Economics 165
Winter 2001-2002
Problem Set 4 Solutions

Problem 1: Fixed exchange rates.

A. *Find out approximately what percentage of countries uses fixed exchange rate regimes these days. How would you modify your answer in order to take into account the relative importance of countries.*

The answer to the first part will depend on what your source is and on how you decided to treat countries that float within some band (i.e. that are neither a purely fixed rate nor a pure float). Most of your answers tended to suggest that the percentage of countries using fixed exchange rate regimes is somewhere in the neighborhood of a quarter to a half. In terms of how you would modify your answer to take account of the relative importance of countries, just look at the names. The larger economic players have more flexible exchange rate regimes. (Note, you need to think about how to treat Europe. I think it probably makes sense to treat it as a flexible exchange rate regime as the European Central Bank does not actively manage the value of the Euro versus other currencies.) This would suggest that fixed exchange rate regimes are not as important as they may seem if you just add up the number of countries using them.

B. *Mathematically, combine the log-linear money market, PPP, and uncovered interest rate equations to establish a relationship between nominal money supply, the exchange rate, its expected rate of change, domestic output, the foreign price level (all in logs), and the foreign or world interest rate.*

This question was done for you in the handout "Notes on the Currency Crisis Model." The resulting equation is $\mathbf{m = lne - \lambda \Delta lne + (p' + \eta y - \lambda i')}$. See the handout for the derivation.

C. *Suppose you are the central banker of a small country and want to maintain a fixed exchange rate. In which direction would you have to adjust money supply in response to changes in all the other variables mentioned above. Which coefficients determine the quantitative aspect of your adjustments?*

In order to maintain a fixed exchange rate, we must keep $\Delta lne = 0$. Hence any change in an exogenous variable must be countered by a corresponding change in the money supply in order to maintain the equality. Hence, if p' or y increase, we must increase money supply. If i' increases, we would need to decrease money supply. The coefficient η will determine by how much we need to increase money supply for a given increase in y, and λ will determine the amount by which we must decrease money supply for an increase in i'.

Problem 2: Consider a country with a fixed exchange rate and substantial budget deficits. The exchange rate is fixed at 1100 local currency units per dollar. Initially (at time = 0), half of its money supply is backed by domestic credit and half by foreign reserves. Due to budget deficits, domestic credit increases at a rate of 10% per month. The semi-elasticity of money demand with respect to the interest rate is 2 and $(p' + \eta y - \lambda i') = 10$.

a) *What is the initial nominal money supply?*

From the money supply equation found in part b of problem 1, we get…

$m = \ln(1100) - 0 + 10 = 17.003$. Recall that m is simply lnM, so in order to get the initial money supply, we exponentiate both sides. Hence $\mathbf{M_0 = exp(17.003) = 24,229,112.4}$

b) *When will the country be forced to abandon the peg, i.e. when do we see a crisis?*

To determine this, we need to know the shadow exchange rate. This is the exchange rate that would prevail if there were no foreign reserves. Since initially, half the money supply is backed by domestic credit this suggest that in the absence of reserves, the initial money supply would be $\mathbf{M_0 = 12,114,556.2}$. Hence $m = \ln M = 16.310$. By the money market equilibrium equation, this suggests that $lne = 16.310 - 10 = 6.310$, or that the initial exchange rate is $\exp(6.310) = 550$.

As time goes by, domestic credit, and hence the money supply, will grow at a rate of 10% per month. Therefore, at month t, $DC_t = M_t = M_0(1.1)^t$. Using the equation for the shadow exchange rate, $lne = \ln(DC_t) + \lambda\mu - 10$, and plugging in DC, $\lambda = 2$ and $\mu = 10\%$, we get…

$lne = \ln M_0 + t\ln(1.1) - 9.8$. A crisis will occur when this value equals the log of the pegged exchange rate, $\ln(1100) = 7.003$. Solve for t…

$7.003 = 16.310 + t\ln(1.1) - 9.8$ implies $t\ln(1.1) = 4.931$. **Hence t = 5.174**. The crisis will occur in just over 5 months.

c) *Depict the money supply and its composition over time.*

Initially, money supply is constant and the composition is changing. Specifically, a greater and greater portion of the money supply is backed by domestic credit (and hence reserves are dwindling). Then, when the crisis occurs, reserves are suddenly wiped out and the money supply shrinks. Of course, as time goes by, domestic credit continues to grow and money supply grows with it. From this point on the money supply is backed entirely by domestic credit.