Christiano 362, Winter 2003 February 21

Lectures 13 and 14: Fixed Exchange Rates

1. Fixed versus flexible exchange rates: overview. Over time, and in different places, countries have adopted a fixed exchange rate monetary policy or regime, and then abandoned it. Sometimes the end of a fixed exchange rate regime is brought on by a financial crisis. We will discuss the operating characteristics of fixed exchange rate regimes and discuss why those regimes seem fragile.

First, the definition. A fixed exchange rate regime is a policy in which the central bank makes a commitment to use its control over the money supply to make sure that the market exchange rate remains set at some announced value. 'Fixed exchange rate regimes' are differentiated according to the strength of the central bank's commitment, and according to what precisely it is commiting to. In terms of the latter, a central bank under fixed exchange rates may be committing to keeping the exchange exactly at some announced value. Or, it may commit to keeping the exchange rate within a specified range of a fixed target, or it may commit to a 'crawling peg': the central bank commits to keeping the exchange rate within a corridor (moving band) of a target which is steadily depreciating (or, more rarely, appreciating). The degree of commitment varies too. It can take the form of an informal announced commitment, or the central bank may be restricted by a law imposed on it by the domestic legislature (the central bank of Argentina was required to maintain a one-for-one parity between the peso and the dollar by the 'convertibility law' passed in 1991). The legal restriction may be something that is imposed by the country itself, without any coordination with other countries. Under these circumstances, the restriction can be lifted by the legislature simply by changing the law (as Argentina did recently). Alternatively, the legal restriction may be part of an international treaty, which would be costly for the legislature to change unilaterally. A currency union typically falls into this category. Examples of this include the states of the United States, and the countries in the Euro area. Dollarization may or may not involve international agreements, although it would always involve legal restrictions on the central bank. Dollarization occurs when one country adopts the currency of another country, without becoming an equal partner in the setting of monetary policy. An example is Panama, which uses the US currency, but does not sit on any governing committees of the US Federal Reserve System. In terms of the strength of their commitment to fixed exchange rates, a verbal commitment by the central bank is

the weakest, while a legal restriction coupled with formal international agreements is the strongest.

The following discussion reviews the operation of the fixed exchange rate system in the context of various types of shocks. The results are that a fixed exchange rate system works well when there are shocks to money demand. It works less well under shocks to aggregate demand. It also works poorly when there is a rise in the foreign rate of interest, although to explain this will require that we modify our model in the (empirically plausible!) direction of making investment a decreasing function of the interest rate. The problems of a fixed exchange rate system under aggregate demand shocks can be mitigated if the partner country in the fixed exchange rate arrangement tends to experience bad aggregate demand shocks at the same time (i.e., it has 'correlated' demand shocks).

The preceding observations can be seen pretty quickly, when you recognize that, according to UIP, a fixed exchange rate system requires the central bank to keep the domestic interest rate equal to the foreign rate: $R = R^*$. In this case, it is (almost!) obvious that shocks to money demand are perfectly accommodated (see below for further explanation), and not allowed to impact on the goods market. At the same time, the impact on output of a bad shock to aggregate demand cannot be softened by letting the interest rate fall and the exchange rate depreciate. This is exactly what would happen in our model if the central bank did nothing and kept the money stock constant. In this case, a bad shock to aggregate demand makes R fall and E rise. The central bank commited to a fixed exchange rate has to respond by preventing the fall in R. To do this, it has to reduce M, precisely at a time when weakening domestic output suggests *increasing* M. In practice, this can be a major problem, and it might be politically unacceptable for an economy that is already in a recession. Very likely, citizens would complain at a time like this that the fixed exchange rate target is simply not worth the high unemployment that goes with a recession. The complaints of citizens would increase the likelihood that a fixed exchange rate regime would soon be abandoned and the exchange rate be allowed to depreciate. This prospect would most likely arouse the attention and interest of speculators who, sensing an opportunity to sell the currency today and buy it back again later at a cheaper price, come in and sell the currency hard right away. This can amplify the pressure on the central bank to abandon the fixed exchange rate regime. These considerations are at the heart of the proposition that fixed exchange rate regimes are 'fragile' and prone to crisis. This is something we will turn to in the next lecture.

2. Fixed Exchange Rates When there are Money Demand Shocks. Under a fixed exchange rate regime, the monetary authority has to manipulate the money supply so that, regardless of what shock hits, the domestic rate of interest is equated to the foreign interest rate, R^* . When there is a shock to money demand, the central bank simply has to conduct open market operations to change M is such a way to guarantee that

$$\frac{M}{P} = L(R, Y),$$

is always satisfied at unchanged R and Y. This means that if money demand rises, then the money supply must be increased by enough to meet the increased demand. If money demand falls, M must be reduced by the same amount. When there are money demand shocks, a fixed exchange rate regime works well, since it serves to insulate the economy completely against the shocks.

- 3. Fixed Exchange Rates with Other Shocks. The story can be quite different if there are other shocks. To show this, we consider shocks to aggregate demand and a shock to the foreign interest rate, R^* . I will establish the following results:
 - Suppose there is a bad shock to aggregate demand. In our model, the fixed exchange rate regime requires that the monetary authority magnify the shock's depressive effect on output by adopting a tight monetary policy. Suppose the foreign country, with whom we have our fixed exchange rate, *also* experiences the drop in aggregate demand, i.e., our drop in aggregate demand is *correlated* with their drop. In the model of the class, it makes no difference whether or not the shock is correlated in this way. However, there are two plausible modifications to the model, either of which implies that a correlated shock may *not* be a very bad thing under a fixed exchange rate regime. One of these modifications adopts the (reasonable!) assumption that an increase in *R* reduces aggregate demand.
 - If R^* jumps, then the fixed exchange rate regime requires that R rise by the same amount. In our model, when this happens there is no effect on aggregate output, Y, or on its components. However, if we adopt the modification mentioned above, that aggregate demand falls with a rise in R, then when R^* rises, the fixed exchange rate regime requires that the monetary authority respond by producing a recession.

We now consider each of these bullets in turn: first, the shock to aggregate demand and then the shock to R^* . After that we consider why the results in the two bullets are interesting.

(a) Shock to Aggregate Demand. In this case, the central bank that would like to keep output unaffected would like to increase the money supply and produce a depreciation of the currency. This is exhibited in Figure 1, which shows the shift up in the AA curve that occurs with an increase in the money supply. Note that with this policy response, the exchange rate depreciates from E1 to E2. This depreciation produces the rise in the current account needed to exactly cancel the initial fall in aggregate demand.

But, under a fixed exchange rate regime, the central bank commits itself to keeping the exchange rate fixed at E1. So, instead of increasing the money supply, the central bank must actually contract the money supply in response to the shock. It must, in effect, do the *opposite* of what it would like to do if its primary concern were with stabilizing output. As it stands, the objective of stabilizing output conflicts sharply with the objective of maintaining the fixed exchange rate.

If the domestic economy could convince the foreign economy to reduce its interest at this time, then the problem of low aggregate demand is not so severe (we'll see this shortly, when we study the effects of shocks to R^* .) The domestic economy is more likely to convince the other economy to go along with an interest rate cut if the latter also has experienced a drop in aggregate demand. Thus, if aggregate demand shocks are correlated across economies bound by fixed exchange rates, then the downside of fixed exchange rates when there are demand shocks isn't so great.

(b) Suppose now that the foreign rate of interest, R^* , rises. Let's not worry for now why the foreign country might do this.

We'll analyze the effects of the shock in the foreign interest rate under two circumstances. First, we'll consider the ('standard') case where aggregate demand is not sensitive to the interest rate. Then, we'll look at the case where it is.

i. The Standard Case. Figure 7 displays the impact on the AA curve of the increase in R^* . It shifts up. If the domestic monetary authority keeps the money stock fixed, and doesn't worry about the fixed exchange rate regime, then the economy can be expected to travel the path indicated by the arrows, from 1 to 2. Initially, there is a large depreciation of the exchange rate because this is needed to reconcile the higher foreign interest rate with the low domestic interest rate: there must be an anticipated appreciation of the domestic currency. If we hold the long-run level of the exchange rate fixed, then this requires that E fall over time, and this requires an immediate jump in E. With the jump in E, the stimulus to CA starts sending output up.

The rise in output raises R and thus brings E down somewhat, and that's what's going on as we slide down the new AA curve towards point 2 in Figure 7.

But, now suppose we recognize that there is a fixed exchange rate regime in place. Then, the monetary authority must reduce the money supply and bring the AA curve back down, so that it intersects point 1 in Figure 7. Note that once we have returned to this point, nothing has happened to aggregate output. The level and composition of output is what it was before. True, the rate of interest is higher, but this does not matter for output because planned spending is not sensitive to the interest rate in the standard model.

11.

The interest rate sensitive case. Now let's repeat the previous exercise under the assumption that desired investment responds negatively to the rate of interest. Let's proceed in the same style we have before, by first ignoring the fixed exchange rate regime. Thus, consider Figure 8. The rise in R^* shifts the AA curve up, just like before. However, now, as the economy begins its slide down the new AA curve, and R is rising, the DD curve begins to shift left. This pattern is indicated by the left arrow in Figure 8. The economy travels southeast along the AA curve and eventually meets the left-shifting DD curve. When it meets, that's a short run equilibrium. It is denoted by point 3. Note that at this point, output is lower than it was before (see point 3 in Figure 7). The reason is that the higher interest rate depresses aggregate demand.

But now let's recognize that there is a fixed exchange rate regime in place. Point 3 in Figure 8 is obviously not consistent with the fixed exchange rate regime because E is too high. The exchange rate needs to be brought back to its original level, indicated as E1 in Figure 9. To do this, the central bank must tighten monetary policy and shift the AA curve down from its level at AA2. As the AA curve shifts down the economy rides the intersection of the AA curve and the DD curve. On this path, E falls, and R rises. The latter means that the DD curve is simultaneously shifting left. As a result, the economy traces the path indicated by the arrow from point 3 to point 4. The DD curve at the end of this path is indicated by DD3, and the AA curve is AA3. Note that the original exchange rate has been restored at point 4, so that the fixed exchange rate regime is preserved. However, the net effect of the rise in R^* has been to reduce output from Y1 to Y2.

In sum, when the other country raises its interest rate and the domestic economy is committed to a fixed exchange rate, then the domestic economy has to raise its interest rate too. This will cause a recession in the plausible case where planned spending falls with a rise in the interest rate.

- 4. Who Cares? The above discussion reviewed some of the characteristics of a fixed exchange rate regime. Essentially, it requires that you maintain the interest rate at the level in the foreign country. This has several consequences. Under a fixed exchange rate regime:
 - Your response to domestic shocks to money demand is excellent.
 - If the foreign country's rate of interest rises, you may be in for a recession as you are forced to raise your interest rate too.
 - If there is a fall in aggregate demand in your country, the fixed exchange rate regime may hinder your ability to stabilize the output effects. You can get around this, to the extent that you can arrange suitable coordinated interest rate changes with your partner countries in the fixed exchange rate system.

These bullets, especially the last two, have important implications. Here are some of them:

(a) The theory of optimal currency areas. Clearly, a big downside to fixed exchange rates is that it frustrates a central bank's ability to deal with aggregate demand shocks. The last bullet indicates, however, that if you can establish fixed exchange rate regimes with countries whose aggregate demand shocks are correlated with yours, then the fixed exchange rate regime is more likely to be successful. This logic is an important ingredient in the 'theory of optimal currency areas', for which the Nobel prize was awarded to Robert Mundell of Columbia University. According to this theory, countries ought to form a currency union (an extreme form of fixed exchange rates) if their shocks are appropriately correlated.¹

The issue of how well shocks are correlated is a factor in discussions about the likely success of the newly formed European Monetary Union. Other monetary unions are also under discussion. For example, one plan would put North and South America on a common fixed exchange rate regime. These discussions involve, in

¹A currency union is a region, like the United States, where there is only one currency. You can think of this as a multiple currency area with fixed exchange rates. Actually, in the US there are 12 different currencies, according to which Federal Reserve bank issued it (check out your bank notes, they indicate which Federal Reserve District they come from). The exchange rate between these currencies is fixed at unity. The Europeans are already well on their way towards a currency union.

part, assessments of how well shocks are correlated across countries. For example, non-US countries like Canada, Mexico, etc., are relatively sensitive to shocks to commodity demand. Suppose the non-US countries are in recessions because world demand for commodities is low. But, suppose that at the same time, the US is in a boom and the Federal Reserve decides to raise interest rates because it is concerned about inflation. The other countries in the western hemisphere would have to raise their rates at the same time, and they just might find this intolerable. This is the kind of consideration that makes them hesitant to join a union in the first place.

- (b) Mexico in 1994. In 1994, the US Fed raised interest rates sharply throughout the year. Mexico was therefore obliged to raise its interest rates because it was committed to a fixed exchange rate with respect to the US dollar. But, this came at a bad time, when there was a presidential election underway. By the end of the year, the Mexicans abandoned the fixed exchange rate regime. The full story behind the Mexican depreciation is more complicated than this. But, most would agree that the US rise in interest rates was a contributing factor to Mexico's abandoning its fixed exchange rate with the dollar.
- (c) The third bullet points to an important issue in assessing the likely success of the European Monetary Union. If the shocks across countries are not well correlated, then sticking to a fixed exchange rate among the countries may turn out to be too difficult. The experience in 1992 is a case in point. The rate of interest in Germany, the leading economic power in Europe, had been rising due to strong aggregate demand related to the reunification of East and West Germany. Because of the fixed exchange rate system then in place, this forced the other countries in Europe to also raise their interest rates. This generated much stress and controversy across Europe because the high interest rates had a depressive effect on the various economies. In the end, Italy and Britain abandoned the fixed exchange rate system because the high interest rates proved to be too much for them.

A primary motivation for European monetary integration is to promote political and cultural integration in Europe and thereby hopefully reduce the likelihood of future military conflicts of the type that have been observed in the past. The third bullet indicates that, ironically, monetary union could itself become a *source* of stress in Europe, if shocks are sufficiently uncorrelated across the countries. On the bright side, the US has managed to do quite well with its experiment in monetary integration, even though shocks across regions of the US are obviously not perfectly well correlated (oil shocks affect the oil producing states differently than the oil consuming states, military spending affects different regions differently, etc.). But, it is not clear how good a model the US is for Europe. In the US, political integration *preceded* monetary integration. In Europe, they are trying to proceed in the opposite direction.



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Figure 1: Responding to a Bad Shock to Aggregate Demand By Increasing The Money Supply



Figure 7: Effect of a Rise in the Foreign Interest Rate, Holding M Fixed.



Figure 8: Effect of a Rise in the Foreign Interest Rate, Holding M Fixed, When R Affects Agg. Demand



Figure 9: The Effect of a Rise in the Foreign Interest Rate Under a Fixed Exchange Rate Regime, and Assuming that Aggregate Planned Spending Falls with a Rise in the Interest Rate

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