$572 billion to $441 billion ($572 billion ÷ 1.296), a reduction of $131 billion. This is a loss for the United States.

Third, U.S. residents also held $313 billion equivalent of assets abroad denominated in foreign currencies. If foreign currency prices of U.S. imports fall by 20 percent of the dollar's depreciation, as discussed above, those import prices will fall by 7.4 percent. That price decline boosts the real value of those assets from $313 billion to $313 billion divided by (1-.074), an increase of $25 billion. This is a gain for the United States. In total, we can estimate that the dollar's 37 percent devaluation has decreased the real value of U.S. international assets $106 billion ($25 billion - $131 billion), and decreased the real value of U.S. international liabilities by $139 billion, for a net real gain to the United States of $33 billion.

The calculations above are based on the effect of dollar depreciation since first quarter 1985 on asset positions at the end of 1984. The fourth step in the estimate takes account of the fact that there have been large additions to U.S. assets abroad and foreign assets in the United States since the end of 1984 that represent additional potential claims on U.S. and foreign goods (see table 1).

The gains and losses on these additional assets here and abroad, caused by dollar depreciation, must be calculated separately in order to consider only the portion of the depreciation that occurred after the assets were accrued. The values of the assets here and abroad that accrued in 1985 are considered here to be changed only by dollar depreciation that occurred after fourth quarter 1985, and assets here and abroad that accrued in 1986 are considered here to be affected only by dollar depreciation that occurred after fourth quarter 1986.

Calculations similar to those above indicate that the depreciation has given the United States a net gain of $18 billion on the accruals to assets that occurred in 1985. On accruals in 1986, the U.S. net gain was $7 billion. Taken together, the $33 billion gain, the $18 billion gain, and the $7 billion gain add to a total one-time gain for the United States of $58 billion.[9]

An alternative calculation of the changed potential claims on U.S. and foreign exports, made using actual changes in export and import prices, indicates a net one-time gain for the United States of $32 billion.

Conclusions

The dollar's 37 percent depreciation between the first quarter of 1985 and the third quarter of 1987 worsened our terms of trade, causing a continuing annual real loss to the nation estimated to be between $24 billion and $100 billion. This annual loss will grow as the volume of trade grows.

The annual loss will be partially offset by the one-time gain from the dollar depreciation's effect on the potential purchasing power of U.S. international assets and liabilities, which we have estimated to be between $32 billion and $58 billion. Comparing the midpoint of the range of annual loss estimates, $62 billion, to the midpoint of the one-time gain estimates of about $45 billion, we can see that the one-time gain will be offset by the annual losses in less than a year, after which the losses will continue to accrue, year after year.

Although a reduction in the terms of trade is costly, that cost may be unavoidable if the United States is to reduce its trade deficit. A reduction of the trade deficit is generally considered desirable because it will reduce the need for the United States to import capital and thus to increase its net international indebtedness, and also because reduction of the trade deficit is generally believed to stimulate domestic production and employment.

Of course, faster growth of the economies of our major trading partners would tend to reduce the U.S. trade deficit without a worsening of the terms of trade. However, foreign governments may be reluctant to stimulate their economies if they expect such action to be inflationary and, in any event, faster foreign growth is unlikely to fully eliminate the trade deficit.

Slower growth of the U.S. economy also would tend to reduce the U.S. trade deficit, but that is, of course, an undesirable method of improving the trade balance.

9. Investors who expect dollar depreciation will, if possible, demand higher nominal returns on their international assets to compensate them for expected losses from depreciation; investors who expect to gain from depreciation will accept lower nominal returns, if necessary. Such adjustments in nominal returns will mitigate the gains and losses and reduce the net gain to the United States from changes in the value of U.S. international assets and liabilities. However, most asset holders are locked into nominal returns that they cannot alter when depreciation occurs, so the offset here will be only partial.

Federal Reserve Bank of Cleveland
Research Department
P.O. Box 6387
Cleveland, OH 44101

BULK RATE
U.S. Postage Paid
Cleveland, OH
Permit No. 385

Address Correction Requested: Please send corrected mailing label to the Federal Reserve Bank of Cleveland, Research Department, P.O. Box 6387, Cleveland, OH 44101.

Federal Reserve Bank of Cleveland October 15, 1987
ISSN 0428-1276

ECONOMIC COMMENTARY

Two Neglected Implications of Dollar Depreciation

by Gerald H. Anderson

The foreign-exchange value of the dollar has been depreciating for more than two-and-a-half years. Most discussion about this depreciation has focused on traditional issues, such as its effects on the overall trade balance, economic growth, import prices, inflation, and interest rates.[1]

Some other important effects, however, have generally been overlooked. Dollar depreciation, for example, is supposed to improve the U.S. trade balance partly by increasing the cost of foreign goods, thus reducing the volume of imports by making them less attractive to consumers.

Higher import prices, however, will have a significant real cost to the nation. The resources the United States would have to expend to purchase a given volume of imports would increase. Only if the prices of U.S. export goods also increased, so that there were greater export earnings from a given volume of exports to help pay the higher import bill, would some of this higher cost be offset. There has been practically no public discussion of the import cost increase, nor attempts to measure it, despite the fact that the net cost to the United States is potentially large. Failure to reduce the trade deficit is also costly, however, in the sense that it implies continued growth of U.S. net indebtedness to foreigners. This trend, in contrast, has received much public attention.

Another potential implication resulting from dollar depreciation centers on the foreign assets owned by U.S. citizens, and on the debts that Americans owe to foreigners. Depending on the currencies in which they are denominated, the values of these assets and liabilities will either be increased or decreased by dollar depreciation. But again, there has been little public discussion of this effect of depreciation.

This *Economic Commentary* discusses and estimates the costs and benefits that dollar depreciation imposes through changes in the prices of imports and exports, and the costs and benefits imposed through changes in the potential purchasing power of U.S. international assets and liabilities.

Because of inadequacies in the data and uncertainty about which are the best concepts of the gains and losses, a range of estimates is presented. Despite their lack of precision, the estimates nevertheless indicate the signs and general magnitudes of these gains and losses, and help round out public discussion of the costs and benefits of dollar depreciation.

It is not the purpose of this presentation, however, to argue that dollar depreciation is either good or bad. Such a judgement must be based on an evaluation of *all* of the effects of depreciation, not just on the net loss that is calculated here. Such an overall evaluation is beyond the scope of this essay.

Change in Terms of Trade

The terms of trade is a measure indicating the amount of imports that can be purchased with a unit of exports. It can be described as the ratio of the prices a nation receives for its exports to the prices it pays for its imports, with all prices measured in the same currency. A decrease in this ratio would be considered a deterioration in the nation's terms of trade: the nation would be worse off economically after the decrease because its exports would have less buying power.

A terms-of-trade loss is not the same as a reduction in a nation's real gross national product (GNP). Real GNP might be unchanged, but a nation with a terms-of-trade loss would still be worse off because a given physical quantity of its goods can now be traded for only a smaller amount of foreign goods. Thus, even if the nation's production of goods and services did not change, the resources it would have available for consumption, investment, and government would be smaller because its exchanges of goods with other nations would be on less-favorable terms.

The amount by which dollar depreciation changes the prices of U.S. imports and exports depends on the size of the depreciation and on the extent to which U.S. and foreign exporters try to offset its effects. A foreign exporter, of Japanese cars, for example, could cushion some of the impact of a dollar decline on its sales by cutting the yen price of an automobile. As a result, the dollar price to U.S. importers will not rise by the full extent of the dollar's depreciation.

In this case, there is less than full "pass-through" of the depreciation to import prices because the Japanese exporter has been willing to shave his profit margin. By the same token, U.S. exporters, finding themselves in a more competitive position because of the dollar's depreciation, may take advantage

Gerald H. Anderson is an economic advisor at the Federal Reserve Bank of Cleveland. *The author would like to thank John Scadding, Mark Sniderman, and E.J. Stevens for helpful comments.*

1. For a discussion of these traditional issues, see Gerald H. Anderson, "Is Dollar Depreciation Desirable?," *Economic Commentary,* December 15, 1985.

2. The equation for calculating the responsiveness of the terms of trade to a change in exchange rates is given in H. Robert Heller, *International Monetary Economics,* 1974, Prentice Hall, Inc., Englewood Cliffs, N.J., page 101. Estimates of supply and demand elasticities of U.S. exports and imports are summarized in the *Handbook of International Economics,* Volume 2, North Holland Publishing Company, 1985, pages 1078, 1079, 1087, and 1088.

of the situation to improve their profit margins by raising the dollar prices they charge. In such a case, there is also less than full pass-through of the dollar depreciation to the foreign-currency prices that foreigners pay for U.S. goods.

The degree to which a depreciation is passed through as price changes, both in export and import markets, depends on how sensitive producers and consumers are to price changes — in other words, on the supply and demand elasticities for exports and imports. These elasticities will differ among products and will depend on many aspects of the market situation, including sellers' profit margins, the amount of idle capacity in the particular industry, expectations regarding the permanence of the exchange-rate change, the degree of competition, the terms of existing contracts between buyer and seller, and the strength of the buyers' demand for the product. Elasticities are usually larger in the long run than in the short run because buyers and sellers have more time to react.

An estimate of the long-run terms-of-trade effect of dollar depreciation, calculated using econometric estimates of the supply and demand elasticities of U.S. imports and exports, indicates that for every 1 percent depreciation of the dollar, the U.S. terms of trade would deteriorate by 0.76 percent in the long run.[2] This means that the physical amount of imports that the U.S. can purchase with the proceeds from a given physical amount of exports declines by about three-quarters of a percent for each 1 percent depreciation of the dollar.

The dollar depreciated by a weighted average of about 37 percent against other major currencies between the first quarter of 1985 and the third quarter of 1987, and was continuing to fall in the fourth quarter. If the long-run relationship cited above holds, the 37 percent depreciation will eventually translate into a 28 percent worsening in the terms of trade.

U.S. exports in 1985 and 1986 averaged $215 billion. Thus it appears that one cost of the dollar depreciation, imposed through a deterioration in the terms of trade, could eventually reach 28 percent of $215 billion, or about $60 billion per year. That is, because dollar depreciation leads to larger increases in the dollar prices of imported goods than in the dollar prices of exported goods, the revenue from a given physical quantity of goods exported after the depreciation will, on average, purchase a smaller physical quantity of imports than before the depreciation. The loss to the nation is the reduction in the physical quantity of imports earned by exporting. This cost will continue year after year and will grow as the volume of exports grows.

The loss calculation described above is conservative in that it ignores the fact that U.S. imports exceeded U.S. exports by an average of $143 billion in 1985 and 1986. Imports that the U.S. is unable to finance with current export earnings are, in essence, purchased with funds borrowed from foreigners.[3] If these loans are repaid, it is likely to be with the proceeds of future exports. Thus, imports are being purchased with current and future exports. The loss from the worsening in the terms of trade can be calculated to be the increase in the volume of exports needed, now or later, to pay for an unchanged volume of imports. U.S. imports in 1985 and 1986 averaged $358 billion, so the loss is 28 percent of $358 billion or about $100 billion per year. Although the volume of imports has a long-run rising trend, the change in the terms of trade might temporarily reduce the volume of imports, causing the loss to be smaller than estimated here.

An alternative to using the long-run terms-of-trade-change estimate given above is to use direct evidence on the degree to which depreciation is passed through by U.S. and foreign exporters. Recent studies of previous episodes of changes in dollar exchange rates found that foreign firms cut the foreign currency prices of their exports by 20 percent of a depreciation and pass through the other 80 percent of a depreciation into higher dollar prices charged to U.S. importers; U.S. exporters, in contrast, pass through only 50 percent of a depreciation, absorbing the other 50 percent in higher dollar prices for their exports.[4]

If this pattern is repeated in the latest depreciation, the terms of trade would deteriorate by 0.3 percent for each 1 percent depreciation of the dollar.[5] In this case, the 37 percent depreciation would cause an 11.1 percent drop in the terms of trade (0.3 x 37%). The cost to the United States, measured in terms of the reduced real purchasing power of U.S. exports, would be $24 billion per year (11.1% x $215 billion). The cost, measured in terms of the increased real cost of imports, would be $40 billion per year (11.1% x $358 billion).

An alternative calculation yields similar results. That approach is to examine the actual change in terms of trade thus far in the current episode of dollar depreciation. Since the dollar began its depreciation in early 1985, import prices have risen much faster than export prices. Between March 1985 and September 1987, prices of imports, excluding fuels, rose about 18 percent while prices of exports rose only about 3 percent. Thus, the terms of trade have worsened by about 12.7 percent so far.[6] In the long run, of course, the terms of trade may worsen further or reverse some of their deterioration. If they don't change, however, the annual cost to the nation would either be $27 billion (12.7% x $215 billion), or $45 billion (12.7% x $358 billion).

The importance to the United States of these annual losses can be more easily appreciated by noting that a $25 billion annual loss is equivalent to a loss of about $100 per person per year, or to a 6.5 percent increase in personal income tax payments. A $100 billion loss is equivalent to about $400 per person or a 27 percent tax increase.[7]

Although these calculations reveal that a large deterioration in the terms of trade entails a large loss to this nation, it is also true that a dollar appreciation, such as occurred in the early 1980's, implies an improvement in the terms of trade and a large gain for the nation. The worsening in the terms of trade estimated here can be viewed as merely reversing some previous improvement, or it can be viewed as persisting only until some possible future improvement. However one chooses to view it, the fact remains that the loss would not have occurred if the dollar had not depreciated, and the loss will persist until a subsequent improvement in the terms of trade, if any, occurs.

Change in Value of U.S. International Assets and Liabilities

At the end of 1984, just before the dollar began to depreciate, foreign-held assets in the United States, and U.S. holdings abroad, were roughly in balance—$892 billion and $885 billion, respectively (see table 1).[8] In 1985 and 1986, foreign assets in the United States increased by $439 billion and U.S. assets abroad increased by $172 billion, leaving the United States a net debtor of approximately $274 billion.

U.S. assets abroad are potential claims on foreign goods that the United States could import, and foreign assets in the United States are potential foreign claims on U.S. export goods. The values of assets here and abroad, measured in the sense of being potential claims on exports and imports, are altered by the changes in export and import prices that accompany dollar depreciation.

Although they too could be considered potential claims on foreign goods, U.S. assets in the United States are excluded from the following calculations because they are different from U. S. assets abroad in that they are not liabilities of foreign residents. Similarly, foreign assets abroad are excluded from the calculations because they are not liabilities of U.S. residents.

Most of the assets that foreigners hold in the United States are dollar-denominated financial instruments such as bonds, loans, and bank deposits. The others are mostly corporate stocks and direct investments that have no currency denomination, but that can be considered to be denominated in dollars because they are claims on dollar-denominated income streams.

Dollar depreciation reduces the value of assets in the United States owned by foreigners, measured in their own currencies. However, the foreigners' real loss from dollar depreciation, and thus the real gain for the United States, occurs because, as discussed earlier, depreciation leads to rises in the dollar prices of U.S. exports that cause the foreigners' holdings of dollars to represent a potential claim on fewer U.S. goods.

About three-fifths of the assets that U.S. residents hold abroad also are primarily financial instruments denominated in dollars. A much smaller amount, primarily certain official reserve assets, are denominated in foreign currencies. The rest are mostly corporate stocks and direct investments and therefore have no currency denomination, but they can be considered to be denominated in foreign currencies because they are claims on foreign-currency-denominated income streams.

The dollar value of dollar-denominated assets abroad owned by U.S. residents is not affected by depreciation. However, the dollar value represents a claim on fewer foreign goods after depreciation than before because depreciation raises the dollar prices of foreign goods. On the other hand, U.S. assets abroad denominated in foreign currencies represent a larger claim on foreign goods after depreciation than before because dollar depreciation is accompanied by a reduction in the foreign-currency price of foreign goods.

To estimate the U.S. gain or loss caused by dollar depreciation's effect on the potential purchasing power of the United States' international assets and liabilities, we can assume that the present depreciation will be passed through into import and export prices in the same proportions as in the past, that is, U.S. export prices rise by 50 percent of the depreciation, U.S. import dollar prices rise by 80 percent of the depreciation, and U.S. import foreign currency prices fall by 20 percent of the depreciation. The estimate of gain or loss to U.S. residents is made in four steps.

First, foreigners held $892 billion of dollar-denominated assets in the United States at the end of 1984 (see table 1). Assuming that 50 percent of the dollar's depreciation is absorbed in higher dollar prices for U.S. exports, the change in price of U.S. exports resulting from the dollar's 37 percent depreciation between first quarter 1985 and third quarter 1987 is 18.5 percent. That reduces the real value of those assets, measured in terms of their potential claim on U.S. exports, from $892 billion to $753 billion ($892 billion ÷ 1.185), a reduction of $139 billion. This is a gain for the United States.

Second, U.S. residents held $572 billion of dollar-denominated assets abroad at the end of 1984. Assuming that foreign firms pass through 80 percent of the depreciation into higher dollar prices, the dollar's 37 percent depreciation raises import dollar prices by 29.6 percent. That reduces the real value of those assets, measured in terms of their potential claim on foreign exports, from

Table 1 Foreign Assets in the United States and U.S. Assets Abroad*
(billions of dollars, end of year)

	1984	1985	1986	Changes 1984 to 1985	Changes 1985 to 1986
Foreign Assets in the United States (line 20)	892	1,061	1,331	169	270
U.S. Assets Abroad Excluding Gold (line 2 less line 4)	885	938	1,057	53	119
Denominated in or Saleable for Foreign Currencies (lines 5, 6, 7, 11, 12, 14, and 17 plus half of lines 16 and 18)	313	356	407	43	51
Denominated in Dollars (lines 10 and 19, plus half of lines 16 and 18)	572	582	650	10	68

*Notes: Where necessary, the author has made assumptions about the currency denomination of certain items. Gold is excluded from U.S. Assets Abroad for reasons given in footnote 8. Basic data are from lines indicated in *Survey of Current Business,* June 1987, page 40, table 2.

3. Actually, the funds will come from both debt and equity transactions, but that does not change the argument so, for ease of exposition, we regard all as coming from debt.

4. Five studies are cited in Robert A. Feldman, "Dollar Appreciation, Foreign Trade, and the U.S. Economy," Federal Reserve Bank of New York *Quarterly Review,* Summer 1982, p. 5.

5. If the initial terms of trade = 100%/100% = 1, then assuming a 1.0% depreciation, the new terms of trade would be 100.5%/100.8% = 0.997. Thus, the terms of trade deteriorate by 1-0.997 = 0.003 = 0.3% for each 1.0% of depreciation.

6. If the initial terms of trade = 100%/100% = 1, and the new terms of trade = 103%/118% = 0.873, then the deterioration is 1-0.873 or 0.127 = 12.7%.

7. The U.S. loss from a worsening of the terms of trade is distributed unevenly among U.S. residents. Consumers of imported products lose because they must pay higher prices, but U.S. producers who compete against foreign goods here or abroad gain from increased profit margins.

8. Gold has been excluded from these figures. Although gold held by the U.S. government is listed as a U. S. asset abroad in reports of the international investment position of the United States, that treatment is a carry over from the time when gold played an important role in the international monetary system. While gold is still an important asset of the U. S. government, it need not be considered a U. S. asset abroad. Indeed, if it were to be considered as a U. S. asset abroad, it is unclear whether it should be considered to be denominated in dollars, whose purchasing power has decreased, or denominated in foreign currency, whose purchasing power has increased. Moreover, gold is different from other U. S. assets abroad in that it is not a liability of a foreign resident.