

Economic Commentary

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Exchange Rates and U.S. Prices

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Between October 1980 and November 1982, the U.S. dollar appreciated substantially in foreign-exchange markets. Relative to the major currencies, the advance of the dollar ranged from 5 percent against the Canadian dollar to 69 percent against the French franc. On a trade-weighted average basis against 10 key currencies, the dollar appreciated 40 percent, fully offsetting its depreciation during the preceding decade. While the dollar has given up only a fraction of its trade-weighted advance since November 1982, many exchange-market analysts anticipate a further depreciation in the near future.

Because an exchange rate represents the price of one nation's currency in terms of another's, prolonged movements in exchange rates can alter a nation's trade flows, capital flows, price levels, and real growth. U.S. inflation, for example, moderated as the dollar appreciated, and many analysts predict that future dollar depreciation would reverse some of those gains. The relationships among exchange rates, prices, and other economic variables are

complex; hence, we should be very careful in attributing price-level moderations or accelerations to exchange-rate movements.

This *Economic Commentary* discusses the relationship between dollar exchange-rate movements and U.S. price levels.¹ The discussion focuses on the many snags encountered in digging toward the root of this relationship. After considering the caveats, we present a simple rule of thumb to approximate the contribution of the recent dollar appreciation to the improved U.S. price performance. We also use this rule to speculate on the impact of future dollar depreciation on U.S. price performance.

The Causality Problem

It is easy to understand that changes in exchange rates automatically alter the price of one nation's products relative to

1. For more detailed discussion of this topic, see Andrew D. Crockett and Morris Goldstein, "Inflation under Fixed and Flexible Exchange Rates," *International Monetary Fund Staff Papers*, vol. 23, no. 3 (November 1976), pp. 509-44; Peter Hooper and Barbara Lowrey, "Impact of the Dollar Depreciation on the U.S. Price Level: An Analytical Survey of Empirical Estimates," *International Finance Discussion Papers*, No. 128, Washington: Board of Governors of the Federal Reserve System, January 1979; and Joel L. Prakken, "The Exchange Rate and Domestic Inflation," *Quarterly Review*, Federal Reserve Bank of New York, vol. 4, no. 2 (Summer 1979), pp. 49-55.

take these costs if it expected the changing demand conditions to be transitory.

The extent of price pressure in the United States after an exogenous dollar depreciation also depends on the response of foreign prices. PPP can be re-established by an increase in U.S. prices, a decline in foreign prices, or both. Generally, the outcome depends on the importance of a foreign country's trade with the United States. If exports to the United States account for a large share of foreign output and the foreign demand for U.S. exports is highly sensitive to price changes, then a dollar depreciation would more likely cause foreign prices to fall. A rather unique problem, however, occurs with oil prices. Because the Organization of Petroleum Exporting Countries (OPEC) sets oil prices in terms of U.S. dollars, a dollar depreciation lowers the foreign-currency price of oil. The dollar depreciation tends to increase foreign oil demand but reduces the purchasing power of each dollar of OPEC revenues. Market conditions permitting, OPEC might respond to a dollar depreciation by raising the dollar price of crude oil. Such a response would intensify the impact of a dollar depreciation on U.S. prices.

The most important factor determining how the demand pressures emanating from an exogenous dollar depreciation translate into higher U.S. prices is the willingness of U.S. monetary authorities to accommodate the price increases through faster money growth. The previous examples assume that monetary policy is accommodative. Suppose, however, that the money supply does not expand enough to permit a rise in the overall price level. The exogenous dollar depreciation would tend to raise the U.S. price of traded goods and their close substitutes. Consumers who would buy these higher-priced goods would need to reduce purchases of other goods. The prices of these other goods would tend to fall. Consequently, in the absence of an accommodative monetary policy, an exoge-

nous dollar depreciation would cause some prices to rise and others to fall.

The Rule of Thumb

Since the inception of floating exchange rates, researchers have attempted to deal with these many caveats and to estimate reliably the price-level impacts of exogenous exchange-rate movements. Hooper and Lowrey (1979) surveyed this literature, standardized the results, and culled a consensus estimate of the price effect of exogenous exchange-rate movements: a 10 percent depreciation of the dollar's real trade-weighted exchange rate increases consumer prices 1.50 percent to 1.75 percent, depending on how oil prices respond to the depreciation and assuming an accommodative monetary policy. Approximately one-half of the impact occurs within one year of the exchange-rate change, while the remainder is spread over the next two years to three years. Using this rule of thumb, and assuming it is also applicable to dollar appreciation, one can approximate the contribution of recent dollar appreciation to the U.S. inflation fight. By making some reasonable assumptions about exchange-rate movements in the future, we can estimate the price implications for the next few years.

The real trade-weighted dollar appreciated 3.9 percent (fourth quarter to fourth quarter) in 1980, 18.3 percent in 1981, and 13.2 percent in 1982. At the same time, the consumer price index (CPI) advanced 12.6 percent in 1980 (fourth quarter to fourth quarter) but then began to moderate in 1981 (9.6 percent) and 1982 (4.5 percent). According to the rule of thumb, the dollar's appreciation over this period moderated the rise in the CPI by 0.1 percentage points in 1980 (fourth quarter to fourth quarter), by 1.6 percentage points in 1981, by 1.9 percentage points in 1982, and by approximately 3.6 percentage points over the

entire three-year period.

Difficult as it is to estimate the effects of past exchange-rate movements on the price level, it is even harder to project the impact of future dollar movements on tomorrow's prices. There is no highly reliable method for forecasting future trends of the dollar. In December 1982, the real trade-weighted dollar stood 12.9 percent above its March 1973, or base-year, value, strongly suggesting that it is more likely to depreciate than appreciate in the years ahead. There is, however, little information about the time frame over which this depreciation would occur. As chart 1 indicates, the real exchange rate can deviate from its base-year level for years at a time. Let us therefore consider three different scenarios. The first scenario assumes that, on balance, the real trade-weighted dollar does not depreciate in 1983. Recent movements in the real trade-weighted exchange rate and forward exchange-rate quotes, adjusted to a trade-weighted basis, are not inconsistent with this scenario. In this case, lagged effects from past dollar appreciation would con-

tinue to moderate price movements in 1983 and 1984. Price-level increases would be reduced by approximately 1.6 percentage points in 1983 and approximately 0.6 percentage point in 1984. At the other extreme, a second scenario assumes that the real trade-weighted dollar would return to its March 1973 level by the end of 1983. In this scenario the favorable price effects would be only 0.9 percentage point in 1983, and a slight boost (0.2 percentage point) would be given to the rise in the price level in 1984. The third scenario assumes that the exchange rate would depreciate more gradually—6.5 percent this year and again next year—to re-attain its base-year value by the end of 1984. While this gradual decline would yield a 1.2 percent favorable impact on 1983 prices, it also would augment the 1984 price levels by approximately 0.1 percentage point. Therefore, while U.S. price performance probably would not continue to benefit from dollar appreciation, a depreciation of the dollar probably would not greatly compromise a disinflation monetary policy in the near term.

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another's. It is more difficult to understand how these relative price changes translate into aggregate price-level changes in the home country. The biggest difficulty in measuring the price-level impact of exchange-rate movements is to determine whether exchange-rate movements cause price changes, or whether price changes cause exchange-rate movements. The causal effect can run either way, because ultimately other factors in the economy determine both exchange rates and price levels.

The relationship between exchange-rate changes and national inflation rates is described by the relative purchasing power parity (PPP) theory. This theory states that exchange-rate movements tend to equal inflation differentials between countries over the long run. If, for example, the United States experienced 10 percent inflation, while West Germany experienced 4 percent inflation, the U.S. dollar would depreciate by 6 percent relative to the deutsche mark. According to PPP, commodity-price differentials create opportunities for profitable international trade; this trade tends to maintain parity among the purchasing powers of various nations' currencies. If, for example, the price of domestically produced goods rises above the dollar price of similar goods produced abroad, U.S. imports would rise and exports would fall as demand shifted toward the less expensive foreign goods. Under fixed exchange rates, this shift tends to raise foreign prices and lower U.S. prices; under flexible exchange rates, this demand shift can cause the U.S. dollar to depreciate as well as cause relative prices to change.

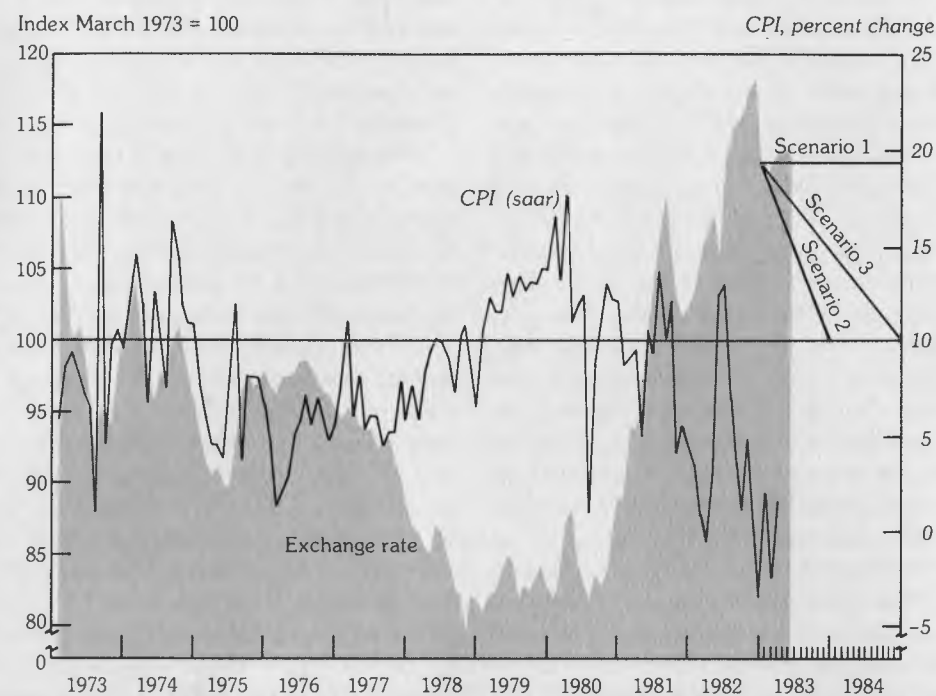
Although discussions of PPP usually imply that causality runs from commodity price changes via trade to exchange-rate movements, the effect in fact can run in the opposite direction. For example, an exchange-rate change resulting from capital flight from foreign currencies to the dollar would lower the price of foreign goods relative to U.S. goods and thereby encourage

the importation of foreign goods. PPP then would tend to be re-established as demand shifts away from U.S. goods toward foreign goods and raises foreign prices relative to U.S. prices.

PPP describes an equilibrium condition. Disturbances can occur from either exchange-rate movements or price changes, but international trade eventually tends to re-establish PPP. In evaluating the effects of exchange-rate movements on prices, it is therefore important to determine why the exchange rate changed in the first place. Did the change result from a third factor that itself was a cause of inflation; or, was the change caused by something outside of (exogenous to) the inflation process? In the former case, it would be erroneous to attribute inflation to the exchange-rate change; in the latter case, however, the exchange-rate movement could contribute independently to a change in prices.

As an example of this problem, consider the inflation process. Inflation is a persistent increase in the overall level of prices. This price increase cannot exist without an equally persistent increase in the supply of money or a decline in the demand for money that outpaces the long-term growth of goods and services. When the Federal Reserve permits an excessive increase in the money supply, individuals—flush with additional money balances—attempt to exchange some of the money for other assets, such as bonds and goods. Especially when the economy is operating close to capacity, this exchange tends to raise prices until an equilibrium between real-money balances and other assets is re-established. Some of the assets purchased during this process could be foreign, and their purchase could result in depreciation of the U.S. dollar. The increase in domestic prices would accentuate the shift in demand toward foreign goods. Furthermore, it is likely that, because of the actions of speculators, the excess U.S. money growth would be re-

Chart 1 The Exchange Rate and U.S. Price Movements



SOURCES: Exchange rate: real trade-weighted exchange-rate index, measured against ten major foreign currencies, March 1973 = 100; Board of Governors of the Federal Reserve System.

CPI: monthly percent change, saar; Bureau of Labor Statistics, U.S. Department of Labor.

flected in the foreign-exchange market through depreciation of the dollar before the excess money growth would be reflected in the commodity markets through higher commodity prices. In this case, although the exchange-rate change might contribute to some further rise in prices, it would not be the primary cause of the inflation.

Because factors independent of the inflation process can, and often do, alter exchange rates, questions about the inflationary consequences of such exogenous exchange-rate changes are important. To measure exchange-rate movements exogenous to the inflation process, economists construct indexes of real exchange rates.

The practical difficulties of constructing such measures are enormous. At a minimum, the accuracy of the real exchange-rate index requires that PPP held during the index's base year. Theoretically, when PPP holds, the real exchange-rate index equals 100; but, as shown in chart 1, the real exchange rate can deviate from its PPP level by substantial amounts for long periods of time.²

2. For a basic discussion see Peter Hooper and John Morton, "Summary Measures of the Dollar's Foreign Exchange Value," *Federal Reserve Bulletin*, vol. 64, no. 10 (October 1978), pp. 783-89; and Ronald I. McKinnon, *Money in International Exchange: The Convertible Currency System*, New York: Oxford University Press, 1979, chap. 6.

Channels of Price Pressure

Even allowing that exogenous exchange-rate changes can affect prices, the channels of influence are long and contain many potentially mitigating circumstances. An exchange rate is the price of one nation's currency in terms of another nation's currency. The change in an exchange rate alters the prices of goods and services produced in one country relative to those produced in another. This shift in prices induces a shift in demand away from the products of the country whose money and goods have become more expensive and toward the products of the country whose currency and goods have become less expensive. These demand shifts initiate pressure on overall price levels in each of the countries. The extent to which these pressures actually translate into higher or lower prices and the speed with which the changes occur, however, depend on many factors; the most important of these are the extent and expected permanency of the exchange-rate change, the degree of slack in the economy, the reaction of foreign prices, and the stance of monetary policy.

The example below illustrates the channels through which these price pressures work for the case of an exogenous depreciation in the U.S. dollar relative to all other currencies. Initially, we assume that the U.S. economy is operating at less than full employment, that monetary policy is accommodative, and that foreign prices do not respond to the exchange-rate change. We later shall alter these assumptions to show how they affect the timing and extent of the outcome.

The most direct price effect of a dollar depreciation is to raise the dollar price of foreign goods, many of which are inputs to production processes in the United States. When possible, U.S. consumers of these imports would seek domestically produced substitutes. When the economy is not at

full employment, manufacturers of import substitutes can accommodate increased demand for their goods by expanding production. As output nears capacity, these producers would raise their prices.

A similar series of events occurs in the U.S. export sector. The dollar's depreciation reduces the foreign currency price of U.S. goods and services, increasing foreign demand for U.S. exports. At less than full employment, U.S. producers can accommodate this demand by expanding production. Capacity constraints eventually would force these producers to raise the dollar price of their products.

The depreciation-induced expansion in the U.S. export and import-substitute industries increases the demand for goods and services needed in the production process of these industries. Production expands and prices begin to rise in the supplier industries; eventually, the demand pressures spread to the basic factors of production. Once the prices of intermediate goods and basic factors of production begin to rise, the depreciation-induced upward pressures on prices would spread even to those industries that do not engage directly in international trade.

As the foregoing example implies, the speed with which an exchange-rate change translates into price movements depends on the degree of slack that exists in the economy. The risk that dollar depreciation would result in higher prices is greater when firms are utilizing large proportions of capacity and the labor force is closer to full employment.

The extent of domestic price pressures resulting from a currency depreciation obviously depends on the size and expected duration of the depreciation. Even a large currency depreciation can have a small price effect if the market expects the depreciation to be quickly reversed. Altering listed prices involves sizable costs, including the possibility of alienating longstanding customers. A firm would not under-