Problem Set 3
Advanced Macroeconomics II
WISE, Xiamen University

March 25, 2015

The due date for this assignment is Friday, April 3, 2015. It needs to be delivered by 12:00 at noon before the tutorial session starts.

You can form a group of up to three persons. Remember to sign your name and student ID on the cover page of your group homework.

Notice: In addition to submitting the written or printed form of your homework answers, please keep your complete codes/data and carry them with a **U-disk** to the tutorial session on April 3, 2015. Each group needs a representative to present and run the codes for your team, which counts for 10 points. Please make sure that the codes can be run within your own folder using Matlab.

Questions: Referring to the paper of Kwan and Chow (1996) and lecture slides, complete the following steps for the model.

For the FONCs on slides page 9.

1. Solve for the steady states on slides page 10. (4 points)
2. Loglinearize all the FONCs on slides page 9. (4 points)

Then you proceed to solve the model into the recursive law of motion.

3. Solve for the undetermined coefficients v_{ck} v_{cz} v_{kk} v_{kz} . (6 points)
4. What are the parameters in the log variable VAR(1): g, G_1 and G_2? (4 points)

Simulation study using the data set in Data_ KwanChow1996.xls in the folder of "DataCodes" on the teaching page. There are some typos in the data of output and capital stock however. Please compare with Table 2 in the authors' paper to correct the typos first before proceeding.

5. Take the MLE estimate of authors, $\left(\tilde{\alpha}, \tilde{\gamma}, \tilde{\beta}\right) = (0.7495, 0.9999, 0.0218)$, to construct the Solow residual series and the model implied series, i.e.

$$\begin{aligned} \ln A_t &= \ln q_t - (1-\alpha)\ln k_t \\ \ln \tilde{A}_t &= \tilde{\gamma} + \ln q_{t-1} - (1-\tilde{\alpha})\ln k_{t-1} \end{aligned}$$

   plot them on one graph. Please label the series properly. (5 points)

6. Compute the model implied shocks to the productivity process,

$$\tilde{\eta}_t = \ln A_t - \ln \tilde{A}_t,$$

and plot it. What is the variance of $\tilde{\eta}_t$? (2 points)

7. Compute the model implied log capital, $\ln \tilde{k}_t$, using information up to t, i.e.

$$\begin{aligned} \ln \tilde{k}_t &= g + [\ln q_{t-1} - (1-\alpha)\ln k_{t-1}]/\alpha \\ &\quad + G_1 [\Delta \ln q_{t-1} - (1-\alpha)\Delta \ln k_{t-1}]/\alpha \\ &\quad + G_2 [\ln k_{t-1} - (\ln q_{t-2} - (1-\alpha)\ln k_{t-2})/\alpha] \end{aligned} \tag{1}$$

and plot the implied capital, $\ln \tilde{k}_t$, and true capital, $\ln k_t$, processes on one graph. Please label the series properly. (5 points)

8. Compute the model implied shocks to log capital,

$$\tilde{e}_t = \ln k_t - \ln \tilde{k}_t,$$

and plot it. What is the variance of $\tilde{e}_t$? (2 points)

9. Assume $\tilde{\eta}'_t = 0$ and $\tilde{e}'_t = 0$ only for $t = 1958, ..., 1962$, while keeping the same values of shocks obtained from above. Simulate logged Solow residual, capital, and output. Replicate Fig.6, Fig.5 and Fig.3 in the paper respectively. (Note: Your figures can be slightly different as we set the disturbance terms during the Great Leap Forward completely to zero.) (7 points)

   Instruction hints: Denote simulated capital as k^s_t and take the actual capital and output in 1952 and 1953 as given initial values. From 1954 to 1957, $\ln k^s_t = \ln \tilde{k}^s_t + \tilde{e}_t = \ln k_t$ by construction, where $\ln \tilde{k}^s_t$ is computed using equation (1). Similarly, $\ln q^s_t = (1-\alpha)\ln k^s_t + \ln \tilde{A}^s_t + \tilde{\eta}_t = \ln q_t$. In year 1958, however, $\ln k^s_t = \ln \tilde{k}^s_t + \tilde{e}_t \neq \ln k_t$, i.e., $\ln k^s_t$ begins to diverge from $\ln k_t$, and so does $\ln q^s_t$ from $\ln q_t$. In the following years, the simulated paths diverge further.

10. Compute the ratios of Simulation/Observed levels for these three series in 1992, using your results. And compare them with the first column of Table 3. (1 point)