MEcon 8,270 — Spring 2019

International Macroeconomics

Problem Set 3: Simulation of ToT Shocks for High-Income Economies

May 15, 2019

Due date and time:	Wednesday, May 22, at 12pm (prior to final exam)
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This problem set asks you to simulate terms-of-trade (ToT) shocks, similar to chapter 7 of Uribe and Schmitt-Grohé (2017). The problem set proceeds in two steps. First you are asked to calibrate the model to a selection of small open high-income economies (including Switzerland). Second, you are asked analyze impulse response functions for a variation in parameter values.

Please upload your solutions to this problem set (as a **zip** file) in the respective folder on *StudyNet*. Your zip file should contain your code, your data set (if applicable), and a pdf file with your written solution. Please create one folder per question (e.g., a folder "Q6 Simulating ToT shocks for Small Open Economies", etc.). Please name the zip file in the following way: PS3_surname_name_19.zip (e.g., PS3_Torun_David_19.zip). After the deadline for submission on Wednesday, May 22, at 12pm (prior to the lecture), the *StudyNet* folder will automatically close and you will not be able to submit your solutions anymore.

6 Simulating ToT shocks for small open high-income economies

Simulate the SOE-MX Model for the following three small open economies (SOEs) with high per-capita incomes: Canada, New Zealand and Switzerland.

The **deliverable product** for this question has *one* component: a verbal comparison of the model-implied and SVAR-implied variances (both conditional on ToT shocks), including tables reporting these values.

1. **Load** the data in the files *ps3_data_Q6.csv*, *ps3_names_Q6.csv* and *ps3_iso_Q6.csv* into MATLAB.

2. This step is already completed in the code. Use the routine from Question 1 of Problem Set 1 to detrend the data of the following per capita variables: terms of trade, ToT_t, trade balance to output ratio, tb_t/y_t, output y_t, consumption c_t, and investment i_t.[1]

3. This step is already completed in the code. Code the SVAR model from Lecture 7:

$$\begin{bmatrix} \widehat{ToT}_{t+1} \\ \hat{\mathbf{v}}_{t+1} \end{bmatrix} = H \begin{bmatrix} \widehat{ToT}_t \\ \hat{\mathbf{v}}_t \end{bmatrix} + \Sigma \begin{bmatrix} \epsilon_t^1 \\ \boldsymbol{\epsilon}_t^2 \end{bmatrix}, \quad \text{where}$$

$$H \equiv \begin{bmatrix} \rho_1 & 0 \\ \boldsymbol{\alpha}_0\rho_1 + \boldsymbol{\alpha}_1 & \boldsymbol{\rho}_2 \end{bmatrix} \qquad \text{and} \qquad \Sigma \equiv \begin{bmatrix} \eta & 0 \\ \boldsymbol{\alpha}_0\eta & \boldsymbol{\gamma}_{22} \end{bmatrix}.$$

   $\mathbf{v}_t$ is a vector of relevant macro variables, ρ_1 is a persistence scalar, $\boldsymbol{\rho}_2$ is a persistence matrix with zero off-diagonal entries, u_t^1 is a random scalar (zero mean, unit variance), and $\boldsymbol{\epsilon}_t^2$ is a random vector (zero mean, full-rank variance-covariance matrix).

   Compute estimates for the matrices H (called h_x in the code files provided) and Σ (called Π in the code files provided).

4. This step is already completed in the code. Set all parameters reported in the first row of Table 7.5 in the Uribe and Schmitt-Grohé textbook equal to the values displayed in the table. Set $s_x = 0.32$, $s_{tb} = -0.1$, and $s_{yx} = 0.52$ in order to match empirical averages for SOEs.

[1] All variables, except for tb_t/y_t, have to be log-quadratically detrended. tb_t/y_t has to be divided by the secular component of output, and then detrended in levels, as in Problem Set 1.

5. This step is already completed in the code. Adjust the routine in order to calibrate country-specific values for ϕ ($= \phi_x = \phi_m$) and ψ to match the two empirical moments σ_i/σ_y and $\sigma_{tb/y}/\sigma_y$.

6. Produce and **report** tables that correspond to Tables 7.4, 7.6 and 7.7 in the Uribe and Schmitt-Grohé textbook.

7. **Compare** the model-implied variances of tb/y, y, c and i (conditional on ToT shocks) to those measured by the SVAR model. Briefly discuss. Then **compare** your version of Table 7.6 with that in the Uribe and Schmitt-Grohé textbook.

8. **Compare** Table 7.7 in the Uribe and Schmitt-Grohé textbook with your results. **Comment** on plausible reasons to set $\phi_m = \phi_x$, as is done in the code.

7 Simulating impulse-response functions for different values of μ

Simulate the impulse-response functions implied by the model fitted in Question 6 for two different values of μ: $\mu = 1$ and $\mu = 10$. Note that no recalibration is necessary. (Keep the remaining parameters fixed, altering μ only).

The **deliverable product** for this question has *one* component: a verbal discussion of the impulse-response functions for a terms of trade shock of ten percent under $\mu = 1$ and $\mu = 10$, and the corresponding graphs.

1. **Simulate** the impulse-response functions (for ten periods after the shock) for all variables specified in the code *plot_mx_ir_Q7.m* under a current terms of trade shock of ten percent. Use the median response of our SOEs for the plots. **Explain** the behavior of these variables. **Explain** the differences between the impulse-response functions when $\mu = 1$ and $\mu = 10$.

2. **Relate** the impulse-response functions to the Harberger-Laursen-Metzler (HLM) Effect and the Obstfeld-Razin-Svensson (ORS) Effect. Briefly discuss.

References

Uribe, Martin and Stephanie Schmitt-Grohé, *Open Economy Macroeconomics*, Princeton and Oxford: Princeton University Press, 2017.