owning only one type. In this talk, I will briefly introduce two famous modern portfolio theories which are Markowitz's (1989) mean-variance portfolio selection and Merton's (1969) maximum utility function. However, in financial economics, these two theories are developed based on the daily closing price. When using only the daily closing price to model the stock prices, we may discard valuable intra-daily information, such as maximum and minimum prices. In this study, we propose an innovative financial interval-valued time series model, including the daily maximum, minimum, and closing prices. The likelihood function and the corresponding maximum likelihood estimates (MLEs) are obtained by stochastic differential equation and the Girsanov theorem. The efficiency of the proposed estimators is illustrated by a simulation study. Finally, the proposed method is utilized to perform the modern portfolio theory based on Merton's (1969) maximum utility function.

Keywords: Interval time series, Modern portfolio theory, Stochastic differential equation.