

Time Series Lab 4

May 14, 2012

1. A Random Coefficient Regression. Consider the following model,

$$\begin{aligned} y_t &= x_t \beta_t + e_t \\ \beta_t &= \beta_{t-1} + v_t, \end{aligned}$$

where y_t and x_t are year-to-year changes of CPI and PPI, respectively, and $e_t \sim N(0, R)$ and $v_t \sim N(0, Q)$. The data file is `cpippi.txt`, which can be downloaded from the course webpage. The first column of the file gives the y2y change of CPI, and the second column gives that of PPI.

- (1) Estimate R and Q using MLE.
- (2) Estimate β_t using all information in $(y_t, x_t)_{t=1}^n$.

2. (optional) Markov Switching. Let (r_t) be monthly returns on Shanghai Stock Composite Index since 2000, and consider the following model,

$$\begin{aligned} r_t &= \mu_{s_t} + w_t, \quad s_t \in \{1, 2\} \\ w_t &= \alpha w_{t-1} + \varepsilon_t, \end{aligned}$$

where $\varepsilon_t \sim i.i.d.N(0, \sigma^2)$ and s_t is a Markov chain with transition matrix $\begin{pmatrix} p & 1-p \\ 1-q & q \end{pmatrix}$.

- (1) Estimate all parameters in the model using MLE.
- (2) Calculate and plot $p(s_t | \mathcal{F}_n)$.