CHAPTER 6
SPOT EXCHANGE RATE DETERMINATION

Chapter Overview

This chapter examines the economic determinants of the spot exchange rate. The principal theme of the chapter is that the exchange rate is a forward-looking variable that should be priced in the same way as other financial assets. It first uses several news items about macroeconomic events to show the forward-looking nature of the foreign exchange market and the difficulties in modeling exchange rates. It then surveys some of the stylized models of exchange rate determination including the flow approach and the stock approach. The stock approach, which is also referred to as the asset approach, has been adopted as the main paradigm for explaining exchange rate movements. The chapter reviews two main categories of asset modes: the monetary and portfolio-balance models and several variants of each model. It outlines the broad predictions of these models and then analyzes the empirical evidence to determine whether these models offer a satisfactory explanation for exchange rate behavior. Empirical evidence suggests that during some periods of higher inflation and over the longer run, exchange rate behavior is significantly related to fundamentals within the context of an asset model. Still, economic models of exchange rates have often been unreliable and unsuitable for forecasting. As usual, the chapter concludes with a discussion of policy choices that affect private enterprises and public policymakers in connection with exchange rate models.

Chapter Outline

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**News and exchange rates**

Example 1:

The U.S. - Japanese trade tussle sent the dollar plunging almost 4% against the yen on Friday, February 11, 1994. "Major support for the yen comes from Japan's trade surplus, which Mr. Weinberg of High Frequency Economics estimates is running at about $120 billion a year. Roughly half is attributable to the U.S., he says. In addition, he noted that 'Japanese institutions have cut back their purchases of foreign securities,' purchases that otherwise would have helped to weaken the yen." (The Wall Street Journal, Tuesday, February 15, 1994, pages C1 and C15.)

Analysis: The balance of payments approach (the flow approach) to the exchange rates determination applies here. Excess demand for foreign goods, services, and assets causes balance of payments deficit (overall balance deficit) and excess demand for foreign currencies, which leads to depreciation of the domestic currency. Japan's trade surplus with the U.S. indicates that there is a greater demand for yen on merchandise trade. This tends to appreciates the yen relative to the $. When Japanese institutions cut back their purchases of U.S. securities, their demand for $ decreases. Again this can contribute to a stronger yen.

Example 2:

Central bank talk buoys dollar (Financial Times, October 31, 1997, page 25)

The dollar perked up midway through trading yesterday amid rumours that central banks were checking rates, and as fears of a renewed slump on Wall Street failed to materialise.

Note: The Dow Jones Industrial Average sank 554.26 points, or 7.18%, to 7161.15 on Monday, October 27, 1997. It was the Dow’s biggest point drop ever, while only the 12th worst in percentage terms. Then, on Tuesday, October 28, the Dow rebounded 337.17 points.

**Economic Models of Exchange Rate Determination (Summary)**

**Balance of Payments Approach**

This approach focuses on the relationship between balance-of-payments flows and the exchange rates. There are two major components of a balance of payments: the current account and the capital account. The current account tracks flows linked to trade in goods and services, and unilateral transfers; the capital account records capital inflows and outflows. The overall balance of payments of a country must be equilibrated at every moment.
Under the freely fluctuating exchange rate system, the exchange rate of two national currencies, like any commodity price, is determined by the interplay of demand and supply. The demand for foreign exchange comes from individuals or trader who make payments to foreigners in foreign currencies. The transactions may involve the import of goods and services or the purchase of foreign securities. There are the items listed on the debit side of a country's balance of payments. The supply of foreign exchange derives from the receipts of foreign currencies obtained from exporting goods and services or selling financial securities to foreigners. These items are entered in the credit column of the country's balance of payments.

**Demand for and supply of a currency (derived demand and supply)**

Demand for a currency derives from demand for goods, services, and assets denominated in the currency

**Demand for foreign goods and services:**
- Higher inflation will make goods and services denominated in a currency more expensive, so demand will be lower for the currency, ==> the currency will depreciate.
- Higher income will cause greater demand for foreign goods and services (Remember our discussion on International Macroeconomics?), and in turn causes greater demand for foreign currency ==> foreign currency will appreciate.
- Caution: higher income will also cause greater demand for real balances (for transaction purposes), so demand for money increases, causing the currency to appreciate (==> monetary approach)

**Demand for foreign capital (investment):**
- Higher interest rate will attract capital inflow, ==> increase demand for the currency ==> currency will appreciate.

The equilibrium exchange rate is determined by the intersection of the demand and supply schedules. Changes in domestic prices, real income, tastes, and other factors cause shifts of the demand schedule. For instance, a rapid growth of domestic real income causes an increase in the demand for imports, shifting the demand schedule rightward. The new equilibrium exchange rate indicates a depreciation of the domestic currency (Draw the supply and demand curves to show this; remember that the exchange rate is expressed as the domestic currency price of the foreign currency). Similarly, changes in prices, real income, and tastes in the foreign country cause shifts of the supply schedule. For example, if a higher inflation occurs in the United Kingdom (a foreign country), this inflation encourages the residents of Britain to purchase more of our exports and brings about an increase in the supply of pounds sterling. This change shifts the supply schedule to the right. As a consequence, the domestic currency appreciates.

The continuing shifts in demand and supply conditions force the exchange rate to adjust continuously to a new equilibrium.

**Balance of payments equation:**
\[ BOP_t = C(S_t P_t^* / P_t^* , Y_t / Y_t^* , Z_t) + K(i_t - i_t^*) \]  \hspace{1cm} (1)

where

- \( BOP_t \): Balance of payments
- \( C \): Current account
- \( K \): Capital account
- \( P_t \): Domestic price level
- \( Y \): Domestic real income
- \( S_t \): Exchange rate expressed as domestic currency units per unit of foreign currency
- \( i_t \): Domestic nominal interest rate
- \( Z_t \): Other factors that affect balance of payments flows

Variables with an asterisk denote corresponding foreign variables.

Exchange rate equation:

\[ S_t = a(p_t - p_t^*) + b(y_t - y_t^*) - c(r_t - r_t^*) \]  \hspace{1cm} (2)

where the lowercase denotes the natural logarithm of the corresponding variables in balance of payments equation. The coefficients, \( a \), \( b \), and \( c \), are supposed to be positive.

Try to interpret the above equation.

**The Monetary Approach**

Instead of emphasizing trade flows and capital movements as the key factors determining exchange rates, the monetary approach focuses on the stock equilibrium condition in each country’s money markets. The monetary approach posits that the equilibrium exchange rate is critically dependent on the money supply and money demand. The exchange rate under this perspective is further determined by the factors governing a nation's money demand and supply functions.

The monetary approach is based on two key underlying concepts: the quantity theory of money and the purchasing power parity (PPP). Each country's money demand and money supply determines its own prices; the prices in two countries are linked by the exchange rate.

\[ m_t = p_t + by_t - ci_t \]  \hspace{1cm} (3)

\[ m_t^* = p_t^* + by_t^* - ci_t^* \]  \hspace{1cm} (4)
where the left-hand side variables, $m_t$ and $m_t^*$, are the logs of the domestic and foreign money supplies, respectively. The right-hand side variables are the elements of the money demand functions (all variables are in logs except for interest rates).

The above two equations can be then expressed as

$$p_t = m_t - by_t + ci_t$$

$$p_t^* = m_t^* - by_t^* + ci_t^*$$

According to PPP

$$s_t = p_t - p_t^*$$

Combining these equations, we have a version of the monetary equation:

$$s_t = (m_t - m_t^*) - b(y_t - y_t^*) + c(r_t - r_t^*)$$

Interpret the above equation and compare with predictions by the balance of payments approach

Exchange rate overshooting (handout)


The Portfolio Balance Approach

Since the monetary approach emphasizes the monetary phenomenon, other types of financial assets have excluded from consideration. The portfolio balance approach highlights the role of wealth and views assets as imperfect substitutes. The exchange rate and interest rates have to adjust to ensure portfolio equilibrium.

Let's consider a very simple version of the portfolio balance model:

$$\frac{B}{SF} = e^{\sigma \beta (r_t^* - E(\Delta r))}$$

where $B$ and $F$ are domestic bonds and foreign bonds held by domestic investors. $F$ is in foreign currency. $S$ is the exchange rate expressed as the domestic currency units per unit of foreign currency. At each moment of time, the existing stocks (or proportion) of
these bonds are fixed and the domestic interest rate and exchange rate must adjust so that
the assets are willingly held by investors.

The exchange rate equation:

\[ s = -\alpha - \beta(i - i^* - E(\Delta s)) + b - f \]  

(10)

where all b, f, and s are logs of the corresponding variables.

What happens if the domestic current account surpluses increase?

What happens if bond-financed government deficits increase?
Answers to end-of-chapter questions

1. How would you explain the seemingly contradictory reaction of the foreign exchange market, sometimes rising and sometimes falling in response to similar news announcements?

Different reactions to what appears to be similar news items could be the result of (1) actual differences in the news items, (2) differing interpretations of news items, or (3) differences in other market conditions at the time of the news announcement. In the text, we reviewed examples of (1) where an increase in interest rates could be interpreted as an increase in either nominal or real interest rates; (2) where an increase in the money supply could be interpreted as a signal of a permanent change in the money supply or simply a temporary blip; and (3) where a fiscal deficit could promote a currency appreciation if it attracts foreign capital to purchase government bonds, but it might also promote inflationary fears and a weaker domestic currency. These interpretations presume that the FX market is efficient.

2. "The foreign exchange market reacts only on unanticipated news." Is this statement true or false? Explain.

True. In theory, the FX market should behave like other well-functioning asset markets. Prices should reflect all available information and respond only to those news announcements that are unanticipated.

3. "The stock models of foreign exchange pricing sees foreign exchange primarily as a medium of exchange for executing international trade transactions." Is this statement true or false? Explain.

False. The stock model of foreign exchange pricing views foreign exchange as an asset which is held in portfolios as long as the return is commensurate with the return on other financial assets.

4. Describe how an increase in the foreign demand for US goods and services would impact supply and demand curves in the flow and stock models of exchange rate determination.

An increase in the demand for US goods and services creates a flow demand for US$ and a flow supply of DM. The SS curve in Figure 6.8 shifts to the left. At the prevailing spot rate ($0.50/DM), the US runs a current account surplus which adds to its holdings of foreign assets. The SS curve in Figure 6.8 gradually shifts to the right and the US$ strengthens. At some rate, say $0.45/DM, the current account is back in balance.

5. Describe how an increase in the stock demand for US assets impacts demand and supply curves in the flow and stock models of exchange rate determination.

An increase in the stock demand for US assets creates a decrease in the stock demand for DM assets (because the proportions of wealth invested in these two assets must total unity).
The $DD$ curve in Figure 6.8 immediately shifts to the left, and the US$ appreciates to, say $0.45/DM$. At this new exchange rate, the flow demand for DM exceeds the flow supply and the US runs a current account deficit. Gradually, the supply of DM assets declines along with the current account deficit. The $SS$ curve shifts to the left, until the current account is brought back to equilibrium.

6. Explain how a shift in the supply and demand for US$ affects the exchange rate in the flow model of exchange rate determination.

In the flow model of exchange rate determination (Figure 6.5), demand and supply curves for US$ are derived from the demand and supply for US goods and services relative to the demand and supply for foreign goods and services. Those factors that increase the demand for US goods ($SS$ [the supply of £] shifts to the right) or decrease the demand for UK goods ($DD$ [the demand for £] shifts to the left) cause the US$ to strengthen.

7. Discuss the similarities and differences between the monetary approach and the portfolio balance approach to the determination of exchange rates.

8. Describe and contrast the monetarist and the overshooting models of exchange rate determination.

The overshooting model is a variation of the monetary model that allows for purchasing power parity to hold in the long-run but not in the short-run. Under the monetary approach, an unexpected increase in the domestic money supply (by 1%) immediately raises domestic prices by 1% and depreciates the domestic currency by 1%. Domestic interest rates are not affected. With the overshooting model, an unexpected increase in the domestic money supply leaves domestic prices unchanged, domestic currency depreciates by more than 1%, while domestic interest rates fall (below world levels) because of a domestic liquidity effect. An intermediate appreciation of domestic currency compensates international investors for the lower domestic interest rate.

9. Can the monetarist model predict changes in the real exchange rate?

The pure monetarist model would not predict any changes in the real exchange rate because the model predicts continuous purchasing power parity. The monetarist model could be modified to permit changes in real variables that would lead to a real exchange rate change.
10. "According to the monetarist model, a rise in the domestic interest rate will result in a fall in the domestic currency." True or false. Explain.

11. "According to the monetarist model, a rise in domestic real income will create added demand for domestic money, thus provoking a rise in the price of domestic currency." True or false. Explain.

True. A rise in domestic real income increases the transaction demand for real money balances. One channel to satisfy this increase in demand is through a domestic currency appreciation.

12. What is the difference between in-sample and post-sample testing of foreign exchange models?

In-sample testing involves fitting a regression model to a body of data, and checking whether the hypothesized values of the regression coefficients are as expected, and whether the model adequately explains the variability in this sample of exchange rates. Post-sample testing involves taking the estimated coefficients from an in-sample period, and using them to make exchange rate predictions on a fresh set of data -- usually a later, "post-sample," time period.

13. From the experience of the 1970s and 1980s, we know that exchange rates can be highly volatile. Does this experience suggest that economic factors are not related to exchange rate behavior?

Economic models of exchange rates, where $S = f(X)$ is such a model, theorize that volatility in $S$ is directly related to volatility in $X$. Thus exchange rates may be volatile because underlying economic variables are volatile. Moreover, models like the overshooting model, show that exchange rate volatility may be greater still when some prices in the economy are sticky and the exchange rate must "over-respond" to produce a short-term equilibrium.

14. Define the term "speculative bubble." Explain how a speculative bubble could develop in the foreign exchange market.
15. How would you devise a governmental policy of communication to the markets to avoid extreme volatility in the foreign exchange market?

Exchange rates are volatile in part because of volatile underlying conditions, and in part because policy "surprises" (unanticipated news announcements) contribute to volatility -- especially in a world with sticky goods prices and exchange rate overshooting. Government policies that limit the volatility in underlying variables and reduce policy surprises should contribute to lower exchange rate volatility.