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OIL PRICES AND EXCHANGE RATES*

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13 November 1973. 'The U.S. dollar continued to rise sharply on international currency markets yesterday on speculator conviction that Arab oil cutbacks will hurt the American economy far less than Europe or Japan' (p. 22).

4 January 1974. 'The U.S. dollar's upsurge continued against European currencies, whose recent slide began with the Arab oil cutback and is intensifying as oil prices soar' (p. 11).

27 March 1979. 'Calls for sharply higher oil prices by some petroleum producing nations set the dollar back against most major currencies...''The reason (for the dollar's fall) is almost entirely what's coming out of the Geneva meeting of OPEC'' one London dealer said' (p. 14).

22 June 1979. 'Dollar Plunges, Continuing Slide Based on Oil Price and Money Supply Worries' (p. 7).

29 January 1980. 'In Tokyo, the dollar was bolstered by the announcement that Saudi Arabia raised the price of its benchmark crude $2 a barrel' (p. 12).

23 September 1980. 'Fighting between Iraq and Iran sent the US dollar tumbling against the British pound but soaring against other major currencies' (p. 8).

(Quotations from *The Wall Street Journal*)

The quotations show a sharply divergent pattern in the response of the foreign exchange market to announcements of oil price increases. During the first oil shock, news about oil price rises led to a strengthening of the dollar, whereas during the 1979 surge of oil prices the reverse was generally true. When the news was not so bad as feared the dollar fell back in 1974, but rose in 1979. In 1980 the pattern shifted once again, back to dollar appreciation.

Is there a rational fundamental explanation for the behaviour of the foreign exchange market, or is it a matter of traders responding to what other traders arbitrarily think? It is difficult to resolve this question, but some insight can be provided through an analytical examination of the relationship between oil price increases and exchange rates.

The paper begins with a theoretical framework for analysing the relation between oil prices and exchange rates, and then uses the theory to explain the behaviour of the foreign exchange market.

I. A DISCRETE-TIME MODEL

Oil price rises affect macroeconomic flows: incomes, current-account balances, and saving. These flows, in turn influence asset stocks and their distribution among oil-importing and oil-exporting countries, and thereby disturb asset-

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market equilibrium. For some period of time, a rise in the price of oil may generate a current-account surplus for OPEC and current-account deficits in the oil-importing countries.[1] The resulting reallocation of wealth may influence exchange rates because of differential portfolio preferences. For example, if the OPEC countries' increased demand for dollars falls short of the reduction in the demand for dollars by the oil-importing countries, there will be an excess supply of dollars in the foreign-exchange market and the dollar will tend to depreciate. Thus, a formal model of oil-price shocks must keep track of current-account flows as well as stock-equilibrium conditions.

In the 1970s the asset-market theory of the balance of payments emphasising stock-equilibrium conditions in the foreign exchange market supplanted the traditional flow view which tended to focus on the current account.[2] A recent development in international financial theory has been the reintroduction of current-account flows into stock-equilibrium models. The model developed in this paper is an application of this synthesis.[3]

Three Countries, Two Currencies[4]

In the simplest version of the model the world is divided into three countries: OPEC (superscript O), America (A), and Europe (E). There are two currencies, dollars and marks, the home currencies for America and Europe respectively. OPEC does not have an indigenous currency for the purposes of this model. Dollar-denominated assets are denoted by F, mark-denominated assets by G, and e is the price of a mark in dollars. The world supplies of dollar assets $\bar{F}$ and mark assets $\bar{G}$ are taken as given and are the sole constituents of wealth in this highly aggregative model of world portfolio balance.[5] Asset demand functions

[1] An attempt to imbed the macroeconomic and balance-of-payments effects of oil-price shocks in an optimising framework is provided by Sachs (1981). In his model, an optimising oil-importing country will not run a current-account deficit when the price of imported oil rises, *ceteris paribus*, unless the oil price rise is temporary. A permanent rise in the price of oil leads to a fall in permanent income, and hence an immediate fall in consumption to a sustainable level, with no change in foreign borrowing, i.e. no change in the current account. If the oil price rise is temporary, however, an optimising oil importer should use foreign borrowing to smooth domestic consumption. Sachs' analysis neglects costs of adjustment and uncertainty as to whether an oil price rise will prove to be temporary or permanent. Intertemporal utility maximisation implies a mix of financing and adjustment to a permanent shock when costs of adjustment increase with the speed of adjustment, as they surely do in practice. Also, there is ample ground, *ex ante*, for the belief that oil price rises associated with political disturbances (the Arab–Israeli war in 1973 and the Iranian revolution in 1979) are likely to be temporary. In general, therefore, for some period of time an oil price rise will entail dissaving and current-account deficits in oil-importing countries, and offsetting surpluses for oil exporters.

[2] See Henderson (1977) for a comparison of the stock-equilibrium models of the 1970s with the 'textbook' flow approach.

[3] This paper draws especially on the Tobin and de Macedo (1980) and Kouri (1978) models, which allow for imperfect asset substitutability in a multi-country setting. Other models in a similar vein include those of Dornbusch and Fischer (1980), Rodriguez (1980) and Branson (1977), but they make small-country assumptions that are not appropriate here. In all these models, the role of the current account in exchange-rate determination derives from its effects on wealth and hence portfolio balance. It should be noted, however, that empirical tests of the portfolio-balance model (as well as those of other structural models of exchange-rate determination) have had only limited success.

[4] This model has some similarities to Krugman's (1982) model, but was developed before having access to the latter.

[5] The appropriate definition of wealth is not clearcut, as discussed below in the empirical section.

are linear-homogeneous in wealth W.[1] Asset demand functions in America and OPEC are denominated in dollars, and in Europe are denominated in marks.[2] Mark- and dollar-denominated assets are assumed to be imperfect substitutes, with all three 'countries' holding positive quantities of both of them.

Wealth is reallocated among the three countries through current-account imbalances. Initially we assume that OPEC saves all the proceeds of its oil sales, and that the demands for imported oil are completely inelastic in America and Europe. Also, it is assumed that incomes in A and E are not affected by the oil price rise, implying that A and E dissave by an amount equal to their current-account deficit, as in Kouri (1978).[3]

The OPEC current account surplus in dollars is $P^O(Q^A+Q^E)$ where P^O is the price of oil and Q^A and Q^E are the quantities of oil imported by A and E respectively. The current account balance of A is $B(e)-P^OQ^A$ where $B(e)$ is the American current account surplus with Europe.[4] The European current account balance is $-B(e)-P^OQ^E$ in dollars, or $-1/eB(e)-1/eP^OQ^E$ in marks. The Marshall–Lerner condition ($B_e > 0$) will be assumed to prevail throughout the analysis. A subscript of -1 denotes the previous period in time; otherwise all variables refer to the current period. All stock variables are measured at the end of the period. (The end of the previous period can also be regarded as the beginning of the current period.)

America (in dollars)

$$F^A = f^A W^A, \tag{1}$$

$$eG^A = g^A W^A, \tag{2}$$

$$W^A = F^A_{-1} + eG^A_{-1} + B(e) - P^OQ^A = F^A + eG^A.^5 \tag{3}$$

[1] Exchange-rate expectations are assumed to be static. In a simplified version of his model, Krugman shows that the results continue to hold under rational expectations. Endogenous interest rates can also be introduced, as discussed in footnote 1, p. 579.

[2] The currency in which asset demands are denominated is not important since one can multiply or divide by e without affecting the equations. Also, the asset demands need not be deflated by price indices since all assets and wealth are taken to be nominal and demands are linear-homogeneous in wealth. Note nevertheless that the appropriate price index for OPEC is a weighted average of the price indices of A and E.

[3] The results are qualitatively unchanged if savings absorb only part of the effect of the oil price increases on aggregate demand, as long as the reduction in aggregate demand is roughly symmetrical in the two oil-importing countries. It proves to be quite difficult to model endogenous goods markets in a multi-country setting in this type of model (see Tobin and de Macedo, 1980). In the case where incomes in A and E fall by similar proportions, however, the fall in non-OPEC aggregate demand is in effect similar to a rise in the OPEC marginal propensity to import, which is introduced below. Ignoring endogenous incomes, therefore, is reasonable if the non-OPEC countries adopt similar macroeconomic responses to oil price increases.

[4] A fuller specification of B is $B(eP^E/P^A, Y^A, Y^E, F^E, eG^A)$, where P^A, P^E are aggregate price levels in A, E and Y^A, Y^E are incomes in A, E. The specification in the text is likely to be acceptable if Y^A and Y^E fall by roughly equal proportions and P^A and P^E rise by roughly equal proportions following an oil price rise. This implies that the oil intensities of production, the extent to which an OPEC price rise influences domestic oil prices, and the degree of monetary accommodation are such as to entail similar income and price level effects in A and E. If this is accepted, the effect of an oil-price shock on bilateral trade between A and E can be identified with the exchange-rate effect. Asset positions (F^E, eG^A) influence net interest payments between A and E, but can be neglected here as largely exogenous with respect to oil-price changes except for changes in e.

[5] Equation (3) may be obtained as follows. Note that $S = B(e) - P^OQ^A$, then

$$W^A = F^A + eG^A = W^A_{-1} + S + G^A_{-1}\Delta e = (F^A_{-1} + e_{-1}G^A_{-1}) + S + G^A_{-1}(e-e_{-1}) = F^A_{-1} + eG^A_{-1} + S.$$

Europe (in marks)

$$1/eF^E = f^E W^E, \tag{1'}$$

$$G^E = g^E W^E, \tag{2'}$$

$$W^E = 1/eF^E_{-1} + G^E_{-1} - 1/eB(e) - 1/eP^O Q^E = 1/eF^E + G^E. \tag{3'}$$

OPEC (in dollars)

$$F^O = f^O W^O, \tag{1''}$$

$$eG^O = g^O W^O, \tag{2''}$$

$$W^O = F^O_{-1} + eG^O_{-1} + P^O(Q^A + Q^E) = F^O + eG^O. \tag{3''}$$

In each country the wealth constraint implies that one of the two asset demand functions is redundant.

Market clearing requires

dollar assets $$F^A + F^E + F^O = F^A_{-1} + F^E_{-1} + F^O_{-1} = \bar{F}, \tag{4}$$

mark assets $$eG^A + eG^E + eG^O = eG^A_{-1} + eG^E_{-1} + eG^O_{-1} = e\bar{G}. \tag{5}$$

World wealth in dollars, measured at the current end-of-period exchange rate e, is $W^O + W^A + W^E = \bar{F} + e\bar{G}$.

We omit the market for dollar assets, as this proves to be convenient when more countries and currencies are added. The market for mark-denominated assets (5), after substituting in (2), (2′), and (2″), is

$$g^A W^A + eg^E W^E + g^O W^O = e\bar{G}. \tag{6}$$

Substituting in the definitions of wealth, we obtain

$$g^A[F^A_{-1} + eG^A_{-1} + B(e) - P^O Q^A] + g^E[F^E_{-1} + eG^E_{-1} - B(e) - P^O Q^E] + g^O[F^O_{-1} + eG^O_{-1} + P^O(Q^A + Q^E)] = e\bar{G}. \tag{7}$$

Totally differentiating (7) yields[1]

$$g^A G^A_{-1}\,de + g^A B_e\,de - g^A Q^A dP^O + g^E G^E_{-1}\,de - g^E B_e\,de - g^E Q^E dP^O + g^O G^O_{-1}\,de + g^O(Q^A + Q^E)\,dP^O = \bar{G}de = (G^A_{-1} + G^E_{-1} + G^O_{-1})\,de,$$

$$\frac{de}{dP^O} = \frac{g^O - \alpha g^A - (1-\alpha)\,g^E}{\Sigma(1-g^i)\,G^i_{-1} + (g^E - g^A)\,B_e}\bar{Q}, \tag{8}$$

where $$\alpha = \frac{Q^A}{Q^A + Q^E}, \quad \bar{Q} = Q^A + Q^E.$$

The denominator of (8) is positive under the plausible assumptions that $1-g^i, G^i$ are positive, i.e. positive quantities of all assets are desired and held; $g^E > g^A$, i.e. the European propensity to hold the home European currency

[1] As mentioned above, exchange-rate expectations are assumed to be static. Interest rates can be introduced by disaggregating assets into high-powered money and securities for each currency, thus obtaining two additional asset-demand equations determining the two interest rates. Although the model becomes more cumbersome, none of the conclusions is altered as long as wealth transfers have roughly symmetrical effects on money and securities. Complications arise, for example, if a wealth transfer raises the demand for dollar securities but lowers the demand for dollar money. This is tantamount to an induced increase in A's money supply, tacked on to any wealth-transfer effects, which tends to cause depreciation of the dollar.

(marks) is greater than the American propensity to hold marks; and $B_e > 0$, the Marshall–Lerner condition.

The sign of (8) then depends only on the numerator, that is, on whether $g^O > \alpha g^A + (1-\alpha) g^E$. An oil price increase will cause the dollar to depreciate against the mark (a rise in e) if $g^O > \alpha g^A + (1-\alpha) g^E$, i.e. if OPEC has a relatively high propensity to hold marks (relatively low propensity to hold dollars). More specifically, it depends on OPEC's propensity to hold marks compared to a weighted average of oil-importing nations' propensities to hold marks, with the weights equal to the shares of the oil deficit. The direction of change of the exchange rate depends solely on whether the reallocation of wealth occasioned by the oil price increase results in excess demand for marks (excess supply of dollars). If there is excess demand for marks, the mark appreciates against the dollar, increasing the share of marks in world wealth, and thereby reestablishing portfolio equilibrium.

Since marks are the home currency for Europe and the foreign currency for America, and OPEC has no home currency, it is plausible that[1]

$$g^A < g^O < g^E \quad (f^A > f^O > f^E).$$

Thus, the size of α is of critical importance in determining the direction of change of the exchange note.

Non-Zero OPEC Marginal Propensity to Import and Non-OPEC Elasticities of Import Demand for Oil

We now consider whether the results continue to hold when the assumptions of zero import-elasticities for oil in non-OPEC countries and a zero marginal propensity to import in OPEC are relaxed.

Suppose that in the time frame of the model OPEC imports rise by a fraction m of the value of the increased oil receipts, and are distributed in fixed proportions a and $1-a$ between American and European goods. The import-elasticity of demand for oil is ϵ^A in A, ϵ^E in E. OPEC's surplus no longer rises proportionately with increases in oil prices because of the induced increase in OPEC imports and a reduced quantity of oil exports.

Let C denote current-account balances, X exports and M imports. When two superscripts appear, it denotes bilateral trade between the two respective countries, e.g. X^{AO} represents A's exports to O. We have, ignoring interest payments,

$$C^O = X^O - M^O = (1-m) X^O, \tag{9}$$

$$C^A = B + X^{AO} - M^{AO}, \tag{10}$$

$$C^E = -B + X^{EO} - M^{EO}, \tag{11}$$

$$M^{AO} = P^O Q^A = \alpha P^O \bar{Q}, \tag{12}$$

$$M^{EO} = P^O Q^E = (1-\alpha) P^O \bar{Q}, \tag{13}$$

$$X^{AO} = maX^O = maP^O \bar{Q}, \tag{14}$$

$$X^{EO} = m(1-a) X^O = m(1-a) P^O \bar{Q}. \tag{15}$$

[1] Empirical support for home-currency preference is provided by Kouri and de Macedo (1978).

α and $\bar{Q}$ should now be interpreted as beginning-of-period values, before the price of oil rose; note that oil is priced in dollars, but it is the mark-equivalent (P^O/e) that matters for European consumers of imported oil, i.e.

$$Q^A = Q^A(P^O),$$
$$Q^E = Q^E(P^O/e).$$

With this information, we can determine the changes in trade flows associated with an oil-price rise:

$$dM^{AO} = (1-\epsilon^A)\,\alpha\bar{Q}\,dP^O, \tag{16}$$
$$dM^{EO} = (1-\epsilon^E)\,(1-\alpha)\,\bar{Q}\,dP^O + \epsilon^E(1-\alpha)\,\bar{Q}P^O/e\,de. \tag{17}$$

Since $X^O = M^{AO} + M^{EO}$, and by (14)–(17), we obtain

$$dX^{AO} = ma\bar{Q}\{[1-\epsilon^A\alpha - \epsilon^E(1-\alpha)]\,dP^O + \epsilon^E(1-\alpha)\,P^O/e\,de\}, \tag{18}$$
$$dX^{EO} = m(1-a)\,\bar{Q}\{[1-\epsilon^A\alpha - \epsilon^E(1-\alpha)]\,dP^O + \epsilon^E(1-\alpha)\,P^O/e\,de\} + \epsilon^E(1-\alpha)\,\bar{Q}P^O/e\,de. \tag{19}$$

For notational simplicity, let

$$\Delta = [1-\epsilon^A\alpha - \epsilon^E(1-\alpha)]\,\bar{Q},$$
$$\phi = (1-m)\,\Delta,$$
$$\kappa = \epsilon^E(1-\alpha)\,\bar{Q}P^O/e.$$

From (9)–(11) and (16)–(19), we have

$$dC^O = (1-m)\,(\Delta\,dP^O + \kappa\,de), \tag{20}$$
$$dC^A = B_e\,de + [-(1-\epsilon^A)\,\alpha\bar{Q} + ma\Delta]\,dP^O + ma\kappa\,de, \tag{21}$$
$$dC^E = -B_e\,de + [-(1-\epsilon^E)\,(1-\alpha)\,\bar{Q} + m(1-a)\,\Delta]\,dP^O - [1-m(1-a)]\,\kappa\,de. \tag{22}$$

Letting $\gamma = [(1-\epsilon^A)\,\alpha - ma\Delta]/\phi$, (20)–(22) can be written

$$dC^O = \phi\,dP^O + (1-m)\,\kappa\,de, \tag{20'}$$
$$dC^A = -\gamma\phi\,dP^O + (B_e + ma\kappa)\,de, \tag{21'}$$
$$dC^E = -(1-\gamma)\,\phi\,dP^O - \{B_e + \kappa[1-m(1-a)\,\kappa]\}\,de. \tag{22'}$$

We can now proceed, as in the previous section, to substitute (20′)–(22′) into the market-clearing condition for mark assets,

$$g^A(G^A_{-1}\,de + dC^A) + g^E(G^E_{-1}\,de + dC^E) + g^O(G^O_{-1}\,de + dC^O) = \bar{G}\,de,$$

which yields,

$$\frac{de}{dP^O} = \frac{\phi[g^O - \gamma g^A - (1-\gamma)\,g^E]}{\sum_i (1-g^i)\,G^i_{-1} + (g^E - g^A)\,B_e + \kappa\{[1-m(1-a)]\,g^E - mag^A - (1-m)\,g^O\}}. \tag{23}$$

It can now be seen that the denominator of (23) is positive under the same assumptions that the denominator of (8) is positive. ϕ is positive if ϵ^A and ϵ^E are less than unity, i.e. a rise in the price of oil still leads to an OPEC current-account surplus, despite a partially offsetting decline in oil import volume.

Therefore, the sign of (23) depends again on a weighted average of portfolio propensities, with γ in (23) corresponding to α in (8). γ, as defined above, is

$$\gamma = \frac{(1-\epsilon^A)\,\alpha - ma[1-\epsilon^A\alpha - \epsilon^E(1-\alpha)]}{(1-m)\,[1-\epsilon^A\alpha - \epsilon^E(1-\alpha)]}. \tag{24}$$

γ can be interpreted as the American share of the oil deficit, calculated at constant exchange rates. The latter proviso is necessary because exchange-rate changes affect European oil-import volume, as discussed above. γ reflects the initial shares of imports (α), as well as elasticities of import demand for oil (ϵ), OPEC absorption (m), and shares of imports to OPEC (a).

In the case where $\epsilon^E = \epsilon^A$, γ simplifies to

$$\gamma = \frac{\alpha - ma}{1-m}. \tag{24'}$$

Several points about γ should be noted. (1) It is possible for a country to have $\gamma < 0$, i.e. a country with a low share of oil imports, high elasticity of oil demand, and/or high share of the OPEC export market, may see its trade balance with OPEC improve following an oil price increase. Of course, this also means that the other country shoulders more than the entire OPEC surplus ($1-\gamma > 1$). Further, if $g^A < g^O < g^E$ as argued above, along with $\gamma < 0$ or $\gamma > 1$, the direction of change of the exchange rate may be inferred without any additional information on the relative size of g^A, g^E and g^O. If $\gamma < 0$, the dollar will gain, while if $\gamma > 1$, the dollar will decline as a result of oil price rises. The time period is likely to be important, by affecting m and ϵ^A, ϵ^E. OPEC absorption and import elasticities of oil demand will increase as the time period lengthens.

(2) Through the parameters α, ϵ^A and ϵ^E, some of the long-run and macroeconomic effects that are otherwise absent from the model may be introduced. The size and nature of energy endowments will be reflected in both α and ϵ, while domestic energy and macroeconomic policies will influence ϵ. ϵ may be high because of substantial coal resources or shale oil which become profitable to extract at high oil prices, or because of an aggressive energy policy featuring *ad valorem* rather than specific gasoline taxes, etc. A country which favours a contractionary macroeconomic response to oil price increases will have a high ϵ relative to a country which expands aggregate demand to counter the deflationary impact of oil price rises.

Adding Another Country and Currency

Although the focus of this paper is on the dollar, the effect of oil price increases on the pound sterling is of considerable interest for several reasons. First, North Sea oil has dramatically reduced the United Kingdom's dependence on OPEC oil in the last few years – British α has declined sharply. Second, OPEC investment in sterling assets has been subject to substantial fluctuations. Up to 1976 some OPEC countries accepted sterling as well as dollars in payment for oil, and OPEC held sizeable sterling investments. There are relatively good data on OPEC investment in sterling assets, published quarterly by the Bank of England. All of this will be discussed more fully in the empirical section.

The model should therefore be extended to incorporate an additional country and currency. No issue of principle is involved, although the derivations are more complex, and some additional restrictions on the parameters are needed. These derivations are carried out in Appendix 1; the main conclusions are reported here.

It is shown in the Appendix that if the oil-price rise results in excess demand for mark assets and excess supply of dollar assets, the mark will necessarily appreciate against the dollar. On the other hand, if there is excess demand for both mark and dollar assets, offset by excess supply of sterling, the direction of change of the dollar/mark exchange rate depends not only on the relative magnitudes of the excess demands, but on several other factors as well, including the shares of marks and dollars in world wealths. (This is because a given shift into marks will have greater effects on the dollar/mark exchange rate the smaller is the share of marks in world wealth, since it involves a greater proportional change.) In this situation, sterling will depreciate against both the dollar and the mark.

Formally letting U denote the United Kingdom and H sterling assets, and following the notation of the previous model, the critical parameters are $-\sum_i \gamma^i f^i$, $g^O - \sum_i \gamma^i g^i$, and $h^O - \sum_i \gamma^i h^i$, where $i = A, E, U$, denoted for simplicity ED_f, ED_g, and ED_h. As before, the incremental shares of the net oil deficit (γ^i) remain of central importance.

II. EMPIRICAL RESULTS

We are interested in calculating $ED_f = f^O - \sum_i \gamma^i f^i$, $ED_g = g^O - \sum_i \gamma^i g^i$, $ED_h = h^O - \sum_i \gamma^i h^i$ for $i = A, E, U$, to ascertain whether a rise in oil prices produces excess supply or demand for a given currency.[1] The currencies are the dollar (f), sterling (h), and all others (g) – termed the mark in the theoretical model, but here representing a bundle of currencies, in particular the mark, the Swiss and French francs, and the yen. To varying degrees, most of these currencies as well as the majority of the lesser European currencies can be considered as tied formally or informally to the mark. In any event, limitations of the data on OPEC portfolio preferences prohibit further disaggregation.

The calculations are carried out in several steps. We focus first on the shares of the net oil deficit and its determinants before turning to estimates of OPEC's portfolio preferences.

Shares of the Oil Deficit

Table 1 presents calculations of α, a and γ.[2] As mentioned above, we are concerned primarily with the United States, the United Kingdom and other industrial countries taken together, but data on α and a for Germany and Japan

[1] The following is not a test of the theory. The objective is to show how the theory – assumed to be correct – can elucidate the behaviour of the foreign exchange market.

[2] α and a are from the IMF *Direction of Trade*. α is based on total imports from OPEC, and is thus not quite the theoretical α (oil and gas account for about 95% of OPEC exports). Marginal and average α and a are assumed to be equal.

are also presented for purposes of comparison. There are several points to be noted. The U.S. share of industrial country imports from OPEC rose sharply, doubling from 1972 to 1978, reflecting increased American dependence on imported oil. Meanwhile, the U.S. share of the OPEC export market fell, although less markedly. Reflecting the increasing contribution of North Sea oil to the British balance of payments, the U.K. share of imports from OPEC declined greatly after 1974.[1] For other industrial countries taken together, α declined and a increased after the early 1970s. Germany in particular improved an already relatively favourable position vis-à-vis OPEC in the course of the 1970s. In 1980, however, U.S. α fell below its 1977 level.

Table 1

Breakdown of Industrial Country Deficits with OPEC*

	α. Share of industrial country imports from OPEC (%)								
	1972	1973	1974	1975	1976	1977	1978	1979	1980
U.S.	14.0	16.0	16.0	18.0	21.5	27.6	28.8	28.6	24.9
U.K.	12.2	11.4	11.7	9.0	8.4	6.6	5.7	4.4	4.3
Others, of which	73.8	72.6	72.3	72.0	70.1	65.8	65.5	67.0	70.8
Germany	9.4	9.5	9.1	8.4	8.2	7.4	8.5	9.1	9.0
Japan	20.9	21.4	23.4	25.1	23.8	23.0	23.1	23.0	25.8
	a. Share of industrial country exports to OPEC (%)								
	1972	1973	1974	1975	1976	1977	1978	1979	1980
U.S.	24.7	23.3	24.2	23.7	22.6	22.1	21.8	20.5	18.3
U.K.	13.7	12.2	10.3	11.5	11.6	11.8	11.5	10.4	11.4
Others, of which	61.6	64.6	65.5	64.8	65.8	66.1	66.7	69.1	70.8
Germany	14.0	15.5	15.5	15.9	17.0	17.0	16.3	14.7	13.8
Japan	16.3	17.6	18.4	18.0	18.0	18.3	18.9	18.4	20.3
	γ. Share of the net oil deficit†								
	$m = 0$			$m = 0.5$			$m = 0.8$		
	1974	1979	1980	1974	1979	1980	1974	1979	1980
U.S.	16.0	28.6	24.9	7.8	36.7	31.5	−16.8	61.0	51.3
U.K.	11.7	4.4	4.3	13.1	−1.6	−2.8	17.3	−19.6	−24.1
Other	72.3	67.0	70.8	79.1	64.9	71.3	99.5	58.6	72.8

Source: IMF *Direction of Trade*, annual issues.

* Industrial countries are defined as Group of 10 plus Austria, Denmark, Norway and Switzerland.

† $\gamma = (\alpha - ma)/(1-m)$, where m is the OPEC marginal propensity to import.

As given by equation (24′) above, the parameter γ incorporates α and a in a summary measure of the oil deficit.[2] γ is calculated for alternative values of m, the OPEC absorption parameter. In the very short run a rise in oil revenues will not alter OPEC spending so $m = 0$ and $\gamma = \alpha$. Over time, however, OPEC will

[1] These figures understate the change in the U.K. oil deficit because the United Kingdom has started to export oil, although it remained a net importer in 1979. On the other hand, U.K. imports of oil-industry equipment have increased, which if included should raise U.K. γ.

[2] γ is calculated on the assumption that the import elasticities of demand are equal, $\epsilon^A = \epsilon^E = \epsilon^U$. 'Europe' appeared to have a more aggressive energy policy and a more contractionary macroeconomic policy response to oil price rises, until 1980. On the other hand the United States has greater energy endowment and perhaps greater scope for further energy conservation.

eventually spend more and more of the revenues generated by a once-for-all increase in oil prices. In the medium term (a year or two) m might be about 0·5, and in the long run (five years) could be as high as 0·8. γ is calculated for 1974 and 1979.[1]

The change in the U.S. γ^A, 1974–9, goes a long way towards explaining the divergent pattern of the response of the dollar to oil price increases. In 1974, for $m = 0{\cdot}8$ γ^A is negative, meaning that a rise in oil prices may, *ceteris paribus*, improve the American balance of trade. By 1979, however, the long run γ^A had risen to 60 %, roughly equal to γ^E, the rest-of-the-industrial-world share of the oil deficit. In 1980 long-run γ^A fell 10 % while γ^E rose 15 %.

The change in the U.K. γ^U is equally marked, going from 20 to −20 % for $m = 0{\cdot}8$ between 1974 and 1979. Oil price increases have tended to be good news for sterling lately, as these figures would suggest.

OPEC Portfolio Preferences

Except under the special circumstances where $\gamma < 0$ or $\gamma > 1$, information on portfolio preferences by currency is also a necessary input in the determination of the impact of oil price rises on exchange rates. In particular, data on OPEC holdings by currency are essential.

Table 2

*Estimated Currency Composition of OPEC Wealth** (%)

	1974	1975	1976	1977	1978	1979	1980
U.S. dollars	60·2	63·1	65·3	63·5	59·3	56·5	56·8
Pound sterling	12·7	7·8	3·4	3·3	3·4	3·9	4·3
Others	27·1	29·1	31·3	33·1	37·2	39·6	38·9

* Excluding grants and loans to less developed countries and international financial institutions.

The Bank of England has published a quarterly table on the disposition of the OPEC surplus since 1974. Although these data are flawed in several respects they can be used to construct measures of OPEC's portfolio preferences by currency. The details of the computations are described in Appendix 2.

Table 2 presents these estimates of the currency composition of OPEC wealth, 1974–80. As can be observed, the share of sterling dropped in 1975 and especially in 1976 during the sterling crisis. Recent data indicate an upsurge in OPEC investment in sterling in 1979 and 1980, with British interest rates at very high levels and the pound at a five-year high. The share of dollars in OPEC wealth appears to have increased until mid-1977, and then fallen off, coinciding with the dollar crisis of 1977–8. These figures probably understate the extent of the diversification out of the dollar in 1977–8 because of substantial OPEC

[1] By comparing estimates of the cumulative rise in OPEC revenue arising from the 1973–4 oil price rise (see Table 3) and the cumulative OPEC current-account surplus (see Table A2 of Appendix 2), one can arrive at rough estimates of m over the 1974–8 period, during which OPEC oil prices were quite stable, as follows. Year 1, 0·1; year 2, 0·4; year 3, 0·5; year 4, 0·55; year 5, 0·65 (year 1 is 1974). In 1978 (year 5) OPEC's annual surplus had fallen to near zero, so that m would probably have continued to rise.

borrowing in dollars during this period. Of course, it is impossible to determine the extent to which such diversification was cause or effect of the sterling crisis of 1976 and the dollar crisis of 1978. Meanwhile, the share of other currencies has gradually but steadily risen from just over a quarter to just over a third of OPEC wealth.

Table 3

Currency Composition of OPEC Oil Revenues ($ billions)

	1973	1974	1975	1976	1977	1978	1979	1980
U.S. dollars	15·7	70·8	84·8	109·2	129·1	123·9	192·0	275·0
Pound sterling	7·7	19·0	12·0	4·0	—	—	—	—
Total	23·4	89·8	96·8	113·2	129·1	123·9	192·0	275·0

Source: Bank of England, Bank for International Settlements.

Table 3 reveals the declining role of sterling as a means of payment for oil. This highlights the fact that oil price increases may alter the demand for a currency not only for investment reasons but also because of transactions demand. During 1974–5 the Bank of England reported that sterling tended to strengthen regularly when the oil payment dates drew near. Sterling also tended to decline when OPEC countries increasingly turned to exclusive use of the dollar in payments for oil and as multinational oil companies liquidated sterling balances held for the purpose of making oil payments.

Oil Prices and Exchange Rates, 1973–4 and 1979–80

Table 4 presents the computations of ED_f, ED_g, ED_h, the measures of excess supply or demand for the dollar, 'mark', and sterling derived below. A positive ED_f suggests excess demand for dollars and a negative ED_f excess supply of dollars, Similarly for ED_g and ED_h. Since the excess demands sum to zero $ED_f + ED_g + ED_h \equiv 0$.

To infer the effect on the exchange rate of two currencies their ED must be compared as explained earlier. For example, the dollar will appreciate against sterling if $ED_f > 0$ and $ED_h < 0$. If ED_f and ED_h are of the same sign the direction of change of the exchange rate cannot be inferred from the ED_i alone.

ED_i are calculated on the basis of Tables 1 and 2, varying m (OPEC absorption) as in Table 1. Table 2 provides estimates of OPEC's portfolio propensities, but data on oil importers' portfolio preferences are also required. *A priori* values (with some sensitivity analysis) are used for the latter.

If one considers aggregate national wealth there can be little doubt that the share of dollar assets in American wealth is close to 100 %, and that the share of dollars in 'European' and U.K. wealths is small but probably not negligible. Reflecting the prominence of the dollar in international financial intermediation, foreigners hold dollar-denominated assets in the form of official foreign exchange reserves, and privately held Treasury securities, Eurodollar deposits, etc.[1]

[1] The share of dollars in aggregate world foreign exchange reserves has remained at about 80 % in recent years (IMF *Annual Report*). The share of dollars in total Eurocurrency deposits dropped slightly in

Nevertheless, after netting out liabilities in dollars, it seems doubtful that the share of dollars in 'European' national wealth exceeds 10 %.

A key underlying issue in estimating portfolio preferences of oil-importing countries is the appropriate definition of wealth. The previous reasoning considered aggregate national wealth. If oil deficits are viewed as transitory, however, it may be more appropriate to disaggregate wealth into working balances and permanent wealth, with the oil deficits being financed out of working balances and borrowing and having relatively little impact on the demand for the assets constituting permanent wealth such as equity and land.[1] In this case

Table 4

Measures of Excess Demand (+) and Excess Supplies (−) for Various Currencies Following Oil Price Increases, under Alternative Assumptions

	1974			1979			1980		
	$m = 0$	$m = 0.5$	$m = 0.8$	$m = 0$	$m = 0.5$	$m = 0.8$	$m = 0$	$m = 0.5$	$m = 0.8$
	(1) Low 'European' and U.K. propensities to hold dollars†								
Dollars ED_f*	36	43	65	21	14	−8	24	18	1
'Marks' ED_g	−39	−44	−63	−21	−19	−13	−25	−25	−27
Sterling ED_h	3	1	−2	0	5	21	1	7	26
	(2) High 'European' and U.K. propensities to hold dollars‡								
Dollars ED_f	10	15	31	1	−6	−20	2	−2	−14
'Marks' ED_g	−16	−20	−33	−1	1	4	−4	−4	−5
Sterling ED_h	6	5	2	2	5	16	2	6	19

* $ED_f = f^O - \Sigma\gamma^i f^i$, $i = A, E, U$. Similarly for ED_g and ED_h. See Tables 1 and 2 for the definitions for the components of ED, and text for explanations.

† $f^A = 100, g^A = h^A = 0; f^E = 10, g^E = 90, h^E = 0; f^U = 10, g^U = 0, h^U = 90$. Other parameters from Tables 1 and 2.

‡ Same as above except that $f^E = 40$, $g^E = 60$; $f^U = 40$, $h^U = 60$.

the European and U.K. propensities to hold dollars (f^E and f^U) should represent the share of dollars in European working balances, not total wealth, and private and official holdings of dollar-denominated Treasury securities and Eurocurrency deposits loom much larger. f^E might be considerably higher than 10 %. The impact of this consideration on the share of dollars in American wealth (f^A) is likely to be much less significant; f^A is likely to remain close to 100 % regardless of the definition of wealth.

Two alternative sets of values for European and U.K. portfolio preferences

the late 1970s, but remains about 65 % (BIS *Annual Report*). For industrial countries, the share of dollars in official reserves and Eurocurrency deposits is probably higher than these figures suggest, since much of the recent diversification out of the dollar has been by less-developed countries, including OPEC.

[1] It is assumed here that all physical wealth is denominated in the currency of the country in which it is located. It could be argued, however, that physical assets are not denominated in any currency: their return and risk reflect the real earnings of the asset, which is independent of the currency of the country in which it is situated. Location may matter in practice, however, because of a variety of market imperfections and transactions costs which, in effect, cause the asset to be viewed as denominated in the domestic currency. For a discussion of this problem see Tobin (1982), pp. 121–2.

were used: (*a*) low propensity to hold dollars ($f^E = f^U = 10$, $g^E = h^U = 90$, $g^U = h^E = 0$), (*b*) high propensity to hold dollars ($f^E = f^U = 40$, $g^E = h^U = 60$, $g^U = h^E = 0$). Note that 'European' holdings of sterling assets and U.K. holdings of 'marks' are assumed to be negligible. Throughout the analysis, Americans will be assumed to hold dollars only ($f^A = 100$, $g^A = h^A = 0$). For OPEC's portfolio propensities, the 1974, 1979 and 1980 values shown in Table 2 were used.

The 1974 calculations of ED_i show that regardless of the magnitude of OPEC absorption m, and under both portfolio preference assumptions, the dollar should appreciate against other currencies, with the possible exception of sterling. This is not surprising given the low American share of the oil deficit in 1974.

For 1979, however, the results for the dollar–mark rate are not so clear-cut and are more sensitive to the size of m and the assumptions about portfolio preferences. For the figures to be consistent with the observed tendency of the dollar to depreciate against the 'mark', it is necessary to assume that m is large (which is likely to be the case in the long run) and/or that the European propensity to hold dollars is high (closer to 40 % than 10 %). The results for sterling, on the other hand, are less ambiguous. Overall, the 1979 figures suggest appreciation of sterling against both the dollar and the mark, particularly as m increases. The benefits of North Sea oil, although possibly understated in the calculations, more than outweigh a large drop in the OPEC propensity to hold sterling, at least for periods beyond the short run. This effect would be magnified if one allowed for expected future British net exports of oil.

Taken as a whole, Table 3 shows the sharp change in the incidence of oil price increases on the balance of payments of the oil-importing developed countries between the first and second oil shocks. The major underlying factor is the changing pattern of dependence on OPEC oil (rising in the United States, falling in the United Kingdom, holding steady in 'Europe'). Changes in the pattern of OPEC imports and OPEC portfolio preferences have also played a part in increasing the relative burden of oil price rises on the American balance of payments (see Tables 1 and 2).

It should be remembered that these calculations do not reflect several considerations mentioned earlier. The shares of the oil deficit (γ) are calculated under the assumption that the elasticities of import demand for oil (ϵ) are equal across countries. It may be, however, that $\epsilon^E > \epsilon^A$, at least until very recently, since Europe was generally perceived to have a more effective energy policy than the United States. This consideration could help explain the tendency of the dollar to depreciate in 1979. On the other hand, no attempt has been made to capture the transactions demand effects associated with the currency in which OPEC oil is denominated. In 1973–4 this effect bolstered the demand for the dollar and sterling, while in 1979–80 it increased the demand for dollars only.

The 1980 figures show a partial return to the 1974 configuration, with ED_f rising and ED_g falling from their 1979 values. Note in particular that ED_g is always negative in 1980 in contrast to 1979. In the case of low m and/or low f^E, f^U, the results are consistent with the observed appreciation of the dollar against the 'mark' in the wake of oil price news in 1980. The other cases are not inconsistent with this behaviour of the dollar. Another consideration, again, might have been the market's reassessment of American energy and macro-economic policy responses, and the scope for further energy conservation in the United States. Also, it appears that in 1980 OPEC ceased 'diversifying' out of the dollar.

Conclusion

This paper has developed a stock/flow model of the effect of oil price increases on exchange rates. The model focuses on the wealth transfer effects associated with oil price rises, and the implications of these wealth transfers for portfolio equilibrium, with the exchange adjusting to clear asset markets. For example, if oil price increases result in a reallocation of world wealth in such a way as to increase the demand for Deutschemarks and lower the demand for U.S. dollars, the mark will appreciate against the dollar. The key parameters turn out to be incremental shares of the oil deficit and portfolio preferences. Shares of the oil deficit in turn vary with the relative dependence on OPEC oil, OPEC's import pattern, and the magnitude of OPEC absorption. The model highlights the importance of both the current and capital accounts of the balance of payments.

The empirical section of the paper attempts to explain the differences in the response of the foreign exchange market to oil price increases between the first and second oil shocks of the 1970s. In 1973–4, the dollar appreciated in the wake of unexpected oil price hikes, but tended to depreciate in 1979 following news about oil price rises. It is found that the most important factor underlying this shift is a sharp increase in the American dependence on OPEC oil. Secondary factors include some diversification out of the dollar on the part of OPEC and a reduction in the U.S. share of industrial country exports to OPEC. A more effective European energy policy may also have played a part by increasing the European elasticity of demand for oil. The implications of oil price rises for the pound sterling are also examined, with the recent tendency of sterling to appreciate when oil prices rise attributed to the benefits of North Sea oil, more then offsetting a very large decline in the share of sterling in OPEC wealth. Overall, the response of the foreign exchange market appears to be explained by the fundamentals.

In 1980 the pattern changed once again. News about oil price rises induced dollar appreciation against currencies other than the pound sterling. This reflects an unexpectedly large fall of American oil import volume in 1980, which altered the market's perception of the current and future distribution of the oil deficits among industrial countries.

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APPENDIX I

Adding Another Country and Currency (Sterling)

There is now a third oil-importing country (U) with home assets (H) denominated in sterling. The price of sterling in dollars is s. The three currencies are imperfect substitutes, so there are now 3 asset demands, e.g. for A:

$$F^A = f^A W^A \quad \text{dollar assets,}$$
$$eG^A = g^A W^A \quad \text{mark assets,}$$
$$sH^A = h^A W^A \quad \text{sterling assets.}$$

The main complication is keeping track of the intra-non-OPEC current accounts. Defining B^A to be A's current account position with E and U, and similarly for B^E and B^U, the wealth equations for A, E, U, and O are:

$$W^A = F^A_{-1} + eG^A_{-1} + sH^A_{-1} + B^A(\overset{+}{e}, \overset{+}{s}) - P^O Q^A, \tag{A 1}$$
$$W^E = F^E_{-1} + eG^E_{-1} + sH^E_{-1} + B^E(\bar{e}, \bar{e}/s) - P^O Q^E, \tag{A 2}$$
$$W^U = F^U_{-1} + eG^U_{-1} + sH^U_{-1} + B^U(\overset{+}{s}, \overset{+}{e}/s) - P^O Q^U, \tag{A 3}$$
$$W^O = F^O_{-1} + eG^O_{-1} + sH^O_{-1} + P^O(Q^A + Q^E + Q^U), \tag{A 4}$$

where $B^A + B^E + B^U \equiv 0$, i.e. the trilateral current accounts between A, E, U must sum to zero. This identity implies that $B^A_e + B^E_e = 0$, etc. Letting $x = e/s$, and again starting with $\epsilon^A = \epsilon^E = \epsilon^U = m = 0$, we have

$$dB^A = B^A_e\, de + B^A_s\, ds, \tag{A 5}$$
$$dB^E = B^E_e\, de + B^E_x \frac{dx}{de} de + B^E_x \frac{dx}{ds} ds = \left(-B^A_e - \frac{B^U_x}{s}\right) de + B^U_x \frac{e}{s^2} ds, \tag{A 6}$$
$$dB^U = B^U_s\, ds + B^U_x \frac{dx}{de} de + B^U_x \frac{dx}{ds} ds = \frac{B^U_x}{s} de + \left(-B^A_s - B^U_x \frac{e}{s^2}\right) ds, \tag{A 7}$$

which implies

$$dW^A = (G^A_{-1} + B^A_e)\, de + (H^A_{-1} + B^A_s)\, ds - Q^A dP^O, \tag{A 8}$$
$$dW^E = (G^E_{-1} - B^A_e - B^U_x)\, de + (H^E_{-1} + B^U_x)\, ds - Q^E dP^O, \tag{A 9}$$
$$dW^U = (G^U_{-1} + B^U_x)\, de + (H^U_{-1} - B^A_s - B^U_x)\, ds - Q^U dP^O, \tag{A 10}$$
$$dW^O = G^O_{-1}\, de + H^O_{-1}\, ds + (Q^A + Q^E + Q^A)\, dP^O \tag{A 11}$$

(taking $e = s = x = 1$ for simplicity).
We have two independent market clearing conditions (omit the dollar market):

$$\text{mark asset market} \qquad e\bar{G} = g^A W^A + g^E W^E + g^U W^U + g^O W^O, \tag{A 12}$$
$$\text{sterling asset market} \qquad s\bar{H} = h^A W^A + h^E W^E + h^U W^U + h^O W^O. \tag{A 13}$$

After differentiating and rearranging, letting $i = A, E, U, O$, Σ over i unless noted otherwise, we obtain

$$\begin{bmatrix} \Sigma(1-g^i)\, G^i_{-1} + (g^E - g^A)\, B^A_e + (g^E - g^U)\, B^U_x & -\Sigma g^i H^i_{-1} + (g^U - g^A)\, B^A_s + (g^U - g^E)\, B^U_x \\ -\Sigma h^i G^i_{-1} + (h^E - h^A)\, B^A_e + (h^U - h^E)\, B^U_x & \Sigma(1-h^i)\, H^i_{-1} + (h^U - h^A)\, B^A_s + (h^U - h^E)\, B^U_x \end{bmatrix} \begin{bmatrix} de \\ ds \end{bmatrix}$$
$$= \begin{bmatrix} g^O - \sum\limits_{i \neq O} \alpha^i g^i \\ h^O - \sum\limits_{i \neq O} \alpha^i h^i \end{bmatrix} \bar{Q} dP^O \tag{A 14}$$

with $$\sum_{i \neq O} \alpha^i = 1.$$

If $f^U = f^E$, $h^A = h^E$, $g^A = g^U$, the matrix is dominant diagonal (since, e.g.,

$$f^U = f^E \Rightarrow g^U + h^U = g^E + h^E \Rightarrow g^U - g^E = -h^U + h^E).$$

Using the adding-up conditions, and omitting the positive denominator, we find

$$\frac{de}{dP^O} = (g^O - \sum_{i \neq O} \alpha^i g^i)\,[\Sigma f^i H^i + (h^U - h^A)\, B_s^A] - (f^O - \sum_{i \neq O} \alpha^i f^i)\,[\Sigma g^i H^i + (h^U - h^E)\, B_x^U]. \quad \text{(A 15)}$$

If $g^O - \sum_{i \neq O} \alpha^i g^i$ and $f^O - \sum_{i \neq O} \alpha^i f^i$ are of opposite signs, the sign of (de/dP^O) is necessarily the same as the sign of the former. If not, it also depends on the sizes of Σf^i and Σg^i, and the wealth transfer effects between the United Kingdom and the other countries associated with any concurrent change in s and x. (ds/dP^O) depends on analogous considerations.

Again we could substitute γ^i for α^i if ϵ^i or $m \neq 0$; in the case where $\epsilon^A = \epsilon^E = \epsilon^U$, we have, as in the two-currency case

$$\gamma^i = \frac{\alpha^i - ma^i}{1 - m}. \quad \text{(A 16)}$$

In summary, the dollar will depreciate against the mark if the rise in oil prices creates excess supply of dollars and excess demand for marks, as in the two-currency case. If there is excess demand for both dollars and marks, however, additional information is needed.

APPENDIX 2

OPEC Portfolio Preferences

The Bank of England (BOE) divides the OPEC surplus into investments in the United Kingdom, the United States, and all other countries. A major problem is that the data on bank deposits are gross, i.e. OPEC borrowing – which has been quite large in some years, notably 1977–8 – is not netted out. Furthermore, most of the classification is by type of investment rather than currency of denomination. Investments in the United Kingdom are disaggregated into sterling and non-sterling assets, the latter consisting mainly of Eurocurrency deposits. All assets in the United States can be assumed to be in dollars. For other countries, the only subdivisions are bank deposits and others. First, for our purposes, flow of funds to less developed countries must be netted out from the latter category, and the necessary data are only available on an annual basis. This enables us to obtain an annual figure for investments, other than bank deposits, in industrial countries other than the United States and the United Kingdom. These holdings are assumed to be denominated in currencies other than the dollar and sterling. The various series described above are presented in Table A 1.

The major problem is determining the currency composition of OPEC bank deposits and loans. As shown in Table A 1, U.K. foreign currency deposits and other country bank deposits constitute more than half the gross flows of funds to industrial countries. Any meaningful estimate of the currency composition of OPEC investment must allocate these bank deposits, if possible net of borrowing, between dollars and non-dollar currencies.

In the absence of information on the currency composition of OPEC bank deposits, I have used the following procedure to get a rough estimate. The Bank for International Settlements (BIS) publishes data on the external positions in dollars and other currencies of banks in individual reporting centres. Thus, the share of dollar

Table A1

Gross Annual OPEC Flow of Funds by Bank of England Classification ($ billions)

	1974	1975	1976	1977	1978	1979	1980	Level, end of 1980
U.K.								
Sterling	6·0	0	−1·9	0·7	0·2	2·2	3·3	12·1
Foreign currency*	15·0	4·3	6·4	3·1	−2·0	15·0	14·3	62·4
U.S.	11·7	9·6	12·1	9·1	1·3	8·9	14·5	69·9
Other industrial countries								
Bank deposits	9·0	5·0	7·0	8·5	5·0	16·4	26·2	77·1
Other	7·0	5·9	3·9	5·4	2·4	4·8	17·0	46·6
Less developed countries and international financial institutions	8·4	10·5	8·4	7·3	6·3	6·5	11·6	59·0
Total	37·1	35·3	35·9	33·7	13·2	53·8	86·9	327·1

Source: Bank of England.

* Primarily foreign currency deposits.

Table A2

The OPEC Current Account Balance, 1973–1980 ($ billions)

	1973	1974	1975	1976	1977	1978	1979	1980
Annual*	6	67	29	35	27	−1	77	110
Cumulative	6	73	102	137	164	163	240	350

Source: Bank of England.

* The annual current account surplus can differ from the gross OPEC flow of funds in Table A1 because of OPEC borrowing and errors and omissions.

deposits to total deposits held by foreigners in the United Kingdom can be obtained, quarterly or annually, and similarly for continental Europe. By making the assumption that OPEC deposits have the same currency composition as those of the typical investor in a particular banking centre, one can get an estimate of the share of OPEC's deposits held in dollars versus other currencies. Because the share of dollars in total externally held deposits is about 80 % in London and 50 % in continental European centres with relatively small year-to-year fluctuations (1 or 2 %), a shift in the location of OPEC's deposits implies a change in their currency composition. The calculated currency composition of OPEC deposits will also change with changes in the share of dollars in Eurocurrency deposits in the international banking system as a whole. Unfortunately, one cannot do the same for OPEC bank borrowing since the BOE does not disaggregate the latter at all.

This method of determining the currency composition of deposits adjusts for valuation changes associated with exchange rate changes because the BIS data are valuation-adjusted. The remaining non-dollar asset categories must be adjusted, however, to reflect the impact of exchange rate changes on the value of the beginning-of-period stock in dollars.

Despite the deficiencies of the BOE data, some cross-checking with other sources and discussions with a Federal Reserve official indicate that the calculated series is roughly correct.

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