

ESSAYS IN INTERNATIONAL FINANCE

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THE NATURE AND EFFICIENCY  
OF THE  
FOREIGN EXCHANGE MARKET

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INTERNATIONAL FINANCE SECTION

DEPARTMENT OF ECONOMICS

PRINCETON UNIVERSITY

Princeton, New Jersey

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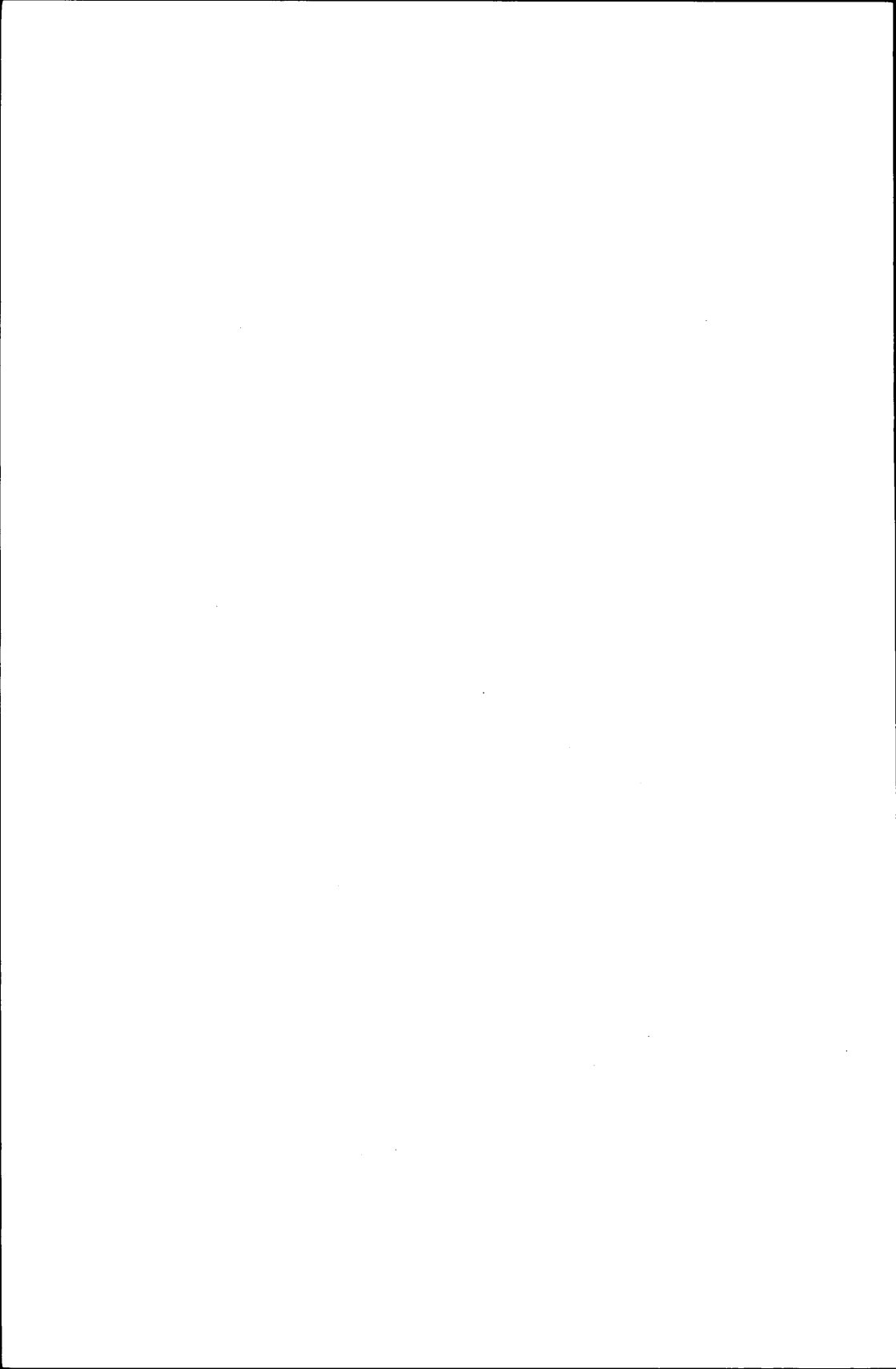


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# THE NATURE AND EFFICIENCY OF THE FOREIGN EXCHANGE MARKET

## I. THE SCOPE AND SIGNIFICANCE OF THIS STUDY

ONE of the most important and least understood markets is the foreign-exchange market. Through this institution, residents of different currency areas are enabled to trade with one another, and invest in one another's assets. Despite Great Britain's dependence upon international trade and London's historic role as banker for the world, the Radcliffe Committee hearings indicated that many economists and bankers do not fully understand the nature of the foreign-exchange market. The Committee was led to ask: "How well organized is the forward-exchange market? Can we hear more about who is engaged in the market? Whom does it comprise?" The answers to these questions left much to be desired.

The Bank of England has varied the Bank Rate to affect, among other things, movements of short-term capital. Nevertheless, the Committee discovered that the Bank does not know the impact of Bank Rate policy upon the foreign-exchange market and upon the international movement of short-term capital.\*

Concern is being shown over the adequacy of the international monetary reserves of the United States relative to its short-term liabilities. As a result of gold outflows, the gold reserves of the United States are \$16.5 billion (as of the end of May 1962), whereas its short-term liabilities to foreign countries exceed \$18.9 billion. Since the dollar is a key-currency, the low ratio of gold to short-term liabilities has been viewed with apprehension. Were a downward trend in this ratio to continue, many believe that foreign confidence in the dollar would be weakened and a serious financial crisis would occur.

One method of coping with the problem of international reserves would be to eliminate the need for official reserves, by leaving the foreign-exchange market free to equilibrate the demand and supply of foreign exchange. Central banks and official stabilization funds would abdicate in favor of private enterprise.

\* Committee on the Working of the Monetary System, Minutes of Evidence (London: HMSO, 1960) para. 3215-19 and 1479-90.

This proposal has found little favor with economists, and still less with members of the New York financial community. While the latter called a system of floating rates "a trader's paradise," many thought that such a system was socially undesirable. They maintain that a foreign-exchange market completely free from government stabilization cannot be relied upon as the sole source of cushioning for current-account disequilibria. The Radcliffe Committee considered that experience between 1914 and 1925, and again between 1931 and 1939, had been sufficient to demonstrate the "inconvenience of a fluctuating pound." Many claim that the recent Canadian experience is inconclusive as a demonstration of the successful operation of a completely free market, since the central bank was in the market constantly to absorb the excess supplies and demands of U.S. dollars. On the other hand, there was little intervention in the Canadian-sterling market, for this rate was highly volatile. For example, the price of sterling ranged from C \$2.71-11/16 to C \$2.75½ during the period January 27, 1959 to February 13, 1959. From March 28, 1959 to May 26, 1959 the price ranged from C \$2.69-15/6 to C \$2.72-5/8. Numerous other similar instances can be cited. These marked price fluctuations suggest that more evidence is required before one may assert that a completely free exchange market is superior to a stabilized exchange market.

The small group of economists who favor a free exchange market adduce *a priori* reasoning to support their claim that a free market would efficiently cushion temporary current-account disequilibria. This group claims that "positive speculators' profits imply that they have stabilized the price."\* Destabilizing actions by speculators are said to imply that they have lost money. Insofar as their operations are profitable, it is claimed that they have been a stabilizing influence. No evidence has been adduced by this group to show whether or not "speculators" did in fact make money. Moreover, the argument concerning the relation between stability and profitability has been shown to be incorrect, in the institutional context of the contemporary exchange market. When there is trading in both spot and forward exchange, and only the spot price is stabilized by the exchange authority, speculators can destabilize the price and yet make money.

Although little is known about the nature of the foreign-exchange market, each group in the dispute holds its position with great confidence. The members of the first group glanced at economic history casually, and found large price movements during a period of free exchange

\* Lester G. Telser, "A Theory of Speculation Relating Profitability and Stability," *The Review of Economics and Statistics*, Vol. XLI (August 1959); Milton Friedman, "The Case for Flexible Exchange Rates," in *Essays in Positive Economics* (Chicago 1953), pp. 157-203.

markets. But these financial experts and economists failed to examine the question of cause and effect. Did the free exchange market unsettle an otherwise stable system; or did the era of a free market coincide with a period of great instability in the balance of payments? If the exchange markets had been stabilized during this period, what would have happened to the international reserves of the various countries? Could stabilized rates have been held at their prewar levels during the period 1919-1925? None of these questions has even been raised by the opponents of free exchange markets. On the other hand, the members of the second group failed to adduce any evidence that the activity of risk-bearers in a free exchange market is such as to avoid excessively large price fluctuations that result from random variations in the balance of payments, i.e., that result when the market has confidence in the stability of the current set of exchange rates. This is an empirical question, and the proponents of free markets have neglected to examine it adequately.

Recently, the U.S. Treasury, acting through the Federal Reserve Bank of New York, has intervened in the forward-exchange market. With the cooperation of the Bundesbank, it has sold D-mark futures, and with the cooperation of the Swiss National Bank it has sold Swiss francs forward, to reduce the forward premia. At the time, the President of the New York Federal Reserve Bank said operations in other European currencies were being considered in order to further strengthen central bank defenses against speculative capital movements.

Efficient intervention presupposes a thorough knowledge of the system of interrelationships known as the foreign-exchange market. Otherwise, the indirect effects of a given policy may run counter to the objectives of the policymakers.

The present essay is devoted to a study of the interrelationships among the participants in the foreign-exchange market. In Section II, we discuss the functions of the foreign-exchange market, and present a general view of the roles of professional risk-bearers, interest-arbitrageurs, borrowers who hedge their foreign-exchange liabilities and speculators. Section III gives a detailed examination of the methods of operation of professional risk-bearers and interest-arbitrageurs in the contemporary foreign-exchange market; the complexities of the market are explicitly considered in this section. Section IV explains the reactions of the foreign-exchange market to current and to anticipated disturbances. There is one pattern of price behavior that results from random variations in the balance of payments; and a different pattern of price behavior that results when the market thinks that changes in the exchange rates will occur in the near future. An examination of the

data enables us to infer the nature of the disturbance: whether it was based upon random or anticipated fluctuations in the balance of payments. Finally, the price relationships that prevailed during recent speculative periods are shown to be compatible with the analysis developed in Section IV. The appendix utilizes the techniques developed in the previous section to answer the question: can professional risk-bearers forecast price in an exchange market which is completely free from central-bank intervention? For this purpose, the free sterling-dollar market from 1921-1925 is examined. We conclude that they were, indeed, able to forecast price and succeeded in making profits.



## II. THE FUNCTIONS OF A FOREIGN-EXCHANGE MARKET

### A. *The Efficiency of a Foreign-Exchange Market*

ALTHOUGH the basic balance of payments may be in equilibrium\* over the year as a whole, at a given exchange rate, it is unlikely that the balance will be in equilibrium every day, week or month. The balance on current account varies during the year from a surplus to a deficit, particularly in countries producing primary products. In the United States, for example, the balance on current account during 1959 was \$172 million; but there were surpluses in the first and last quarters, and deficits in the second and third quarters, of the year. A foreign-exchange market which results in a situation whereby the basic balance is in equilibrium at every quarter, month, week, or day is an inefficient market. An analogy can be made between the fluctuations in the net supply of wheat and in the net supply of foreign exchange. Wheat is harvested a few times during the year. It is socially desirable that the consumption of wheat, or foreign exchange which is simply a command over imports, be spread out over the year. This spreading (or smoothing) out can only occur if there are institutions willing to sell foreign exchange during periods of shortage and buy foreign exchange during periods of surplus. A period of shortage occurs when our basic balance tends to be negative; and a period of surplus occurs when our basic balance tends to be positive. An efficient market exists if there are institutions willing to buy and sell foreign exchange for, and from, inventory during these periods. In effect, these institutions invest in foreign exchange during periods of surplus and disinvest during periods of shortage. Through variations in the inventories of these private institutions, i.e., the short-term capital account,† the supply and demand for foreign exchange will be equal every day, although the basic balance may be in equilibrium only over the year as a whole.

A year is an arbitrary period of time. At a given exchange rate, the

\* The basic balance of payments is the sum of the current-account balance plus the long-term capital account plus unilateral transfers. The term equilibrium has many meanings, especially in the balance-of-payments literature. In the present chapter it is used to mean that the sum of surpluses and deficits over a given period of time is equal to zero.

† The short-term capital account refers to the *private* sector's *net* change in short-term claims against foreigners. The sum of the short-term capital account plus the net change in *official* claims against foreigners is identically equal to the basic balance. Since the analysis here is devoted exclusively to the private sectors, variations in the official or government claims against foreigners are excluded from the present analysis of how the foreign-exchange market operates.

basic balance may be in equilibrium over the current year. Suppose that a shortage or a surplus of foreign exchange is anticipated for the following year. An efficient exchange market should induce the economy to prepare for future shortages or surpluses. If a shortage is anticipated, the economy should be induced to accumulate foreign exchange at present: i.e., to export short-term capital. On the other hand, if a surplus is foreseen, the economy should be induced to borrow (import) short-term capital during the current period. Again, an analogy can be made with wheat production. If a wheat shortage is expected, the economy should be induced to accumulate wheat inventories. That is, current production should exceed current consumption. On the other hand, if a surplus of wheat is expected, current consumption should exceed current production and wheat inventories (if they exist) should be reduced.

An efficient foreign-exchange market cannot exist unless there are institutions which can be induced to accumulate foreign exchange during periods when there is a surplus in our basic balance, and decumulate stocks of foreign exchange during periods when there is a shortage in our basic balance. The terms "surplus period" and "shortage period" refer to a longer period of time, over which the basic balance is zero.

The institutions which can be induced to import or export short-term capital occupy a crucial role in determining the efficiency of the foreign-exchange market. A general and simplified discussion of the variables which influence their behavior is the subject of this section. The phenomena of interest arbitrage, the switching of finance with the exchange risk covered, speculation in foreign exchange and the necessity of a set of professional risk-bearers are explained. The simple rules and conclusions presented here are modified in the next section to correspond more accurately to the complex world of our experience.

### *B. Short-Term Investment and Borrowing*

I. RISK-AVOIDING SHORT-TERM INVESTORS. Many institutions which invest in domestic Treasury bills and other domestic short-term securities can be induced to invest in foreign Treasury bills and other foreign short-term securities, and vice-versa. A comparison of the relative rates of return on domestic and foreign assets is one of the key considerations involved in the selection of an efficient portfolio. Suppose that the investor firmly expects to hold the bill until its maturity three months later. The expected return on an investment of \$1 in U.S. Treasury bills is \$1 multiplied by the Treasury-bill rate. The expected return on \$1 invested in U. K. Treasury bills is not necessarily \$1 multiplied by the U. K. Treasury-bill rate. There is no certainty that the American investor will be able to sell his sterling for the same price at

which it was purchased. Whenever there is uncertainty concerning the rate of exchange, the expected return on foreign investment is not necessarily the same as the foreign-interest rate.

Whenever forward markets exist, the risks of exchange-rate fluctuations can be reduced by shifting them to the professional risk-bearers. The investor in U. K. Treasury bills can get a quotation on a *swap* from a professional risk-bearer. The *swap* is a simultaneous purchase and sale of foreign exchange of different maturities, entered into with a given party. Thus the investor may be told, on March 28, 1962, that he can buy pounds for \$2.81-3/4 and that he can sell his pounds three months later for \$2.80-1/8. The investor could contract a current (spot) purchase and a forward sale of pounds, on that date, at a cost of 2.307 per cent per annum. A potential short-term investor would compare the Treasury-bill rates in the two countries with the cost of the swap, to determine relative returns on comparable assets. His expected return on a U. K. Treasury bill held to maturity would be equal to the U. K. Treasury-bill rate less the cost of the swap (2.307 per cent). It is this rate of return, with the exchange risk covered, that can properly be compared with the rate of return on a U.S. Treasury bill. Whenever the foreign-interest differential (i.e., the foreign rate less the U.S. rate) exceeds the cost of the swap, the rate of return on a foreign asset held to maturity exceeds the rate of return on a domestic asset held to maturity. Thereby an outflow of short-term capital is induced; that is, Americans are induced to accumulate interest-yielding foreign exchange.

On the other hand, when the foreign-interest differential is less than the cost of the swap, an inflow of short-term capital is induced. For example, if on March 28, 1962, the U. K. Treasury-bill rate was 4.5 per cent and the U. S. Treasury-bill rate was 2.7 per cent, the expected return on a U. S. Treasury bill to maturity exceeded the return on a U. K. Treasury bill held to maturity, with the exchange risk covered. An institution which owns, or has access to, pounds could do the following on March 28, 1962: (i) buy dollars for pounds; (ii) invest in U. S. Treasury bills; and (iii) sell the dollars forward for pounds, to be delivered in three months. It would earn 2.7 per cent on the Treasury bills and 2.307 per cent on the swap, for a total of 5.007 per cent. This exceeds the 4.5 per cent return that it could earn on U. K. Treasury bills held to maturity; and it would have pounds at the end of three months for use in its main business. In this situation, an English branch of the American concern is induced to decumulate pounds, and an English concern is induced to supply pounds in the present.

Interest arbitrage is the phenomenon whereby firms tend to invest

abroad with the exchange risk covered with a forward sale of the currency. The institutions engaged in this form of investment, the interest-arbitrageurs, are risk-avoiders.

2. RISK-AVOIDING SHORT-TERM BORROWERS. The same variables which induce short-term investors to invest in (say) New York, rather than in London, induce certain firms to borrow short-term funds in London rather than in New York. The choice among alternative sources of finance, with the exchange risk covered, is the dual to interest arbitrage discussed above. Its effects are exactly the same as those of interest arbitrage.

An American concern in need of funds for (say) three months may command such an outstanding international reputation that it can borrow as easily in London as it can in New York. Most likely, it will have branches in all major money markets. The prime-commercial-paper rate in New York may be 3.25 per cent per annum, and in London it may be 4.63 per cent per annum. If the concern in question borrows in London, its expected cost in dollars is uncertain if it sells the borrowed sterling for dollars, and fails to protect itself against the exchange risk. When the loan has to be repaid, the price of sterling may have risen above, or have fallen below, the price at which the borrowed sterling was originally purchased. The borrowing concern, if it chooses, can reduce the exchange risk by comparing the costs of borrowing in London and in New York with the exchange risks covered.

To borrow in London the firm must pay 4.63 per cent per annum. If the sterling is sold for dollars and simultaneously repurchased for delivery in three months, the firm will make 2.307 per cent per annum (given the rates quoted in section A above). Its net borrowing cost would be 2.323 per cent ( $4.63 - 2.307$  per cent) per annum. On the other hand, if it borrowed in New York its cost would be 3.25 per cent per annum. The foreign-interest differential of 1.38 per cent ( $4.63 - 3.25$  per cent) is less than the discount on the forward pound of 2.307 per cent. Hence, if the debt will be repaid at maturity, it is cheaper to borrow abroad with the exchange risk covered than it is to borrow at home. Thereby a supply of pounds is produced in the foreign-exchange market.

Whenever an inflow of funds into the United States is induced as a result of interest arbitrage, American firms are induced to borrow abroad rather than at home. This increases the supply of (spot) foreign exchange offered in the market. Foreign firms are discouraged from borrowing in New York and, as a result, the demand for foreign exchange is reduced. Conversely, whenever an outflow of funds from