

## Speculative Attacks: First Generation Models

### The basic setup

- Consider the standard monetary model of the exchange rate with flexible prices. Then the equilibrium exchange rate is given by:

$$\hat{s}_t = (m_t - m_t^*) - c(y_t - y_t^*) + b(r_t - r_t^*) \quad (1)$$

- Assuming that the actual exchange rate is fixed (fixed-rate regime) then eq (1) would give the “Shadow” exchange rate (i.e. this exchange rate would prevail if there was no intervention in the form of defending the fixed regime)
- So to recap: the actual rate is fixed ( $\bar{s}_t$ ), if let float freely it would be  $\hat{s}_t$ . So, the latter is consistent with the fundamentals
- Employing the UIP we can re-write (1) as follows:

$$\hat{s}_t = (m_t - m_t^*) - c(y_t - y_t^*) + b\Delta s_t^e \quad (2)$$

- And in a more compact way:

$$\hat{s}_t = m_t + f_t + b\Delta s_t^e$$

where  $f_t = -m_t^* - c(y_t - y_t^*)$  (3)

- $f_t$  is the basic fundamental

$$\hat{s}_t = m_t + f_t + b\Delta s_t^e = F_t + b\Delta s_t^e \quad (4)$$

- $F_t$  is the total fundamental (including domestic money supply)
- assuming that the basic fundamental is constant, then the total fundamental can only change as a result of changes in the domestic money supply
- Note that if the fixed exchange rate regime is perfectly credible then  $\Delta s_t^e = 0$
- In the spirit of Svensson, non-zero expected exchange rate change reflect an anticipated breakdown
- The domestic money stock is described by the “accounting” identity:  $M_t = R_t + C_t$  (5)

- Where R stands for FX reserves available to defend the regime, and C stands for domestic credit

*So, the crucial question is what will happen if the monetary authorities pursue a policy which is inconsistent with the fixed regime?*

- To answer this, we need to define the sustainable rate of credit expansion (benchmark):  $m_t = \bar{s} - f_t$  (6)
- Hence, given the level of the basic fundamental at any moment the money stock must remain constant  $\Delta M = 0 \Rightarrow \dot{p} = 0 \mid \dot{p}^* = 0$
- So, since the money stock must remain fixed, any increase in the domestic credit will flow out through the balance of payments in the form of a reduction in reserves
- The change in the money supply is (from 5):  $\dot{M}_t = \dot{R}_t + \dot{C}_t$  (7)

- Define:  $\mu = \frac{\dot{C}_t}{C_t}$  as the rate of growth of domestic credit
- Then:  $\dot{M}_t = \dot{R}_t + \mu C_t = 0$  (8)
  
- In other words, the CB losses reserves at the rate:  
 $\dot{R}_t = -\mu C_t$  (9)
- Allowing domestic credit to grow faster than zero (as implied by the fundamentals) is clearly unsustainable. Sooner or later the reserves will be exhausted. When that happens then the regime will collapse forcing the exchange rate to devalue and reach its shadow value.
- So the important questions are
  - (i) *when this will happen?*
  - (ii) *how long it will take before the regime collapses?*

## **The post-collapse exchange rate**

- assume that the regime switches to a pure float after a collapse
- now the post-collapse xr can be easily calculated as the shadow rate ( $\hat{s}_{T+}$ )
- also assume that the speculators have perfect foresight, the equation 4 becomes:

$$\hat{s}_{T+} = m_{T+} + f_{T+} + b\dot{\hat{s}}_{T+} \quad (10)$$

- After a collapse reserves are exhausted therefore the money supply must consist exclusively of a stock of domestic securities growing at rate  $\mu$ , implying that the exchange rate must be depreciating at rate  $\mu$ . Hence,

- $\hat{s}_{T+} = m_{T+} + f_{T+} + b\mu \quad (11)$

## **How does the collapse occur?**

- A ‘step’ increase in the price of foreign currency would allow a trader to make unlimited profits (arbitrage)
- Borrow domestic money just before the collapse, exchange it into foreign money.
- As a whole all traders are fully informed, hence the demand for foreign currency would become infinite the moment before  $T$  (the collapse), let’s call, that  $T^-$
- So the CB being committed to supply the required foreign currency in order to defend the peg, the reserves would be **exhausted instantaneously**.
- In other words, the crisis would occur whenever traders decided to make their move to buy up the stock of reserves. **So, what is really crucial is the timing of this event.**
- We can rule out any date after the exhaustion of reserves for obvious reasons

- So there is an incentive to trade the instant before reserves run out.
- Any individual aiming at arbitrage would have to make a pre-emptive move before the collapse.
- However, this is true for each and every trader, so the crisis must be moved an instant sooner than  $T^-$
- But the same logic applies and the timing of must be moved earlier
- The only date not subject to this circularity is the unique moment when the shadow exchange rate is equal to the fixed exchange rate.
- Why? Because then, and only then, a collapse can occur without resulting in a step-change in the exchange rate.
- If the collapse takes place when  $\hat{s} > \bar{s}$ , then traders expect a depreciation
- While when  $\hat{s} < \bar{s}$  they expect appreciation

- Now having pinned down the timing of the crisis mechanism, we can find the exact period at which the attack will occur.
- $C_t = C_0 + \mu t$ , also use that in the post-crisis the whole money stock is domestic credit and that the shadow exchange rate equals the fixed rate, we obtain:

$$\hat{s}_{T+} = C_T + f_t + b\mu = C_0 + \mu T + f_t + b\mu = \bar{s}$$

- solve for T to get:  $T = \frac{\bar{s} - C_0 - f_t - b\mu}{\mu} = \frac{R_0 - b\mu}{\mu}$