Symbolic interval-valued data analysis for time series based on auto-interval-regressive models

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Abstract

This study considers interval-valued time series data. To characterize such data, we propose an auto-interval-regressive (AIR) model using the order statistics from normal distributions. Furthermore, to better capture the heteroscedasticity in volatility, we design a heteroscedastic volatility AIR (HVAIR) model. We derive the likelihood functions of the AIR and HVAIR models to obtain the maximum likelihood estimator. Monte Carlo simulations are then conducted to evaluate our methods of estimation and confirm their validity. Real data examples from the S&P 500 Index and PM2.5 are used to demonstrate our method. This study considers interval-valued time series data. To characterize such data, we propose an autointerval-regressive (AIR) model using the order statistics from normal distributions. Furthermore, to better capture the heteroscedasticity in volatility, we design a heteroscedastic volatility AIR (HVAIR) model. We derive the likelihood functions of the AIR and HVAIR models to obtain the maximum likelihood estimator. Monte Carlo simulations are then conducted to evaluate our methods of estimation and confirm their validity. Real data examples from the S&P 500 Index and PM2.5 are used to demonstrate our method.

Keyword: AIR model, HVAIR model, Interval-valued time series, Order statistics, Symbolic data analysis