ECON 517: Open Economy Macroeconomics, Spring 2017

Problem Set #1

This problem set covers small open economies — both the data and the models. Feel free to discuss this with your colleagues, but please write your own code and turn in your own work. Submit a neat summary of your solutions and keep your output to less than 10 pages.

1. Collect quarterly data for GDP (Y), consumption (C), government spending (G), investment (I), exports (X), and imports (M) for the United States, Canada, and Argentina. This data can be found in the OECD *National Quarterly Accounts*. For the same three countries, collect data on the real exchange rate from the Bank for International Settlements web page.

Take logs of the data (except for the trade balance), HP filter the data ($\lambda = 1600$), and complete the following table for each country.

Table 1: Business cycle properties

	Std. deviation	Correlation		
	(relative to Y)	Y	RER	TOT
Y				
C				
G				
I				
X				
M				
NX/Y				
TOT				
RER				

For Y, report the absolute standard deviation. All variables are real except for NX/Y, TOT, and RER.

2. Consider a small open economy that is subject to productivity shocks and government spending shocks. The social planner solves

$$\begin{aligned} \max_{c_t,\ell_t,k_{t+1},b_{t+1}} & E_0 \sum_{t=0}^{\infty} \beta^t u(c_t, \ell_t) \\ \text{s.t.} \quad c_t + i_t + \Phi(k_{t+1} - k_t) + b_{t+1} &\leq y_t - G\exp(g_t) + (1 + r_t)b_t \\ y_t &= \exp(z_t)k_t^{\alpha}\ell_t^{1-\alpha} \\ r_t &= r^* + \psi\left(\exp(\bar{b} - \tilde{b}_t) - 1\right) \\ k_{t+1} &= k_t(1 - \delta) + i_t \end{aligned}$$

The exogenous state variables follow a bivariate AR(1) process,

$$a_{t+1} = Aa_t + \epsilon_a \qquad \epsilon_a \sim N(0, \Sigma),$$

$\tilde{b}$ is the average debt holding in the economy (which the household does not think it can influence), the capital adjustment cost function is $\Phi(k_{t+1}-k_t)=\frac{\phi}{2}(k_{t+1}-k_t)^2$, and preferences are

$$u(c_t,\ell_t)=\frac{(c_t-\omega\ell_t^{\nu})^{1-\gamma}-1}{1-\gamma}. \tag{1}$$

(a) Report the set of equations that characterize the equilibrium of this model.[1]

(b) Compute and report the steady state. Let $\gamma=2$, $\beta=0.99$ (and $\beta(1+r^*)=1$), $\alpha=0.36$, $\delta=0.025$. Find ν so that the Frisch labor supply elasticity is one, and ω so that the household devotes one third of its time endowment to market work. Let $\psi=0.001$, and find $\bar{b}$ so that, in the steady state, the debt-output ratio is -1.

(c) Solve a linearized version of the model. I will be using Dynare to do this. You are welcome to do this anyway you would like. Johannes Pfeifer's GitHub has lots of sample codes, including code for small open economy models. (https://github.com/johannespfeifer/dsge_mod)

Set $\sigma_z=0.013$ and $\sigma_g=0.01$. The rest of the covariance matrix is set to zero. Set $a_{11}=a_{22}=a_{33}=0.95$ and set the rest of A to zero. Set ϕ so that the $\sigma_i/\sigma_y=3$.

Turn in plots of the impulse response functions for y, nx/y, b/y, c, ℓ, and i to a shock to z and a shock to g.

(d) Report a version of table 1 from the output of your linearized model. Skip the terms of trade and the real exchange rate rows.

(e) Redo parts (b)–(d) replacing preference with

$$u(c_t,\ell_t)=\frac{(c^{\mu}(1-\ell)^{1-\mu})^{1-\sigma}-1}{1-\gamma},$$

calibrating μ so that steady-state labor effort is one third.

(f) In broad terms, how are the results with quasi-linear preferences different from the results with Cobb-Douglas preferences? Does one utility do a better job of matching the data from question 1? Does it depend on the country?

[1] Before you do this, take a look at part (e). You may want to write your equations and codes in a way that makes it easy to change the utility function.