

Seminar 6

ECON 4330

April 25, 2013

Problem 1: Price-specie flow mechanism

(This question is based on the exam spring 2010)

A price-specie flow mechanism is a term dating back to Hume. It relates to how prices and species (i.e. money) flows in a way that restores balance. In this problem it refers to a long-run extension of the M-F model, see 6.6-6.8 in OEM. Here we only look at the **fixed exchange rate** version from 6.6. The M-F model is a model for the short run. A medium/long run model must take into account (i) how prices adjust, and (ii) how the stock of foreign debt evolves. For the latter we use the current account identity (in continuous time). Equations:

- IS-curve:

$$Y = C(Y_p, W, i_*) + X\left(\frac{EP_*}{P}, Y, Y^*\right) \quad (1)$$

- Definition of private disposable income:

$$Y_p = Y - \rho_* \frac{EF_*}{P}$$

- Definition of real wealth:

$$W = -\frac{EF_*}{P} \quad (2)$$

- Phillips curve

$$\dot{P} = P\gamma(Y - \bar{Y}) \quad (3)$$

- Definition of natural output

$$\bar{Y} = \Phi(\bar{N}, \bar{K}) \quad (4)$$

- Accumulation of foreign debt:

$$\dot{F}_* = i_* F_* - \frac{P}{E} X\left(\frac{EP_*}{P}, Y, Y_*\right) \quad (5)$$

The exogenous variables are E , i_* , Y_* , P_* , \bar{N} and \bar{K} . Initial conditions are $P(0) = P_0$ and $F_*(0) = F_{*0}$.

1. One may interpret the model as having a *temporary* and a *stationary* equilibrium.
 - (a) Explain in relation to the model what is meant by these two different equilibria
 - (b) Argue that the temporary equilibrium defines $Y = Y(P, F_*, x)$, where x denotes the vector of all exogenous variables. Derive and interpret the partial effects of F_* and P on Y .
2. Use $Y = Y(P, F_*, x)$ to write the model as a system of two differential equations:

$$\dot{P} = \phi_1(P, F_*, x) \quad (6)$$

$$\dot{F}_* = \phi_2(P, F_*, x) \quad (7)$$

- (a) Define the stationary equilibrium
 - (b) Interpret the requirements for internal and external balance
3. The Jacobian matrix

$$A = \begin{pmatrix} \phi_{11} & \phi_{12} \\ \phi_{21} & \phi_{22} \end{pmatrix}$$

contains the derivatives of ϕ_i with respect to their first and second arguments ($i = 1, 2$).

- (a) Discuss the sign of ϕ_{21}
 - (b) A sufficient set of conditions for stability is $tr(A) < 0$ and $|A| > 0$. Confirm that these are satisfied if $\phi_{11} < 0$, $\phi_{12} < 0$, $\phi_{21} > 0$ and $\phi_{22} < 0$.
4. Phase diagrams are useful to represent the dynamics
 - (a) Draw a phase diagram for the two differential equations conforming to the sign assumptions in 3.
 - (b) Give brief intuitive explanations for the slopes of the curves for external and internal balance.

- (c) Comment on the difference between stability in this model and dynamic stability in the Dornbusch model.
5. Suppose the economy is initially in a stationary equilibrium.
- (a) Show how the curves in the phase diagram shift if \bar{N} suddenly rises by ΔN (labor immigration)
 - (b) What does this mean for the foreign debt and the price level in the new stationary equilibrium?
 - (c) What does the transitional path look like?

Problem 2: PPP and pricing

1. Let P be the domestic price level, and P_* be the foreign price of an identical basket of goods. E is the exchange rate
- (a) Define absolute PPP
 - (b) Define relative PPP
 - (c) Does the law of one price imply absolute PPP?
 - (d) Can absolute PPP hold if the law of one price fails?
 - (e) What is the value of the real exchange rate under absolute and relative PPP?
 - (f) Is PPP reasonable if some goods are non-traded?

Let us now investigate an alternative market structure in which PPP may fail. Assume that the economy consists of many different goods, each produced in a quantity X_i , for $i = 1, 2, \dots, n$. Every producer has some monopoly power. His/her optimization is:

$$\max_{P_i} \left(P_i - \frac{W}{A_i} \right) X(P_i)$$

where it is assumed that W/A_i is the constant marginal cost and $X(P_i)$ is the demand function. The demand function summarizes demand from consumers both home and abroad.

2. Show that the first-order condition for the firm is

$$P_i \left(1 - \frac{1}{\epsilon_i} \right) = \frac{W}{A_i}$$

where ϵ_i is the elasticity of demand.

3. Assume that all firms have the same productivity ($A_i = A$) and let

$$\epsilon_i = \frac{1}{1 - \Lambda(P_i/P)^{\lambda_1}(P_i/EP_*)^{\lambda_2}}$$

Realize that this implies $P_i = P_j = P$. Combining with the first order condition we can solve for the domestic price level:

$$P = \left(\frac{W}{\Lambda A} \right)^{\frac{1}{1+\lambda_2}} (EP_*)^{\frac{\lambda_2}{1+\lambda_2}}$$

The term *exchange rate pass-through* refers to how large the elasticity of the domestic price level with respect to the exchange rate is.

- (a) What is the pass-through under PPP?
- (b) What is the pass-through in our simple model?
- (c) What constraints must be put on the model to replicate PPP pass-through?

Problem 3: Traded and non-traded goods

Consider an open economy producing two goods. One is traded (denoted T) and the other is non-traded (denoted N). Aggregate production functions for the two sectors are:

$$Y_T = A_T K_T^\alpha N_T^{1-\alpha} \tag{8}$$

$$Y_N = A_N K_N^\gamma N_N^{1-\gamma} \tag{9}$$

Assume constant returns to scale. Production takes place in representative firms that are price-taking profit maximizers. Assume that capital is mobile across borders, while labor is only mobile across sectors within the country. The total capital stock, K , and the total supply of labor, N , is fixed. Let P_T and P_N be the price of traded and non-traded goods, respectively, and let w be the real wage measured in terms of *tradables*.

1. The world interest rate r (measured in tradables) is taken as exogenous. How is the equilibrium real wage w determined?
2. Explain how the relative price level P_N/P_T can be pinned down using supply side equations only, ignoring demand.

3. Let the nominal price index P be defined as

$$P = P_T^\gamma P_N^{1-\gamma}$$

Discuss the differential impact productivity growth in the non-traded goods sector has on the producer real wage w and the CPI-based real wage. What about the impact of productivity growth in the traded goods sector?