9 Lecture 9: Macroeconomic adjustment under fixed exchange rates

Krugman and Obstfeld, Ch. 19, p. 516-521

- We have studied **how** fixed exchange rate systems collapse.
- We have also hinted at **why** they collapse. At some level, the ultimate cause is that the cost of staying committed to them becomes too high in terms of some other (usually internal) objective. A better understanding, requires an understanding of:
  - how fixed exchange rate systems work;
  - what are the macroeconomic costs of remaining committed.

Simple model to understand the macroeconomic adjustment required in response to various types of shocks under alternative (fixed versus flexible) exchange rate regimes.

Assumptions:

- Two-country-world version of Mundell-Fleming with flexible prices.
- Same money demand and investment functions in the two countries.
- Exogenous expectations of depreciation are equal to zero → same nominal interest rate.
- Expected inflation is the same in both countries → same real interest rate[8].
- We will concentrate only on medium run equilibrium. You know that in the short run (sticky prices) output responses take the place of price responses.

[8] These assumptions imply that if one wants to be rigorous such a model can be used only to analyse the effect of unexpected shocks.

$$\text{IS'}\ \bar{Y} = C(\bar{Y} - \bar{T}) + I\left(r\right) + \bar{G} + NX\left(\frac{EP^*}{P}, \bar{Y}, \bar{Y}^*\right) \tag{147}$$

$$\text{LM}\ \frac{M}{P} = \frac{\bar{Y}}{V\left(r\right)} \tag{148}$$

$$\text{IS*'}\ \bar{Y}^* = C^*(\bar{Y}^* - \bar{T}) + I\left(r\right) + \bar{G}^* - NX\left(\frac{EP^*}{P}, \bar{Y}, \bar{Y}^*\right) \tag{149}$$

$$\text{LM}^*\ \frac{M^*}{P^*} = \frac{\bar{Y}^*}{V\left(r\right)}. \tag{150}$$

$NX^* = -NX$ follows from the two-country-world assumption[9].

[9]Everything would still go through relaxing it, but the notation would get more cumbersome.

Start from real markets (IS). The two goods market equilibrium conditions constitute a system of two equations in the two endogenous variables $\left(r, \frac{EP^*}{P}\right)$. We get more insight into the solution by adding and subtracting them to obtain

$$\text{SIS: } \bar{Y} + \bar{Y}^* = C(\bar{Y} - \bar{T}) + C^*(\bar{Y}^* - \bar{T}) + 2I\,(r) + \bar{G} + \bar{G}^* \tag{151}$$

$$\text{DIS: } \bar{Y} - \bar{Y}^* = C(\bar{Y} - \bar{T}) - C^*(\bar{Y}^* - \bar{T}) + \bar{G} - \bar{G}^* + 2NX\left(\frac{EP^*}{P}, \bar{Y}, \bar{Y}^*\right). \tag{152}$$

- SIS determines r. World real interest rate equates total desired expenditure to production.
- DIS determines $\frac{EP^*}{P}$. Real exchange rate ensures that excess of home output over home expenditure are compatible across countries.

- *Symmetric shocks* do not require any offsetting change in the current account; e.g. $\Delta G = \Delta G^* > 0$ raises r by an amount that crowds out investment by the same offsetting amount in the two countries. Since output minus desired expenditure is unchanged in the two countries, **no need for change in** NX **and** $\frac{EP^*}{P}$.

- *Asymmetric shocks* **affect the real exchange rate**; two types:

  1. Same absolute value (switch from foreign to home goods or viceversa): e.g. $\Delta CA > 0$ at given real exchange rate calls for an appreciation of the real exchange rate (lower $\frac{EP^*}{P}$) to reestablish equilibrium. No change in r.

  2. Different absolute values: e.g. $\Delta G > 0$ and $\Delta G^* = 0$. Now also r is affected, but **real exchange rate still needs to change.** The latter is what is crucial here.

- Money market equilibrium just determines how the required real adjustment affects nominal variables: E and P, P^*; i.e. how the adjustment is reflected in changes respectively in E, P, P^*.

  – Flexible exchange rates. P and P^* can be chosen independently while E adjusts to ensure that the real exchange rate satisfies DIS. **Countries can run independent monetary policies.**

  – Fixed exchange rates. With E fixed, $\frac{P^*}{P}$ cannot take any value. It has to ensure that the real exchange rate still satisfies DIS. Taking ratio of LMs

$$\frac{M}{M^*} = \frac{P}{P^*}\frac{\bar{Y}}{\bar{Y}^*}. \tag{153}$$

  M and M^* cannot be chosen independently. **No independent monetary policies.**

- Under *flexible exchange rates* SIS determines r, DIS determines $\frac{EP^*}{P}$, LMs (through M and M^*) determine P and P^*. The ratio $\frac{P^*}{P}$ can take any value as E ensures that DIS is satisfied.

- Under *fixed exchange rates* SIS determines r, DIS determines $\frac{EP^*}{P}$. The difference is that with E given, this implies DIS determines $\frac{P^*}{P}$. M and M^* can no longer be chosen independently (nominal money supply is endogenous for at least one country).

- *n-th country problem* or the *n-1 problem*: which country gets to set its nominal money supply?

  In a system of fixed exchange rates involving n countries there are $n-1$ exchange rates. So, there is one degree of freedom. Either one country can choose its own money supply (the asymmetric solution) or the burden of adjustment is split in some way (the symmetric solution) for example by setting the total money supply and not allowing it to change when an adjustment is needed.

9.1 Sharing the adjustment under fixed exchange rates (flexible prices)

Again, the issue is relevant only under fixed exchange rates. Under flexible ones, countries can run independent monetary policies.

Two possible ways of managing a fixed exchange rate system.

1. **Gold standard.** Each unit of both the home and foreign money supply has to be backed by gold reserves (it cannot be backed by any other asset such as government bond) and the price of gold in terms of each currency is given (e.g. it is constant at one). This implies $M = R$ and $M^* = R^*$. The total gold supply, hence the total money supply, is fixed at S^{Gold}; i.e. $R + R^* = S^{Gold}$. An increase in M can only be achieved through a fall in M^*. The home central bank has to buy reserves and print home money and the foreign bank has to sell its reserves which will end in the coffers of the home bank.

2. **Peg not backed by gold.** This implies $M = D + R$ and $M^* = D^* + R^*$. The central bank can affect the money supply by conducting open market operations in home bonds in addition to reserves.

   Suppose one central bank, e.g. the foreign one, wants to keep its money supply constant. It can do so by offsetting any change in reserves by an opposite change in domestic credit. The home central bank though has no control on its own money supply. With M^* exogenous, M has to be endogenous to ensure that $\frac{P^*}{P}$ and real exchange rate satisfy DIS.

   This does not have to be the case though. An alternative scenario would be for each central bank to keep domestic credit constant and let the money supply change as reserves change. This would work exactly as the gold standard.

Consider the adjustment to shocks under the two scenarios.

- Symmetric shock: e.g. $\Delta G = \Delta G^* > 0$.

$$\text{SIS: } \bar{Y} + \bar{Y}^* = C(\bar{Y} - \bar{T}) + C^*(\bar{Y}^* - \bar{T}) + 2I\,(r) + \bar{G} + \bar{G}^* \tag{154}$$

$$\text{DIS: } \bar{Y} - \bar{Y}^* = C(\bar{Y} - \bar{T}) - C^*(\bar{Y}^* - \bar{T}) + \bar{G} - \bar{G}^* + 2NX\left(\frac{EP^*}{P}, \bar{Y}, \bar{Y}^*\right) \tag{155}$$

$$\text{LM } \frac{M}{P} = \frac{\bar{Y}}{V\,(r)} \tag{156}$$

$$\text{LM}^* \frac{M^*}{P^*} = \frac{\bar{Y}^*}{V\,(r)}. \tag{157}$$

  - Higher r, but no change in $\frac{P^*}{P}$. Real money supply has to fall as real money demand is down.

– Under the gold standard M and M^* are unchanged as there is no pressure on the exchange rate. As r is higher, prices must increase by the same amount in both countries to reestablish money market equilibrium.

– If the peg is not backed by gold, the fall in the real money supply could be achieved through a lower nominal money supply (money printing does not require fall in some other country's money supply). If one central bank cuts the money supply, the other central bank has to do the same. No real problem though as there interests are aligned (symmetric shock).

- Asymmetric shock: e.g. $\Delta CA > 0$ at unchanged real exchange rate.

$$\text{SIS: } \bar{Y} + \bar{Y}^* = C(\bar{Y} - \bar{T}) + C^*(\bar{Y}^* - \bar{T}) + 2I\,(r) + \bar{G} + \bar{G}^* \tag{158}$$

$$\text{DIS: } \bar{Y} - \bar{Y}^* = C(\bar{Y} - \bar{T}) - C^*(\bar{Y}^* - \bar{T}) + \bar{G} - \bar{G}^* + 2NX\left(\frac{EP^*}{P}, \bar{Y}, \bar{Y}^*\right) \tag{159}$$

$$\text{LM } \frac{M}{P} = \frac{\bar{Y}}{V\,(r)} \tag{160}$$

$$\text{LM}^* \ \frac{M^*}{P^*} = \frac{\bar{Y}^*}{V\,(r)}. \tag{161}$$

  - Unchanged r, but $\frac{P^*}{P}$ has to fall (appreciate). Hence, so must $\frac{M^*}{M}$.
  - Under the gold standard the pressure on the nominal exchange rate to appreciate forces the central bank to increase the supply of its currency by buying reserves of gold and (automatically) the foreign central bank to sell them. M increases while M^* falls.

The burden of the adjustment is shared with P increasing at home and P^* falling abroad.

– If the peg is not backed by gold and the foreign central bank does not want its price level to fall, P has to increase by more than under the gold standard. Of course this would not be the case if the burden of adjustment was shared on the foreign central bank did not try to keep its money supply constant.

- A number of fixed exchange rate systems, such as Bretton Woods, the European Exchange Rate Mechanism and the Argentinian currency board collapsed because of asymmetric shocks *and* because the burden of adjustment was not shared