

TOOLS FOR APPLIED MACRO 2017

PROBLEM SET 2

INSTRUCTIONS

Write up your results carefully and clearly and submit electronically in pdf format to pkn8@cornell.edu before Wednesday March 8. Attach any Matlab code used in the exercise in a separate folder. Use notation as indicated in the questions. A well-written problem set should be understandable to a reader who has not read the questions nor looked at the Matlab code.

QUESTION 1

For the US, find quarterly data for CPI inflation (π_t), GDP growth ($\Delta y_t \equiv \ln y_t = \ln y_{t-1}$ gives growth in per cent), the Federal Funds Rate (r_t). Use entire post WWII data except the post-2007 financial crisis data. Make sure that you use **seasonally adjusted** time series. (Google "FRED St Louis" if you do not know where to look for data.)

- (1) Plot the data.
- (2) Estimate the parameters of the AR(1) model

$$x_t = c + \phi x_{t-1} + \varepsilon_t : \varepsilon_t \sim N(0, \sigma^2)$$

using grid search and exact maximum likelihood for each individual time series i.e. for $x_t = \pi_t, \Delta y_t, r_t$.

- (3) How did you choose the boundaries of the grid?
- (4) Estimate the AR(1) above using conditional maximum likelihood. Are your estimates different?

QUESTION 2

- (1) For the tri-variate *VAR* model

$$\begin{bmatrix} r_t \\ \Delta y_t \\ \pi_t \end{bmatrix} = \mathbf{c} + \Phi_1 \begin{bmatrix} r_{t-1} \\ \Delta y_{t-1} \\ \pi_{t-1} \end{bmatrix} + \dots + \Phi_p \begin{bmatrix} r_{t-p} \\ \Delta y_{t-p} \\ \pi_{t-p} \end{bmatrix} + \varepsilon_t : \varepsilon_t \sim N(0, \Omega)$$

determine the appropriate lag order p and find the conditional maximum likelihood estimates of $\mathbf{c}, \Phi_1, \Phi_2, \dots, \Phi_p$ and Ω .