FLOATING EXCHANGE RATES AND U.S. COMPETITIVENESS

Investigation No. 332-124
Under Section 332
of the Tariff Act of 1930

USITC PUBLICATION 1332

DECEMBER 1982

United States International Trade Commission / Washington, D.C. 20436

UNITED STATES INTERNATIONAL TRADE COMMISSION

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EXECUTIVE SUMMARY

In an uncomplicated world, exchange rates would change only to keep a rough parity between national price levels. In the complicated real world, however, exchange rates are constantly changing and can deviate significantly from the values that equate national price levels. The purpose of this study is to explain the behavior of floating exchange rates and to examine the effect of changes in the value of the dollar on the international competitiveness of U.S. products.

Exchange rates can be fixed, or they can be allowed to float; the past century has seen years when each has prevailed. From 1870 to 1914, most currencies of the world were pegged either to gold or to a currency that was pegged to gold (usually the British pound). Most countries kept their exchange rates completely fixed throughout this period by making the preservation of the exchange rate the most important concern of domestic economic policy. The outbreak of World War I brought this era of the gold standard to an abrupt end; the gold standard was not reinstituted until after the war.

The financial chaos during the Great Depression led to major shifts in international gold flows and caused several countries, including the United Kingdom, to abandon the gold standard once again. A period of international cooperation began in 1936, but that period was short-lived because of the imposition of exchange controls during World War II.

In 1944 the Bretton Woods system was developed, under which all foreign currencies were pegged to the dollar or to currencies that were pegged to the dollar. This system worked reasonably well for a number of years, but rising U.S. balance-of-payments deficits forced the system to be abandoned in 1971 despite formal and informal restrictions on the convertibility of dollars into gold. An effort was made to revive the system in late 1971, but this effort collapsed in March 1973.

The present system of exchange rates is really a hybrid system. As of September 1982, 37 currencies were pegged to the U.S. dollar; 13, to the French franc; and 5, to other currencies. Thirty-nine currencies were pegged to a weighted basket of major currencies; four currencies were on a crawling peg system; and eight European Community currencies had a common float. The currencies of nonmarket economy countries do not have formal exchange rates. Most of the remainder of the countries of the world allow their currencies to float.

The great advantage of floating exchange rates is that the exchange rate adjusts to equilibrate a country's balance of payments. Domestic economic policy can be used to promote full employment or to maintain stable prices. A disadvantage of floating exchange rates is that the uncertainty of future exchange rates can create exchange risks they may impede international trade. Under fixed exchange rates, future exchange rates are known, but domestic economic policy must be geared to keeping the exchange rate constant.

Economists have several theories to explain how exchange rates are determined. The purchasing-power-parity theory is one of the most popular, simple, and durable explanations of exchange-rate movements. This theory holds that currencies are valued for what they will buy. Although it has great intuitive appeal, numerous studies have found that purchasing power parity does not hold, at least in the short run. The purchasing-power-parity theory is a useful tool, however, because it identifies divergent rates of inflation as an important source of exchange-rate movements.

Two other theories, the elasticities approach and the monetary approach, were unable to explain large deviations from purchasing power parity and the erratic behavior of exchange rates in the absence of significant monetary changes or changes in the real flow of goods and services.

The portfolio-balance theory has become the most popular explanation of exchange-rate movements. This theory assumes that the spot exchange rate is determined by the flow of short-term securities in the asset market and that the long-run exchange rate is determined by stock changes caused by current-account imbalances. Short-term assets are assumed to move between countries because of differences in real exchange rates and differences in perceived risk.

Expectations play a large role in determining exchange rates in the portfolio-balance theory. Changes in exchange-rate expectations can change the expected return on investments and the composition of investor portfolios when investors react to these changes. Recently, the most important cause of large changes in exchange-rate expectations has been unpredictable movements of the money stock.

An appreciation of the U.S. dollar puts U.S. exporters at a disadvantage in world markets and forces domestic producers to compete with cheaper imports. In 1971, for the first time since 1873, the United States had a merchandise-trade deficit. Since 1971, the merchandise-trade balance has been in surplus in only 2 years. Despite the large recent deficits, the U.S. current-account balance has tended to fluctuate around zero, because of the strong performance of the services account.

Generally, prices of homogeneous products are affected more by exchange-rate changes than are prices of heterogeneous products. The market-clearing prices of homogeneous goods are often determined in a single currency and at a single location; prices in other locations are derived from these prices by taking exchange rates and transportation costs into account. The prices of heterogeneous goods are generally determined on a case-by-case basis and hence are less likely to show the full effects of exchange-rate changes.

Bilateral trade balances have generally responded to movements in bilateral exchange rates for the United States with Canada and the United Kingdom. Changes in the U.S. trade balance with Japan, however, have generally preceded changes in the yen/dollar exchange rate. Also, changes in the trade balance with West Germany have at times responded to changes in the deutsche mark/dollar exchange rate.

An econometric model was used to test the validity of the portfolio-balance theory. The conclusions from this empirical work do not completely validate the theory, but neither do they cause us to reject it. These somewhat ambiguous results are consistent with results found in other studies.

INTRODUCTION

In an uncomplicated world, exchange rates would change only to keep a rough parity between national price levels. Each country's most efficient industries would enjoy a clear price advantage abroad, whereas its least efficient industries would be under continuous pressure from imports. In such a world, businessmen, workers, and public officials could make decisions with a clearer understanding of the competitive status of any particular industry.

In the complicated real world, however, exchange rates are constantly changing and can deviate significantly from the values that equate national price levels. The effect of these deviations is to greatly complicate the tasks of all who must make decisions on the basis of the competitiveness of particular industries.

The purpose of this study is to explain the behavior of floating exchange rates and to examine the effect of changes in the value of the dollar on the international competitiveness of U.S. products. To supplement these discussions, this study examines how exchange rates are determined.

BACKGROUND

An exchange rate is the price of one currency in terms of another currency. A separate exchange rate exists for each pair of independent national currencies, e.g., the dollar and the yen, and the yen and the mark. Much like the price of any other product, an exchange rate is determined by the interaction of supply and demand in organized markets. Organized foreign-exchange markets exist in most major cities of the world and are closely linked by telephone and telex. Arbitrage, the simultaneous purchase and sale of the same foreign currency in different markets to profit from unequal prices, ensures that exchange rates are the same in all markets.

The supply of a particular currency comes from holders of this currency who wish to purchase goods, services, and financial assets denominated in the currency of another country. Similarly, the demand for this currency comes from holders of foreign currencies who wish to purchase goods, services, and financial assets denominated in this currency.

Many economic and noneconomic factors are involved in this interaction of supply and demand. Although economists can only partially explain the complex process that determines exchange rates, an understanding of the main relationships underlying how exchange rates are determined can be obtained.

Before looking into the reasons for exchange-rate movements, some background material is needed. The institutions affecting exchange rates and the recent history of these rates are discussed because such knowledge contributes greatly to a thorough understanding of exchange rates.

Exchange Rates

Exchange rates can be expressed in two ways. The first gives the number of units of foreign currency, say the British pound, that can be bought with one unit of domestic currency, say the U.S. dollar. On November 12, 1982, this ratio was 0.6039; that is, a dollar on this day would buy 0.6039 pound. The second gives the number of units of domestic currency needed to buy one unit of foreign currency. On November 12 this ratio was 1.6560; it would take 1.6560 dollars to buy one British pound. By definition, the second ratio is the reciprocal of the first. To prevent confusion, only the first method of reporting exchange rates will be used in this paper. This means that when the dollar depreciates, the exchange rate falls (i.e., the dollar can buy fewer British pounds than it did before the depreciation).

Describing the change in value of one currency vis-a-vis any other currency is simple. If the pound/dollar exchange rate were to move from 0.5 to 1.0, the dollar would appreciate 100 percent vis-a-vis the pound. 1/

Effective Exchange-Rate Indexes

Evaluating exchange-rate movements becomes more complex when one wants to consider many exchange-rate shifts at the same time. Because a currency can move in different directions and by different amounts against different currencies, the overall change is not clear. For example, if the dollar were to appreciate 25 percent against the mark, depreciate 10 percent against the pound, and appreciate 15 percent against the yen, what would be the change in the overall value of the dollar?

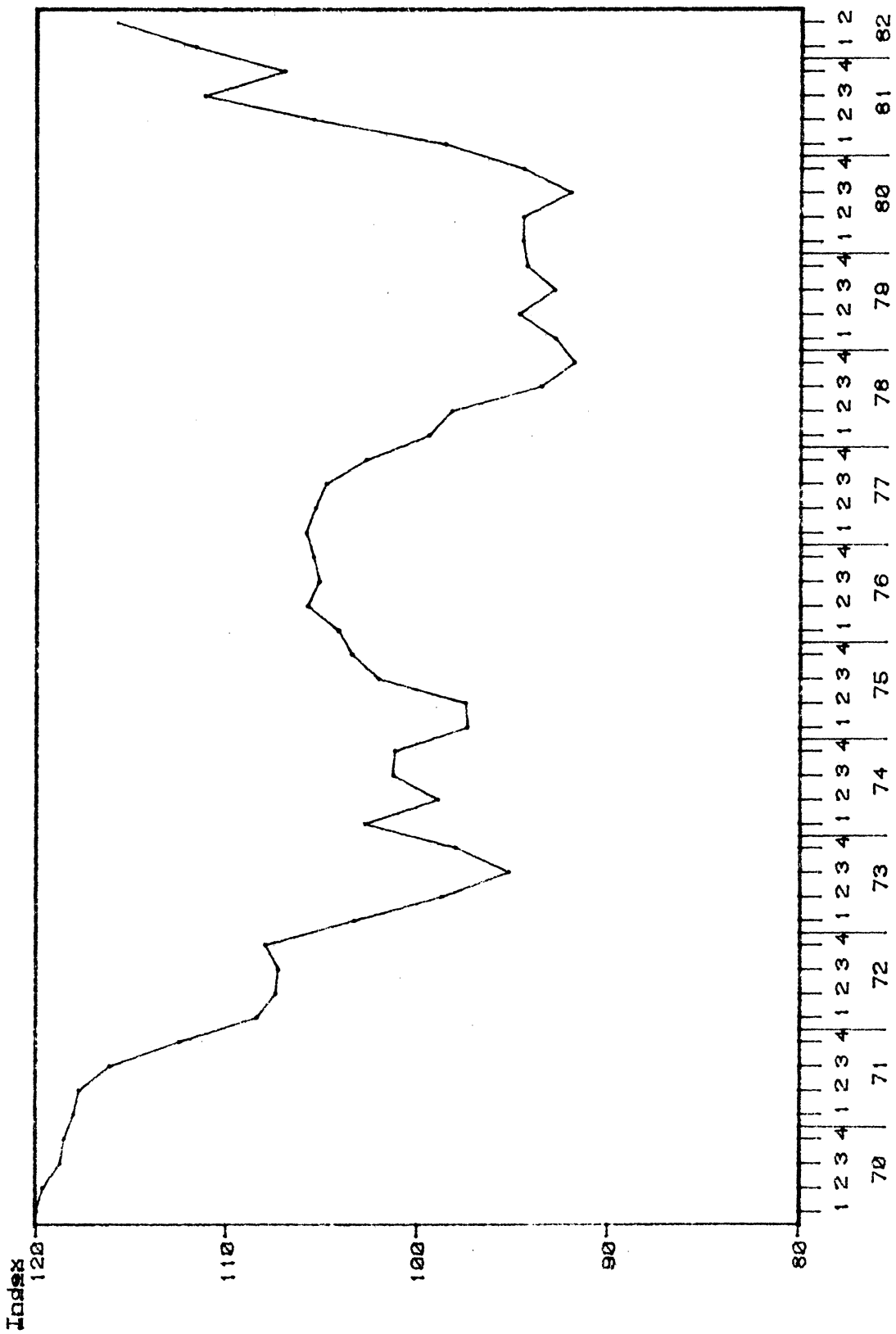
To express the change in the value of a currency against more than one currency, an average of bilateral changes must be used. The most common way to average bilateral exchange-rate changes is to weight them by bilateral merchandise-trade shares. For example, changes in the Canadian dollar/U.S. dollar exchange rate would be weighted by 0.47 in computing an effective exchange-rate index for the U.S. dollar because U.S. trade with Canada accounts for 47 percent of U.S. international merchandise trade.

A weighted average of bilateral exchange-rate indexes is called an effective exchange-rate index. It allows a set of bilateral exchange-rate changes to be described by a single measure. Figure 1 shows the movement of the U.S. effective exchange rate since 1970.

Effective exchange-rate indexes can vary in many ways: in the number of countries used to compute the averages, the base year used to determine the weights, and the transactions included in the trade definitions (exports, imports, total trade, total trade plus services, and so forth).

1/ Or, conversely, the pound would depreciate 50 percent vis-a-vis the dollar, from 2 dollars per pound to 1 dollar per pound.

FIGURE 1.--U.S. EFFECTIVE EXCHANGE-RATE INDEX (1975=100).



Source: Compiled from official statistics of the International Monetary Fund.

Different Exchange-Rate Regimes

Exchange rates can be fixed, or they can be allowed to float. Under a fixed system, the government declares a par value for its currency in terms of some other asset, such as another currency, a group of currencies, or gold. The government then ensures that the declared price remains the actual price by buying and selling its currency, when necessary, at the par value. With a floating system, free-market forces determine the exchange rates, which are constantly changing. Instances of a total and continuing government absence from exchange-rate intervention are rare.

In a fixed (or pegged) exchange-rate regime, an official increase in the value of a currency is called a revaluation. An official decrease in the value of a currency is called a devaluation.

Under a floating (or fluctuating) exchange-rate regime, when the value of a currency increases, the currency is said to have appreciated. When the value of the currency decreases, the currency is said to have depreciated.

Crawling peg

Because of the unsettling effects of sudden, sharp exchange-rate changes that take place under a pure fixed system, countries today usually make peg adjustments more frequently and more gradually than in the past. For example, Brazil currently has mini-devaluations that occur at least once a month. The name for such an exchange-rate regime is a crawling peg. By eliminating the severity and suddenness of large devaluations, this system reduces the uncertainties and risks facing participants in international transactions.

Managed float

The current floating exchange-rate regime that many countries are on is called a managed or dirty float. Under such a system, governments can intervene in the foreign-exchange markets to influence exchange-rate behavior without committing themselves to pegging exchange rates at particular levels. This system allows the authorities to stabilize short-term exchange-rate movements through carefully executed intervention.

Balance-of-Payments Accounting

To better understand the position of the dollar in international financial markets, and to set the stage for later discussion, a brief look into balance-of-payments accounting is necessary.

The balance-of-payments account shows the overall changes in a nation's international financial situation during a year. It is divided into four accounts.

Current account

The current account is probably the most important and most well-known of the four subdivisions in the balance of payments. It includes both tangible physical items (ordinary merchandise) and a number of intangible items

(services) such as insurance, tourism, shipping, and investment income. The United States had merchandise-trade surpluses from 1946 to 1970, but has had merchandise-trade deficits every year since 1976. The services balance has been in surplus for every year since 1959, largely because of the income that U.S. investors get from foreign investments.

Also included in the current account are unilateral transfers (gifts), which consist of foreign aid, the sending home of funds by immigrants, and the contributions of citizens to international charities. This item has been in deficit for the United States every year since World War II. Figures 2-4 show the U.S. current account, services, and trade balances since 1953.

A current-account surplus implies that a country is an international supplier of loanable funds because it has received more money than it has spent. This permits a country to build up its assets or to reduce its liabilities vis-a-vis the rest of the world. Conversely, a current-account deficit implies a shortage of loanable funds, a gap that has to be made up through foreign borrowing. A deficit nation will be a net demander of loanable funds in the international market.

Whether positive or negative, the current-account balance measures a country's balance of indebtedness. When the current-account balance is positive, domestic spending is less than the total national product. This implies that the remaining products are being sold to foreigners in exchange for new financial claims or liability reductions against them. When the current-account balance is negative, home-country spending exceeds the national product. This excess spending must be paid for by increasing the country's foreign liabilities.

Capital account

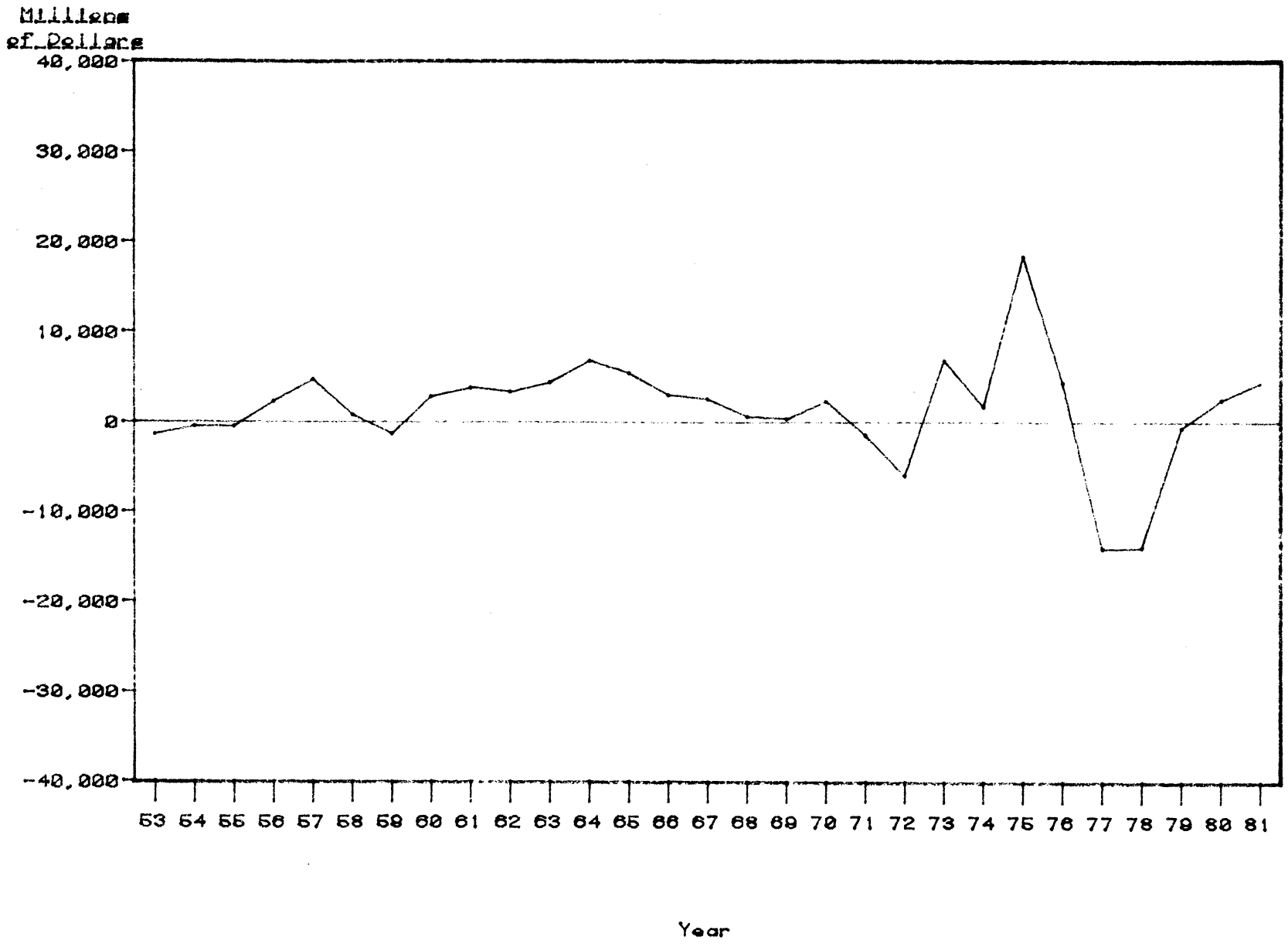
Another important account in the balance of payments is the capital account. The capital account contains strictly financial entries, both long and short term. Such items as acquisitions of foreign firms, international loans, and sales of foreign securities are included in this account. The United States has been in deficit in the capital account for 21 of the last 29 years. Figure 5 shows the U.S. capital-account balance since 1953.

Official reserve account

The official reserve account is a residual account in the balance of payments. This account shows changes in a government's foreign assets and liabilities. Under fixed exchange rates, these changes result primarily from exchange-market intervention, which influences exchange rates. Under floating exchange rates, this account balance is near zero because the government is not intervening in the foreign-exchange markets. The government is therefore neither gaining nor losing reserves.

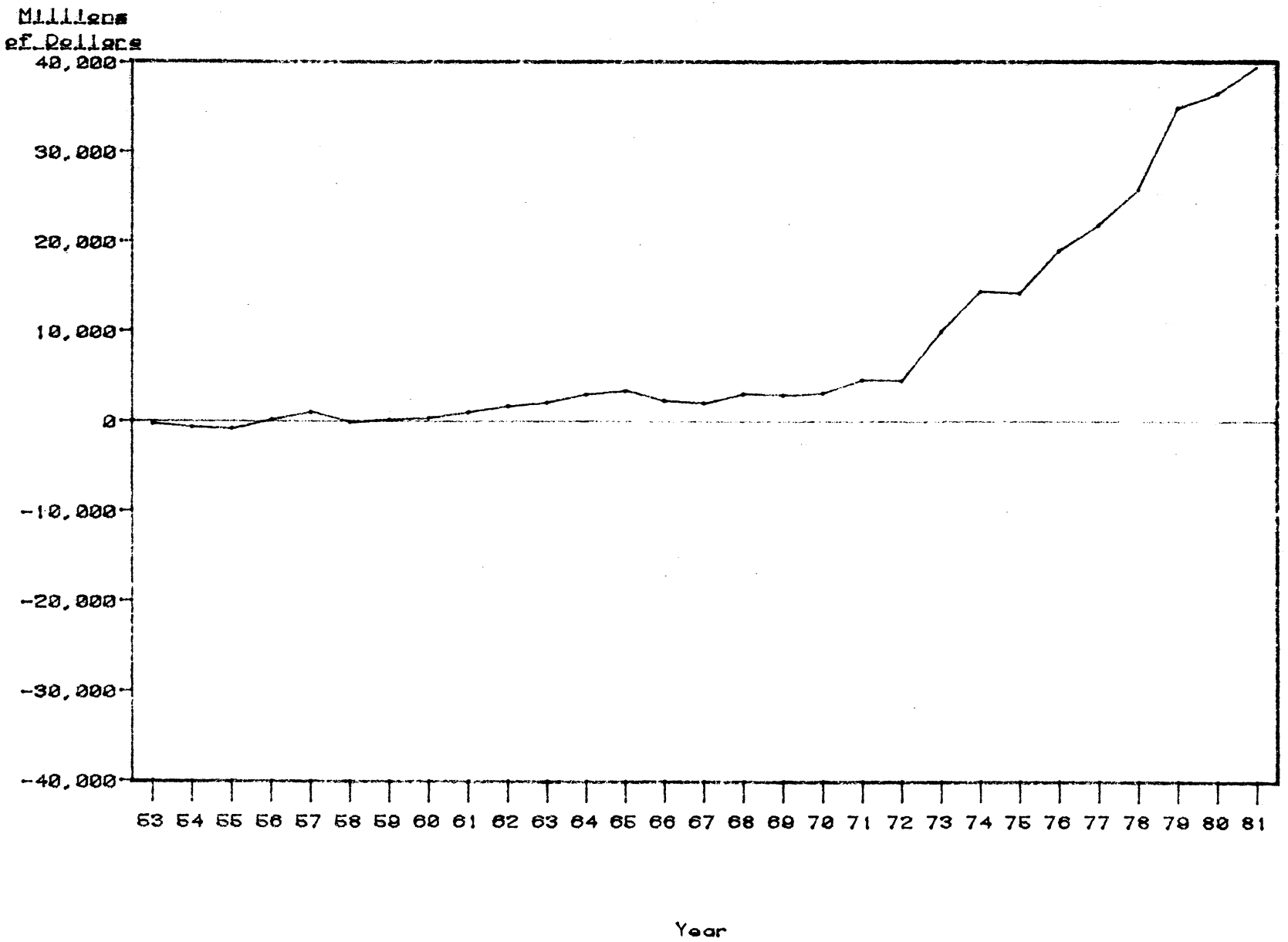
Under fixed exchange rates, reserve assets and government bonds are used to finance balance-of-payments deficits. In the case of a deficit, such financing can go on only as long as the reserve assets last or as long as foreign countries are willing to accept the IOU's of the deficit country. In the case of a surplus, such financing can go on as long as the surplus nation is willing to accumulate reserve assets and claims on foreign countries.

FIGURE 2.--U.S. CURRENT-ACCOUNT BALANCE.



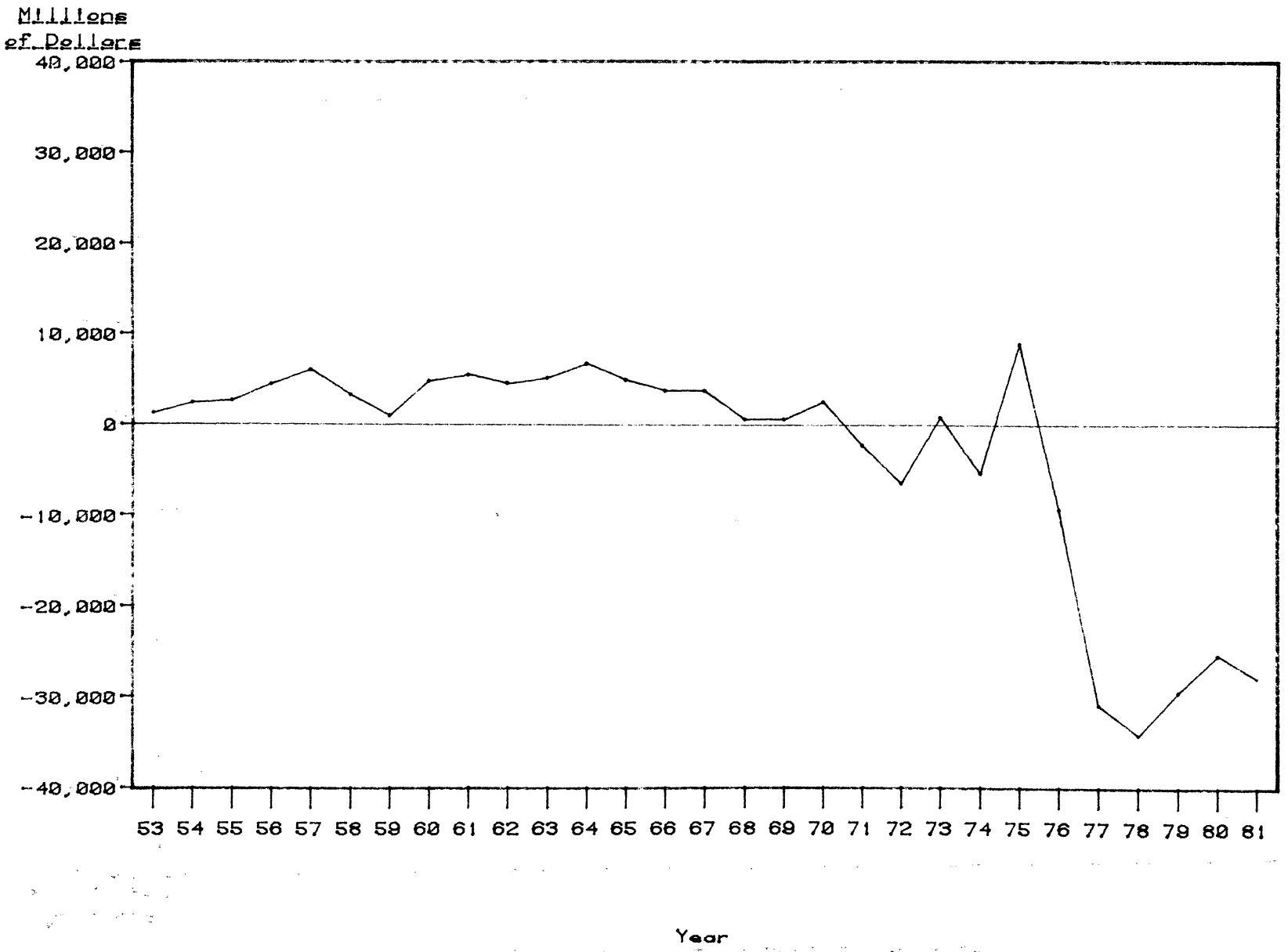
Source: Compiled from official statistics of the International Monetary Fund.

FIGURE 3.--U.S. SERVICES BALANCE.



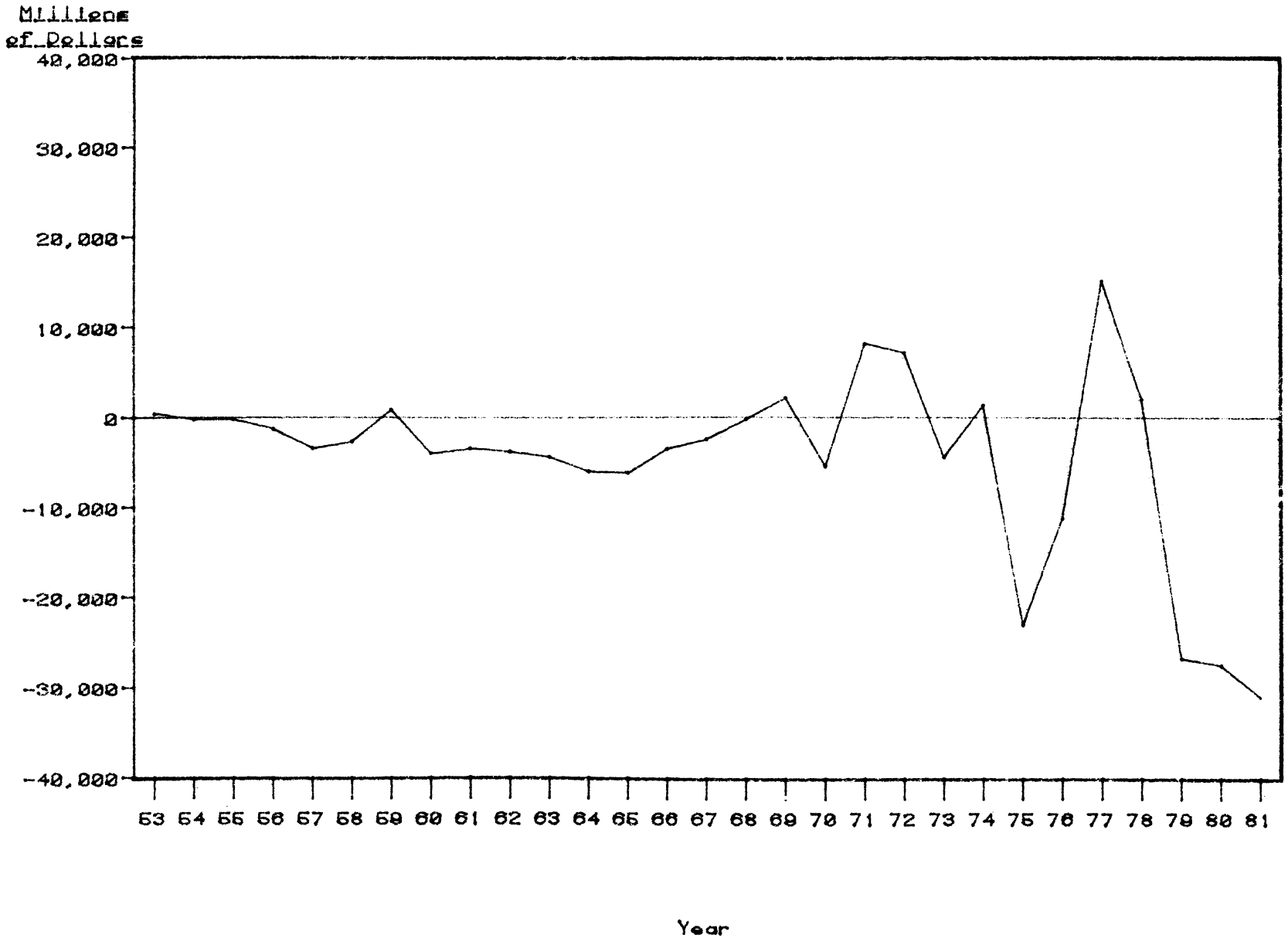
Source: Compiled from official statistics of the International Monetary Fund.

FIGURE 4.--U.S. MERCHANDISE-TRADE BALANCE.



Source: Compiled from official statistics of the International Monetary Fund.

FIGURE 5.--U.S. CAPITAL-ACCOUNT BALANCE.



Source: Compiled from official statistics of the International Monetary Fund.

Errors and omissions

The double-entry accounting system of the balance of payments means that in theory the balance of these three accounts should add to zero. In practice, however, inaccuracies occur in the reported data and leave an unexplained gap between total credits and total debits. This missing residual is offset through a special account called errors and omissions. This item ensures that the balance of payments will always be zero.

Because of this fourth account, a balance-of-payments surplus or deficit cannot exist, at least not in a literal sense. Yet statements about balance-of-payments surpluses and deficits are often made. Without specifying what is meant by a balance-of-payments surplus or deficit, the meaning of these statements is not clear. For example, reference to a balance-of-payments deficit could mean that the trade balance is negative, the current-account balance is negative, or the sum of the current and capital accounts is negative.

In this paper, the term "balance-of-payments deficit (surplus)" will mean that the sum of the current and capital accounts is negative (positive). This was the definition used in the days of fixed exchange rates, when the sum of these two accounts had to be offset by changes in a government's liabilities to foreigners.

Recent History of Exchange Rates

To place the current international financial scene in perspective, it is useful to look at the history of exchange rates over the past century, which has seen several different exchange-rate regimes.

The gold standard (1870-1914)

During the heyday of the gold standard, most currencies were pegged either to gold or to a currency that was pegged to gold (usually the British pound). Although minor countries occasionally devalued their currencies, the major countries kept their exchange rates completely fixed throughout this period. They did so by making the preservation of the exchange rate the most important concern of domestic economic policy; achieving full employment or smoothing business cycles were secondary concerns.

To maintain the price of gold in its own currency, a government directly linked the size of the domestic money stock to the size of the domestic monetary gold stock. Thus, when the gold stock increased, the money stock increased; when the gold stock decreased, the money stock decreased.

The fixed relationship between gold and the domestic money stock was theoretically at the center of all balance-of-payments adjustments. 1/ Under the gold standard, if a country was running a balance-of-payments surplus, it was receiving more foreign currency than it needed. Through the domestic central bank, this excess foreign currency was exchanged for gold by the foreign central bank. The result was that the domestic country had a larger gold stock and hence a larger money stock than before. The foreign country, meanwhile, had smaller gold and money stocks than before.

1/ Monetary policy was the primary instrument for manipulating the domestic economy in this period. Fiscal policies of any kind were not commonly used at this time.

The increase in the domestic money stock in the surplus country led to lower interest rates, increased investment and consumption spending, and higher prices. Lower interest rates led to capital outflows, and higher prices led to increased net imports. Capital outflows and increased net imports combined to ensure that the payments balance would ultimately be restored. Opposite adjustments took place in the deficit country to speed up the adjustment process. Thus, a disequilibrium in the balance of payments under the gold standard tended to correct itself.

During this period, adjustment was facilitated by the absence of trade unions. Their absence meant that wages could go down as well as up in response to market conditions. Because lower wages reduced costs, prices could fall in deficit countries. Without such price flexibility, the adjustment mechanism would have depended primarily on capital flows.

Although balance-of-payments deficits under the gold standard were understood to be automatically corrected by gold outflows, countries generally avoided experiencing gold outflows by adopting similar monetary policies. In addition, many countries raised interest rates to attract foreign capital, offset balance-of-payment deficits, and prevent gold outflows. The United Kingdom, which had the dominant currency of that time, the pound, was the major proponent of interest-rate adjustments because it held very low gold reserves. Therefore, although an automatic adjustment process existed, balance-of-payment deficits were usually corrected before the process had a chance to work.

The outbreak of World War I brought the gold standard era to an abrupt end. The ravages of war and the breakdown in monetary discipline during the war prevented the prewar system of fixed exchange rates from being resumed immediately after the war. Therefore, many currencies were allowed to float freely after the war.

The interwar float (1918-26)

The period of floating exchange rates lasted until the postwar economic situation had stabilized enough for the world to return to the gold standard. To help determine an appropriate exchange rate between currencies, the purchasing-power-parity theory was formalized. Applied to the postwar situation, this theory said that the new system of fixed exchange rates should reflect the changes in price levels since 1914. For example, if one country's price level had doubled since 1914 while all others' remained unchanged, that country's currency should be worth half its 1914 value. Most countries, however, ignored this theory and simply returned to their prewar parities to avoid the loss of national prestige associated with devaluing the national currency.

The interwar chaos (1926-39)

Restoring the gold standard resulted in the overvaluation of several important currencies, including the British pound. These overvaluations were not corrected by the normal balance-of-payments adjustments because the authorities in many countries did not want to expose their economies to

deliberate deflation or inflation. The United Kingdom tried to maintain its overvalued currency, and did succeed for a while, but only at the expense of high domestic unemployment.

The financial chaos during the Great Depression caused a sharp increase in the demand for gold because of increased hoarding. This led to major shifts in international gold flows and interfered with the operation of the gold standard. As a result, several countries were forced to abandon the gold standard because they were unable to sustain the large outflows of gold required to maintain parity. Even the British pound, which had been the most important currency in the world up to this time, went off the gold standard in September 1931. Although many nations, particularly Commonwealth nations, decided to peg to the pound, the majority, including the United States, remained on the gold standard. By going off the gold standard, the United Kingdom took a major step in reducing the international importance of the pound and in establishing the U.S. dollar as the most important currency in the world. 1/

To counteract the effects of the worldwide depression on domestic employment, many countries engaged in devaluation wars to encourage exports and discourage imports. Protectionist policies designed to limit foreign lending, foreign investment, and imports were also tried during these times. In retrospect, these beggar-thy-neighbor policies prevented any international effort to end the depression, and probably delayed the general economic recovery.

In 1936, a period of international cooperation developed when the United Kingdom, the United States, and France decided not to devalue their currencies without first consulting the other two. This period of cooperation was short-lived, however, because following the outbreak of World War II, most countries imposed exchange controls. 1/

The Bretton Woods era (1944-71)

Because the painful lessons of the 1930's were not lost on national leaders, a conference was held in July 1944 in Bretton Woods, New Hampshire to determine the nature of the international monetary system in the postwar era. Although many countries wanted to restore fixed exchange rates, they were no longer willing to make the maintenance of the exchange rate the primary concern of domestic economic policy; full employment would be the primary concern in the postwar era.

Two sister institutions emerged from this conference: the International Bank for Reconstruction and Development, now called the World Bank, which initially helped in European reconstruction and which now serves as an

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1/ Although the United States went off the gold standard in 1933, it went back on in 1934 after an official devaluation of 69 percent.

1/ During World War II, exchange rates lost much of their significance in determining the character of international trade. Trade among allies was determined not by comparative advantage and ability to pay, but by need. After all, the overriding goal of this time was to win the war, not to achieve a current-account surplus. As a result, exchange rates functioned largely as an intergovernmental accounting device.

instrument for financing economic development, and the International Monetary Fund, which develops and oversees the ground rules and code of behavior for the world financial system.

The international monetary system that emerged from this conference was a system of pegged exchange rates based on the golden dollar. Under this system, all foreign currencies were pegged to the U.S. dollar or to currencies that were pegged to the dollar. As a result, all currencies were indirectly convertible to all other currencies through the dollar. For its part, the United States agreed to sell gold to foreign central banks at the rate of $35 an ounce. Thus, the U.S. gold stock, which in 1946 accounted for about three-quarters of all Western monetary gold, in effect became the central gold reserve for the entire world.

Because the United States emerged from World War II as the strongest nation in the world, both militarily and economically, the dollar was given a unique role in the postwar international monetary system. The dollar was a strong currency--the strongest--and was readily accepted by other countries in trade. 1/ Because dollars could be invested in safe, interest-bearing assets such as U.S. Treasury bills, foreign central banks held both dollar-denominated assets and gold as reserves. The dollar became the currency that all countries wanted and was often used as payment in transactions that did not even involve the United States. 2/

As a small, technical concession to floating exchange rates, exchange rates were allowed to fluctuate within narrow limits around the pegged rate. Under the Bretton Woods system, exchange rates were permitted to fluctuate from 1 percent above to 1 percent below their fixed rates. For example, if the dollar price of the British pound was pegged at $2.40, the actual exchange rate could fluctuate between $2.38 and $2.42.

1/ A strong currency need not imply a strong economy. If unemployment is high and the economy in a recession, imports will tend to be low and a currency will tend to be strong. Conversely, if the economy is booming, imports will tend to be high and the currency weak. If the weakness of the currency is caused by an event such as high inflation, it does reflect an unsatisfactory performance of the economy. Each case must be assessed on its own merit. In the postwar era, the strength of the U.S. economy, which accounted for over 50 percent of world industrial production at the end of World War II, contributed greatly to the strength of the dollar.

2/ Studies by S. P. Magee and R. S. Rao, "Vehicle and Nonvehicle Currencies in International Trade," American Economic Review, vol. 70, No. 2, May 1980, pp. 368-373, and S. Grassman, "A Fundamental Symmetry in International Payment Patterns," Journal of International Economics, vol. 3, No. 2, May 1973, pp. 105-116, suggest that two-thirds of all international trade is invoiced in the exporter's home currency, one-fourth in the importer's home currency, and the remainder in the currency of a third country--usually the U.S. dollar. The role of the dollar as a third-country currency is thought to have declined significantly since the 1950's. This decline can be traced directly to the decline in the percentage of the world's output that the United States accounts for. In 1976, the United States accounted for 25 percent of the world's gross domestic output.

Unlike under the gold standard, currency devaluations were allowed under the Bretton Woods agreement. 1/ Because fixed exchange rates are hard to maintain over a number of years, a country was allowed to devalue its currency if it felt that it could no longer support its present exchange rate. Such devaluations were generally sudden and severe. Countries were also allowed to revalue their currencies. But because such an action would make their products less competitive in world markets, this was seldom done.

To keep its currency fixed vis-a-vis the dollar, each foreign central bank was required to buy or sell dollars in exchange for its own currency whenever its pegged rate was threatened. The dollar thus became the official intervention currency used by the central banks of the world. 2/ To prevent potential conflicts with other countries over the levels at which exchange rates should be pegged, the United States agreed to stay out of the foreign-exchange markets entirely.

During this era of pegged exchange rates, government intervention was necessary to keep exchange rates fixed. During the immediate postwar period, U.S. payments abroad generally exceeded U.S. receipts from abroad. Foreign central banks were thus acquiring the large holdings of dollars that they needed to intervene in the foreign-exchange markets. Because all currencies were pegged to the dollar, when any one country fixed its exchange rate in relation to the dollar, it simultaneously fixed its exchange rate vis-a-vis all other countries. Arbitragers assured that nondollar exchange rates would be consistent with dollar exchange rates.

Therefore, to preserve the fixed exchange-rate system, all countries needed large reserves of dollars. 3/ Only the dollar would do because it was the dollar that these other currencies were pegged to. Because all foreign currencies were pegged to the dollar, the value of the dollar in terms of these currencies was determined by the foreign monetary authorities. The United States could do nothing directly about the dollar's exchange rate.

1/ Under the gold standard, countries did not devalue their currencies. Although no penalty for devaluing existed, countries did not devalue their currencies because they were willing to allow their domestic economies to respond to external pressures. If a country had devalued its currency, it is possible that such an action might have weakened the framework of the gold standard and prompted other countries to devalue. This would have eliminated the discipline needed for the gold standard to work.

2/ An intervention currency is the currency that a country uses to affect the value of its own currency. For example, if the Australian Government believes that the Australian dollar is depreciating for no apparent reason, it might buy Australian dollars in the foreign-exchange market with U.S. dollars. This makes the U.S. dollar an intervention currency. Conversely, if Australia believes its currency is appreciating for no apparent reason, it might sell its dollars and buy U.S. dollars. Again the U.S. dollar would be an intervention currency. The U.S. dollar is often used as an intervention currency because of the large number of dollars outstanding. Adding or subtracting a few dollars from the foreign-exchange markets does not change the value of the dollar. However, central bank buying or selling of less widely held currencies, such as the Australian dollar, can affect the values of these other currencies a good deal. Almost by definition, an intervention currency is a reserve currency--to sell dollars, you must have dollars.

3/ Under a free float, governments do not need to keep reserves for the purpose of intervening in the foreign-exchange markets.

An important consequence of the passive role played by the United States in foreign-exchange markets was that the U.S. Government did not have direct control over the state of its balance of payments; as long as other countries succeeded in pegging their exchange rates at desired levels vis-a-vis the dollar, the state of the U.S. balance of payments was residually determined. Another way of looking at this is to realize that the sum of current-account balances for the world must equal zero. Because the United States could not directly affect the value of the dollar, the U.S. current-account balance was determined residually by the sum of the current-account surpluses and deficits of all other countries.

Thus, the U.S. dollar in the immediate postwar period had three roles that made it unique among the currencies of the world. First, it was used as a reserve currency. Second, it was used as an intervention currency. Finally, it was used as a transaction currency in deals that did not involve the United States. Although other currencies such as the West German deutsche mark and Japanese yen are sometimes used today in these roles, the U.S. dollar is still the main currency used for these special purposes.

Dollar shortage (1945-59).--In the years immediately following World War II, while war-torn countries were still reconstructing their economies, demand for U.S. exports was almost insatiable. Because the United States was by far the leading supplier of plant and equipment, the dollar was in great demand.

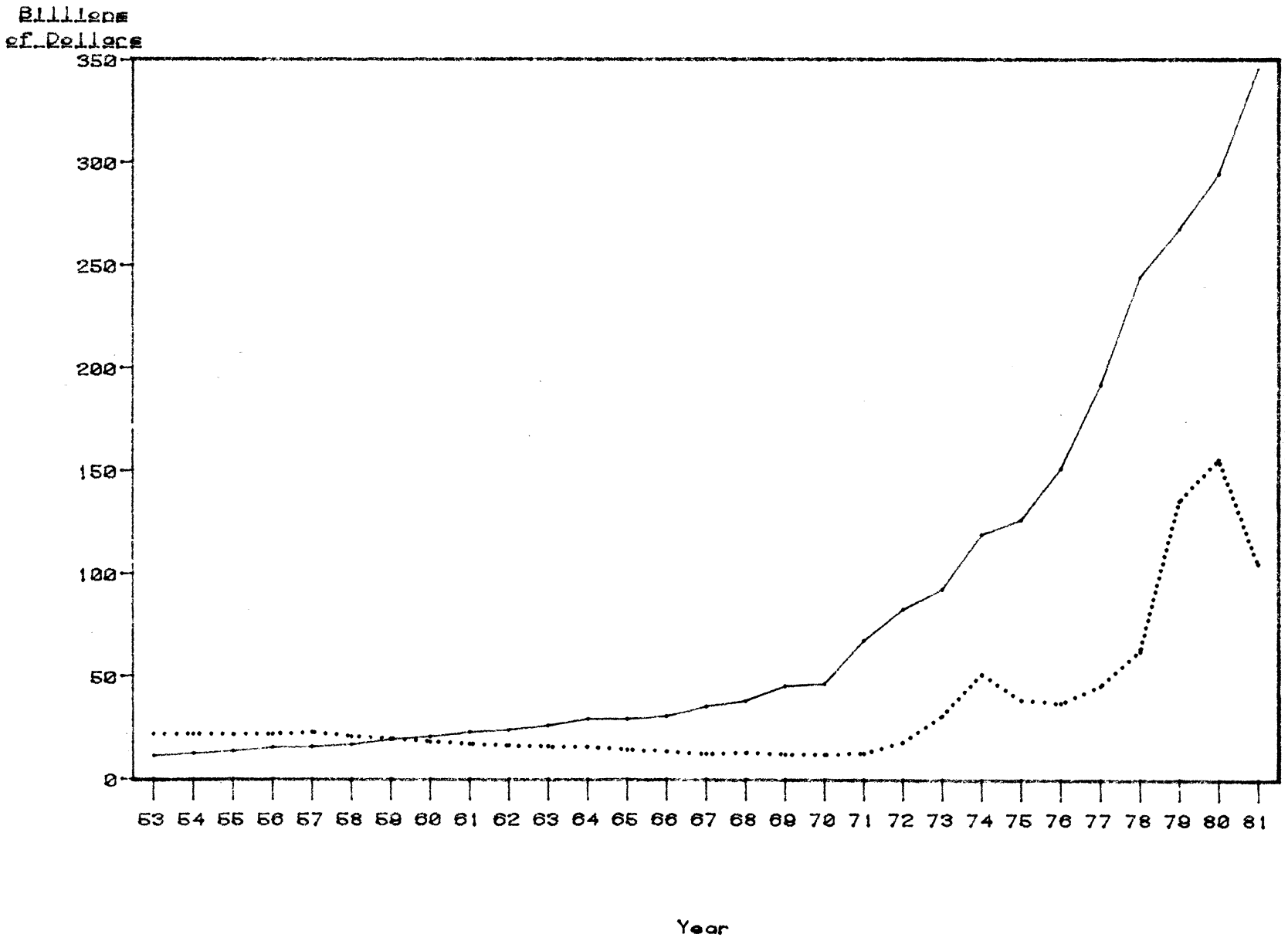
The United States was running trade-balance surpluses during this period. But because of rapidly growing capital outflows and steady increases in foreign aid, it was running balance-of-payments deficits. Other countries did not mind because their surpluses gave them the opportunity to accumulate reserves. These countries viewed accumulating reserves as saving for a day when they would have a balance-of-payments deficit.

By the end of 1959, several factors had led to an enormous increase in the dollar claims on the United States held by foreign banks. The recovery of productive capacity in other major industrial countries meant that the United States was no longer the sole supplier of many industrial goods and that its exports were no longer in great demand. Also, U.S. exports suffered a loss of competitiveness following the devaluation of the British pound and several other currencies in 1949 and because of the relatively high U.S. inflation rate during the Korean War years.

Dollar glut (1960-71).--Until 1960, deficits in the U.S. balance of payments were welcomed as beneficial to the rest of the world. U.S. deficits provided the rest of the world with tremendous amounts of liquidity in the form of both gold and claims on dollars. At the end of 1959, the value of the U.S. gold stock and the value of the outstanding liabilities of the U.S. Government were almost exactly equal. Figure 6 shows the market value of the U.S. gold stock and the outstanding liabilities of the U.S. Government.

The United States was able to run up large balance-of-payments deficits in the 1950's and 1960's because foreign countries were willing to increase their holdings of dollar-denominated assets. The role of the U.S. dollar as an intervention and reserve currency was responsible for this. The U.S. position was like that of a person who was able to write checks without having

FIGURE 6.--COMPARISON OF U.S. GOLD STOCK AND EXTERNAL LIABILITIES.



Source: Compiled from official statistics of the International Monetary Fund.

people cash them. Only the United States was able to run up such deficits; no other country could have done so because the rest of the world would not have been willing to accumulate assets denominated in that country's currency.

As U.S. gold reserves shrank and its liabilities to foreigners rose, however, the attitude of foreigners toward holding increasing amounts of U.S. dollars changed. When it became clear that the United States would not follow restrictive monetary and fiscal policies in an effort to end the deficits, countries started converting their excess holdings of dollars into gold.

The United States faced a dilemma. If it instituted restrictive monetary and fiscal policies to eliminate the deficit, the world would suffer an economic slowdown because of lower U.S. imports and an acute liquidity shortage. (The dollar accounted for about two-thirds of the world's expanding monetary reserves.) If, on the other hand, the United States allowed its foreign liabilities to grow, the number of dollars outstanding would far exceed the value of the U.S. gold stock. If countries decided to cash in their dollars for gold, the system would collapse, as it had in 1931; and if countries did not cash in their dollars, the world would be off the gold-dollar standard and on a straight dollar standard.

Under these circumstances, the exchange-rate system needed to be realined. Because of the dollar's unique role as the international standard of value and reserve currency, however, it could not be devalued easily. To overcome this problem, surplus countries such as West Germany and Japan should have revalued sharply. But pressures from domestic importers and exporters, which wanted to maintain their competitive positions in international markets, prevented large revaluations from occurring.

To slow the rapid increase in dollar claims against it, the United States restricted capital outflows in the mid-1960's. Despite this action, by 1968 the U.S. gold stock had fallen to $10.9 billion. Meanwhile, dollar claims on the United States had risen to $38.5 billion. Thus, claims potentially convertible into gold in 1968 amounted to more than 3 1/2 times the value of the remaining U.S. gold. In contrast, the U.S. gold stock in 1951 had been $22.9 billion and the claims on the United States had been $8.9 billion. Because of the huge imbalance between the U.S. gold stock and the claims on it, foreign banks informally agreed not to cash in their dollars for gold. This agreement bought the Bretton Woods system a little more time.

In the mid-1960's, the United States increased its spending on social programs at the same time that defense spending increased because of the Vietnam war. This led to a marked increase in the U.S. inflation rate and a sharp decline in the U.S. trade balance. To accommodate the costs of the new social programs and the war, the Federal Reserve greatly increased the growth rate of the money supply. When the increased money stock was spent on domestic goods, inflation increased; when it was spent on foreign goods, the trade balance fell. The rate of increase in Government spending had decreased somewhat by the early 1970's; however, the inflation rate had already become unbearably high (6 to 7 percent), and the U.S. current-account balance fell to its lowest level in years.

Faced with $67.8 billion in outstanding liabilities and with only $10.2 billion in gold, the United States finally gave up trying to play by the Bretton Woods rules.

On August 15, 1971, President Nixon formally announced that the United States would no longer redeem dollars for gold. This action, which was primarily symbolic, would have placed the world on a straight dollar standard if foreign central bankers had continued pegging to the dollar. To further encourage revaluation, the President imposed a 10-percent tariff surcharge on imports into the United States. This surcharge was to last until exchange-rate adjustments took place. As a result of this action, most major countries stopped pegging their currencies to the dollar and adopted a managed float. The 3-month period of freely floating exchange rates that followed resulted in an approximately 7-percent fall in the U.S. effective exchange rate.

Smithsonian agreement (December 1971-March 1973)

A new system of fixed exchange rates, established under the Smithsonian agreement in December 1971, resulted in an official devaluation of the U.S. dollar by an average of 9 percent. The United States, however, thought that a larger devaluation was necessary. Although pegged rates were reestablished under the Smithsonian agreement, the dollar remained inconvertible into gold.

The Smithsonian agreement was short-lived. Large current-account deficits, coupled with a lack of governmental support for the dollar in foreign-exchange markets, caused continued pressure on the dollar. This pressure led the United States to devalue the dollar by 11 percent in February 1973. But even this action was not enough to stop the run on the dollar, and 1 month later floating exchange rates were back. The era of the dollar standard was over.

Floating exchange rates (March 1973-present)

The new float was supposed to be as short-lived as the August-December 1971 float had been. However, a rather long "temporary" period ensued. Negotiations over a new set of pegged rates were expected to be long and difficult. In addition, many economists believed that floating rates would be more palatable than fixed rates, given the problems of the previous years. In late 1973, once the temporary floating exchange-rate system was found to be operating quite nicely, it was decided to continue it indefinitely.

The present system of exchange rates is really a hybrid system. Most of the currencies of the world belong to developing countries, and most of these are pegged to one of the major currencies of the world. As of September 1982, 37 currencies were pegged to the U.S. dollar; 13, to the French franc; and 5, to other currencies. Thirty-nine currencies, including those of Sweden and Austria, were pegged to a weighted basket of major currencies. Four

countries, including Brazil, had crawling peg system. Eight of the 10 European Community countries were joined their currencies in a common float. 1/

The currencies of nonmarket economy countries such as the Soviet Union and the People's Republic of China are inconvertible and do not have formal exchange rates. Most of the remainder of the countries of the world, including the United States, Japan, Canada, Switzerland, and the United Kingdom, allow their currencies to float.

Although the U.S. dollar is no longer "as good as gold," as it literally used to be, it is still the prime intervention currency in the present-day system of managed floats. Therefore, the exchange value of the dollar, much more so than that of any other currency, is partly determined by the activities of foreign central banks.

Floating Versus Fixed Exchange Rates

The history of exchange rates shows periods of both floating and fixed exchange-rate regimes. These two systems will be examined more closely to learn the advantages and disadvantages of each.

Floating exchange rates

The great advantage of floating exchange rates is that the exchange rate adjusts to equilibrate a country's balance of payments. Freed from having to use monetary and fiscal policies to balance its payments, a country can use such policies to promote full employment, maintain stable prices, and encourage economic growth.

Monetary policy becomes more effective under flexible exchange rates than under fixed rates. For a country in a recession, an expansionary monetary policy will lower interest rates and thus encourage investment expenditures. Lower interest rates will also induce a capital outflow to countries with higher interest rates. This capital outflow will depreciate the exchange rate and thereby encourage exports and discourage imports. The resulting higher demand for domestically produced goods will provide an additional stimulus to the domestic economy.

1/ In March 1973, the countries of the European Community (EC) permitted their currencies to float relatively freely in the foreign-exchange market vis-a-vis other currencies. But they maintained strict limits on changes in their mutual exchange-rate relations. Thus, exchange rates were pegged intrabloc, but were floated extrabloc. The ultimate aim of this joint float was to create a single, unified EC currency. The EC's monetary integration advanced further in March 1979, when the European Monetary System (EMS) was formed. The EMS created the European Currency Unit (ECU), defined as a weighted average of the 10 EC currencies, fixed the central rate of the member country's currencies in terms of ECU's, and established a reserve fund to be used for short- and medium-term balance-of-payments assistance for the EC. The United Kingdom and Greece did not join the EMS. Intrabloc exchange rates have been adjusted several times.

Although these are compelling reasons for using flexible exchange rates, some nations have preferred the fixed-exchange-rate alternative because of several problems associated with floating exchange rates.

First, the uncertainty of future exchange rates creates exchange risks that may impede international trade and capital movements. Traders and investors become wary of engaging in international transactions if the return on such transactions is unknown. Because of this uncertainty, they may decrease their activity in international markets relative to what it would be under fixed rates.

Although buying contracts to purchase foreign currency in the future can lessen the burden of these risks, these contracts are sometimes expensive. Also, they cannot be used to hedge long-term borrowing and lending because they seldom last beyond 1 year. Exchange risk also exists in a pegged system; significant currency devaluations can occur under pegged exchange rates.

For small, open economies that are highly dependent on foreign trade, constant exchange-rate fluctuations could introduce continuous variations in the domestic price level. As a result, resources could be constantly reallocated, and the population could even lose confidence in the currency as a store of value. To cope with this problem, many small countries with open economies peg their currencies to the currency of a large country with which they trade a great deal.

Second, the prospect of destabilizing speculation exists under floating exchange rates. The efforts of speculators could cause exchange rates to gyrate wildly and cause countries heavily dependent on imports and exports to suffer. International trade could contract if businessmen become less willing to engage in such trade in light of the uncertainty of price.

Because of these concerns about destabilizing speculation, many supporters of floating exchange rates favor official intervention on at least some occasions. A problem with government intervention is deciding when it should be used. Official intervention will not necessarily lead to smooth movements of exchange rates; it may even lead to or contribute to destabilizing speculation. Continued use of official intervention to minimize exchange-rate movements can lead to an exchange-rate system more like a pegged-rate system than a floating-rate system.

Third, fiscal policy becomes less effective with floating exchange rates. The use of fiscal policy to pull a country out of a recession will raise interest rates, attract foreign capital, and thus appreciate the domestic currency. As a result, exports become less competitive and imports more competitive. The adverse effect on the trade balance works against the domestic recovery.

Fixed exchange rates

Fixed exchange rates allow money to perform its functions as a unit of account and a store of value without becoming what some have called a flexible yardstick. Pegging exchange rates allows all currencies to be thought of as a single entity and thus reduces the uncertainty about future transactions. To fully enjoy these advantages, however, countries must avoid changing the pegged exchange rates.

A problem with fixed exchange rates is that they require the governments of deficit countries to change those domestic policies that led to the deficit. The requirement that internal policies be subservient to external policies finds much less support today than it did 30 years ago.

Exchange and import controls are often imposed with fixed exchange rates to cope with balance-of-payments deficits. These restrictions can limit international transactions much more than floating exchange rates can.

Because of the inflexibility of wages for industrial workers and the general feeling that limiting unemployment should be the primary economic goal of government, countries today probably do not have the economic discipline necessary to have a viable system of fixed exchange rates. As long as countries continue to place internal goals ahead of external goals in their national priorities, floating exchange rates will probably remain.

EXCHANGE-RATE THEORIES

The switch to floating exchange rates in 1973 allowed economists, for the first time in a number of years, to test their theories on how exchange rates are determined. As a result of this testing, it was found that the two dominant theories of the 1960's--the elasticities-absorption approach 1/ and the monetary approach--could not completely explain actual exchange-rate movements. 2/ Although simplistic, these two theories did provide the foundation for a more complete theory of exchange rates, the portfolio-balance approach. Originally developed as an offshoot of the monetary approach, the portfolio-balance approach now incorporates the essential elements of the elasticities approach, and can be regarded as a synthesis of its two predecessors.

Before looking at the portfolio-balance theory, let us examine the other theories of floating exchange rates.

Purchasing-Power Parity

Although the purchasing-power-parity (PPP) theory is not a complete theory of exchange-rate determination, it is one of the most popular, simplest, and most durable explanations of exchange-rate movements. The PPP theory holds that currencies are valued for what they will buy. Therefore, the exchange rate between two currencies is determined by their relative internal purchasing powers as measured by the ratio of the general price levels in the two countries concerned. It follows from the theory that changes in relative national price levels determine changes in the exchange rate.

In particular, the theory predicts that the rate of change of the exchange rate will tend to equal the difference between the relative rates of inflation at home and abroad. For example, if the rate of inflation in the United States is 5 percentage points lower than the rate of inflation in the United Kingdom, the theory maintains that the dollar will tend to appreciate by about 5 percent relative to the British pound.

The theory suggests that the way to increase a currency's external value is to increase its internal value by reducing the domestic rate of inflation. When two countries experience the same inflation rate, the relative purchasing power of their currencies will remain unchanged, and the exchange rate between them will stabilize.

1/ Hereafter, the elasticities-absorption approach will be called the elasticities approach.

2/ Before the advent of floating exchange rates in 1973, the emphasis of international finance theory was on the determination of a country's balance of payments and on the effect of a devaluation on a country's balance of payments. Once the shift to floating rates occurred, interest naturally shifted to explaining exchange-rate movements because, in theory, currency depreciation or appreciation resulting from balance-of-payments imbalances should lead to an eventual adjustment in real goods and services flows that would eliminate the imbalances. Both the elasticities and monetary approaches were designed primarily to explain the behavior of the balance of payments and, after slight changes, were used to explain exchange-rate movements.

The PPP theory holds that when the actual exchange rate does not equilibrate national price levels, automatic responses will tend to move the exchange rate toward the equilibrium value. These automatic responses are triggered by price differences between countries that shift international trade flows and the associated demand for and supply of foreign exchange. Thus, according to the theory of PPP, changes in exchange rates maintain the international price competitiveness of a country's export industries and import-competing industries by offsetting differences in national inflation rates.

For example, if the dollar price of the pound falls below its PPP level, the pound becomes undervalued and the dollar overvalued relative to their actual internal purchasing powers. 1/ The undervalued pound makes British goods seem underpriced to Americans, who flood the foreign-exchange market with dollars, seeking to buy pounds. Conversely, the overvalued dollar makes U.S. goods appear overpriced to Britons. This dries up the supply of pounds seeking to be converted into dollars. The resulting surplus of dollars and the corresponding shortage of pounds would quickly move the exchange rate back to PPP. By means of this self-adjusting mechanism, the actual exchange rate would tend to hover around the PPP level.

Because the PPP theory holds that exchange-rate movements serve to offset differential rates of inflation, real relative prices and thus all real variables are undisturbed by exchange-rate changes. Therefore, according to the theory, changes in exchange rates have no long-term effect on exports, imports, or the trade balance. The physical quantities of these variables are unchanged; only the monetary units in which they are measured have changed.

The question then arises: How valid is the PPP theory? It has been said that "Under the skin of any international economist lies a deep-seated belief in some variant of the PPP theory of the exchange rate." 2/ It certainly makes intuitive sense that the price of a good in one country should be the same, aside from freight and duties, as the price of the same good in a different country. Commodity arbitrage would take place if the exchange rate did not equilibrate the two price levels. The resultant trade flows would change the relative price level as well as the exchange rate until arbitrage would no longer be possible. Given a world with no transportation costs or customs duties, the PPP theory would hold.

Mere casual observation, however, reveals that factors other than relative price levels also affect exchange rates. Such factors, which include tariffs and transportation costs, may produce a permanent disparity between the actual exchange rate and the PPP rate. For example, the costs of transporting a house from one country to another are so large that the difference between the prices of houses in two countries can be substantial.

1/ This disturbance of equilibrium could be caused by any number of factors--changes in expectations, capital flows, speculation, productivity increases, oil embargoes, commodity shortages, shifts in international demand, and so forth.

2/ R. Dornbusch and P. Krugman, "Flexible Exchange Rates in the Short Run," Brookings Papers on Economic Activity, 3:1976, p. 540.

Another reason the theory is inadequate in explaining exchange-rate fluctuations is that national price levels cannot adjust as rapidly as exchange rates to changes in underlying economic conditions. Exchange rates are extremely sensitive to unforeseen changes that alter expectations of the future. National price levels, however, are relatively unresponsive to unforeseen changes in economic conditions because they are composed largely of commodity prices that are fixed by contracts. Consequently, when unforeseen changes occur, exchange rates adjust immediately, whereas national price levels adjust with a lag. Because the lengths of the adjustment periods differ, prices temporarily can diverge from PPP. In turbulent periods like the 1970's, when shocks and surprises occurred frequently, exchange rates will deviate from PPP most of the time.

Numerous studies have found that the PPP theory, the so-called law of one price, does not hold, at least in the short run. 1/ Evidently, the real-world problems involved in establishing a commodity arbitrage system prevent the PPP theory from holding over the short term. It seems to hold better among the neighboring European countries than between each of these countries and the United States. Presumably the lower cost of commodity arbitrage between neighboring countries is responsible.

Although the PPP theory does not seem to hold in the short run, exchange rates are generally believed to exhibit PPP in the long run. The problem is that the long run can be so long that, because of changes in production methods and tastes, the equilibrium PPP condition can change before it is achieved. Long-run PPP can then become an elusive equilibrium that is never achieved because the equilibrium exchange rate is constantly changing.

To determine if the theory holds, real exchange-rate indexes are often used. These indexes are obtained by adjusting changes in exchange rates for inflation differentials. Such measures determine whether exchange-rate changes have eliminated differences in the price competitiveness of one country's tradable goods vis-a-vis those of its trading partners.

A real exchange-rate index deflates changes in nominal exchange rates by changes in relative price levels. It shows the relative change in PPP from some base period. 2/ It can be defined as--

$$(2.1)\quad \text{Real exchange-rate index} = \frac{\text{Nominal exchange-rate index X foreign price index}}{\text{Domestic price index}}$$

If the real exchange-rate index stays at unity, the domestic currency has not changed in value since the base year. If the real exchange-rate index is greater than one, the domestic currency is undervalued compared with that in

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1/ Some believers in the theory hold that it cannot be verified because of the nature of the price levels used. They claim that if price levels were properly specified, they would empirically prove the existence of PPP. See, for example, P. Krugman, "Purchasing Power Parity and Exchange Rates," Journal of International Economics, vol. 8, No. 3, August 1978, pp. 397-407.

2/ The foreign and domestic price indexes have the same base period as the exchange-rate index.

the base year. This could occur either if the domestic price level has fallen relative to the foreign price level or if the domestic currency price of foreign exchange has risen with no offsetting movement in relative price levels. Figures 7-10 show bilateral real exchange-rate indexes on a 1975 basis for the United States and four of its major trading partners.

For the period of fixed exchange rates from 1953 to 1970, rough purchasing power parity existed among the major Western countries. The real exchange rate with the U.S. dollar remained relatively constant for most countries until 1970. Commodity arbitrage between each country and the United States seemed to be effective in alining the prices of tradable goods when exchange rates were stable for long periods.

Real exchange rates were affected by the advent of quasi-fixed and freely floating exchange rates after 1970. The real exchange-rate indexes show that nominal exchange-rate movements did not offset internal price movements to maintain PPP when the direction of exchange-rate fluctuations could not be easily predicted. Effective commodity arbitrage to aline international prices has become more difficult since the end of the fixed-exchange-rate period.

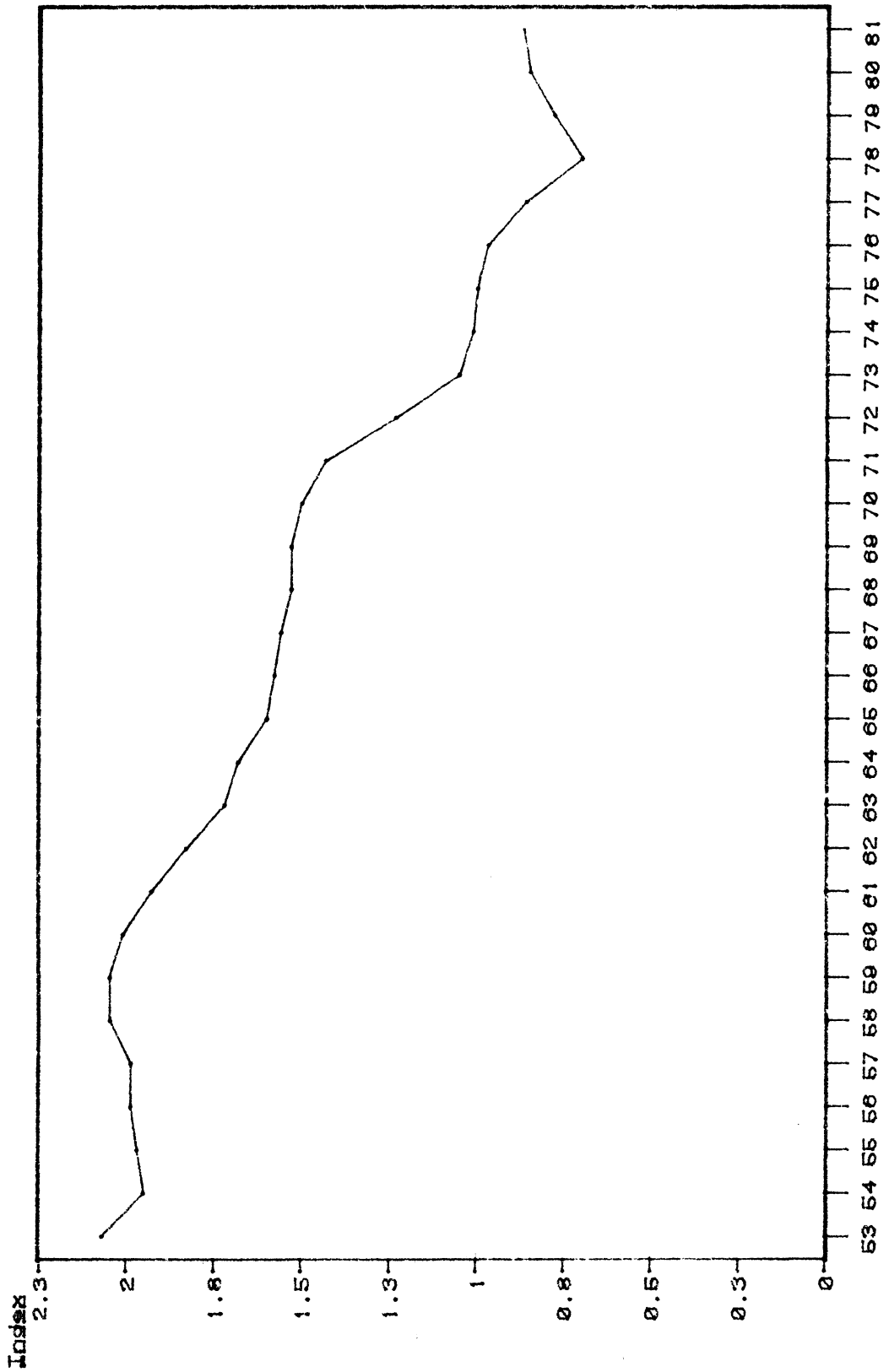
Despite its shortcomings, the PPP theory remains a useful tool. It identifies divergent rates of price inflation as an important source of exchange-rate movements. It reminds us that policies that strengthen the internal value of a currency also strengthen its external value. Finally, the PPP theory suggests that an exchange-rate depreciation need not be inflationary if it reflects, rather than creates, underlying inflationary pressures.

Elasticities Approach

The elasticities approach was the dominant theory of exchange-rate determination from the 1930's to the 1960's. It assumes that an exchange rate is determined by the interaction between the demand for a foreign currency by domestic importers and investors and the supply of domestic currency from foreign importers and investors resulting from the flow of goods, services, and capital between two countries. The theory assumes that a country whose currency is undervalued enjoys a price advantage over the rest of the world. As its exports increase and its imports decrease, the value of its currency is bid up. Conversely, a country with an overvalued currency sees its exports suffer and its imports grow. This tends to reduce the demand for its currency, and therefore, the value of its currency falls. Relative price levels, growth rates, and income levels are assumed to affect a country's demand for imports and, consequently, its exchange rate. Less important in determining the exchange rate is the flow of capital across countries by arbitragers taking advantage of differing returns on short-term investments. The emphasis of the elasticities approach is on the effects of the current-account balance and the difference in interest rates on the flow of goods and short-term capital between countries.

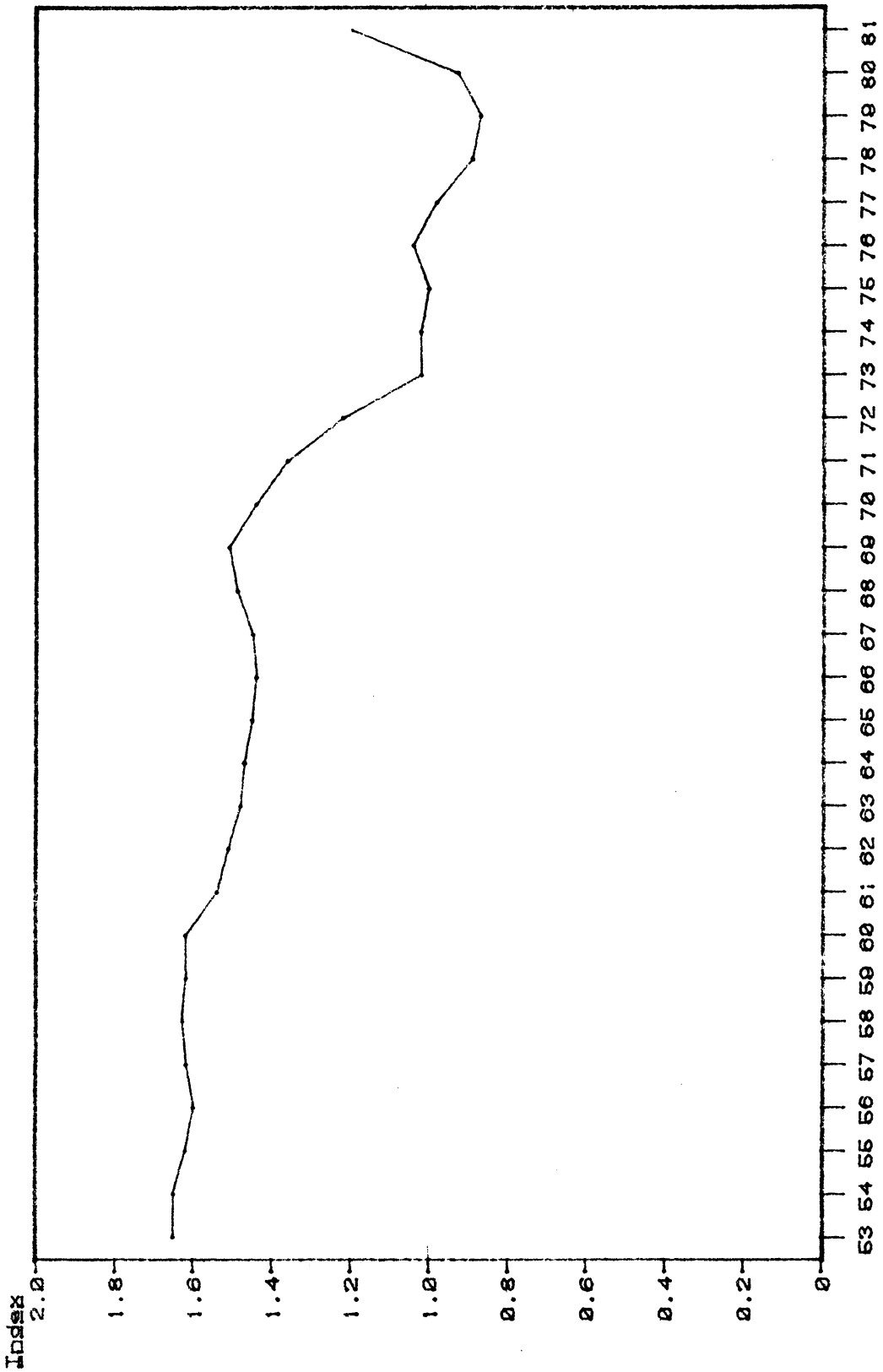
Unlike the PPP theory, the elasticities approach does allow two situations in which relative prices could differ between countries. First, because a country that is growing relatively rapidly tends to import

FIGURE 7.--YEN/U.S. DOLLAR REAL EXCHANGE-RATE INDEX. (1875=1.00)



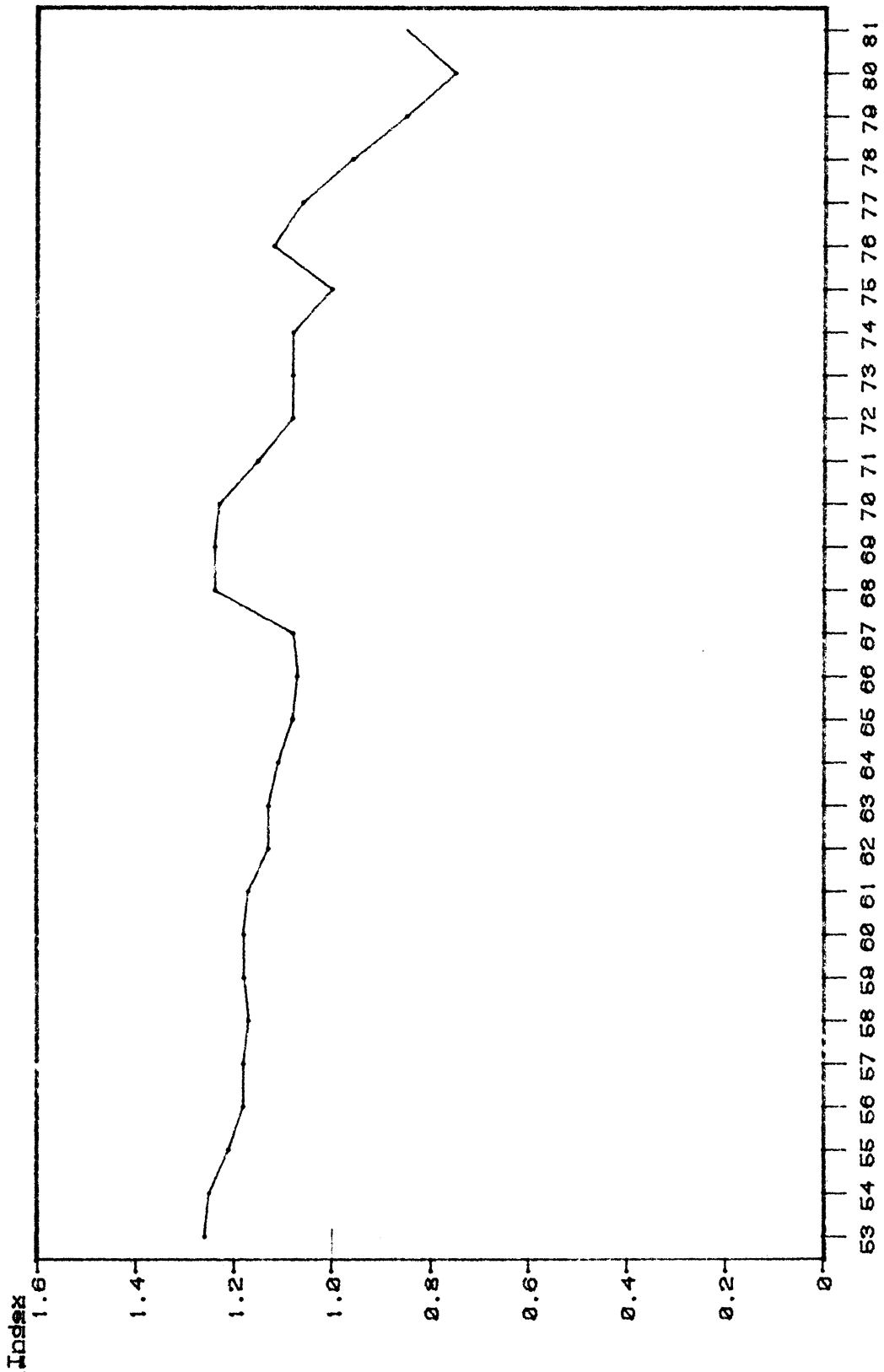
Source: Compiled from official statistics of the International Monetary Fund.

FIGURE 8.--MARK/U.S. DOLLAR REAL EXCHANGE-RATE INDEX.
(1975=1.00)



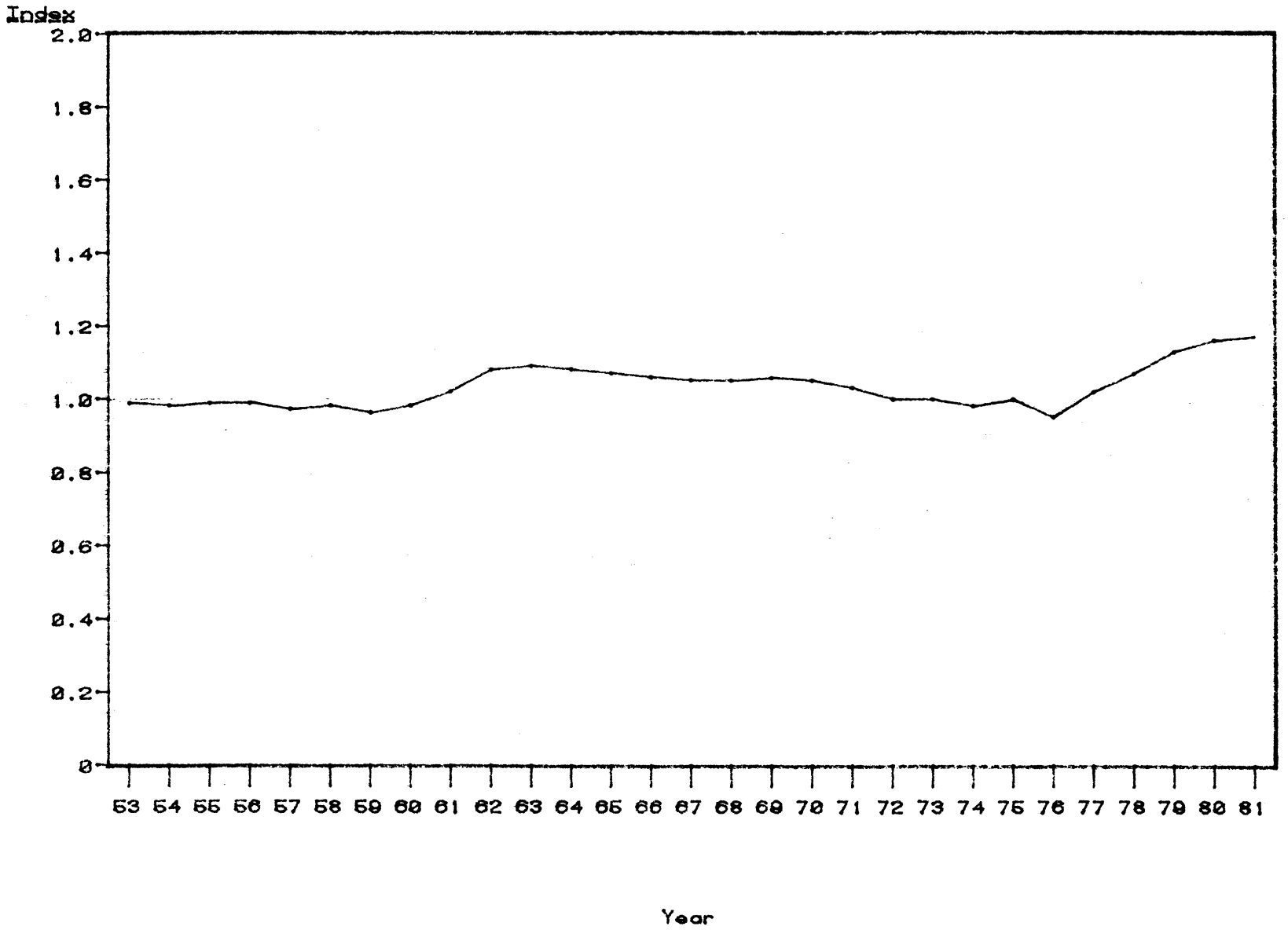
Source: Compiled from official statistics of the International Monetary Fund.

FIGURE 9.--POUND/U.S. DOLLAR REAL EXCHANGE-RATE INDEX.
(1975=100)



Source: Compiled from official statistics of the International Monetary Fund.

FIGURE 10.--CANADIAN DOLLAR/U.S. DOLLAR REAL EXCHANGE-RATE INDEX.
(1975=100)



Source: Compiled from official statistics of the International Monetary Fund.

relatively more than it exports, its currency tends to decline. This gives its exports and import-competing industries a price advantage over foreign competitors and, therefore, moves the country toward a trade balance. 1/

Second, a country with an excess of domestic savings tends to have relatively low real interest rates. This encourages capital outflows, because these excess savings earn higher returns abroad. The capital outflow, in turn, decreases the value of the currency and leads to a trade surplus. Hence, such a country has a competitive edge and a balance-of-trade surplus just offsetting its capital-account deficit.

According to the theory, exchange rates change to eliminate trade imbalances. 2/ Countries with relatively high inflation rates would have depreciating currencies to maintain the international competitiveness of their goods and to prevent large trade imbalances.

Because the level of merchandise trade changes slowly, the elasticities approach suggests that exchange rates should also change slowly. This predicted behavior, however, was quite different from the erratic behavior of floating exchange rates in the mid-1970's. Coupled with the large trade deficits that some countries had, it soon became obvious that the elasticities approach, with its emphasis on trade flows and its total neglect of expectations was not a complete theory of exchange-rate determination.

Monetary Approach

The other main theory of exchange rates, the monetary approach, 3/ like the elasticities approach, has had a long history. 4/ The monetary approach, however, generally has been less widely held than the Keynesian elasticities approach, especially during the glory days of Keynesian economics, the early 1960's. Because monetarism was able to explain domestic inflation in late 1960's, interest in the monetary approach to the exchange rate rose.

1/ Import demand is the absorption portion of the elasticities-absorption approach. Because import demand is assumed to depend on national income, the elasticities-absorption approach is regarded as a Keynesian theory of the exchange rate. The elasticities portion of the elasticities-absorption approach comes from the days of fixed exchange rates, when the effect of a devaluation on the trade balance was thought to depend on the elasticities of demand for imports and exports.

2/ When this theory was first discussed, the merchandise-trade balance was the balance-of-payments account that economists thought mattered most. Only the recent large surpluses in the services account led them to realize that the current-account balance is what really matters.

3/ The monetary theory of exchange rates should not be confused with the monetarist approach to stabilization policy. Although both theories stress the importance of the money stock in determining prices and the inability of the money stock to affect real variables in the long run, the two approaches are distinct theories; belief in one does not necessarily imply a belief in the other. Confusion about the distinction between them exists, because both theories are strongly identified with the University of Chicago and because believers in one approach tend to believe in the other.

4/ The monetary approach, although it reached its present form with Gustav Cassel in 1918, was first described in the late 18th century.

The monetary approach to exchange-rate determination says that because the exchange rate is the relative price of two monies, its equilibrium value is attained when the existing stocks of the two monies are willingly held. Operating through the relative demand for, and supply of, the two monies, real and monetary factors are able to influence the equilibrium exchange rate. The emphasis is on the stocks of the two monies, the degree to which people are willing to hold these stocks, and the willingness of the monetary authorities to supply money. Crucial to this approach is the existence of stable money-demand functions and integrated world markets.

Belief in the monetary approach is often accompanied by belief in the PPP theory. Because supporters of the monetary approach believe that changes in national price levels are determined by changes in the money stock, the assumption of PPP is consistent with the assumption that the exchange rate is determined by relative money stocks.

When used in conjunction with PPP, the monetary approach leads to economic models that are quite simple. Domestic and foreign monetary sectors are specified and the model closed with PPP. Thus, a simple monetary model can be concisely expressed using three equations:

$$(1)\quad M = P \cdot K(i,Y) \qquad \text{(domestic money market)}$$

$$(2)\quad M^* = P^* \cdot K(i^*,Y^*) \qquad \text{(foreign money market)}$$

$$(3)\quad P^* = S \cdot P \qquad \text{(purchasing power parity)}$$

The first two equations express the equilibrium relationship between the supply of money (M) and the demand for money in the domestic and foreign markets (foreign variables are marked with asterisks). Demand for money is the product of the real demand for money [K()] and the general price level (P). In this simplified monetary model, the amount of money that people wish to hold increases with the level of economic activity (Y) and decreases with the market rate of interest (i).

The third equation simply expresses mathematically the equilibrium PPP relationship: given PPP, the exchange rate (S) will be in equilibrium when the foreign price level is equal to the domestic price level times the exchange rate. 1/ Under PPP, in order to maintain a stable exchange rate, the intervening country must accept a change in the money stock equivalent to that of the nonintervening country, which may affect the level of domestic inflation.

1/ The theorized relationship between domestic and foreign prices in (3) is in part responsible for the common belief that floating exchange rates permit independent monetary policies for the countries of the world, whereas fixed exchange rates do not permit independent policies. In reality, residents of a country hold a portfolio of different currencies to facilitate transactions and to diversify their holdings to reduce the risk of a large exchange-rate loss. Stronger currencies, i.e., those that are associated with countries with low inflation rates and current-account surpluses, are likely to be demanded more than weak currencies. This phenomenon, called currency substitution, means that even with flexible exchange rates, the monetary policies of other countries will have some effect on a country's money stock or interest rates or both. Thus, complete national monetary independence is impossible even with floating exchange rates. Floating exchange rates do, however, permit a much greater degree of monetary independence than do fixed exchange rates.

By rearranging terms and making the right substitutions, the monetary model can be solved for the equilibrium exchange rate:

$$(4) \quad S = \frac{M^* \cdot K(i,Y)}{M \cdot K(i^*,Y^*)}$$

This equation clearly shows the relationship between the exchange rate and the relative supply of, and demand for, money that is fundamental to the monetary approach. Whereas the money stocks play a major role in determining the exchange rate, the current account has no direct effect in this model. The current account can only indirectly affect the exchange rate through its effect on real income.

The monetary approach fell into disfavor for two reasons. First, when large deviations from PPP were found to exist for long periods of time, one of the fundamental assumptions of the monetary approach was violated. Second, because the monetary approach deals only with long-run equilibrium values, it was unable econometrically to do more than partly explain very long-term movements in exchange rates. The inadequacy of its theoretical basis and the empirical attacks on its explanatory powers were enough to force economists to search for a better theory of exchange-rate determination.

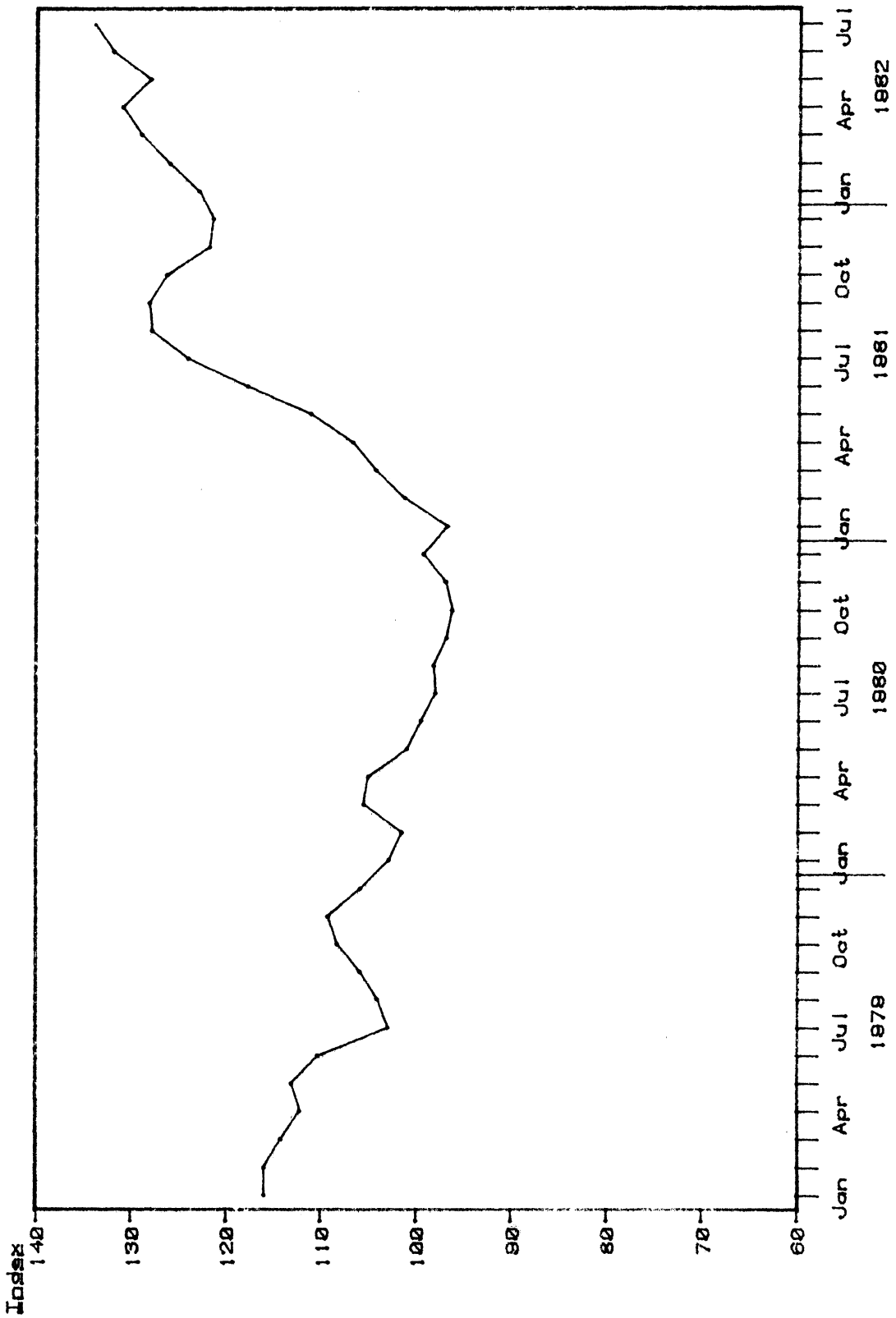
Portfolio-Balance Approach

As figures 11-14 show, rather large short-term movements in bilateral exchange rates have occurred between the dollar and several major currencies. This behavior of the U.S. dollar in foreign-exchange markets undermined the usefulness of the existing theories of exchange-rate determination. The elasticities and monetary approaches were unable to adequately explain large deviations from PPP and the erratic behavior of exchange rates in the absence of significant monetary changes or changes in the real flows of goods and services. Because of the shortcomings of these theories, the portfolio-balance theory has become increasingly useful for explaining exchange-rate fluctuations.

The portfolio-balance approach emphasizes that the domestic currency is one of many real and financial assets that domestic residents may wish to hold. Each asset, including the domestic currency, offers a combination of risk and expected return that is based on current economic conditions and on expectations about the future. Shifts in these perceived risks and expected returns induce investors to reallocate their portfolios between assets denominated in different currencies and, thus, to bring about changes in the exchange rate.

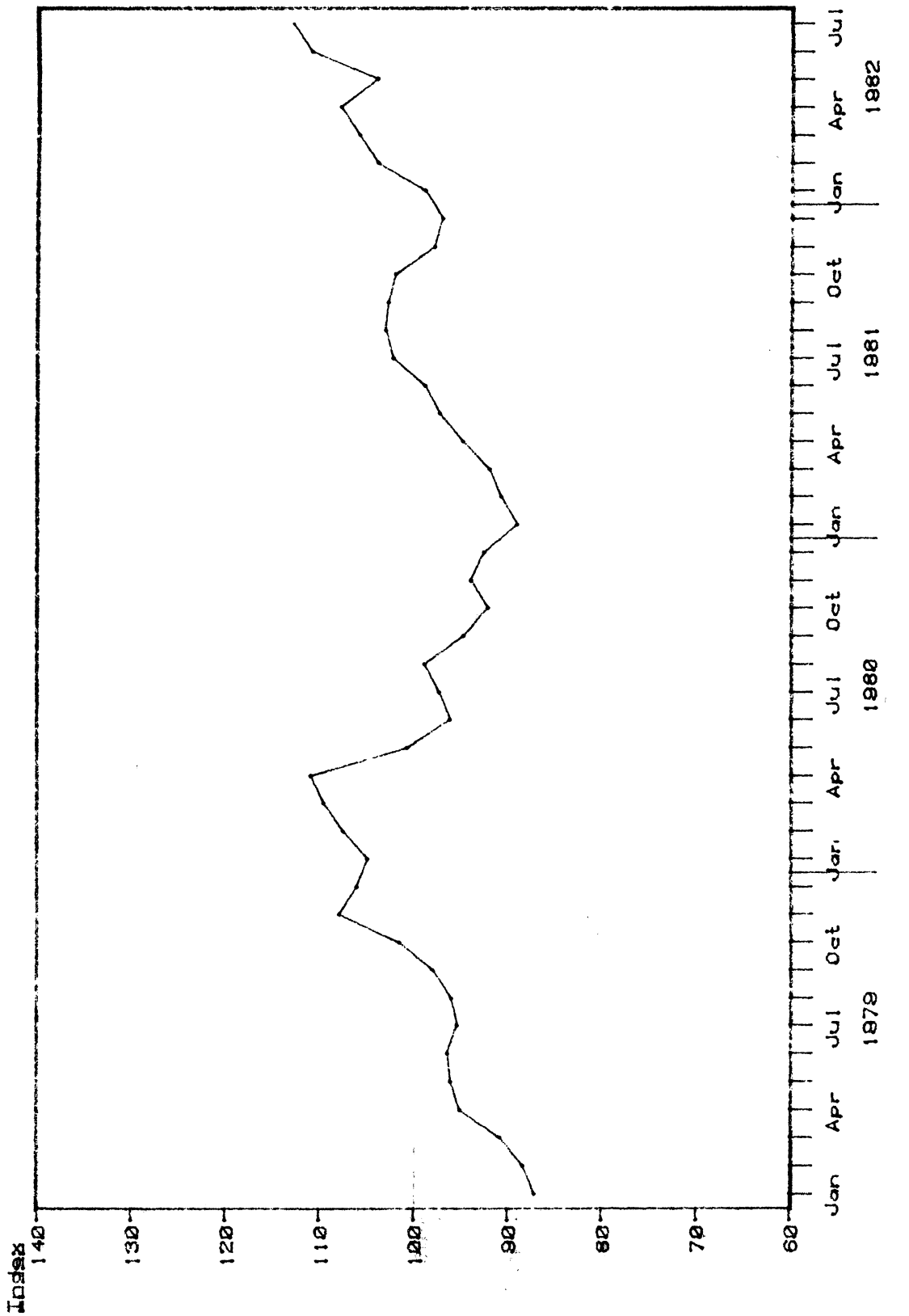
The portfolio-balance theory assumes that the spot exchange rate is determined by the flow of short-term securities in the asset market. But it assumes that the long-run exchange rate is determined by stock changes caused by current-account imbalances. In the short run, the movement of assets between countries to maximize expected returns and to minimize perceived risk completely dwarfs the flow of funds caused by the demand for goods and services in determining the exchange rate. In the long run, however, the accumulated flow of goods and services redistributes wealth and changes expectations of future current-account balances. As expectations of future current-account balances change, expectations of future exchange rates also

FIGURE 11.--POUND/U.S. DOLLAR EXCHANGE-RATE INDEX.
(1980=100)



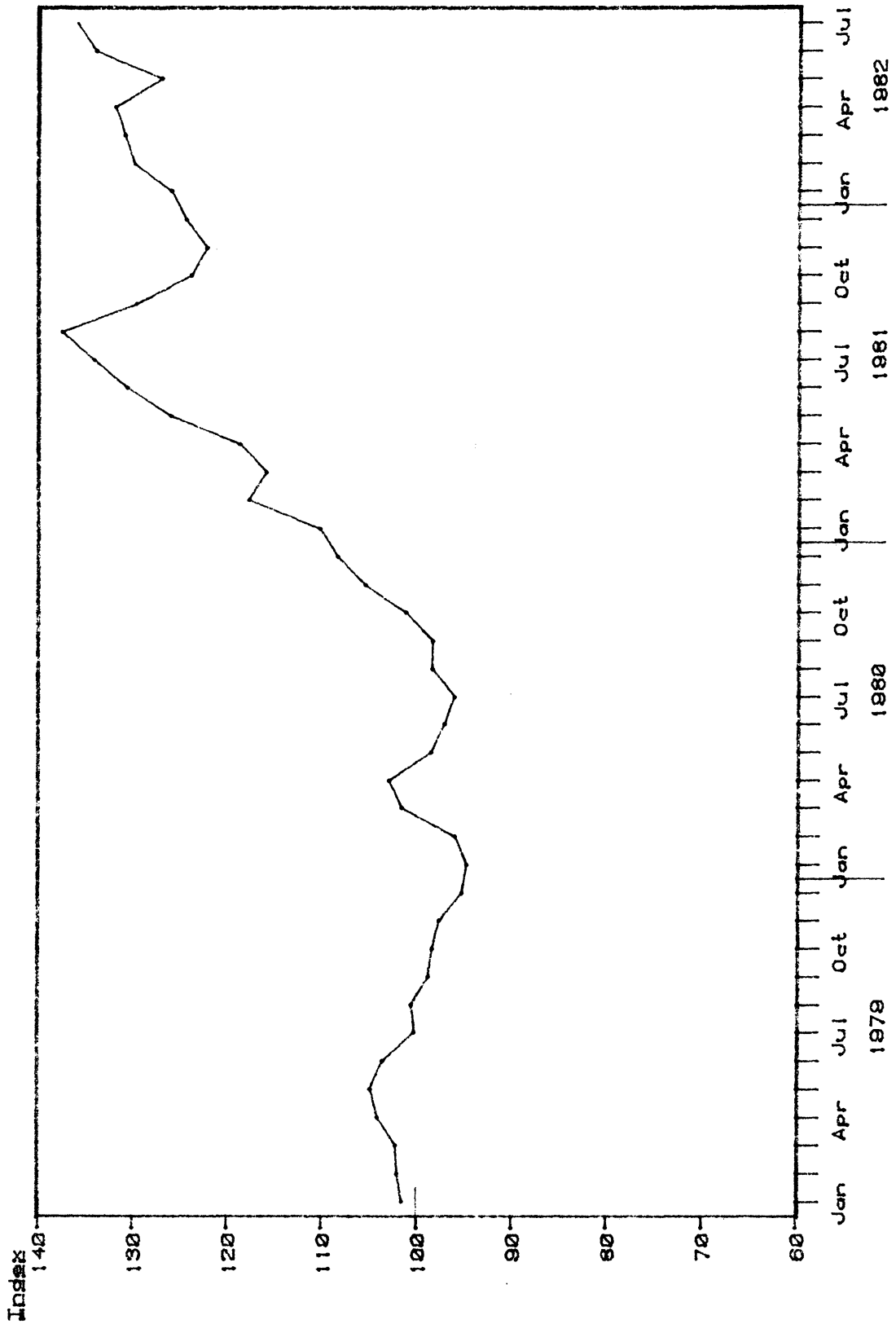
Source: Compiled from official statistics of the International Monetary Fund.

FIGURE 12.--YEN/U.S. DOLLAR EXCHANGE-RATE INDEX.
(1980=100)



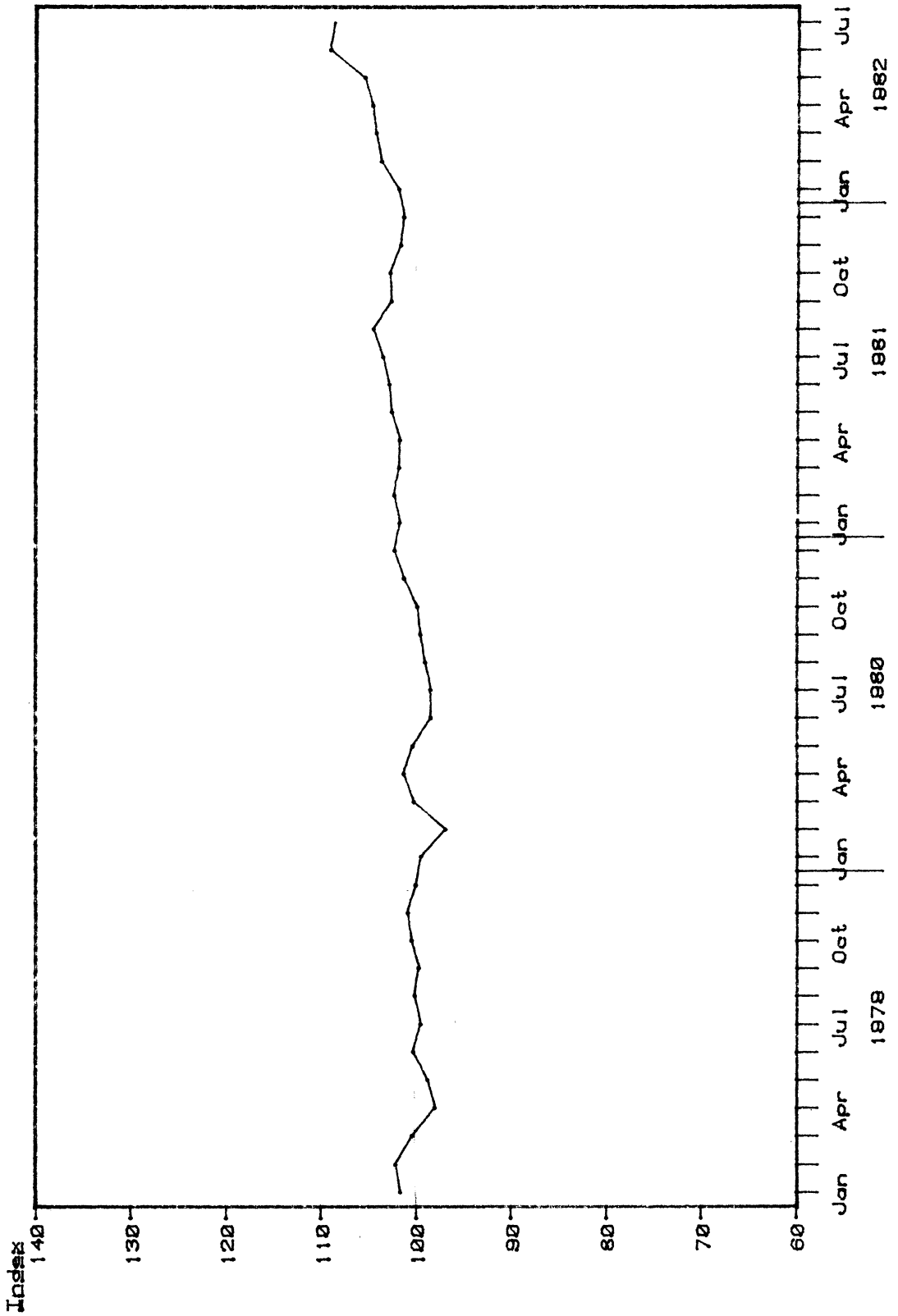
Source: Compiled from official statistics of the International Monetary Fund.

FIGURE 13.--MARK/U.S. DOLLAR EXCHANGE-RATE INDEX.
(1980=100)



Source: Compiled from official statistics of the International Monetary Fund.

FIGURE 14.--CANADIAN DOLLAR/U.S. DOLLAR EXCHANGE-RATE INDEX.
(1980=100)



Source: Compiled from official statistics of the International Monetary Fund.

change. Thus, the link between exchange rates and the current-account balance appears to be more important than the link between exchange rates and capital flows in the long run. 1/

Current-account balance

The transfer of wealth between countries caused by current-account imbalances affects exchange rates, because the holders of the increased wealth have different portfolio preferences than those who originally had the wealth. Although people hold their wealth in both domestic and foreign assets, domestic residents would presumably prefer to hold a higher percentage of their assets denominated in the domestic currency than would foreign residents. Any relative increase in wealth will increase the demand for the currency of the recipient country. Therefore, any transfer of wealth caused by trade flows will increase the demand for the currency of the country with the current-account surplus. This should cause the surplus country's currency to appreciate.

The expectation effect of the current-account balance can also affect exchange rates. For example, the unexpectedly large West German current-account deficits in early 1981 caused investors to revise their thinking about how much the mark would have to depreciate to promote exports and curb imports to eliminate these large deficits. Hence, the value of the mark against the dollar declined.

When future developments affecting a country's payments position can be foreseen, their anticipated effects will cause speculative adjustments in market rates. An example of this was the strength of the Norwegian krone and the British pound following the discovery of oil in the North Sea. Even though this discovery would not affect the current-account balances of the countries involved for a number of years, investors realized the long-term effect that the discovery could have on future trade flows and bid up the prices of these currencies before any oil was produced. 2/

Although the current-account balance is not the primary determinant of exchange-rate movements as it was in the elasticities approach, it does play an important role in the portfolio-balance approach. The portfolio-balance theory holds that the expected long-term exchange rate is the rate that is

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1/ Although the portfolio-balance approach and the elasticities approach have some similarities, the portfolio-balance approach emphasizes the capital account in the short run, whereas the elasticities approach emphasizes the current account.

2/ M. P. Dooley and P. Isard, "The Portfolio-Balance Model of Exchange Rates," Board of Governers, International Finance Discussion Paper, No. 141, May 1979, argue that the role of the wealth effect of the current account is small relative to the effects of changing expectations on the long-run exchange rate. The conventional theory holds that wealth effects dominate. See, for example, R. Dornbusch and P. Krugman, "Flexible Exchange Rates in the Short Run," Brookings Papers on Economic Activity, 3:1976, pp. 537-584.

consistent with a country's desired current-account balance. 1/ Some countries desire current-account surpluses to save for a rainy day, whereas others prefer to incur deficits to increase current investment. 2/ Once a deficit country has a sufficient level of capital stock, its current-account deficit should turn into a surplus as it begins exporting its increased production. Large industrial nations generally are assumed to prefer current-account surpluses, whereas developing nations are generally assumed to prefer current-account deficits until they are sufficiently industrialized.

Interest rates and risk

Because the asset market determines the short-run exchange rate in this theory, the reason assets move between countries is important. The portfolio-balance approach assumes that foreign assets are imperfect substitutes for domestic assets and holds that assets move between countries because of differences in their expected yields and risks. To get a better understanding of this relationship, let us look at a recent example.

In mid-1982, the mark/dollar exchange rate was at its highest level in several years. Two main reasons accounted for this. First, the difference between short-term interest rates was quite high (14 percent in the United States versus 9 percent in West Germany). Investors were able to obtain a higher return on their money in the United States than in West Germany. As a result, a huge flow of funds from West Germany to the United States occurred and helped push up the exchange rate.

Second, political unrest in Poland reminded investors of the proximity of West Germany to the Warsaw Pact nations. The possibility that the Soviet Union would intervene in Poland and escalate the cold war increased the possibility that a limited war would be fought on German soil. Investors apparently decided that, given those conditions, they would rather invest in U.S. assets than in West German assets. Even without a war, this period of tension discouraged investment in West Germany and, therefore, reduced future West German exports. Thus, the high mark/dollar rate discounted not only the possibility of war, but the real effects of the possibility as well. Thus, these two effects, the interest rate differential and the risk factor, combined to increase the value of the dollar versus the mark. To equalize the expected overall returns of dollar- and mark-denominated assets, taking into account the difference in perceived risk, the mark/dollar rate had to rise.

1/ The current-account balance and not the merchandise-trade balance should be considered in determining the long-term exchange rate, especially for the United States. The huge U.S. surplus in the services account places the United States in a rather unique position of being able to run up large merchandise-trade deficits, yet have current-account surpluses.

2/ A country could desire a current-account deficit in order to consume more now, but this would be unsustainable, because at some point, the deficit must be repaid. See J. Salop and E. Spitaller, "Why Does the Current Account Matter?" IMF Staff Papers, vol. 27, No. 1, March 1980, pp. 101-134, for a discussion of the optimal current-account balance and the sustainability of deficits.

Inflation

Investors are also concerned with the relative inflation rates of the countries involved. Obviously, a large difference in interest rates matters little if the inflation differential is also large. For example, one can obtain bonds with a 50-percent interest rate denominated in Brazilian cruzeiros. In the light of Brazil's 108-percent inflation rate, however, the lure of high interest rates loses most of its appeal.

Presumably investors are primarily interested in the real return (interest rate minus inflation rate) on their investments. Casual observers of foreign-exchange markets may wonder why changes in exchange rates are often blamed on changes in interest rates, yet seldom blamed on changes in inflation rates. Interest rates change daily, whereas inflation rates are measured by price changes over longer periods and, thus, change rather slowly. This means that the real return on investments is changed much more often and to a greater degree by interest rate changes than by inflation rate changes.

Inflation also affects exchange rates by changing the relative prices of imports to domestic goods. If a country has a higher inflation rate than its major trading partners, the prices of imports in that country will fall relative to the prices of competing domestic goods. This should increase the demand for imports, and thus for foreign exchange, until eventually the exchange rate decreases enough to offset the price differential.

As a result, the long-run differential in inflation rates is expected to mirror the movement of the long-run exchange rate, i.e., PPP will hold in the long run. Expectations are important, because the expected inflation rates are important to investors.

Expectations

Expectations play a large role in determining exchange rates in the portfolio-balance theory. Changes in exchange-rate expectations can change the expected returns on investments and can change the composition of investor portfolios when investors react to these changes. These reactions to expected exchange-rate changes can lead to actual exchange-rate changes. Thus, to a certain extent, changes in exchange-rate expectations are self-fulfilling and can lead to large exchange-rate changes despite nothing real occurring. The establishment of expectations does not matter, but the change in these expectations does matter.

In an organized asset market such as the foreign-exchange market, current prices reflect expectations about the future. New information changes expectations and is immediately reflected in corresponding changes in prices as arbitragers seek to exploit possible profit opportunities. An analogous event occurs when news about the future profitability of a corporation affects the current market price of its common stock.

Because asset prices depend on expectations, periods that are dominated by uncertainties, constant streams of new information, and rumors that cause frequent changes in expectations are likely to be periods in which changes in expectations are the prime causes of movements in exchange rates. During such periods, exchange rates should be expected to fluctuate a great deal, because expectations are constantly changing.

Forward exchange rates generally are assumed to be the best available proxies for expected future exchange rates. 1/ If this assumption is true, then predicted changes in exchange rates account for a very small fraction of actual changes. For example, the month-to-month changes in the spot values of the mark/dollar rate during March 1973-December 1979 were 10 times larger on average than their forward premiums. Changes in expectations about future exchange rates caused by new information becoming available probably create the large disparity between predicted future rates and actual future rates. The constant movement of exchange rates over time suggests that expectations about future exchange rates are quite shallow and are easily changed by relatively minor events.

Although actual exchange-rate changes have been large relative to predicted exchange-rate changes and large relative to changes in national price levels, they have been considerably smaller than changes in the prices of assets like gold, silver, and common stocks. 2/

Although expectations increase the intuitive appeal of the portfolio-balance theory, the problems inherent in quantifying expectations make it difficult to test the theory econometrically. Thus, empirical tests of the portfolio-balance theory require some assumptions about the nature of the expectations. These assumptions can make the portfolio-balance theory difficult to prove if the expectations are not properly specified. They also, however, make it difficult to disprove the theory, because it can be claimed that the expectations were not properly specified and hence, any results obtained from the model are not valid. 3/

The theory of rational expectations has some explanatory power over exchange-rate movements. Under this theory, the forward-exchange market is dominated by well-informed, profit-maximizing speculators whose actions in the forward market set the forward premium equal to the expected exchange-rate change. The existence of these rational investors implies that the foreign-exchange market is efficient and discounts future expected changes in the demand for, and the supply of, foreign exchange into the current spot rate.

The theory of rational expectations stands in contrast to the standard economic theory of adaptive expectations in which the present value of a variable is assumed to be related to past values of this variable. Under this latter theory, exchange-rate expectations are assumed to be based on simple extrapolations of past trends. Such extrapolations are effective only if inflation rates, interest rates, and economic growth are stable. The 1950's

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1/ Every foreign-exchange transaction specifies not only the quantities of the two currencies to be exchanged, but also the date of their delivery. Spot contracts call for immediate delivery; forward contracts call for delivery at a specified later date. In forward contracts, the amount of currency to be exchanged is defined at the time the contract is made. Thus, regardless of any changes that might occur in market conditions, the exchange rate is fixed beforehand. These so-called forward exchange rates reflect what the transactors expect the future exchange rate will be.

2/ As an empirical matter, exchange rates, much like stock prices, seem to follow a random-walk process. For such a process, current prices are the best forecasters of future prices (allowing for some drift). If exchange rates do follow a random-walk process, they do not involve (ex ante) unexploited profit opportunities.

3/ If an empirical test does not exist that could reject a hypothesis if it is incorrect, the hypothesis is said to be lacking empirical content and cannot be subjected to scientific testing.

and 1960's fulfilled these conditions, whereas the 1970's did not. The theory of adaptive expectations is much easier to employ econometrically because of the certainty of past values as opposed to uncertainty of future values. This theory has been around for a number of years, whereas the rational-expectations school, spearheaded by economists at the University of Minnesota and the Federal Reserve Bank of Minneapolis, is a phenomenon of the 1970's.

When rational expectations are introduced into the analysis, the monetary and elasticities theories of exchange rates are merged. The merger leads to a theory in which asset prices, which are determined by monetary conditions, adjust in response to changes in exchange-rate expectations that reflect future current-account developments. Asset prices adjust because today's exchange rate, as well as today's expectation about tomorrow's exchange rate, is ultimately linked to today's expectation about the long-term exchange rate. 1/

Government action

Major changes in exchange-rate expectations can be caused by changes in the political environment (domestic or international), unexpected current-account balances, or just market rumors. The most important causes of large changes in exchange-rate expectations, however, are the unpredictable actions of the Government, and in particular, those of the monetary authorities.

Money supply.--At 4:15 p.m. every Friday, the Federal Reserve Board announces the money supply figures for the previous week. The Federal Reserve Board has selected this time to make its announcement, because it wants to limit the effect that its announcement could have on both the stock market and

1/ Rational expectations assume that investors' exchange-rate expectations are consistent with the way that exchange rates are actually determined in the economy. Thus, the market's predictions of future exchange rates are the same as those generated by the actual mechanism that determines exchange rates. An interesting characteristic of the rational-expectations hypothesis is that, at every instant, the expected exchange-rate path must equal the actual exchange-rate path. If this were not true, the rational speculators would jump into the market whenever a disparity between expected and actual exchange-rate paths existed and would expect to reap a profit in the move from the current rate to the expected future rate. The actions of these speculators would serve to fulfill their own expectations. This idea of self-fulfilled perfect foresight on the part of rational speculators seems extreme to some economists. Its validity is currently being discussed in the economic literature. See, for example, C. A. Rodriguez, "The Role of Trade Flows in Exchange Rate Determination: A Rational Expectations Approach," Journal of Political Economy, vol. 88, No. 6, Dec. 1980, pp. 1,148-1,158, or B. Kantor, "Rational Expectations and Economic Thought," Journal of Economic Literature, vol. 17, No. 4, Dec. 1979, pp. 1,422-1,441. Regardless of the outcome of this debate, the theory of rational expectations has added significantly to our understanding of exchange-rate movements.

the foreign-exchange market. By waiting until these markets have closed for the weekend, the Federal Reserve Board gives investors time to mull over its latest announcement before taking action on it. 1/

Changes in the money stock have two effects on the spot exchange rate. First, in the short run, money-stock changes can affect the real interest rate by changing the present level of nominal interest rates. High real interest rates will cause an increase in capital flows coming into the country as foreign investors take advantage of these high yields. 2/ This will cause the domestic currency to appreciate. Conversely, a rapid increase in the money stock will lower real interest rates and, therefore, increase capital outflows and tend to lower the value of the domestic currency.

Second, in the long run, changes in the money stock can affect investors' expectations about future inflation rates. Large increases in the money stock are assumed to eventually lead to a higher inflation rate. Investors will move out of the currencies of countries with expected high inflation rates to avoid a loss of purchasing power. This will cause the currency to depreciate immediately. These two effects of money-stock changes should have the same effect on exchange rates--an increase in the money stock means a depreciating currency both in the long and short runs. 3/

Policy announcements.--The Government can also affect exchange-rate expectations through other channels. In particular, policy announcements can have a noticeable effect on the spot rate. For example, when President Reagan announced his program to reduce the U.S. inflation rate, the dollar strengthened considerably. Similarly, when President Carter announced on November 1, 1978, a series of comprehensive measures to support the dollar, within 1 month the dollar promptly responded by rising an average of 11 percent vis-a-vis the Swiss mark, the Japanese yen, and the German mark.

Government intervention.--Although government intervention in foreign-exchange markets affects exchange rates, such intervention under floating exchange rates is usually considered a leaning-against-the-wind action designed to prevent destabilizing speculation. Destabilizing speculation, which is often cited as being the cause of a sharp decline in the price of a country's currency, is caused when speculators take a position in the market that is unjustified by real standards, but that nonetheless does affect the exchange rate. 4/ The effect can only last for a short time, however, because

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1/ A known, steady growth rate of the money stock would reduce the risk premium associated with holding the dollar by reducing the uncertainty of monetary policy, and should lead to greater stability in the dollar. Monetarists advance this as a reason for adopting a constant money-growth policy.

2/ A slow increase in the money stock is generally assumed to lead to a short-run rise in interest rates.

3/ Although high interest rates cause a stronger currency, high interest rates could be correlated with a weak currency. This could occur if the monetary authority countered a weak currency with low money-stock growth and, hence, high interest rates in an effort to strengthen the currency.

4/ Speculators probably do not consult each other, but they probably do act collectively in the sense that they understand by intuition and experience how other speculators will react in certain conditions. Hence, at any given time, speculator expectations concerning any given currency will be similar. Because speculators think alike, if they believe an exchange rate will move in a certain direction, it will do so by their very actions.

the real factors that determine the exchange rate should soon outweigh the assault fever. If the effects of destabilizing speculation could be identified, government intervention could successfully counteract these short-term disturbances.

Not all sharp declines in exchange rates, however, are unjustified by real conditions. An attack on a currency can be the natural result of investors taking a position in the market that best reflects their expectations of future exchange-rate moves based on real considerations. 1/ Attempts by the government to stem the attack on its currency by taking an active postition in the foreign-exchange market often fails because the government holds only limited amounts of foreign exchange and because the attack is fueled by real factors. Government intervention can only work for a short time in the face of a strong, real surge. Determining if a sharp movement in the exchange rate is caused by destabilizing speculation or by real factors is difficult.

During the Bretton Woods era, government intervention seemed to be more successful than it is today, because such intervention kept exchange rates pegged. This success is somewhat deceptive, however, because the Bretton Woods years were characterized by stable growth and low inflation rates--conditions that allowed for slow changes in exchange rates. During this period, sustained government intervention was unable to prevent crises, in the British pound in 1967 and the French franc in 1958 and again in 1969, that led to formal devaluations.

Adjustment mechanism

Critical assumptions in the portfolio-balance theory are the perfect mobility of assets and the existence of a continuous and instantaneous equilibrium in the capital market. In this theory, the goods market is allowed to be out of equilibrium, but the capital market is not. Because the capital market and capital-market prices are assumed to adjust much faster than the commodity and labor markets and their associated prices, a phenomenon called overshooting appears.

A disturbance in the money markets will have an immediate effect on interest rates and exchange rates, but will have a relatively delayed effect on prices and wages. Trade flows take time to react to price and exchange-rate changes because of the lags involved in recognizing a long-term shift in trends and then in implementing any marketing changes. Therefore, the capital market alone must equilibrate the market for foreign exchange. The exchange rate often overshoots its long-run position, and thus, is subsequently expected to depreciate. This reduces the otherwise unequal expected rates of return on foreign and domestic assets.

From the viewpoint of financial transactions, no overshooting ever occurs; the capital market is always in equilibrium. Only from the viewpoint of current-account transactions does overshooting occur. If the exchange rate did not overshoot, the exchange rate might never reach its goods-market equilbrium position. Through a series of damped oscillations caused by the overshooting, the adjustment process is speeded up, and the exchange rate

1/ The only difference between an attack and an ordinary movement is that the attack suddenly has an unusually large number of investors who strongly believe that the exchange rate will move in a certain direction.

reaches its long-term equilibrium value much quicker than it would without the overshooting. Unfortunately, this adjustment procedure can confuse businessmen trying to distinguish long-run shifts from short-run shifts when making investment decisions.

Appendix A contains empirical results from a model based on the portfolio-balance theory.

Conclusion

The above discussion indicates that many factors--current-account balances, policy announcements, changes in expectations, government intervention, money-stock changes, risk, inflation rates, political developments, real interest rates--help explain how exchange rates are determined in a world of floating exchange rates. Different factors account for different exchange-rate movements. These different factors can occur in a wide variety of combinations and can influence the exchange rate in different directions. Although some of these influences may seem to dominate for a period, exchange rates are determined by a complex interactive process in which all of these influences are important.

COMPETITIVENESS

The recent appreciation of the U.S. dollar against most major currencies has led to the claim that producers in the United States have suffered a loss in competitiveness to their foreign counterparts. When the dollar appreciates, U.S. exports become more expensive in world markets, because foreigners can purchase fewer dollars with each unit of their currency than they could before the appreciation. Conversely, imports become less expensive to U.S. residents because the dollar buys more foreign currency than it used to. Thus, an appreciation of the dollar puts U.S. exporters at a disadvantage in world markets and forces domestic producers to compete with cheaper imports. 1/ Because a currency appreciation reduces exports and increases imports, an appreciation will, after a lag of up to several years, lead to a deteriorating trade balance. 2/

Trade Balance

Questions have been raised recently about the ability of U.S. products to compete in world markets. Until 1971, the U.S. merchandise-trade balance had been positive for every year since 1873. Since 1971, however, the U.S. merchandise-trade balance has been positive in only 2 years--1973 and 1975. The deficit peaked in 1978 at $33.76 billion; the deficit was $27.89 billion in 1980.

The merchandise-trade balance, however, only takes into account the difference between tangible exports and tangible imports. The trade balance does not include the services balance, a critical omission for the United States, which has had a surplus in its services balance since 1957. To live within its limits, a country should try to balance roughly the flow of funds into and out of the country. A problem arises when the merchandise-trade balance is examined alone, because only part of the flow of funds is included.

The current account, the combination of the trade and services balance minus unilateral transfers, better determines if a country is living within its limits. For the United States, the positive balances in services trade were sufficiently large in several years during the 1970's to allow the current-account balance to be positive. Overall, the U.S. current-account balance has tended to fluctuate around zero.

Many people, however, continue to view the decline in the U.S. trade balance with alarm. The most important reason for this decline is that the huge technological advantage that the United States had over its major trading partners at the end of World War II has been largely eliminated. Other countries now produce a mixture of goods similar to that produced by the United States. The relative share of U.S. exports in world markets has diminished, because foreign importers have found substitutes for products that previously were available only from the United States.

1/ A depreciation puts U.S. exporters at an advantage in world markets by allowing them to compete with more expensive imports.

2/ Conversely, a currency depreciation will ultimately result in an improved trade balance.

Second, the United States is no longer the unchallenged leader in technological innovations that it used to be. Indeed, the United States now imports many advanced technological items because they are not produced domestically. For example, video cassette recorders (VCR's) are very popular in the United States, and yet, over 98 percent of them are produced in Japan. In 1981, U.S. VCR imports amounted to about $500 million.

Third, productivity increases in the United States over the past two decades have not kept up with increases in other countries. For example, from 1960 to 1979, annual gains in Japanese productivity averaged 9.2 percent, whereas annual gains in U.S. productivity averaged only 2.5 percent over the same period. West Germany had average annual productivity gains of 5.4 percent over the same period. 1/ Higher productivity increases can offset wage increases and can result in lower prices and an increase in competitiveness.

Fourth, the huge increase in the price of imported oil contributed to the recent increase in the U.S. merchandise-trade deficit. U.S. imports of oil rose from $2.6 billion in 1969 to $79.7 billion in 1981 or by 2,965 percent. 2/ The average price of a barrel of oil increased 1,009 percent, from $3.09 in 1968 to $34.28 in 1981. Over the same period, the consumer price index increased 162 percent. When the cost of petroleum is excluded from the U.S. trade balance, the trade balance shows a surplus (fig. 15).

A factor related to the rise in the price of oil has been the increase in the imports of cars. Partly as a result of the greater fuel efficiency of foreign cars, imports of cars increased 421 percent, from $3.4 billion in 1969 to $17.7 billion in 1981. 3/ Thus, the direct and indirect effects of the enormous rise in the price of oil on the U.S. trade balance have been large.

Fifth, wage rates in the United States are higher than those in foreign countries. High wages, if not offset by higher productivity, increase the costs of production and, thus, raise the prices of American goods relative to foreign products. For example, it has been estimated that a Japanese firm can produce a car for between $1,000 and $1,500 less than an American firm. Most of this savings comes from the difference of $7.86 per hour between the average hourly wage for American auto workers and Japanese auto workers. 4/

Finally, and most important for this study, exchange-rate changes can affect the trade balance. As mentioned earlier, if a country's currency appreciates, the price of exports generally will rise and the price of imports

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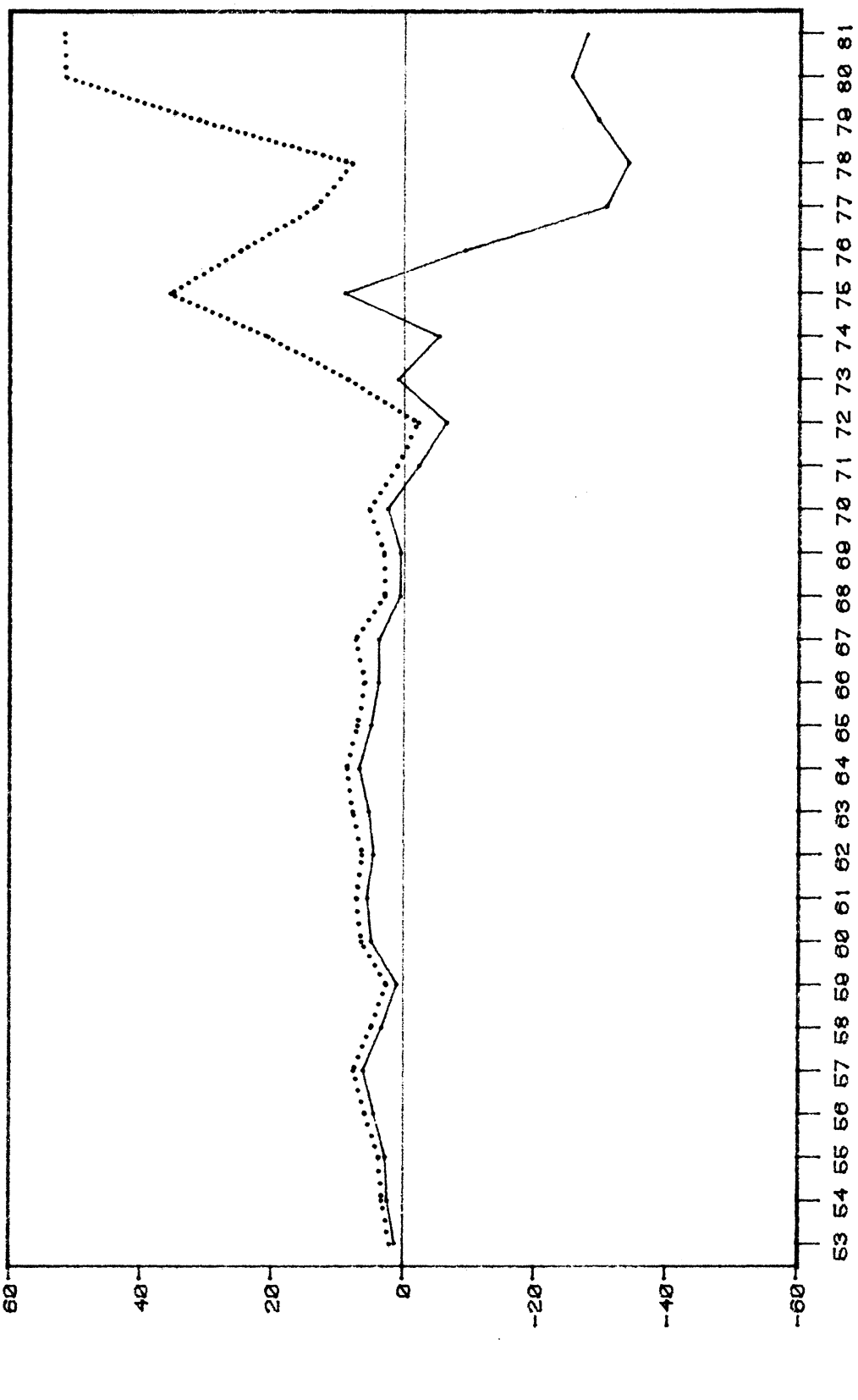
1/ Joint Economic Committee, Congress of the United States, The 1981 Midyear Report: Productivity, July 23, 1981, p. 4.

2/ International Financial Statistics, September 1982, p. 428.

3/ The U.S. Automobile Industry: Monthly Report on Selected Economic Indicators: Report to the Subcommittee on Trade, Committee on Ways and Means, on Investigation No. 332-121 . . ., USITC Publication 1125, February 1981; and Automotive Trade Statistics 1964-78 . . ., USITC Publication 1002, September 1979.

4/ U.S. Senate, Issues Related to the Domestic Auto Industry, Dec. 1, 1981, pp. 37 and 41.

FIGURE 15.--COMPARISON OF U.S. TRADE BALANCE WITH AND WITHOUT OIL IMPORTS.



Source: Compiled from official statistics of the International Monetary Fund.

generally will fall. 1/ As the currency appreciates, the trade balance would move toward a deficit. If the currency appreciation is large enough and lasts long enough, exporters may find it necessary to build production facilities in the importing country to remain competitive. For example, Volkswagen built an auto assembly plant in Pennsylvania in 1976 partly because the mark had appreciated sharply relative to the dollar in the early 1970's.

Definition

When people refer to a country gaining competitiveness, they are referring to the perceived improvement of one country's position relative to another in the world market. Such an improvement can be reflected in increased exports or in reduced imports. An increase in competitiveness is usually, but not always, caused by a relative decrease in the price of the goods produced by the country that is becoming more competitive. Non-price measures that can increase competitiveness include improvements in product quality, reliability of service, consumer tastes, credit terms, and marketing strategy. Because non-price measures are much more difficult to quantify than prices, a perceived change in competitiveness is usually tested for by looking at changes in relative prices.

Relative prices, however, are not perfect measures of price competitiveness. If firms in two countries sell substitute products, one firm can lower its price relative to the price of its competitors and become more price competitive. This firm would become more price competitive whether it drops its price 5 percent or 50 percent. We cannot, however, say that the firm has become twice as competitive as it was originally if it drops its price 50 percent. All we can say is that the firm is now more competitive.

Thus, competitiveness is a concept that can be determined qualitatively (more competitive, less competitive), but not determined quantitatively (twice as competitive, half as competitive). Any findings about changes in competitiveness must be limited to findings of direction and not of degree.

In a world of multilateral trade and many tradable commodities, no simple measure can accurately portray a nation's competitiveness. Determining the changes in competitiveness caused by currency fluctuations is even more difficult, because trade changes caused by such fluctuations tend to lag behind exchange-rate changes. These lags can last anywhere from a few days to 10 years. At least five lags exist between changes in exchange rates and their ultimate effects on real trade: lags in recognizing the changed situation, in deciding to change real variables, in rescheduling delivery time, in replacing inventories and materials, and in altering production.

1/ In addition to lowering the price of imports, an appreciation of the dollar can lead to lower priced domestic goods.

First, by lowering the prices of imports, an appreciation of the dollar lowers any price index that includes the prices of imports. Because price indexes affect wages through cost-of-living clauses, an appreciation of the dollar can lead to lower wages that ultimately can lead to lower priced domestic goods.

Second, when the dollar appreciates, imports that serve as inputs to domestic production become cheaper. This lowers the domestic costs of production and should lead to lower prices for domestic goods.

Third, increased competition from lower priced imports will lead to a reduction in domestic prices.

Example

The following example explains how exchange-rate changes can affect prices and a firm's competitiveness. Assume that a German firm makes a product that it sells for 2 marks to both domestic and foreign buyers. If the exchange rate between Germany and the United States were 2.00 (2 marks = $1.00), the German firm would sell the product in the United States for $1.00, which equals 2 marks (this assumes the buyer pays any transportation costs). If the dollar were to appreciate so that it would take 4 marks to buy one dollar, the 2 marks that the German firm would want to receive as payment for its product could be obtained for only $.50 (if 4 marks = $1 then 2 marks = $.50). Thus, the German firm would now sell its products in the United States for $.50, and still receive the same number of marks. U.S. producers, who were competitive with imports at the previous selling price of $1 would find their costs unchanged by the exchange-rate change and might be unable to sell their product at $.50 and remain in business very long. Thus, as a result of the exchange-rate change, the U.S. producers would have suffered a loss of price competitiveness.

A similar story can be told on the export side. If a U.S. firm wants $1.00 for a product regardless of the nationality of the buyer, after the dollar appreciates, the U.S. firm would have to raise its selling price in Germany to 4 marks from 2 marks to receive $1. German firms that produce a similar good would find their costs unchanged by the exchange-rate change and could continue to sell the product at 2 marks without any loss of profits. The U.S. firm would have to raise its selling price to 4 marks to keep per unit profits constant. Thus, the U.S. firm would have suffered a loss of competitiveness.

Suppose that instead of agreeing on the price at the same time the goods are shipped, a U.S. importer were to agree to buy, and a German exporter agree to sell, 100 units of a product for $1 per unit, or 2 marks per unit. Assume that during the period between the time the contract was entered into and the time final payment is made the U.S. dollar appreciates from 2 marks to 4 marks. An important consideration after such an appreciation is whether the contract was denominated in marks or in dollars. If the contract was denominated in marks, the U.S. importer would pay $50 and have a capital gain of $50. The German firm would still receive 100 marks. In this case, the price of U.S. imports would fall 50 percent in dollars and be unchanged in marks.

If the contract were denominated in dollars, U.S. importers would pay $100. But German exporters would receive 400 marks and have a capital gain of 200 marks because of the dollar appreciation. Thus, importers want contracts to be denominated in the depreciating currency, whereas exporters want contracts to be denominated in the appreciating currency.

Price Competitiveness

A change in price competitiveness between two countries can arise from either a change in the domestic prices of tradable goods or a change in the exchange rate. Changes in competitiveness caused by changes in domestic prices are seen by most people as being real changes. Technology improvements, productivity increases, or relative wage decreases are factors

that can lead to relative price changes. These factors can be influenced by the producing firm and, thus, can be controlled to some extent by the firm.

Changes in competitiveness caused by changes in exchange rates, however, cannot be controlled by any firm. 1/ As the previous section showed, exchange-rate changes are caused by a large number of factors--none of which are controlled by the firm. Thus, the firm is an exchange-rate taker and can only respond to exchange-rate changes.

Although all industries feel the effects of a strong domestic currency on their internatiuonal competitiveness, the strength of a country's currency will not hurt every industry equally. In the United States, industries such as textiles and steel, which produce a relatively homogeneous product and that are highly price sensitive because of intense competition from abroad suffer most from a loss of competitiveness when the dollar appreciates. On the other hand, industries such as the aircraft industry, which produce relatively specialized products, are little affected by a strengthened dollar. These industries suffer least because of their dominance in international markets or because of long-term contracts. For example, airplane buyers typically make payments over a 10-year period, during which currency changes tend to even out. U.S. farm products also enjoy a strong position in international markets, because they account for a large share of the total agricultural market.

To aid in the discussion of competitiveness, economists often classify goods into two categories. The first category contains goods that can be neither imported nor exported profitably because of prohibitive transportation costs. Such goods are called nontradables. Examples of nontradable goods are haircuts, houses, and gardening services.

The second category is tradable goods, of which two different kinds exist. Tradable goods in which producing firms can set the market prices for their own particular products are called heterogeneous tradables. In the short run, producers of heterogeneous tradables face a downward-sloping demand curve from foreign and domestic buyers (i.e., the firm is not a price taker, but rather, has some discretion in setting the price). Heterogeneous tradables are usually manufactured products with distinctive characteristics, such as a brand name. This heterogeneity allows different market prices to exist for similar, although not identical, products. Automobiles, televisions, and shoes are in this category.

The second kind of tradable goods, homogeneous tradables, are commodities in which one firm's output may be precisely compared with that of others. Most agricultural and primary products belong to this category. Daily and weekly fluctuations in the prices of these goods are usually quickly arbitraged across countries unless barriers to trade prevent such arbitrage.

For heterogeneous tradables, prices are relatively fixed. Differences between current sales and current production are reflected in inventory changes. For this reason, inventory levels are often out of equilibrium (not

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1/ Some countries, notably Holland and the United Kingdom, have had periods in which they have had appreciating currencies because of the actions of one industry--the oil industry. In these cases, however, the industry influenced the exchange rate, but did not control it.

at the preferred level). The company's control over price, however, insulates its inventory from pure price risk. Only in extreme circumstances would the firm be forced to sell its inventory at sharply reduced prices.

Because homogeneous tradables are standardized commodities, the identity of any particular producer's commodity is not important. Each producer is usually a small part of the total world market and is a price taker. The prices at which he purchases and sells are determined within narrow limits by global supply and demand. Unlike inventories of heterogeneous tradables, the values of homogeneous tradables inventories cannot be protected by an administered wholesale or retail price and, thus, fluctuate in the open market.

Prices for homogeneous tradables in international trade are often quoted in dollars. If homogeneous tradables have a high enough volume in international trade, a centralized commodity exchange may concentrate worldwide supply and demand at a single geographic point--often in a country with a commonly used international currency. New York, Chicago, and London house many such centers. For example, U.S. dollar prices of various grades of wheat are registered daily with the Chicago Board of Trade, to which transportation costs can be added to establish grain prices in dollars anywhere in the world.

Although homogeneous tradables are often traded in a centralized international exchange and usually have sale prices quoted in pounds or dollars, prices for homogeneous tradables may be quoted in dollars even if formal trading exchanges do not exist for these products. Petroleum prices have long been traded throughout the world at fairly uniform spot prices (except in crisis situations) without such a geographically centralized exchange. Nevertheless, almost all quoted prices and payments for oil products that cross international boundaries are in U.S. dollars.

Because the dollar continues to be the world's dominant currency, many major commodities are internationally traded in dollars. This role has helped to maintain, despite a rising dollar, the competitiveness of certain American products. The competitive advantage of a foreign manufacturer is tempered to the extent that he must purchase dollar-denominated raw materials.

A foreign manufacturer whose products require much labor and few raw materials, however, can thrive when the dollar appreciates. Such a manufacturer could raise its market share by raising its price only to the extent that its costs have changed because of the exchange-rate move, or it could increase its profit margin by raising its price by the same amount as its competitors.

For fairly homogeneous commodities not traded on organized markets (for example, steel plate), a short-term discrepancy between the relative dollar prices for products of different countries might occur. Over time, however, inventories would decrease and orders would increase in the countries with lower priced products. Inventories would accumulate and orders would decline in countries with higher priced products. The changes in inventories and

orders are market signals to producers, and should induce a uniform pricing arrangement. Thus, regardless of how the market is organized, no permanent discrepancy between the prices of homogeneous products can occur. 1/

Transportation costs aside, if the domestic currency depreciates in international markets, immediate pressure develops to increase the domestic currency price of both importables and exportables that are homogeneous tradables. Their domestic dollar prices are fixed, but the foreign-market prices expressed in dollars would rise because of the depreciation. Large amounts of these goods would soon leave the country if their prices did not rise to reflect a depreciation. Owners of homogeneous tradables are price takers and can sell as much as they want at the given price, but they cannot control that price.

On the other hand, exports of heterogeneous tradables are often maintained at fairly rigid prices. The pricing of such goods is often based on cost-plus pricing. 1/ Exchange-rate movements will not affect production costs for most firms significantly in the short run and, therefore, will leave export prices essentially unchanged in terms of the exporter's currency. A depreciation is less likely to force an immediate increase in the domestic currency prices of these goods, particularly if the firm thinks that the exchange-rate change may be transitory.

In the tradable goods sector, therefore, prices of different types of goods seem to respond to changes in exchange rates over two different lengths of time:

1. A short run, generally of a few days, in which domestic selling prices of homogeneous tradables change by the full amount of the exchange-rate change.

2. An intermediate run, generally of a few months although possibly a few years, over which the domestic currency prices of heterogeneous tradables change by the full amount of the exchange-rate change, depending on the competitive advantage perceived by domestic manufactures of maintaining an unchanged price to domestic and overseas customers.

1/ Of course, government intervention in the marketplace can cause extended periods of price discrepancy between markets.

1/ In cost-plus pricing, a firm assumes that it will sell an "average" number of units, and then estimates the total cost of producing these units. After figuring per unit costs, it tacks on a percentage for advertising, profits, and so forth. This yields the selling price. Automobiles have traditionally been priced this way. See Frederick M. Scherer, Industrial Market Structure and Economic Performance, 1971, pp. 173-179.

For heterogeneous tradables, deviations from PPP over months or even years can be very substantial under floating exchange rates. Because commodity arbitrage is so imperfect for these commodities in the short run, it cannot be relied upon to contain exchange-rate movements within the predictable and narrow limits suggested by the law of one price.

Pass-Through

The expected changes in international trade flows caused by exchange-rate changes can occur only if these exchange-rate changes are at least partially reflected in the prices of traded goods, rather than being absorbed by the exporter. The extent to which exchange-rate changes are transformed into changes in the prices of imports and exports is known as the pass-through effect of the exchange-rate changes.

The degree of pass-through is important, because domestic buyers have incentives to alter their purchases of foreign goods only to the extent that the prices of these goods change in terms of the domestic currency. That, in turn, depends on the willingness of exporters to allow the exchange-rate change to affect the prices they charge for their products, measured in terms of the buyer's currency. A successful pass-through means that in depreciating countries, the domestic currency price index of imports should be rising, and in appreciating countries, it should be falling.

Incomplete pass-through can occur if the exporter decides to absorb part of the exchange-rate change to maximize profits or to maintain market share. The pass-through response of exporters to currency appreciation will vary from industry to industry, depending on the amount of competition the industry faces from foreign firms.

The exporting firm may sell through independent foreign wholesalers that vary their markup to maintain stable prices to customers, and thereby maintain their market position against local competition. The exporting firm sells at one price in its own currency and therefore at a constantly varying price in the importing country's currency. Stable prices are maintained to final customers through variation in the wholesaler's margin. This is another source of incomplete pass-through.

If a firm sells to all consumers at one price in its own currency, its price to foreign customers in their currency varies proportionally with the exchange rate, and complete pass-through occurs. Firms that prefer to keep market prices stable and that have extensive foreign markets, however, might be expected to try to maintain stable prices in all markets. Firms in oligopolistic markets might bring considerable market power to such efforts. To do this, the exporting firm would quote a local currency price in each market and maintain these prices despite exchange-rate movements. This would mean zero pass-through.

This relationship between the domestic and foreign prices is based on the firm's estimate of the long-run equilibrium exchange rate. Short-term fluctuations around that rate are simply ignored. If major exchange-rate movements occur that change the firm's estimate of the long-run equilibrium rate, it can make a single adjustment in the relationship between prices. It will not, however, react to what is thought to be transitory changes in the exchange rate. Such a pricing policy requires that the firm accept a

constantly varying return in its own currency from sales in foreign markets. Therefore, fluctuations in the exchange rate would affect export profits rather than prices.

Although economists have an idea what goods are most affected by exchange-rate moves, they cannot predict what the actual pass-through effect of an exchange-rate move will be. For importers, such a decision depends on the demand conditions in the domestic market, the competition from other importers and domestic producers, profit levels, and the change in the cost of the product. For exporters, this decision will be based on the demand conditions for this product in the world market, the relative return available in other markets, the size of the exchange-rate change, the actions of other exporters, and the level of profits.

Empirical Evidence

A recent study by Deardorff and Stern 1/ examined the effects of the 11.6-percent appreciation of the dollar from the second quarter of 1980 to the second quarter of 1981 on U.S. trade. According to the study, 1 year after the dollar appreciation, exports should fall by $2.8 billion, imports should rise by $15.0 billion, and the trade balance should fall by $17.8 billion. By the end of the third year following the appreciation, exports should fall by $7.5 billion, imports should rise by $16.1 billion, and the trade balance should fall by $23.6 billion.

Their study predicted that the U.S. sectors that suffer the largest decline in exports are in nonelectrical machinery; fuel products; textiles; miscellaneous manufactures; chemicals; transport equipment; electrical machinery; and food, beverages, and tobacco. The U.S. sectors that experience the largest increases in imports are in transport equipment, petroleum and related products, miscellaneous manufactures, electrical machinery, chemicals, nonelectrical machinery, metal products, agricultural products, rubber products, iron and steel, and wearing apparel.

Relationship Between Bilateral Exchange Rates and Trade Balances

Increases in the bilateral value of the U.S. dollar generally are followed by decreases in the bilateral U.S. trade balance because of the change in competitiveness caused by the exchange-rate movements. As a result of a dollar appreciation, U.S. exports to foreign countries become more expensive to foreigners, and foreign exports to the United States become less expensive to Americans. These two effects would combine to lower the trade balance. Conversely, decreases in the bilateral value of the U.S. dollar are generally followed by increases in the bilateral U.S. trade balance. The effect of any exchange-rate movements on the bilateral trade balance should be noticeable within a few quarters. It may, however, take several years before the full effect is felt.

Immediately after a currency depreciation, a nation's trade balance may fall. Such an effect, called the J-curve, occurs because the volume of trade

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1/ A. V. Deardorff and R. M. Stern, "The Sectoral Impact of the Recent Appreciation of the U.S. Dollar," The University of Michigan, Mar. 5, 1982.

is relatively fixed in the short run, whereas the price of traded goods can change much more quickly. 1/ With trade volumes fixed, the price of imports rising, and the price of exports falling, the trade balance of a country that has a depreciating currency may fall for a short time. The effect of the depreciation on the trade balance can remain negative for up to 2 years. 2/ Generally, however, the trade balance is positively affected by a currency depreciation within 1 year.

Figures 16-19 show the bilateral exchange rate and trade balance between the United States and four other countries. The figures show that the short-run relationship between the bilateral trade balance and the exchange rate can vary widely, depending on circumstances.

U.S. trade with the United Kingdom and Canada has roughly followed the expected pattern: changes in the U.S. trade balance with these countries have generally followed opposite changes in the value of the dollar vis-a-vis the currencies of these countries. Surprisingly, changes in the U.S. trade balance with Japan has generally preceeded changes in the value of the dollar vis-a-vis the yen. Changes in the U.S. trade balance with West Germany has combined periods of the expected pattern and periods of the Japanese pattern.

The trade balance between the United States and the United Kingdom drifted within a relatively narrow range until 1978. In late 1978, it began to rise rapidly and reached a peak in mid-1980. From there it plummeted, reaching bottom in mid-1981.

Meanwhile, the value of the U.S. dollar fell vis-a-vis the British pound from 1976 until 1980. The value of the dollar rose rapidly in 1981 and 1982. The rise in the U.S. trade balance during 1978-80 corresponds nicely with the fall in the value of the U.S. dollar in 1976-1980. Similarly, the steep decline in the U.S. trade balance since 1980 appears related to the increase in the value of the dollar since late 1980.

The relationship between the trade balance and the exchange rate for the United States and Canada also exhibits a fairly normal pattern. Except for an increase in the value of the U.S. dollar from 1976 to 1978, the exchange rate between the U.S. dollar and the Canadian dollar has not changed drastically during the era of floating exchange rates. Overall, the value of the U.S. dollar increased throughout much of the past 9 years, and the U.S. trade balance with Canada has fallen.

More specifically, the U.S. dollar hit a temporary low in the second quarter of 1974, and the trade balance hit a temporary high in the second quarter of 1975; the dollar hit a high in the third quarter of 1975, and the trade balance hit a low in third quarter of 1976; the dollar hit a low in the second quarter of 1976, and the trade balance hit a high in the first quarter

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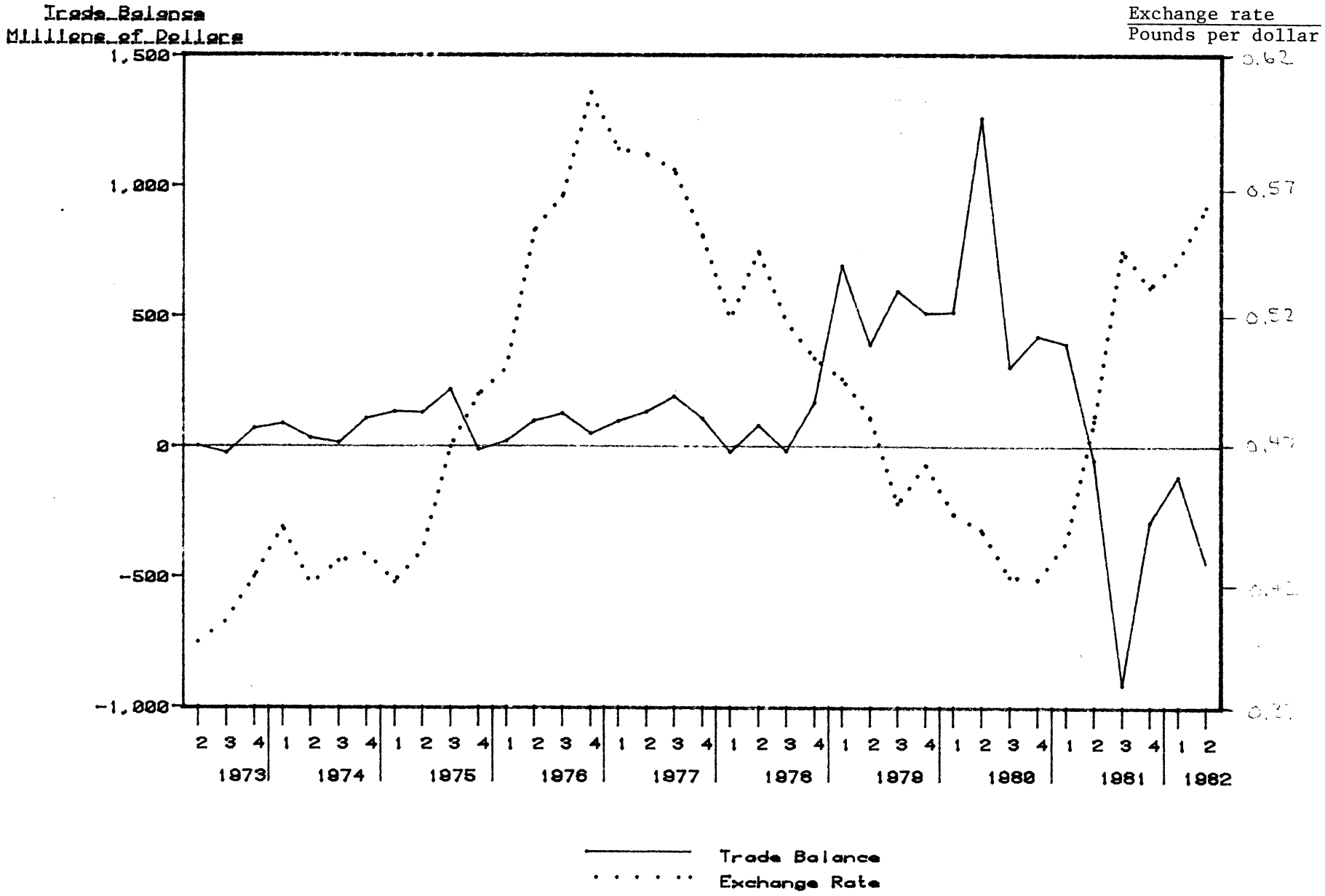
1/ This effect is called the J-curve effect because the trade balance, measured across time, resembles the letter J. The trade balance falls for a brief period after a depreciation; trade volume levels are relatively fixed, and then zoom upward once predepreciation contracts expire. No name has yet been given to the effect that occurs when a currency appreciates and results in a short-run increase in the trade balance.

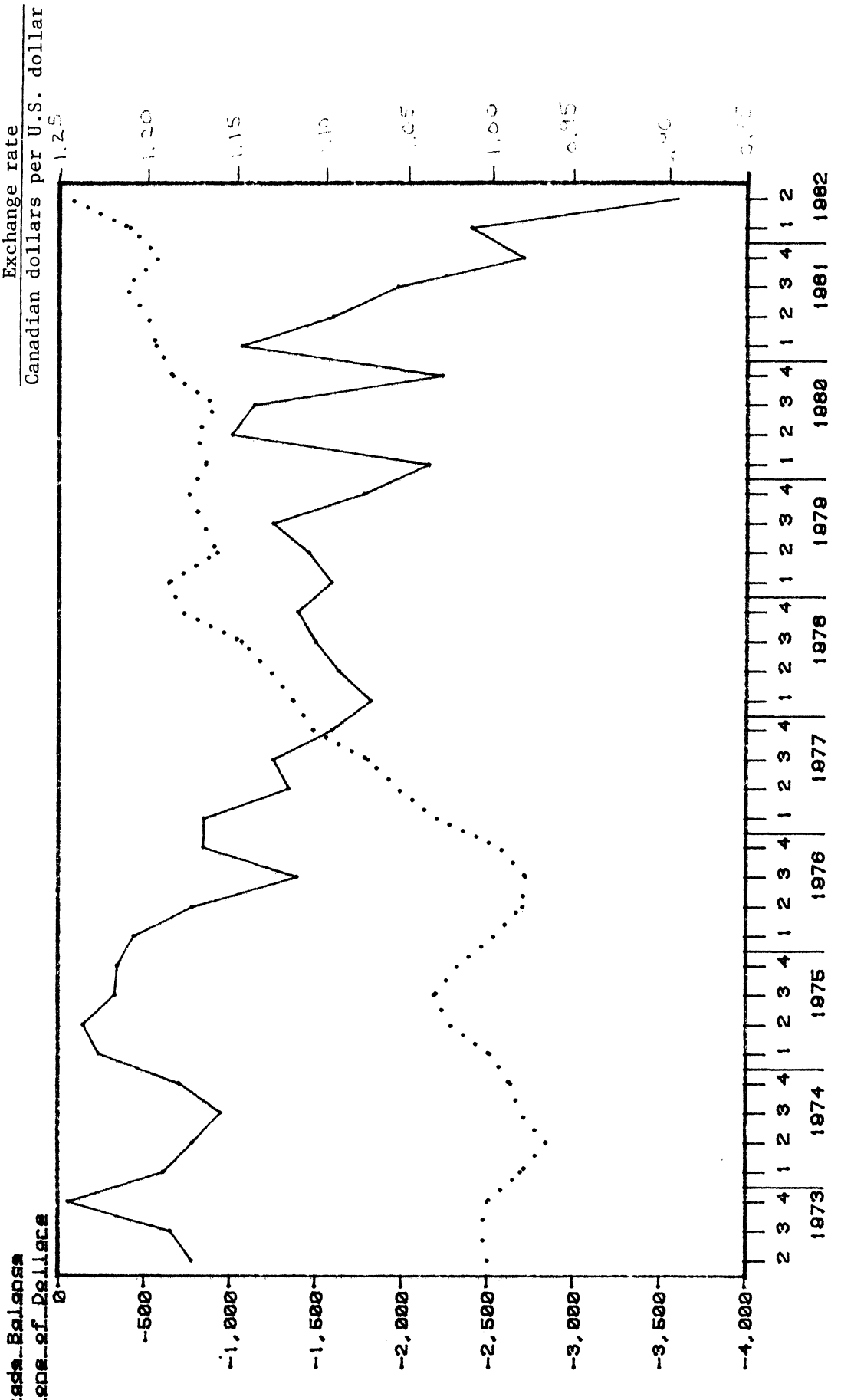
2/ The longest negative effect of an exchange-rate depreciation on the trade balance found by Wilson and Takacs (1980) was five quarters.

FIGURE 16.--UNITED KINGDOM-U.S. TRADE BALANCE AND EXCHANGE RATE.



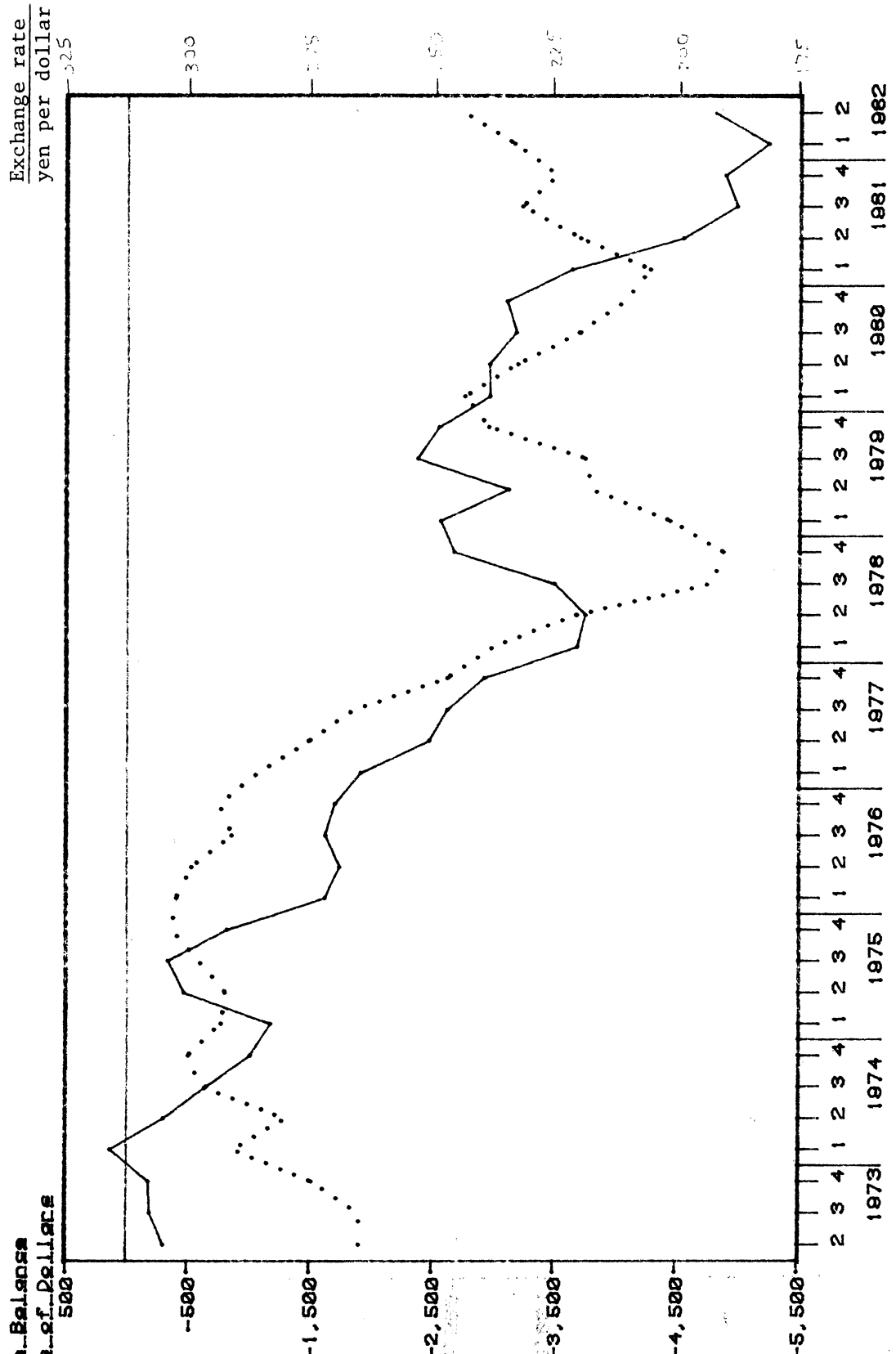
Source: Compiled from official statistics of the International Monetary Fund.

FIGURE 17.--CANADA-U.S. TRADE BALANCE AND EXCHANGE RATE.



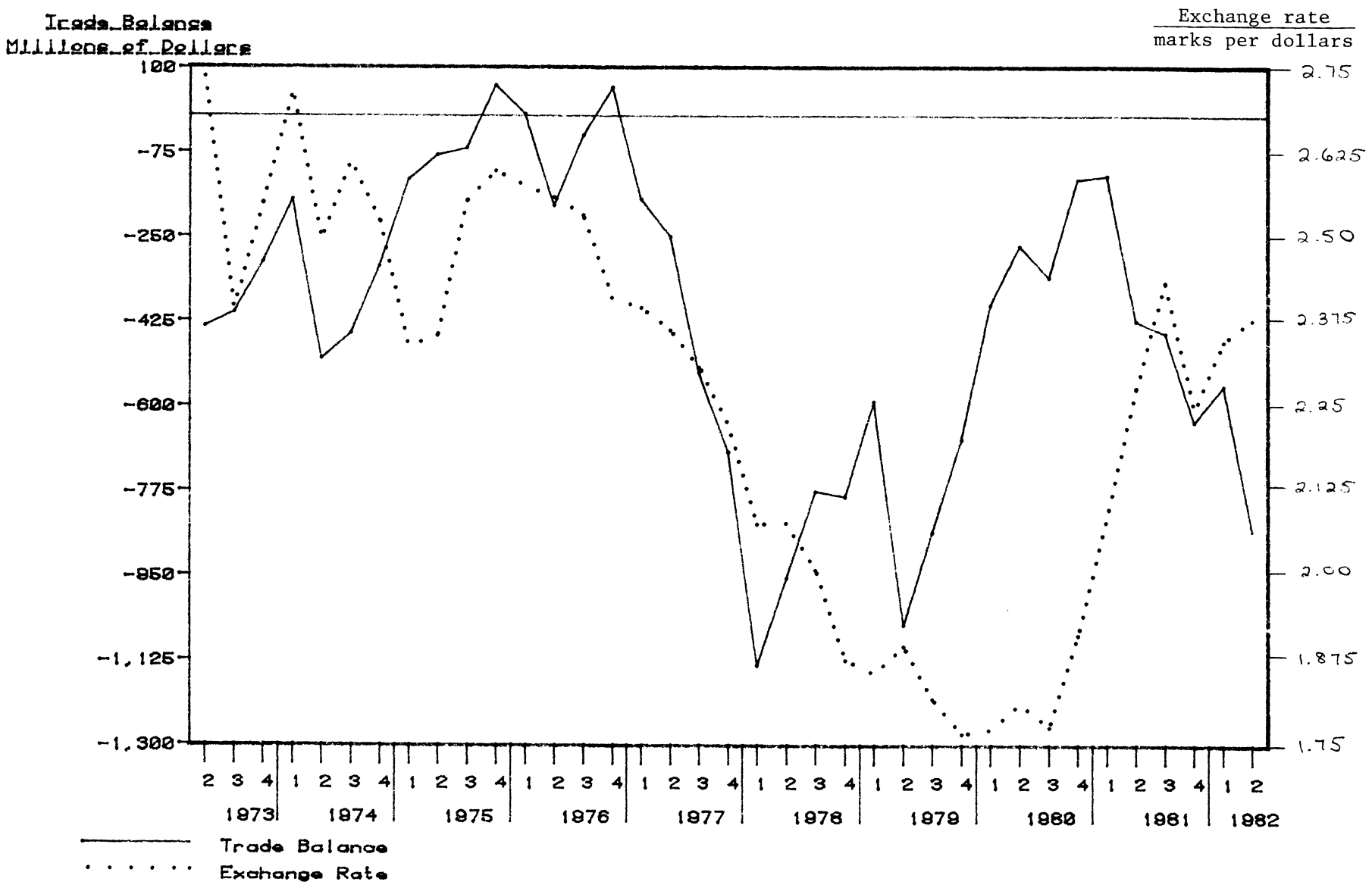
Source: Compiled from official statistics of the International Monetary Fund.

FIGURE 18.-- JAPANESE-U.S. TRADE BALANCE AND EXCHANGE RATE.



Source: Compiled from official statistics of the International Monetary Fund.

FIGURE 19.-- WEST GERMAN-U.S. TRADE BALANCE AND EXCHANGE RATE.



Source: Compiled from official statistics of the International Monetary Fund.

of 1977; the dollar hit a high in the fourth quarter of 1978, and the trade balance hit a new low in the first quarter of 1980; the dollar hit a 50-year high in the second quarter of 1982, and the trade balance hit an all-time low in the second quarter of 1982.

From 1975 to 1980, movements in the yen/dollar exchange rate actually lagged behind movements in the U.S. trade balance with Japan, rather than vice versa. This was especially true from 1975 to 1978, when both the U.S. trade balance with Japan and the value of the dollar vis-a-vis the yen fell precipitously.

A partial explanation could be that once the dollar started depreciating rapidly and the price of Japanese goods started rising in the United States, U.S. importers and consumers expected the trend to continue and rushed out to purchase Japanese goods before their prices rose even more. The opposite behavior could have occurred in Japan. Japanese importers, seeing that U.S. goods were constantly being lowered in price, may have postponed the purchase of such goods, expecting even further price decreases. This short-run phenomenon would cause the U.S. trade balance with Japan to fall while the dollar depreciated vis-a-vis the yen. A similar effect could have occurred among investors who felt that the dollar would continue to decline vis-a-vis the yen. In the long run, of course, domestic and third-country substitutes would be expected to take the place of the expensive Japanese imports in the United States, and Japanese consumers would be expected to eventually buy the cheaper U.S. goods.

In 1981, and early 1982 the U.S. trade balance with Japan and the value of the dollar vis-a-vis the yen moved rather sharply in opposite directions. It will be interesting to see if the relationship between the trade balance and the exchange rate will now take the expected course or if the yen/dollar exchange rate is influenced by some other, as yet unidentified, economic forces.

The relationship between the trade balance and the exchange rate for the United States and West Germany has had periods of both expected and unexpected behavior. From 1973 to 1975, the value of the U.S. dollar vis-a-vis the mark and the U.S. trade balance with West Germany fluctuated quite a bit with no obvious trend. At the end of 1975, however, the value of the dollar vis-a-vis the mark started a plunge that finally ended in late 1979. The U.S. trade balance with West Germany plunged between 1976 and 1978. Thus, from 1976 to 1978, both the value of the dollar vis-a-vis the mark and the trade balance fell, much as they had with Japan from 1975 to 1978. The trade balance with West Germany rose, however, beginning in 1978 and reached a peak in early 1981. This rise in the trade balance probably was a result of the fall in the value of the dollar that began in 1975. The value of the dollar vis-a-vis the mark has risen sharply since the third quarter of 1980, while the trade balance with West Germany has fallen sharply since the beginning of 1981.

Changes in the Competitiveness of Specific Products

The value of the dollar fell against the Japanese yen and the German mark from 1973 to 1981. As a result, the competitiveness of most products from these two countries would be expected to have declined vis-a-vis U.S. products. To illustrate how the competitiveness of some products has changed, the dollar prices of specific exports from Japan and West Germany are compared with the dollar prices of similar U.S. exports. These results show that for a

vast majority of a sample of manufactured export goods, the United States lost competitiveness from 1973 to 1981 despite the fall in the value of the dollar. These results suggest that factors other than exchange rates can also affect competitiveness.

In figure 20, Japanese export prices of particular products are compared with U.S. export prices of the same products. 1/ The Japanese export price is divided by the U.S. export price to form a ratio of the two prices. This ratio is then indexed so that the value of the index in the base period, June 1973, equals 100 for all products. The ratio of Japanese prices to U.S. prices in the base period is compared with the same ratio in the end period, December 1981, by drawing a line from the value of the index in June 1973 to the value of the index in December 1981. If the ratio of Japanese prices to U.S. prices was unchanged from June 1973 to December 1981, the line drawn connecting the two would correspond to a horizontal line drawn where the value of the index equals 100. This would indicate that the competitiveness of the U.S. products vis-a-vis the Japanese product has not changed since June 1973.

If the export price of a Japanese product had increased relative to the U.S. export price, the ratio would increase, and the resultant connecting line would be above the horizontal line. This increase in the ratio would indicate that the U.S. product has gained competitiveness since June 1973 relative to the Japanese product.

If the export price of a Japanese product had decreased relative to the U.S. export price, the ratio would decrease, and the resultant connecting line would be below the horizontal line. This decline would indicate that the U.S. product has lost competitiveness since June 1973 relative to the Japanese product.

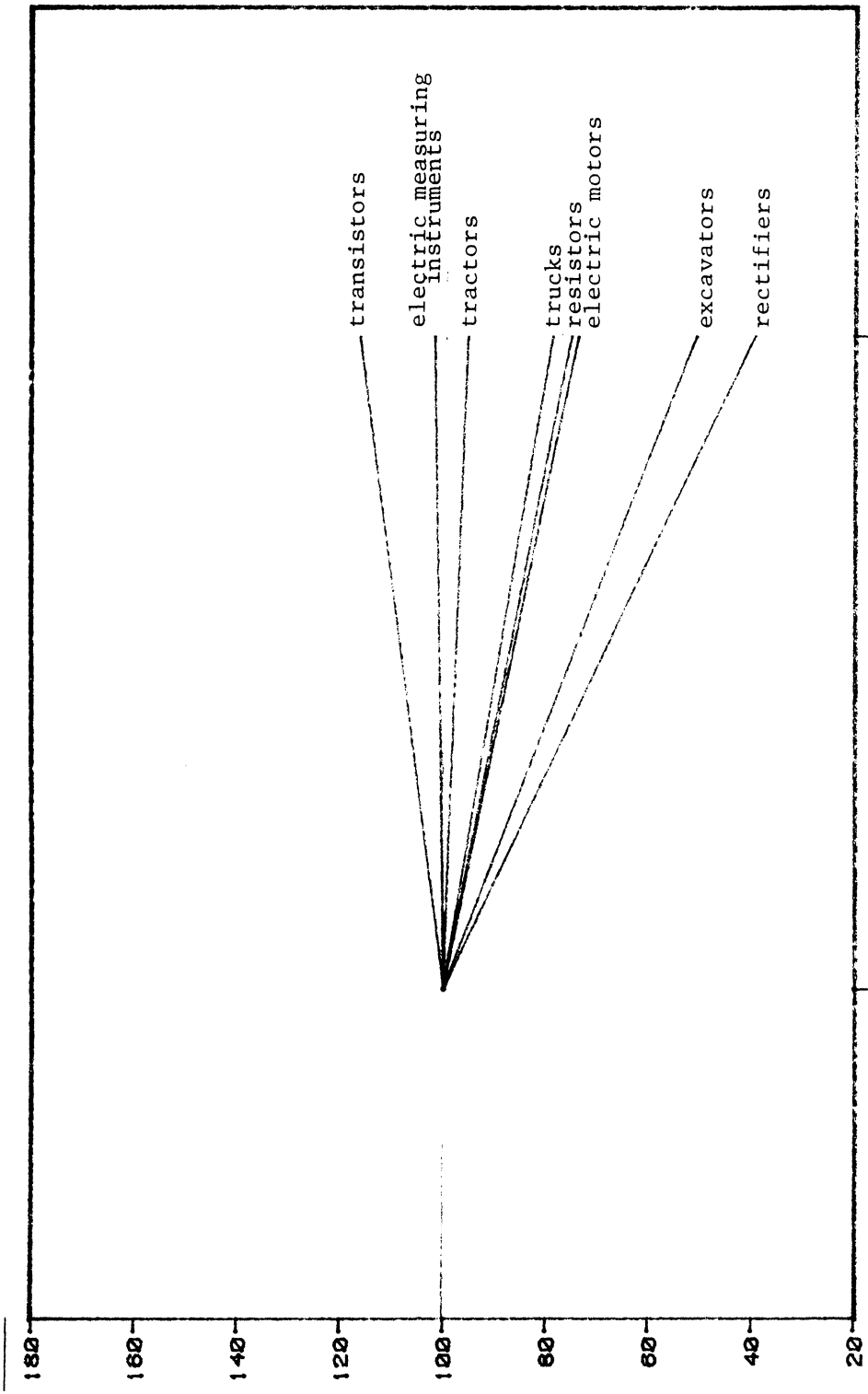
The figure shows that U.S. export prices have risen relative to Japanese export prices for 11 of 13 products since June 1973. The relative increase in U.S. prices was especially large for excavators, rectifiers, and pumps for liquids; for tractors, the increase was relatively small. U.S. prices decreased relative to Japanese prices for three goods--transistors, metal valves, and electric measuring equipment. Therefore, despite a 17.3-percent decline in the value of the dollar from June 1973 to December 1981, the majority of U.S. exports examined here have decreased in competitiveness vis-a-vis similar Japanese products since June 1973.

In figure 21, the changes in the index of the ratios of West German export prices to U.S. export prices are graphed. The derivation of these figures is similar to that for figure 20.

The figure shows that U.S. export prices have risen relative to West German export prices for all 27 products since June 1973. The increase in relative U.S. prices was especially large for electrical components; mining machinery; taps, cocks, and valves; machine tools; grinding machines; pumps for liquids; and construction equipment. The increase was relatively small for electrical controlling devices; car accessories; electromechanical handtools; cranes, hoists, and winches; and printing machines. Therefore, as with the Japanese comparison, the fall in the value of the dollar, 12.4

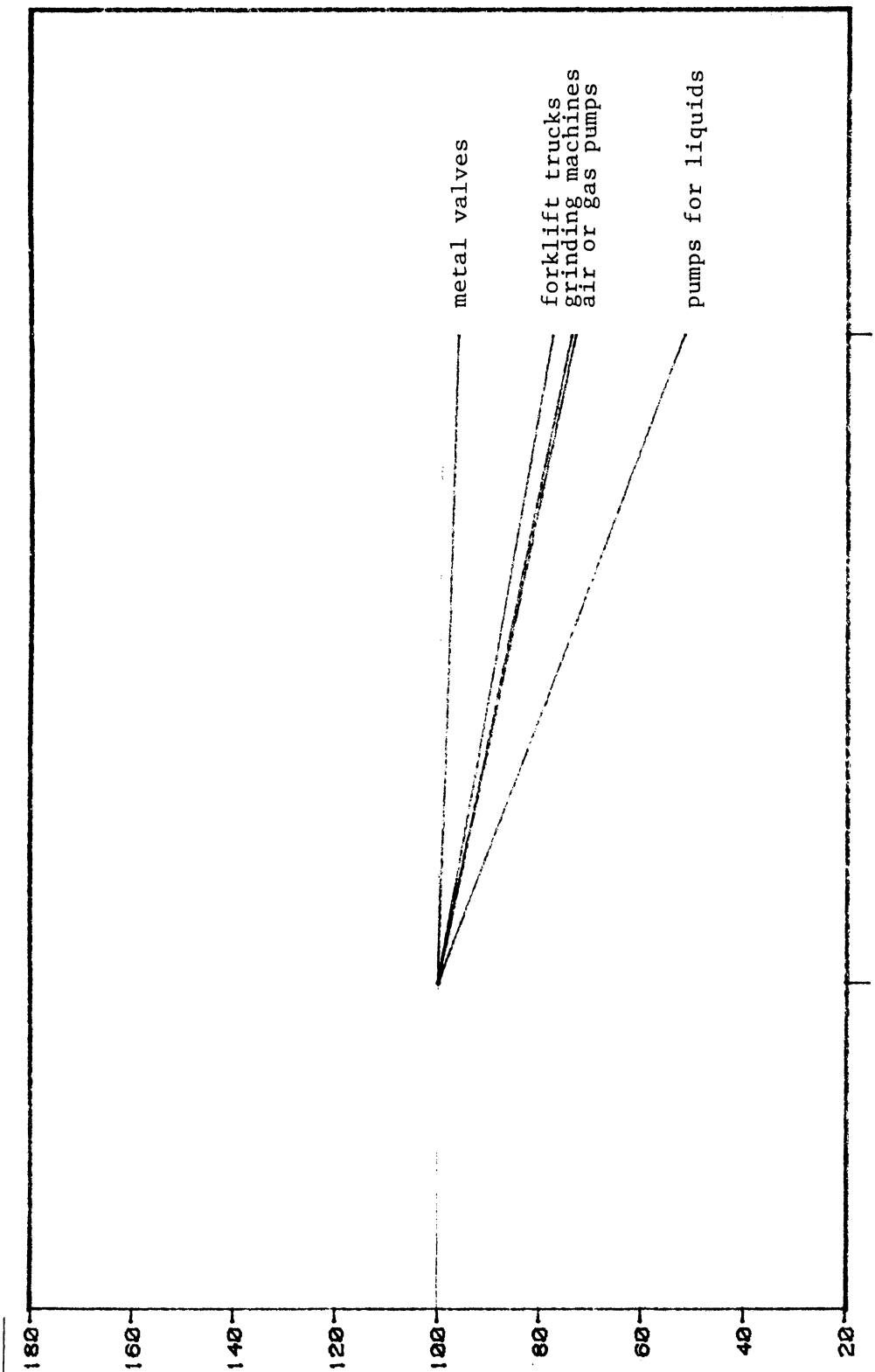
1/ The data were provided by the Bureau of Labor Statistics (BLS), but are not official BLS index series.

Figure 20.--Ratio of Japanese export prices to U.S. export prices.
(June 1973 = 100)



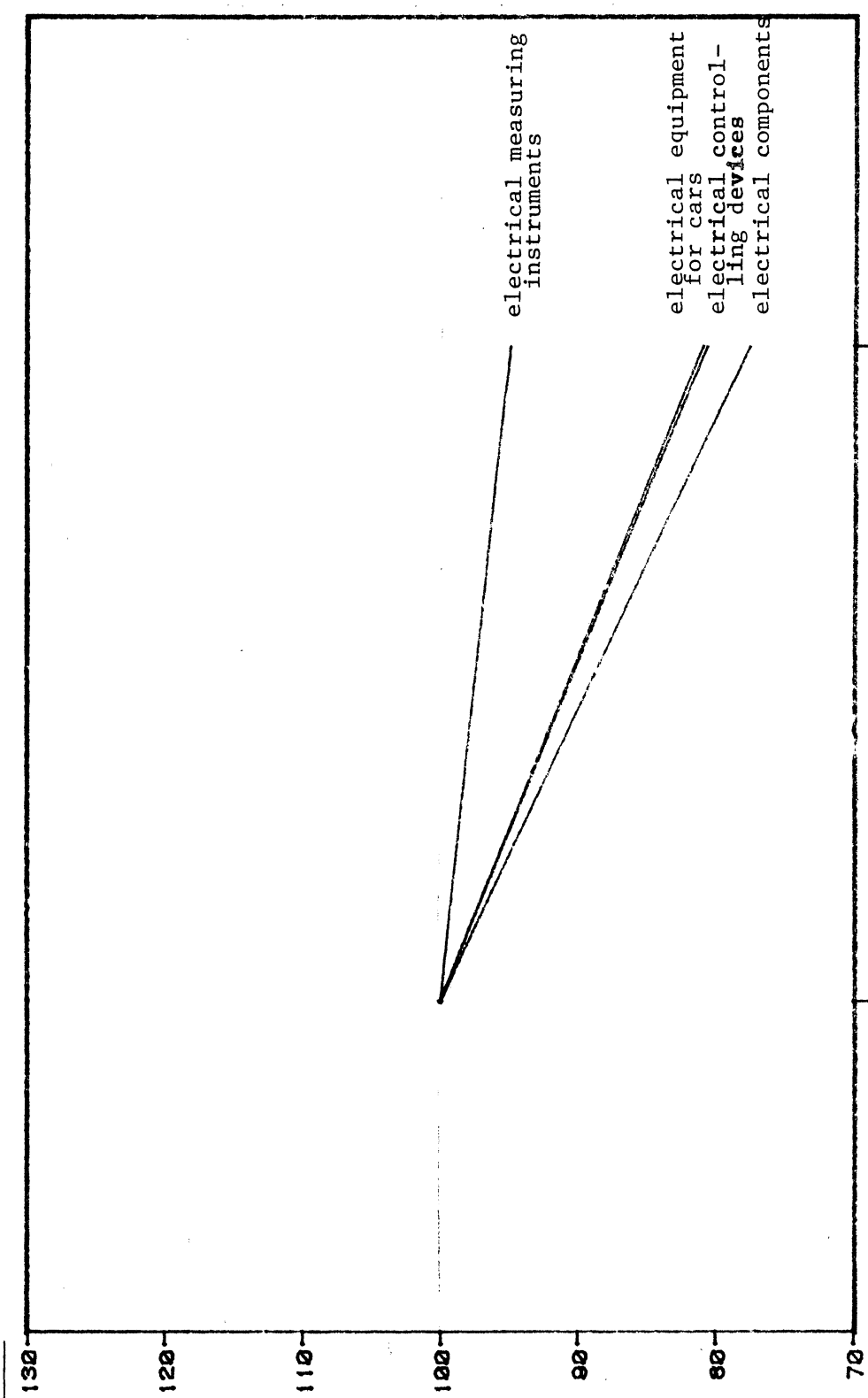
Source: Compiled from statistics of the Bureau of Labor Statistics.

Figure 2C.--Ratio of Japanese export prices to U.S. export prices-- continued
(June 1973 = 100)



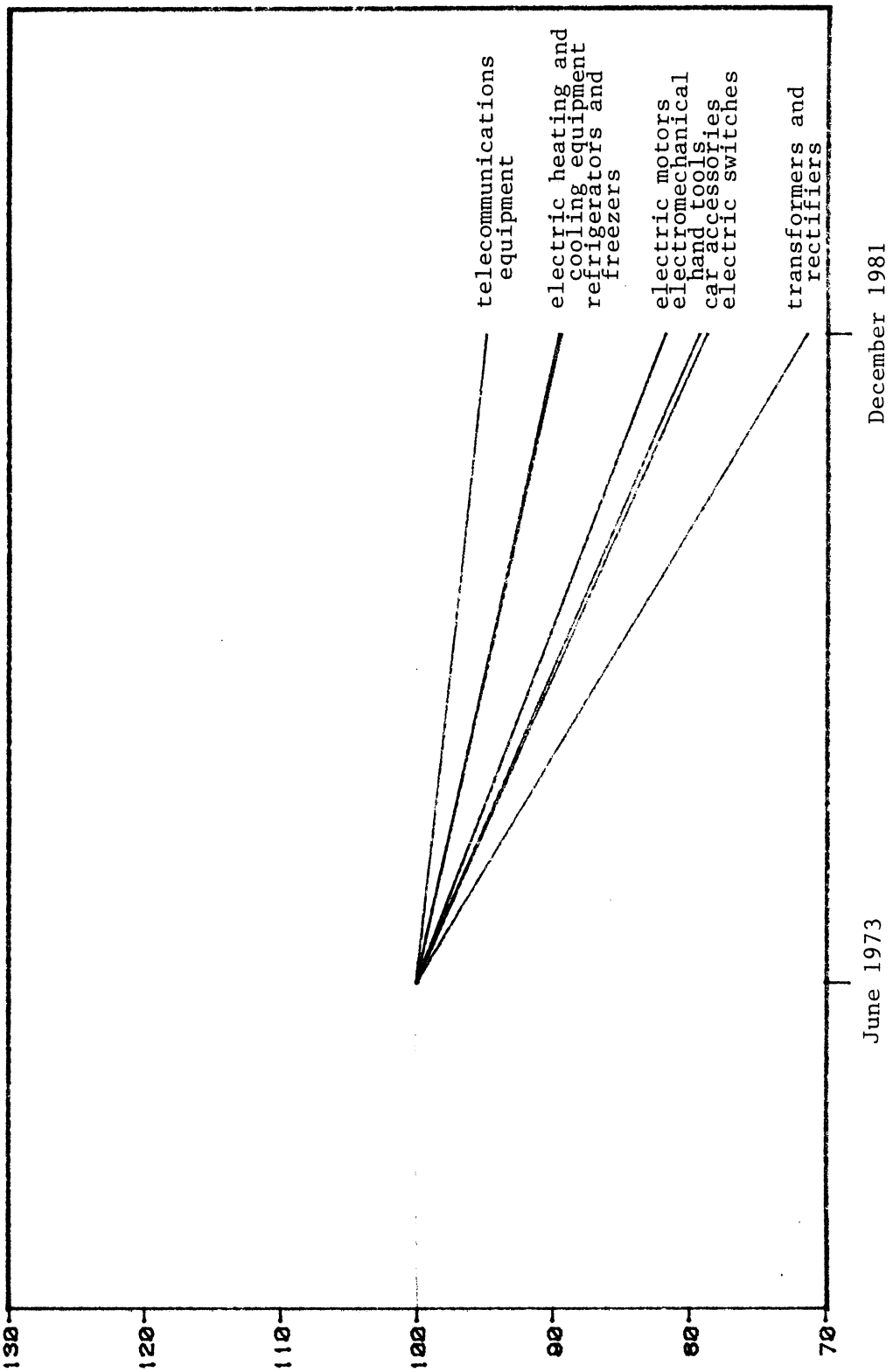
Source: Compiled from statistics of the Bureau of Labor Statistics.

Figure 21.--Ratio of West German export prices to U.S. export prices.
(June 1973 = 100)



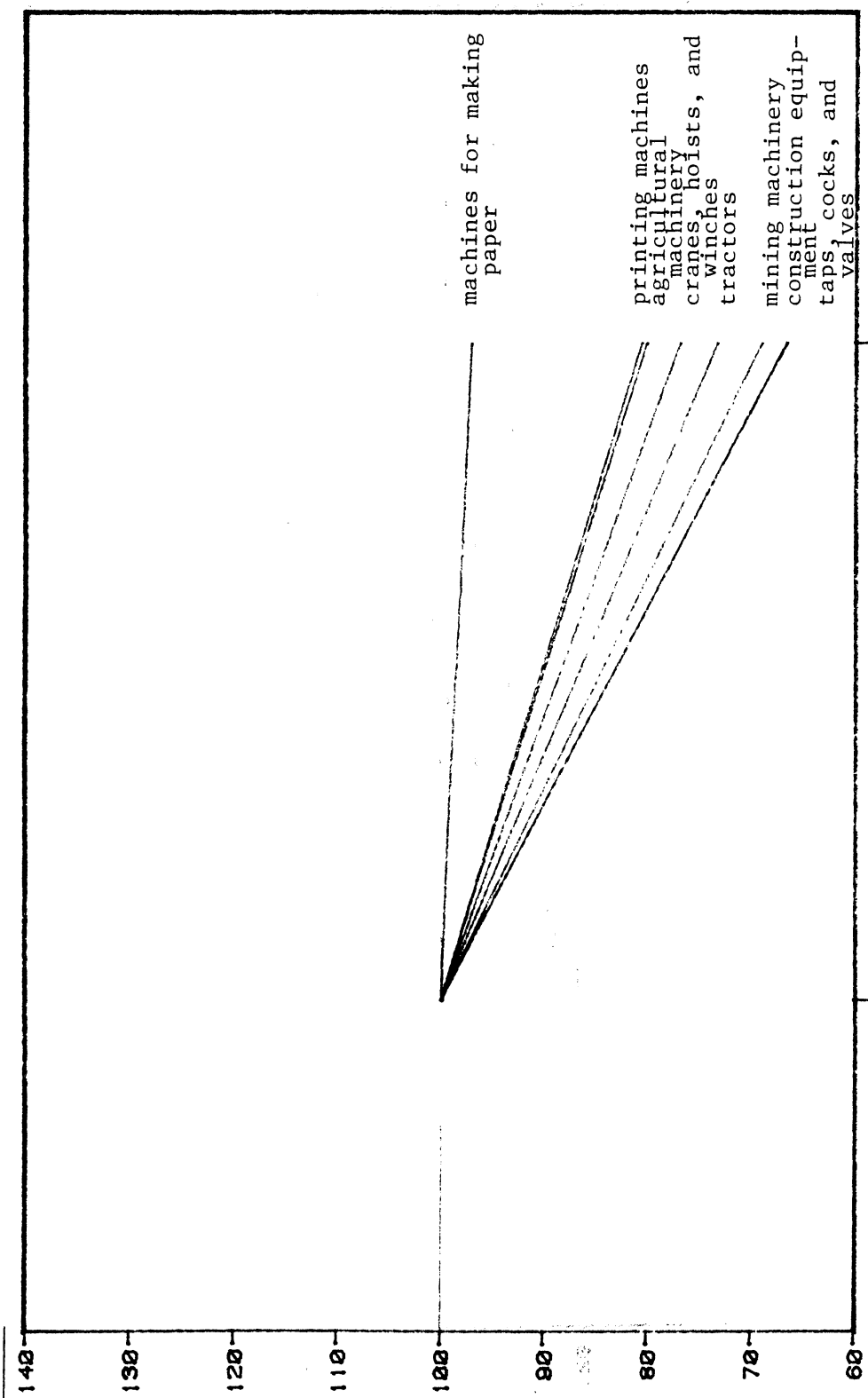
Source: Compiled from statistics of the Bureau of Labor Statistics.

Figure 21.--Ratio of West German export prices to U.S. export prices--continued.
(June 1973 = 100)



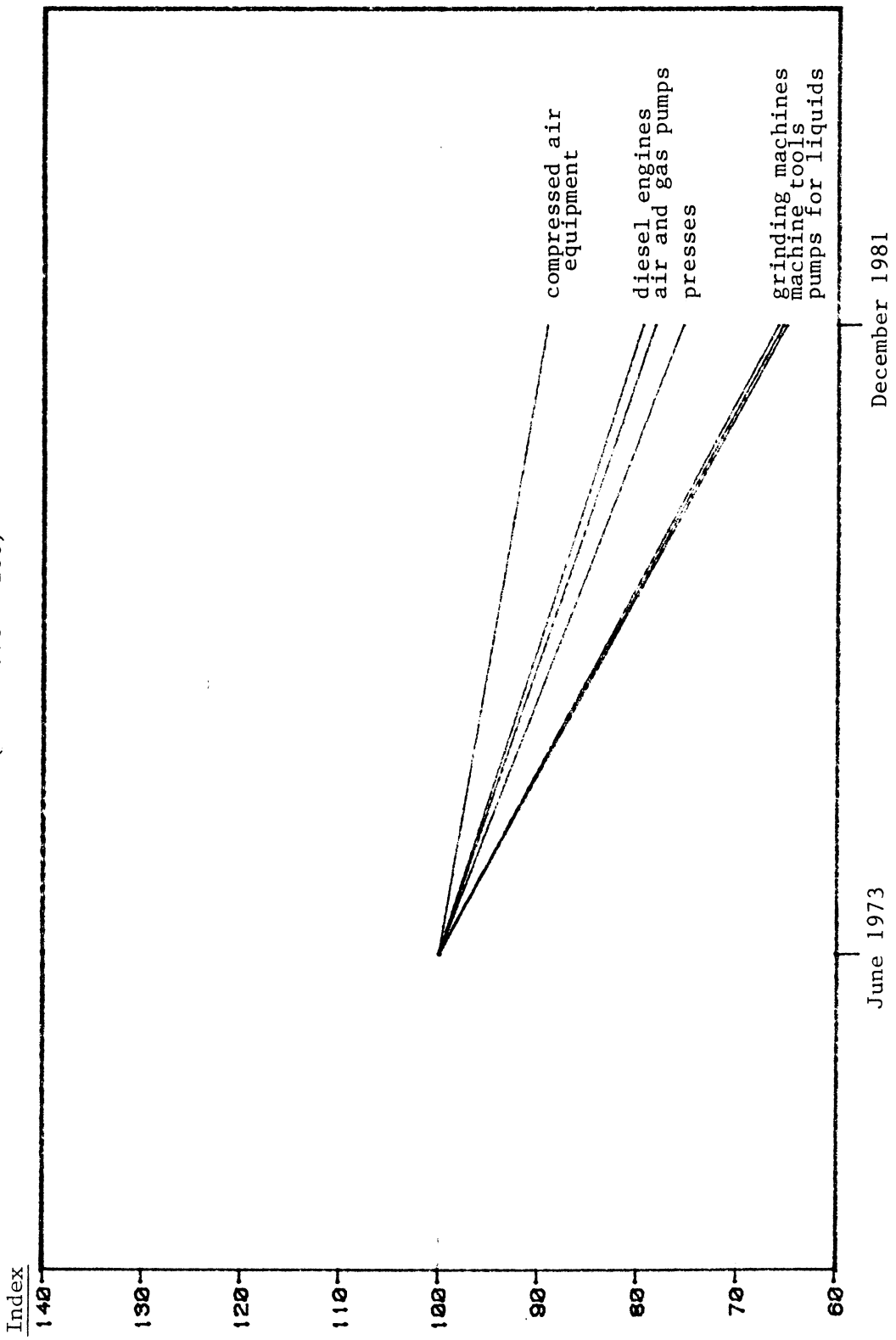
Source: Compiled from statistics of the Bureau of Labor Statistics.

Figure 21.--Ratio of West German export prices to U.S. export prices--continued.
(June 1973 = 100)



Source: Compiled from statistics of the Bureau of Labor Statistics.

Figure 21.--Ratio of West German export prices to U.S. export prices--continued.
(June 1973 = 100)



Source: Compiled from statistics of the Bureau of Labor Statistics.

percent vis-a-vis the West German mark, did not increase the relative competitiveness of the majority of U.S. exports examined here since June 1973.

The products examined here may not accurately reflect the change in competitiveness that the majority of U.S. products have experienced since June 1973. However, the downward drift of the U.S. trade balance since 1973, illustrated in figure 4, also suggests that the competitiveness of U.S. products in general decreased from 1973 to 1981.

Conclusion

Exchange-rate changes can affect prices, and, thus, a country's competitiveness. The effect of exchange-rate changes on competitiveness will depend on the nature of the good involved. Commodity arbitrage will generally allow a complete pass-through of exchange-rate changes for homogeneous products, whereas heterogeneous products will usually have an incomplete pass-through, at least in the short run. Some producers of heterogeneous products, however, may allow complete pass-through to occur.

For homogeneous goods, price changes caused by exchange-rate changes will generally appear within a short time, often within a few days. For heterogeneous goods, however, price changes caused by exchange-rate changes will generally take at least several months to appear. This suggests that the full effect of the recent strength of the dollar has not been felt yet.

Shifts in bilateral trade flows between the United States and Canada, and the United States and the United Kingdom have generally followed changes in bilateral exchange rates. Recent changes in bilateral trade flows with Japan have generally occurred simultaneously with large exchange-rate changes; for a period, shifts in trade flows preceded exchange-rate changes.

APPENDIX

EXCHANGE-RATE MODEL

Theory

The exchange-rate model used in this analysis follows from the portfolio-balance theory. 1/ We start with the open-interest arbitrage condition:

$$(A.1) \quad (\triangle \log e)^* = r_f - r + R$$

where the expected annual change in the exchange rate e (in terms of foreign exchange per unit of domestic currency) is equal to the foreign minus domestic interest differential (r_f-r) plus a risk premium (R). The "*" denotes expectations, and the subscript f denotes a foreign variable.

Following Dornbusch (1976) and Frankel (1979), 2/ we assume that the expected annual change in the exchange rate is a function of the gap between the current spot rate, e, and the current market expectation about the long-run equilibrium rate, $\bar{e}^*$, plus the expected rate of change in $\bar{e}$.

$$(A.2) \quad (\triangle \log e)^* = Z(\log \bar{e}^* - \log e) + (\triangle \log \bar{e})^*$$

where "-" denotes equilibrium values. The parameter Z represents a proportional speed of adjustment.

The expected change in the equilibrium exchange rate is also assumed to equal the difference between the foreign and domestic expected equilibrium annual rates of inflation:

$$(A.3) \quad (\triangle \log \bar{e})^* = \bar{\pi}_f^* - \bar{\pi}^*$$

Substituting (A.3) and (A.1) into (A.2) and rearranging, yields the spot exchange-rate equation:

$$(A.4) \quad \log e = \log \bar{e}^* - (1/Z)[(r_f - \bar{\pi}_f^*) - (r - \bar{\pi}^*)] - (R/Z)$$

This equation says that the difference between the spot exchange rate and the expected equilibrium rate is proportional to the real interest differential and the risk premium.

The expected equilibrium exchange rate is assumed to equal the expected equilibrium price ratio times the expected real equilibrium exchange rate:

$$(A.5) \quad \bar{e}^* = (\bar{P}_f^*/\bar{P}^*)\bar{q}^*$$

where P is the price level and q is the real exchange rate. The equilibrium real exchange rate is defined as the rate that is expected to equilibrate the relative current-account balances in the long run. The equilibrium real exchange rate is assumed to move in response to changes in the relative accumulated current-account balances:

$$(A.6) \quad \bar{q}^* = \exp[d((\Sigma CAB_f/Y_f) - (\Sigma CAB/Y))]$$

1/ This theoretical section follows directly from P. Hooper and J. Morton, "Fluctuations in the Dollar: A Model of Nominal and Real Exchange Rate Determination," Discussion Paper No. 82, Board of Governors, October 1980.

2/ R. Dornbusch, "Expectations and Exchange Rate Dynamics, Journal of Political Economy, December 1976, vol. 84, No. 6, pp. 1164-1176; J. A. Frankel, "On the Mark: A Theory of Floating Exchange Rates Based on Real Interest Differentials," American Economic Review, September 1979, vol. 69, No. 4, pp. 610-622.

where ΣCAB is the accumulated current-account balance, Y is nominal income, "exp" denotes the exponential function, and d is a parameter.

Combining (A.5) and (A.6) gives us the expected equilibrium exchange rate:

$$(A.7)\quad \bar{e}^* = (\bar{P}_f^*/\bar{P}^*)\exp[d((\Sigma CAB_f/Y_f) - (\Sigma CAB/Y))]$$

If no relative accumulated current-account balance exists, then a long-term purchasing-power-parity (PPP) condition holds, i.e., $(\Sigma CAB_f/Y_f) - (\Sigma CAB/Y) = 0$ implies that $e^* = (P_f^*/P^*)$. The model therefore says that any movement from the PPP condition will, in the long run, be caused by a relative current-account imbalance.

If we assume that the price level is determined in the money markets of the home and foreign countries, then

$$(A.8)\quad M/P = y^a \exp(-Br)$$

$$(A.9)\quad M_f/P_f = y_f^a \exp(-Br_f)$$

where M is the nominal money stock and y is real income. 1/

The money-demand parameters a and B are assumed to be identical across countries. The expected equilibrium relative prices can be derived by dividing the expected equilibrium values of (A.8) by those of (A.9) and rearranging:

$$(A.10)\quad (\bar{P}_f^*/\bar{P}^*) = (\bar{M}_f^*/\bar{M}^*)(\bar{y}_f^*/\bar{y}^*)^{-a}\exp(B\bar{r}_f^* - B\bar{r}^*)$$

Substituting (A.10) into (A.7), and (A.7) into (A.4) yields

$$(A.11)\quad \log e = \log(\bar{M}_f^*/\bar{M}^*) + a\log(\bar{y}_f^*/\bar{y}^*) + B(\bar{r}_f^* - \bar{r}^*)$$
$$-(1/Z)[(r_f - \bar{\pi}_f^*) - (r - \bar{\pi}^*)]$$
$$+ d[(\Sigma CAB_f/Y_f) - (\Sigma CAB/Y)] - R/Z$$

Equation (A.11) presents our theoretical model of exchange-rate determination. It specifies the spot exchange rate as a function of (1) the expected equilibrium relative prices, as determined by expected equilibrium relative money stocks, real incomes, and interest rates, (2) the deviation of the spot rate from its expected equilibrium as determined by the real interest differential (reflecting the slow adjustment of prices to recent monetary shocks), (3) the expected equilibrium real exchange rate as determined by the cumulative difference of the relative current-account balances, and (4) risk.

1/ This is the Cagan version of the money-demand equation.

Empirical Results

Unfortunately, estimates for the parameters of (A.11) cannot be obtained because of the presence of several variables that cannot be measured directly. Some assumptions were made about these unknown values so that the model could be used empirically.

The expected interest differential ($\bar{r}_f^* - \bar{r}^*$) was assumed to equal the expected inflation differential ($\bar{\pi}_f^* - \bar{\pi}^*$) in equilibrium. The long-term interest differential (LR_f-LR) was used as a proxy for the expected inflation differential. This assumes that real long-term interest rates are constant so that changes in nominal long-term interest rates reflect changes in inflation expectations. The expected sign of the inflation differential is positive; an increase in the relative inflation rate of a country vis-a-vis the United States should cause that country's currency to depreciate vis-a-vis the U.S. dollar. The current inflation differential was also tried as a proxy for the expected inflation differential. The results from these regressions, however, were not as satisfactory as from those using the long-term interest differential.

Expected equilibrium money stocks ($\bar{M}_f^*$, $\bar{M}^*$) and real incomes ($\bar{y}_f^*$, $\bar{y}^*$) were estimated by weighted averages of their current and past values. 1/ The expected sign of the income varible is negative; an increase in relative real income for a country should lead to a greater demand for that country's currency and, thus, that currency should appreciate. Some regressions were run using weighted current and future values to estimate equilibrium values. The results from these regressions were not significantly different from the results presented here. The M1 definition of the money stock was used. 2/

The risk premium, an essential feature of the portfolio-balance model, accounts for all variables other than rates of return that affect asset demand and supply. In our empirical application, the proxy for the risk premium was the weighted average of past exchange-rate movements squared. The expected sign of the risk variable is positive; an increase in the volatility of exchange-rate changes should cause a country's currency to depreciate vis-a-vis the U.S. dollar because of the dollar's role as the world's main currency. Other proxies for the risk variable were tried, but this one provided the best results. Other proxies included the weighted averages of the log of the price of gold, the log of the price of oil, past exchange-rate

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1/ The weighting scheme used for all variables in this paper was a four-quarter moving average using decreasing weights. For example, $\bar{y}_t^* = .4y_t + .3y_{t-1} + .2y_{t-2} + .1y_{t-3}$.

2/ M1 consists of currency, demand deposits held in commercial banks, and other checkable deposits held by depository institutions.

appreciations squared, and future exchange-rate movements squared (assumes that investors had perfect foresight, an often made assumption).

The current-account variable for country i in period t was defined as

$$(A.12)\quad CCAB_{it} = \sum_{j=1973:2}^{t}(CAB_{ij}/Y_{it}) - \sum_{j=1973:2}^{t}(CAB_{(US)j}/Y_{(US)t})$$

where i = 1-10 (10 countries), CAB_{ij} is the domestic value of the current account balance for country i in period j, and Y_{it} is nominal income for country i in period t. Thus, the higher this variable the higher a country's current- account balance is relative to the U.S. current-account balance, and the higher the expected value of its currency. The expected sign of this variable is negative; an increase in the relative current-account balance for a country vis-a-vis the United States should cause that country's currency to appreciate vis-a-vis the U.S. dollar.

Although the current-account sum begins in the second quarter of 1973, this does not mean that we believe that previous quarters' current-account balances had no effect on exchange rates. If we had started the sum from, say the first quarter of 1970, only the intercept term among the estimated coefficients would be different; the coefficients on all the explanatory variables including the current-account balance would be unchanged. 1/

Other definitions for the current-account variable were tried. These included the difference between current $CCAB_{ij}$ and the mean value of $CCAB_{ij}$ for the period from the second quarter of 1973 to the fourth quarter of 1980, the difference between CAB_{it} and $CAB_{(US)t}$ unweighted by nominal income, and the difference between current $CCAB_{it}$ and the mean value of $CCAB_{it}$ for all countries. The results using the other definitions were not substantially different.

The expected sign of the real-return variable is negative; an increase in the real return for a country vis-a-vis the United States should cause that country's currency to appreciate vis-a-vis the U.S. dollar.

To conform to the model, the coefficients for the relative money stock variables were constrained to equal one for all countries. Regressions that were run without this constraint had money stock coefficients that in many cases were significantly different from one. This result could indicate that some problems exist with the theoretical model.

1/ Because the sum of the current-account balance from the first quarter of 1970 to the first quarter of 1973 would be the same for all the current-account sum variables, it would be the same as adding a constant to each current-account observation. Such a constant would not affect the coefficient on the current-account variable, but would be reflected by a change in the constant term equal to the product of the constant and the current-account coefficient.

Quarterly equations were fitted covering the period from the second quarter of 1973 through the fourth quarter of 1980. The second quarter of 1973 marked the beginning of floating exchange rates, whereas the final quarter of 1980 was the final quarter for which a complete data set was available. All variables were seasonally adjusted using the Census X-11 program. All data came from the International Monetary Fund International Financial Statistics.

Ten U.S. bilateral exchange rates were examined. These bilateral rates involved the currencies of the United Kingdom, the Netherlands, Japan, Belgium, Brazil, France, Italy, West Germany, Canada, and Switzerland.

The technique of seemingly unrelated regressions (SUR) was used to account for the interrelationship between these bilateral exchange rates. 1/ Because internal developments in the United States will often cause the dollar to move in the same direction against all the major currencies of the world, the use of SUR seems appropriate.

The results of the estimation procedure are presented in the following table. The Durbin-Watson statistic (DW) and the R-squared value (R^2) are from the ordinary-least-squares (OLS) regressions and are not from the SUR results. The computer program used did not have the capability of presenting these values for the SUR results.

Preliminary results indicated the presence of autocorrelation among the disturbance terms. The two-stage Cochrane-Orcutt procedure was used to correct for the autocorrelated disturbances. The resultant Durbin-Watson statistics were higher, but in some cases, still remained in the uncertain region. Table 1 gives the value of rho used for each equation. The values in parentheses below the parameter estimates are t-ratios.

The results show that the real-income coefficient had the expected negative sign in 8 of 10 cases, and that in 3 cases, it was significant at the 5-percent level. 2/ The income coefficients for Belgium and Switzerland had unexpected positive signs, but only the Belgian coefficient was positive and significant.

The inflation differential coefficients were significant in four of the seven cases in which they had the expected positive sign. Only one coefficient had a negative sign and was significant.

The real-return variable had the most unexpectedly-signed coefficients; five coefficients had the expected negative sign, and five had positive signs. The French coefficient was the only unexpectedly signed coefficient that was significant. Two coefficients were expectedly signed and significant.

The current-account balance (CAB) variables were significant for 7 of the 10 countries; unexpectedly signed, positive coefficients accounted for only 1 of these significant variables (Belgium). Overall, three CAB variables had the unexpected sign.

1/ For a discussion of seeming unrelated regressions, see J. Kmenta, Elements of Econometrics, New York: Macmillan, 1971, pp. 517-529.

2/ For the remainder of this paper, any coefficient that is significant at the 5-percent level will be referred to as significant.

Estimated exchange-rate equations

Country	Constant	Money stock	Real income	Inflation differential	Real return	Current-account balance	Risk	R^2	DW	Rho
Belgium	0.526	1.000	1.250	4.242	0.325	0.864	2.000	0.85	1.58	0.167
	(1.96)		(2.37)	(2.53)	(0.59)	(9.92)	(6.04)			
Canada	0.966	1.000	-0.096	-0.238	-2.492	-0.282	0.812	.82	1.56	.3332
	(3.20)		(-1.06)	(-0.16)	(-5.44)	(-7.79)	(2.00)			
Brazil	1.623	1.000	-0.968	-0.007	-0.345	-0.135	0.556	.99	1.38	.0802
	(8.36)		(-6.70)	(-0.09)	(-2.66)	(-2.35)	(3.56)			
France	-0.038	1.000	-2.491	2.224	2.133	0.137	0.989	.40	1.27	.4214
	(-0.23)		(-3.53)	(1.80)	(3.36)	(0.65)	(3.73)			
Federal Republic of Germany	-0.155	1.000	-1.467	3.238	-0.514	-0.847	1.369	.72	1.00	.6171
	(-1.08)		(-3.62)	(4.05)	(-1.36)	(-3.39)	(5.09)			
Switzerland	0.437	1.000	0.533	4.052	1.556	-0.140	2.551	.78	1.16	.6738
	(1.16)		(1.16)	(1.97)	(1.54)	(-0.98)	(4.62)			
United Kingdom	-0.559	1.000	-0.719	4.124	-0.885	0.144	1.125	.35	1.29	.5724
	(-1.03)		(-1.59)	(5.37)	(-1.48)	(0.68)	(3.25)			
Netherlands	0.002	1.000	-0.836	8.235	-0.378	-0.631	1.210	.81	1.66	.4301
	(0.00)		(-2.23)	(8.52)	(-1.57)	(-6.18)	(3.96)			
Japan	0.264	1.000	-0.188	2.774	0.839	-1.713	1.104	.72	0.96	.5125
	(0.24)		(-0.37)	(1.59)	(1.27)	(-4.77)	(2.65)			
Italy	1.213	1.000	-0.585	-2.702	0.106	-1.268	0.638	.66	0.73	.5986
	(0.98)		(-0.86)	(-2.79)	(0.23)	(-6.59)	(2.27)			

Note.--The value reported in parentheses are t-ratios.

The risk variable had the expected sign and was significant in all cases. Although no coefficients on the risk variable had an unexpected sign and were significant, some of the problems with the explanatory powers of the model probably can be traced to problems with the risk variable. In particular, the lack of political or announcement effects is unfortunate. The problem of quantifying expectations and people's fears becomes evident here.

The R^2 ranged from .35 for the United Kingdom to .99 for Brazil, with a mean of .81. The very high R^2 for Brazil is easily explained by looking at the relationship between the relative money stock of Brazil and the cruzeiro/dollar exchange rate. Since 1972, the ratio of the Brazilian money stock to the U.S. money stock has increased 1,305 percent. Over the same period, the exchange rate between the value of Brazilian cruzeiro has decreased 954 percent. An OLS regression was run on the cruzeiro-dollar exchange rate without the restriction on the money-stock coefficient. This regression had a coefficient of 1.03 and a t-value of over 37 for the money stock.

The R^2 for France and that for the United Kingdom were substantially higher in those equations run without the money-stock restriction (.93 for France and .86 for the United Kingdom). This result indicates that, according to our model, for these two countries especially, the relationship between the nominal money stock and the exchange rate has not followed the theoretically predicted path. For the United Kingdom, a tight monetary policy and a rising CAB have recently combined to cause an increase in the value of the pound despite a high inflation rate. Because the money stock coefficient was restricted to equal 1.0, the model apparently was unable to explain a great deal of the pound/dollar exchange rate.

The other country that had a low R^2 was France. The movement of the franc during this period seemed to be strongly influenced by political considerations that were not accounted for by the model. The recent election of a Socialist government and the fear of a Socialist victory in 1978 appears to have caused large declines in the value of the franc. Because the model relies primarily on economic occurrences, these depreciations of the franc went unexplained by the model.

Looking at the coefficients by countries instead of by variables, we see that only one country--the Netherlands--had every sign correct and that only one country--Belgium--had three incorrect signs. All other countries had one or two incorrect signs.

What conclusions can be drawn from these results? It is fairly clear that if a country has a higher growth rate in real income than another country, then the first country will have an increased demand for its money and thus will have an appreciating currency vis-a-vis the other country's currency.

The difference in expected long-term inflation rates seems quite important in determining the spot exchange rate. A higher expected inflation rate leads to a depreciating currency, because the long-term exchange rate is expected to ensure PPP.

The real-return variable did not perform as well. The use of quarterly data probably limited the usefulness of this variable, which is usually responsible for short-term movements of the exchange rate. Over a period of 3 months, this variable might prove to be insignificant because of offsetting movements in the exchange rate and real returns. Thus, the inability of the real-return differential to explain exchange-rate movements in our model is not too surprising. Our quarterly model is apparently too long term to be able to fully explain exchange-rate movements caused by short-term capital flows.

The performance of the current-account variable was also quite poor, but probably for the opposite reason. Our model might be too short run to be able to take into account those changes in the long-run equilibrium exchange rate that current-account imbalances lead to. Although we used a cumulative current-account total to explain the long-run equilibrium exchange-rate level, apparently the use of a quarterly model caused problems for this specification. An annual model might provide better results, although the limited number of available observations might prove unmanageable.

The low DW statistics for some countries, despite the corrections for first-order autocorrelation, indicate that the error terms are correlated across time. However, the Cochrane-Orcutt technique failed to improve the DW statistic, indicating that this relationship between error terms may not follow a first-order autoregressive scheme. No attempt was made to identify more elaborate patterns of correlation between the error terms.

The conclusions from this empirical work, although they do not completely validate the portfolio-balance theory, does not cause us to reject the theory either. But, it appears that the portfolio-balance theory and its empirical model can still be improved upon. These somewhat ambiguous results, however, are quite consistent with results found in other studies. Although most previous econometric work has concentrated on the U.S. effective exchange rate or on the mark/dollar rate, the findings of significant effects of real income and inflation differentials and insignificant effects of the current-account balances are not uncommon. Judging from the results of this study, other bilateral exchange rates behave similarly to the mark/dollar rate.

More work needs to be done on trying to quantify expectations. Also, the proper effect of the current-account deficit should be more thoroughly investigated. Finally, more noneconomic information needs to be built into the risk variable, especially political developments.

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