Chapter 6 : exchange rate determination : theory

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Section 1 : introduction

Introduction

- In this chapter, look at theoretical approaches explaining the behaviour of exchange rates $\rightarrow$ Useful to
- Understand the macroeconomic conditions affecting exchange rates $\rightarrow$ allows to estimate the fundamental value of the exchange rate.
- Take corrective actions in terms of policy
- Predict exchange rates

Nature of approaches

- Competing macroeconomic approaches to understand and predict exchange rates
- If not macroeconomic, what else ? $\rightarrow$ microstructure approach emphasizing the role of information, order flows, dealers, traders, customers , ... $\rightarrow$ see later if possible
- Each macro approach will emphasize one macro aspect : trade flows, capital flows, money, ... $\rightarrow$ they can be used as complements to have a better idea of the behaviour of the exchange rate in the long run
- But in the short term, failure to explain most movements of the exchange rate $\rightarrow$ alternative approaches (such as technical trading)

Macro approaches

- The trade elasticity approach
- The PPP approach with Balassa-Samuelson dimension
- The monetary view of the exchange rate determinantion
- The portfolio balance approach

Section 2 : The Elasticity View of the exchange rate

Idea

- Exchange rate is determined by the flow of currency through the exchange rate market
  $\rightarrow$ Emphasis on one component of the Balance of Payment : trade flows
- Capital flows not explicitely taken into account $\rightarrow$ Useful to
- understand the behaviour of economies in the past (restrictions on capital flows
- understand the behaviour of developing economies with less developed capital markets
- Nevertheless, capital flows can be treated as exogenous shocks ; for endogenous explanation, see asset view of exchange rate.

Comments on Figure

- Determination of s as a fuction of quantity of foreign exchange which is supplied and demanded
- 2 simple curves : Demand for FX DD : nominal value of quantity of imports : P^*Q_M : where P^* is the price of the foreign currency price (fixed) and Q_M is the quantity of imports which is decreasing in $P_M = P^*S \rightarrow$ downward sloping
- Supply of FX : SS: $\frac{P}{S}Q_X$ upward sloping : as s depreciates (increases), exports less costly $\rightarrow$ boost of exports $\rightarrow$ increase in the supply of FX.

Pegging the exchange rate

- If the authorities peg the exchange rate at S_0: if there is a shift in the demand for FX, the authorities intervene in the FX market and supply cp of FX.
- If fluctuations are allowed, in this case, authorities allow some variation in the value of the currency (depreciation of the currency) and they intervene when the exchange rate reaches a higher value $\rightarrow$ supply of dq only.
- this was the case during the period of the EMS : semi fixed exchange rate regime
- Here the increase in the demand for FX is due to an increase in the imports or a decrease in the net exports.

The Marshall-Lerner condition

- The Marshall-Lerner condition gives the condition under which a change in S will have some impact on the balance of payments (balance of trade):
- $B = P_x X(s) - P_m^* s M(s)$, where B is the BP, price is expressed in the home currency, P_x is the price of exports and P_m^* is the price of imports in foreign currency.
- Suppose $P_m^* = P_x = 1$; we have $B = X(s) - sM(s)$
- and $\frac{dB}{ds} = \frac{dx}{ds} - s\frac{dM}{ds} - M$
- everything can reexpressed in terms of home import demand elasticity s_m and foreign demand elasticity for the home country's export s_x.

The Marshall-Lerner condition

- $s_m = -\frac{dM}{ds}\frac{s}{M}$
- $s_x = -\frac{dX}{ds}\frac{s}{X}$
- we get $\frac{dB}{ds} > 0$, i.e. devaluation improves the BP iff $\frac{X}{SM}s_x + s_m - 1 > 0$
- If trade is balanced ($\frac{X}{SM} = 1$), the TB improves if the price elasticities are high enough , i.e. $s_x + s_m > 1$.
- If the BP is initially in deficit, then the sum of trade elasticities wrt s must be higher than 1.

The Marshall-Lerner condition

- So far, we have assumed that supply elasticities are infinite $\rightarrow$ unrealistic assumptions in some cases $\rightarrow$ what if we assume that these elasticities are finite
- Suppose that trade is balanced
- we get $\frac{dB}{ds} > 0$ if
- $\frac{s_x(d_x-1)}{s_x+s_m} + \frac{d_m(s_m+1)}{d_m+s_m} > 0$ where s_x and s_m are home and foreign export supply elasticities; d_x and d_m are home and foreign import demand elasticities
- First term : increase in country's export earnings due to devaluation; Second term : increase in country's spending on imports due to devaluation.

Impact of devaluation on B

- Crucial role of d_x : foreign country's import demand elasticity; if s_x is quite high:
- if d_x high : improvement in export's earnings due to the increase in exported volume
- if d_x low (i.e. 0) : decrease in export's earnings due to the fact price of exports has decreased and not compensated by increase in volume.
- Small open economy case :d_x and s_m are close to infinity $\rightarrow$ devaluation always improves balance of payements.

cases of d_x

- In which case d_x high or low ?
- d_x varies across products and thus across countries: for developing countries,d_x quite low since people always need raw materials. $\rightarrow$ argument against devaluations in developing countries exporting raw materials.
- For normal products,d_x quite low in the short run due to market positions $\rightarrow$ first effect ; after a while, shift in market shares $\rightarrow$ d_x high enough for virtuous effect $\rightarrow$ J curve concept .
- Look at estimated values for the US and the episode of depreciation of the USD during the 85-87 period.

US case

- imports elasticity and export elasticity sum up $>$ 1 in the LR
- response of volume to change in s takes more than 7 months
- Effect of exchange rate on price is less than 1 $\rightarrow$ evidence of pricing to market.
- income elasticities are quite significant.
- $\rightarrow$ J-curve effect for the US current account : initially BP worsened but after a while, improvement.
- a 20 percent devaluation of s is meant to yield an improvement of 1.45 percent of the CA after 5 years and to induce $\Delta BP > 0$ after 2 years.

Section 3 : The Monetary View of Exchange Rate Determination

2 approaches

- The flexible price approach assumes that prices are flexible;
- In contrast, sticky price approach assumes that prices are fixed in the short run $\rightarrow$ long run identical while short run different
- the sticky price model gives rise to the famous overshooting properties of the exchange rate
- In the flex-price approach, PPP is assumed to hold $\rightarrow$ not supported empirically $\rightarrow$ might explain why predictions using the FLMA are not very good.

The flex-price approach

- Idea : theory of price determination along with PPP
- We consider here a 2-country version : variables with * refer to foreign variables
- Each country produces a good and goods are perfect substitutes; PPP is assumed to hold : $s_t = p_t - p_t^*$ (everything is in log)
- In the flex-price approach, PPP is assumed to hold $\rightarrow$ not supported empirically $\rightarrow$ might explain why not so good predictions.
- Capital is perfectly mobile and asset holders can rebalance their portfolio instantly

The flex-price approach

- Equilibrium in the money markets: $\triangle s^e_{t+1} = (i - i^*)_t$
- Wealth constraint for domestic resident (counterpart for foreign residents not written here) : $W = M + B + B^*$ or $W = M + V$ where M denotes stock of money and B refer to bonds. Bonds are perfect substitutes.
- equilibrium in the money market implies equilibrium in the bond markets and the other way around. $\rightarrow$ focus on the money market $\rightarrow$ this is why one calls monetary approach.
- Money demand relationships (Cagan demand for money): $m^D_t - p_t = \alpha_1 y_t - \alpha_2 i_t$ and $m^{D*}_t - p^*_t = \alpha_1 y^*_t - \alpha_2 i^*_t$
- Equilibria in both money markets: $m^D_t = m^s_t = m_t$ and $m^{D*}_t = m^{s*}_t = m^*_t$

Equilibrium and implications

- by substitution, one gets the equilibrium value for s_t: $s_t = m_t - m_t^* - \alpha_1(y_t - y_t^*) + \alpha_2(i_t - i_t^*)$
- A couple of implications
- A x percent increase in domestic money supply leads to an x percent increase (depreciation) in s_t : inflation by a country of its currency leads to a decrease in the external value of its currency : intuitive
- effect of y: leads to an appreciation (less intuitive and in sharp contrast with trade approach of FX)
- increase in y leads to an increase in money demand $\rightarrow$ market equilibrium reached with decrease in p_t $\rightarrow$ with PPP, appreciation of s_t

interpretations

- Examples of this : Germany and Japan in the 80's and 90's : high growth rates and appreciating currencies
- Effect of i: an increase in i leads to a depreciation of s_t
- Weired ? no because most effects through money demand : decrease in money demand and with fixed supply, increase in $p_t \rightarrow$ with PPP : depreciation of s_t.

Forward looking equations

- One can build on this to understand why the current exchange rate displays a great amount of variability wrt to its current fundamental determinants
  $(z_t = m_t - m_t^* - \alpha_1(y_t - y_t^*))$
- We can start from equation **??**:
  $s_t = z_t - \alpha_2(\Delta p^e - \Delta p^{e*})_{t+1}$
- Assuming rational expectations :
  $s_{t+1}^e = E(s_{t+1}|I_t) = E_t s_{t+1}$
- By suceesive substitution, we get

$$s_t = \frac{1}{1+\alpha_2} \sum_{j=0}^{\infty} (\frac{\alpha_2}{1+\alpha_2})^j E_t z_{t+j} \qquad (1)$$

Forward looking equations

- The current exchange rate depends
- on the current fundamentals (excess money supplies, excess incomes)
- but also on expected fundamentals
- Ther impact of current changes in fundamentals depend crucially on the perception of the future path of these fundamentals;
- If the change is perceived as temporary $\longrightarrow$ the exchange rate will be little affected
- If the change is perceived as permanent $\longrightarrow$ the exchange rate will depreciate by far more the current fundamentals imply.

The sticky price version

- The monetary approach also has a sticky price version
- p_t is sticky in the short-run but not in the long run $\rightarrow$ PPP holds in the LR but not in the short run
- This induces some overshooting properties of s_t: the exchange rate depreciates by more than implied in the long run by the change in the fundamentals (e.g. excessive money supply).

Mecanisms in the sticky price version

- Basic mecanisms.
- prices are sticky in the SR, flex in the LR
- money demand depends on domestic prices (+) and domestic interest rates (-)
- Uncovered interest rate parity holds on a continuous basis : $i_t - i_t^* = \triangle s_{t+1}^e$
- suppose unexpected increase in domestic money supply
- to restore the equilibrium, either increase in domestic prices or-and decrease in domestic interest rates

Mecanisms in the sticky price version

- But if prices are sticky, decrease in i below i^* requires $\triangle s^e_{t+1} > 0$
- for this to be possible, one needs that agents anticipe a future exchange rate appreciation $\rightarrow$ overshooting of s wrt to the long run value.
- analysis in terms of figures.

Section 3 : The Portfolio view of Exchange Rate Determination

Weaknesses of previous analysis

- Big weakness of previous approach
- No role for stock variables
- No role for a role of a change in asset stocks $\rightarrow$ approach accounting for change in positions in asset positions.

Idea of portfolio approach

- Circular determination
- Asset stocks
- Changes lead to changes in asset prices : interest rates (bonds and money) and exchange rates (currency)
- Change leads in changes in in real wealth and real exchange rates
- This will affect the current account $\longrightarrow$ changes in net foreign assets
- This leads to a change in stocks of assets .

The portfolio approach

- No clear evidence in favour of this approach
- Nevertheless, might explain some episodes of exchange rate dynamics that cannot be explained by the monetary approach
- Example : 1978-79 period : Monetary growth in Germany in excess of US monetary growth and of German income growth $\longrightarrow$ the monetary approach would predict Dmark depreciation
- Observe Dmark appreciation wrt USD. Why ? German current account surplus and US current account deficit $\longrightarrow$ increase in demand for German assets.

Parity conditions

- absolute PPP: $P = sP^*$
- relative PPP : $ds = dp - dp^*$
- Real exchange rate : $Q = s(P^*/P)$
- UIP: $1 + i_t = 1 + i_t^* \frac{S_{t+1}^e}{S_t}$
- $\Leftrightarrow$i$_t = i_t^* + \frac{S_{t+1}^e - S_t}{S_t}$
- CIP :$i_t = i_t^* + \frac{F_t - S_t}{S_t}$