

Package Name: Uhlig
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Add-in Type: Global
Default Proc Name: Uhlig
Default Menu Text: Uhlig BVAR with SV
Interface: Dialog and command line

Description

We consider the VAR(k) model with time-varying error precision matrices

$$Y_t = B_0 C_t + B_1 Y_{t-1} + B_2 Y_{t-2} + \cdots + B_k Y_{t-k} + \mathcal{U}(H_t^{-1})' \varepsilon_t, \quad \text{with } \varepsilon_t \sim N(0, I_m)$$

$$H_{t+1} = \frac{u(H_t)' \Theta u(H_t)}{\lambda} \quad \text{with } \Theta \sim \mathcal{B}_m\left(\frac{v+c+km}{2,1}, \frac{1}{2}\right)$$

where Y_t contains observable data ($m \times 1$) and C_t denotes deterministic regressors such as a constant and a time trend. $\mathcal{U}(H_t)$ denotes the upper Cholesky factor of a positive definite matrix H and $\mathcal{B}_m(p, q)$ denotes the multivariate beta-distribution.

To use this method, we need to select a prior. Uhlig suggest setting the prior mean \bar{B}_0 to correspond to a random walk specification and to choose $v = 20$, for quarterly data and $\lambda = v/(v + 1)$.

We use the importance-based sampling to analyze the posterior. First, integrate over H_{T+1} to find the marginal posterior

$$\begin{aligned} \log(\pi_{T, \text{marg}}(B)) &= \text{cons} + 1/2 \sum_{t=1}^T \log |(B - \bar{B}_t) N_t (B - \bar{B}_t)' + \frac{v}{\lambda} S_t| \\ &\quad - \frac{l+v}{2} \log \left| (B - \bar{B}_T) N_T (B - \bar{B}_T)' + \frac{v}{\lambda} S_T \right| \end{aligned}$$

Conditional on the coefficient matrix B , precision matrix H_{T+1} has a Wishart distribution $\mathcal{W}_m(l + v, \Omega)$, where

$$\Omega^{-1} = \lambda(B - \bar{B}_T) N_T (B - \bar{B}_T)' + v S_T$$

Find the maximum of the marginal posterior with the following modified Newton-Raphson method. Let

$$J = -\frac{l+v}{2} N_T \otimes \left(\frac{v}{\lambda} S_T\right)^{-1} - \frac{1}{2} \sum_{t=1}^T N_t \otimes \left(\frac{v}{\lambda} S_t\right)^{-1}$$

be the sum of all second derivatives of the individual pieces of the marginal posterior evaluated at their individual maximum. Set $B^0 \equiv \bar{B}_T$ and iterate on

$$vec(B^n) = vec(B^{n-1}) - J^{-1} \frac{\partial}{\partial vec(B)} \log(\pi_{T,marg}(B^{n-1}))$$

until convergence. Let the B^* denote the maximum of the posterior and let J^* be the Hessian of the marginal posterior at $vec(B^*)$. Use as importance sampling density a t-distribution centered at B^* with Hessian J^* .

Dialog

Upon running the add-in from the menus, a dialog will appear:

The first box lets you specify the endogenous variable for BVAR model with stochastic volatility. On the next box enter number of the lag of endogenous variable (p). On the third box enter random walk prior of BVAR. On the fourth box insert the mean (calibration of intercepts) of BVAR model. Other boxes are optional.

Command line:

`uhlig(options) lag BVAR_prior(vector) BVAR_mean(vector) @ endogenous_variables`

for example:

```
uhlig(estimate=1) 4 "0.3, 0.7, 0.9" "3.2, 0.0, 2.5" @ lgdp infl_dt ffr_dt
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uhlig(estimate=2) 4 "0.3, 0.7, 0.9" "3.2, 0.0, 2.5" @ lgdp infl_dt ffr_dt
```

Option

| | |
|----------|---------------------------------------|
| tight | Overall tightness prior parameter |
| vprior | v parameter for prior |
| estimate | 1= results only , 2=forecasting |
| mcdraw | Number of draws of importance sampler |
| niter | Number of iteration of maximum beta |
| fsuff | Forecast suffix |
| fhor | Forecast horizon |
| sample | Estimation sample |
| seed | Random number seed (optional) |

References:

Uhlig Harald., 1997, "Bayesian Vector Autoregression with Stochastic Volatility", Econometrica, Vol65(1), pp59-73