MEcon 8,270 — Spring 2019

International Macroeconomics

Problem Set 2: Simulation of the EDEIR model for Switzerland

April 24, 2019

Due date and time:	Wednesday, May 8, at 12pm (prior to lecture)
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This problem set asks you to simulate the EDEIR model from Uribe and Schmitt-Grohé (2017) for Switzerland, using the calibrated values from Problem Set 1. The problem set proceeds in two steps: from analyzing impulse response functions from our baseline model, to introducing an alternative utility function.

Please upload your solutions to this problem set (as a **zip** file) on the respective folder on *StudyNet*. Your zip file should contain your code, your data set, and a pdf file with your written solution. Please create one folder per question (e.g., a folder "Q4 Simulating the EDEIR model for Switzerland", etc.). Please name the zip file in the following way: PS2_surname_name_19.zip (e.g., PS2_Torun_David_19.zip). After the deadline for submission on Wednesday, May 8, at 12pm (prior to the lecture), the *StudyNet* folder will automatically close and you will not be able to submit your solutions anymore.

4 Simulating the EDEIR model for Switzerland

Simulate the EDEIR model for the Swiss economy, using the calibrated values from Question 1 in Problem Set 1, and the Matlab routines from Question 3 in Problem Set 1.

The **deliverable product** for this question has *one* component: a verbal discussion of the impulse-response functions for a technology shock of one percent, and the corresponding graphs.

1. You have already completed this step in Question 3 of Problem Set 1. Set σ, δ, r^*, and β following Mendoza (1991), and calibrate α, $\bar{d}$, ω, ψ, ϕ, ρ, and η to match the same Swiss moments as in Question 3 of Problem Set 1.

2. **Paste** the code from *additional_run.m* to the bottom of your *edeir_run_Q3.m* file. Also, **copy** the file *ir.m* into the same folder as your *edeir_run_Q3.m* file.

3. **Simulate** the impulse-response functions (for ten periods after the shock) for output, consumption, investment, hours worked, the trade balance to output ratio, the TFP shock, and the current account to output ratio in Switzerland under a current technology shock of one percent. **Explain** the behavior of these variables.

5 Simulating the EDEIR model for Switzerland under alternative preferences

Simulate the EDEIR model for the Swiss economy using an alternative utility function.

The **deliverable product** for this question has *four* components: a copy of your edited Matlab code, an analytic derivation of the new equilibrium conditions, a verbal discussion of the ability of the model to explain observed business cycle patterns, and a comparison of the impulse-response functions from this version of the model with those from Question 4.

Drop the GHH specification by Greenwood et al. (1988) and adopt instead the following Cobb-Douglas specification, introduced in Lecture 5 as an alternative:

$$u(c_t, h_t) = \frac{\left[c_t^{\gamma}(\bar{h} - h_t)^{1-\gamma}\right]^{1-\sigma} - 1}{1-\sigma} \qquad \text{with } \gamma \in (0,1),\ \sigma > 0.$$

1. **Derive** for the decentralized economy the equilibrium conditions that *change* through the introduction of this alternative utility function. Note that the Matlab code is written in terms of the social planner's solution (as in Chapter 4 of the textbook). You only need to rederive and state the following three conditions:

(a) Under the alternative utility function, $u_c(c_t, h_t) = \lambda_t$ changes.
The old condition used to be $\left(c_t - \frac{h_t^\omega}{\omega}\right)^{-\sigma} = \lambda_t$.

(b) Under the alternative utility function, $u_h(c_t, h_t) = \lambda_t w_t = \lambda_t A_t F_h(k_t, h_t)$ changes.
The old condition used to be $h_t^{\omega-1} = (1-\alpha)A_t(k_t/h_t)^\alpha$

(c) Show that labor supply in steady state equals

$$h = \frac{\bar{h}}{1 + \frac{1-\gamma}{\gamma(1-\alpha)}\left(1 - \delta\kappa^{1-\alpha} - \frac{tb}{y}\right)}.$$

Hints: Note that $\kappa \equiv k/h$ so that $y = \kappa^\alpha h$. Also note that $tb = -r^*\bar{b} = r^*\bar{d}$. You may find it useful to rely on the steady-state level of consumption $c = y - \delta k - r^*\bar{d}$ in the derivation.

2. **Adjust** the conditions from item 1, as well as the definition of λ in steady state, in the respective Matlab files. Note that tb/y is a targeted value in the Matlab code.

3. This step is already completed in the code. Set σ, δ, r^*, and β following Mendoza (1991), and calibrate α and $\bar{d}$ to match the same Swiss first moments as in Question 3 of Problem Set 1.

4. This step is already completed in the code. Adjust the routine in order to calibrate γ, $\bar{h}$, ψ, ϕ, ρ, and η to match the same Swiss second moments as in Question 3 of Problem Set 1.

5. **Set** the Swiss target values for calibration as in Question 3 of Problem Set 1.

6. **Report** the calibrated parameter values for γ, $\bar{h}$, ϕ, ψ, ρ, and η.

7. **Compute** the model-implied (theoretical) second moments for the calibration to Switzerland.

8. **Comment** on the ability of the model to explain observed business cycle patterns in Switzerland between 1980 and 2017, and **compare** the results to those from Question 3 in Problem Set 1.

9. **Simulate** the impulse-response functions (for ten periods after the shock) for output, consumption, investment, hours worked, the trade balance to output ratio, the TFP shock, and the current account to output ratio in Switzerland under a current technology shock of one percent. **Explain** the behavior of these variables. **Compare** these impulse-response functions to those from Question 4.

References

Greenwood, Jeremy, Zvi Hercowitz, and Gregory W. Huffman, "Investment, Capacity Utilization, and the Real Business Cycle," *American Economic Review*, June 1988, *78* (3), 402–17.

Mendoza, Enrique G., "Real Business Cycles in a Small Open Economy," *American Economic Review*, September 1991, *81* (4), 797–818.

Uribe, Martín and Stephanie Schmitt-Grohé, *Open economy macroeconomics*, Princeton and Oxford: Princeton University Press, 2017.