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Lecture 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 later.

2. Fixed Exchange Rates When there are Money Demand Shocks. Suppose there is a shift up in the demand for money. That is, the demand for money is given by:

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

When a rises, then people prefer to hold a larger share of their income in the form of money. When a falls, they prefer to hold less. Suppose that a rises. As a useful benchmark to compare with what happens under a fixed exchange rate, we first consider the case when M is held fixed and E^e does not respond. The first question to address is which curve shifts, AA or DD? Clearly the DD curve does not shift because a does not appear anywhere in there. The shock, a, is something that hits the financial markets, not the goods market. Specifically, it hits the money market. To see what it does to the AA curve, consider the diagram of the financial markets (i.e., UIP and MM) from which the AA curve is constructed. In particular, Figure 3 shows how money demand rises with a. To determine what the change in a does to the location of the AA curve, we ask what has to happen to E to maintain equilibrium in the financial markets at a given level of Y. The answer to this question tells us the magnitude of the vertical drop of the AA curve. Figure 3 shows us what this magnitude is. The economic logic behind the drop is this. Given the unchanged value of E^e, and the increase in R from R_1 to R_2 produced by the rise in a, international financial markets will find domestic financial assets more attractive. In an attempt to acquire them, traders bid for the US dollar, causing it to appreciate. That is, E falls. With each lower value of E, traders anticipate a greater depreciation of the domestic currency, because of our assumption that E^e is unchanged. This subtracts from the high nominal return on domestic assets. When E falls just enough so that the resulting anticipated depreciation wipes out the difference between R and R^f, then traders are indifferent between domestic and foreign assets. At this point, the financial markets are in equilibrium. All this is the long story behind the fact that the AA curve shifts down, as indicated in Figure 4.

Under the fixed M policy, the economy drops from 1 to a in Figure 4 instantly. At the exchange rate, E_2, the real exchange rate is low, meaning that domestic goods are expensive relative to foreign goods. This results in a fall in CA. This drop in aggregate demand generates a rise in unintended inventories, which causes retailers to order fewer goods, so that output begins to fall. With the fall in output, the amount of transactions falls, and so the demand for money begins to shift left. This partially undoes the initial jump in money demand induced by the rise in a. As a result the interest rate falls from its initial high value of R_2 and part of the initial drop in E is also undone. In the short run equilibrium, the economy settles at point 2, where the exchange rate has appreciated somewhat relative to E_1, but not as much as at E_2. Similarly, the interest rate (not visible in Figure 4) settles at a value intermediate to R_1 and R_2 in Figure 3.

To summarize. Under the fixed M policy, an increase in money demand

results in a higher interest rate, an appreciated exchange rate and a recession. The latter reflects that the exchange rate appreciation hurts net exports.

Now consider what happens in the fixed exchange rate policy. In this case, the central bank is commited to holding the exchange rate at E_1. To do so, it needs to shift the AA curve back up from AA' to AA. It does this by increasing M. In terms of Figure 3, it must increase M so that the interest rate does not rise above R_1. It does so by fully accommodating the desired increase in money demand captured by the rise in a. Under the fixed exchange rate regime, the equilibrium level of output is unaffected by a money demand shock.

Here is an intuitive way to think about the logic we have just reviewed. Under a fixed exchange rate regime, the central bank is required to keep $E^e = E$, so that, according to UIP, $R = R^f$. Thus, if there is a change in money demand, the monetary authority must move the money supply so that the interest rate is unaffected. But, the only way money demand shocks have an impact on the rest of the economy - according to our model - is via their impact on the interest rate. Since a fixed exchange rate regime does not allow money demand shocks to affect the domestic interest rate, it follows that under a fixed exchange rate regime, money demand shocks cannot affect output. This is generally viewed as a favorable characteristic of fixed exchange rate regimes. The idea is that it is a bad thing for the craziness in financial markets summarized by shocks to a to affect real activity in the goods market.

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.
   - 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.

   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. Figure 5 considers three scenarios. In each case, there is a negative shock to aggregate planned spending, represented by a shift left in the DD curve (make sure you

can explain how and why this curve shifts). In addition, I assume that E^e does not change in any of the three scenarios. Equilibrium points 2 and 3 are useful benchmarks, for thinking about the fixed exchange rate scenario, which is the last one we consider.

Point 2 is the short run equilibrium that occurs when the money supply is not permitted to react to the demand shock (this is the kind of equilibrium that we have considered before). The shock induces the indicated left-shift in the DD curve. At the initial point, 1, the economy experiences an excess of production over planned spending. Unintended inventories accumulate and firms respond by reducing orders. The result is a fall in output. The fall in output momentarily puts the economy below the AA curve. That is, with the fall in money demand associated with the fall in output, the money market goes out of equilibrium. The result of this is that the interest rate falls, and the exchange rate depreciates (make sure you understand why). The fall in output together with the constantly equilibrating financial markets shows up in the figure as the economy sliding up the AA curve to point 2 where things stop. At point 2, the economy is in a short run equilibrium, which is a recession. The recession is not as severe as it might have been, had the economy not been cushioned by the fall in the interest rate (without the fall in the interest rate, the economy would have ended up at point 4 in the short run equilibrium). Still, it's a recession. A central bank that does not like to see output fall, either because it is sensitive to political pressure or because of its own preferences, will prefer to go to point 3. The central bank can reach point 3 by increasing the money supply in response to the negative demand shock. This has the effect of shifting the AA curve up. To stabilize output, the monetary authority must increase the money supply by enough to get the AA curve to intersect the $DD\prime$ curve at point 3. At this point, they've created enough of a depreciation of the currency, so that the resulting rise in CA is enough to exactly offset the fall in planned spending that shifted the DD curve left in the first place.

Ok, now let's look at what happens under a fixed exchange rate regime. In this case, the monetary authority must keep the exchange rate fixed at E_1. This requires shifting the AA curve so that it intersects the new DD curve at the targetted exchange rate. The way the monetary authority shifts the AA curve to left, is by reducing the money supply. It must reduce the money supply by enough to prevent the fall in the interest rate that would occur as the drop in output causes the demand for money to fall. By preventing the fall in the interest rate, the monetary authority in effect stops the thing that might have cushioned the economy's recession. The monetary authority under a fixed exchange rate

regime do the *opposite* of what a stabilizing monetary authority would want to do. This is a serious shortcoming of a fixed exchange rate regime. A bad demand shocks can create a severe conflict between domestic policy goals (stabilizing the economy) and the monetary policy regime.

(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 6 shows how the AA curve shifts up with the increase in R^*. 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. The large depreciation, in conjunction with the fixed E^e, creates the expectation that E will appreciate. This compensates foreigners who hold domestic financial assets, for the fact that the domestic nominal interest rate is now low. The depreciation of the exchange rate which is produced by the asset markets, has an effect on goods markets by causing a depreciation in the real exchange rate, q. The resulting stimulus to CA leads to a rise in output as firms react to an unanticipated drop in inventories. This rise in output has a feedback effect on financial markes, as it raises money demand and pushes up R. The higher R causes E to jump by less. The economy then slides down the new AA curve into point 2 in Figure 6.
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 6. 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.

ii. The interest rate sensitive case.
Now let's repeat the previous exercise under the assumption that some component of planned spending responds negatively to the rate of interest. For example, it makes sense to suppose that investment is a decreasing function of the interest rate. Let's proceed in the same style we have before, by first ignoring the fixed exchange rate regime. Thus, consider

Figure 7. 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 7. 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 2 in Figure 6, indicated as point 2 in Figure 7). The reason is that the higher interest rate directly depresses aggregate demand.

But now let's recognize that there is a fixed exchange rate regime in place. Point 3 in Figure 7 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 E_1 in Figure 8. To do this, the central bank must tighten monetary policy and shift the AA curve down in response to the rise in R^*. As the AA curve shifts left, the interest rate rises. This is because of the reduction in M, as well as because of the fall in output. The rise in the interest rate causes the DD curve to shift left. The economy settles at point 2 in a short run equilibrium. Now, the fact that the domestic central bank under a fixed exchange rate regime must raise the domestic interest rate when R^* rises implies that the domestic economy experiences a recession.

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.

(c) Policy Coordination. When planned spending is sensitive to the interest rate, then a monetary authority under a fixed exchange rate has an additional tool for stabilizing the economy. It can coordinate policy with the foreign central bank. Thus, suppose there is a bad demand shock. This shifts the DD curve left. Under the fixed exchange rate regime the central bank must prevent the shock from reducing the rate of interest. Now suppose that when this happens, the domestic central banker calls the foreign central banker and suggests that both countries coordinate to reduce their interest rates. The preceding analysis suggests that in the interest sensitive case, this will stimulate output. This type of policy coordination will tend to be possible if negative demand shocks strike the domestic and foreign ecnomies simultaneously. In this case, the foreign central banker will be eager to get rates down.

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 was an important factor in discussions about the introduction of the Euro. There have been on-and-off discussions about other monetary unions too. For example, one plan would put North and South America on a common fixed exchange rate regime. These discussions involve, in 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

[1] A 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.

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 commited 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 Euro. 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, a 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.

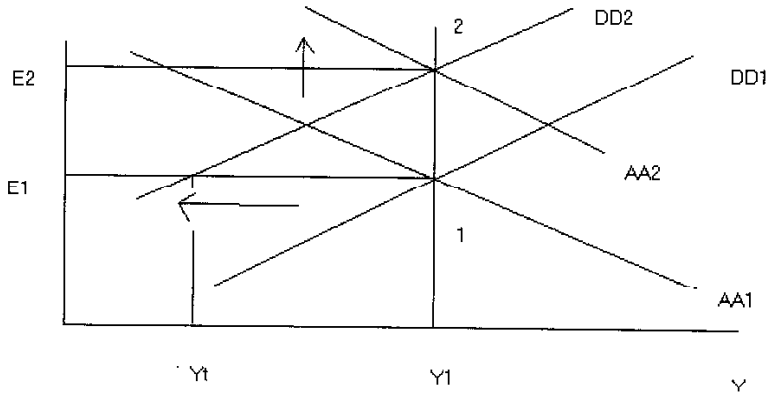

Figure 1: Responding to a Bad Shock to Aggregate Demand By Increasing The Money Supply

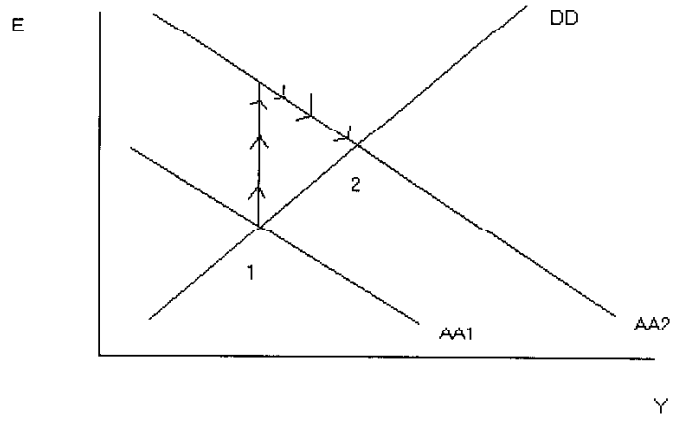

Figure 7: Effect of a Rise in the Foreign Interest Rate, Holding M Fixed.

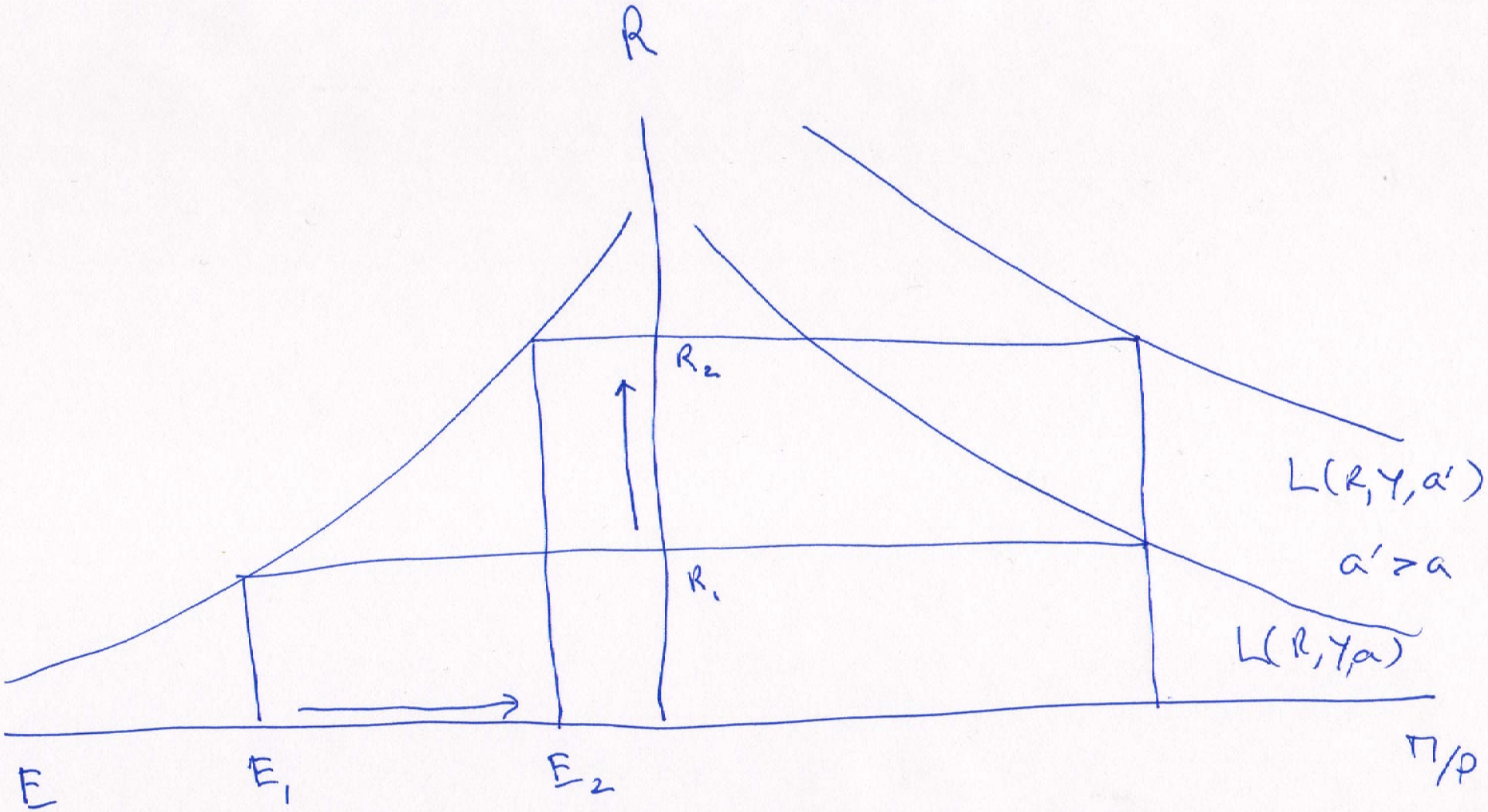

Figure 3: Change in Equilibrium E After June in a, Under Assumption that Y Does Not Respond.

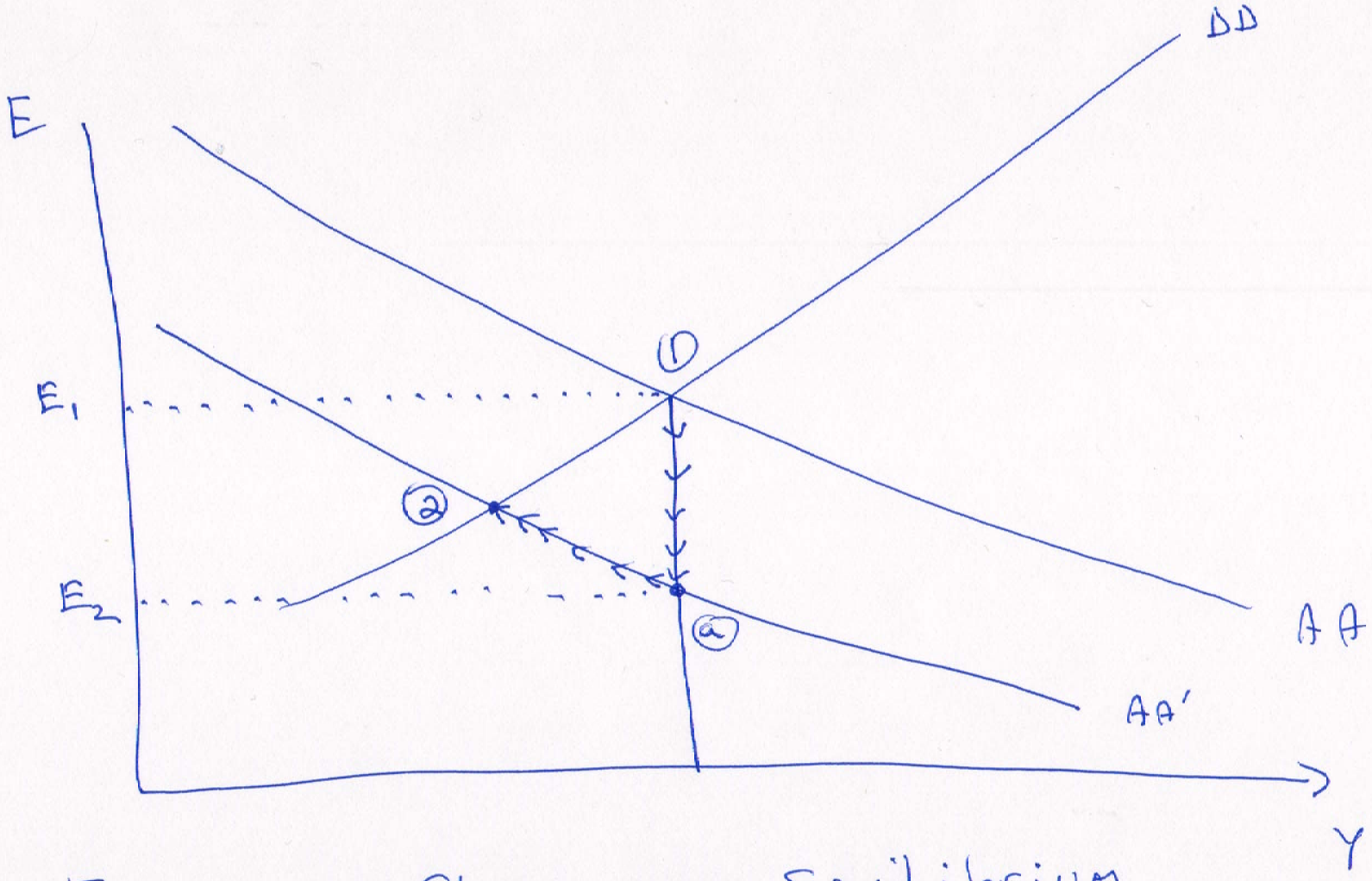

Figure 4: Short run Equilibrium
When a jumps, E^e remains
unchanged and Policy Fixes M

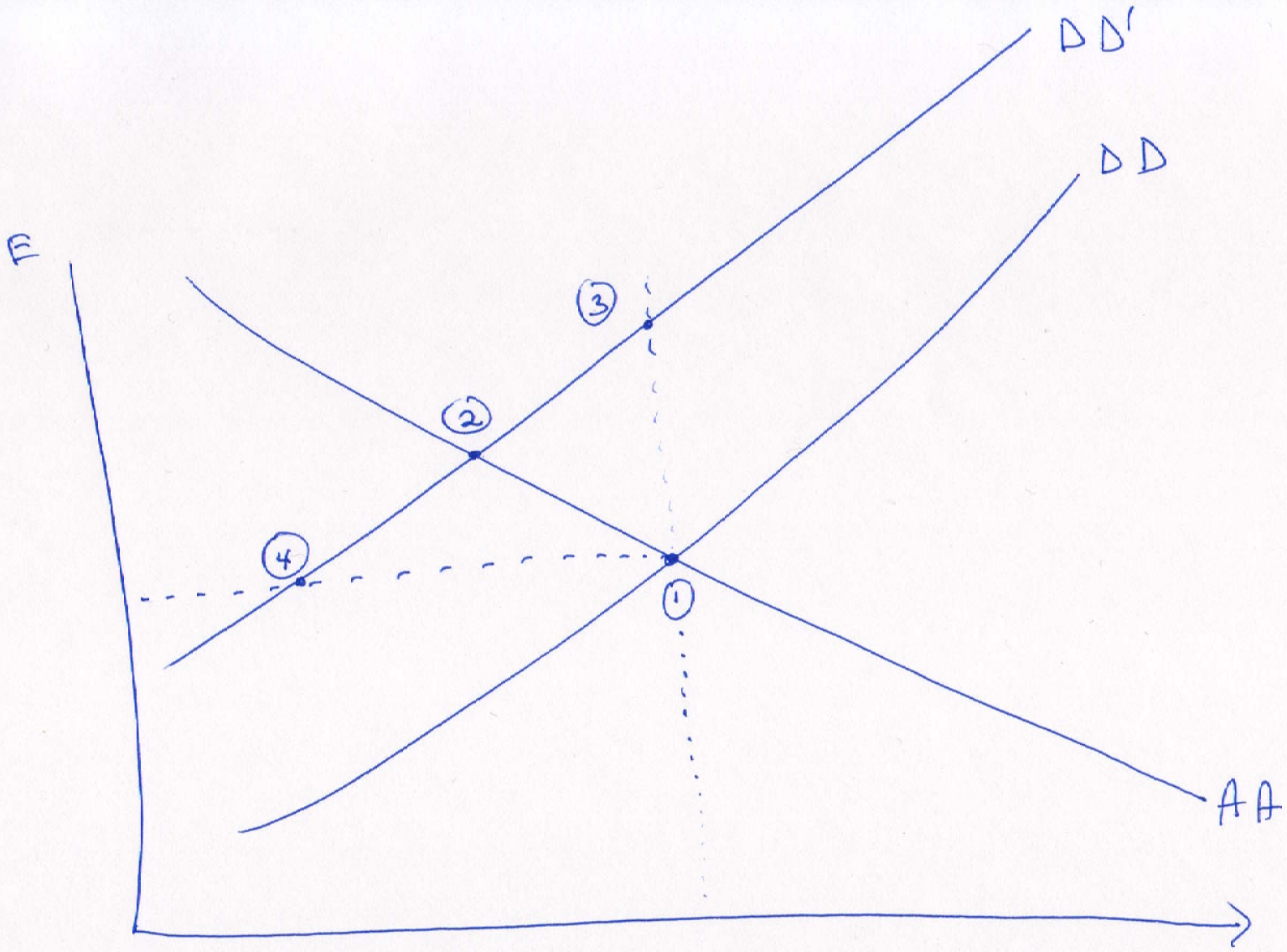

Figure 5: Response to Negative Planned Spending Shock Under three Different Monetary Regimes. In All Cases, E^e Constant.

(2) S.R. Equilibrium Under Fixed M
(3) S.R. Equilibrium For "Stabilizing" Policy
(4) S.R. Equilibrium Under Fixed Exchange Rate.

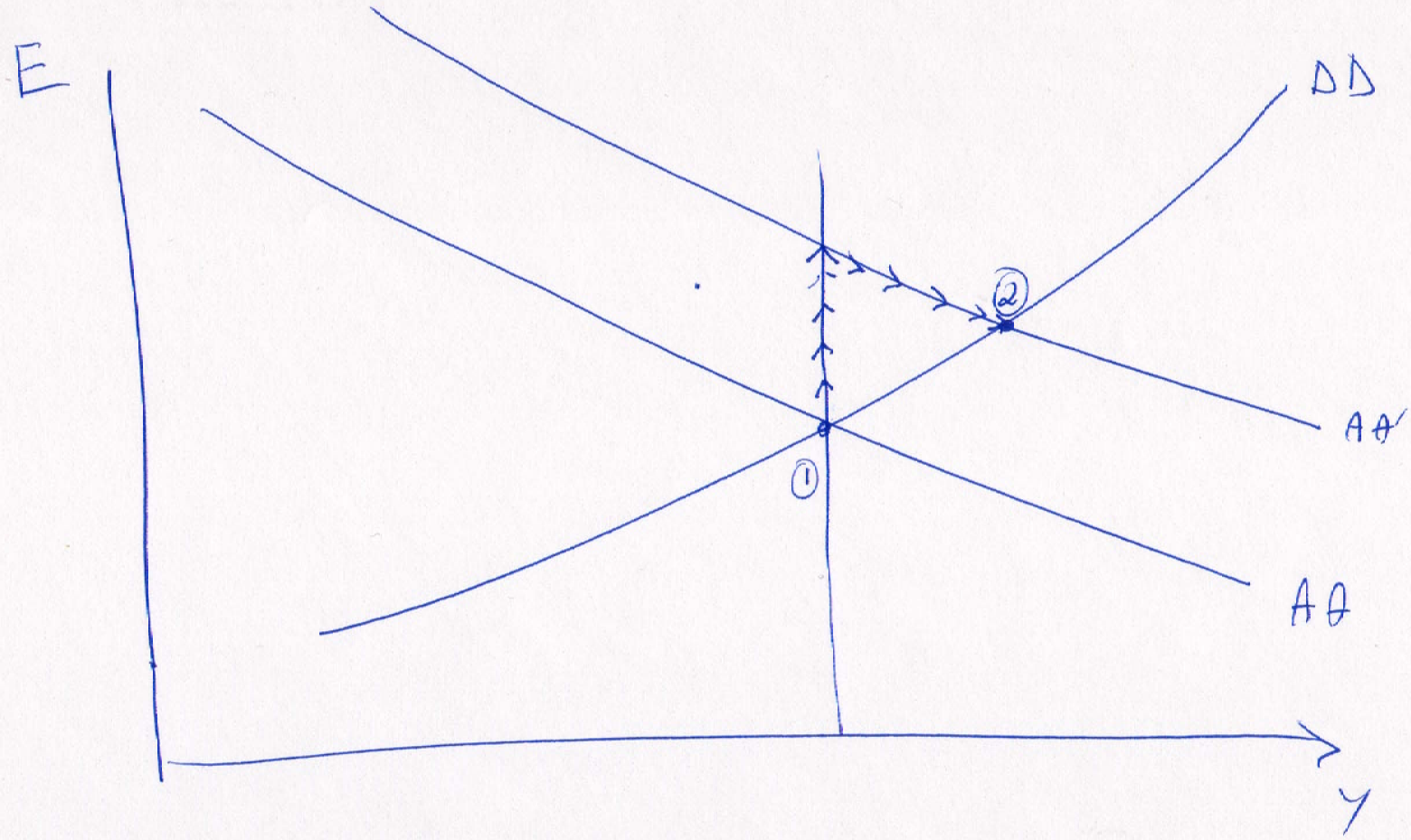

Figure 6: Effect of Jump in Foreign Interest Rate

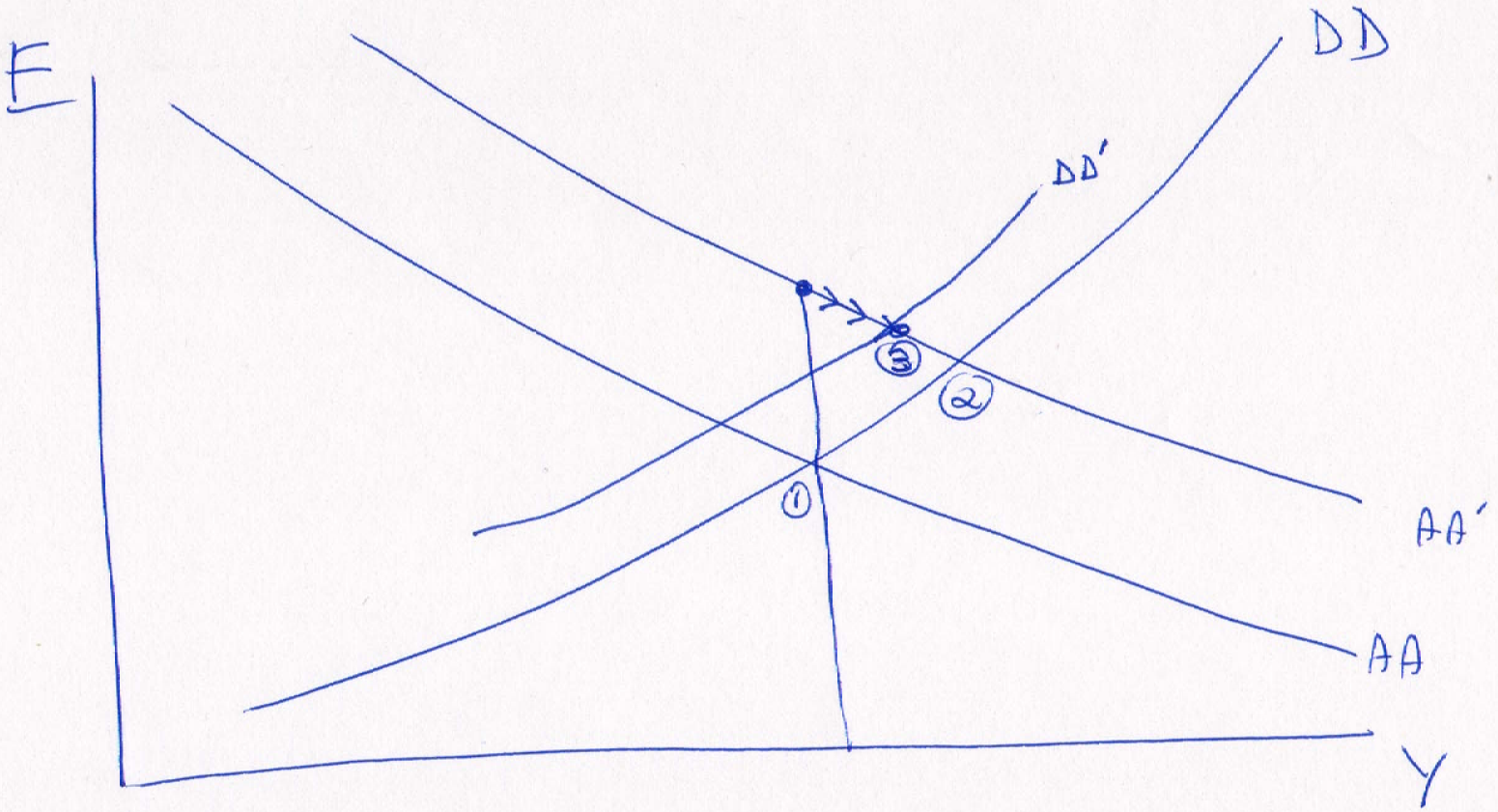

Figure 7: Effect of Rise in R^* when E^e and M are Fixed, And Aggregate Planned Spending is ~~sensitive~~ Sensitive to R.

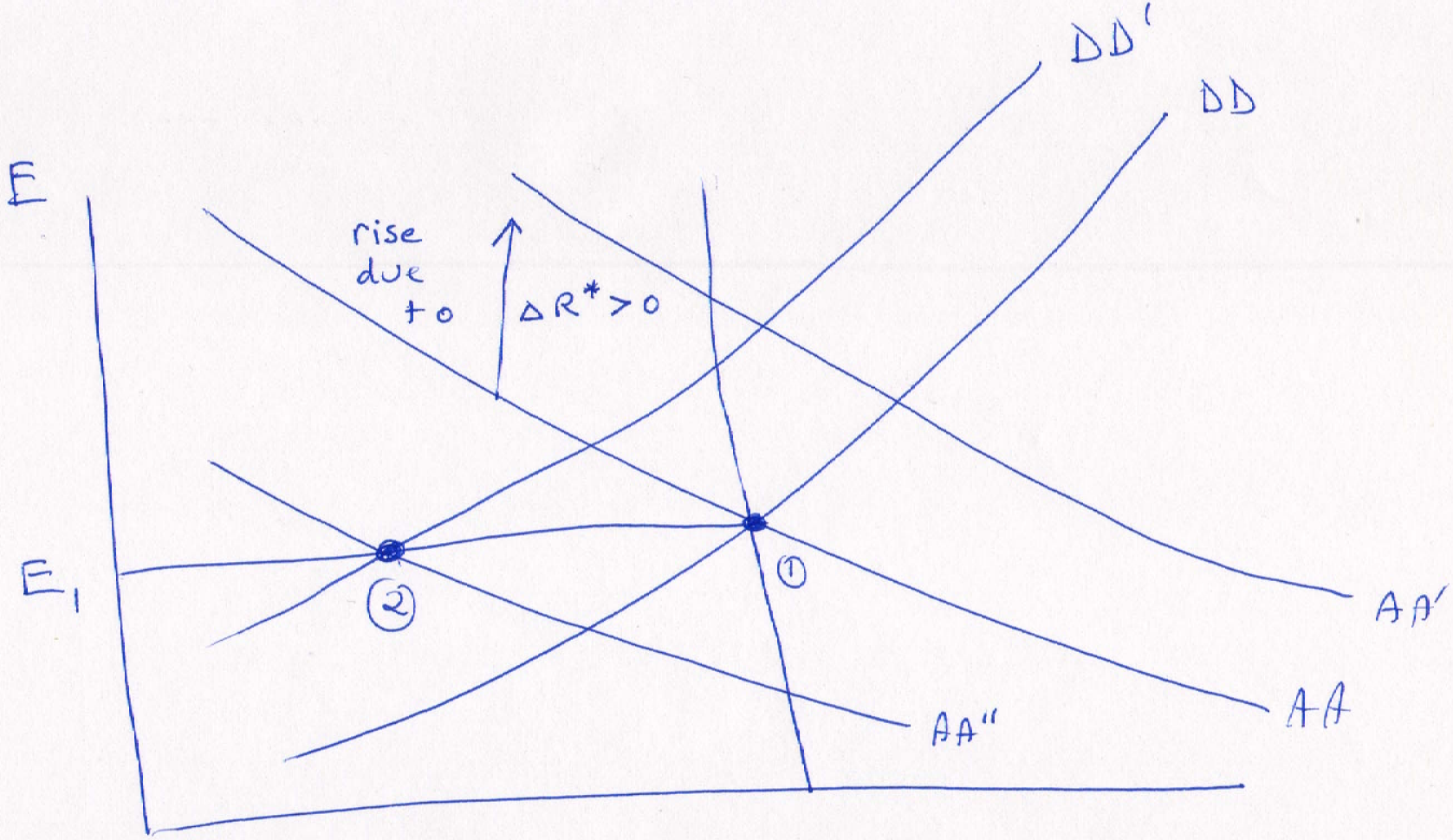

Figure 8: Short Run Equilibrium ~~in~~ In a Interest Sensitive Case Under Fixed Exchange Rate. Shock: Rise in Foreign Interest Rate.