A Note on The Dynamic Effects of Supply and Demand Shocks in the Crude Oil Market

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Online Appendix

A Prior distribution

Let $\boldsymbol{\Theta} = \{\boldsymbol{\theta}_{1:k,0}, \boldsymbol{\Sigma}_{\theta,1:k}, \boldsymbol{\Sigma}_{h,1:k}, \boldsymbol{\theta}_{1:k,1:T}, \mathbf{h}_{1:k,0:T}\}$ be the parameter set of the hybrid TVP-VAR model. We assume vague but proper prior distributions. For example, the prior for the degree of freedom is $\nu_i \sim \mathcal{G}(2, 0.1)$. The prior for the variance of shock to the volatility and time-varying parameters are $\sigma^2_{h,1:k} \sim \mathcal{G}(\frac{1}{2}, \frac{1}{2\mathbf{V}_h})$ and $\sigma^2_{\theta,1:k} \sim \mathcal{G}(\frac{1}{2}, \frac{1}{2\mathbf{V}_\theta})$ where $\mathbf{V}_h = \mathbf{V}_\theta = 1$, this prior is less influential in comparison to the conjugated inverse gamma prior especially when the true value is small. The priors of the initial volatility and $\mathbf{h}_0$ and initial regression coefficients $\boldsymbol{\theta}_{i,0}$ are $\mathbf{h}_0 \sim N(\mathbf{a}_{h_0}, \mathbf{V}_{h_0})$ where $\mathbf{a}_{h_0} = \log \hat{\Sigma}_{OLS}$ is the estimated residual variance of a univariate AR(p) model using the ordinary least square method, and $\mathbf{V}_{h_0} = 4\mathbf{I}_k$, see Clark (2011); $\boldsymbol{\theta}_{0,i}$ follows a Minnesota prior with the overall shrinkage $l_1 = 0.2$ and the cross-variable shrinkage $l_2 = 0.5$, see Koop and Korobilis (2010).

References

T. E. Clark. Real-time density forecasts from Bayesian vector autoregressions with stochastic volatility. *Journal of Business and Economic Statistics*, 29(3):327–341, 2011.

G. Koop and D. Korobilis. *Bayesian multivariate time series methods for empirical macroeconomics*. Now Publishers Inc, 2010.