Msc Macro: New Open-Economy Macroeconomics

Philip R. Lane, TCD

Spring 2014

Overshooting Revisited

- SOE model (section 10.2 of OR textbook)
- Nontraded sector: monopolistic, sticky prices
- Traded sector: competitive, global price taker

The Model

- Individual j endowed with $\bar{y}_T$ and monopoly power over a variety of the nontraded good z
- Utility

$$U_t^j = \sum_{s=t}^{\infty} \beta^{s-t} \left[\begin{array}{c} \gamma \log C_{T,s}^j + (1-\gamma) \log C_{N,s}^j + \frac{\chi}{1-\varepsilon} \left(\frac{M_s^j}{P_s} \right)^{1-\varepsilon} \\ -\frac{\kappa}{2} y_{N,s}(j)^2 \end{array} \right]$$

- C_N is composite

$$C_N = \left[\int_0^1 c_N(z)^{\frac{\theta-1}{\theta}} dz \right]^{\frac{\theta}{\theta-1}}$$

The Model

- Price levels

$$
\begin{aligned}
P &= P_T^{\gamma} P_N^{1-\gamma} \left(\frac{1}{\gamma^{\gamma}(1-\gamma)^{1-\gamma}} \right) \\
P_N &= \left[\int_0^1 p_N(z)^{1-\theta} dz \right]^{\frac{1}{1-\theta}} \\
P_T &= \xi P_T^*
\end{aligned}
$$

- International bonds indexed to price of tradables (constant world real interest rate in terms of tradables)

$$\beta(1+r) = 1$$

Resource Constraints

$$P_{T,t}B^j_{t+1} + M^j_t = P_{T,t}(1+r)B^j_t + M^j_{t-1} + p_{N,t}(j)y_{N,t}(j) + P_{T,t}\bar{y}_T - P_{N,t}C_{N,t} - P_{T,t}C^j_{T,t} - P_{T,t}\tau_t$$

- τ_t per-capita taxes (expressed in terms of tradables)
- Government budget constraint

$$0 = \tau_t + \frac{M_t - M_{t-1}}{P_{T,t}}$$

- Demand for variety j

$$y^d_N(j) = \left[\frac{p_N(j)}{P_N}\right]^{-\theta} C^A_N$$

- C^A_N aggregate per capita consumption of nontradables

First-Order Conditions

$$C_{T,t+1} = C_{T,t}(=\bar{y}_T)$$

$$C_{N,t} = \frac{1-\gamma}{\gamma}\left(\frac{P_{T,t}}{P_{N,t}}\right)C_{T,t}$$

$$\frac{\gamma}{C_{T,t}} = \chi\frac{P_{T,t}}{P_t}\left(\frac{M_t}{P_t}\right)^{-\varepsilon} + \beta\frac{P_{T,t}}{P_{T,t+1}}\left(\frac{\gamma}{C_{T,t+1}}\right)$$

$$y_{N,t}^{\frac{\theta+1}{\theta}} = \left[\frac{(\theta-1)(1-\gamma)}{\kappa\theta}\right]\left(C_{N,t}^{A}\right)^{\frac{1}{\theta}}\frac{1}{C_{N,t}}$$

- $C_{T,t+1} = C_{T,t}$ implies

$$\frac{M_t}{P_t} = \left\{\frac{\chi}{\gamma}\left[\frac{C_{T,t}P_{T,t}/P_t}{1-(\beta P_{T,t}/P_{T,t+1})}\right]\right\}^{\frac{1}{\varepsilon}}$$

Steady-State Equilibrium

$$C_{N,t} = y_{N,t}(z) = C^A_{N,t}$$

$$\bar{y}_N = \bar{C}_N = \left[\frac{(\theta-1)(1-\gamma)}{\kappa\theta}\right]^{1/2}$$

- Depends on θ, γ, κ
- $(1-\gamma)$ weight on nontradables in utility
- κ disutility of work effort
- High θ implies high level of competition (high price elasticity of demand for nontraded varieties)

Short-Run Equilibrium Response to an Unanticipated Money Shock

- Nontraded prices set one period in advance. Initially, $\bar{p}_{N,0} = \bar{P}_{N,0}$.
- Short-run demand-determined output $y_N^d = C_N$

$$y_N = C_N = \frac{(1-\gamma)}{\gamma} \left(\frac{P_T}{\bar{P}_N} \right) \bar{y}_T$$

- Solving for P_T from money-demand equation

$$\varepsilon(\hat{m} - \hat{p}) = \hat{p}_T - \hat{p}$$

where $\hat{x} = (X_1 - \bar{X}_0)/\bar{X}_0$ denote S-T percentage deviations; $\bar{x} = (\bar{X}_1 - \bar{X}_0)/\bar{X}_0$ denote L-T percentage deviations

$$\begin{aligned} \hat{p} &= \gamma \hat{p}_T \\ \bar{e} &= \bar{p}_T = \bar{m} = \hat{m} \end{aligned}$$

Short-Run Equilibrium Response to an Unanticipated Money Shock

- Solving for $\hat{p}_T$

$$\hat{e} = \hat{p}_T = \frac{\beta + (1-\beta)\varepsilon}{\beta + (1-\beta)(1-\gamma+\gamma\varepsilon)}\bar{m}$$

- Overshooting ($\hat{e} > \bar{e}$) if $\varepsilon > 1$

Intuition

- Overshooting ($\hat{e} > \bar{e}$) if $\varepsilon > 1$
- $\frac{1}{\varepsilon}$ is consumption elasticity of money demand
- $\hat{y}_N = \hat{c}_N = \hat{p}_T = \hat{e}$ (unit elasticity of nontradable consumption to depreciation)
- $\hat{c} = (1 - \gamma)\hat{c}_N$
- $\hat{p} = \gamma \hat{p}_T = \gamma \hat{e}$
- By contradiction, $\hat{p}_T = \bar{p}_T = \hat{e} = \bar{e} = \bar{m} = \hat{m}$ implies change in real balances of $\hat{m} - \hat{p} = (1 - \gamma)\bar{m}$ but change in money demand of only $(1/\varepsilon)(1 - \gamma)\bar{m}$.