Time-Varying Parameter Models – Achieving Shrinkage and Variable Selection

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Time-varying parameter (TVP) models are a popular tool for handling data with smoothly changing parameters. However, in situations with many parameters the flexibility underlying these models may lead to overfitting models and, as a consequence, to a severe loss of statistical efficiency. This occurs, in particular, if only a few parameters are truely time-varying, while the remaining ones are constant or even insignificant. As a remedy, hierarchical shrinkage priors have been introduced for TVP models to allow shrinkage both of the initial parameters as well as their variances toward zero.

The present paper contributes to the literature in two ways. First, we investigate shrinkage for TVP models based on the Normal-Gamma prior which has been introduced by Griffin and Brown (2010) for standard regression models. Our approach extends Belmonte, Koop, and Korobilis (2011) who considered the Bayesian LASSO prior, a special case of the Normal Gamma prior. While both priors reduce the risk of overfitting and increase statistical efficiency, they do not allow for variable selection. Hence, as a second contribution, we follow Frühwirth-Schnatter and Wagner (2010) and consider TVP models with spike-and-slab priors which explicitly incorporate variable selection both with respect to the initial parameters as well as their variances.

Following Belmonte et al. (2011), hierarchical shrinkage priors as well as spike-and-slab priors are applied to EU area inflation modelling based on the generalized Phillips curve. Since the corresponding time series are relatively short, variable selection through the spike-and-slab priors is particularly sensitive to the choice of hyperparameters.