Econ315: International Macroeconomics
Solution problem set 8

Note: this problem set will not be graded. In the second part of the course problem sets will be graded every other time.

STRUCTURE OF THE MODEL:

Consider the following small open economy model. The money demand equation is decreasing in the nominal interest rate:

$$\frac{M_t^d}{P_t} = \alpha - \beta i_t \tag{1}$$

and money supply follows from Central Bank balance sheet:

$$M_t^s = FX_t + DC_t \tag{2}$$

The money market equilibrium implies:

$$\frac{FX_t + DC_t}{P_t} = \alpha - \beta i_t \tag{3}$$

Under perfect capital mobility the uncovered interest rate parity equation holds:

$$\frac{e_{t+1}^e - e_t}{e_t} = i_t - i_t^* \tag{4}$$

We assume that there is perfect foresight so that the agents correctly foresee the future path of the nominal exchange rate. We normalize the foreign interest rate to 0.

$$e_{t+1}^e = e_{t+1} \text{ with } i_t^* = 0 \Rightarrow \frac{e_{t+1} - e_t}{e_t} = i_t$$

In this simple model we also assume that purchasing power parity holds and we normalise the foreign price level to 1.

$$\frac{e_t P_t^*}{P_t} = 1 \text{ with } P_t^* = 1 \Rightarrow e_t = P_t$$

a) The domestic credit component of the money supply expands constantly at the rate μ.

$$DC_t = DC_{t-1} + \mu$$

In order to keep the exchange rate fixed the central bank needs to maintain the overall money supply constant. If the nominal exchange rate is fixed at

the level $\overline{e}$, we have from (4) that the nominal interest rate is equal to the foreign correspondent and equal to zero. Since purchasing power parity holds, the money market equilibrium (3) implies that

$$FX_t + DC_t = \alpha\overline{e}$$

in each period t. If the domestic credit component is growing at the rate μ then the foreign reserve components must decline at the same rate for the above equality to hold. So we have that

$$FX_t = FX_{t-1} - \mu \quad \forall t : FX_t \geq 0$$

The peg cannot be sustained forever because at some point, that depends on the initial reserve holdings and the rate of growth of domestic credit, the reserve hits the zero bound.

b) The shadow exchange rate is the nominal exchange rate that would prevail if the exchange rate is free to float (i.e. there are no intervention in the foreign exchange market). The evolution of the nominal exchange rate under no intervention can be easily obtained from the previous equilibrium conditions and using our assumptions. The money market equilibrium relation becomes:

$$\frac{FX_t + DC_t}{e_t} = \alpha - \beta\left(\frac{e_{t+1} - e_t}{e_t}\right)$$

That can be rewritten as:

$$FX + DC_t = \alpha e_t - \beta\left(e_{t+1} - e_t\right)$$

Note that since there are no intervention in the foreign exchange market (i.e. FX do not change) then in the equation that defines the shadow exchange rate we drop the t subscript. As discussed in the lecture the shadow exchange rate will depreciate by an amount proportional to the amount at which the domestic credit component of money supply is expanding. To show this consider the equation that defines the shadow exchange rate at time t and $t+1$:

$$FX + DC_t = \alpha e_t - \beta\left(e_{t+1} - e_t\right) \text{ at } t$$

$$FX + DC_{t+1} = \alpha e_{t+1} - \beta\left(e_{t+2} - e_{t+1}\right) \text{ at } t+1$$

Subtracting one from the other we have:

$$FX + DC_{t+1} - (FX + DC_t) = \alpha e_{t+1} - \alpha e_t - \beta\left[(e_{t+2} - e_{t+1}) - (e_{t+1} - e_t)\right]$$

That simplifies to:

$$DC_{t+1} - DC_t = \alpha\left(e_{t+1} - e_t\right) - \beta\left[(e_{t+2} - e_{t+1}) - (e_{t+1} - e_t)\right]$$

Now we conjecture that the change in the nominal exchange rate is constant (i.e. $(e_{t+2} - e_{t+1}) = (e_{t+1} - e_t)$) so that:

$$DC_{t+1} - DC_t = \alpha (e_{t+1} - e_t) \Rightarrow \mu = \alpha (e_{t+1} - e_t)$$

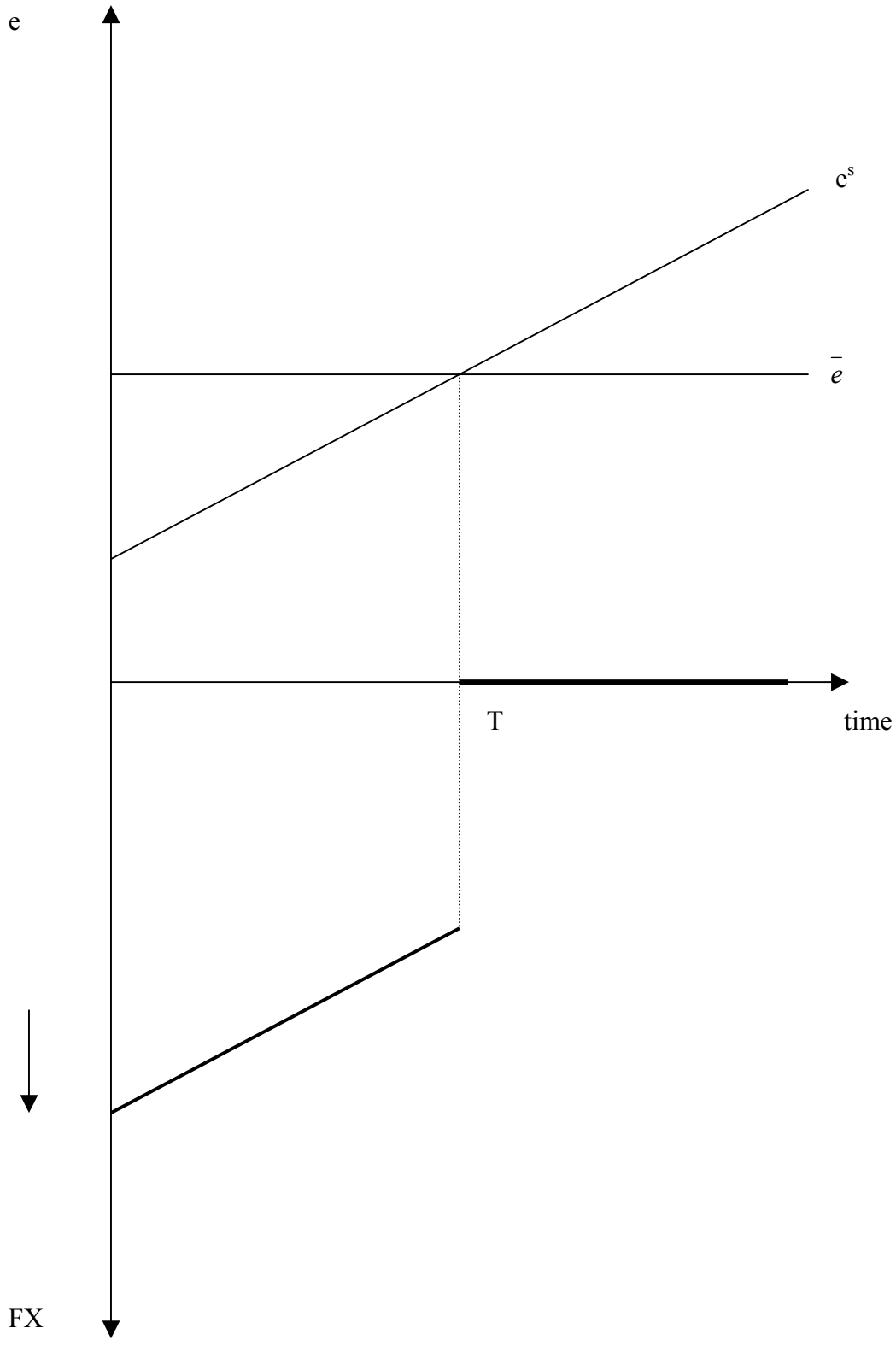
c) Figure 1 summarises the time path of the shadow exchange rate and the timing of the attack. The model important prediction is that the exchange rate will have to be abandoned before the central bank runs out of reserves. Why? Otherwise there would have to be a perfectly anticipated jump in the exchange rate. Such jump implies an instantaneously infinite rate of capital gain and therefore presents an arbitrage opportunity that motivates traders in buying all the central bank reserves before they reach zero on their own. If the attack occurs at time $T_1 > T$ then the exchange rate would jump: speculators that hold the currency will incur in a capital loss. In a perfect foresight model then they will sell the currency before T_1.

If the attack will occur at time $T_2 < T$ then the exchange rate will appreciate discretely: this cannot be an equilibrium since people do not want to sell a currency that will appreciate. The speculator would prefer to sell as much foreign currency as possible to the central bank and buy it back at the lower price that would prevail after the crisis.

Absence of discrete jump in the nominal exchange rate prevent speculative attacks at times like T_1 or T_2.

d) Once the central bank runs out of reserves the money supply, M^s, will begin to expands at rate μ. We also know that the expected rate of depreciation and inflation will jump from 0 to μ. As a consequence the demand for real money balances will drop sharply on the day of the transition from the fixed to the floating regime. Money market equilibrium at time T requires a fall in nominal balances. At the date of the attack, agents abruptly exchange currency for the central bank's reserves.

e) This model is not really suited for explaining the recent Asian Crisis. Two main features characterize the Asian Crises: the role of banking and financial sectors and the transmission of the crisis across countries (i.e. contagion effect). The model in the problem set only consider the inconsistence between the external objective in terms of maintaining the parity and the internal conduct of monetary policy. Taken as it stands, the Krugman model offers an unsatisfactory explanation of the Asian events. A better model should consider the interaction between structural weakness of those economies and market sentiment (combining then element from 1st and 2nd generation models) where the fundamental weakness of the Asian countries consisted in the exposed position of the banking and corporate sectors. (see the Pesenti and Tille article for a detailed analysis).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$\bar{e}$
T
time
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