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RESERVE REQUIREMENTS ON EUROCURRENCY DEPOSITS: IMPLICATIONS FOR THE STABILIZATION OF REAL OUTPUTS

by

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I. Introduction

The development of closer links between domestic financial markets and the Eurocurrency markets has provided an incentive for further investigation of the implications of placing reserve requirements on Eurocurrency deposits.[1/] In this paper a rational expectations model of a two-country world economy described in Section II is employed to analyze the implications of placing a reserve requirement on Eurodollar deposits for the stabilization of real outputs.[2/] The approach is similar to that of other recent contributions to the analysis of monetary policy. Suggested changes in financial regulations are evaluated under various assumptions about the relative magnitudes of different unanticipated and contemporaneously unobservable shocks to the world economy.[3/] Specifically, it is assumed that the monetary authorities in each of the two countries, the United States (U.S.) and Germany, set their policy instrument in an attempt to achieve a desired value for their country's real output, which is their ultimate target.[4/] Two policy regimes are considered. Under the fixed exchange rate regime studied in Section III the policy instrument of the U.S. authorities is the U.S. monetary base, and the policy instrument of the German authorities is the exchange rate. Under the flexible exchange rate regime studied in Section IV the policy instrument of each set of authorities is its country's monetary base, and the exchange rate is allowed to vary. Under both exchange rate regimes deviations between the actual values and desired values of real outputs arise because the authorities have incomplete current information about the shocks which buffet the world economy. Changes in the level of the reserve requirement on Eurodollar deposits affect the variances of these deviations because they affect the responsivenesses of the demand for U.S. high-powered money to changes in the endogenous variables and the impact effects of some exogenous shocks. Some conclusions are contained in Section V.

II. The Model

The model is a description of economic interactions among agents in the U.S. and Germany, denominated in two currencies, the dollar and the Deutsche Mark (DM). The nine groups of agents whose behavior is portrayed are U.S. nonbanks, German nonbanks, U.S. banks' home country offices (U.S. banks), German banks' home country offices (German banks), U.S. and German banks' foreign affiliates (Eurobanks), the U.S. central bank (Federal Reserve), the German central bank (Bundesbank), the U.S. Treasury, and the German Treasury.

First, attention is focused on the financial sector of the model. Eight financial instruments are mentioned below, but simplifying assumptions and balance sheet constraints imply that attention can be focused on the markets for only two instruments, U.S. high-powered money and German high-powered money.

The composition of the portfolio of each group of agents is described below and is summarized in Table 1. Table 1 also contains a list of all financial instruments included in the model and a summary of the market

Table 1

Composition of Agents' Portfolios and

Market Clearing Conditions for the Financial Instruments

Agents \ Instruments	H	EA	L	ES	D	EG	V	EX	W
U.S. Banks	H^B		L^B	ES^B	$-D^B$				$-W^B$
German Banks		EA^{*B}	L^{*B}	ES^{*B}		$-EG^{*B}$			$-W^{*B}$
Euro-Banks	H^A		L^A	ES^A			$-V^A$	$-EX^A$	$-W^A$
U.S. Nonbanks			$-L^N$	$-ES^N$	D^N		V^N	EX^N	$-W^N$
German Nonbanks			$-L^{*N}$	$-ES^{*N}$		EG^{*N}	V^{*N}	EX^{*N}	$-W^{*N}$
Federal Reserve	$-H^C$		L^C						
Bundes-bank		$-EA^{*C}$		ES^{*C}					
U.S. Treasury			$-\bar{L}$						W^T
German Treasury				$-E\bar{S}$					W^{*T}

H – U.S. high powered money

A – German high powered money

L – Dollar claims on nonbanks and U.S. Treasury

S – DM claims on nonbanks and German Treasury

D – U.S. banks' dollar demand deposits

G – German banks' DM demand deposits

V – Eurodollar deposits

X – Euro-DM deposits

W – Net worth in dollars

clearing conditions for these financial instruments. In order to make possible aggregation of holdings of financial instruments denominated in different currencies, all DM denominated magnitudes are converted to dollars using the exchange rate (E) which is defined as the dollar price of a DM. The sum of the entries in any row of Table 1 is the balance sheet constraint for the associated group of agents and, therefore, must be identically equal to zero. Also, the sum of entries in any column except the last is the excess demand for the associated financial instrument and, therefore, must be equal to zero in equilibrium.

U.S. banks' holdings and German banks' holdings (Rows 1 and 2) are designated with the superscript B, and the latter are differentiated with an asterisk as are all German holdings. The banks in each country have as liabilities home currency demand deposits and as assets home currency high-powered money, home currency claims on both nonbanks and the home treasury, and foreign currency claims on both nonbanks and the foreign treasury.[5/]

The Eurobanks (Row 3), whose holdings are designated with the superscript A, have as liabilities Eurodollar deposits and Euro-DM deposits and as assets U.S. high-powered money, dollar claims on both nonbanks and the U.S. Treasury, and DM claims on both nonbanks and the German Treasury.

U.S. nonbanks' holdings and German nonbanks' holdings (Rows 4 and 5) are designated with the superscript N, and the latter are differentiated with an asterisk. Nonbanks in each country hold all the financial instruments except for home and foreign currency high-powered moneys and foreign currency demand deposits.[6/]

U.S. central bank holdings and German central bank holdings are designated with the superscript C, and the latter are differentiated with an asterisk. The central bank in each country holds home currency claims against both nonbanks and the home treasury and issues home currency high-powered money. In addition, the U.S. (German) Treasury issues a stock of dollar (DM) denominated liabilities represented by $\overline{L}$ ($\overline{S}$).

Certain assumptions about commercial banks and central banks guarantee that there are only two nominal interest rates in this model and that these nominal interest rates satisfy the uncovered interest parity condition. First, it is assumed that the interest rates on demand deposits at commercial banks in both countries are fixed at zero. Second, it is assumed that all commercial banks are risk neutral price takers which have zero intermediation costs. Third, it is assumed that the Federal Reserve (Bundesbank) pays interest on dollar (DM) bank reserves at a rate equal to the rate on dollar (DM) claims on nonbanks and the U.S. Treasury (German Treasury). Under these assumptions all variable-rate instruments denominated in a given currency pay the same rate of interest. Furthermore, the representative dollar interest rate (i) must equal the representative DM interest rate ($\overset{*}{i}$) plus the expected rate of depreciation of the dollar:

$$i = \overset{*}{i} + \overline{e} - e, \qquad (1)$$

where e is the (logarithm of the) exchange rate (E), and $\overline{e}$ is the constant expected value of e. Only when these conditions are met will Eurobanks expect neither profits nor losses from accepting deposits denominated in either currency and holding claims denominated in either currency.[7/]

Now consider the demands by U.S. and German nonbanks for the various financial instruments. Three asset demand functions are specified explicitly: U.S. nonbanks' demands for demand deposits and Eurodollar deposits and German nonbanks' demand for demand deposits:

$$\frac{D^N}{Q} = \underline{d}(\frac{PY}{Q}, i) - \alpha - \gamma, \tag{2a}$$

$$\frac{V^N}{Q} = \underline{v}(\frac{PY}{Q}, i) + \alpha - \beta, \tag{2b}$$

$$\frac{\overset{*}{G}{}^N}{\overset{*}{Q}} = \overset{*}{\underline{g}}(\frac{\overset{*}{P}\overset{*}{Y}}{\overset{*}{Q}}, \overset{*}{i}). \tag{2c}$$

D^N, V^N, and $\overset{*}{G}{}^N$ are the nominal values of the desired holdings. Q ($\overset{*}{Q}$) is the price deflator for U.S. (German) nonbanks measured in dollars (DM). Each country produces only one good, and the two goods are different. P ($\overset{*}{P}$) is the price of a unit of U.S. (German) output measured in dollars (DM). Y ($\overset{*}{Y}$) is the output of the single good produced in the U.S. (Germany) measured in physical units. α, β, and γ are stochastic disturbance terms associated respectively with shifts by U.S. residents out of demand deposits into Eurodollar deposits, out of Eurodollar deposits into nonreservable instruments, and out of demand deposits into nonreservable instruments. It is assumed that these disturbance terms and those introduced below have zero means and constant variances and that they are mutually and serially uncorrelated.

The following partly linear, partly log-linear approximation of equations (2) will be employed below:

$$D^N = d_0 + d_1 q + d_2 p + d_3 Y - d_4 i - \alpha - \gamma, \tag{3a}$$

$$d_1 = \overline{D}^N - \underline{d}_1 \overline{Y},\ d_2 = \underline{d}_1 \overline{Y},\ d_3 = \underline{d}_1,\ d_4 = - \underline{d}_2$$

$$V^N = v_0 + v_1 q + v_2 p + v_3 Y + v_4 i + \alpha - \beta, \tag{3b}$$

$$v_1 = \bar{V}^N - \underline{v}_1\bar{Y},\ v_2 = \underline{v}_1\bar{Y},\ v_3 = \underline{v}_1,\ v_4 = \underline{v}_2,$$

$$\overset{*}{G}{}^N = \overset{*}{g}_0 + \overset{*}{g}_1\overset{*}{q} + \overset{*}{g}_2\overset{*}{p} + \overset{*}{g}_3\overset{*}{Y} - \overset{*}{g}_4\overset{*}{i}, \tag{3c}$$

$$g_1 = \bar{\overset{*}{G}}{}^N - \overset{*}{\underline{g}}_1\bar{\overset{*}{Y}},\ \overset{*}{g}_2 = \underline{g}_1\bar{\overset{*}{Y}},\ \overset{*}{g}_3 = \overset{*}{\underline{g}}_1,\ \overset{*}{g}_4 = -\overset{*}{\underline{g}}_2.$$

p, q, $\overset{*}{p}$, and $\overset{*}{q}$ are the logarithms of P, Q, $\overset{*}{P}$, and $\overset{*}{Q}$. A bar over a variable denotes its zero-disturbance value, the value that variable would assume if all disturbance terms in the markets for financial instruments and goods were zero. In deriving equations (3) it has been assumed that units are chosen so that $\bar{P} = \bar{Q} = \bar{\overset{*}{P}} = \bar{\overset{*}{Q}} = 1$. d_0, v_0, and $\overset{*}{g}_0$ are constants. $\underline{d}_j$, $\underline{v}_j$, and $\overset{*}{\underline{g}}_j$, $j = 1, 2$, are the derivatives of $\underline{d}$, $\underline{v}$, and $\underline{g}$ with respect to their jth arguments evaluated at the zero-disturbance values of the relevant variables.

Demand deposits can be used directly in making transactions. In this paper U.S. residents' Eurodollar deposits are viewed as short-term deposits that can be converted into demand deposits without much delay. It is assumed that as real incomes rise nonbanks' portfolio preferences shift toward assets that are relatively more useful in making transactions; thus d_j, v_j, and $\overset{*}{g}_j$, $j = 2, 3$ are positive. Furthermore, it is assumed that the real income elasticities of the real demands given by equations (2) are less than or equal to one ($\underline{d}_1\bar{Y}/\bar{D}^N$, $\underline{v}_1\bar{Y}/\bar{V}^N$, $\overset{*}{\underline{g}}_1\bar{\overset{*}{Y}}/\bar{\overset{*}{G}}{}^N \leq 1$), so d_1, v_1, and $\overset{*}{g}_1$ are positive or zero.[8/]

Assumptions made earlier along with one additional assumption that is stated below imply that U.S. (German) nonbanks' demand for any financial instrument can be expressed as a function of one rate of return, the nominal interest rate on variable-rate dollar (DM) instruments. First, the assumptions made above about banking institutions imply that variable-rate instruments denominated in the same currency pay the same rate of interest. Hence nonbanks face at most four different real rates of return: real returns on fixed-rate and variable-rate instruments denominated in each currency. Second, it has been assumed that nonbanks of a given country do not hold fixed-rate instruments denominated in the currency of the other country, thus at most three real rates of return are relevant to nonbanks of a given country. Third, banks guarantee that variable nominal interest rates satisfy uncovered interest parity. Thus, the variable-rate financial instruments considered by nonbanks of a given country offer the same real rate of return. The difference between this real rate of return and the real rate of return on home currency fixed-rate assets is the nominal yield on home currency variable-rate instruments. Finally, it is assumed that for each group of nonbanks only this difference affects the allocation of its net worth between all variable-rate instruments and the home currency fixed-rate instrument.

It is assumed that all nonbanks regard all the instruments in their portfolios as <u>strict gross substitutes</u>.[9/] This assumption implies that whenever the interest rate on a given asset (liability) rises the desired holding of that asset (liability) rises (falls) and the desired holdings of all other assets (liabilities) fall (rise) while the desired holdings of all liabilities (assets) rise (fall). It is also assumed that for each financial instrument <u>the own rate effect exceeds the sum of cross rate effects</u>. This assumption implies that if all variable interest rates rise by the same amount, as they must if the expected rate of depreciation of the dollar remains unchanged, then the desired holdings of each interest bearing asset must rise, the desired holding of each interest bearing liability must fall, and the desired holdings of demand deposits must fall. Thus $\underline{d}_2$ and $\overset{*}{\underline{g}}_2$ are negative, and $\underline{v}_2$ is positive, so d_4, $\overset{*}{g}_4$, and v_4 are all positive.

Two conditions guarantee equilibrium in financial markets.[10/] The demands for both kinds of high-powered money must equal the supplies:

$$H^C = H^B + H^A, \tag{4}$$

$$\overset{*}{A}{}^C = \overset{*}{A}{}^B. \tag{5}$$

It is assumed that U.S. banks hold the high-powered money implied by the required reserve ratio on their demand deposits (k_D), that German banks hold the German high-powered money implied by the required reserve ratio on their demand deposits ($\overset{*}{k}_G$), and that Eurobanks hold the U.S. high-powered money implied by the required reserve ratio on Eurodollar deposits accepted from U.S. residents (k_V).[11/] Furthermore, it is assumed that the reserve ratio for dollar demand deposits is greater than the reserve ratio for Eurodollar deposits of U.S. residents ($k_D > k_V$). Thus equilibrium conditions for the two high-powered money markets can be written as

$$H^C = h_0 + h_1 q + h_2 p + h_3 Y - h_4 i - (k_D - k_V)\alpha - k_V\beta - k_D\gamma, \tag{6}$$

$$h_j = k_D d_j + k_V v_j,\ j = 0, 1, 2, 3;\ h_4 = k_D d_4 - k_V v_4,$$

$$\overset{*}{A}{}^C = \overset{*}{a}_0 + \overset{*}{a}_1 \overset{*}{q} + \overset{*}{a}_2 \overset{*}{p} + \overset{*}{a}_3 \overset{*}{Y} - \overset{*}{a}_4 \overset{*}{i}, \tag{7}$$

$$\overset{*}{a}_j = \overset{*}{k}_G \overset{*}{g}_j,\ j = 0, 1, 2, 3, 4.$$

It follows from assumptions made above that the demand for U.S. (German) high-powered money depends positively on the (logarithms of the) U.S. (German) price deflator and price of U.S. (German) output as well as on U.S. (German) output and that the demand for German high-powered money depends negatively on $\overset{*}{i}$. However, it must be established that the demand for U.S. high-powered money depends negatively on i. Given the assumptions made above about non-banks' demands for financial instruments it is an implication of the balance sheet constraint for U.S. residents that

$$\overset{(-)}{D_i^N} + \overset{(+)}{V_i^N} \equiv \overset{(-)}{L_i^N} + E(\overset{(-)}{S_i^N} - \overset{(+)}{X_i^N}) < 0, \tag{8}$$

where $D_i^N = -d_4$ and $V_i^N = v_4$. $-h_4 = -(k_D d_4 - k_V v_4)$ is more negative than k_D times the left hand side of (8) because $k_D > k_V$, so U.S. high-powered money demand must respond negatively to i.

Now, attention is turned to the real sector of the model. Equilibrium output in the U.S. (Y) and Germany ($\overset{*}{Y}$) must be equal to aggregate demand for that output:

$$Y = y_0 + y_1 Y + y_2 \overset{*}{Y} - y_3 r - y_4 \overset{*}{r} + y_5 t + \lambda + \mu, \tag{9}$$

$$\overset{*}{Y} = \overset{*}{y}_0 + \overset{*}{y}_1 \overset{*}{Y} + \overset{*}{y}_2 Y - \overset{*}{y}_3 \overset{*}{r} - \overset{*}{y}_4 r - y_5 t - \mu. \tag{10}$$

The demands for both U.S. and German output respond positively to both countries' income (outputs), and the sums of the marginal propensities to consume the two goods is less than one in both countries ($y_1 + \overset{*}{y}_2 < 1$, $\overset{*}{y}_1 + y_2 < 1$). The demands for both outputs respond negatively to both the expected real return to saving for U.S. residents (r) which is given by

$$r = i - (\bar{q} - q), \tag{11}$$

and the expected real return to saving for German residents ($\overset{*}{r}$) which is given by

$$\overset{*}{r} = \overset{*}{i} - (\overline{\overset{*}{q}} - \overset{*}{q}), \tag{12}$$

where $\bar{q}$ and $\overline{\overset{*}{q}}$ are the zero-disturbance values of the (logarithms of the) U.S. and German price deflators. The (logarithm of the) price deflator for residents of each country is a weighted average of the (logarithms of the) prices of the two goods expressed in that country's currency:

$$q = \delta p + (1 - \delta)(e + \overset{*}{p}), \tag{13}$$

$$\overset{*}{q} = (1 - \overset{*}{\delta})(p - e) + \overset{*}{\delta}\overset{*}{p}, \tag{14}$$

where δ and $\overset{*}{\delta}$ represent the ratio of spending on home output to total spending in the U.S. and Germany respectively. Demand for the U.S. (German) good responds positively (negatively) to the (logarithm of the) relative price of the German good (t) which is given by

$$t = e + \overset{*}{p} - p. \tag{15}$$

It is assumed that trade is initially balanced and that units are defined so that one unit of the German good would trade for one unit of the U.S. good if all disturbances were zero. Under these assumptions the responsivenesses of the demands for U.S. and German goods to the relative price of the German good are equal in absolute value. λ and μ are stochastic terms which represent respectively shifts up in the demand for the U.S. good alone and shifts up in the demand for the U.S. good at the expense of the German good.

Equilibrium output in the U.S. and Germany must also be equal to aggregate supply:

$$Y = \overline{Y} + \frac{1}{f}(p - \overline{p}), \tag{16}$$

$$\overset{*}{Y} = \overline{\overset{*}{Y}} + \frac{1}{\overset{*}{f}}(\overset{*}{p} - \overline{\overset{*}{p}}). \tag{17}$$

The deviations of actual outputs $(Y, \overset{*}{Y})$ from their zero-disturbance values $(\overline{Y}, \overline{\overset{*}{Y}})$ depend positively on the deviations of the (logarithms of) actual prices $(p, \overset{*}{p})$ from their zero-disturbance values $(\overline{p}, \overline{\overset{*}{p}})$.12/

The description of the model is now complete. It is convenient to obtain equilibrium conditions for the markets for the U.S. good, the German good, U.S. high-powered money, and German high-powered money as functions of U.S. output, German output, the representative dollar nominal interest rate, the exchange rate, and the German high-powered money supply:13/

$$-\ y_Y\hat{Y} + y_{\overset{*}{Y}}\hat{\overset{*}{Y}} - y_i\hat{i} + y_e\hat{e} \qquad = -\lambda - \mu, \tag{18a}$$

$$\overset{*}{y}_Y\hat{Y} - \overset{*}{y}_{\overset{*}{Y}}\hat{\overset{*}{Y}} - \overset{*}{y}_i\hat{i} - \overset{*}{y}_e\hat{e} \qquad = \mu, \tag{18b}$$

$$h_Y\hat{Y} \qquad - h_i\hat{i} \qquad = (k_D - k_V)\alpha + k_V\beta + k_D\gamma, \tag{18c}$$

$$\overset{*}{a}_{\overset{*}{Y}}\hat{\overset{*}{Y}} - \overset{*}{a}_i\hat{i} - \overset{*}{a}_e\hat{e} - \hat{\overset{*}{A}}{}^C = 0, \tag{18d}$$

where

$$y_Y = 1 - y_1 + f[\delta y_3 + (1 - \overset{*}{\delta})y_4 + y_5], \qquad h_Y = h_2 f + h_3,$$

$$y_{\overset{*}{Y}} = y_2 + \overset{*}{f}[-\ (1 - \delta)y_3 - \overset{*}{\delta}y_4 + y_5],$$

$$y_i = y_3 + y_4, \qquad h_i = h_4,$$

$$y_e = y_5 - (1 - \delta)y_3 - \overset{*}{\delta}y_4$$

$$\hat{y}_Y = \hat{y}_2 + f[-(1 - \hat{\delta})\hat{y}_3 - \delta\hat{y}_4 + y_5],$$

$$\hat{y}^*_Y = 1 - \hat{y}_1 + \hat{f}[\hat{\delta}\hat{y}_3 + (1 - \delta)\hat{y}_4 + y_5], \qquad \hat{a}^*_Y = \hat{a}_2\hat{f} + \hat{a}_3,$$

$$\hat{y}_i = \hat{y}_3 + \hat{y}_4, \qquad \hat{a}_i = \hat{a}_4,$$

$$\hat{y}_e = y_5 + \hat{\delta}\hat{y}_3 + (1 - \delta)\hat{y}_4 \qquad \hat{a}_e = \hat{a}_4.$$

In equations (18) a hat over a variable represents the deviation of that variable from its zero disturbance value. Furthermore, in order to simplify the analysis we have assumed that the income elasticities of the three deposit demands given by equations (3) are equal to one so that $d_1 = v_1 = \hat{g}_1 = h_1 = \hat{a}_1 = 0$.[14/] An increase in U.S. (German) output has a negative direct effect on excess demand for U.S. (German) output and a negative indirect effect which occurs because the associated increase in the U.S. (German) price level implies higher real interest rates and a lower (higher) relative price for the German good. An increase in German (U.S.) output has a positive direct effect on excess demand for U.S. (German) output and indirect effects through associated changes in the relative price and real interest rates. The positive relative price effect is assumed to dominate the negative real interest rate effects. An increase in U.S. (German) output increases excess demand for U.S. (German) high-powered money directly and indirectly through the associated rise in the price of the U.S. (German) good. The representative dollar nominal interest rate is positively associated with the real interest rates and negatively associated with excess demand in all four markets. The exchange rate is positively associated with the German nominal interest rate, both real interest rates, and the relative price of the

foreign good. It follows that a depreciation of the dollar ($\hat{e} > 0$) definitely reduces excess demand in the German high-powered money and German output markets. It is assumed that the positive relative price effect dominates the negative real interest rate effects so that a depreciation raises excess demand for U.S. output. Thus, under the assumptions laid out above all of the coefficients in equations (18) are positive. The four equations (18) determine $\hat{Y}$, $\hat{\overset{*}{Y}}$, $\hat{i}$, and either (under fixed exchange rates) $\hat{\overset{*}{A}}^C$ or (under flexible exchange rates) $\hat{e}$ given an unchanging value of the exogenous U.S. high-powered money supply and the disturbances α, β, γ, λ, and μ.

The policy change considered in this paper is the imposition of a reserve requirement on the Eurodollar deposits of U.S. residents at both U.S. and German owned Eurobanks with the payment of interest on required reserves. If the cooperation of the German monetary authorities were not obtained, only the subset of those deposits consisting of deposits at U.S. owned Eurobanks could be reserved. However, since interest would be paid on required reserves, U.S. owned Eurobanks would incur no opportunity cost when they held reserves, would not be placed at a competitive disadvantage, and would not lose the reserved deposits to German owned Eurobanks. Thus, reserving only the subset of deposits at U.S. owned Eurobanks would have qualitative effects similar to those of reserving all the deposits. Of course, the cooperation of the German monetary authorities would be more likely if the reserve requirement helped them achieve their macroeconomic goal.

In order to determine the circumstances under which monetary authorities might find it desirable to place a reserve requirement on the Eurodollar deposits of U.S. residents it is necessary to specify the goals and operating strategies of the monetary authorities. The goal of the authorities in each country is to minimize deviations of output from a desired level. Since it is assumed that the monetary authorities do not observe Y, $\overset{*}{Y}$, or the five disturbances, the operating strategy for each monetary authority involves setting its policy instrument so that the expected value of its country's output equals the desired value. The policy instrument of the U.S. authorities is always the U.S. high-powered money supply. Under fixed exchange rates the policy instrument of the German authorities is the exchange rate, while under flexible exchange rates it is the German high-powered money supply. Since policy instruments are set before the values of current disturbances are known, there are generally deviations between the actual values of outputs and their desired (and their expected) values. However, the size of these deviations can be influenced by the exchange rate regime and reserve requirements.

The purpose of the remainder of this paper is to determine how deviations of U.S. and German outputs from their desired values are affected when the reserve ratio for Eurodollar deposits held by U.S. residents is increased. It is assumed that k_V can be varied within a range which has a lower limit of zero and an upper limit of the exogenous reserve requirement on demand deposits. Given the earlier assumption that the disturbance terms are mutually uncorrelated, it is possible to consider the effect of an increase in k_V when each of the stochastic shifts is the only source of uncertainty. These effects can then be combined to obtain the overall effect of an increase in k_V.

III. Fixed Exchange Rates

In this section it is assumed that the Bundesbank keeps the exchange rate fixed ($\hat{e} = 0$) by varying the supply of German high-powered money with exchanges of German high-powered money for DM claims on nonbanks and the German Treasury.[15/] Under this assumption the change in the German high-powered money supply is determined recursively by the change in German high-powered money demand, so equation (18d) can be ignored.

Figure 1 is useful in illustrating the workings of the model under fixed exchange rates. Given a value of $\overset{*}{Y}$ the YY, $\overset{**}{YY}$, and HH schedules represent the pairs of i and Y which clear the markets for U.S. output, German output, and U.S. high-powered money. The signs of the slopes of these schedules are implications of the previously made assumptions about the coefficients in equations (18). However, these earlier assumptions do not determine the relative slopes of the $\overset{**}{YY}$ and HH schedules. The implications of alternative assumptions about the relative slopes of these schedules will be pointed out at later stages in the analysis. As $\overset{*}{Y}$ rises the YY and $\overset{**}{YY}$ schedules in Figure 1 shift. The $\overset{**}{YY}$ schedule shifts southeast, for instance from $\overset{**}{YY}_0$ to $\overset{**}{YY}_1$, reflecting the negative influence of $\overset{*}{Y}$ on the excess demand for German output. The YY schedule shifts northeast, for instance from YY_0 to YY_1, reflecting the positive influence of $\overset{*}{Y}$ on the demand for U.S. goods. The remaining schedule, $Y\overset{*}{Y}$, is the locus of combinations of i, Y, and (implicitly) $\overset{*}{Y}$ that clear the U.S. and German goods markets. The $Y\overset{*}{Y}$ schedule has a negative slope and is flatter than the YY schedule. Consider a rise in $\overset{*}{Y}$ at a fixed i. The increase in Y required to clear the German goods market ($Y_b - Y_0$) is larger than the increase in Y

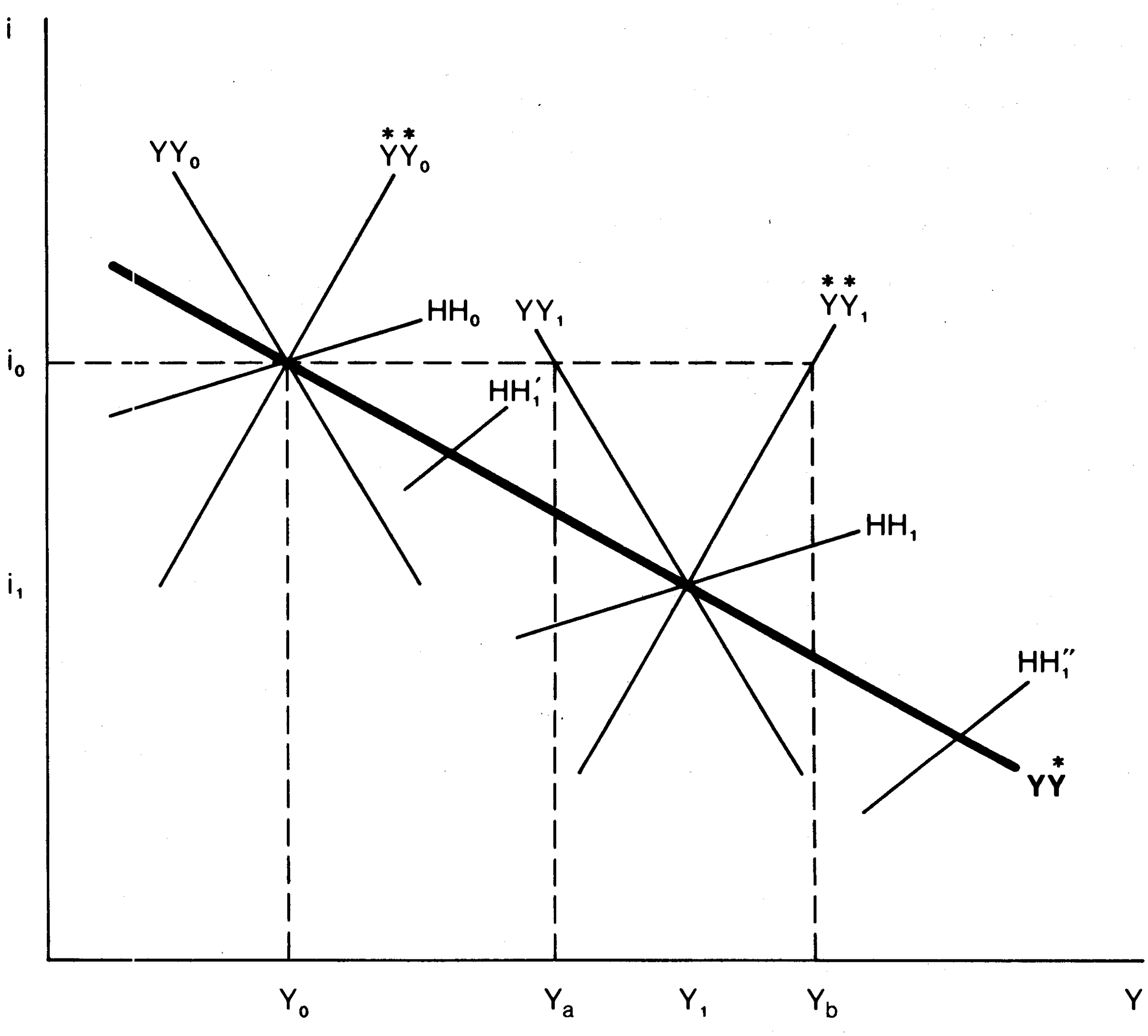

Figure 1. Shifts in asset demands, fixed exchange rates

required to clear the U.S. goods market ($Y_a - Y_0$); thus the $\overset{**}{YY}$ schedule shifts farther to the right than the YY schedule. Since the YY and $\overset{**}{YY}$ schedules always intersect along the $\overset{*}{YY}$ schedule, the $\overset{*}{YY}$ schedule has a negative slope and is flatter than the YY schedule.

The familiar analysis of the implications of fixing the money supply in a closed economy provides some initial intuition about the circumstances under which an increase in k_V would be desirable, at least from the U.S. point of view.[16/] If the money supply in a closed economy is fixed and there are no disturbances in the goods market so that the IS curve is stable, the variance of output is lower the smaller are disturbances in the money market, that is, the more stable the LM curve.[17/] Furthermore, if there are disturbances in the goods market, fixing the money supply is more successful at dampening these disturbances when the income responsiveness of the demand for money is high and the interest rate responsiveness of the demand for money is low in absolute value, that is, when the LM curve is steep.

In our framework under fixed exchange rates the U.S. authorities have adopted a policy of fixing the monetary base but the Eurodollar reserve requirement can be set so as to complement that policy. Specificially, the analogue of the closed-economy IS schedule is the $\overset{*}{YY}$ schedule, and the analogue of the closed economy LM schedule is the HH schedule. By varying the Eurodollar reserve requirement, k_V, the policy maker changes both the magnitude of the exogenous shifts in the HH schedule and the slope of that schedule.

Consider the effects of an increase in k_V on the shifts in the HH schedule caused by exogenous disturbances. First, given $k_V < k_D$ an increase in k_V decreases the absolute value of shifts in the HH schedule resulting from shifts between demand deposits and Eurodollar deposits (α). Second, an increase in k_V increases the absolute value of the shifts in the HH schedule resulting from shifts between Eurodollar deposits and nonreservable instruments.

Now consider the effect of an increase in k_V on the slope of the HH schedule. First, an increase in k_V raises the responsiveness of the demand for U.S. high-powered money to changes in U.S. output (h_Y):

$$\frac{\partial h_Y}{\partial k_V} = v_2 f + v_3 > 0. \tag{19}$$

h_Y rises because increasing k_V raises the weight on U.S. residents' demand for Eurodollars in the demand for H. The demand for Eurodollars responds positively to an increase in Y because of the direct effect of the increase in Y (v_3) and because of the indirect effect of the associated increases in p ($v_2 f$). Second, an increase in k_V reduces the absolute value of the responsiveness of the demand for U.S. high-powered money to changes in the representative dollar interest rate (h_i):

$$\frac{\partial h_i}{\partial k_V} = - v_4 < 0. \tag{20}$$

h_i is equal to the negative of the weighted sum of the interest rate responsiveness of the nominal demands for demand deposits and Eurodollar deposits where the weights are the appropriate reserve requirements. Since the interest responsiveness of Eurodollars is positive, h_i falls when k_V rises. As a result of the rise in h_Y and the fall in h_i, the slope of the HH schedule increases.

The various effects of an increase in k_V on the HH schedule often have conflicting implications for the dampening influence of this increase. We suggest an approach which can sometimes be used to resolve these conflicts.

It is useful to explain this approach in the course of analyzing a particular disturbance, a shift from demand deposits to Eurodeposits. The impact effect of this disturbance is an excess supply of H which implies a shift of HH from HH_0 to HH_1. This excess supply puts downward pressure on the interest rate which induces excess demand in both goods markets and results in increases in both types of output. The increase in $\overset{*}{Y}$ shifts the $\overset{**}{YY}$ schedule to the southeast and the YY schedule to the northeast. At the new equilibrium represented by the point (Y_1, i_1), Y and $\overset{*}{Y}$ are higher, and i is lower.

It is not immediately clear whether an increase in k_V dampens or amplifies the increases in Y and $\overset{*}{Y}$. It is definitely true that the impact effect of the disturbance on the excess supply of U.S. high-powered money is smaller and that the HH schedule is steeper. However, it is not clear whether the net result of these changes is to produce a shift in the HH schedule along the $Y\overset{*}{Y}$ schedule which is smaller (HH_1') or larger (H_1''). Although the smaller impact effect and the increased income responsiveness imply a smaller shift, the decreased absolute interest rate responsiveness implies a larger shift.

Our approach to resolving this ambiguity is based on the observation that if there is an excess demand for (supply of) H given the initial equilibrating responses of i and Y (i_1 and Y_1), then the HH_1' (H_1'') schedule is relevant so that an increase in k_V dampens (amplifies) the increase in Y, the decrease in i, and the increase in $\overset{*}{Y}$. Our approach consists of holding the initial equilibrating responses of the endogenous variables constant, raising the reserve requirement on Eurodollar deposits, and determining whether there is an excess demand for or supply of H.[18/]

To apply this approach to the shift from demand deposits to Eurodeposits note that the change in the excess demand for U.S. high-powered money $(\widehat{EXDH}/\alpha)$ resulting from the initial equilibrating responses of Y and i to a positive α $(\hat{Y}/\alpha$ and $\hat{i}/\alpha)$ must be zero:[19/]

$$0 = \frac{\widehat{EXDH}}{\alpha} = h_Y\frac{\hat{Y}}{\alpha} - h_i\frac{\hat{i}}{\alpha} - (k_D - k_V). \tag{21}$$

Holding the initial equilibrating responses of Y and i the same, the effect of an increase in k_V on the change in excess demand resulting from a positive α is given by

$$\frac{\partial(\widehat{EXDH}/\alpha)}{\partial k_V} = \overset{(+)}{\frac{\partial h_Y}{\partial k_V}}\,\overset{(+)}{\frac{\hat{Y}}{\alpha}} - \overset{(-)}{\frac{\partial h_i}{\partial k_V}}\,\overset{(-)}{\frac{\hat{i}}{\alpha}} + 1. \tag{22}$$

The disturbance has a smaller impact on excess supply, and the initial equilibrating increase in Y creates more excess demand, but the initial equilibrating decline in i creates more excess supply. To see that the former effects outweigh the latter effect divide (21) by $k_D - k_V$ and add the result to (22) to obtain

$$\frac{\partial(\widehat{EXDH}/\alpha)}{\partial k_V} = \overset{(+)}{\left(\frac{\partial h_Y}{\partial k_V} + \frac{h_Y}{(k_D - k_V)}\right)}\overset{(+)}{\frac{\hat{Y}}{\alpha}} - \overset{(+)}{\left(\frac{\partial h_i}{\partial k_V} + \frac{h_i}{k_D - k_V}\right)}\overset{(-)}{\frac{\hat{i}}{\alpha}} > 0. \tag{23}$$

(23) is positive because the term in the last set of parentheses on the right hand side has the same sign as

$$(k_D - k_V)\frac{\partial h_i}{\partial k_V} + h_i = k_D(d_4 - v_4) > 0, \tag{24}$$

which is positive by the earlier proof that $h_i = k_D d_4 - k_V v_4 > 0$ for all $k_D \geq k_V$. Thus, an increase in k_V creates an excess demand for H holding the equilibrating responses of the endogenous variables constant; the HH_1' schedule is relevant, and raising k_V dampens the equilibrating responses of Y and $\overset{*}{Y}$ to a shift from demand deposits to Eurodeposits.[20/]

The remaining two shifts in asset demands are also defined so that their impact effect is an increase in the excess supply of H that shifts the HH schedule from HH_0 to HH_1 in Figure 1. Thus, they both have the same qualitative effects on the endogenous variables as a shift from demand deposits to Eurodeposits. However, the implications of raising k_V are not the same for all the asset shifts.

Consider a shift from Eurodeposits to a nonreservable instrument. For this shift an increase in k_V implies that the impact effect on the excess supply of H is larger rather than smaller. Once again it is not immediately apparent whether HH_1' or HH_1'' is relevant. Although the increased income responsiveness implies a smaller shift, the larger impact effect and decreased absolute interest responsiveness imply a larger shift. It is now demonstrated that the latter two effects dominate. The initial equilibrating responses of Y and i must clear the market for U.S. high-powered money:

$$0 = \frac{\widehat{EXDH}}{\beta} = h_Y \frac{\hat{Y}}{\beta} - h_i \frac{\hat{i}}{\beta} - k_V. \tag{25}$$

Differentiating with respect to k_V holding the initial equilibrating responses of the endogenous variables constant yields

$$\frac{\partial(\widehat{EXDH}/\beta)}{\partial k_V} = \overset{(+)}{\frac{\partial h_Y}{\partial k_V}} \overset{(+)}{\frac{\hat{Y}}{\beta}} - \overset{(-)}{\frac{\partial h_i}{\partial k_V}} \overset{(-)}{\frac{\hat{i}}{\beta}} - 1. \tag{26}$$

Dividing (25) by k_V and subtracting the result from (26) implies

$$\frac{\partial(\widehat{EXDH}/\beta)}{\partial k_V} = (\overset{(-)}{\frac{\partial h_Y}{\partial k_V}} - \overset{(+)}{\frac{h_Y}{k_V}})\frac{\hat{Y}}{\beta} - (\overset{(-)}{\frac{\partial h_i}{\partial k_V}} - \overset{(-)}{\frac{h_i}{k_V}})\frac{\hat{i}}{\beta} < 0, \tag{27}$$

since the term in the first set of parentheses has the same sign as

$$k_V\frac{\partial h_Y}{\partial k_V} - h_Y = -k_D(d_2 f + d_3) < 0. \tag{28}$$

Thus, an increase in k_V creates an excess supply of H; the H_1'' schedule is relevant, and increasing k_V amplifies the equilibrating responses of Y and $\overset{*}{Y}$ to a shift from Eurodeposits to nonreservable assets.21/

As the final shift in asset demands consider a shift from demand deposits to a nonreservable instrument. In contrast to both of the previous two shifts, the impact effect of the shift on excess supply is not changed by an increase in k_V. Once again it is not immediately apparent whether HH_1' or H_1'' is relevant since the increased income responsiveness and decreased absolute interest responsiveness work in opposing directions. However, in this case the ambiguity cannot be resolved without further restrictions on asset demands. The initial equilibrating responses of Y and i must clear the market for U.S. high-powered money:

$$0 = \frac{\widehat{EXDH}}{\gamma} = h_Y\frac{\hat{Y}}{\gamma} - h_i\frac{\hat{i}}{\gamma} - k_D. \tag{29}$$

Differentiating with respect to k_V yields

$$\partial(\frac{\widehat{EXDH}}{\gamma})/\partial k_V = \overset{(+)}{\frac{\partial h_Y}{\partial k_V}}\overset{(+)}{\frac{\hat{Y}}{\gamma}} - \overset{(-)}{\frac{\partial h_i}{\partial k_V}}\overset{(-)}{\frac{\hat{i}}{\gamma}} \gtrless 0. \tag{30}$$

The stronger the output and price responsivenesses of the demand for Eurodeposits (that is, the larger $\frac{\partial h_Y}{\partial k_V}$) and the weaker the interest rate responsiveness of the demand for Eurodeposits (that is, the smaller $-\frac{\partial h_i}{\partial k_V}$) the more likely it is that an increase in k_V will create excess demand and, therefore, reduce the change in Y induced by shifts between demand deposits and nonreservable instruments.[22/]

The first shift in the demand for goods to be considered is a shift up in the demand for the U.S. good alone. In terms of Figure 2, the increase in demand for the U.S. good shifts the YY schedule to the right, say to YY_1. Consider the changes in Y and i that clear the U.S. and German goods markets at a constant $\overset{*}{Y}$. The increased demand for the U.S. good causes U.S. output to increase. The rise in Y implies an excess demand for the German good which can only be offset by a rise in i. The higher values of Y and i that clear the two goods markets are represented by the point (i_1, Y_1). Note that (i_1, Y_1) is a point on the new $Y\overset{*}{Y}$ schedule $Y\overset{*}{Y}_1$.

In the new equilibrium i and Y are definitely higher than their pre-disturbance values as indicated by the intersection of $Y\overset{*}{Y}_1$ and HH_0 at the point (i_2, Y_2). To determine whether $\overset{*}{Y}$ will rise or fall consider the point (i_1, Y_1). If HH is flatter than $\overset{**}{YY}$ so that this point implies an excess supply of H as in Figure 2, then $\overset{*}{Y}$ must be higher in the new equilibrium. The increase in $\overset{*}{Y}$ shifts the YY and $\overset{**}{YY}$ schedules southeast along $Y\overset{*}{Y}_1$ from (i_1, Y_1) to (i_2, Y_2). If HH were steeper than $\overset{**}{YY}$ so that the point (i_1, Y_1) implied an excess demand for H, then $\overset{*}{Y}$ would be lower in the new equilibrium.

When k_V is increased, the slope of the HH schedule becomes steeper (HH rotates from HH_0 to HH_0') unambiguously dampening the increase in Y and amplifying the increase in i. The smaller increase in Y and the larger increase in i both work to decrease the final value of $\overset{*}{Y}$. Therefore, if $\overset{*}{Y}$ rises (falls) with a shift up in demand for U.S. good alone then an increase in k_V dampens (amplifies) the response of $\overset{*}{Y}$.[23/]

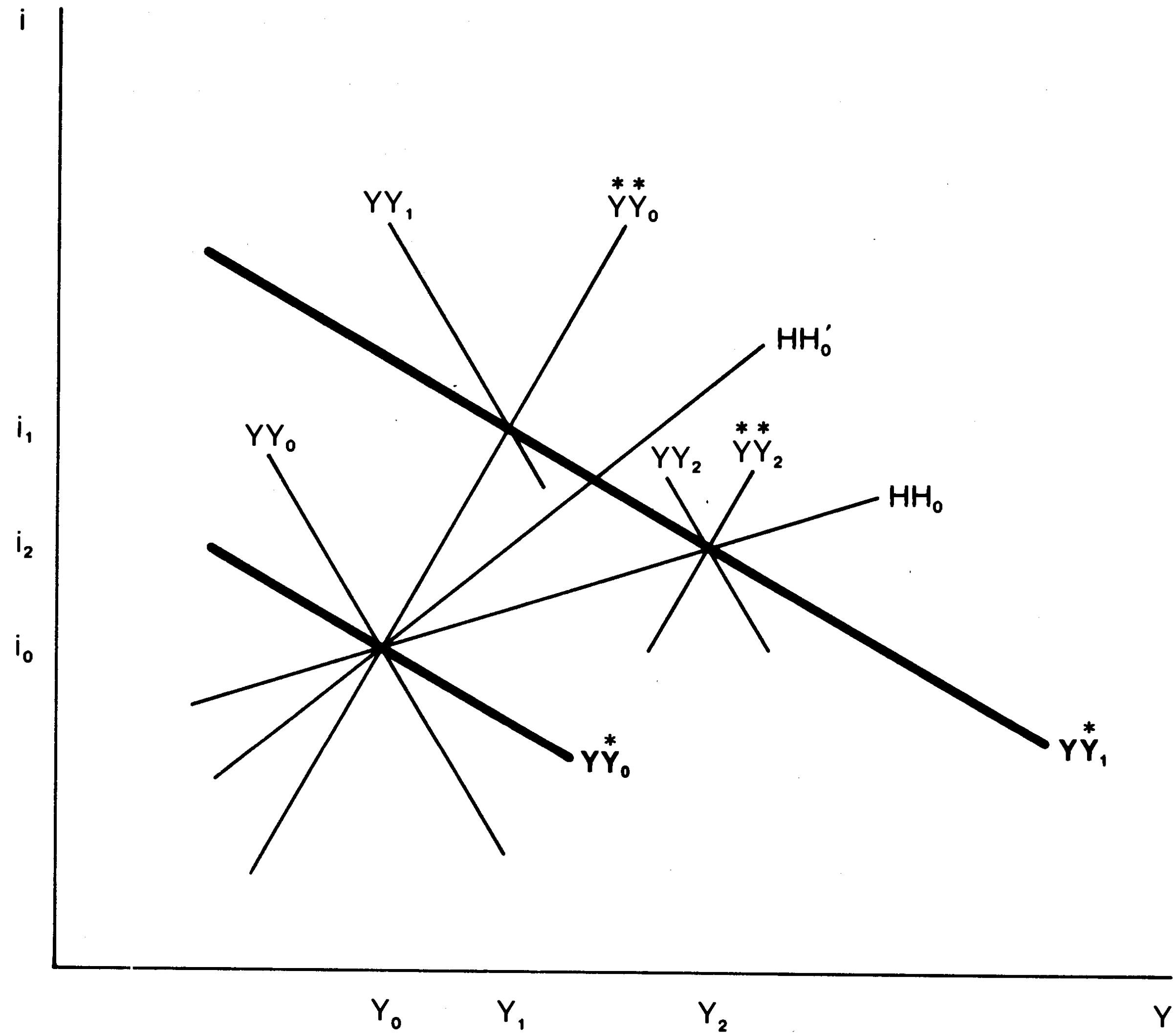

Figure 2. Shift up in demand for U.S. good alone, fixed exchange rates

Now consider a shift in demand from the German good to the U.S. good. In terms of Figure 3 this disturbance shifts YY_0, $\overset{**}{YY}_0$, and $Y\overset{*}{Y}_0$ to YY_1, $\overset{**}{YY}_1$, and $Y\overset{*}{Y}_1$. At a fixed i and $\overset{*}{Y}$ the increase in Y which clears the German goods market $(Y_b - Y_0)$ must be larger than the increase in Y which clears the U.S. goods market $(Y_a - Y_0)$. Hence $\overset{**}{YY}$ shifts further to the right than YY, and at their new intersection (i_1, Y_1) the interest rate is lower.

At (i_1, Y_1) there is an excess demand for H, hence $\overset{*}{Y}$ and Y fall, and i rises shifting the goods market schedules to the northwest. As for the final equilibrium values, Y and i definitely rise, and $\overset{*}{Y}$ definitely falls.

Once again, when k_V is increased the HH schedule becomes steeper (rotates from HH_0 to HH_0') dampening the increase in Y and amplifying the increase in i. As before, the smaller increase in Y and the larger increase in i work to decrease the final value of $\overset{*}{Y}$. Since $\overset{*}{Y}$ unambiguously falls with a demand shift from German to U.S. goods, this decrease in the final value amplifies the response of $\overset{*}{Y}$.[24]

IV. Flexible Exchange Rates

In this section it is assumed that the Bundesbank sets the supply of German high-powered money ($\hat{\overset{*}{A}}{}^{C} = 0$) and allows the exchange rate to vary. Under this assumption all four of equations (18) are employed in determining $\hat{Y}$, $\hat{\overset{*}{Y}}$, and $\hat{i}$ as well as $\hat{e}$.

Figure 4 is useful in illustrating the workings of the model under flexible exchange rates. Given values of $\overset{*}{Y}$ and e, the YY, $\overset{**}{YY}$, HH, and AA schedules represent the pairs of i and Y which clear the markets for U.S. output, German output, U.S. high-powered money, and German high-powered money. The signs of the slopes of these schedules are implications of the previously made assumptions about the coefficients in equations (18).

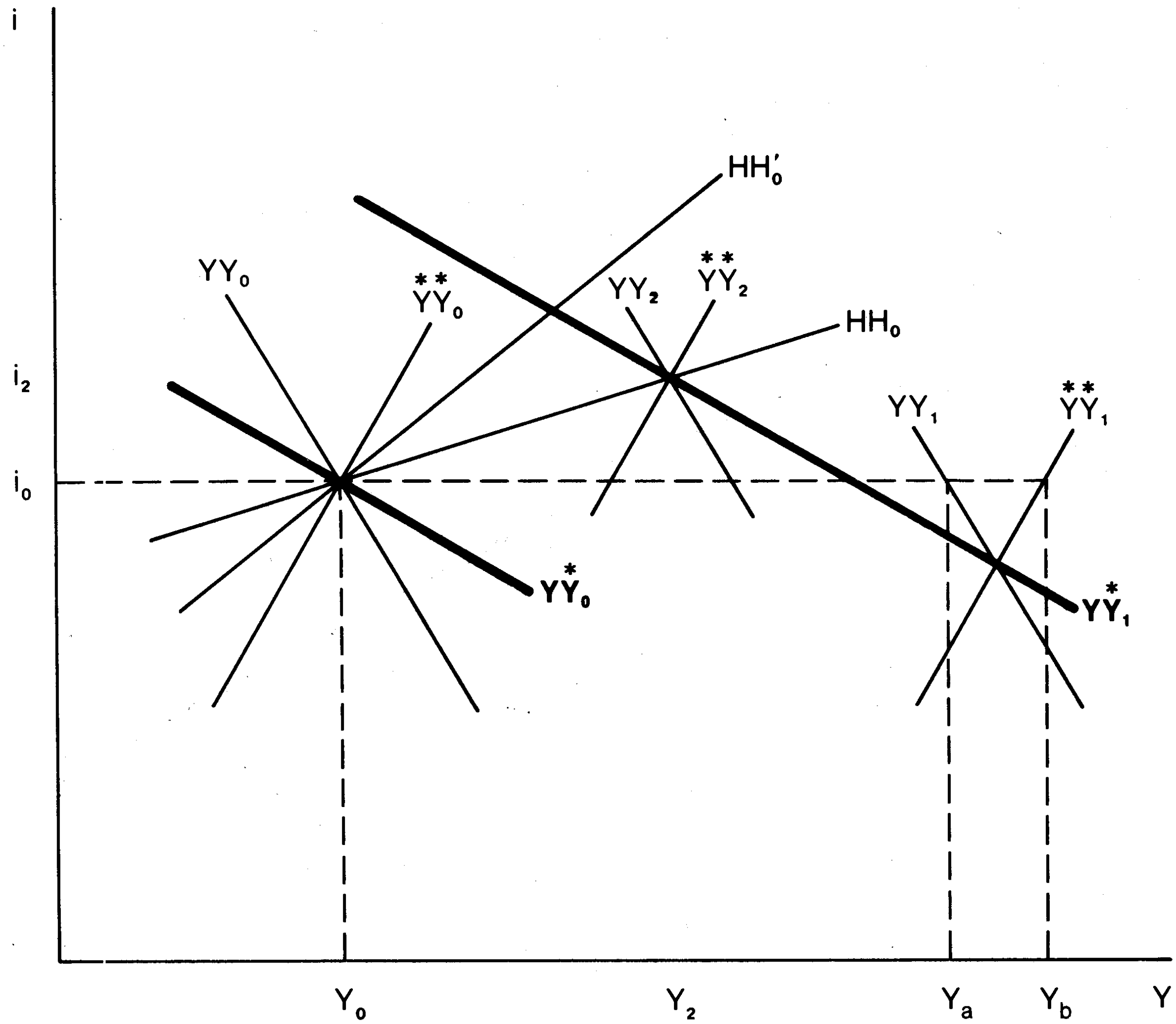

Figure 3. Shift from German good to U.S. good, fixed exchange rates

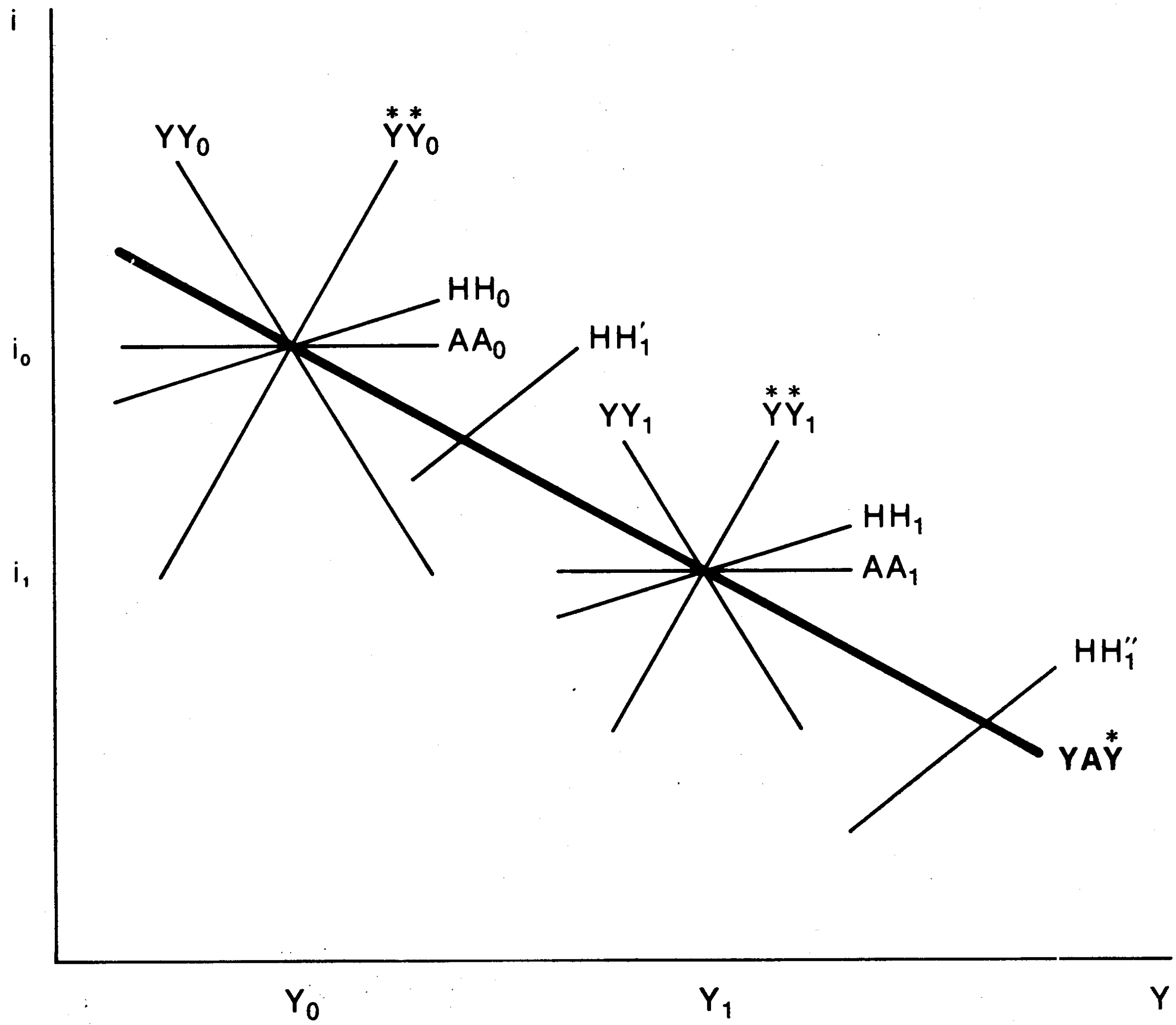

Figure 4. Shifts in asset demands, flexible exchange rates

As noted above these earlier assumptions do not determine the relative slopes of the $\overset{**}{YY}$ and HH schedules. The implications of alternative assumptions about the relative slopes of these schedules will be pointed out at later stages in the analysis.

Under flexible exchange rates the analogue of the closed-economy IS curve is the $YA\overset{*}{Y}$ schedule in Figure 4. This schedule is the locus of combinations of i, Y, and (implicitly) $\overset{*}{Y}$ and e that clear both goods markets and the German high-powered money market.

Figure 5 is useful in establishing the important properties of the $YA\overset{*}{Y}$ schedule. Given values of i and e, the $\overset{\sim\sim}{YY}$, $\overset{\sim\sim}{\overset{**}{YY}}$, and $\overset{\sim\sim}{AA}$ schedules represent the pairs of Y and $\overset{*}{Y}$ which clear the markets for U.S. output, German output, and German high-powered money. The signs of the slopes of these schedules and their relative slopes are implications of previously made assumptions about the coefficients in equations (18). The $\tilde{Y}\overset{*}{Y}$ schedule represents the combinations of Y, $\overset{*}{Y}$, and (implicitly) e which clear both the markets for U.S. and German output. To determine the slope of the $\tilde{Y}\overset{*}{Y}$ schedule, consider a rise in e at a fixed $\overset{*}{Y}$ and i. The increase in Y required to clear the German goods market $(Y_b - Y_0)$ is larger than the increase in Y required to clear the U.S. goods market $(Y_a - Y_0)$, so the $\overset{\sim\sim}{\overset{**}{YY}}$ schedule shifts farther to the right than the $\overset{\sim\sim}{YY}$ schedule. Since the $\overset{\sim\sim}{YY}$ and $\overset{\sim\sim}{\overset{**}{YY}}$ schedule always intersect along the $\tilde{Y}\overset{*}{Y}$ schedule, the $\tilde{Y}\overset{*}{Y}$ schedule has a negative slope.

Now the properties of the $YA\overset{*}{Y}$ schedule can be established using Figure 5. First, note that a decrease in i with e constant creates excess demand in all three markets. Thus it shifts the $\overset{\sim\sim}{AA}$ schedule to the south, the $\overset{\sim\sim}{YY}$ to the southeast, and the $\overset{\sim\sim}{\overset{**}{YY}}$ schedule to the northwest, for example to $\overset{\sim\sim}{AA}_2$, $\overset{\sim\sim}{YY}_2$, and $\overset{\sim\sim}{\overset{**}{YY}}_2$. Second, note that the new $\tilde{Y}\overset{*}{Y}$ schedule $(\tilde{Y}\overset{*}{Y}_2)$ passes through the

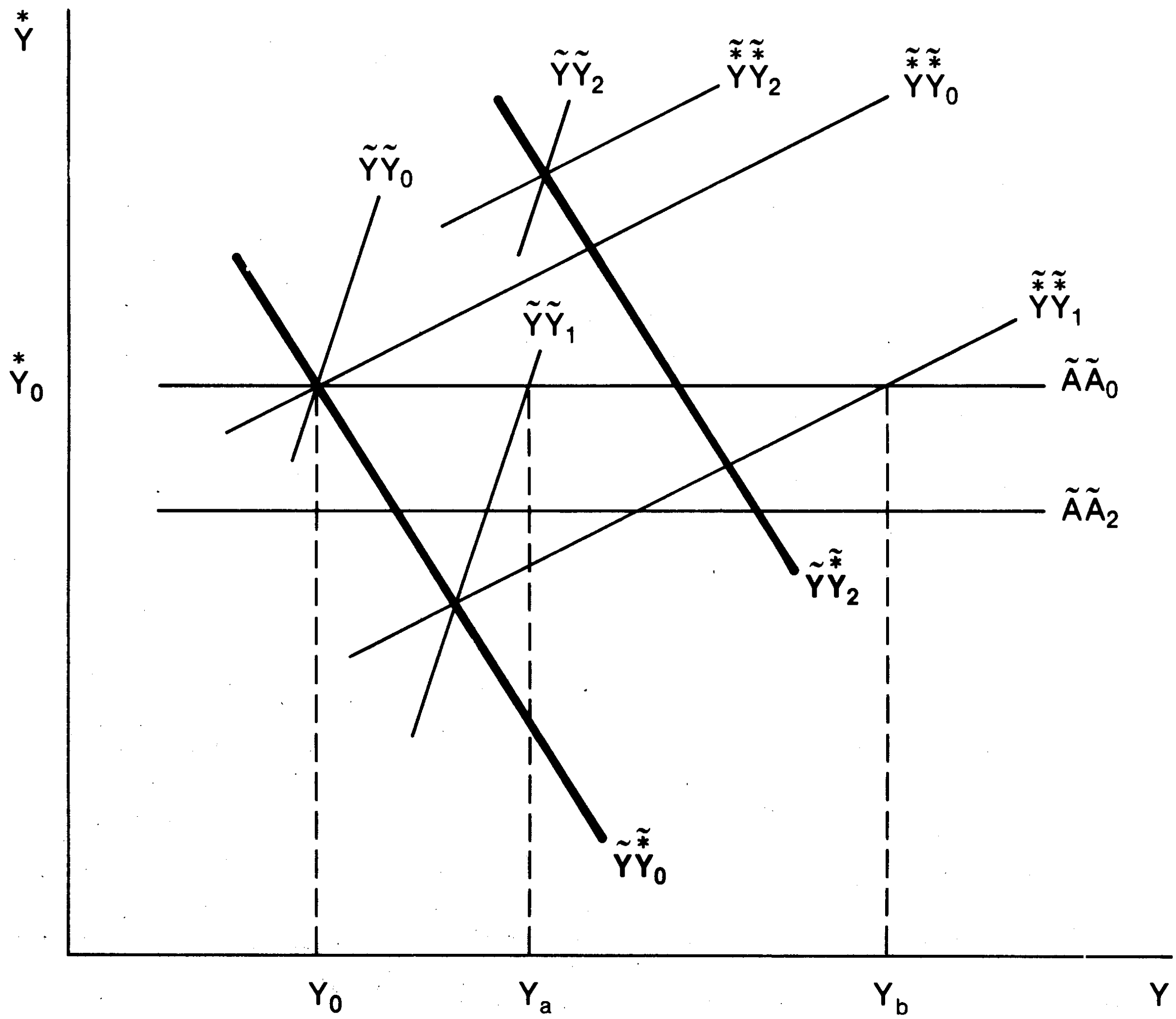

Figure 5. Derivation of $YA\overset{*}{Y}$ schedule, flexible exchange rates

intersection of $\widetilde{YY}_2$ and $\widetilde{\overset{**}{YY}}_2$. Third, note that as e rises $\widetilde{YY}$ and $\widetilde{\overset{**}{YY}}$ shift from $\widetilde{YY}_2$ and $\widetilde{\overset{**}{YY}}_2$ to the southeast along $\widetilde{Y\overset{*}{Y}}_2$ until they reach the $\widetilde{AA}$ schedule which shifts north from $\widetilde{AA}_2$. Therefore, a decrease in i leads to increases in Y and e and may lead to an increase or decrease in $\overset{*}{Y}$ depending on whether $\widetilde{YY}$, $\widetilde{\overset{**}{YY}}$, and $\widetilde{AA}$ meet above or below $\overset{*}{Y}_0$.25/

The argument of the last paragraph establishes that the $YA\overset{*}{Y}$ schedule of Figure 4 has a negative slope and that movements to the southeast along $YA\overset{*}{Y}$ imply increases in e and indeterminate changes in $\overset{*}{Y}$. Whether the $YA\overset{*}{Y}$ schedule is steeper or flatter than the YY is indeterminate but does not affect the analysis.

Just as in the fixed rates case the implied response of the endogenous variables to all shifts in asset demands are analyzed simultaneously since each shift in asset demands is defined so that its impact effect is an excess supply of H. The general case of an increase in the excess supply of H is represented in Figure 4.

The impact of each asset disturbance is an excess supply of H which implies a shift of HH from HH_0 to HH_1. The excess supply of H puts downward pressure on the interest rate which induces a rise in the exchange rate. The increase in e shifts the YY, $\overset{**}{YY}$, and AA schedules southeast along the $YA\overset{*}{Y}$ schedule resulting in a new equilibrium at the higher Y and e, and lower i represented by the point (Y_1, i_1). The sign of the change in $\overset{*}{Y}$ is ambiguous.

The next step in the analysis is to determine whether an increase in k_V dampens or amplifies the equilibrating responses of Y and $\overset{*}{Y}$. For each shift in asset demands an increase in k_V has exactly the same effect on the HH schedule under flexible exchange rates as it did under fixed exchange rates. As before, for each shift it is not clear from a graphical analysis whether an increase in k_V dampens or amplifies the equilibrating responses of Y and $\overset{*}{Y}$, that is, whether HH_1' or HH_1'' is relevant. For two of the three cases the ambiguity can be resolved by applying our approach of holding the initial equilibrating responses of the endogenous variables constant, raising k_V and determining whether there is an excess demand for or supply of U.S. high-powered money. An increase in k_V dampens the increase in Y and the ambiguous equilibrating response of $\overset{*}{Y}$ if it increases the excess demand for H at the old post-disturbance equilibrium.

For each shift in asset demands the same steps are followed under flexible exchange rates as under fixed exchange rates, and the final results are once again given by equations (23), (27), and (30). Under flexible exchange rates as under fixed exchange rates $\hat{Y}/\alpha$, $\hat{Y}/\beta$, $\hat{Y}/\gamma > 0$ and $\hat{i}/\alpha$, $\hat{i}/\beta$, $\hat{i}/\gamma < 0$. Thus, the conclusions regarding whether an increase in k_V creates excess demand for or excess supply of H, whether H_1' or H_1'' is relevant, and whether an increase in k_V dampens or amplifies the equilibrating responses of Y and $\overset{*}{Y}$ are the same under both exchange rate regimes.

The first shift in the demand for goods to be considered is a shift up in the demand for the U.S. good alone, and the analysis of this shift is illustrated in Figure 6. Consider the changes in i, Y, and (implicitly) $\overset{*}{Y}$ required to clear the U.S. and German goods markets and the German high-powered money market at a fixed e. The increased demand for the U.S. good shifts YY to the northeast, for instance from YY_0 to YY_1 and causes U.S. output to increase. The rise in Y implies an excess demand for the German good inducing an increase in $\overset{*}{Y}$. The rise in $\overset{*}{Y}$ implies an excess demand for German high-powered money inducing an increase in i. Thus, in order to

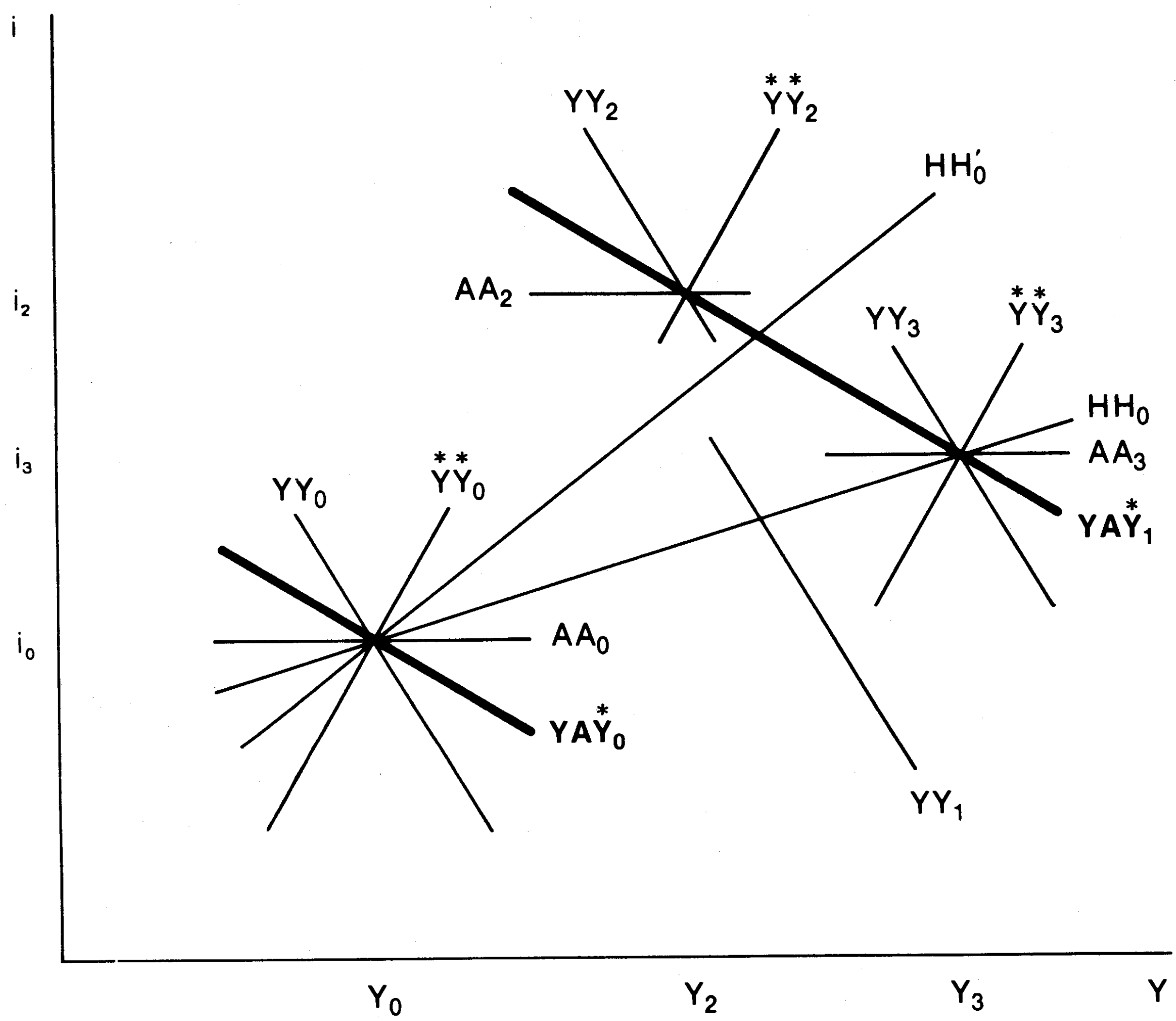

Figure 6. Shift up in demand for U.S. good alone, fixed exchange rates

clear these three markets Y, $\overset{*}{Y}$, and i must rise. The increase in $\overset{*}{Y}$ shifts the AA schedule to the north, for instance from AA_0 to AA_2; shifts the $\overset{**}{YY}$ schedule to the southeast, for instance from $\overset{**}{YY}_0$ to $\overset{**}{YY}_2$; and results in an additional northeasterly shift in the YY schedule, for instance from YY_1 to YY_2. The higher values of Y, i, and (implicitly) $\overset{*}{Y}$ that clear the three markets are represented by the point (i_2, Y_2). Note that (i_2, Y_2) is a point on the new $YA\overset{*}{Y}$ schedule $YA\overset{*}{Y}_1$.

In the new final equilibrium i and Y are definitely higher as indicated by the intersection of $YA\overset{*}{Y}_1$ and HH_0 at the point (i_3, Y_3). Variations in e shift the YY, $\overset{**}{YY}$, and AA schedules along $YA\overset{*}{Y}_1$ from (i_2, Y_2) to (i_3, Y_3). If (i_2, Y_2) implies an excess supply of H as in Figure 6, then e must rise shifting the three schedules to the southeast along $YA\overset{*}{Y}_1$. If (i_2, Y_2) implied an excess demand for H, then e would fall. It can be shown that a sufficient, but not necessary condition for the point (i_2, Y_2) to imply an excess demand for H is that HH be steeper than $\overset{**}{YY}$.[26/] Whatever happens to e, the final equilibrium value of $\overset{*}{Y}$ may be higher or lower than the pre-disturbance value. It can be shown that a sufficient but not necessary, condition for $\overset{*}{Y}$ to rise is that HH be flatter than $\overset{**}{YY}$.

When k_V is increased, the slope of the HH schedule becomes steeper (HH rotates from HH_0 to HH_0') unambiguously dampening the increase in Y. Whether the ambiguous equilibrating response in $\overset{*}{Y}$ is dampened or amplified cannot be determined without further information about the relative magnitudes of some of the parameters. Given the increase in k_V, there is definitely an excess demand for H at the old post-disturbance equilibrium values of the endogenous variables represented by the point (i_3, Y_3). Unfortunately, as has been shown above an excess demand for H has an ambiguous effect on $\overset{*}{Y}$. Thus, for example, even if the HH schedule is flatter than the $\overset{**}{YY}$ so that a shift up in the demand for the U.S. good definitely raises $\overset{*}{Y}$, an increase in k_V might dampen or amplify this increase.

Now consider a shift in demand from the German good to the U.S. good. The analysis of this shift is illustrated in Figure 7. Consider the Y, i, and (implicitly) $\overset{*}{Y}$ that clear the U.S. and German goods markets and the German high-powered money market at a fixed e. First suppose both e and $\overset{*}{Y}$ are fixed. The increased demand for the U.S. good shifts YY to the northeast, for instance from YY_0 to YY_1, and the reduced demand for the German good shifts $\overset{**}{YY}$ to the southeast, for instance from $\overset{**}{YY}_0$ to $\overset{**}{YY}_1$. $\overset{**}{YY}$ shifts farther to the east than YY because a larger increase in Y is required to clear the market for the German good at a fixed i. Now allow $\overset{*}{Y}$ to vary. The Y and i which clear the markets for the U.S. good and German high-powered money (i_0 and Y_1) imply an excess supply of the German good; hence $\overset{*}{Y}$ must fall. The fall in $\overset{*}{Y}$ shifts YY to the southwest, for instance from YY_1 to YY_2; $\overset{**}{YY}$ to the northwest, for instance from $\overset{**}{YY}_1$ to $\overset{**}{YY}_2$; and AA to the south, for instance from AA_0 to AA_2. Note that the point of intersection of the three shifted schedule (i_2, Y_2) lies on the new $YA\overset{*}{Y}$ schedule $YA\overset{*}{Y}_1$.

In the final equilibrium i and Y are definitely higher as indicated by the intersection of $YA\overset{*}{Y}_1$ and HH_0 at the point (i_3, Y_3). The point (i_2, Y_2) definitely implies excess demand for U.S. high-powered money. Hence e must fall shifting the YY, $\overset{**}{YY}$, and AA schedules to the northwest along $YA\overset{*}{Y}_1$. Although movements along $YA\overset{*}{Y}$ may imply increases or decreases in $\overset{*}{Y}$, it can be shown that the decrease in $\overset{*}{Y}$ required to reach (i_2, Y_2) dominates any possible rise associated with the movement from (i_2, Y_2) to (i_3, Y_3).27/ Thus, the final equilibrium value of $\overset{*}{Y}$ must be lower than its pre-disturbance value.

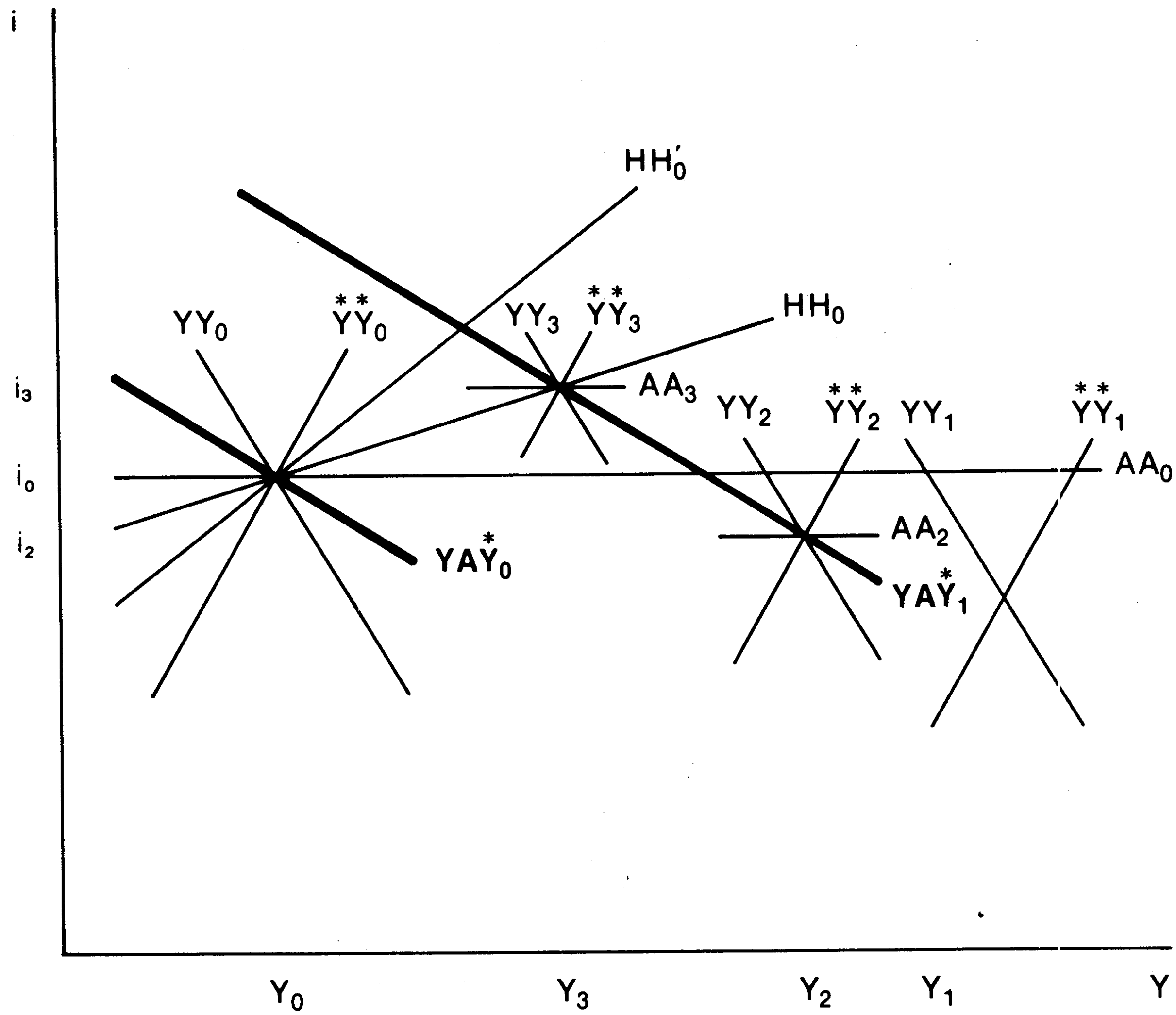

Figure 7. Shift from German good to U.S. good, flexible exchange rates

As before, when k_V is increased, the slope of the HH schedule becomes steeper (HH rotates from HH_0 to HH_0') unambiguously dampening the increase in Y. Whether the decrease in $\overset{*}{Y}$ is dampened or amplified cannot be determined without further information about the relative magnitude of some parameters. Given the increase in k_V, there is definitely an excess demand for H at the old post-disturbance equilibrium values of the endogenous variables represented by the point (i_3, Y_3). However, an excess demand for H has an ambiguous effect on $\overset{*}{Y}$.

V. Conclusions

In this section we restate our general approach, briefly summarize our results, and draw some general conclusions. A single general approach underlies all the specific results in the paper. Suppose an initial set of equilibrating responses in the endogenous variables clears the markets following a particular shift at an initial value of the Eurodollar reserve requirement. Depending on the shift under consideration an increase in k_V may create an excess demand for or an excess supply of H given the initial equilibrating responses in the endogenous variables. U.S. high-powered money demand varies directly with U.S. output, inversely with the U.S. interest rate, and inversely with each of the asset demand disturbance terms as we have defined them. An increase in k_V alters the responsivenesses to changes in both endogenous variables and the impact effects of some of the disturbances. The initial set of equilibrating responses no longer clear the markets, and there must be further equilibrating responses. These further equilibrating responses are exactly the ones associated with an increase in the excess demand for or supply of H. Thus, while a small change in k_V does not change the qualitative effects of a particular shock on the endogenous variables, it does modify the quantitative effects in the same way that they would be modified by a small decrease or increase in the supply of H.

The specific results for asset demand shifts under the two exchange rate regimes are quite similar. Y and i are the only endogenous variables that affect the demand for H. Since all asset demand shifts are defined so that they lead to an excess supply of H, they all imply a rise in Y and a fall in i. Furthermore, an increase in k_V always increases the income responsiveness of the demand for H and reduces the absolute value of the interest rate responsiveness. However, depending on the type of asset demand disturbance, an increase in k_V may decrease, increase, or leave unchanged the impact effect on the demand for H. For a shift out of demand deposits into Eurodollar deposits represented by a positive α, an increase in k_V reduces the impact of α on the demand for H. It has been shown that the effects of the increase in the Y responsiveness and the smaller impact of α dominate the effect of the decrease in the absolute value of the i responsiveness so that an increase in k_V creates an excess demand for H given the initial set of equilibrating responses. The effects of this excess demand partially offset the effects of the excess supply created by the disturbance thereby dampening the responses of all the endogenous variables including Y and $\overset{*}{Y}$.

For a shift out of Eurodollar deposits into nonreserved instruments represented by a positive β, an increase in k_V increases the impact of β on the demand for H. It has been shown that the effects of the decrease in the absolute value of the i responsiveness and the larger impact of β

dominate the effect of the increase in the Y responsiveness so that an increase in k_V creates an excess supply of H given the initial set of equilibrating responses. The effects of this excess supply add to the effects of the excess supply created by the disturbance thereby amplifying the responses of all the endogenous variables including Y and $\overset{*}{Y}$.

For the two shifts just discussed between reserved Eurodollars and other instruments, the results confirm the wisdom of a strategy of minimizing the difference between reserve requirements on the instruments involved. Specifically, when the Eurodollar reserve requirement is between the reserve requirement on demand deposits and zero, an increase in the Eurodollar reserve requirement dampens the response of both real outputs to shifts between Eurodollar deposits and demand deposits and amplifies the response of real outputs to shifts between Eurodollar deposits and nonreserved instruments (instruments with zero reserve requirements).

A shift in asset demands between demand deposits and nonreserved instruments is an example of a shift between a reserved and a nonreserved instrument where neither instrument is a Eurodollar deposit. For this type of shift an increase in k_V does not affect the impact of the disturbance on the excess demand for H. It has been shown that net effect of the increase in the Y responsiveness of the demand for H and the decrease in the absolute value of the i responsiveness may be to create either an excess demand for or an excess supply of H given the initial equilibrating responses. Thus, the implications of an increase in k_V for the stabilization of both outputs are ambiguous.

Now we turn to the results for shifts in goods demands. Both of the shifts in goods demands are defined so that they imply initial equilibrating responses which include rises in both Y and i. Since an increase in k_V increases the Y responsiveness of the demand for H and decreases the absolute value of the i responsiveness, it always creates an excess demand for H for the initial set of equilibrating responses. Thus, for both kinds of shifts in goods demands under both exchange rate regimes, an increase in the Eurodollar reserve requirement is unambiguously helpful in stabilizing U.S. output.

This result provides the basis for a more general conclusion. Suppose that stabilization of home output is the objective of the monetary authorities, that shifts in goods demands of the type studied here are the only disturbances to the economy, and that fixed-rate demand deposits have already been reserved. In these circumstances it is helpful to reserve deposits for which demand varies directly with home output and with the interest rate. Of course, the Eurodollar deposits of our paper are one example of this type of deposit. Another might be relatively short-maturity, variable-rate time deposits at home banks that are not subject to an interest rate ceiling. What matters for the desirability of reserving a particular type of deposit is how the demand for that deposit responds to home output and the interest rate and not that the deposit is "checkable" or is a "transactions deposit" except in so far as these attributes are associated with desirable properties of the demand for the deposit.

The implications of an increase in k_V for the stabilization of German output in the cases of shifts in goods demand are usually ambiguous. First consider the fixed exchange rate regime. An increase in k_V creates an excess demand for H given the initial equilibrating responses of Y and i, and an excess demand for H definitely leads to a decline in $\overset{*}{Y}$. While this decline in $\overset{*}{Y}$ unambiguously amplifies the initial equilibrating decline in $\overset{*}{Y}$ in the case of a shift from the German good to the U.S. good, it may dampen or amplify the ambiguous initial response of $\overset{*}{Y}$ in the case of a shift up in the demand for the U.S. good alone. Now consider the flexible exchange rate regime. As before an increase in k_V creates an excess demand for H given the initial equilibrating responses. However, it has been shown that an increase in the excess demand for H has an ambiguous effect on $\overset{*}{Y}$. Thus, even if the sign of the initial equilibrating response of $\overset{*}{Y}$ is unambiguous, as it is in the case of a shift in demand from the German good to the U.S. good, whether an increase in k_V dampens or amplifies the response of $\overset{*}{Y}$ cannot be determined without further information about some of the parameters.

For asset demand shifts a Eurodollar reserve requirement is helpful in stabilizing $\overset{*}{Y}$ if and only if it is helpful in stabilizing Y, so there is no potential policy conflict. For shifts in goods demands a Eurodollar reserve requirement is always helpful in Y stabilization, but often has ambiguous implications for $\overset{*}{Y}$ stabilization and sometimes definitely destabilizes $\overset{*}{Y}$. These effects are not unique to a Eurodollar reserve requirement. As suggested above they would also be associated with a reserve requirement on a variable-rate time deposit at a U.S. bank the demand for which varied directly with U.S. output. Changes in financial regulations that affect the demand for U.S. high-powered money have implications for foreigners whether or not they directly affect the Eurodollar market. However, the implications for foreigners of regulations affecting the Eurodollar market have a larger impact on the likelihood of the adoption of such regulations because of the obvious claim of the authorities in several countries to a voice in deciding on them.

Appendix

This appendix contains proofs of three assertions made in the text and a brief discussion of the implications of assuming that the income elasticities of the deposit demands given by equations (2) are less than rather than equal to one.

Under flexible exchange rates the equilibrium conditions are obtained by setting $\hat{\overset{*}{A}}{}^{C}$ equal to zero in equations (18). Let Δ represent the determinant of the resulting system and Δ_{ij} represent the ijth minor of that system. Then

$$\Delta = h_Y\Delta_{31} - h_i\Delta_{33} > 0, \tag{A1}$$

$$\Delta_{31} = \overset{*}{a}{}^{*}_{Y}(y_i\overset{*}{y}_e + \overset{*}{y}_i y_e) + (1 - \overset{*}{y}_1 - y_2)\overset{*}{a}_4(y_i + y_e) + y_2\overset{*}{a}_4(y_i + y_e + \overset{*}{y}_i - \overset{*}{y}_e) > 0, \tag{A2}$$

$$\Delta_{33} = \overset{*}{a}_e(\overset{*}{y}_Y y^*_Y - y_Y\overset{*}{y}{}^{*}_{Y}) + \overset{*}{a}{}^{*}_{Y}(\overset{*}{y}_Y y_e - y_Y\overset{*}{y}_e) < 0, \tag{A3}$$

since the assumptions made in the text imply that $y_i + y_e + \overset{*}{y}_i - \overset{*}{y}_e > 0$, $\overset{*}{y}_Y y^*_Y - y_Y\overset{*}{y}{}^{*}_{Y} < 0$, and $\overset{*}{y}_Y y_e - y_Y\overset{*}{y}_e < 0$.

Consider the effects of an increase in the demand for the U.S. good alone ($\lambda > 0$) on e and $\overset{*}{Y}$:

$$\hat{e}/\lambda = (1/\Delta)[\overset{*}{a}{}^{*}_{Y}(\overset{*}{y}_Y h_i - h_Y\overset{*}{y}_i) - \overset{*}{a}_4 h_Y\overset{*}{y}{}^{*}_{Y}] \gtrless 0, \tag{A4}$$

$$\hat{\overset{*}{Y}}/\lambda = (1/\Delta)[\overset{*}{a}_4(\overset{*}{y}_Y h_i - h_Y\overset{*}{y}_i) + \overset{*}{a}_4 h_Y\overset{*}{y}_e] \gtrless 0. \tag{A5}$$

HH is steeper (flatter) than $\overset{**}{YY}$ if and only if $\overset{*}{y}_Y h_i - h_Y\overset{*}{y}_i$ is negative (positive). If HH is steeper than $\overset{**}{YY}$, then e definitely falls. If HH is flatter than $\overset{**}{YY}$, then $\overset{*}{Y}$ definitely rises.

Consider the effect of a shift from the German good to the U.S. good ($\mu > 0$)

$$\hat{\overset{*}{Y}}/\mu = -(\overset{*}{a}_e/\Delta)[h_i(y_Y - \overset{*}{y}_Y) + h_Y(y_i + y_e + \overset{*}{y}_i - \overset{*}{y}_e)] < 0, \qquad \text{(A6}$$

since $y_Y - \overset{*}{y}_Y > 0$ and $y_i + y_e + \overset{*}{y}_i - \overset{*}{y}_e > 0$.

If the income elasticities of the deposit demands given by equations (2) are less than rather than equal to one, then equations (18c) and (18d) become

$$\tilde{h}_Y\hat{Y} + \tilde{h}^*_Y\hat{\overset{*}{Y}} - \tilde{h}_i\hat{i} + \tilde{h}_e\hat{e} = (k_D - k_V)\alpha + k_V\beta + k_D\gamma, \tag{A7}$$

$$\tilde{\overset{*}{a}}_Y\hat{Y} + \tilde{\overset{*}{a}}_Y\hat{\overset{*}{Y}} - \tilde{\overset{*}{a}}_i\hat{i} - \tilde{\overset{*}{a}}_e\hat{e} - \hat{\overset{*}{A}}^C = 0, \tag{A8}$$

where

$$\tilde{h}_Y = (h_1\delta + h_2)f + h_3,\ \tilde{h}^*_Y = (1 - \delta)\overset{*}{f}h_1,\ \tilde{h}_i = h_4,\ \tilde{h}_e = (1 - \delta)h_1,$$

$$\tilde{\overset{*}{a}}_Y = (1 - \overset{*}{\delta})f\overset{*}{a}_1,\ \tilde{a}^*_Y = (\overset{*}{a}_1\delta + \overset{*}{a}_2)\overset{*}{f} + \overset{*}{a}_3,\ \tilde{\overset{*}{a}}_i = \overset{*}{a}_4,\ \tilde{\overset{*}{a}}_e = (1 - \overset{*}{\delta})\overset{*}{a}_1 + \overset{*}{a}_4.$$

Note that under each exchange rate regime U.S. high-powered money demand can be expressed as a function of Y, i, and one additional variable. Under fixed exchange rates that variable is $\overset{*}{Y}$ since $\hat{e} = 0$ in (A7); under flexible exchange rates it is t since $\hat{e}$ can be set equal to $\hat{t} - \overset{*}{f}\hat{\overset{*}{Y}} + f\hat{Y}$ in (A7).

The approach of the text can be used to obtain some results for this case. Proofs of these results are available from the authors on request. For shifts in asset demands the qualitative results are similar to those in the text. Under both exchange rate regimes an increase in k_V dampens the effects on Y and $\overset{*}{Y}$ of variations in α, amplifies the effects of variations in β, and has an ambiguous impact on the effects of variations in γ.

For shifts in goods demands the results are less clear cut. If $\delta \to 1$ with $\overset{*}{\delta}$ anywhere in the permissible range between zero and one, the additional variable drops out of U.S. high-powered money demand, and the qualitative results for both shifts in goods demands under both exchange rate regimes are similar to those in the text.[28] Otherwise, the qualitative results may or may not be similar.

Consider a shift up in the demand for the U.S. good alone under both exchange rate regimes. The initial equilibrating responses of Y and i are increases, and an increase in k_V raises the Y responsiveness of the demand for H, lowers the absolute value of the i responsiveness, and increases the responsiveness to changes in the additional variable. Thus, if the initial equilibrating response of the additional variable is an increase, as it may be under either exchange rate regime, an increase in k_V definitely creates an excess demand for H given the initial equilibrating responses of the endogenous variables. Furthermore, even when the equilibrating response of the third variable is a decrease, an increase in k_V definitely creates excess demand for H if the income responsiveness of Eurodollar deposits exceeds the income responsiveness of demand deposits for then the effect of the increased responsiveness of the demand for H to changes in Y dominates the effect of the increased responsiveness to changes in the additional variable.

Now consider a shift in demand from the German good to the U.S. good under both exchange rate regimes. The initial equilibrating response of Y and the effects of an increase in k_V on all the responsivenesses of the demand for H to changes in the endogenous variables are the same as those described in the preceding paragraph. However, the initial equilibrating response of i may be either an increase or a decrease, and the initial equilibrating response of the additional variable is definitely a decrease. A set of sufficient conditions under which an increase in k_V creates excess demand for H given the initial equilibrating responses is made up of the condition that the initial equilibrating response of i be an increase and the condition that the effect of the increased responsiveness of the demand for H to changes in Y dominate the effect of the increased responsiveness to changes in the additional variable.

Footnotes

*Economists, Board of Governors of the Federal Reserve System. This paper will appear in Bhandari and Putnam (forthcoming). The authors have benefited greatly from discussions of many of the issues considered in this paper with Stephen Axilrod, Ralph Bryant, Michael Dooley, Richard Froyen, Lance Girton, Don Roper, Jeffrey Shafer, and Roger Waud. Helpful suggestions were received from Peter Clark, Walter Enders, Robert Flood, James Healy, Robert Hodrick, Pentti Kouri, Paul Krugman, Harvey Lapan, and Maurice Obstfeld. This paper represents the views of the authors and should not be interpreted as reflecting the views of the Board of Governors of the Federal Reserve System or other members of its staff.

1/ Among the studies which consider important questions raised by the existence and rapid growth of the Eurocurrency markets are Freedman (1977), Hewson and Sakakibara (1975), Masera (1972), and Niehans and Hewson (1976).

2/ This model is a flexible price, rational expectations version of the model in the Appendix to Chapter 18 of Mundell (1968).

3/ This approach to the evaluation of alternative monetary policy regimes originated with Poole (1970) and has subsequently been developed and applied by many analysts. It has been applied in the open economy context by Bryant (1980). It has been used in analyzing the implications of alternative reserve requirement systems for money stock stabilization by Froyen and Kopecky (1979), Kaminow (1977), Kopecky (1978), Laufenberg (1979), and Sherman, Sprenkle, and Stanhouse (1979) and for real output stabilization by Baltensperger (1980), Rolnick (1976), Santomero and Siegel (1981), and Sprenkle and Stanhouse (1981) and in a related study of the implications of alternative definitions of a monetary aggregate for real output stabilization by Roper and Turnovsky (1980).

4/ Henderson and Waldo (1981) investigate the implications of Eurocurrency reserve requirements for the control of a monetary aggregate, which is the intermediate target of the monetary authorities.

5/ It is assumed that there is no interbank lending. If the deposits of a bank exceed the sum of required reserves and dollar and DM claims, then it purchases dollar or DM claims from another bank.

6/ It could be assumed that U.S. (German) nonbanks hold U.S. (German) currency which, of course, is high-powered money without affecting the analysis. However, if it were assumed that U.S. (German) nonbanks held German (U.S.) demand deposits and currency, some of the results below could not be obtained unless additional assumptions were made about the relative magnitudes of parameters. For example, it could not be proved that the interest rate responsiveness of the demand for U.S. high-powered money is definitely negative.

7/ The profits and losses of banks do not affect the wealth of nonbanks participating in the market for traded financial assets because it is assumed that the risk neutral owners of banks do not sell shares to risk averse holders of traded financial assets and do not hold traded financial assets.

8/ The best available data suggests that about half of U.S. nonbanks' Eurodollar deposits have original maturities of less than thirty days. If U.S. residents' Eurodollar deposits were viewed as long-term deposits that could only be converted into demand deposits with a significant delay, then v_2 and v_3 would be negative, and while some of our results would be unaffected others might be changed. See footnotes 20 through 24.

9/ The assumption that dollar demand deposits at U.S. banks and Eurodollar deposits are imperfect substitutes is crucial for the analysis below. This assumption is plausible and empirically supportable. The two types of deposits have somewhat different payment provisions and are subject to different political risk factors. Furthermore, legal restrictions have some effect on depositors' decisions about where to place their funds. Factors such as these may explain (1) why some nonbanks actually hold dollar certificates of deposit issued by U.S. banks instead of Eurodollar deposits despite an opportunity cost which usually exactly reflects U.S. reserve requirements and (2) why there is substitution in favor of Eurodollar deposits when rising nominal interest rates lead to an increase in this opportunity cost.

10/ In Henderson and Waldo (1981) it is demonstrated that these two conditions guarantee equilibrium in financial markets in a model with more financial instruments. There, as here, banks are assumed to be risk neutral.

11/ It could be assumed that both U.S. and German banks hold excess reserves on which no interest is paid. Under this assumption the qualitative effects of interest rate changes on the desired holdings of excess reserves would be the same as those on desired holdings of demand deposits, and none of the results of the paper would be affected. It could also be assumed that all Eurodollar deposits were reservable but, unless additional assumptions were made about the relative magnitudes of parameter values, some of the results derived below could not be obtained. For example, it could not be proved that the interest rate responsiveness of the demand for U.S. high-powered money is definitely negative.

12/ Theories of supply under which deviations of actual aggregate supply from a "natural" level depend on price forecast errors have been developed by Lucas (1973), Sargent (1973), and Fischer (1977).

13/ Equation (18a) is derived using equations (1), (9), (11), (12), (13), (14), (15), (16), and (17). Equation (18b) is derived using equations (1), (10), (11), (12), (13), (14), (15), (16), and (17). Equation (18c) is derived using equations (6), (13), (16), and (17). Equation (18d) is derived using equations (1), (7), (14), (16), and (17).

14/ A brief discussion of how our results are affected by relaxing this assumption is contained in the Appendix.

15/ It makes no difference whether the German authorities exchange German high-powered money for dollar claims on nonbanks and the U.S. Treasury or for DM claims on nonbanks and the German Treasury since banks regard these two types of claims as perfect substitutes.

16/ This analysis originated with Poole (1970).

17/ This conclusion also definitely holds when there are disturbances in the goods market that are uncorrelated with disturbances in the money market.

18/ It is assumed that H^C is increased when k_V is increased so that when all the disturbances are zero, the values of all the other nominal variables are the same at both the original and the new higher values of k_V.

19/ The equilibrating responses could also be expressed as partial derivatives; for example, $\hat{Y}/\alpha = \partial Y/\partial \alpha$.

20/ It can be shown that if $v_2, v_3 < 0$, then the equilibrating responses of Y and $\overset{*}{Y}$ are dampened under both fixed and flexible exchange rates.

21/ It can be shown that if $v_2, v_3 < 0$, then the equilibrating responses of Y and $\overset{*}{Y}$ are amplified under both fixed and flexible exchange rates.

22/ If $v_2, v_3 < 0$ the equilibrating responses of Y and $\overset{*}{Y}$ are unambiguously amplified under both fixed and flexible exchange rates.

23/ If $v_2, v_3 < 0$, HH becomes steeper if and only if $d_4(v_2 f + v_3) + v_4(d_2 f + d_3) > 0$. Otherwise HH becomes flatter, and the results under both fixed and flexible exchange rates must be modified accordingly.

24/ See footnote 23.

25/ If expectations were static so that $i = \overset{*}{i}$, then $\overset{*}{Y}$ would definitely fall, as in Mundell's model, since $\overset{*}{i}$ and $\overset{*}{Y}$ would have to move in opposite directions to keep the demand for A constant.

26/ For proof of this assertion and the one made later in this paragraph, see the Appendix. If expectations were static, then $\overset{*}{Y}$ would definitely rise, as in Mundell's model, in accordance with the reasoning of footnote 20.

27/ For proof of this assertion, see the Appendix.

28/ The assumption that U.S. nonbanks' average propensity to import $(1 - \delta)$ approaches zero does not imply that their marginal propensity to import $(\overset{*}{y}_2)$ approaches zero.

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