Multistep Prediction Errors in Integrated Autoregressive Processes with Polynomial Time Trends

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Abstract

Assume that observations are generated from nonstationary autoregressive (AR) processes with deterministic time trends. We adopt a fitted model which possibly over specifies the orders of autoregressive and time trends to predict future observations and obtain an asymptotic expression for the multistep mean-squared prediction error (multistep MSPE) of the least squares predictor. This expression provides the first exact assessment of the impacts of nonstationary, model complexity, and model over-specification on the corresponding multistep MSPE. It not only provides a deeper understanding of the least squares predictors in nonstationary time series, but also forms the theoretical foundation for asymptotical efficient order selection in nonstationary AR processes with possibly deterministic time trends.

Key words: Deterministic time trends; Fisher information matrix; Mean squared prediction error; Plug-in method; Unit roots.