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Bayesian nonparametric vector autoregressive models

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Abstract

Vector autoregressive (VAR) models are the main work-horse model for macroeconomic forecasting, and provide a framework for the analysis of complex dynamics that are present between macroeconomic variables. Whether a classical or a Bayesian approach is adopted, most VAR models are linear with Gaussian innovations. This can limit the model's ability to explain the relationships in macroeconomic series. We propose a nonparametric VAR model that allows for nonlinearity in the conditional mean, heteroscedasticity in the conditional variance, and non-Gaussian innovations. Our approach differs to that of previous studies by modelling the stationary and transition densities using Bayesian nonparametric methods. Our Bayesian nonparametric VAR (BayesNP-VAR) model is applied to US and UK macroeconomic time series, and compared to other Bayesian VAR models. We show that BayesNP-VAR is a flexible model that is able to account for nonlinear relationships as well as heteroscedasticity in the data. In terms of short-run out-of-sample forecasts, we show that BayesNP-VAR predictively outperforms competing models.

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