Open Economy Macroeconomics
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Portfolio Balance and the Current Account

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Introduction

- The Dornbusch model allows for differential adjustment in the goods and asset (forex) markets
- Portfolio Balance (PB) approach rests on a similar assumption
- Differences relative to the Dornbusch model do exist however
  - instead of UIP, PB assumes that international investors are risk averse (in their portfolio choices of domestic and foreign assets)
    - hence persistent premiums mark deviations from UIP
- Full implications of the PB would involve utility maximization under uncertainty, but we will focus only on the implications of the risk premium per se

Introduction cntd

- The most important of these implications (of risk premia) says that investors will tend to diversify their holdings of risky assets, with portfolio shares increasing in the relative returns of individual assets (relative to other assets)
  - portfolio share of an asset fall, on the other hand, when its relative riskiness increases
  - assets are thus not any more perfect substitutes
  - within a diversified portfolio, assets could be at least partly complements so that the interest rate elasticity of the demand for assets will be far less than infinite
- The financial sector in the PB approach is far more detailed than in the Dornbusch model (or M-F model, for that matter)
- PB integrates wealth accumulation (ie. saving) into the model as the vital link between the short-run equilibrium in the financial sector and the long-run equilibrium of the rest of the economy

Introduction cntd

- In an open economy private sector saving takes the form of accumulation of foreign currency assets (via the capital account)
- Under floating the balance in the capital accounts is a reflection of the balance in the current account
- Hence, there exists a link between the BoP and the exchange rate
- PB models are very general and includes as special cases the previous models
  - in a sense they can be seen as integrating the Dornbusch and M-F models
- PB models are also far more complex, not only analytically, but also because they introduce variables that tend to be difficult to measure
  - this means headache for econometricians trying to e.g. test PB models!

Specification of asset markets

- Starting point: small open economy, whose residents hold foreign asset (, but whose assets are not held by foreigners)
  - assets: domestic currency M (euros), bonds issued by the domestic government B and US dollar denominated assets F issued by the US government
  - F is fixed in the short-run at \$F, which is equivalent to €FS, S = euro price of one unit of US dollars
- Hence, Euroland nominal wealth (in euros) can be written as

$$W = \overline{M} + \overline{B} + SF \tag{1}$$

where bar signifies that the variables are determined exogenously (ie. they are non-modelled)

- The **demand** for each asset is taken as **interdependent**
  - think of a decision process as involving an agent's stock of wealth being distributed between available assets

Specification of asset markets

- Ie. each investor has to choose each asset's share in the portfolio of assets
  - these shares are derived by maximizing the investor's future welfare/utility
- We shall skip the math underlying such utility maximization problems and instead proceed on an intuitive basis
- Think of two assets, one riskless, A, with sure return of r^A, and the other one, B, risky with an uncertain return of r^B (ie. a random variable)
- PB assumes that the **excess return on asset B**, $r^B - r^A$ has to be large enough to incentivize risk averse investors to hold it (compensation for risk)
  - but what determines the share of B in the portfolio?
    - diversification: a small increase in the excess return will increase B's share
    - also: the higher B's **relative return**, relative to other assets, the higher the share

Specification of asset markets

- Now, the above argument is symmetric, ie. also A's share depends of the excess return and A's relative return
- Generalizing the above logic to our three asset case, we can write the asset shares as functions $m()$, $b()$ and $f()$ as follows

$$\begin{aligned} \frac{\overline{M}}{W} &= m\left(r, r^f + \Delta s^e\right),\ m_1 < 0,\ m_2 < 0 \\ \frac{\overline{B}}{W} &= b\left(r, r^f + \Delta s^e\right),\ b_1 > 0,\ b_2 < 0 \\ \frac{SF}{W} &= f\left(r, r^f + \Delta s^e\right),\ f_1 < 0,\ f_2 > 0 \end{aligned} \tag{2}$$

- Mind you, no need to account for the price level, although previously we concentrated on real money balances
  - above are shares, so price level drops out, as it should appear both in the numerator and denumerator

Specification of asset markets

- Note that there are now three types of variables in our PB model
  1. Endogenous even in the short-run: the spot exchange rate S and the domestic interest rate r
     1. both react instantaneously to clear financial markets at all times
  2. Exogenous in the short-run, endogenous in the long-run: W, F, P, Δs^e are all "sticky", ie. slow to react to disturbances
  3. Exogenous both in the short- and long-run: r^f, P^f, M, B
- Assumptions:

$$\begin{aligned} b_1 + b_2 &> 0 \\ f_1 + f_2 &> 0 \end{aligned} \tag{3}$$

which imply that the **own rate of return** dominates the **cross rate of return** in the determination of portflio shares

Specification of asset markets

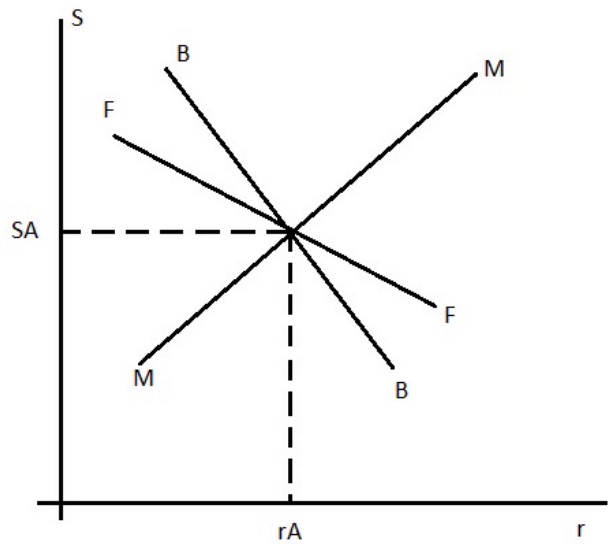
- Finally, since by eq. (1) the portfolio shares sum to unity - **adding-up constraint** $1 = \frac{\overline{M}}{W} + \frac{\overline{B}}{W} + \frac{SF}{W}$ - we have the following restriction on the partial derivatives of the share functions

$$\begin{aligned} m_1 + b_1 + f_1 &= 0 \\ m_2 + b_2 + f_2 &= 0 \end{aligned} \tag{4}$$

  which can be verified by, taking the partical derivatives of both sides of the adding-up constraint
- Note that in the world of zero risk premium all the partial derivative will be infinite, reflecting the fact that investors view the assets as perfect substitutes
  - this is basically the reason why in the Dornbusch model, we can replace asset demand functions by the simple UIP

Short-run equilibrium

- The standard way of analyzing the PB model's short-run properties is with the aid of PB ~~line~~ lines: MM, BB and FF for the three assets resp.



Short-run equilibrium

- Two effects emerge:
  - euro value of the given stock of US dollar assets SF (F fixed!) will increase, which increases the value of wealth, which, in turn, will increase the demand for all assets, *other things being equal* (ie. cet. par.)
  - in the (domestic) money market, demand for money increases as wealth increases; hence excess demand for money (M fixed!), so that the interest rate r has to increase to clear the money market
    - thus: S increases and so does r so that MM-curve slopes up
- In the domestic bond market, on the other hand, the wealth induced increase in their demand generates an excess demand for domestic government bonds (B fixed!) so that r has to **fall**, ie. bond prices have to increase to clear the domestic bond market; hence, BB-curve slopes down
- In the market for foreign assets, we have two effects:

Short-run equilibrium

- 1. The increase in wealth tends to increase the demand for foreign assets, putting pressure on the return on them to fall (prices to increase)
  2. The latter effect tends to increase the **euro value of the supply of foreign assets**, which effect dominates
- So the net effect is to create an excess supply of foreign assets, which can be reduced by reducing the domestic interest rate, ie. the return on competing assets; thus, FF-curve slope down
- The assumptions in (3) guarantee that the BB-curve is steeper than the FF-curve
- The intersection of any two of the lines will generate a short-run equilibrium exchange rate and domestic interest rate $\left(S^A, r^A\right)$; the third line has to pass through the same point of intersection by the adding-up constraint (ie. by Walras law)
- So we can safely ignore one of the schedules in the figure, as equilbrium (shares) in the two other markets at $\left(S^A, r^A\right)$ would immediately imply an equlibrium (share) for domestic bonds

Case 1: Money supply increase, domestic asset decrease

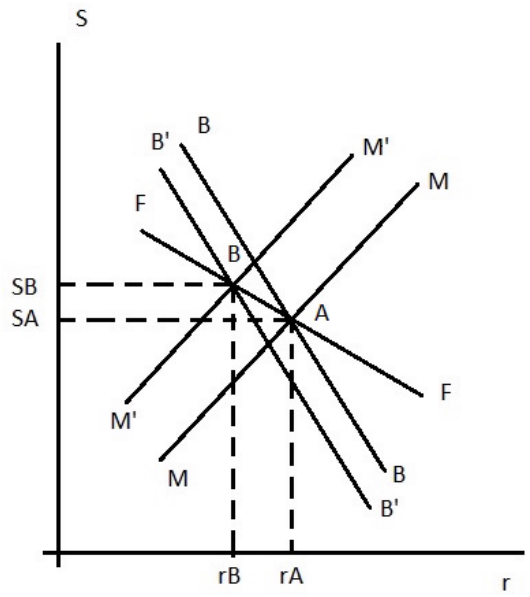
- We can now perform a set of experiments on the effects of changes in the policy variables or even of changes in the behavioural relationships summarized by the share functions
- Concentrate on the effects of changes in the money supply; however, a complication has to be sorted out first
- Now we need to figure out exactly **how** the money supply changes; previously (in the Dornbusch model) we could ignore this
- In the present context, a change in the money supply could come through changes in
  - foreign exchange (reserves)
  - stock of domestic bonds
- Two types of open market operations then
- Deficit spending (domestic credit) is ruled out as this would imply an increase in nominal wealth; instead concentrate on the following three cases

Case 1: Money supply increase, domestic asset decrease

1. Money supply increase, domestic asset decrease

- Suppose the domestic central bank buys domestic government bonds with newly printed money, ie. performs an open market operation
- The effect of this operation on the domestic financial market is: an excess supply of money and excess demand for bonds
- Hence, domestic interest rates have to fall (bond prices have to go up)
- In terms of the following figure, both the MM- and BB-curve has to shift to the left
- MM-curve has to shift further, since the direct effect in the money market is greater than the impact on the bond market, where the effect is in part dissipated by a spillover effect on to the demand for foreign assets, which have become more attractive due to the fall in the domestic interest rate

Case 1: Money supply increase, domestic asset decrease



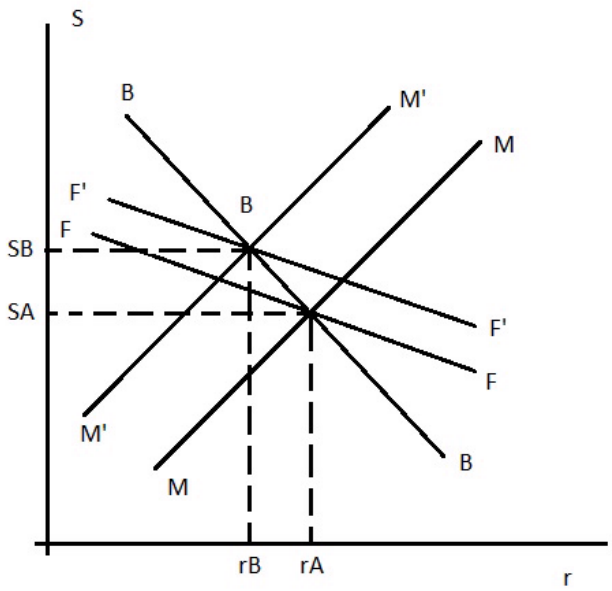
Case 1: Money supply increase, domestic asset decrease

- That is, foreign asset have become more attractive because of the fall in the domestic interest rate
- Consequently, the increase in the demand for dollar denominated assets explains the rise in the price of foreign exchange at the new equilibrium (B), ie. the fall in the value of the euro
- In conclusion: the money supply increase results in a short-run fall in the domestic interest rate and a fall (increase) in the value of the euro (foreign currency)
    - note: the depreciation of the euro should not be expected to be anywhere near in proportion to the increase in the money stock!

Case 2: Money supply increase, foreign currency asset decrease

- Alternatively ECB could buy dollar-denominated assets from euroland holders
  - in practice it may be difficult to identify the nationality of the holders, but it is essential that they are euroland residents, otherwise the whole framework of asset market equations, wealth constraint and so on breaks down
- Anyway, the initial effect is to shift the MM curve up and to the left reflecting, given the initial interest rate and exchange rate, an excess supply of domestic money
- Money goes into the market for foreign currency assets creating an excess demand for them; and since their supply is fixed, the induced excess demand can be offset only by an increase in the price, S, at which those securities translate into euro, ie. euro has to weaken
- Hence, the FF curve shift up and to the right and the the new equilibrium is at point B: lower r, higher S

Case 2: Money supply increase, foreign currency asset decrease



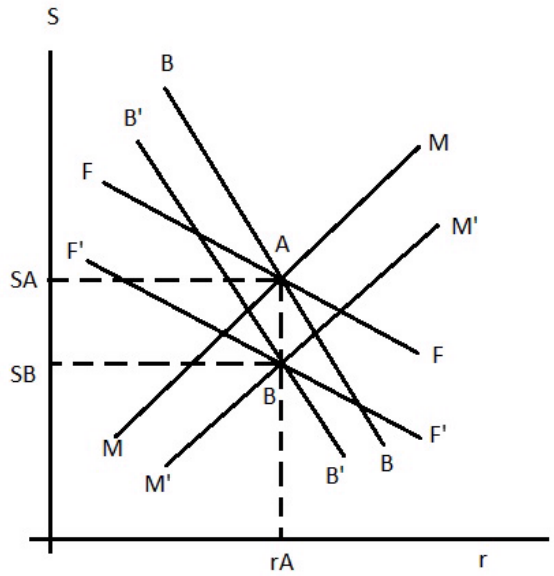
Case 3: Wealth effects - an increase in the stock of foreign currency assets

- Now, think of an increase in the (dollar value of the) supply of foreign securities
- This case differs in two important respects from those analyzed thus far:
  - here we are dealing with a net increase in wealth, rather than the exchange of one type of asset for another, ie. this is the case of private sector asset accumulation (= saving) rather than public sector policy change
  - it is not only the equivalence between an increase in foreign currency assets and saving, it is the **only** form saving can take, given the structure of the model; ie. saving is to be understood in the present context as a flow accumulation of dollar assets via current account surplus
- Note: as long as the euro is floating, euroarea capital account deficit (surplus) corresponds to an equal current account surplus (deficit)
- This is in fact the central feature of PB models

Case 3: Wealth effects - an increase in the stock of foreign currency asset

- Because of price stickiness (cf. Dornbusch model), short-run adjustment in PB models is confined to the financial markets, which may well settle on an exchange rate - interest rate combination consistent with a non-zero current account balance, given the initial price level and the level of national income; hence, a continuing flow of capital across the exchanges emerges, adding to or subtracting from the stock of claims on the ROW, and causing a perpetual shift in the financial markets
- Let us illustrate this shift in the following figure
- Take the FF schedule first: it must shift down and to the left, because the only way the increased supply of dollar assets can be absorbed is for the euro to strenghen to keep, SF, constant

Case 3: Wealth effects - an increase in the stock of foreign currency asset



Case 3: Wealth effects - an increase in the stock of foreign currency asset

- There is no possiblity of a change in the domestic interest rate r, since there has been no change in the relative quantities of either of the domestic currency assets
- Hence, the other two curves - MM and BB curves - have to shift vertically downwards
- What's the mechanism?
  - as the dollar value of the supply of foreign securities increase, the domestic residents' net wealth increases, so they want increase their holdings of domestic currency securities
  - so they exchange dollar securities for domestic assets, thereby generating an excess supply of dollars driving down their price S (which falls, ie. euro strenghens)
  - the induced excess demand for euros would in other circumstances require a rise in euroarea interest rate, while the excess demand for domestic bonds would require exactly the opposite (, as the excess demand puts an upward pressure on domestic bond prices)

Case 3: Wealth effects - an increase in the stock of foreign currency asset

- Neither of the above can happen, so the exchange rate of the euro keeps strenghening as long as euro value of the dollar assets, SF, is above itse initial value
- We can now estimate the required rate of appreciation of the euro
- If the domestic interest rate is to remain constant, wealth must be unchanged once the short-run adjustment is completed
- Since the quantities of domestic assets are constant, the euro value of dollar securities ends up where it started
- Hence the rate of appreciation has to be proportional to the initial rate of increase in the quantity of dollar claims that initiated the whole process, ie. we must have

$$-\frac{\Delta S}{S} = \frac{\Delta F}{F} \tag{5}$$

- This implication provides the key to the whole adjustment process; moving on to describe the long-run will wittness to this

The long-run and current account equilibrium

- The above analysis takes a number of variables as given
- The background against which the financial markets adjust is a real economy, where the values of the two key variables, the domestic price level P and volume of foreign currency assets F are determined
- Under unchanged expectations, we can outline the real sector as follows
- Take the real exchange rate as the key variable affecting the real economy as in the Dornbusch model; other variables can be thought of as shift factors
- Excess demand (supply) in the domestic goods market results in net imports (exports)
- Net exports is not the same as current account surplus; in particular, the current account includes investment income accruing to domestic residents from holding dollar assets
- Hence, an increase in the value of these holdings, if not reversed in the long-run, will be associated with an increase in the euroarea dollar interest income $r^f F$

The long-run and current account equilibrium

- This increase in the euroarea dollar interest income will imply a fall in the surplus required on other current account items consistent with a zero current account balance
- Consequently, in the long-run, an increase in F requires, from the point of view of current account balance, a less competitive euroarea
- Any particular current account surplus (deficit) will determine the rate of accumulation (depletion) of the euroarea's dollar assets
- It is this interaction between the real economy and the financial markets which ultimately returns the economy to long-run equilibrium
- As far as the price level is concerned, inflation will emerge as a result of the gap between the current real money stock and the level that is consistent with the goods market equilibrium, ie. with the long run level of the real exchange rate
- Hence, long-run equilibrium occurs when the euroarea price level and the quantity of foreign assets in the euroarea are such as to balance the current account

Case 4: A money supply increase in the long-run

- Assume the ECB increases the money supply permanently (say by 10%) by buying domestic bonds
- The outcome is not the same as in the benchmark monetary model, where all the real variables have returned back to their original values
- Now, the open market purchase will weaken the euro (as shown previously); given the initial price level (ie. before it start to adjust through inflation), the real exchange rate depreciates
- Net exports increase, domestic residents begin to accumulate dollar claims on the USA; this will tend to strenghen the euro, as shown above, tending to reverse the impact of real depreciation
- Over time, domestic price level increases, eroding competitiveness; at some point the domestic price level has increased as much as the increase in the quantity of money
- At this point, net exports fall to zero and the volume of dollar assets is constant

Case 4: A money supply increase in the long-run

- Although the stock of dollar claims does not grow any more, it is positive generating a flow of investment income to euroarea residents
- Since the real exchange rate is back at its initial level, current account is no longer in balance, ie. net exports are zero, but current account surplus is equal to the investment income on the net asset accumulation, whic took place earlier
- Hence, the exchange rate needs to continue appreciating so as to carry the real exchange rate sufficiently high to generate net imports equal to net investment income
- So, in the full long-run equilibrium, euroarea's competitiveness has been eroded relative to time prior to the increase in the money supply and it will be paying for its net imports with capital service!