Different approaches to forecast interval time series: a comparison in finance

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Abstract— An interval time series (ITS) is a time series where each period is described by an interval. In finance, ITS can describe the temporal evolution of the high and low prices of an asset throughout time. These price intervals are related to the concept of volatility and are worth considering in order to place buy or sell orders. This article reviews several approaches to forecast ITS. On the one hand, the first group of methods consists of using univariate or multivariate forecasting methods. The possible cointegrating relation between the high and low values is analyzed for multivariate models and the equivalence of the VAR models is proved for the minimum and the maximum time series, as well as for the center and radius time series. On the other hand, the second group of methods adapts classic forecasting methods to deal with ITS using interval arithmetic. These methods include exponential smoothing, the k-NN algorithm and the multilayer perceptron.

The performance of these approaches is studied in two financial ITS. As a result, evidences of the predictability of the ITS are found, especially in the interval range. This fact opens a new path in volatility forecasting.

Index Terms— Financial time series; interval data; exponential smoothing; artificial neural networks; nearest neighbors methods; vector autoregressive models; interval arithmetic

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