14.02 Fall 2001
Problem Set 6 Solutions
Posted October 31, 2001

I. True/False

1. False. Your grandmother is not accounting for the expected exchange rate depreciation of the Real (Brazilian currency) inherent in the higher interest rate on Brazilian bonds. (This abstracts away from default risk, transaction costs etc.)

2. False. "Trustless" should have been a hint to see that even though this new debt promises to pay a certain amount in US$ at maturity, the government may default and choose not to pay. Therefore to compensate holders of the debt, the country has to offer a higher interest rate over the risk-free US government bonds. (Aside: there is an entire credit-rating industry involved in assessing these risks whether for corporate 'junk bonds' or for sovereign country bonds).

3. False. While not denying the remote possibility that the new minister's speech may have influenced NX, but we have not modeled psychology in our IS-LM model. The realistic explanation is the J-curve, it takes time for exchange rate devaluations to feed into an improved trade balance.

4. True. The MIT class will be deserted since the return from taking a class at Harvard exceeds that of taking the MIT class, given the exchange rate is fixed at 1-to-1. The situation can be improved by "devaluing" the exchange rate of Harvard relative to MIT to 3-to-1 (200% devaluation). Alternatively, can impose "capital controls" to restrict students from engaging in profitable arbitrage. (This is closer to what happens in reality.)

5. False. The real exchange rate's level is purely arbitrary. Remember that the price indices used are just that: indices. Even if you used actual prices of the consumption basket in each of the two countries, you will not be able to make a good comparison either. That is because the typical consumption bundle in Ukraine is different from that in the US (more Vodka, less Buds). So it may turn out that you will be disappointed once you move there and have to pay a big premium on your Buds.

6. False. Expansionary monetary policy implies a decline in i. Using the interest parity condition, this means that people expect an appreciation. But the problem tells you that

in the long run, the exchange rate depreciates proportionally to the increase in money supply. Therefore to reconcile the two stories, the exchange rate depreciates today by MORE than in the long run. (Aside: this is known as exchange rate "overshooting".)

II. Small versus Large Economy

1. Our theory tells us that an exchange rate depreciation should lead to an increase in our net exports. This is modeled in the behavioral equation given for NX, assuming $\mu > 0$.

2. (i) Start with the interest parity condition:

$i = i^* + \frac{E^e_{t+1} - E_t}{E_t}$, now substitute $E^e_{t+1} = 1$ and also $i^* = (1 - a^j)\ \bar{i}^* + a^s i$ (where j = {s,l})

This gives E(i):

$E_t = \frac{1}{1 + (1-a^j)(i - \bar{i}^*)}$

(ii) Refer to figures at end of solutions. Clearly the larger country has a flatter slope, their exchange rate does not react much because foreign interest rates are much more responsive to changes in i for a large country. They intersect when $E_t = E^e_{t+1} = 1$ and $i = \bar{i}^*$

3. Goods mkt: Y=Z is the equilibrium condition.

where $Z = C + I + G + NX$

Solving, $Y = \alpha Y + \beta Y - \gamma i + G + \delta Y^* - \lambda Y - \mu^j \frac{1}{E}$,(where j = {s,l})

and replacing for E(i) from part 2. you get the IS:

$Y = \frac{1}{1 - \alpha - \beta + \lambda}(G + \delta Y^* - (\gamma + \mu^j(1 - a^j))i - \mu^j + \mu^j(1 - a^j)\ \bar{i}^*)$

Therefore $\frac{\partial i}{\partial Y} = -\frac{1 - \alpha - \beta + \lambda}{\gamma + \mu^j(1 - a^j)}$

Refer to figures at end of solutions. The larger country has a steeper slope, note

$\mu^l(1 - a^l) < \mu^s(1 - a^s)$. Intuitively, for a given change in the interest rate, there is a bigger effect on output in the smaller country because of the exchange-rate channel of the interest rate: not only do net exports respond more to the exchange rate in small countries ($\mu^s > \mu^l$) but also the exchange rate is more responsive to the interest rate in small countries (see part 2).

4. Can see from figure, that an expansionary monetary policy has a bigger effect on Y in the small country (review intuition above).

5. A fiscal expansion is more effective in a large country, for a given increase and a shift

to the right in the IS, output will increase more in the large country due to a steeper IS.

III. Non-standard IS

1. Our standard behavioral equation for consumption has modeled consumption as a function of (disposable) real income. In this economy, the workers nominal income is WY and we have to deflate that using the prices of the goods they purchase, E, to obtain their real income. Therefore, we now have an additional channel of the exchange rate in that it influences the relative real income of workers relative to profit earners.

2. Figure will be similar to II (where have two types of IS curves, there it was small versus large economy. In this problem can adapt for standard versus non-standard). Can see that compared to the standard IS, the non-standard IS is steeper. Intuitively, the higher the interest rate, the more appreciated the currency and that will improve the workers real income and thus their consumption and thus output through demand. So this offsets the usual negative effect of higher interest rates on Y because of less investment and less net exports.

3. The usual case of shifting the LM curve, and can see that monetary policy is less effective in our new non-standard economy. Refer to figures and intuition from part 2.

4. Clearly the workers are fed up with the decline in the real value of their nominal income in terms of the goods they buy. By asking for their wages to be indexed, they insure against such exchange rate depreciations because now wages respond by increasing. In the limit, for W=E, there is perfect indexation to the exchange rate and workers consumption reverts to the standard behavioral equation.

IV. Balance of Payments Crisis with a Fixed Exchange Rate

1. If the exchange rate is expected to remain fixed in the future, then $i = i^*$. Therefore if the Central Bank engages in a purchase of foreign reserves, suppose of an amount ΔF, then because money supply can't change, this must mean that the Central Bank has to sell an equal amount of government bonds to offset the increase on high-powered money that would have resulted from the purchase of foreign reserves.
   The balance sheet of the Central Bank will look like:

Assets   Liabilities

govt bonds ($\Delta B = - \Delta F$) High-powered money ($\Delta H = 0$)

foreign reserves ($\uparrow \Delta F$)

2. If the fixed exchange rate is not believed to be sustainable in the future, then by

assigning a probability, π, to a 100% depreciation, this means that the probability of maintaining the fixed exchange rate in the future (no depreciation) is $1 - \pi$. So the expected depreciation is equal to $\frac{E_{t+1}^e - E_t}{E_t} = \pi * (100\%) + (1 - \pi) * (0)$ Therefore from the interest parity condition:
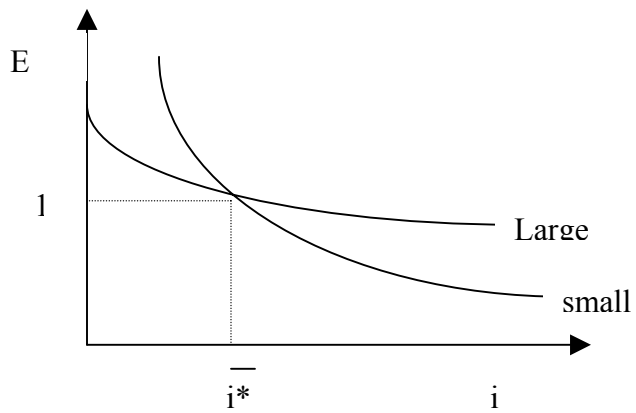
$i = i^* + \pi$

3. This government policy will be inconsistent with fixed exchange rates eventually once the foreign reserves run out. To see this, if $\frac{dB/dt}{B} = \mu$, then $\frac{dF/dt}{F} = -\mu$ since just as in part 1, money supply can't change. Eventually once reserves run out, the fixed exchange rate will have to be abandoned and given that the Central Bank still has to finance the government by buying government bonds, this would translate in $\frac{dH/dt}{H} = \mu$ and thus a steady increase in money supply.
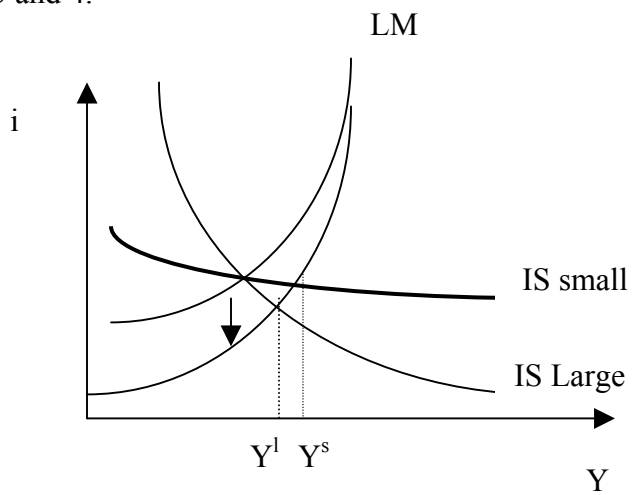
(Aside: you are not responsible for this, but for your general thirst for economic knowledge: Under the setup above, reserves will not fall over time at the same gradual rate until they hit 0 as you may initially think. What happens is a gradual fall and then at a time, T, perfectly foreseen by all market participants there will be a rational speculative attack on the currency and reserves will fall sharply in that instant to 0 as everyone rushes to buy foreign currency from the Central Bank at the fixed exchange rate. The Central Bank will defend the fixed exchange rate to the bitter end, by standing ready to sell foreign reserves at that rate. For more on this, take the international course or read Krugman (1979) who initially modeled this in the days before he started writing opeds for the NYTimes.)

4. Once capital controls are imposed, the Central Bank can choose the interest rate while maintaining the fixed exchange rate. Therefore interest parity does not have to hold. But, in reality capital controls will be imperfect and so the Central Bank will be able to lower interest rates for some time only because there will still be some loss in reserves over time.

Figures for PS 6
II Small versus Large Economy
2(i) and (ii)

E

1

$\overline{i^*}$ i

Large

small

3 and 4.

LM

i

IS small

IS Large

Y^l Y^s

Y

5.

i

Y^s Y^l

Y