Chapter 14

Money, Interest Rates, and Exchange Rates

14.1 Introduction

In chapter 13, we showed how the exchange rate between currencies depends on two factors, the interest rate that can be earned on deposits of those currencies and the expected future exchange rate.

To fully understand the determination of exchange rates, we have to learn how interest rates themselves are determined and how expectations of future exchange rates are formed.

In this chapter we expand our understanding of the determination of exchange rates by linking domestic money markets to the foreign exchange market. As we shall see, developments in the money market influence the exchange rate both by changing interest rates and by changing people's expectations of future exchange rates.

14.2 Money Market

An economy's *money supply* M^s is controlled by the central bank. The central bank directly regulates the amount of currency in existence and also has indirect control over the amount of checking deposits issued by private banks. The procedures through which the central bank controls the money supply are complex, and we assume that the central bank simply sets the size of the money supply at the level it desires.

People's *money demand* M^d is a function of 3 main ingredients:

- **Interest rate** R. This is what you could earn if you would not hold money but rather interest-bearing assets. If R rises, holding money is more costly, so money demand falls.

- **Price level** P. A rise in price level means it takes more money to buy the usual basket of goods. So a rise in P means increase money demand.
- **Real national income** Y. An increase in Y will increase money demand. You will want to buy more goods and services and so you will need more money to make the increased number of transactions.

In other words:

$$M^d = P * L(R, Y) \tag{14.1}$$

The money market is in equilibrium when:

$$M^s = M^d \tag{14.2}$$

or

$$\frac{M^s}{P} = L(R, Y) \tag{14.3}$$

14.3 Interlude: Short-run versus long-run

Economists make an important distinction between the short-run and long-run. As we shall see, this distinction will have an important impact on our model.

In the *short-run*, prices P are sticky and the economy is not necessarily at its full-employment level of output Y. We can represent this by assuming that both P and Y are exogenous. In that case, the interest rate R is the equilibrating factor in the money market.

In the *long-run*, prices P are flexible and the economy is at its full-employment level of output Y. The interest rate R also has reached its real rate. We can represent this by assuming that both Y and R are exogenous and P is endogenous. In that case, price P is the equilibrating factor in the money market.

14.3.1 Graphical Representation of Short-Run Money Market

In the short run, we use the simplifying assumptions that the prices P are sticky and output Y is given. The interest rate R is the adjusting variable that clears the money market.

If the interest rate R goes up, people want to hold less real money $\frac{M^d}{P}$. As a result, there is a negative relation between the interest rate and real money demand.

If the interest rate R goes up, this has no impact on real money supply $\frac{M^s}{P}$.

14.3.2 Comparative Statics

Suppose the Federal Reserve decides to increase its money supply M^s. All else equal, what is the short-run effect on the US interest rate?

All else equal, what is the short-run effect of an increase in US output Y on the US interest rate?

All else equal, what is the short-run effect of an increase in US prices P on the US interest rate?

14.3.3 Money Market Clearing in the Long-Run

In the long-run, we assume that prices P are flexible. We also assume that the economy is at "full employment" with both income Y and the interest rate R given.

Since we know that $\frac{M^s}{P} = L(R, Y)$, we can express this as:

$$P = \frac{M^s}{L(R, Y)} \tag{14.4}$$

This equation indicates that the long-run price level P depends on the "full employment" interest rate R, "full employment" real output Y, and the domestic money supply M^s. Because the interest rate and output are fixed at their long-run levels, this implies that $L(R, Y)$ is fixed. Therefore, the long-run price level P is directly proportional to the money supply M^s. In other words, a 10% increase in the money supply in the long-run leads to a 10% increase in the price level and has no effect on the real interest rate and real output. This is the basic argument of *money neutrality*.

Example 1: On January 1, 1960 France pushed through a currency reform where 1 new Franc equaled 100 old Franc. The effect of this reform was to lower the number of currency units in circulation (i.e. money supply) and all franc prices to 1/100th of their old franc values. But the redefinition of the monetary unit had no effect on real output, real interest rates or the relative prices of goods.

Example 2: There is strong empirical evidence concerning the long-run link between national money supplies and national price levels predicted by economic theory (see pages 375-377).

14.4 The Money Market and the Foreign Exchange Market in the Short-Run

14.4.1 Temporary U.S. Money Expansion

Suppose the Federal Reserve increases its money supply temporarily. Since it is temporarily, the money expansion has no impact on long-run prices. In the money market, this leads to a reduction in the US interest rate. The reduction in the US interest rate reduces the rate of return of dollar deposits relative to euro deposits, thus inducing investors to sell their dollars and buy euros. As a result, the dollar depreciates.

14.4.2 Temporary European Money Expansion

Suppose the European Central Bank increases its money supply temporarily. The increase causes the European interest rate to drop, thus reducing the expected rate of return of euro deposits to decrease relative to dollar deposits. As a result, investors decide to sell their euros for dollars, thus leading to an appreciation of the dollar.

14.4.3 Temporary Rise in U.S. Output

Suppose there is sudden rise in output in the United States. This leads to excess money demand in the US money market and therefore induces an increase in the US interest rate. In the foreign exchange market, investors take advantage of the higher return to dollar deposits by selling their euros and buying dollars. As a result, the dollar appreciates.

14.4.4 Temporary Rise in Prices

Suppose there is sudden rise in prices in the United States. This leads to a reduction in real money supply in the US money market and therefore induces an increase in the US interest rate. In the foreign exchange market, investors take advantage of the higher return to dollar deposits by selling their euros and buying dollars. As a result, the dollar appreciates.

14.5 The Money Market and the Foreign Exchange Market in the Long-Run

Thinking again about France's currency reform, it is relatively easy to see the long-run effect of a permanent decrease in the money supply on the exchange rate. The currency reform decimates the price level in France. In order for this not to lead to a change of the relative prices against the rest of the world, this implies that the foreign exchange rate needs to appreciate by the same amount.

Intuition: suppose a loaf bread used to cost 100 old Franc. After the currency reform, a loaf of bread would only cost 1 new Franc. If the Franc does not appreciate by 100, then foreigners would be able to suddenly buy 100 breads for the price of one.

In the long run, a permanent increase in a country's money supply causes a proportional increase in the price level and a proportional long-run depreciation of its currency against foreign currencies.

$$\Delta M = \Delta P = \Delta E \tag{14.5}$$

14.6 Expectations and the Long-Run

Investors know that a permanent money expansion will lead to a currency depreciation in the long-run and that a permanent monetary contraction will lead to a currency appreciation in the long-run. The fact that they know this implies that in the short-run the expected exchange rate changes.

14.6.1 Permanent U.S. Money Supply Increase

Suppose the Federal Reserve decides to increase its money supply permanently. What is the impact on the exchange rate in the short-run and long-run?

Short-Run

In the short-run there will be two effects:

- The money supply increase will shift down the money supply curve $\frac{M^s}{P}$.
- Investors will expect a future depreciation of the dollar. As a result, the expected return on euro deposits $R_{EU} + \frac{(E^e_{\$/euro} - E_{\$/euro})}{E_{\$/euro}}$ curve shifts up.

Both effects lead to a depreciation of the dollar exchange rate.

Long-Run

In the long-run market forces will eventually cause the price level to rise proportionately to the rise in the nominal money supply. So the real money supply $\frac{M^s}{P}$ will return to its original level. This implies that the interest rate R returns to its original level. As the U.S. interest rate rises, the dollar becomes a more attractive asset, so the demand for dollars rises, and the value of the dollar E appreciates over time. The dollar keeps on appreciating until the total rate of dollar depreciation is proportional to the rise in the US money supply (In the long-run $\Delta M = \Delta P = \Delta E$).

14.6.2 Exchange rate overshooting

Consider the movements of the variables over time. Immediately after increasing M^s, the dollar depreciates a lot. Then, as the price gradually adjusts, the dollar appreciates some over time. But in the long run, the dollar ends up at a lower value than before the money supply increase. This process is called *exchange rate overshooting*: the short run movement in the exchange rate exceeds (in absolute value) the long run movement in the exchange rate.

The exchange rate overshooting theory has often been used to explain why exchange rates seem to be excessively volatile. The argument is that chaotic monetary policies lead to amplified volatility in the exchange rate.

A policy recommendation therefore is that modest improvements in monetary stability would be rewarded with large gains in exchange rate stability. It is an empirical bust at least as far as it concerns exchange rates among the United States, Japan and Europe. According to Rogoff, monetary policy in the G-3 is far more stable today than in the mid-1970s, yet the volatility of exchange rates has only dropped marginally.