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Homework #7

1. In lecture #14, part 3.b.(ii), there is an analysis of what we call the ‘interest sensitive’ version of our model. We will typically carry out that analysis by appropriately shifting the  $DD$  curve whenever the interest rate changes. There is a more direct way to do the analysis, which we explore here. The equations of the ‘interest sensitive’ version of the model are:

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

$$UIP : R = R^f + \frac{E^e - E}{E}$$

$$Goods : Y = C(Y - T) + I(R) + G + CA\left(\frac{EP^f}{P}, Y - T\right)$$

The  $DD$  and  $AA$  curves can be constructed simply by substituting our for  $R$  from  $UIP$  into  $MM$  and  $Goods$  :

$$AA : \frac{M}{P} = L\left(R^f + \frac{E^e - E}{E}, Y\right)$$

$$Goods : Y = C(Y - T) + I\left(R^f + \frac{E^e - E}{E}\right) + G + CA\left(\frac{EP^f}{P}, Y - T\right).$$

Note that the first equation describes a relation between  $E$  and  $Y$  : raise  $E$  and the first argument in  $L$  falls, so that  $L$  itself rises. To preserve equilibrium (i.e., the equality),  $Y$  must be reduced. This is the negative relationship traced out by the  $AA$  curve that we have been studying all along. Consider the second equation. Here, if you raise  $E$ , then  $I$  rises because we assume  $I$  is a decreasing function of its argument. In addition,  $CA$  rises. As a result,  $Y$  must be increased in order to preserve equilibrium.

- (a) Compare the slope of the  $DD$  curve in the interest sensitive case and in our ‘standard case’, when  $I$  is not a function of the interest rate. Present a careful geometric proof.
- (b) Suppose  $R^f$  increases. Which curve shifts more in the vertical direction,  $DD$  or  $AA$ ? Present a careful geometric proof.
- (c) Suppose  $R^f$  increases, and  $E^e$  remains unchanged. Show, geometrically, where the short run equilibrium is if monetary policy fixes  $M$ . Explain, in words, what happens as the economy moves to the short run equilibrium.

- (d) Consider the previous question, under a fixed exchange rate policy. Explain why it is that under a fixed exchange rate policy, the central bank would have a very strong temptation to revise up its exchange rate target (i.e., *devalue the currency*).
- (e) In class, we do not substitute out for  $R$  in the goods market and money market equations. Instead, we shift the  $DD$  curve when  $R$  changes. Redo questions (c) and (d) above with this alternative approach and show that you get the same answer. In developing your answer, include on the  $E, Y$  diagram both types of  $DD$  curve.
2. We have discovered that a fixed exchange rate policy can be very costly when demand shocks are important. However, when the country against which the exchange rate is fixed has the same demand shocks at roughly the same time, then a fixed exchange rate policy may not be so bad as long as there is *policy coordination* between the countries. This works only in the interest sensitive case, which we consider here. In this question, you should proceed as we do in class, defining the  $DD$  curve to have the interest rate in it as an argument, and shifting the  $DD$  curve when  $R$  changes.
- (a) Suppose there is a negative shock to aggregate demand ( $E^e$  does not change). Show what happens under a fixed  $M$  policy and a fixed  $E$  policy. Illustrate your observations clearly in the  $E, Y$  diagram.
- (b) Consider again the negative  $DD$  shock under a fixed exchange rate. Indicate, in an  $E, Y$  diagram, the old and new  $DD$  curves, the old  $AA$  curve and the new  $AA$  curve, after the monetary authority does what it needs to to keep the exchange rate fixed in a short run equilibrium. Suppose the domestic central banker (a woman) would like the old equilibrium level of output to be the short run equilibrium. She decides to call the foreign central banker (a man) to see if she can persuade him to cut his interest rate.
- What would she do to decide how much of an interest rate cut is needed? (Hint: focus on the  $DD$  curve.)
  - If she manages to convince the foreign central banker to cut the interest rate by the amount she wants, what will she do to the domestic money supply? That is, what will she set  $M$  to, relative to what it was before the  $DD$  shock?
- (c) In view of your answers to (a) and (b), can you explain why the Europeans worried so much about whether demand shocks across Europe are correlated, when they were deliberating over the costs and benefits of adopting the single currency.

3. Consider the case where  $\rho$  drops because foreigners find domestic assets more attractive. Suppose we are in the 'interest rate sensitive case'. Suppose too that  $E^e$  is constant.
  - (a) Describe the short run equilibrium under a fixed  $M$  policy. Explain with graphs, and intuition.
  - (b) Describe the short run equilibrium under a fixed  $E$  policy. Explain with graphs. In describing the intuition, be sure to explain carefully why the short run effects on  $Y$  of the change in  $\rho$  under the two policies are so different.
4. Carefully work through the effects of an increase in  $G$  and a cut in  $T$  in the interest sensitive version of the model. Compare what happens under a fixed  $M$  and a fixed  $E$  policy.