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MAJOR CURRENCIES FROM OPEC'S VIEWPOINT

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MIT Energy Laboratory
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I. Introduction

With the price of oil quoted in terms of the U.S. dollar and with the dollar fluctuating differently with respect to different currencies the question has emerged as how to measure the fluctuation in the value of the dollar which is relevant to OPEC's economic interest and is theoretically meaningful. Related to this is the question of devising an appropriate standard of value for measuring the real rate of return obtained on OPEC's financial surpluses. Concern over these two questions has recently heightened, partly because of the large and continuous depreciation of the dollar since the beginning of 1977, with its implication for the real price of oil, and partly because of the need for some indices of value to be used by oil-producing countries in evaluating their options of choosing between "oil-in-ground and money-in-bank."¹ The problem of comparing these two options is particularly keen to surplus-oil-producing countries such as Saudi Arabia and Kuwait who are compelled to invest a relatively high proportion of their oil revenues in foreign financial assets.

In most of the discussions concerning the fluctuation of the dollar and its implication for OPEC's oil revenues, reference is usually made either to its fluctuation against the strong currencies such as the German mark, and the Japanese yen, or to some U.S. trade-weighted index.² These measures, though useful in providing some general idea about the fluctuation of the dollar, are not the most relevant ones considered from OPEC's viewpoint. Clearly, the measure of the dollar's fluctuation relevant to OPEC should reflect OPEC's trade direction and its investments across different countries. Assuming that in the long

run OPEC is mainly concerned with the real values of its oil earnings, the appropriate measure of the dollar's fluctuation is the rate of change in the purchasing power of the dollar with respect to OPEC's imports of goods and services.

In this paper our objectives are two: First, to present data on the rate of change in the purchasing power of the dollar from OPEC's viewpoint for the period 1971-1977, and to use this to measure the depreciation in OPEC's financial assets. Second, to compare the performance of the dollar with other major currencies from OPEC's point of view over the same period and to see how OPEC would have fared had currencies other than the U.S. dollar been used for oil-pricing purposes.

II. The Purchasing Power of the Dollar

So long as the dollar is used as the denominator for the price of oil, the purchasing power of a barrel of oil to OPEC is the same as the purchasing power of the dollar. It can be shown that the rate of change in the real purchasing power of the dollar calculated from OPEC's viewpoint can be written as³

$$\dot{V}_i/V_i = - \sum_j w_{ij} \dot{P}_j/P_j - \sum_j w_{ij} \dot{R}_j/R_j \quad (1)$$

where V_i denotes the real purchasing power of the dollar calculated from the viewpoint of the i th OPEC member country; W_{ij} is the proportion of the i th OPEC member country's imports originating from the j th country; P_j is the export price in country j ; R_j is the exchange rate in country j defined as the price of domestic currency in terms of the U.S. dollar, and $(\dot{})$ on the top of any variable indicates the time derivative of that variable.

From (1) it follows that the rate of change in the purchasing power of the dollar calculated from OPEC's viewpoint is composed of two parts: (a) a part due to the fluctuation of the dollar against other currencies and (b) a part due to inflation prevailing in OPEC's trading partner. Both inflation and dollar depreciation erode the purchasing power of the dollar and, as a result, shrink the real price of oil.

In implementing equation (1) empirically we have considered the trade shares of OPEC with nine of the key industrial countries. These are: the United States, Japan, Belgium, France, Germany, Italy, the Netherlands, Switzerland and the United Kingdom. Together these countries account for an overwhelmingly large proportion of OPEC's world trade. For instance, in 1977 they supplied about 76.7% of total OPEC's import needs.

The data on imports of OPEC as a whole and for individual member countries were taken directly from the IMF, Direction of Trade. These data refer to total imports of goods and services in millions of U.S. dollars. The data on exchange rates and on export prices were taken from the IMF, International Financial Statistics. These include 29 quarterly observations from the fourth quarter of 1970 to the fourth quarter of 1977.

Table 1 reports the numerical values of the rates of change in the purchasing power of the dollar calculated from the viewpoint of OPEC as a whole and from the viewpoint of major member countries. An interesting aspect of this table is the varying degree of the dollar's loss in purchasing power during this period. Its highest loss occurred in 1973 and 1974, about 24 percent per year, and its minimum loss occurred in 1975. For the remaining years, the loss in the purchasing power of the dollar was more or less the same, about 8 percent per year.

Table 1

The Rate of Change in the Purchasing Power of
Dollar from OPEC's Viewpoint

(Percent Per Year)

Year	Indonesia	Iran	Iraq	Kuwait	Libya	Saudi Arabia	Venezuela	OPEC* as a Whole
1971	- 8.25	- 8.613	- 9.284	- 8.66	- 9.589	- 8.486	- 6.289	- 8.48
1972	- 7.112	- 5.379	- 5.352	- 5.835	- 5.563	- 5.812	- 5.731	- 6.28
1973	-25.34	-24.98	-24.24	-24.07	-22.98	-24.26	-24.011	-24.35
1974	-24.34	-23.573	-23.558	-23.94	-26.77	-24.4	-24.315	-23.95
1975	+ 4.321	.483	+ 1.44	+ .56	- 1.207	+ 1.365	- 1.211	- .05
1976	- 8.725	- 7.758	- 8.053	- 7.61	- 5.711	- 7.47	- 6.72	- 7.17
1977	- 9.651	- 9.088	-10.288	-10.265	- 8.367	- 8.352	- 6.62	- 9.147
Cumulative								
1971 -1977	-79.12	-78.88	-79.31	-79.81	-80.16	-77.41	-75.42	-79.42
1974 -1977	-38.39	-39.92	-40.44	-41.25	-42.055	-38.86	-38.86	-40.31

*OPEC member countries included in this calculation are Algeria, Indonesia, Iran, Iraq, Kuwait, Libya, Nigeria, Oman, Qatar, Saudi Arabia, United Arab Emirates and Venezuela.

The second interesting feature of this table concerns the rather close degree of uniformity observed in the pattern of change in the purchasing power of the dollar across all OPEC member countries. For OPEC as a whole or for individual member countries, the dollar lost about 80 percent of its purchasing power during the period 1971-1977 and about 40 percent over the years 1974-1977. In another words, one petrodollar in 1977 is equivalent to about 20 cents in 1971 dollar prices and to about 60 cents in 1974 dollar prices. Translating the loss into the purchasing power of OPEC's net foreign financial assets, it amounts to approximately \$37.2 billion.⁴ That is to say, in terms of 1974 dollar prices OPEC suffered a loss of about \$37.2 billion in its dollar holdings as of the end of 1977.

III. Comparing the Dollar's Performance with That of Other Currencies.

Equation (1) describes the calculation of the rate of change of the dollar's purchasing power from OPEC's viewpoint. A similar calculation can be made to calculate the purchasing power of other industrial currencies. This is done and the results are presented in Table 2. This table contains the numerical values of the rate of change in the purchasing power of the dollar, the yen, sterling, the German mark, and the Swiss franc, calculated from OPEC's viewpoint, i.e., its import shares.

An important feature of this table is the wide disparity existing in the performance of the strong currencies, namely, the yen, the Swiss franc, and the Deutsch mark, and the weak currencies, such as the British pound and the U.S. dollar. The loss in the purchasing power of the British pound calculated from OPEC's viewpoint is substantial; it amounts

Table 2
 Comparing the Rate of Change in the Purchasing Power
 of Major Currencies from OPEC's* Viewpoint
 (Percent per Year)

Year	U.S. dollar	Yen	Sterling	Swiss franc	D.M.
1971	- 8.48	1.08	- 4.35	- .16	2.08
1972	- 6.28	.17	-11.75	- 1.85	- 3.15
1973	-24.35	-12.29	-23.67	- 3.86	.43
1974	-23.95	-32.28	-25.83	-10.68	-22.33
1975	- .05	- 1.16	-12.33	4.34	- 2.11
1976	- 7.17	- 3.78	-27.57	1.21	.59
1977	- 9.14	8.55	.26	2.63	- 1.26
Cumulative					
1971-1977	-79.42	-39.71	-105.25	- 8.37	-25.75
1974-1977	-40.31	-28.67	-65.47	- 2.5	-25.11

*For the name of OPEC member countries included in this calculation, see footnote to Table (1).

to about 105% over the period 1971-1977 and 65% over the period 1974-1977. Next is the dollar with losses of about 80% and 40% over the same period of time. In terms of comparative advantage or disadvantage, OPEC would have been worse off had the British pound been used as the unit of account for oil. The implicit gain to OPEC would have been highest had the Swiss franc been used as the denominator for the price of oil.

NOTES

1. The phrase oil-in-ground and money-in-bank has been adopted from Adelman (1978).
2. See for example Amuzegar (1978).
3. The purchasing power of the dollar here is defined as the amount of goods and service that one dollar unit can purchase for OPEC. To derive equation (1) write down the total imports of OPEC in terms of the U.S. dollar, M, as:

$$M = \sum_j P_j X_j R_j \quad (A.1)$$

where X_j is the quantity of OPEC's imports originating from country j and the rest of the variables are defined as before. The rate of growth of total imports can be decomposed into three terms, that is,

$$\dot{M}/M = \sum W_j \dot{P}_j/P_j + \sum W_j \dot{R}_j/R_j + \sum W_j \dot{X}_j/X_j \quad (A.2)$$

From (A.2) it follows that the rate of change in the purchasing power of the dollar is equal to:

$$- \sum W_j \dot{P}_j/P_j - \sum W_j \dot{R}_j/R_j$$

For a detailed discussion of this see Dailami (1978). By defining the purchasing power of the dollar as the utility that one dollar unit can buy and assuming a Cobb-Douglas utility function, Kouri and Braga de Macedo (1978) derive a similar equation. The main difference between their equation and ours is that they assume import shares are constant where here we assume that they can change through time.

4. The total of OPEC's net foreign assets was \$155 billion at the end of 1977 (see World Financial Markets, July 1978). It is believed that about 60 percent of this was held in dollar denominated assets. This is based on Aburdene's estimate (1978).

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