EC 831: Empirical Methods in Macroeconomics

Aeimit Lakdawala

Michigan State University

Taylor Rule with time-varying parameters

We want to estimate the following model:

$$
\begin{aligned}
i_t &= \phi_{\pi,t}\pi_t + \phi_{u,t}u_t + \rho i_{t-1} + \varepsilon_t \qquad \varepsilon_t \sim N(0, \sigma_\varepsilon^2) \\
\phi_{\pi,t} &= \phi_{\pi,t-1} + e_{\pi,t} \qquad e_{\pi,t} \sim N(0, \sigma_\pi^2) \\
\phi_{u,t} &= \phi_{u,t-1} + e_{u,t} \qquad e_{u,t} \sim N(0, \sigma_u^2)
\end{aligned}
$$

The data are in the file `data_baseline.mat`. It is a matlab matrix file.

It contains the following variables:
1) unrate (Unemployment rate): u
2) pi (Inflation): π
3) tbill3m (interest rate): i
4) dates (vector of dates 1954:Q4 to 2013:Q3)

- Use all data in the estimation
- Demean tbill3m (no constant in obs eqn)

For this assignment we will use classical methods, i.e. MLE

- Parameters to estimate: $\rho, \sigma_\varepsilon^2, \sigma_\pi^2, \sigma_u^2$

Maximum Likelihood

1) Set $\xi_{0|0} = [\phi_{\pi,0|0}, \quad \phi_{u,0|0}] = [0, \quad 0]$ and $P_{0|0} = \begin{pmatrix} 10 & 0 \\ 0 & 10 \end{pmatrix}$

2) Use the Kalman Filter to evaluate the likelihood and estimate the parameters by MLE

3) For the mle estimates, store the filtered and smoothed values of the two tv coefficients

4) On two separate graphs plot i) filtered values and ii)smoothed values for the two tv coefficients on y axis with dates on x axis, with one standard deviation confidence intervals in both cases

Optional: Bayesian Estimation

Gibbs Sampler:

- Normal prior for $\rho, \xi_{0|0}$
- Inverse gamma prior for $\sigma_\varepsilon^2, \sigma_\pi^2, \sigma_u^2$
- Use Carter-Kohn algorithm to sample ξ^T

Compare with MLE estimates