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A procedure for identification of appropriate state space and ARIMA models based on time-series cross-validation. (English) [Zbl 07042385](#)

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Summary: In this work, a cross-validation procedure is used to identify an appropriate Autoregressive Integrated Moving Average model and an appropriate state space model for a time series. A minimum size for the training set is specified. The procedure is based on one-step forecasts and uses different training sets, each containing one more observation than the previous one. All possible state space models and all ARIMA models where the orders are allowed to range reasonably are fitted considering raw data and log-transformed data with regular differencing (up to second order differences) and, if the time series is seasonal, seasonal differencing (up to first order differences). The value of root mean squared error for each model is calculated averaging the one-step forecasts obtained. The model which has the lowest root mean squared error value and passes the Ljung-Box test using all of the available data with a reasonable significance level is selected among all the ARIMA and state space models considered. The procedure is exemplified in this paper with a case study of retail sales of different categories of women's footwear from a Portuguese retailer, and its accuracy is compared with three reliable forecasting approaches. The results show that our procedure consistently forecasts more accurately than the other approaches and the improvements in the accuracy are significant.

MSC:

62 Statistics

86 Geophysics

Keywords:

model identification; state space models; ARIMA models; forecasting; retailing

Software:

astsa; expsmooth; forecast; Forecast; itsmr; R

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