Check your understanding: The IS-LM-BP model

EC 140

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A simplified discussion of the IS-LM-BP model.

IS-LM-BP

- Mundell-Fleming Model based on idea that capital flows must offset trade deficits for stable international reserves.
- Speed of capital flows depends on perceptions as captured by F.
- The same differences in interest rate between two countries can cause very different movement in international capital flows.
- Without perfect capital mobility, there are *unequal interest rates in countries even without capital controls.*
- From the SAM equation

  $$Y = C + I + G + N_x$$

  Where G = *government expenditure* including government wages.
- The behavioral equation for C = *consumption* is

  $$C = \bar{C} + c(1 - t)Y$$

  where $\bar{C}$ is autonomous consumption, c the marginal propensity to consume and t is the proportional tax rate.
- The behavioral equation for I = *investment* is

  $$I = \bar{I} - bi$$

  where $\bar{I}$ is the autonomous level of investment and b is the effect of the interest rate, i, on the level of investment.
- The behavioral equation for N_x *net exports* or the trade balance is

  $$N_x = Ee_r^{\gamma} - e_r mY$$

  where the autonomous component in the trade balance is $\bar{E}$ and the real exchange rate is

  $$e_r = ep^*/P$$

  where e is the nominal exchange rate, p^*, the foreign price and P is the domestic price level (GDP deflator). The marginal propensity to import is m. The responsiveness of exports to real exchange rate is given by γ.

The IS curve

- IS Curve: *combinations of income and the interest rate such that savings equals investment.*
- In other words, for a given level of income, what is the level of interest that makes investment equal to the sum of savings?
- This is the locus of equilibria in the *goods market*.
- The *IS* curve is the *reduced form* of equations above. It is obtain by substituting upward:

$$Y = \frac{\bar{A} - bi + N_x}{[1 - c(1-t)]} = \alpha(\bar{A} - bi + N_x)$$

where $\bar{A}$= $\bar{C} + \bar{I} + G$ is a catch-all parameter, and the "simple Keynesian multiplier", or

$$\alpha = \frac{1}{[1 - c(1-t)]}$$

- To get the graphical definition of the IS curve

$$i = -\frac{Y}{\alpha b} + \bar{A}/b + N_x/b \qquad (1)$$

Here the slope of the IS curve is $-1/\alpha b$ and the intercept is $\bar{A}/b + N_x/b$.

The LM curve

- The *LM* curve balances the supply and demand for money in the portfolio of wealth held by the private sector. It is given by

$$kY - h(i - i^*) = M_s/P$$

where k is the *transaction coefficient* and h is the speculative coefficient. The foreign interest rate is denoted i^*. The money supply is M_s and p is the price level.

- To get the graphical *LM* curve, solve i in the last equation for i.

$$i = \frac{k}{h}Y - M_s/P + i^* \qquad (2)$$

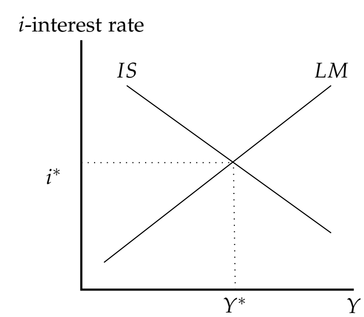

Figure 1: IS-LM

BP curve

- The BP curve captures the balance of payments in the model. It is the sum of the current account balance and the capital account balance. The equation is satisfied when the *change in reserves is zero*

$$N_x + F(i - i^*) = 0$$

where F is the capital flow parameter.

- If the interest rates are the same, then the capital account surplus is zero.

$$e_r m/FY - Ee_r^\gamma/F + i^* = i$$

where the slope is $e_r m/F > 0$ and the intercept is $-Ee_r^\gamma/F + i^*$ which may be of either sign.

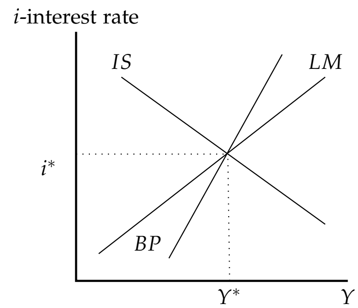

Figure 2: IS-LM-BP

Fixed exchange rates

- In fixed exchange rates, the money supply is endogenous. If there is an inflow of capital or an increase in exports, then the money supply will increase and vice-versa. Therefore equation 2 *floats*, that is the i, Y equilibrium is determined by the combination of the IS and BP curves. With i and Y known, the supply of money, M_s/P is determined by the LM equation.
- In *fixed* exchange rates, the model consists of the 7 equations, 1-7. The variable list is $V(Y, C, I, N_x, e_r, M_s, i)$. The parameter list is $P(\bar{C}, c, t, G, \bar{I}, b, \bar{E}, \gamma, e, p^*, P, m, i^*, k, h)$.
- Substituting the definitions of $\bar{A}, \alpha$ and N_x this is three equations in the variables Y, i, M_s with parameters: $\bar{C}, c, t, G, \bar{I}, b, G, \bar{E}, \gamma, e, p^*$ m, i^*, k, h and P.
- In *flexible* exchange rates, substituting the definitions of A, α and N_x, this is three equations in the variables Y, i, e with parameters: $a, c, t, G, \bar{I}, b, G, \bar{E}, x, m, i^*, v, f, M$ and P.
- With *perfect capital mobility* the BP curve drops out and we have $i = i^*$

Solving the Model-fixed exchange rates

- With *fixed* exchange rates, solve the IS and the BP together then let the LM curve determine the real value of the money supply.

$$Y = \alpha\bar{A} - \alpha bi + \alpha N_x$$

$$N_x + F(i - i^*) = 0$$

$$i = i^* - N_x/F$$

$$Y = \alpha\bar{A} - \alpha b i^* + \alpha b N_x/F + \alpha N_x$$

$$Y = \alpha\bar{A} - \alpha b i^* + \alpha(b/F + 1)N_x$$

$$Y = \alpha\bar{A} - \alpha b i^* + \alpha(b/F + 1)(\bar{E}e_r^{\gamma} - mY)$$

$$Y + \alpha(b/F + 1)mY = \alpha\bar{A} - \alpha b i^* + \alpha(b/F + 1)\bar{E}e_r^{\gamma}$$

$$Y = \frac{\alpha[(\bar{A} - bi^*) + (b/F + 1)\bar{E}e_r^{\gamma}]}{[1 + \alpha(b/F + 1)m]}$$

Plug Y back into the BP equation to get i.

Solving the Model-flexible exchange rates

- With *flexible exchange rates*, multiply the BP by α to get

$$\alpha N_x = -\alpha F(i - i^*)$$

- Next substitute into the IS curve to get an expression in Y and i

$$Y = \alpha\bar{A} - \alpha b i - \alpha F(i - i^*)$$

Combine terms with i

$$Y = \alpha\bar{A} - \alpha(b + F)i + \alpha F i^*$$

- From the LM curve

$$kY - h(i - i^*) = M_S/P$$

$$i = (k/h)Y - M_S/hP + i^*$$

and substitute into the IS curve

$$Y = \alpha\bar{A} - \alpha(b + F)(k/h)Y + \alpha(b + F)M_S/Ph - \alpha(b + F)i^* + \alpha F i^*$$

simplifying

$$[1 + \alpha(b + F)(k/h)]Y = \alpha[\bar{A} + (b + F)M_S/Ph - bi^*$$

$$Y = \frac{\alpha[\bar{A} + (b + F)M_S/Ph - bi^*]}{[1 + \alpha(b + F)(k/h)]}$$

- Substitute this Y into the LM curve to determine i.
- Substitute the i, Y combination into the BP to get e_r