

Open Economy Macroeconomics

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Currency Substitution

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- Core of the Portfolio Balance approach:
 - risk premia, hence tradeable nominal asset imperfect substitutes
 - asset market quicker to adjust relative to goods market
- Retain these assumption
- Investigate the implications of *currency substitution* (CS)

Introduction: money as a store of value

- Currency substitution not a perfect name for the underlying phenomenon
 - the approach focuses on money as a store of value
 - ignores the role of money as a means of payment
- Money treated as an asset that happens to carry a fixed, zero rate of interest
- Focuses on the question of how CS affects the exchange rate

Introduction: starting point

- Starting point:
 - holding of domestic as well as foreign currency by an agent of a country is both feasible and legal
 - what will determine the portfolio shares of the two currencies in the agent's portfolio of non-interest bearing assets
- Much depends on what other asset are available
- Most of the literature assumes that the two currencies are the only assets available to the agent to choose from
 - hence the rate of currency depreciation will determine the portfolio share

Introduction: small modification of the PB approach

- CS can be seen as a small modification to the PB approach
 - instead of two tradeable bonds - domestic and foreign - as alternatives to money, CS restricts the menu of assets to the two currencies
- Consider how the (foreign currency - USD - value of the) stock of foreign currency can change
 - continue to assume that foreigners cannot hold domestic currency and that neither borrowing nor lending is allowed¹
 - *hence, the stock of foreign currency can only change via changes in the current account surplus/deficit*

¹The latter assumption is not as stark as it appears. It basically means that the potentially existing stock of bonds is constant.

Introduction: small modification of the PB approach

- Note that we have here pretty much the same structure as in the PB model
 - instanttaneous equilibrium in the asset market, and a flow excess demand or supply in the real sector changing the stock of foreign currency during the adjustment period
- The real sector is richer than in the PB approach
 - two sectors, tradeable and non-tradeable
 - price of tradeables determined in the world market, while that of non-tradeables is determined by the local conditions
 - hence, changes in the real exchange rate affects wealth both through a real balance effect and through the effects of changes in the terms of trade on the current account
 - the latter effect works over a longer time

Introduction: exchange rate overshooting

- The CS approach generates a number of interesting implications of macroeconomic policy
- We will focus only on one: an increase in *monetary growth* will generate an outcome which closely resembles instantaneous nominal exchange rate overshooting
 - this will boost competitiveness of the domestic economy, quite like in the Dornbusch model

The Model: key assumptions

- Key assumptions of the CS model:
 - 1 Two sector economy: tradeable and non-tradeable
 - 2 The price of non-tradeables, P_N , is determined by the equality of the demand for and supply of non-traded goods (equilibrium condition)
 - 3 The price of tradeables is determined exogenously in the international economy. Fix this price to 1, so that the domestic currency price of tradeables is equal to S , the euro price of a USD
 - 4 Portfolio choice is restricted to the two currencies - euros (issued by domestic government) and USD (issued by foreign government)
 - 5 The value of financial assets held ('wealth' for short), measured in terms of the traded good is

$$W = \frac{M}{S} + F = m + F$$

The Model: production

- Equilibrium condition for the non-tradeables

$$X_{NT}^S = H(Q, W) = 0, \quad H_1 < 0, \quad H_2 < 0$$

where $H(\cdot)$ is the excess supply function for non-tradeables

- For traded goods, equilibrium (zero excess supply) prevails only in the long-run
- In the short-run, excess supply amounts to to a current account surplus the counterpart of which is the accumulation of foreign currency, denoted by $\dot{F}$

$$X_T^S = J(Q, W) = \dot{F}, \quad J_1 > 0, \quad J_2 < 0$$

- See the graph below

Long-run equilibrium: Graphics

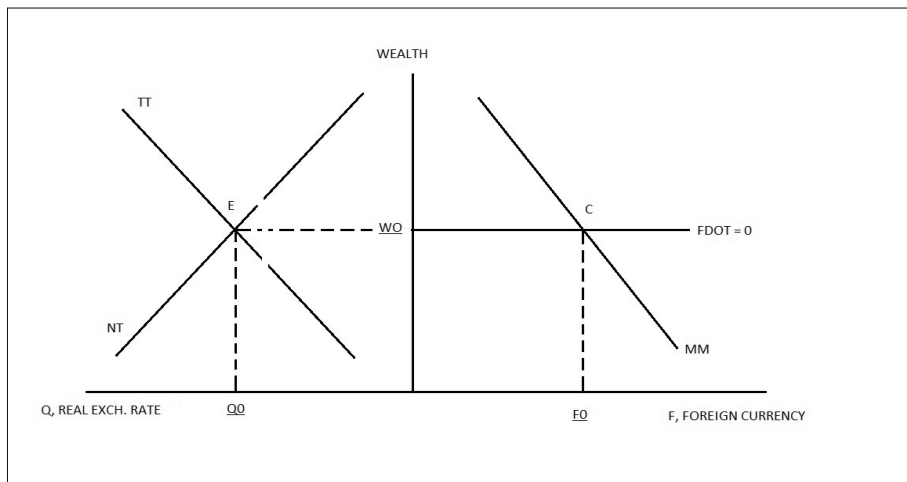


Figure: Long-run equilibrium in the CS model.

- The NT curve in the above figure displays the equilibrium condition in the non-tradeables sector; note

$$\begin{aligned}dX_{NT}^S &= 0 = H_1 dQ + H_2 dW \iff \\ \frac{dW}{dQ} &= -\frac{H_1}{H_2} < 0\end{aligned}$$

so that real depreciation of the domestic currency goes with lower wealth; so that in the (Q, W) -space (the l.h.s. figure) there's a downward sloping NT curve (note: when you move left, Q increases, so along NT, W falls)

Long-run equilibrium: interpretation

- The TT curve, describing the combination of wealth and real exchange rate that sustain zero current account balance in the long-run
 - in the short-run excess supply of tradeables (points below the TT-line) or excess demand for tradeables (points above the TT-line) generate current account surpluses/deficits whose counterparts must be accumulation of foreign currency
- Given the assumptions listed above, there is a unique pair of wealth and real exchange rate - ($\underline{W0}$, $\underline{Q0}$) in the figure - that sustain long-run equilibrium in the traded and non-traded sector with zero current account balance (zero inflow of foreign currency)
- We will analyze the money market equilibrium as represented by the MM-curve in the above figure

Money Markets: the currency substitution function

- The relative demand for money - the currency substitution function - is the core of the model
- This tells us that the ratio of real domestic currency balances to foreign currency, m/F , depends on the rate of depreciation of the domestic currency $\dot{s}$

$$\frac{m}{F} = L(\dot{s}), \quad L' = \frac{dL}{d\dot{s}} < 0$$

- Note: we are restricting ourselves to the perfect foresight case, so that the *expected* and *actual* rate of depreciation coincide:
 $\mathbb{E}(\dot{s}) = \dot{s}$; this simplifies the analysis considerably

Money Markets: rate of depreciation

- The relative demand for money is a monotonically decreasing function of the rate of depreciation, so that we can invert the function

$$\dot{s} = l\left(\frac{m}{F}\right), \quad l = L^{-1}, \quad l' < 0$$

- Hence, money market clearing requires a lower ratio of domestic to foreign currency when the rate of depreciation rises
- Now, since $W = m + F$ or $m/F = \frac{W-F}{F}$ we can write

$$\dot{s} = l\left(\frac{W-F}{F}\right) = l\left(\frac{W}{F} - 1\right)$$

Money Markets: condition for static wealth

- Given $W = m + F$, the condition for wealth to remain constant over time, $\dot{W} = 0$, is simply that

$$\dot{F} = -\dot{m}$$

- What does this imply? Since $m = M/S$, $\dot{m}$ can be written in terms of the difference between the growth rate of the numerator and denominator:

$$\begin{aligned}\dot{m} &= \frac{d}{dt} \left[\frac{M}{S} \right] = \frac{\dot{M}S - M\dot{S}}{S^2} \\ &= \frac{M}{S} \left[\frac{\dot{M}}{M} - \frac{\dot{S}}{S} \right] = \frac{M}{S} (\mu - \dot{s})\end{aligned}$$

where μ denotes the rate of growth of the money stock.

Money Markets: the final form

- We can rewrite the condition for constant wealth in its final form

$$\dot{F} = \frac{M}{S} (\dot{s} - \mu) = (W - F) \left[I \left(\frac{W}{F} - 1 \right) - \mu \right] \quad (\text{MM})$$

- This is the desired relationship between $\dot{F}$, F and W that is consistent with constant level of wealth
- In the above figure this relationship is plotted as a downward sloping line MM, although it could be upward sloping. Why the ambiguity?

Money Markets: resolving the ambiguity

- In the above equation the difference between W and F affects the r.h.s. through two channel: the term in front of the square brackets and the term inside the square brackets (the I -function)
- Now, if wealth falls, consumption falls, generating an increase in the current account surplus or a decrease in the deficit; the l.h.s. of the above equation increases
- So, a fall in W and an increase in F would reduce $W - F$, but increase $I\left(\frac{W}{F} - 1\right)$, since $I' < 0$ and W/F is falling
 - the first term suggests a positive (upward sloping MM) and the second term a negative (downward sloping MM) relationship between W and F in order to be consistent with and increase in the r.h.s. of the equation
 - we are effectively assuming that the second term dominates

Money Markets: a change in monetary policy

- MM curve crosses the horizontal line at the point C, where the long-run equilibrium is obtained with a constant level of wealth
- Since $\dot{F} = 0$ at the point C, the long-run equilibrium requires

$$\begin{aligned}\dot{s} - \mu &= 0 \iff \\ L\left(\frac{m}{F}\right) &= \mu \iff \\ \frac{m}{F} &= I(\mu) \iff \\ W - F &= I(\mu)F \iff W = [1 + I(\mu)] F\end{aligned}$$

- Consider next a change in monetary policy: and increase in the *rate of growth of the money stock*

Money Markets: a change in the level of M has no effects

- The effect of a change in the level of the domestically printed money M is as in the benchmark monetary model
 - as long as it has no effects on expectations, a once and for all increase in M causes a rise of the same proportion in the price of both goods, leaving the real money stock, wealth and foreign currency balances unchanged
- What about the effects of an increase in the rate of growth of the domestic currency, ie. an increase in μ ? See the figure below

Monetary Policy: monetary acceleration

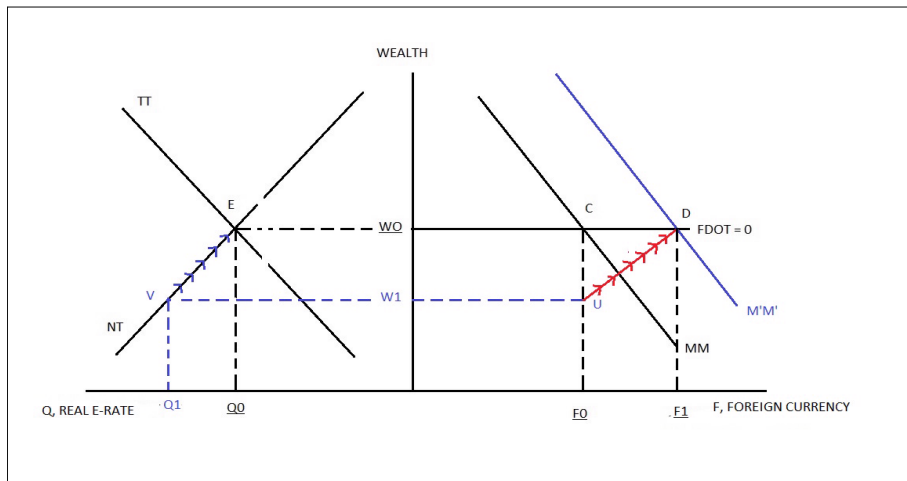


Figure: Monetary acceleration in the CS model

- Monetary acceleration will shift the MM-curve out to the right
 - starting from the equilibrium at C, and increase in μ requires an increase in the I -function for the economy to return to a constant wealth equilibrium - see the MM-equation above
 - since the I -function depends negatively on the ratio W/F , an increase in I requires a fall in the ratio W/F
 - hence at the constant wealth level $\underline{W0}$, a fall in $\underline{W0}/F$ requires an increase in F , ie. the new equilibrium and, hence, the new MM-curve, has to lie to the right of the old equilibrium/MM-curve

Monetary Policy: monetary acceleration

- At the point D, the economy is back in its long-run equilibrium with a constant wealth level and with the real exchange rate back at its initial level
- The only change in D vis-à-vis C is that the share of foreign currency in the currency portfolio has increased (and that of the domestic currency decreased)
- What about the adjustment path (from C to U, wherefrom along the red line to D)?
- At the moment of the announcement of an increase in μ , the opportunity cost of holding domestic money is *perceived* (NB! rational expectations/perfect foresight) to rise, with the consequent fall in the *desired* ration m/F
- The quantity of foreign currency can only change over time via changes in the current account balance $\rightarrow F$ is momentarily fixed

Monetary Policy: monetary acceleration

- Hence, the ratio m/F fall through a fall in the numerator $m = M/S$
- Since the stock of domestic currency is momentarily fixed, m falls via an instantaneous depreciation (increase in S) of the domestic currency
- As m falls, wealth also falls from the the value of $\underline{W0}$ to a temporary level of (e.g.) $W1$ at the point U
- Hence, consumption falls, which implies that the *relative* price of non-tradeables has to decrease (NB! Non-tradeable sector clears all the time)
- Thus, there will be a real depreciation of the domestic currency - an increase in Q from $\underline{Q0}$ to a temporary value of $Q1$ at the point V

Monetary Policy: overshooting

- S/P_N is often used as a measure of the real exchange rate; but we have defined Q as $Q = SP^f/P$
- We have set $P^f = 1$; on the other hand the domestic price level is usually an average of S and P_N ; hence, the relative price P/P_N is an increasing function of S/P_N (so is Q)
- An increase in S/P_N must mean that nominal exchange rate S increases more than the price of non-tradeables P_N ; hence the nominal exchange rate increases more than the domestic price level
 - in this sense the nominal exchange rate overshoots

Monetary Policy: adjustment path

- The transition to the new long-run equilibrium is (from U to D and V to E) is characterized by a real appreciation, ie falling Q
 - hence the overshooting pattern is reversed, with the rate of depreciation less than the rate of non-tradeable inflation
 - At V the combination of a relative high price of tradeables and low wealth leads to a current account surplus, so that in the aftermath of the monetary acceleration the domestic economy gains foreign exchange implying that wealth begins to recover from its initial fall
 - Thus, we expect to see the following in an economy passing through this adjustment phase:
- 1 Currency depreciation at a slower rate than domestic inflation - appreciating real exchange rate

2. A current account surplus, on a decreasing scale as adjustment proceeds
3. A consequent rise in foreign currency balances and wealth
 - We should thus observe a *nominal* depreciation and current account surplus, in contrast to the PB model
 - This reflects the currency substitution process itself: higher domestic inflation implies a long-run shift in desired asset shares in favour of foreign currency, which can emerge only via short-run current account surpluses
 - The central mechanism of the CS model can be viewed as a hedging process

CS as a Hedging Process

- P^f constant or exogenous; hence, foreign currency represents a direct and riskless claim on the consumption basket
- Going further: foreign currency can be identified with an undated forward purchase of tradeables
- From this perspective, economic agents respond to a rise in the rate of monetary expansion by increasing the inflation-hedge properties of their portfolios, in the process 'locking in' the price of their imports
- Since the quantity of foreign currency is fixed at the moment of the change, agents cannot *in aggregate* achieve any increase in their dollar holdings; the only possible outcome is a rise in the price of the dollar, ie. nominal depreciation of the domestic currency