Economics 202b: Fall 2000
Problem Set 5: Open Economy Macro and Exchange Rate Crises

Brad DeLong

Consider a small open economy with purchasing power parity (thus the price level p and the exchange rate e are the same thing), in which money demand is given by Philip Cagan's model:

$$(m_t - p_t) = -\lambda \times \frac{dp_t}{dt}$$

where m and p are the logs of the nominal money stock held by the public and the price level, respectively, and where λ is a parameter: the semi-elasticity of money demand. The government tries to fix the exchange rate at a value of 1 (so its log equals zero) by being willing to buy domestic money for foreign exchange. Since the rate of price change is zero as long as the exchange rate is fixed, the initial value of the money stock must be one as well.

The government's stock of foreign exchange follows the law of motion:

$$\frac{dF_t}{dt} = -\theta M_t + \frac{dM_t}{dt}$$

where F and M are the levels of the government's foreign exchange reserves and the nominal money stock held by the public, respectively. At every instant the government prints nominal money at a proportional rate θ of the current money stock held by the public in order to cover its deficit. If the public does not wish to hold extra money balances the newly-printed money is immediately traded to the government for reserves that are then spent on imports. To the extent that the public wishes to hold additional money, the loss of reserves is lessened.

Once reserves have been driven to zero by the inevitable speculative attack, then dF/dt is thereafter always zero, the exchange rate is no longer equal to one, and the rate of money-printing steps up. The log of the nominal money stock then evolves according to:

$$\frac{dm_t}{dt} = \phi$$

where φ may be different from θ.

1. How fast does the central bank lose reserves before the speculative attack during the period in which the exchange rate is fixed?

2. What happens to the nominal money stock, the price level, and the exchange rate after the speculative attack that exhausts the government's foreign-exchange reserves?

3. Calculate the "shadow" value of the exchange rate: what the exchange rate would be (as a function of time, the parameters of the model, and the initial stock of reserves) assuming that the speculative attack has occurred (and been successful: exhausted the government's reserves) an instant before the present?

4. At what point in time must the speculative attack occur if agents have perfect foresight, and so avoid large instantaneous capital gains or losses on their portfolios?

5. How does the moment at which the speculative attack occurs depend on the initial level of reserves F_0? How does it depend on the rate of money-printing under fixed exchange rates θ?

6. Suppose that $\theta = 0$. Must a speculative attack occur? If "no," explain why not.

7. Suppose that $\theta = 0$. Can a speculative attack occur? If your answer is "yes," explain under what circumstances it can occur, and explain when it occurs.