

### Estimating a VAR with Minnesota Prior in MATLAB

The code for the VAR estimation is based on Del Negro and Schorfheide (2011), “Bayesian Macroeconometrics,” in: *Oxford Handbook of Bayesian Economics*.

The environment is that of a 4-variables VAR(4) given by:

$$\mathbf{y}_t = \Phi_c + \Phi(L)\mathbf{y}_t + \mathbf{u}_t \quad \mathbf{u}_t \sim N(0, \Sigma)$$

The VAR contains, respectively, the log of de-trended real GDP per capita, the inflation rate (GDP deflator), a measure of nominal interest rate and real money balances. Data are quarterly and refer to the US economy for the period 1959(1):2006(4). The model is estimated using Bayesian methods. In particular, given a prior  $p(\Phi, \Sigma)$  and the likelihood function  $L(\mathbf{Y}_{1,T} | \mathbf{Y}_{-p+1,0}, \Phi, \Sigma)$ , we get a posterior density through Bayes rule:

$$p(\Phi, \Sigma | \mathbf{Y}) \propto L(\mathbf{Y}_{1,T} | \mathbf{Y}_{-p+1,0}, \Phi, \Sigma) p(\Phi, \Sigma)$$

We specify that  $p(\Phi, \Sigma)$  follows the Inverted Wishart Multivariate Normal density, with moments derived using dummy observations from the Minnesota prior. This prior is conjugate for the likelihood function in this model.

The file `VAR.m` estimates the above model using a direct sampling algorithm. The file returns a figure plotting the recursive averages and the posterior marginal density of the largest eigenvalues of the companion form matrix. The file also returns the marginal data density in the scalar `mdd`.

`VAR.m` uses a number of subroutines in the folders `Minnesota Prior` and `Data` to perform this task. In particular:

- `vm-loaddata.m`  $\Rightarrow$  Loads the data used in the estimation;
- `vm-spec.m`  $\Rightarrow$  It is a file that controls the hyper-parameters of the Minnesota prior;
- `vm-dummy.m`  $\Rightarrow$  Generates dummy observations using the Minnesota prior;
- `vm-mdd.m`  $\Rightarrow$  Computes the marginal data density.