Econ 165 | Stanford University
Winter 2002-03 | TA: Kanda Naknoi

<u>Answer for Homework 4</u>

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Question 1: Currency regimes

(1.a) List at least 5 different currency regimes and their real world examples

See Table 17-1, pp. 483-485 in the textbook. The description of each regime is given in page 485. We can order them by degree of floating as follows.

(1) Independent floating (The U.S. and major industrialized nations)
(2) Managed floating with no pre-announced path for the exchange rate (Singapore)
(3) Exchange rates within crawling bands (Israel)
(4) Crawling pegs (Bolivia)
(5) Pegged exchange rates within horizontal bands (Egypt)
(6) Other conventional fixed peg arrangements (China)
(7) Currency board arrangements (Bulgaria)
(8) Exchange Arrangements with no separate legal tender (Euro area)

Note: The table is constructed based on what each country reports to the IMF. In fact, some countries do not act as they report. For example, Thailand reports an independent floating regime, but there are studies showing that Thailand act as if she pegs to a basket of currencies and assigns a large weight to U.S. dollar even now.

(1.b) Derive log-linear money supply equation. Then discuss how fixing exchange rate restricts domestic monetary policy.

Log-linear money market: $m\text{-}p = \eta y\text{-}\lambda i$ (1)

Absolute PPP: $p = \ln e + p^*$ (2)

UIP: $i - i^* = \Delta \ln e$ (3)

Substitute (2) into (1) and arrange term.

$$m = \ln e + p^* + \eta y - \lambda i \qquad (4)$$

Substitute (3) into (4).

$$m = \ln e - \lambda \Delta \ln e + (p^* + \eta y - \lambda i^*) \qquad (5)$$

The variables inside the bracket in the RHS of (5) - p*, y and i^* - are exogenous.

Fixing exchange rate is by definition setting ln e as constant, and Δln e as zero. Hence,

$$m = c + (p^* + \eta y - \lambda i^*). \qquad (6)$$

where c is constant. Given parameters η and λ, and exogenous variables p*, y and i^*, the RHS of (6) must become constant. This is how money supply under a fixed exchange rate regime is constricted by foreign price p* and foreign interest rate i^*.

(1.c) Discuss pros and cons of a hypothetical move of NAFTA towards a monetary union.

There will be only one single currency in the monetary union. The move does not imply free factor mobility.

Pros: The move <u>promotes trade and investment</u> inside the area because of the absence of currency risk.

Cons:

(1) Member countries lost independence in conducting monetary policies. The degree of dependence depends on how the new common currency is constructed. The more weight in the new currency assigned to home currency, the more home central bank can maintain independence.
(2) Since monetary union does not imply free factor mobility, member economies requires fiscal transfer scheme among member nations to stabilize their economies in a wake of disturbances. Such an international fiscal transfer requires a new set of institutions and rules.
(3) Member countries lost ability to conduct independent fiscal policy, because regional fiscal disciplines are required to keep inflation in check with the preset money supply.

Question 2: The semi-elasticity of money demand with respect to the interest rate is 1 and $(p^* + \eta y - \lambda i^*)=10$.

(2.a) What is the initial money supply?

Combine money market condition ($m\text{-}p = \eta y\text{-}\lambda i$), and PPP (p=ln e +p^*) with UIP ($i - i^* = \Delta\ln e$). Then,

$$m = \ln e - \lambda\Delta\ln e + p^* + \eta y - \lambda i^*. \quad (1)$$

Substitute the given information into (1).

$$m = \ln (100) – 0 +10$$
$$= 14.6052$$
$$M = \exp(14.6052) = 2,202,647.$$

(2.b) When do we see a crisis?

Recall that we see the crisis <u>when ln ĕ = ln ē</u>. As given,

$$\ln \bar{e} = \ln (100). \quad (2)$$

From the currency crisis model, we know the shadow exchange rate equation.

$$\ln \breve{e} = b_t^H + \lambda\mu - (p^* + \eta y - \lambda i^*). \quad (3)$$

In fact,

$$b_t^H = b_0^H + t \ln(1+\mu). \quad (4)$$

At t=0, domestic bond is a quarter of money supply. From (a), we can compute b_0^H.

$$b_0^H = \ln (M/4) = \ln (M) – \ln 4 = 14.6052 – 1.3863 = 13.2189 \quad (5)$$

Substitute (5) into (4).

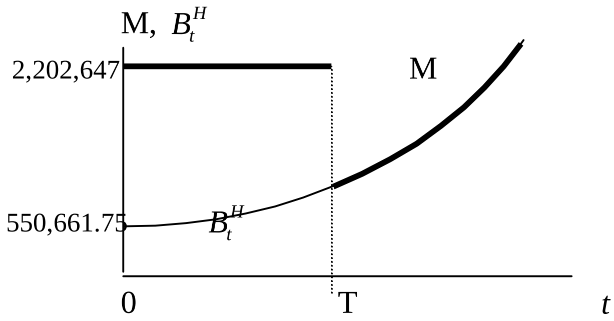
$$b_t^H = 13.2189 + t \ln(1.1) \quad (6)$$

Substitute (6) into (3), and then equates it to (2).

$$\ln (100) = 13.2189 + t \ln(1.1) + 1(0.1) –10$$
$$t = (\ln(100) –0.1 – 3.2189) / \ln(1.1) = 13.4958$$

The crisis will happen <u>shortly after 13.4958 months</u>.

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



Question 3: Face value of debt is 90.

(3.a) What is the price before and after the announcement of the buyback?

Without a buyback, payoff in the bad state has to include 10 of international reserves. Before the announcement,

$$P = [(0.2)40 + (0.8)90]/90 = 88.9\% \qquad (1)$$

After the announcement,

$$P' = [(0.2)30 + (0.8)(90-X)]/(90-X), \qquad (2)$$

where X is the buyback face value. Notice that payoff in the bad state excludes reserves. Since the cost of buyback is financed by international reserve,

$$10 = X P'. \qquad (3)$$

Equation (2) and (3) form a 2-equations system with 2 unknowns. Therefore,

$$X = 11.41 \qquad (4)$$

$$P' = 87.6\% \qquad (5)$$

Notice that the buyback causes price to fall, not rise. This is because the debtor finances the buyback by herself. That results in a fall in payment in the bad state from 40 to 30.

(3.b) How are the gains distributed between the debtor and its creditors?

Creditor's gain = Change in the value of debt
= (P'-P) 90 = (0.876-0.889) 90
= -1.17 < 0

Therefore, the creditor loses from the buyback.

Debtor's gain = Expected payoff
= [0.8(11.41-10)+0.2(0)]
= 1.13 > 0

If the good state occurs, the debtor does not have to serve for total face value and get to keep 11.41 because of the buyback. But she also loses the reserves in the good state, if she does the buyback. (Recall that she gets to keep 10 of reserves in the original case.) If the bad state occurs, the debtor pays as much as they can afford to pay and have no funds left, regardless of the buyback. That is why the last term in the bracket is zero. The debtor benefits from the buyback. I would recommend the buyback. In this problem, the drop in price of debt works as a wealth transfer from the creditor to the debtor. Notice that the sum of creditor loss and debtor gain is approximately zero.

(3.c) What if the buyback reduces the probability of the bad state to zero?

Then the following 2 equations give the new price and the buyback face value.

$$P''=(90-X)]/(90-X) \quad (6)$$

$$10 = X P'' \quad (7)$$

From (6) and (7), $P''=1$, and $X = 10$.

Creditor's gain = Change in the value of debt
= (1-0.889) 90
= 10

Debtor's gain = Expected payoff
= (1-0.8)(10) + (0-0.2)(0)
= 2

In the good state, the debtor gets to keep 10 no matter what she does. But the probability of the good state changes from 0.8 to 1 if she does the buyback. In the bad state, she gets zero regardless of how the probability changes. By increasing the probability of the good state, both the debtor and creditor benefit from the buyback. In this extreme example, the creditor is reassured by the buyback that he will face no default risk. For the debtor, the buyback is even more desirable than in question (3.b) since the gain is larger.