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Lecture #18: More on Fixed Exchange Rates

1. Imperfect Asset Substitutability. The belief that a central bank can independently pursue domestic objectives while keeping exchange rates fixed may be one reason that central bankers sometimes walk into 'first generation' style currency crises.

   One set of reasons underlying this belief comes under the heading, 'imperfect asset substitutability'. To understand this, recall our previous breakdown of wealth into money and bonds:

   $$W = M + B.$$

   (Recall, what we call 'bonds' here actually includes all assets which promise a payoff.) The idea up to now has been that the way a central bank affects the economy is by changing the composition of wealth between money and bonds. The central bank can affect this composition by conducting open market operations, in which it buys bonds with money (an operation that expands the money supply) or sells bonds for money (an operation that contracts the money supply). According to the theory, the effects of these open market operations depend exclusively on their impact on the quantity of money. In particular, the effect does not depend on exactly *what* assets the central bank buys. In B, of course, there are lots of different types of assets. There are domestic government bonds and other assets issued domestically, as well as foreign government bonds and assets. The notion that the economic effect of an open market operation is the same, regardless of what asset the central bank buys corresponds to the notion that all assets in B are essentially the same to investors. This corresponds to the idea that there is *perfect asset substitutability*.

   But, in reality assets are only *imperfectly substitutable*. Even assets that generate the same expected return are *not* the same. Different assets have different risks associated with them. This is why people like to diversify their holdings. They don't want their portfolio to contain too much of one asset. To compensate them for holding a disproportionate amount of some asset, its rate of return has to be high.

   The sensible idea that assets are imperfectly substitutable is the basis for a dubious idea that central banks can independently control the exchange rate and pursue domestic objectives. If this were true, this would of course be a wonderful thing. Last time, we pointed out how things can happen (a rise in R^*, a fall in aggregate demand) which

appear to place a fixed exchange rate regime in the sharpest possible conflict with domestic policy objectives (i.e., the objective of maintaining employment and output at their efficient level.) It would be a really great thing if, at a time like this, the central bank had *two* instruments, one that allows it to target the exchange rate and the other that allows it to pursue domestic objectives. Unfortunately, the evidence suggests that, at best, the central bank has only one instrument, its control over the stock of money, M, that it can use to affect the economy. Still, enough people believe the two-instrument theory coming under the heading, 'imperfect asset substitutability', that it deserves to be spelled out.

This is how it works. Let's split bonds, B, into two parts, B^d and B^f. B^d is domestic assets and B^f is foreign assets. Domestic government debt is contained in B^d and the debt of foreign governments is contained in B^f. By conducting the right set of open market operations, the central bank can alter the composition of B^f and B^d in B, while leaving M unchanged. To see how this works, suppose the central bank buys \$100 worth of B^f. This has the following effect on the central bank's balance sheet:

Assets	Liabilities
+\$100 B^f	+\$100 M

Now, suppose that the central bank 'sterilizes' the impact of this operation on the money supply. It can do so by selling \$100 of domestic assets to the public. The combined effects of the two transactions is given in the following table:

Assets	Liabilities
+\$100 B^f	+\$100 M
-\$100 B^d	-\$100 M

Note that the net effect of the two transactions is to keep the money stock unchanged and to alter the composition of assets in the possession of the central bank. The theory we have developed up to now has the implication that there is no impact on the economy of these two operations. They have no effect because they have no impact on M.

Those who focus on the limited substitutability of assets believe that there *is* an effect of these changes. They note that the two open market

operations leave the public holding more domestic assets than before and fewer foreign assets. The idea is that to get them to keep a relatively larger fraction of their eggs in one basket (domestic assets, rather than foreign), they have to be compensated with a higher interest rate. That is, the rate of return on domestic assets, R, must be higher if the central bank makes B^f higher and B^d lower. The amount by which the interest rate must be higher is measured by a 'risk premium' term, ρ. The risk premium is posited to be an increasing function of the stock of domestic assets held by the public. That is, ρ can be expressed as $\rho(B^d)$, where the function, ρ is increasing in its argument. Then, the interest parity relation boils down to:

$$R = R^* + \frac{E^e - E}{E} + \rho(B^d).$$

This says that the return on domestic assets, R, has to be equal to the foreign nominal return plus the anticipated rate of depreciation in the exchange rate, *plus* a risk premium. That is, the expected rate of return on domestic assets has to be *higher* than the expected rate of return on foreign assets, $R^* + (E^e - E)/E$, before people are happy to hold the outstanding stock of assets (to be happy, they must be indifferent, on the margin, between a small shift in assets B^d to B^f.) Another way to put all this is that, if the expected return on domestic assets were simply equal to the expected return, $R^* + (E^e - E)/E$, on foreign assets, then people wouldn't be happy holding the domestic assets when $\rho > 0$. Given the relatively large fraction of those assets, when B^d is high, people want to see the expected return on domestic assets be higher than the expected return on foreign assets.

These are the kinds of considerations underly the notion that there are, in effect, two channels by which the central bank can affect the domestic economy. One operates via its control over the fraction of wealth held in money and bonds. The other operates via its control over the fraction of domestic and foreign assets in bonds. To see the implications of this for monetary policy, let's consider a couple of exercises.

(a) Example 1. Suppose the central bank executes the operation described above: a sterilized purchase of foreign assets. Suppose the operation is temporary. The effect on asset markets can be seen in Figure 1. The UIP curve shifts up by the increase in the risk premium. Now, *if* the level of output and the money stock are kept unchanged, then the domestic interest rate, R, does not change.[1]

[1]It is assumed that the change in risk does not alter the demand for money. This is an assumption I will return to later.

To get people to be happy with the given international distribution of financial assets with an unchanged R requires that there be an expected depreciation in the exchange rate, i.e., $(E^e - E)/E$ must fall. Given the unchanged E^e, this implies that E must jump. There must be a depreciation of the currency. This is what Figure 1 says: with no change in R, E must jump from $E0$ to $E1$. The way the markets bring about the depreciation is by people choosing to sell local assets and buy foreign assets. The composition of these assets in the world as a whole is fixed, however, so that all people actually succeed in doing is bidding down the value of the currency. Once the value has dropped to $E1$, the resulting anticipated appreciation is enough to compensate them for the extra risk they now see in domestic assets.

So, in this modified model, the central bank can, by doing sterilized purchases of foreign assets, depreciate its own currency. Because in our model this has the effect of producing a *real* depreciation (P and P^* are both fixed in the short run), this has the effect of stimulating aggregate demand. As output increases, the demand for money increases and R is driven up. The higher rate of interest produces an appreciation, offsetting some of the initial positive effect on output of the initial fall in the exchange rate (i.e., rise in E). These things can all be captured simultaneously in the $AA - DD$ curve, as in Figure 2. The economy follows the arrows, going from point 1 to point 2.

This example is relevant to discussions about Japan. Recall that there, the nominal rate of interest is zero. As a result, increases in the money supply have no impact on the interest rate. The interest rate cannot be driven below zero. But now, there is potentially another channel open for the central bank to stimulate the economy. Suppose the Bank of Japan increases the world supply of Japanese assets by buying foreign assets, and selling Japanese government debt. The idea is that the risk premium on Japanese assets will go up. This will drive up the AA curve. With the higher AA curve, the exchange rate will depreciate. This will stimulate the economy and even cause the interest rate to rise above zero, as money demand gets stronger. In the plausible case in which DD shifts left with a higher interest rate, the output effect will be less strong than if DD were not a function of R. Still, there will be a positive effect on output, even if DD shifts to the left a little.

Note how different this channel is from the one we're used to, in which the central bank's effect on the economy operates via its effect on the money stock. One tipoff that something very different is going is that in the process of stimulating the economy, the central bank *raises* the rate of interest. What's going on here is that the link from monetary policy to the economy is very different when monetary policy focuses

on B^f/B^d rather than M/B. The effect on the economy of a sterilized intervention operates directly through (has a first-order effect on) the exchange rate. The higher interest rate is a second-order after-effect of the exchange rate depreciation. In the conventional approach, movements in the interest rate are central to the mechanism by which the central bank affects the exchange rate.

(b) Example 2. Consider a version of the previous example, modified so that instead of keeping M fixed, the central bank keeps E fixed. So, we are back to studying the fixed exchange rate regime. The situation is depicted in Figure 3. The fixed exchange rate is E_0, which is indicated by the horizontal line. The job of the central bank is to see to it that the AA curve intersects the DD curve on that line.

Consider first the effect of increasing B^f/B^d through a sterilized purchase of foreign assets. As before, this shifts the AA curve up. If the central bank does nothing to the money supply, the economy would jump vertically up to the AA' curve, and then slide down to the right where AA' intersects DD, as before. But a central bank in a fixed exchange rate regime cannot accept this, because it would violate the exchange rate target, E_0. So, it has to pull the AA curve back from AA', by reducing the money supply. Suppose the central bank does this without changing B^f/B^d, so we don't have to worry about anymore changes in ρ.[2] If R does not enter into the DD curve, then the AA curve must be pulled back to where it was before, with no effect on the equilibrium level of output. It's not clear, in this case, why the sterilized purchase of foreign interest earning assets was executed in the first place.

But now suppose that a rise in R shifts the DD curve left. Then, as the AA curve is pulled back down with a reduction in the money stock, the rising interest rate causes the DD curve to shift left, to $DD1$. In the end, the economy will settle at position 2, with a lower level of output.

Now, at one level the previous example does not motivate very well why any central banker might want to avail themselves of the new tool, their ability to control B^f/B^d. After all, we've simply managed to *reduce* output. But, this misses the point. The important thing here is that the central bank has been able to affect the domestic economy

[2]Thus, let $B = B^d(1+\lambda)$, where $\lambda = B^f/B^d$, so that $B^f = \lambda B^d$. A contractionary open market operation that reduces the money supply by ΔM, (i.e., $\Delta M < 0$) keeps λ fixed if $\Delta B^d = -\Delta M/(1+\lambda)$ and $\Delta B^f = \lambda \Delta B^d$. That is, it increases both B^d and B^f in such a way that the ratio, B^d/B^f, remains unchanged.

without violating the fixed exchange rate. Let's study a slightly different example now, which motivates better why central bankers might be excited by the new tool.

(c) Example 3. Suppose now the central bank purchases domestic assets, and partially sterilizes the impact on M by selling foreign assets. By increasing its holdings of domestic assets, it reduces B^d, the holdings by the public of domestic assets. Similarly, by reducing its holdings of foreign assets, it increases B^f. Thus, the central bank reduces B^d/B^f and increases M. It does this in a way that keeps the exchange rate unchanged at E_0. To analyze this experiment, let's do it in two steps, as in example 1. In the first step, B^d/B^f is reduced, and M is kept fixed. In the second step, M is increased to ensure that the AA curve intersects the DD curve at E_0. The situation is depicted in Figure 4. The economy goes from 1 to 2. The fall in B^d/B^f shifts the AA curve down. The rise in M pushes it back. However, as it is shifting back with the rise in M, the interest rate falls, shifting the DD curve to the right. This is why output ends up higher.

This example shows how an expansionary monetary policy, coupled with an appropriate adjustment in the ratio of foreign and domestic debt, can in principle expand the economy while remaining consistent with the fixed exchange rate.

2. Does the Central Bank in fact Have Two Tools? The previous discussion suggests that, in principle at least, the central bank can independently target the exchange rate and the domestic economy. Most economic researchers who have tried to use the data to determined if this is in fact true come away with the conclusion that a central bank cannot, over a reasonable time horizon like a month or more, influence the exchange rate by changing B^d/B^f. One problem is that the open market operations necessary for a central bank to significantly affect the ratio B^f/B^d, would have to be very large. The situation is very different with respect to M. As indicated in a previous lecture, when the central bank does an open market purchase of B, it has a potentially large effect on M. This is because the resulting increase in M is likely to be a multiple of the actual increase in banking system reserves generated by the open market purchase itself.

3. Costs and Benefits of Fixed Exchange Rates.

   In the past several lectures we have emphasized the downside of fixed exchange rates: they deprive the central bank of the ability to stabilize the economy and they are subject to potentially damaging crises.

Yet, countries in various times and places have adopted fixed exchange rates. What did they hope to gain from this? They obviously thought the benefits would outweigh the costs. So, what are these benefits?

The main benefit is that fixed exchange rates reduce the incidence of high inflation that a lot of countries have experienced. These high inflation episodes reflect one of several things. Governments bring pressure to bear on the central bank to increase the money supply. This can happen when the government wants to spend money, but it is unwilling or unable to raise taxes. Under these circumstances, the central bank essentially prints the money for the government by a mechanism in which the government issues debt, and the central bank buys the debt (this is how the money supply increases over time in countries like the US). High inflation can also occur if the central bank simply tries to expand the economy repeatedly over a period of time. Finally, a central bank which is left to its own devices to do as it wishes, is vulnerable to expectations traps, discussed in earlier lectures.

Going to fixed exchange rates can help on all these accounts. Ignoring the dubious story about limited asset substitutability, a central bank essentially loses control over the money supply when it is on fixed exchange rates. Then, it cannot simply print money to finance government expenditures, or to fine tune the economy. Similarly, there is some chance that it reduces its vulnerability to the kind of expectation traps referred to above, in which private expectations of high inflation drive the central bank to supply high inflation. It would not make sense for expectations of inflation to 'suddenly take off' when the central bank has no ability to actually make the high inflation happen.

Of course, there is the downside of fixed exchange rates, the currency crises. However, this downside can be minimized. One option that countries are considering very seriously is the option of making the fixed exchange rate regime much more credible through institutional reform. Two types of institutional reform include currency unions and 'dollarization'. A currency union occurs when a group of countries get together and adopt the same currency. This is what the thirteen US colonies did at the time they ratified the US constitution. This is what the European economies are in the process of doing. Here, you have to be a little careful. As discussed in previous lectures, you don't want to form fixed exchange rates with countries that are very different from yours. The other institutional reform, dollarization, is being considered by several countries in the Western Hemisphere. This is like a currency union, but with a twist. Under dollarization, a country adopts the US dollar as its currency. However, that country has no control over how monetary policy is conducted. This is different from a currency union, where all the members in the union participate in making monetary policy.

Whether a country dollarizes or goes into a currency union, it probably would reduce the likelihood of currency crises. (See the paper by Francois Velde on the web site.) Certainly currency crises of the second generation.