CHAPTER 4. FLEXIBLE PRICES: THE MONETARY MODEL

The monetary approach was the earliest approach to explain the related phenomena of exchange rate variations, on the other hand, and the BOP, in the other. While it is completely inadequate in explaining the wild day-to-day, month-to-month gyrations seen in recent years, it nonetheless provides some useful insights into the broader picture of long run trends. It consists of two basic building blocks: PPP and demand for money.

4.1 The Simple Monetary Model of a Floating Exchange Rate

4.1.1 The Setting:

a. AS is vertical

This does not imply that output is constant. It can only vary as the result of a change in the productivity of the economy: accumulation of capital, growth in the labor force or its educational level, etc.. And a vertical AS curve presupposes perfect price flexibility in all markets.

b. The demand for real money balances is a stable function of only a few domestic macroeconomic variables. In fact, for the moment and till further notice, we shall work with the Cambridge quantity equation provided below:

\[ M^d = kPy \quad k > 0 \]

Given a money stock, \( M^s_0 \), equilibrium means:

\[ M^s_0 = M^d = kPy = kY \]

The figure below shows that the fall in the price level is of the same proportion as the rise in income as we move from A to D. However, a change in \( M^s \) would shift AD curve. AD curve will shift upward and to the right when there is an increase in \( M^s \). At point B, \( P_1 \) must be greater than \( P_0 \) by the same proportion as \( M^s_1 \) is greater than \( M^s_0 \).
c. PPP obtains at all times

\[ P_{\text{Yen}} = P_{\text{S}} \times S_{\text{Yen/S}} \quad \text{or} \quad S.P^* = P \]

This equation states PP of each country’s currency must be the same whether spent on the domestic market or converted into foreign currency and spent abroad.

Consider the figure below where the vertical axis plots the domestic price level, and the horizontal plots spot exchange rate. The line drawn from the origin is PPP line. Points A and B are equilibrium levels of domestic prices and foreign prices. Points above and to the left of the line are ones where domestic economy is uncompetitive (domestic price level is too high), so it is worth importing goods from abroad. The opposite is true below the PPP line.

In terms of real exchange rate, above the PPP line a real depreciation is required to restore the equilibrium, and below it, the opposite is true.
4.1.2 Equilibrium

In figure 5.2(b), with the initial money stock $M^0$, $P_0$ is the closed economy equilibrium price level at point A as in the open economy also. $S_0$ is the equilibrium level of exchange rates. A lower value of $S$ would leave domestic output uncompetitive on world markets and hence result in excess supply of the home currency.

We can combine the nature of the equilibrium as:

$$M^0 = M^d = kP_0y = kSP^*y \quad \text{and} \quad S = \frac{M_0^s}{kP^*y}$$

To increase the numerator or decrease the denominator will cause the price of foreign exchange to rise (domestic currency to depreciate).

4.1.3 A Monetary Expansion ($M^0$ Increases) Under Floating Exchange Rates

Let’s start with an expansion in money stock to a new level of $M_1$ by assuming other exogenous variables unchanged (real income, $y$ and foreign price level, $P^*$). At $P_0$, there is clearly excess supply of money, which will cause economic agents to increase spending so as to reduce their money balances. The counterpart of the excess supply of money is therefore an excess demand for goods and services measured by the distance of $(y^d_1 - y_0)$ in figure 5.2(b).
The extra spending will drive prices up given a fixed real income and output. This will also cause exchange rates to rise to keep domestic output competitive. Domestic currency will be depreciated so to restore the equilibrium.

In the monetary model, a given percentage increase in the domestic money supply leads, other things being equal, to a depreciation of the same proportion in the value of domestic currency.

### 4.1.4 An Income Increase Under Floating Exchange Rates

At any price level, higher real income implies a greater demand for money. With a given money supply we must have constant nominal income, Py. So, the higher is real income, the lower must the price level be. The impact effect must be to create excess demand for money and excess supply of goods and services equal to the gap, \( y_1 - y_0 \) at \( P_0 \) in figure 5.3(b) and at \( AS_1 \).

![Figure 5.3 Income increase under floating rates.](image)
The reduced spending will bring deflation bringing price level from P₀ to P₁. Point b will be equilibrium in which both money market and goods/services market clear.

In the open economy, the exchange rates must have fallen (domestic currency appreciates) from S₀ to S₁. Otherwise, at point G, domestic goods/services would be over competitive meaning a fall in domestic prices only (depreciation in real exchange rates). So equilibrium will be obtained at point B in figure 5.3(a). PPP I preserved by appreciation so that the fall in the domestic price is offset by appreciation.

In the monetary model, a rise in domestic real income leads, other things being equal, to an appreciation of the home currency.

4.1.5 A Foreign Price Increase under Floating Exchange Rates

When P* increases, PPP line will be steeper, exchange rates will decrease as a result of a change in SP* = P meaning an appreciation of domestic currency. The new equilibrium level will be point B.

In the monetary model, a rise in the foreign price level, other things being equal, is associated with an appreciation of the domestic currency, and no other change in the domestic economy. Money market equilibrium is unaffected by the change in foreign prices which keeps the domestic price level fixed at P₀ in figure 5.4, and forces the burden of adjustment on to the exchange rate.
4.1.6 The Two Country Model of a Floating Exchange Rate

We can formalize the same assumption mentioned all previously for foreign countries. For example, quantity equation could be formalized as:

\[ M^d = k^*P^*y^* \]

If we divide it by domestic parameters we get:

\[ \frac{M_0^S}{M_0^{S*}} = \frac{kPy}{k^*P^*y^*} \]

which shows that relative money stock is equal to the relative real demands for money.

Under PPP, we have \( P/P^* = S \) and we can rewrite the equation as:

\[ \frac{M_0^S}{M_0^{S*}} = \frac{kSy}{k^*y^*} \]

and if we solve it for \( S \) we get:

\[ S = \frac{M / M^*}{ky / k^*y^*} \]

showing that exchange rates (\( S \)) equal the ratio of numerator (relative money stocks) to the denominator (relative real demands). Therefore, anything which tends to increase domestic money supply relative to foreign money supply, or diminish domestic demand for money relative to foreign demand for money, will cause domestic currency to depreciate (\( S \) to rise).

The last equation can be rewritten as follow:

\[ S = \frac{\bar{M}}{ky} \]
4.2 The Simple Monetary Model of a Fixed Exchange Rate

Now consider a situation where exchange rate is not allowed to move. Under fixed rate system, as mentioned before, $M^S$ is not an exogenous variable. Instead, the policy variable was domestic credit, DC, and:

$$FX + DC = M^S$$

$FX = foreign currency reserves and S is fixed.$

4.2.1 A Money Supply Increase Under Fixed Exchange Rates

An expansionary monetary policy means an increase in DC from $DC_0$ to $DC_1$. If $FX$ is assumed to be zero, then Money supply would be equal to $DC_0$ itself. The point H in figure 5.5(c) is the initial equilibrium level together with a in figure 5.5(b) and A in figure 5.5(a).

Under fixed rate system, S will be fixed and $P = \bar{S}P'$ in which S and P are fixed exogenously.

With an expansion in DC, the 45° line in the money supply diagram shifts upward by the amount of expansion to point J where $FX$ is unchanged and money supply rises to $M^S_1$. This will cause the price level to increase to $P_1$ at point b which means a upward shift in AD curve. Higher price level has made domestic economy uncompetitive at fixed foreign prices and fixed exchange rates.
At point C, there will be an incentive for importing from abroad and exports will tend to fall down. This will cause a deficit in BOP. The situation is unsustainable which would cause an immediate depreciation of domestic currency. However, by assumption, they avoid that outcome by using FX to buy domestic currency, or to finance the ongoing payments deficit. The result will be a fall in FX.

Reduction in FX tends to reduce money supply, so the system moves from J to K, from b back to a, and from C down to A. At point A, BOP deficit is reduced to zero on the PPP line. Given PPP, demand for money must equal:

\[ M^d = kPy = k(\bar{S}P^*)\bar{y} \]

Adjusting demand and supply;

\[ M^d = k\bar{S}P^*\bar{y} = M^s = FX + DC \]

and solving the equation for FX gives us;

\[ FX = k\bar{S}P^*\bar{y} - DC \]

The equation above tells us that FX must be exactly equal to the gap between the given demand for domestic currency and the supply generated by the local banking system, through the process of domestic credit expansion.

At the new equilibrium levels of Money supply, price level and BOP, only FX and DC will be changed. If we compare points K and H, the new money supply is made up as follows in point K:

\[ M^s_0 = FX_1 + DC_1 \]

The net outcome is that the money stock now consists of more domestic credit (DC) and less foreign exchange reserves (FX).

**Sterilization of reserve changes**

It is the process of neutralizing the effect of a BOP deficit (surplus) by creating (retiring) enough DC to offset the fall in FX.

As a result of sterilization, DC will get larger and FX smaller. FX will be exhausted after sterilization. Each expansion of DC will prolong the reserve loss and hence generate the need for further credit creation. So, the application of sterilization is questionable and has been a great deal of debate both among researchers and policy makers, about how far sterilization is actually feasible.
4.2.2 An Income Increase Under Fixed Exchange Rates

With price level unchanged, an increase in real income amounts to a rise in the demand for real money balances, other things being equal. The impact will cause domestic residents to spend less, so as to raise their balances to a level commensurate with their new, higher volume of transactions. In doing so, they force prices level down making domestic output over competitive, and leading a BOP surplus and a rise in FX. This process will come to an end only when the domestic money stock has grown enough to match the new, larger demand. The domestic money stock will have risen, AS will shift to the right and the home price level will have returned to its PPP level in figure 5.5.

4.2.3 A Foreign Price Increase Under Fixed Exchange Rates

As a result of a rise in world price level, the effect under fixed rate system is to directly increase the home country’s competitiveness, causing a surplus in BOP and a rise in FX. PPP line will be steeper again in figure 5.5, M$ will increase which causes the price level to jump up until it reaches the parity with that of outside world.

This creates an important implication: a country, which pegs its exchange rate, has ultimately to accept the world price level. In the common jargon of the 1960s and 1970s, it is forced to import inflation from the rest of the world. The fact that it cannot control its own M$ means it cannot choose its price level or inflation rate independently of developments beyond its borders.

4.2.4 Devaluation Under Fixed Exchange Rates

No fixed exchange rate is fixed forever. Sooner or later peg rates will change to a new level. What happens when the peg is adjusted?

The economy is at initial equilibrium at points A, a and G in figure 5.6. When domestic currency devaluates, exchange rate shifts from $\bar{S}_0$ to $\bar{S}_1$. The overnight, impact effect is to move the economy to a point like C. Initially the price level is assumed to be unchanged at P0 causing the home currency to be temporarily over competitive. Foreign goods now costs more, while domestic prices are unchanged. A surplus in BOP will cause a rise in FX.

A rise in FX with unchanged DC will increase M$ from G to H and, AD and real money balances from a to b. AD curve shifts upwards. In terms of money market, with real income and output constant, and hence an unchanged demand, the price level must be bid up as agents attempt to reduce their excess real balances by buying additional goods. The new equilibrium will be obtained at point B.
In terms of goods and services market, if output is pegged at $y_0$, the increased demand by domestic residents (for cheaper import substitutes) and by foreigners (for home country’s exports) cannot be satisfied. The excess demand must simply generate inflation.

### 4.3 Interest Rates in the Monetary Model

Demand for money equation $\frac{M^d}{P} = ky - lr$ implies that demand for real balances will be lower, at any given level of income, the higher the interest rates. At any price level, nominal demand will be smaller at a higher interest rate $r_1$ than at a lower interest rate, $r_0$.

A rise in interest rates creates a temporary excess supply of money and excess demand for goods and services. AD curve will shift to the right in figure 5.7 at an initial price level of $P_0$, generating immediate excess demand equal to $(y_{d1} - y_0)$, and consequent inflation. As price level rises, the economy moves up its new AD curve from c to b.

Translating the argument into money market terms, at the point c the higher opportunity cost induces agents to economize on real balances by attempting to spend more. They drive up the prices until the real money stock has been reduced sufficiently to reinstate equilibrium at the new, higher interest rate. When equilibrium is reached, at the new price level of $P_1$ nominal income has increased so as to generate a transactions demand great enough to offset the impact of the higher opportunity cost.
If the exchange rates are floating, the higher interest rate must be associated with a higher value of $S$ (domestic currency depreciates). The net effect on the exchange rate depends on relative interest rates.

**Figure 5.7** Interest rate increase under floating exchange rates.