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A REASSESSMENT OF MEASURES OF THE DOLLAR'S EFFECTIVE EXCHANGE VALUE

by

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and

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ABSTRACT

Recent attention has focused on measures of the dollar's effective exchange rate amid disappointment by some observers with the response of the U.S. trade balance to the depreciation of the dollar since February 1985. In particular, these observers suggest that the traditional indexes, which include only currencies of industrial countries, overstate the dollar's decline because it has depreciated much less against the currencies of some key newly industrialized trading partners.

This paper begins with a description of the uses of effective exchange-rate indexes and describes theoretically the choice of an index, which varies with the application. Although the inclusion of currencies of developing countries in an index may be useful for analyzing trade developments, it is not appropriate for some other purposes, such as providing information for monetary conditions. The latter part of the paper focuses on measures of exchange rates suitable for analyzing trade flows and domestic inflation and compares their performance in the context of the equations used by the Federal Reserve Board staff to forecast trade components and price deflators for exports and imports. The results suggest that the addition of the currencies of important developing-country trading partners in an index of exchange rates improves its performance in forecasting export volume and import prices but makes little difference for the forecasts of export prices.

A Reassessment of Measures of the Dollar's Effective Exchange Rate

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B. Dianne Pauls and William L. Helkie*

Introduction and Summary

This paper reassesses alternative measures of the effective foreign-exchange value of the dollar. The appropriate choice of an exchange-rate index depends on its application; no single index is best for answering all questions. For this reason, the paper begins with a consideration of alternative uses of an effective exchange-rate index. A discussion of the conceptual issues that arise in constructing such a measure follows, including: weighting schemes, country coverage, real versus nominal indexes, and the choice of a price index to use for a deflator if a real measure is desired.

To assess the practical significance of these issues, the behavior of several alternative indexes is compared over the floating rate period along with their performance in trade equations. The major empirical findings are:

1) Virtually all of the major published exchange-rate indexes and broader indexes constructed in this paper suggest that roughly two-thirds to three-fourths of the dollar's rise from late 1980 had been reversed by the end of 1986. The Dallas Federal Reserve's nominal index is the only index that tells an appreciably different story. A summary analysis is presented in Table 2.

2) A bilateral trade-weighted index of the dollar's value exhibits less variation than a multilateral trade-weighted index based on the same set of currencies, reflecting the larger weight assigned to the Canadian dollar in a bilateral weighting scheme and the relative stability of the U.S.-Canadian bilateral rate.

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3) Updating the weights (from 1973-76 to 1978-83 averages) in an index of the G-10 currencies makes little difference in the behavior of the index.

4) Expanding country coverage to encompass the rest of the OECD does not noticeably alter the behavior of a multilateral weighted index of the G-10 currencies but including several key developing country trading partners reduces the extent to which the dollar's earlier rise has been reversed. Most of these indexes indicate that about two-thirds of the dollar's decline had been reversed by the end of 1986.

5) An index that includes the currencies of these developing countries should be expressed in real terms.

6) Regarding the performance of alternative indexes of exchange rates in explaining and forecasting trade developments:

a) For the nonoil import price deflator equation, all three of the indexes tested -- a multilateral trade-weighted index of the G-10 currencies; an index of the currencies of the G-10 plus eight developing countries with multilateral trade weights; and bilateral U.S. nonoil import weights -- performed similarly in explaining the data within the sample period.

b) A multilateral trade-weighted index of the G-10 currencies, and indexes of the currencies of the G-10 plus eight developing countries using multilateral trade weights, and bilateral U.S. nonagricultural export weights provided similar fits for the nonagricultural export price deflator equation in sample. Of these indexes, the multilateral trade-weighted index of the G-10 currencies provided the best fit for the nonagricultural export volume equation in sample.

c) The indexes that also included some developing country currencies yielded substantial improvement -- on the order of 60 percent -- in the out-of-sample forecast errors for the nonagricultural export volume and the nonoil import price deflator equations but made little difference in the forecast for export prices.

d) No single index is ideal for all applications. Among the broader indexes, an index based on multilateral trade shares performed better in forecasting export volume, while an index based on bilateral nonoil import shares performed better in forecasting import prices.

1. Effective Exchange-Rate Indexes

An effective exchange rate index is a statistic that summarizes a set of, often divergent, changes in bilateral exchange rates. With the advent of more frequently adjusted exchange rates, such a measure became

necessary, especially for the dollar, as the broad-based pattern of U.S. trade and capital flows implied that no single bilateral exchange rate was an adequate indicator of changes in the dollar's value. The Federal Reserve Board staff's index, developed in 1971 when the fixed exchange rate system first broke down, was originally intended primarily as a summary measure of how the dollar was faring in exchange markets against the currencies of the 10 major countries that participated in the Smithsonian Accord.

More generally, the objective in constructing an effective exchange-rate index presumably is to summarize the individual foreign currency prices of the dollar with respect to their influence on some macroeconomic variable or policy objective. That is, a change in the effective exchange rate of the dollar measures the uniform change in the value of the dollar against all other currencies that would have produced the same effect on some macroeconomic variable as the actual configuration of bilateral exchange rate changes that occurred. Because the choice of an index will vary with its application, it is important to consider the possible alternative uses of an effective exchange-rate index before discussing its construction.

2. Uses of Effective Exchange-Rate Indexes

A summary measure of exchange rate changes might be used as an indicator of the effect of changes in exchange rates on the U.S. trade position.[1] In particular, the price competitiveness of U.S. goods, as reflected in the relative price of U.S. goods vis-a-vis foreign goods denominated in a common currency, is a principal determinant of our trade

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1. Peter Hooper and John Morton, "Summary Measures of the Dollar's Foreign Exchange Value," Federal Reserve Bulltein, October 1978.

balance. Because the data cannot distinguish the effects of numerous bilateral exchange rates on trade components, a summary measure is needed for this application. To construct such a measure requires an index of foreign currency prices of the dollar -- a nominal effective exchange-rate index -- as well as indicators of relative price levels in the United States and abroad. These measures could be combined into a real effective exchange-rate index.

A second use of an effective exchange-rate index is to help assess the overall effect on the domestic price level of various changes in bilateral exchange rates.[2] Changes in exchange rates alter domestic prices directly through changes in the prices of imported goods and indirectly both by influencing prices of domestically produced goods that compete with imports and by altering foreign demand for U.S. goods. If the primary interest is in evaluating the effects of changes in the dollar prices of foreign goods on the domestic price level both an index of nominal exchange rates and an index of foreign prices are needed. However, because foreign exporters' responses to changes in home currency prices and to changes in exchange rates may differ, it may be desirable to treat each of these as a separate determinant of domestic inflation rather than combining them into a single real effective exchange-rate index. Specifically, changes in home currency prices of foreign goods may be more likely to be regarded as permanent and reflected more readily in import prices, while fluctuations in exchange rates often are viewed as temporary and therefore may be passed through into import prices more slowly. Of course, the indirect effect of exchange rate changes on

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2. Ibid.

U.S. inflation as a result of changes in U.S. export demand is best captured by variation in a real effective exchange-rate index.

Third, a summary measure of exchange rate changes might be of interest as a factor influencing asset demands. For example, foreign currency and foreign-currency denominated deposits or securities could be considered along with domestic-currency denominated deposits or securities as alternatives to domestic currency in a formulation of money demand. According to this specification, the nominal rate of interest on domestic and foreign deposits or securities and the expected rate of change of the exchange rate enter money demand along with income, wealth or some other scale variable. In addition, the exchange rate influences money demand indirectly through its effect on the domestic price level, and hence, the level of real balances and real wealth.

Moreover, there is a school of thought that views the exchange rate along with interest rates as a source of information for monetary policy about financial conditions.[3] Given that changes in nominal interest rates can reflect either changes in real rates or changes in inflation expectations, nominal interest rates alone can give ambiguous signals about the stance of monetary policy. Because the exchange rate should respond differently to movements in real interest rates and changes in inflation expectations, the nexus of interest rates and exchange rates may provide a better indication of monetary conditions -- assuming that the exchange rate enters asset demand functions, including the demand for money.

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3. Charles Engel and Jeffrey Frankel, "Why Interest Rates React to Money Announcements: An Explanation from the Foreign Exchange Market," Journal of Monetary Economics, Vol. 13, No. 1., January 1984.

Finally, an effective exchange-rate index might be useful in assessing changes in the real value of the wealth of U.S. residents. This use corresponds most closely to the classic application of consumer price indexes in evaluating changes in the standard of living or utility. Because the information about the foreign currency composition of assets and liabilities required for such an analysis is not available, however, this application is difficult.

3. Construction of an exchange-rate index -- conceptual issues

There are at least four dimensions in which effective exchange rate indexes may differ. One involves various aspects of weighting schemes, including the choice of base period for the weights. A second entails country coverage. Third, an index may summarize either nominal or real exchange rate changes. And, fourth, if the index is intended to measure real exchange rate changes, an issue arises as to which price indexes to use as deflators.

a. Weighting schemes

A large number of potential weighting schemes could be used; the choice depends on the intended use. Most effective exchange-rate indexes for the U.S. dollar currently reported by public and private organizations employ weighting schemes based on trade shares under the rationale that the U.S. trade position is a variable of prime concern. The two most common weighting schemes are bilateral trade shares -- used by Morgan Guaranty, the U.S. Treasury, the Commerce Department, The Bank of Canada, the Bundesbank, and the newly developed indexes by the Federal Reserve Banks of Atlanta and Dallas, -- and multilateral trade shares

employed by the Federal Reserve Board staff. Bilateral trade shares are defined as:[4]

$$w_i = \frac{x^i_{US} + m^i_{US}}{\sum_k (x^k_{US} + m^k_{US})}$$

where: w_i = weight of currency i

x^i_{US} = U.S. exports to country i

m^i_{US} = U.S. imports from country i

Multilateral trade shares, as defined in the Board's index, are computed as:

$$w_i = \frac{x_i + m_i}{\sum_{k \neq US} (x_k + m_k)}$$

where: x_i = exports from country i to the rest of the countries in the index

m_i = imports to country i from the rest of the countries in the index

Neither of these simple weighting schemes is readily obtained from theory, which dictates that the appropriate weights for an effective exchange-rate index should be derived from structural or reduced form equations relating the macroeconomic variable of interest to each of the individual bilateral exchange rate changes as well as to its other determinants. The weights obtained in this way capture both the direct impact of exchange-rate changes on the variable in question and the

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4. Some of the organizations cited above compute separate effective exchange-rate indexes using bilateral export weights and bilateral import weights, rather than combining these into a single measure.

indirect impact of exchange-rate changes that occur through other variables in the system and via so-called third-country effects, plus the relative strength of those effects. Third-country effects take account of competition between the United States and Germany, for example, in third markets, as well as the presence of other competitors in the U.S. and German markets.

If the U.S. trade position is the variable of interest, quasi-reduced form equations or expressions relating exports and imports to individual exchange rates, price levels, and domestic demands can be obtained. In general, the theoretically derived weights from such a model are complex functions of own and cross price elasticities of demand and supply, and bilateral trade shares.[5] One problem in implementing the strict theoretical approach in constructing an exchange-rate index is that reliable estimates of the required elasticities generally are not available. This leaves the analyst with having to use some type of trade shares as an approximation to the theoretically preferred weights.[6] In choosing between bilateral and multilateral weighting schemes, it should be noted that trade shares enter the general expression for the weights as complex functions of individual bilateral shares in different markets. For example, the theoretical weight for the mark-dollar bilateral exchange rate contains both the U.S. share of exports in the German market and the U.S. share of exports in other markets where the

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5. Janet Yellen, "The Theory of Effective Exchange Rate Measures," Board of Governors of the Federal Reserve System, September 1974.

6. The IMF employs a quasi-theoretical approach in constructing its effective exchange rate indexes, based on its multilateral trade model, where many of the elasticities are simply assumed. The Bank of England has adopted the IMF's weighting scheme in its effective exchange rate indexes.

United States and Germany compete, as well as the appropriate own and cross-price elasticities.

The theoretically preferred weights reduce to simple bilateral trade shares for the country in question only in the special case where all own price elasticities of demand and supply are equal and all cross-price elasticities are zero.[7] This would imply that there are no third-country effects, which may be an unreasonably strong assumption. As these conditions are unlikely to be met in practice, a weighting scheme based on a more general formulation is clearly preferable.

Multilateral trade weights attempt to capture the effect of competition in other markets besides the home market, but may understate the importance of specific markets to specific countries. For example, consider constructing effective exchange rate indexes for the yen and the Dutch guilder based on multilateral trade weights. Both of these currencies have appreciated by similar amounts against the dollar from its peak in early 1985 and hence have shown comparable changes against other currencies. Because a multilateral index weights these other currencies similarly in constructing effective exchange rate indexes for the yen and guilder, both currencies will display roughly comparable appreciation on an effective basis. Yet, Japan obviously has suffered a greater loss of overall competitiveness than the Netherlands because Japan relies more heavily on the U.S. market and also competes extensively with the newly industrialized countries in Asia, whose currencies have depreciated against the yen. In contrast, the bulk of Dutch competition is with other European countries, whose currencies are little changed against the guilder.

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7. Yellen, "The Theory of Effective ".

An alternative weighting scheme that explicitly incorporates third-country effects by assessing who the competitors are in each market is used by the EC and OECD.[8] According to these modified bilateral indexes, the weight of a given currency -- the mark, for example -- in an index for the dollar is calculated by aggregating over markets the product of Germany's market share in a particular importing country and the relative importance of that market to the United States. Germany's market share is expressed as the ratio of Germany's exports to a given importing country to total sales to that country by the reference group of countries, including the home country but excluding the United States because the measure is intended to assess the relative role of each U.S. competitor in a given market. The relative importance of the market for the United States is measured by the ratio of U.S. sales in that market to total U.S. sales, including U.S. sales in the home market. Thus the weight for currency i is expressed as:

$$w_i = \left(\frac{y_i}{\sum_{k \neq US} x_k^i + y_i}\right)\left(\frac{x_{US}^i}{\sum_k x_{US}^k + y_{US}}\right) + \sum_{j \neq i}\left(\frac{x_i^j}{\sum_{k \neq US} x_k^j + y_j}\right)\left(\frac{x_{US}^j}{\sum_k x_{US}^k + y_{US}}\right)$$

where: y_i = country i's sales in its own domestic market

x_i^j = country i's exports to country j

8. Martine Durand, "Method of Calculating Effective Exchange Rates and Indicators of Competitiveness," OECD Working Paper, February 1986. "The Influence of Exchange Rate Changes on Prices: A Study of 18 Industrial Countries -- Technical Annex: The Calculation of Effective Exchange Rates and Indices of Competitiveness," European Community note, September 1986.

While broadening the definition of competing goods and alternative markets to include a country's sales in its domestic market these approaches limit the home country's sales to so-called tradable goods under the assumption that the cross-price elasticity of demand between tradables and nontradables is zero. However, it may be difficult to obtain sectoral data for the output of tradable goods, even if manufacturing output is used as a proxy for tradable goods, as it is in the OECD index.

Although these modified bilateral weights are not strictly comparable to the weights that are theoretically preferred for assessing trade developments, they are likely to be a closer approximation than either the simple bilateral or multilateral weighting schemes. The modified bilateral scheme weights the bilateral share of U.S. exports to a particular importing country by the market share of a given country -- for example, Germany -- in that importing country. According to the theoretical approach these bilateral export shares should be weighted by the cross-price elasticity of demand for goods from Germany with respect to a change in the price of U.S. goods to the importing country. However, it can be shown that market shares are a function of cross-price elasticities, as well as own price elasticities and the individual prices of goods to the importing country.

Morgan Guaranty, in its recently developed broad index, employs a modified bilateral weighting scheme for exports that does not incorporate third-country effects as fully as the OECD and EC measures.[9] These export weights are then combined with simple bilateral import shares to obtain a set of trade weights. For example, in constructing an

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9. World Financial Markets, Morgan Guaranty, October/November 1986.

effective index for the dollar, Morgan Guaranty defines its modified bilateral weight for the mark as the product of Germany's relative importance as a competitor in its own market and the bilateral share of U.S. exports to Germany:

$$w_i = \left(\frac{y_i}{\sum_{k \neq US} x_k^i + y_i} \right) \frac{x_{US}^i}{\sum_k x_{US}^k} + \frac{m_{US}^i}{\sum_k m_{US}^k}$$

The relative importance of Germany as a competitor in its own market is defined as in the EC and OECD indexes -- that is, as the ratio of Germany's sales in its home market to total sales to Germany by the reference group of countries (including Germany but excluding the United States). Like the EC and OECD, Morgan uses only trade flows in manufactured goods as a proxy for tradable goods. Although Morgan's weighting scheme takes account of U.S. competition with other countries besides Germany in the German market, it omits U.S. competition with Germany in third markets in obtaining a weight for the mark. Moreover, in assessing the relative importance of each market to the United States, Morgan's index uses simple bilateral U.S. export shares, thereby neglecting the role of U.S. sales in its home market.

When other objectives besides analyzing trade developments are considered, the theoretical weights will differ. For an index used to assess the effect of changes in bilateral exchange rates on the domestic consumer price level, the theoretical weights are a function of a country's own and cross-exchange-rate elasticities of prices of imports and domestically produced tradable goods as well as the shares of

bilateral imports and domestically produced tradables in total domestic consumption. The direct effect of exchange-rate changes on import prices in the consumer price level is reflected in the own exchange-rate elasticity of import prices and the share of, say, U.S. imports from the reference country as a percentage of total domestic consumption. The indirect effect of exchange rate changes on the price of competing goods, including both foreign goods and domestically produced tradables, is represented by the cross-exchange-rate elasticities of the prices of these goods together with their shares, individually, in total domestic consumption. If the objective is to focus more narrowly on the effect of exchange rate changes on import prices, the weights depend on own and cross-exchange-rate elasticities of import prices as well as bilateral import shares. Thus, the same type of third-country considerations arise in constructing an index for analyzing the effect of exchange rate changes on import prices as were discussed in the trade volume case above. However, empirical evidence suggests that cross-elasticities of import prices with respect to exchange-rate changes are relatively small; for example, import prices of German goods are little affected by changes in the dollar-yen exchange rate. Therefore, simple bilateral import shares generally are regarded as a more acceptable weighting scheme for applications involving import prices.

In considering an exchange rate index as an indicator of monetary conditions, the theoretical weights are complex functions of the elasticities of money demand with respect to foreign interest rates, the expected rate of change in the price of foreign currency, and real wealth; the elasticity of the domestic price deflator with respect to foreign prices; and the currency composition of asset portfolios. Not

only is it difficult to obtain reliable estimates of the required elasticities, but data on the currency composition of assets generally are not available. Under the assumption that the currency composition of portfolios reflects relative asset supplies, shares in global wealth -- estimated as shares in world GNP -- can be used as an approximation to the theoretically preferred weights.

b. Country coverage

Country coverage, too, will differ according to the purpose of the index. If the index is used to analyze trade and inflation then countries with either a significant share in world trade -- if a multilateral weighting scheme is used -- or U.S. trade -- under a bilateral weighting scheme -- are candidates for inclusion. For applications involving asset demands, the index should encompass countries whose assets are widely traded in financial markets.

In addition to these theoretical criteria there are several practical considerations regarding country coverage. First, it is desirable that the country have a well-developed foreign exchange market. The use of multiple exchange rates in some developing countries presents difficulties in determining the appropriate exchange rate for inclusion. Second, countries that seek to link their currencies directly to currencies included in the index as a result of policy decisions about exchange rates may be omitted provided the weights are appropriately adjusted. In general, so long as the movement of the excluded currencies is highly correlated with the movement of the currencies in the index, their absence will not appreciably affect the behavior of the index or its usefulness in econometric work. For applications involving real

exchange rates, of course, the currencies excluded from the index should be highly correlated in real terms with those included in the index.

c. Real versus nominal indexes

As previously noted, a real exchange-rate index is appropriate for questions pertaining to the effect of exchange rates on trade developments. However, because most standard price measures are available at best monthly, daily movements in nominal exchange rate indexes often are used as a proxy for changes in real or price-adjusted measures. This usage is valid provided the inflation rates of the countries included in the index are, on average, similar to that in the country for whose currency an effective exchange-rate index is being constructed.

d. Choice of price index to use as a deflator

For applications involving real indexes, an issue arises regarding which price index to use as a deflator. Each of the standard measures has advantages and disadvantages.[10] Consumer prices provide a broad measure of the prices of domestic finished goods and services, and are available on a relatively consistent and timely basis across countries. However, they include the prices of some nontraded items such as housing and a wide range of services. Wholesale prices focus more narrowly on the goods sector, but their coverage can vary substantially across countries. For example, in many countries these indexes are heavily influenced by the prices of a select group of basic commodities, which may not reflect underlying domestic manufacturing costs or output prices. Furthermore, for some developing countries that might be considered in a broader index, the standard measures of domestic consumer

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10. Hooper and Morton, "Summary Measures."

and producer prices may be biased downward by the existence of price controls. Although export price indexes capture the price of goods actually traded, they exclude the prices of potentially tradable goods, such as domestic import substitutes. Moreover, to the extent that exports are priced in the short-run to meet competition in foreign markets, with firms absorbing exchange-rate changes by varying profit margins, movements in exchange rates may be a poor indicator of changes in underlying domestic costs. Unit labor costs reflect a major component of domestic production costs, while avoiding measurement problems associated with short-run fluctuations in profit margins in response to exchange-rate changes. However, they have some important drawbacks as a measure of competitiveness: they omit other components of production costs such as costs of capital and material inputs, and thus they overlook changes in the relationship between unit labor costs and output prices.

4. Recent behavior of alternative indexes

To assess the practical significance of the choice of weighting schemes and country coverage, the behavior of alternative indexes during the floating rate period is compared in the following set of charts.

a. G-10 -- alternative weighting schemes

First, several indexes for the G-10 countries' currencies are examined. Chart 1 compares an index based on multilateral trade shares, with indexes based on bilateral trade shares and GNP weights. All three indexes were constructed using average weights for 1978-83.[11] In constructing GNP weights, nominal GNP in dollar terms was used. Although

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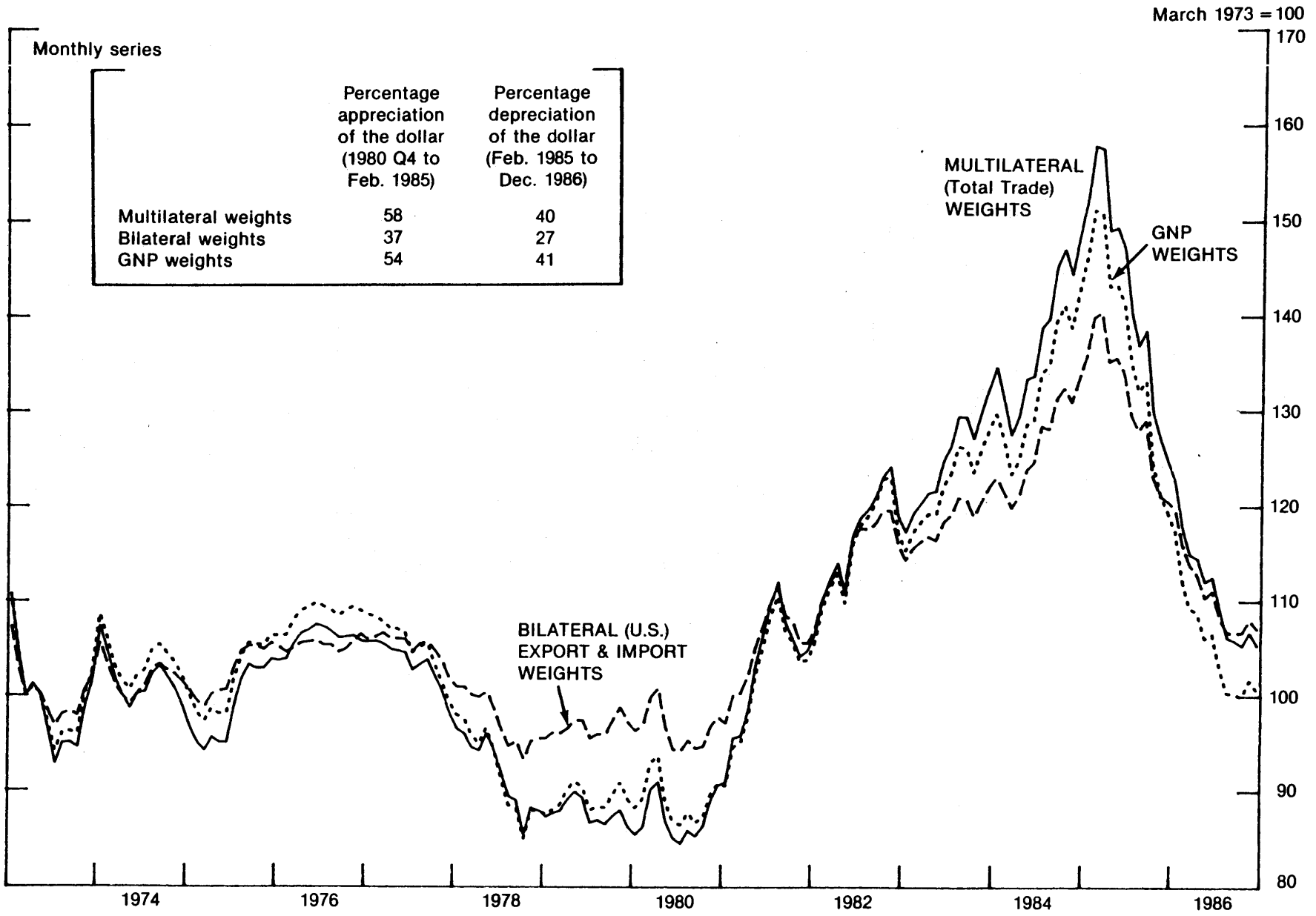
11. This differs only slightly from the current FRB staff index, which uses 1972-76 average multilateral trade shares as weights. A comparison of the two sets of weights is presented in columns 1 and 2 of Table 1.

Chart 1

Exchange Value of the Dollar Against the G-10 Currencies



NOTE: Percentage changes are computed logarithmically. Indexes use 1978-1983 average weights.

Table 1

Alternative Trade Weights for the G-10 Countries

Country	Current Federal Reserve Board Staff Index: 1972-76 Multilateral Trade Weights	1978-83 Multilateral Trade Weights	IMF Weights (1980)	1978-83 OECD Weights	Morgan Modified Bilateral Weights (1980)	1978-83 Bilateral Trade Weights
Belgium	6.4	7.1	2.8	1.9	3.0	3.3
Canada	9.1	7.8	23.2	31.6	28.1	37.8
France	13.1	13.0	11.6	5.3	6.9	5.1
Germany	20.8	20.4	14.9	11.4	13.5	9.3
Italy	9.0	9.5	8.6	4.9	5.0	4.2
Japan	13.6	15.4	24.4	32.0	25.1	23.1
Netherlands	8.3	8.1	3.7	2.1	2.7	4.0
Sweden	4.2	3.4	3.2	1.8	2.0	1.5
Switzerland	3.6	3.5	1.9	2.0	2.4	2.4
United Kingdom	11.9	11.8	5.8	7.1	11.1	9.3

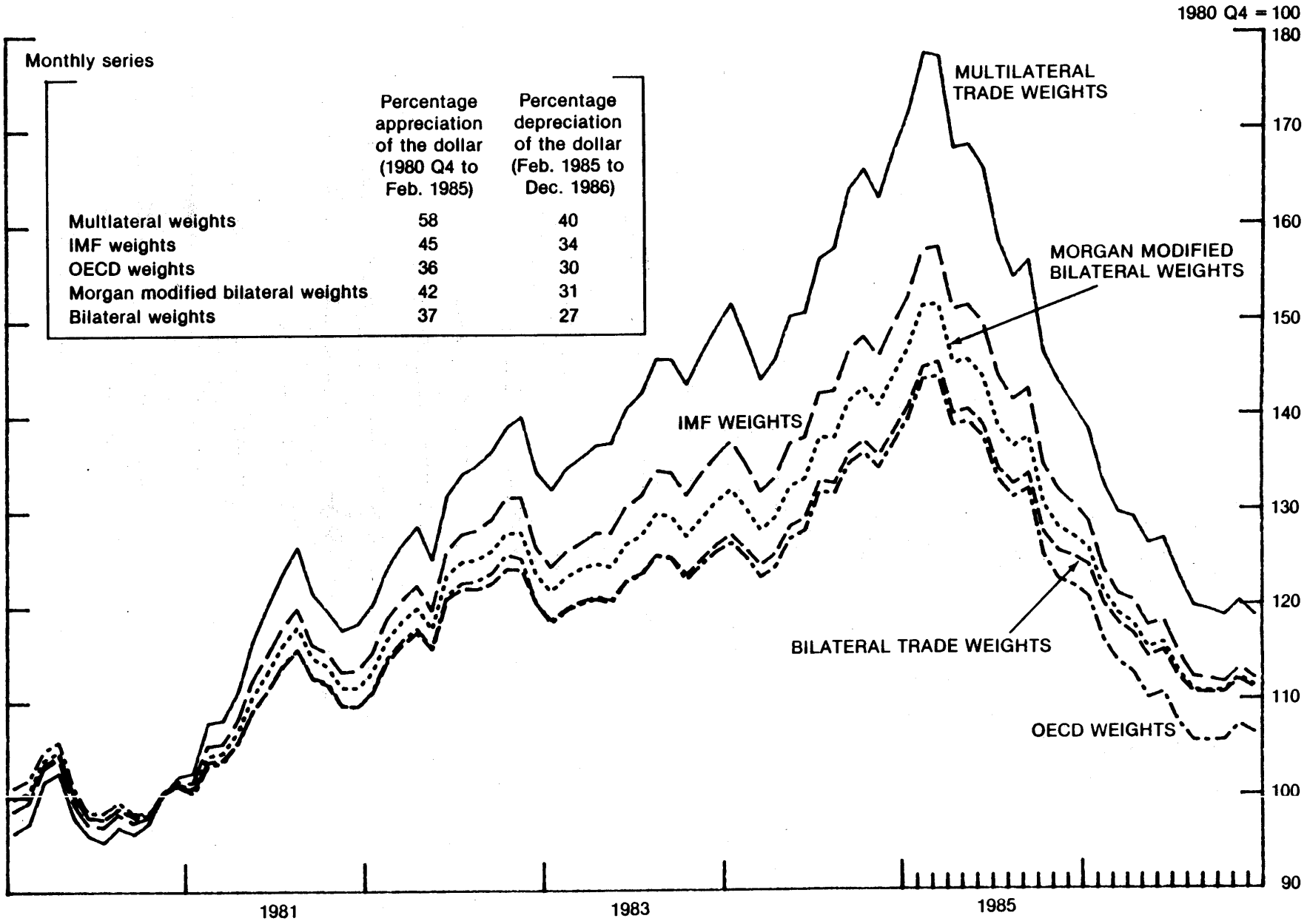
a measure of GNP across countries in a common currency can vary solely as a result of exchange rate fluctuations, it is assumed that those distortions are minimized by using a relatively long (six year)-average in constructing the weights. The indexes with multilateral and GNP weights display similar movements, while the bilaterally weighted index shows a less pronounced rise in the dollar through early 1985 and a smaller decline subsequently.

The difference in the magnitude of the recent swings in the value of the dollar based on multilaterally and bilaterally weighted indexes reflects the larger weight of the Canadian dollar in the bilateral index as the Canadian dollar has changed relatively little vis-a-vis the U.S. dollar during this period. Whether it is appropriate to assign the Canadian dollar such a large weight is an open question. More than 50 percent of the trade between Canada and the United States consists of homogeneous commodities -- whose prices are determined in world markets -- and intracompany transactions in the automotive industry. As the prices of these goods may be relatively insensitive to changes in U.S.-Canadian exchange rates, bilateral weights may overstate the importance of the Canadian dollar in assessing the price competitiveness of U.S. goods.

Several indexes of the G-10 currencies based on more elaborate trade-weighting schemes are illustrated, along with those based on simple bilateral and multilateral weighting schemes in Chart 2. For the IMF, OECD, and Morgan indexes, the weights for the G-10 currencies were renormalized to yield indexes covering only the G-10 currencies. The weights for the various indexes are shown in Table 1.

Chart 2

Exchange Value of the Dollar Against the G-10 Currencies—Comparison of Alternative Trade-weighting Schemes



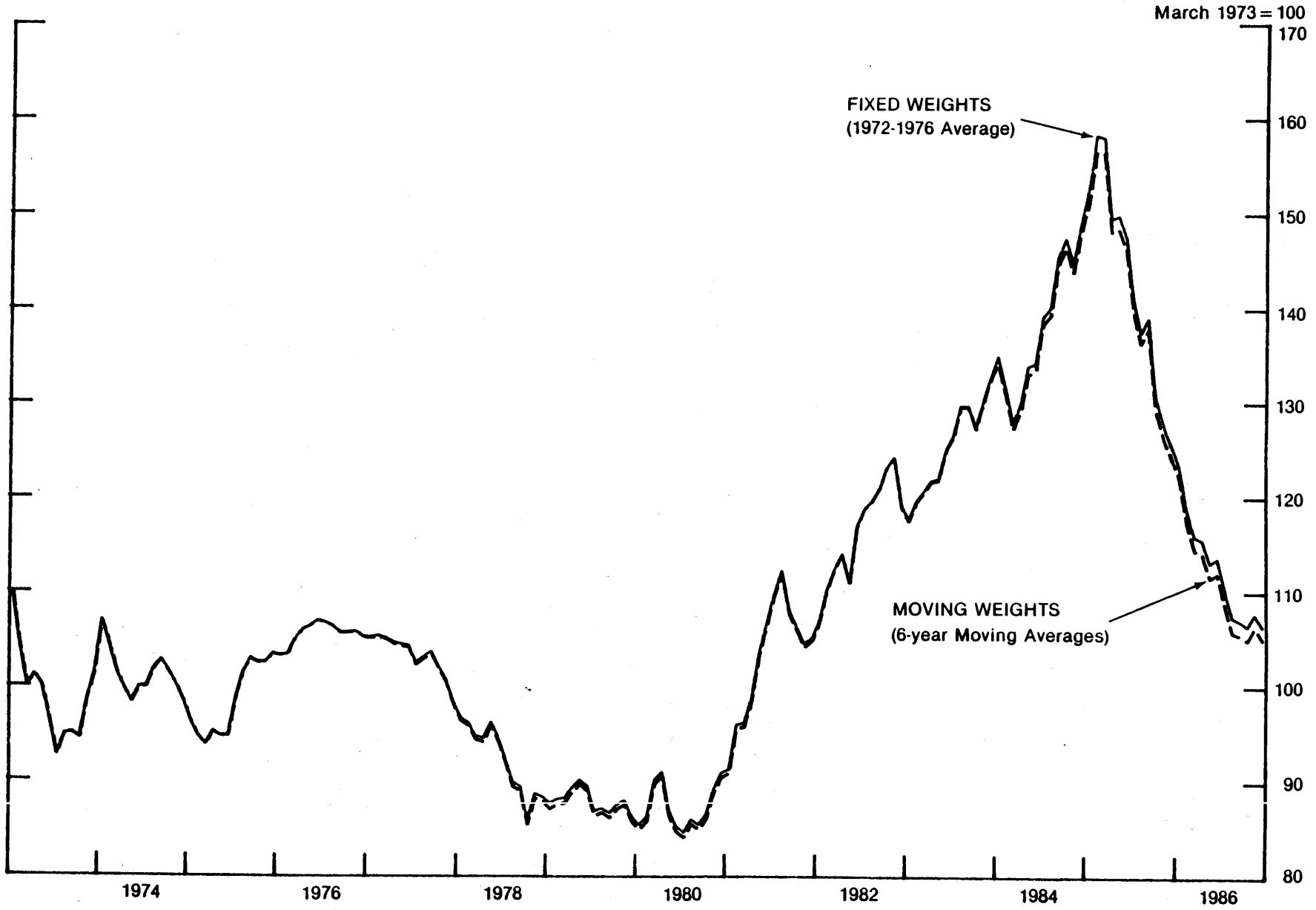
NOTE: Percentage changes are computed logarithmmically. The IMF, OECD, and Morgan Broad (modified bilateral) indexes were renormalized to obtain indexes for the G-10 only based on each weighting scheme.

Indexes using the Morgan and the OECD modified bilateral weighting schemes display less absolute appreciation and depreciation of the dollar against the G-10 currencies than either the Federal Reserve Board staff's or the IMF's multilaterally weighted indexes. The index based on Morgan's modified bilateral weighting scheme closely parallels the simple bilateral index, which is not surprising given that it is based on simple bilateral import shares and it uses simple bilateral export shares to gauge the relative importance of each export market to the United States in obtaining modified bilateral export weights. The OECD construct, however, tells an appreciably different story, suggesting that over 80 percent of the dollar's decline from late 1980 had been reversed by the end of 1986. This result stems from the larger weight assigned to the Japanese yen in the OECD scheme, as the dollar has substantially more than reversed its rise against the yen from late 1980, in contrast to its movements against other G-10 currencies. The larger weight of the yen in the OECD weighting scheme apparently reflects a sizable role for Japanese firms as competitors in their home and the U.S. markets, as well as extensive competition with the United States in third markets.

Chart 3 compares a G-10 multilateral trade-weighted index using fixed weights with one using six-year moving average weights. The two series show virtually identical movements, and display a maximum deviation of less than 2 percent of the underlying series. This result reflects the relative stability of G-10 trade shares over this period -- as can be seen by comparing columns 1 and 2 of Table 1 -- and the close similarity in the movements of a number of these currencies' bilateral exchange rates.

Chart 3

Exchange Value of the Dollar Against a Multilateral Trade-weighted Average of the G-10 Currencies



b. G-10 vs. G-10 plus rest of OECD

The next set of charts explores the effect of expanding country coverage as well as varying weighting schemes. First we consider expanding the current G-10 index to encompass the rest of the OECD, thereby accounting for nearly 75 percent of world trade versus 50 percent for the G-10 countries alone. As shown in the upper panel of Chart 4, the broader index tracks the G-10 index quite closely, owing to the relatively small trade shares for the non-G-10 OECD and the link between several of these currencies and the G-10 currencies. As the difference in the movements in nominal exchange rates in the G-10 and the non-G-10 OECD that account for the spread in the top panel largely reflect different inflation experiences, this similarity is even more striking on a CPI-adjusted basis -- the lower panel of Chart 4.

c. G-10 vs. G-10 plus eight developing-country currencies

In contrast, the behavior of the dollar's value in terms of a weighted-average of the currencies of certain developing countries differs substantially from that of an index based on the G-10 currencies alone. Chart 5 depicts dollar's value vis-a-vis a weighted average of eight of the key developing-country trading partners of the United States -- Mexico, Brazil, Hong Kong, Malaysia, Philippines, Singapore, South Korea, and Taiwan -- accounting for 35 percent of world trade by nonindustrialized countries.[12] Although the dollar has appreciated several hundred percent in nominal terms against a weighted-average of

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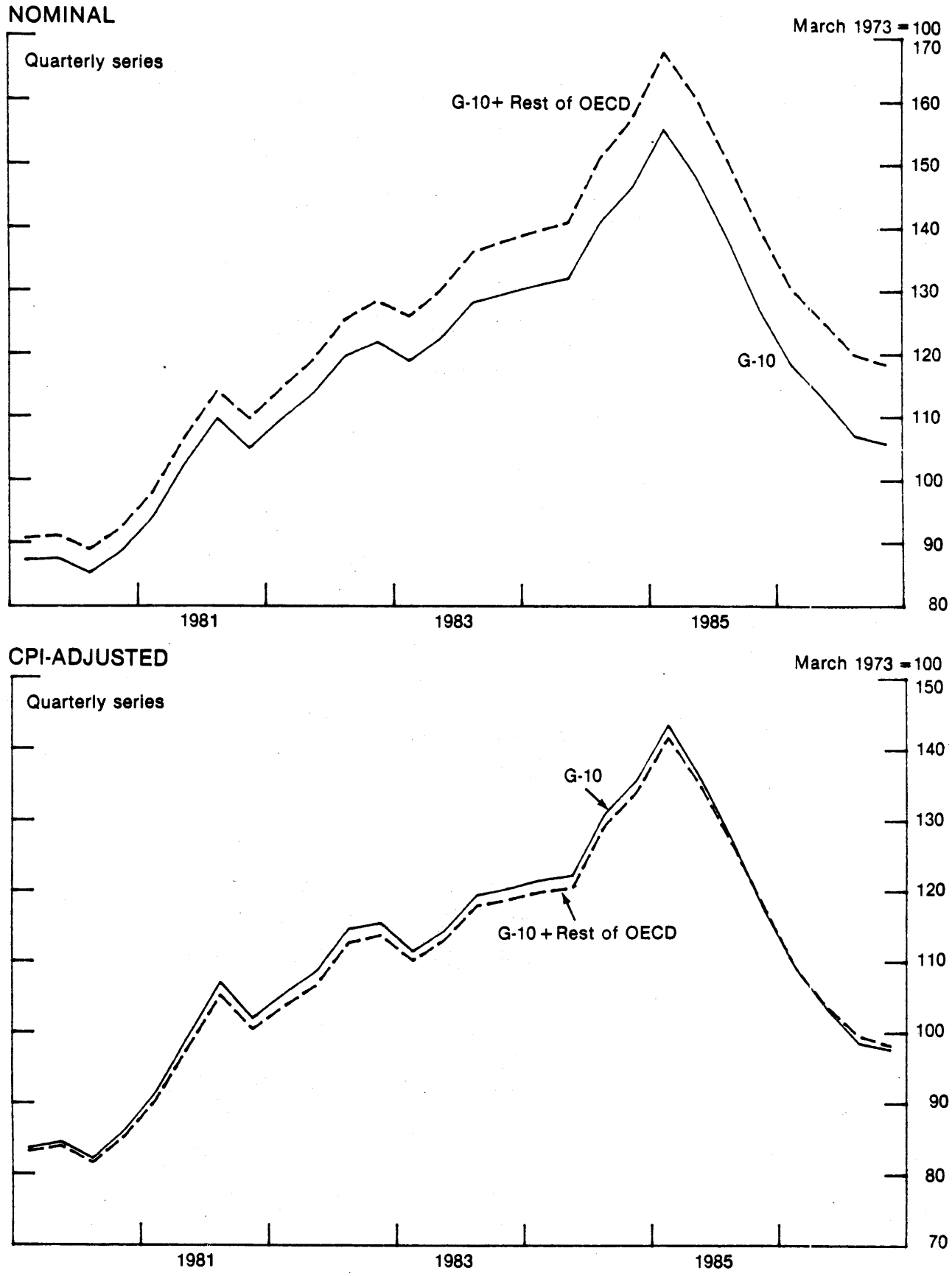
12. In 1978-83 these eight countries accounted for the largest shares of U.S. nonoil imports from nonindustrialized non-OPEC countries. If more recent data are used, the countries that are large primary producers, such as Malaysia and the Philippines diminish in importance. For exchange rates for these currencies, market rates, as published in the International Financial Statistics, were used; the principal market rate was used for the Mexican peso.

Chart 4

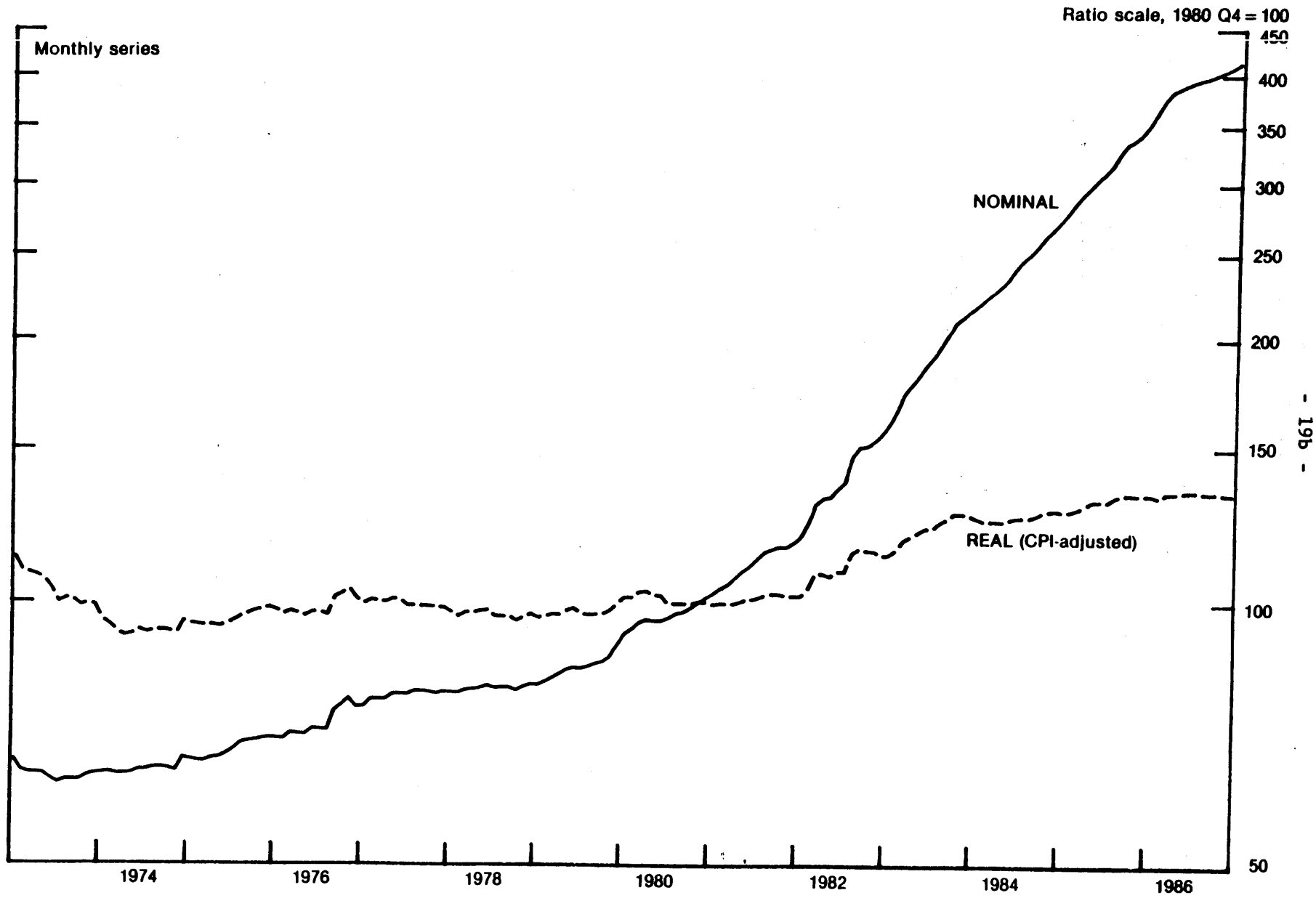
Multilateral Trade-weighted Indexes of the Dollar's Exchange Value



NOTE: Indexes use 1978-1983 average weights.

Chart 5

Exchange Value of the Dollar against a Multilateral Trade-weighted Average of 8 Developing Country Currencies*



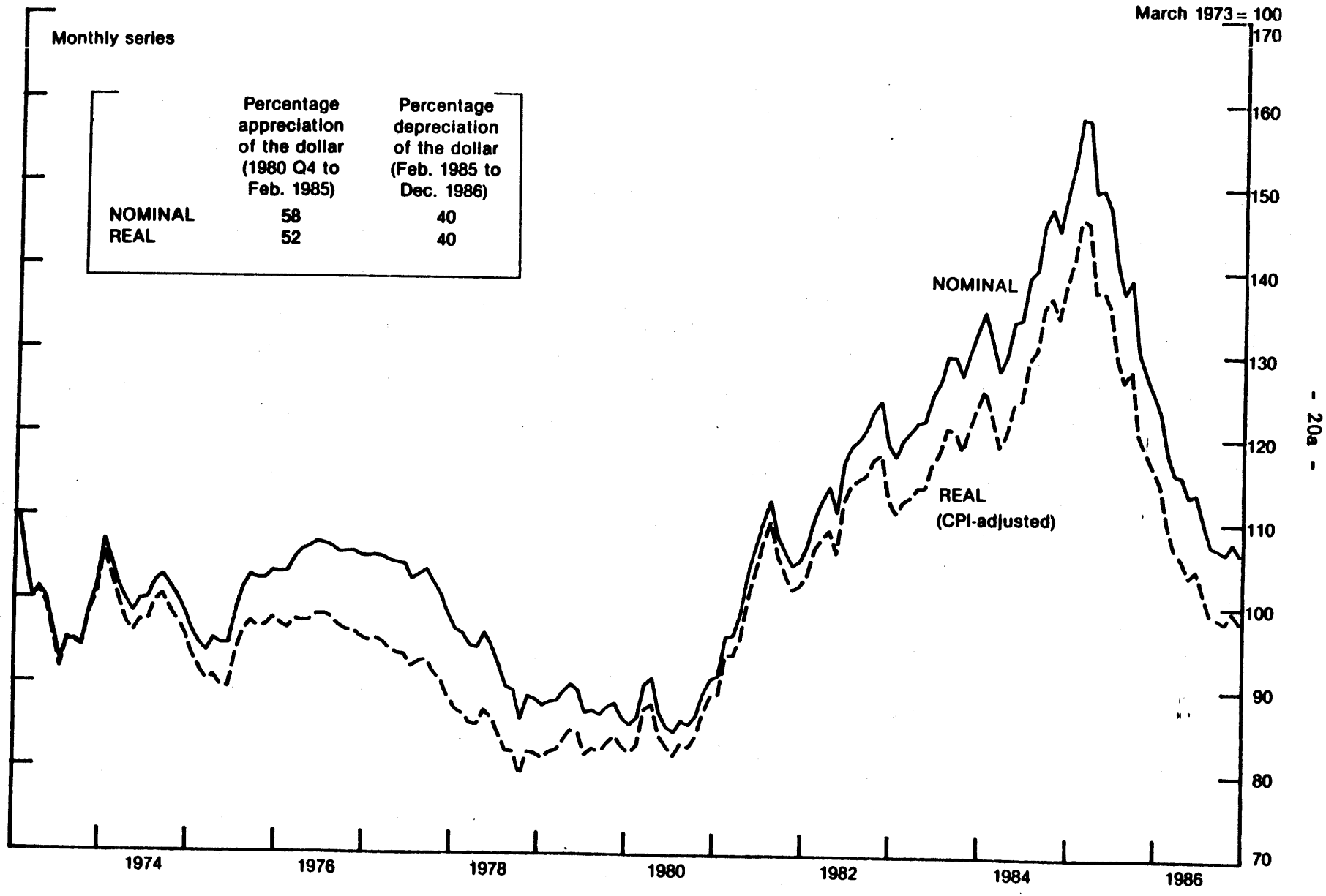
*Mexico, Brazil, Hong Kong, Malaysia, Philippines, Singapore, South Korea, and Taiwan.

these currencies, its real (CPI-adjusted) appreciation is much less owing to the enormous rates of inflation in Mexico and Brazil. By comparison, the dollar's value against a weighted-average of G-10 currencies displays about the same behavior in both real and nominal terms reflecting the close similarity in inflation rates between the United States and the foreign G-10 economies (Chart 6).

From early 1985 through the fourth quarter of 1986 the dollar appreciated about 3 percent in real terms against a multilateral trade-weighted average of the currencies of eight developing countries, in contrast to a decline of 40 percent in real terms vis-a-vis a comparably weighted-average of currencies of the G-10 countries. However, this figure belies substantial differences in changes in the dollar's real value against these individual developing-country currrencies. All of the Asian currencies, except the Philippine peso, showed small changes against the dollar on a CPI-adjusted basis from the first quarter of 1985 through the fourth quarter of 1986. This relative stability in exchange rates reflects the policy in many of these countries of essentially pegging the currency to the dollar's value, with periodic adjustments to the peg, as well as the similarity in inflation rates between these countries and the United States. One prominent example of a sliding peg is the Taiwan dollar, which appreciated 5 percent in real terms against the dollar during this period. Pressure to appreciate further the Taiwan dollar has resulted as Taiwan has amassed large current account surpluses and foreign exchange reserves. The Philippine peso depreciated about 13 percent on a CPI-adjusted basis against the dollar from the first quarter of 1985 through the end of 1986 reflecting several factors: an attempt to rectify the real appreciation of the peso from late 1983 to early

Chart 6

Exchange Value of the Dollar Against a Multilateral Trade-weighted Average of the G-10 Currencies



NOTE: Percentage changes are computed logarithmically. Indexes use 1972-1976 average weights.

1985, the difficulties the Philippines has had in servicing its international debt, and relatively sluggish trade growth compared with that of many of the other Asian countries included in the index.

Among the Latin American currencies, the Mexican peso depreciated more than 50 percent in real terms against the dollar from the first quarter of 1985 through the fourth quarter of 1986 as Mexico corrected the real appreciation of the peso in 1984-85 and adjusted to a loss in revenues resulting from the fall in oil prices. The Brazilian cruzado, on the other hand, appreciated nearly 15 percent on a CPI-adjusted basis against the dollar during this period. Throughout most of 1986 the nominal exchange rate of the cruzado was pegged to the U.S. dollar as part of the Cruzado Plan, which was intended to check inflation expectations.[13] With the nominal exchange rate fixed or experiencing only mini-devaluations, while inflation was much more rapid in Brazil than in the United States, the real value of the cruzado in terms of the dollar rose.[14]

To examine the effect of including the currencies of developing countries in an overall index, a real exchange-rate index consisting of the currencies of the G-10 plus eight developing countries is compared with a real index of the G-10 currencies alone. In constructing the broader indexes, first the individual currencies of the G-10 and eight developing countries are assigned weights based on 1978-83 average bilateral nonoil import shares or, alternatively, multilateral trade

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13. Prior to the introduction of the cruzado in the end of February 1986, the predecessor currency -- the cruzeiro -- depreciated rapidly, in parallel with inflation.

14. The 15 percent appreciation of the cruzado against the dollar on a CPI-adjusted basis understates the true real appreciation of the cruzado because of the downward bias in the Brazilian CPI introduced by price controls.

shares. Because the G-10 countries account for roughly 60 percent of world trade with industrialized countries, while the eight developing countries represent only 35 percent of world trade with nonindustrialized countries, the weights of the currencies of the G-10 and eight developing countries are adjusted to reflect the proportion of U.S. nonoil imports, or, alternatively, world trade accounted for by industrial and nonindustrial countries, respectively. The weights for each of the G-10 currencies are renormalized to sum to the 78 percent share of world trade accounted for by industrial countries -- for the multilaterally weighted index -- and the 71 percent share of U.S. nonoil imports from industrial countries -- for the index based on bilateral nonoil import weights. The weights for each of the developing country currencies are similarly renormalized to reflect he share of world trade, and, alternatively U.S. nonoil imports, represented by developing countries.

Table 2 displays the alternative weights. For comparison, the weights currently used in the Federal Reserve Board staff's index (average 1972-76 multilateral trade shares) are presented in column 1. Column 2 lists the G-10 multilateral trade-weights using 1978-83 average global trade shares. Column 3 gives an overall multilaterally weighted index for the G-10 plus eight developing countries. Bilateral nonoil import weights and bilateral nonagricultural export weights for the G-10 plus eight developing-country currencies are presented in columns 4 and 5. Shares for exports and imports are shown separately because these are the variables that appear in the disaggregated trade equations discussed in the following section.

Using an index based on multilateral weights, the real value of the dollar depreciated nearly 30 percent against a weighted average of

Table 2

Alternative Trade Share Weights

Country	Current index: 1972-76 G-10 multilateral trade weights (1)	G-10 1978-83 multilateral trade weights (2)	G-10 + 8 developing countries multilateral trade weights (3)	G-10 + 8 developing countries bilateral non-oil import weights (4)	G-10 + 8 developing countries bilateral nonagricultural export weights (5)
G-10 countries	100.0	100.0	78.2	71.0	64.5
Belgium	6.4	7.1	7.1	1.9	4.9
Canada	9.1	7.8	7.8	36.9	42.1
France	13.1	13.0	13.0	4.7	6.3
Germany	20.8	20.4	20.4	10.5	8.5
Italy	9.0	9.5	9.5	4.2	3.9
Japan	13.6	15.4	15.4	29.8	14.8
Netherlands	8.3	8.1	8.1	1.7	4.2
Sweden	4.2	3.4	3.4	1.5	1.6
Switzerland	3.6	3.5	3.5	2.2	3.0
United Kingdom	11.9	11.8	11.8	6.6	10.7
Developing countries	0.0	0.0	21.8	29.0	35.5
Brazil			15.2	11.3	11.4
Mexico			11.1	20.0	39.2
Hong Kong			15.0	14.9	7.6
Malaysia			3.8	5.6	5.1
Philippines			4.8	5.1	5.7
Singapore			15.5	5.6	10.1
South Korea			15.8	14.9	11.4
Taiwan			14.3	22.6	9.5

the currencies of the G-10 and eight developing countries from early 1985 through the fourth quarter of 1986, compared with an almost 40 percent decrease vis-a-vis the G-10 currencies alone (Chart 7). For bilateral nonoil import weights, the decline in the real value of the dollar is about 20 percent in terms of the currencies of the G-10 plus eight developing countries versus nearly 30 percent against only the G-10, as shown in the bottom of Chart 7. Overall, the more comprehensive indexes indicate that roughly two-thirds of the dollar's rise had been reversed by the fourth quarter of 1986, compared with a reversal of three-fourths or more for the narrower indexes (Table 3). Indeed, an index of the G-10 currencies based on bilateral nonoil import weights shows that nearly 90 percent of the dollar's decline had been retraced. This figure reflects the larger weight assigned to the yen when bilateral nonoil import weights are used, as the dollar has more than reversed its rise against the yen from late 1980.

Chart 8 compares the broader indexes of the dollar's real value based on multilateral trade weights, and, alternatively bilateral nonoil U.S. import weights. Note that the smaller absolute decline in the value of the dollar based on bilateral nonoil import weights reflects the larger weight assigned to Canada and Mexico in a bilateral weighting scheme.[15] Recall that the Mexican peso depreciated sharply against the dollar in real terms from the first quarter of 1985 to the fourth quarter of 1986. Moreover, this figure is not representative of all Latin American currencies, many of which appreciated slightly in real terms against the dollar during this period.

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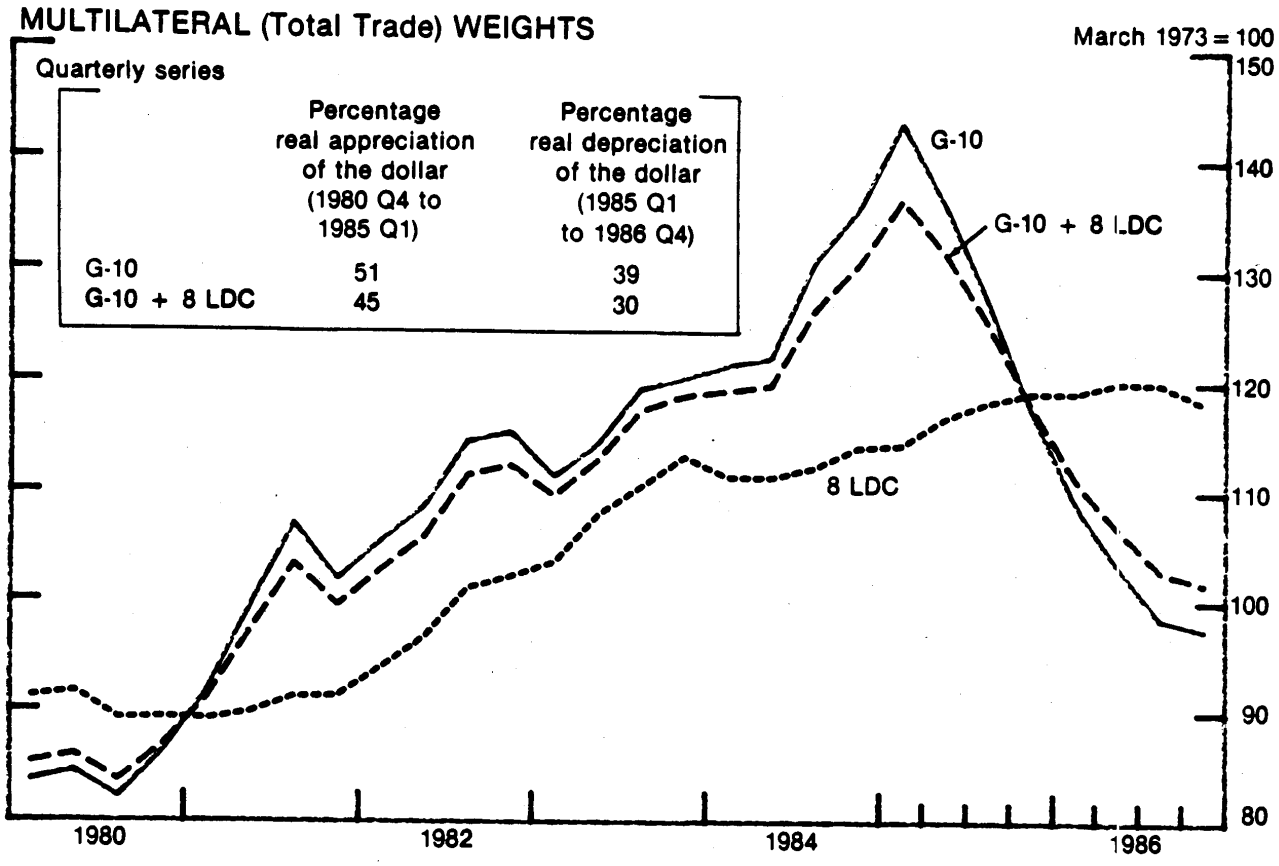
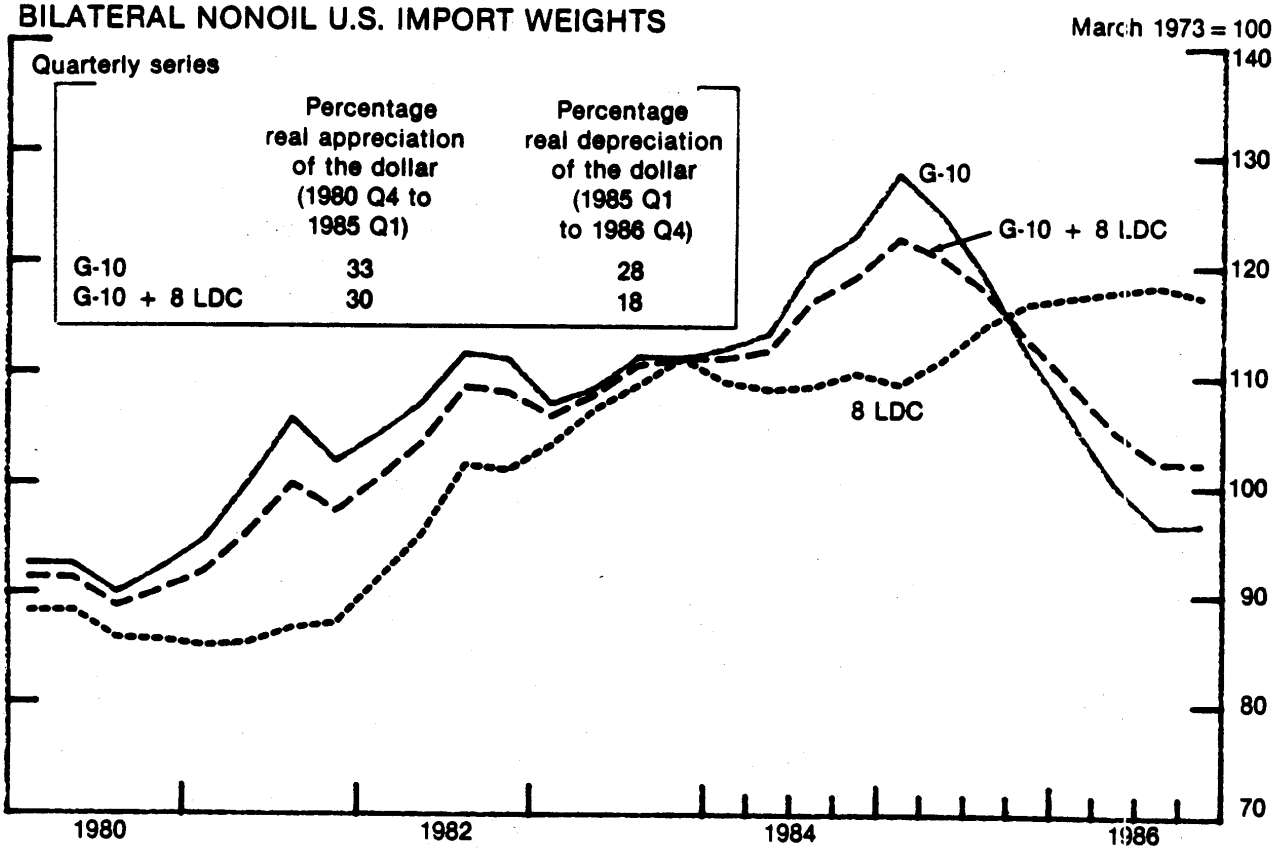
15. If bilateral total trade weights are used in place of bilateral nonoil import weights, Mexico's weight is even larger. This is probably inappropriate, however, as oil tends to be priced in dollar terms.

Chart 7

Indexes of the CPI-adjusted Exchange Value of the Dollar





NOTE: Percentage changes are computed logarithmically. Indexes use 1978-1983 average weights.

Table 3

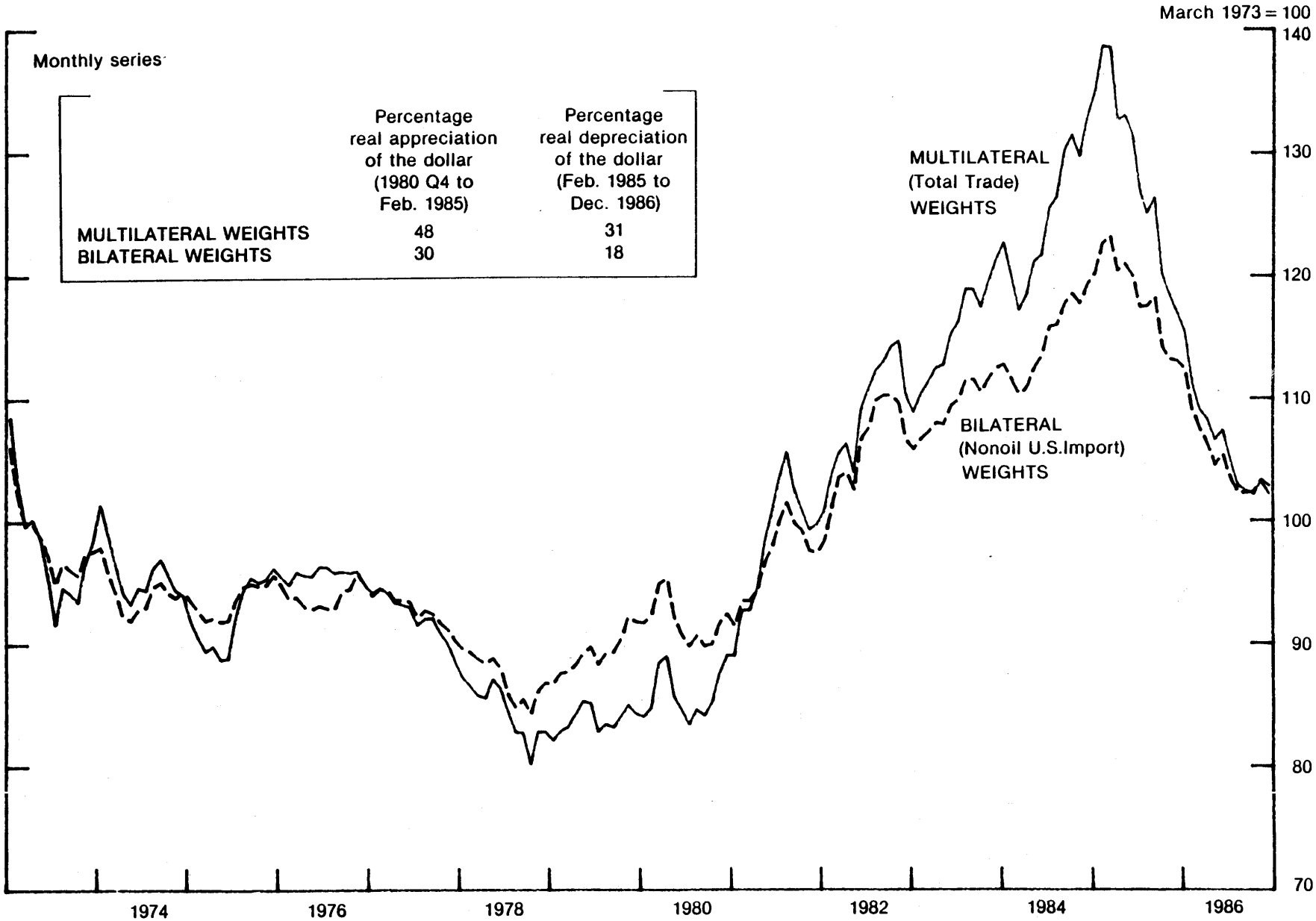
Comparison of Alternative Exchange-Rate Indexes

	Appreciation of the dollar (1980:Q4-Feb. 1985)[1]	Depreciation of the dollar (Feb. 1985-Dec. 1986)[1]	Proportion of Dollar's Rise Reversed
G-10 multilateral (1978-1983 average) weights, nominal	58	40	69
Federal Reserve Board (1972-1976 average weights)	58	40	69
G-10 GNP weights, nominal	54	41	76
G-10 bilateral (total trade) weights, nominal	37	27	73
IMF	47	31	66
Morgan Guaranty, 15 countries, nominal	40	29	73
Atlanta Federal Reserve	34	21	62
Dallas Federal Reserve, nominal	61	3	5
G-10 multilateral weights, real	52	40	77
G-10 bilateral (U.S.) non-oil import weights, real	32	28	88
G-10 + 8 developing countries multilateral weights, real	48	31	65
G-10 + 8 developing countries bilateral (U.S.) non-oil import weights, real	30	18	60

1. Percentage changes are computed logarithmically.

Chart 8

Indexes of the Real Value of the Dollar Against the Currencies of the G-10 and 8 Developing Countries



NOTE: Percentage changes are computed logarithmically. Indexes use 1978-1983 average weights.

5. Performance of alternative indexes as explanatory variables

Although the inclusion of a representative sample of currencies of developing countries in an effective exchange rate index tends to reduce somewhat the proportion of the dollar's rise that has been reversed, ultimately a principal interest is the usefulness of alternative indexes in forecasting movements in the U.S. trade balance and import prices.

To provide some insight on this question, equations for U.S. nonoil import prices, U.S. nonagricultural export volume, and U.S. nonagricultural export prices were estimated and simulated using three alternative sets of weights to compute weighted averages of bilateral exchange rates and prices.[16] Based on the preceeding discussion, the indexes examined were: (1) the G-10 currencies using multilateral trade weights, (2) the currencies of the G-10 plus eight developing countries using multilateral trade weights, and (3) the currencies of the G-10 plus eight developing countries using bilateral U.S. nonoil import weights -- for the nonoil import price equation -- or bilateral U.S. nonagricultural export weights -- for the nonagricultural export price and volume equations. All indexes were based on 1978-83 trade shares. The equation for nonagricultural export volume contains a real exchange-rate index, while the price equations include a nominal

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16. Other components of U.S. trade flows were not included in these tests because: (a) the Federal Reserve Board staff's model for oil imports does not contain exchange rates as an explanatory variable, (b) the Federal Reserve Board staff's model for the volume of nonoil imports is affected only indirectly by exchange rates through import prices, and (c) the existence of extensive subsidies and restrictions in agricultural markets complicate the modeling of agricultural export volume. See William Helkie and Peter Hooper, "The U.S. External Deficit in the 1980s: An Empirical Analysis," International Finance Discussion Paper #304, Board of Governors of the Federal Reserve System, February 1987.

index and the weighted-average foreign price level separately, allowing for an asymmetry in the pass-through into import/export prices.[17]

Three sets of empirical results were examined. First, the overall fit of the equations was compared under the three alternative weighting schemes. Next, in order to focus on the performance of these equations in a more recent period, in-sample and post-sample prediction errors for the period 1984:1-1985:4 were assessed.

The results are shown in Tables 4 to 7. The differences in overall equation fit across weighting schemes -- based on quarterly data for the period 1966:1 to 1985:4 -- were slight for both the nonoil import price and the nonagricultural export price deflator equations -- Tables 4 and 5. The estimates of the elasticities of import and export prices with respect to the exchange rate essentially increase to take account of the decrease in the variation in the dollar's value in moving first to a broader index and then to bilateral weights. For the nonagricultural export volume equation -- Table 6 -- the G-10 multilateral trade-weighted index performed somewhat better than the alternative indexes, achieving about a 13 percent reduction in the sum of squared residuals.

Table 7 presents both in-sample and post-sample prediction errors, calculated as average absolute percentage errors for the simulation period 1984:1 to 1985:4. All three indexes did reasonably well in projecting nonagricultural export prices and nonoil import prices in sample. In the equation for the volume of nonagricultural exports, the multilateral trade-weighted G-10 index produced a somewhat better prediction in sample. The broader indexes, however, yielded a substantial improvement in the post-sample prediction for both the nonoil

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17. Ibid.

Table 4

Nonoil Import Price Deflator Equation Estimates
under Alternative Weighting Schemes (1966Q1-1985Q4)

Explanatory Variable	G-10 Multilateral Trade Weights	G-10 + LDC Multilateral Trade Weights	G-10 + LDC Bilateral Trade Weights*
	Elasticity Estimates (and t-ratios)		
Constant	2.424 (7.96)	3.501 (12.00)	4.343 (13.22)
Exchange Rate **	-0.540 (-9.57)	-0.717 (-12.28)	-0.921 (-13.61)
Foreign CPI	0.808 (25.93)	0.821 (22.071)	0.863 (23.418)
IFS Commodity*** Price Index	0.219 (5.70)	0.180 (4.39)	0.171 (4.40)
R^2(corrected)	0.990	0.989	0.993
Sum of Squared Residuals	0.0124	.0130	.0132
Standard Error	0.0131	.0134	.0135
Durbin-Watson	1.33	1.34	1.34
Rho	0.713 (9.07)	0.723 (9.35)	0.656 (8.10)

* Bilateral nonoil import weights
** Eight-quarter distributed lag.
*** Four-quarter distributed lag.

Table 5

Nonagricultural Export Price Deflator Equation
Estimates under Alternative Weighting Schemes
(1965Q1-1985Q4)

Elasticity Estimates (and t-ratios)

Explanatory Variable	G-10 Multilateral Trade Weights	G-10 + LDC Multilateral Trade Weights	G-10 + LDC Bilateral Trade Weights*
Constant	-0.33 (-0.95)	0.19 (0.43)	1.00 (1.35)
U.S. Export Weighted PPI	1.077 (12.85)	0.976 (10.27)	0.823 (5.47)
Foreign Dollar Prices**	0.195 (3.48)	0.275 (4.17)	0.408 (3.62)
R^2 (corrected)	0.977	0.982	0.980
Sum of Squared Residuals	0.0118	0.0111	0.0114
Standard Error	0.0126	0.0123	0.0124
Durbin Watson	1.0166	1.68	1.68
Rho	0.812 (13.69)	0.789 (12.45)	0.799 (12.50)

* Bilateral non-agricultural export weights.
** Four-quarter distributed lag.

Table 6

Nonagricultural Export Volume Equation
Estimates under Alternative Weighting Schemes
(1966Q1-1985Q4)

Elasticity Estimates (and t-ratios)

Explanatory Variable	G-10 Multilateral Trade Weights	G-10 + LDC Multilateral Trade Weights	G-10 + LDC Bilateral Trade Weights*
Constant	-6.72 (-1.81)	-15.49 (-2.64)	-16.30 (-2.71)
Relative Price**	-0.672 (-6.54)	-0.382 (-3.44)	-0.443 (-3.21)
Foreign GNP	2.087 (6.39)	2.252 (4.54)	2.287 (4.53)
Relative Supply	1.176 (2.44)	2.654 (3.15)	2.878 (3.22)
Dock Strike	0.800 (10.45)	0.799 (10.90)	0.798 (10.83)
R^2 (corrected)	0.931	0.723	0.707
Sum of Squared Residuals	0.048	0.054	0.055
Standard Error	0.0255	0.0271	0.0274
Durbin-Watson	1.99	2.17	2.15
Rho	0.720 (9.48)	0.92 (25.47)	0.93 (29.27)

* Bilateral non-agricultural export weights.
** Eight-quarter distributed lag.

Table 7

In-Sample and Post-Sample Prediction Error for Nonoil Import Price Deflator, Nonagricultural Export Volume, and Nonagricultural Export Price Deflator, 1984Q1-1985Q4

Mean Absolute Percent Error (8 Quarters)

	G-10 Multilateral Weights	G-10 + LDC Multilateral Weights	G-10 + LDC Bilateral Weights*
Nonoil Import Price Deflator			
In Sample	0.40	0.41	0.68
Post Sample	2.39	1.10	0.76
Nonagricultural Export Volume			
In Sample	0.86	1.15	1.21
Post Sample	4.06	1.28	1.46
Nonagricultural Export Price Deflator			
In Sample	0.43	0.41	0.54
Post Sample	0.47	0.47	0.58

*/ Bilateral nonoil import weights are used in the nonoil import price deflator equation and bilateral nonagricultural export weights are use in the nonagricultural export volume and price deflator equations.

import price deflator and the nonagricultural export volume equations. The reduction in the forecast error attained by expanding the coverage of the index is on the order of 60 percent for both equations. Furthermore, the improvement in the forecast is greater if an index based on bilateral nonoil import shares is used for predicting import prices and if a multilateral trade-weighted index is used for predicting export volume. For the nonagricultural export price deflator, all three indexes performed similarly in the out-of-sample tests.

6. Review of recent outside proposals

Table 8 summarizes the major features of the various alternative exchange rate indexes that have been developed recently along with some of the traditional indexes.[18] Several of these measures are illustrated in Chart 9. All of the indexes displayed, except the Dallas Federal Reserve index, show roughly parallel movements, suggesting that, overall, about two-thirds to three-fourths of the dollar's rise from late 1980 had been reversed by the end of 1986, as indicated in Table 3. Of course, the bilateral trade-weighted indexes constructed by Morgan Guaranty and the Atlanta Federal Reserve Bank exhibit somewhat less variation than do the multilateral trade-weighted indexes, owing to the larger weight given to the Canadian dollar. Moreover, the Atlanta Federal Reserve's index shows less variation than Morgan's because it also includes several currencies of the newly industrialized Asian countries, which essentially

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18. Michael Cox, "A New Alternative Trade-Weighted Dollar Exchange Rate Index," Federal Reserve Bank of Dallas Economic Review, September 1986. See also Durand, "Method of Calculating", "The Influence of Exchange Rates" (European Community), "Why Our Trade Gap Persists" (Manufacturers' Hanover), World Financial Markets, (Morgan Guaranty), and Jeffrey Rosensweig, "A New Dollar Index: Capturing a more Global Perspective," Federal Reserve Bank of Atlanta Economic Review, June/July 1986.

Table 8

The Construction and Major Features of Various Dollar Exchange Rate Indexes

Index	Trade weights		Number of countries	Country coverage
	Construction	Year(s)		
Federal Reserve Board Staff	Multilateral, exports plus imports	1972-76	10	Belgium, Canada, France, Germany, Italy, Japan, Netherlands, Sweden, Switzerland, United Kingdom
IMF	Multilateral, based on multilateral exchange rate model	1980	15	10 above plus Australia, Austria, Denmark, Norway, Spain
Morgan Guaranty	Bilateral, exports, plus imports (manufacturing only)	1980	15	Same as above
EC	Modified bilateral	Moving, annually through 1983; later figures based on 1983 weights	17	15 above plus Finland, Ireland
OECD	Modified bilateral (manufacturing only)	Moving, annually	22	17 above plus Greece, Iceland, New Zealand, Portugal, Turkey

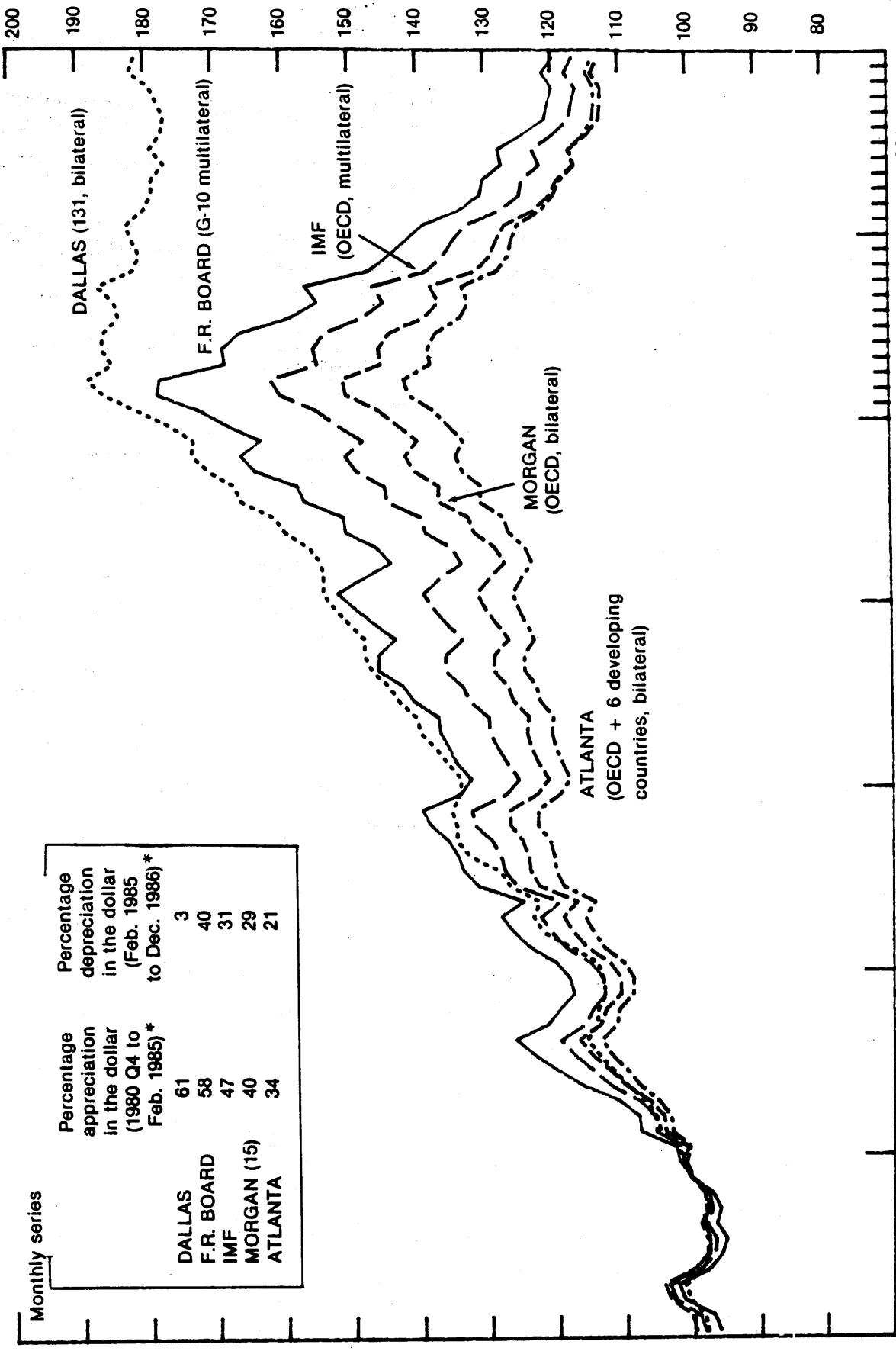
Table 8 (continued)

The Construction and Major Features of Various Dollar Exchange Rate Indexes

Index	Trade weights		Number of countries	Country coverage
	Construction	Year(s)		
Morgan Guaranty (Real)	Modified bilateral exports plus bilateral imports (manufacturing only)	1980	40	15 in Morgan Guaranty narrow index plus Argentina, Brazil, Chile, Colombia, Ecuador, Finland, Greece, Hong Kong, Iceland, India, Indonesia, Kuwait Malaysia, Mexico, New Zealand, Pakistan, Peru, Philippines, Portugal, Saudi Arabia, Singapore, South Korea, Taiwan, Thailand, Venezuela
Manufacturers Hanover	Bilateral, exports plus imports	1985	17	Australia, Belgium, Brazil, Canada, China, France, Germany, Hong Kong, Italy, Japan, Netherlands, Mexico, Singapore, South Korea, Taiwan, United Kingdom, Venezuela
Atlanta Federal Reserve Bank	Bilateral, exports plus imports	1984	18	G-10 plus Australia, China, Hong Kong, Saudi Arabia, Singapore, South Korea, Spain, Taiwan
Dallas Federal Reserve Bank	Bilateral, exports plus imports	Moving, annually	131	All U.S. trading partners excluding the Soviet Union
Dallas Federal Reserve Bank (Real)	Bilateral, exports plus	Moving, annually	101	Subset of 131 in above index

Chart 9

Indexes of the Weighted-Average Foreign Exchange Value of the Dollar



* Percentage changes are computed logarithmically.

have been pegged to the dollar's value, with periodic adjustments in the peg in some instances.

For most of the indexes displayed in the chart, a nominal index will exhibit roughly the same behavior as a real index, reflecting the close similarity of inflation rates between the United States and the included countries, on average. The Dallas Fed index, like the Manufacturer's Hanover index -- not shown in the chart, but listed in Table 8 -- incorporates several countries with very high inflation rates, thereby presenting a particularly misleading picture of the price competitiveness of U.S. goods. In an attempt to incorporate some currencies of key trading partners that are developing countries with high inflation rates, and yet provide a potentially useful measure of the dollar's value, the Dallas Federal Reserve Bank and Morgan Guaranty -- in its broad index -- construct price-adjusted measures. Nonetheless, there is still considerable question regarding the quality of the data for many of these developing countries; the use of multiple exchange rate practices and price controls may obscure meaningful measurement of so-called real exchange rates on a consistent basis.

Finally, while all of these other institutions suggest that the merit of their particular index is its ability to account for changes in the U.S. trade position, none has subjected their index to formal statistical tests.[19]

7. Conclusion

The choice of an index for the dollar's foreign-exchange value varies with its intended use. No single measure is appropriate for all

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19. The Federal Reserve Bank of Cleveland is constructing an index and performing statistical tests, currently.

applications. While the current debate has focused solely on a measure of the dollar's value as an indicator of the price competitiveness of U.S. goods, an exchange-rate index also is useful in assessing the overall effect of various bilateral exchange rate changes on inflation and may provide an important source of information about monetary conditions.

Attempts to derive theoretically the weights for the individual currencies from a reduced form or structural equation relating the variable of interest to bilateral exchange-rate changes, indicate that the weights generally are complicated functions involving own and cross-price elasticities of demand and supply. If the price competitiveness of U.S. goods is the issue at hand, the other terms in the weights are bilateral trade shares. Only in the unlikely case where third-country effects are absent do these weights reduce to simple bilateral trade shares. Generally, some type of multilateral or modified bilateral weighting scheme that takes account of third-country effects, albeit perhaps crudely, is regarded as more appropriate for evaluating the impact of exchange rate changes on trade components.

The empirical results suggest that the proportion of the dollar's rise that has been reversed diminishes when the currencies of some key developing-country trading partners are included in an exchange-rate index. The more comprehensive indexes of the dollar's value indicate that roughly two-thirds of the dollar's rise from late 1980 had been retraced by the fourth quarter of 1986, compared with about three-fourths based on the narrower indexes.

Nonetheless, a principal question is whether the broader indexes of exchange rates perform better in explaining and forecasting trade

flows and import prices. The tests conducted for the volume and prices of nonagricultural exports and prices of nonoil imports show only small differences in the ability of alternative indexes to fit the data in sample; the estimated parameters essentially adjust so as to offset the smaller depreciation in the value of the dollar when measured by a broader index. In terms of the out-of-sample performance, however, the broader measures yielded substantial improvement in the predictions for the prices of nonoil imports and the volume of nonagricultural exports in 1984-85, reducing the mean absolute forecast error by about 60 percent. Moreover, the improvement in the forecast during this period is greater if an index based on bilateral nonoil imports is used for predicting nonoil import prices and if a multilateral trade-weighted index is used for predicting export volume.

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