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4 Macroeconomic Policy Design in an Interdependent World Economy: An Analysis of Three Contingencies

Willem H. Buiter

4.1 Introduction

In this chapter I take up three policy issues that have been of central concern in recent academic and official discussions of international economic interdependence and macroeconomic policy coordination. They are:

1. What should be the monetary and/or fiscal response in the rest of the industrialized world to a unilateral tightening of U.S. fiscal policy, and what should be the U.S. monetary response to that?

2. What should be the monetary and fiscal response in the industrialized countries to a sudden, large change in an important exchange rate? For concreteness I shall refer to this event as a "collapse of the U.S. dollar."

3. What should be the policy response in the industrialized world to a disappointing real-growth performance?

All three issues are clearly of more than academic interest. In this chapter I attempt to give qualitative answers using a simple analytical model. However simple the individual-country models may be, the

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This paper was written while I was a consultant in the Research Department of the IMF during the summer of 1985. The topic was suggested to me by Andrew D. Crockett. Malcolm Knight made a number of incisive comments on an earlier draft. The opinions expressed in the paper are my own.

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interdependent global economic system very soon grows too large for analytical treatment; numerical simulation methods are called for. Recent work by Sachs (1985) and by Sachs and McKibbin (1985) has demonstrated the usefulness of such an approach. The advantages in terms of intuition and insight from keeping things sufficiently small and transparent to permit a simple algebraic and diagrammatic analysis are such, however, that a first pass at this problem "in two dimensions" is justified.

Section 4.2.1 outlines the simple two-country Dornbusch-style model that has a floating exchange rate, perfect capital mobility, rational exchange-rate expectations, and gradual price adjustment. The long-run or steady-state comparative statics are reviewed in section 4.2.2 while section 4.2.3 characterizes the nature of the dynamic adjustment process. Possible responses to a tightening of U.S. fiscal policy are reviewed in section 4.3. In section 4.4 possible responses to a collapse of the U.S. dollar are considered and section 4.5 deals with the policy implications of a slowdown in world economic activity. Qualifications and conclusions are found in section 4.6.

4.2 An Analytical Approach

4.2.1 The Model

Consider the simple two-country or two-region version of the Dornbusch (1976) open macroeconomic model with a free-floating exchange rate and perfect capital mobility given in equations (1)–(12) below. This model can be viewed as a sluggish-price-adjustment, rational-exchange-rate-expectations version of Mundell's two-country model (Mundell [1968]). Except for some inconsequential differences, this model is the one used by Miller (1982). Turnovsky (1985) has used this model to analyze the effects of a number of anticipated and unanticipated monetary and fiscal shocks. (See also Buiter [1985a] for another application.) All variables other than interest rates are in natural logarithms.

All coefficients are non-negative. Country 1 will be referred to as the United States and country 2 as the rest of the world (ROW).

(1) $$m_1 - p_1 = k_1 y_1 - \lambda_1 i_1 + \eta_1$$

(2) $$y_1 = -\gamma_1 r_1 + \delta_{12}(e + p_2 - p_1) + \epsilon_{12} y_2 + f_1$$

(3) $$\dot{p}_1 = \psi_1(y_1 - \bar{y}_1) + \dot{m}_1$$

(4) $$r_1 = i_1 - \dot{p}_1$$

(5) $$i_1 = i_2 + \dot{e} + \tau_2 - \tau_1$$

(6) $$m_2 - p_2 = k_2 y_2 - \lambda_2 i_2 + \eta_2$$

(7) $$y_2 = -\gamma_2 r_2 - \delta_{21}(e + p_2 - p_1) + \epsilon_{21} y_1 + f_2$$

(8) $$\dot{p}_2 = \psi_2(y_2 - \bar{y}_2) + \dot{m}_2$$

(9) $$r_2 = i_2 - \dot{p}_2$$

(10) $$c \equiv e + p_2 - p_1$$

(11) $$l_1 \equiv m_1 - p_1$$

(12) $$l_2 \equiv m_2 - p_2$$

In these equations m_j is the nominal money stock of country j, p_j its gross domestic product (GDP) deflator, y_j its real output, i_j its nominal interest rate, and r_j its real interest rate; e is the nominal exchange rate, expressed as the number of units of country 1's currency per unit of country 2's currency; f_j is a measure of fiscal stance in country j, τ_j is country j's tax rate on interest income accruing from abroad and its subsidy rate on the interest cost of borrowing from abroad. These taxes drive a wedge between the domestic nominal-interest rate and the interest rate on loans denominated in the same currency overseas. The real exchange rate or competitiveness is c, and l_j is country j's stock of real-money balances.

The model has rational exchange-rate expectations and rational inflation expectations by investors. The exchange rate is set in an efficient, forward-looking asset market. It can make discrete "jumps" at a point in time in response to "news." Domestic costs p_j are predetermined (i.e., given at a point in time), but their rates of change respond to excess demand or supply and "core inflation."

The model will have short-run Keynesian but long-run classical or monetarist features. Each country's demand for real-money balances varies positively with its own national income y_j and negatively with its own nominal interest rate i_j.[1] There is no endogenous direct currency substitution.[2] A shift parameter η_j is added to allow for portfolio shifts. The demand for each country's output depends on its real interest rate r_j, on competitiveness c, on the other country's level of real income, and on the domestic fiscal impulse f_j. Domestic costs are governed by an augmented Phillips curve. The (logarithm of the) level of capacity output $\bar{y}_j$ (or the natural rate of unemployment) in each country is exogenous. The augmentation term in the Phillips curve is taken to be the current rate of growth of the money stock $\dot{m}_j$. This is done merely to permit a simple diagrammatic analysis of the model's properties. More satisfactory ways of modeling the augmentation term are discussed in Buiter and Miller (1982, 1983, 1985).

The two countries are not only linked through competitiveness and activity effects but also directly through an integrated international financial market. Equation (5) represents the condition for (after-tax) uncovered interest parity. U.S. and ROW currency-denominated interest-bearing assets are perfect substitutes in private portfolios. This will be the case if the international financial markets are efficient and if there are risk-neutral speculators.

It will be convenient to represent the essential dynamics of this economic miniworld through three state variables, $l_j, j = 1,2$; real-money balances in each of the two countries; and c, U.S. competitiveness.

4.2.2. The Long-Run Equilibrium

The long-run comparative statics in this model are completely classical or monetarist. Output in each country is at its exogenously given full employment level, and changes in the levels and growth rates of nominal money stocks are translated into corresponding changes in the levels and proportional rates of change of costs and of the exchange rate. Equation (13a–i) summarizes the long-run equilibrium of this economy.

(13a) $$y_i = \bar{y}_i \qquad i = 1, 2$$

(13b) $$\dot{p}_i = \dot{m}_i \qquad i = 1, 2$$

(13c) $$\dot{e} = \dot{m}_1 - \dot{m}_2$$

(13d) $$r_1 = r_2 + \tau_2 - \tau_1$$

(13e) $$c = \frac{1}{\Lambda}[\gamma_1 f_2 - \gamma_2 f_1] - \frac{\gamma_1\gamma_2}{\Lambda}(\tau_1 - \tau_2) + \frac{(\gamma_2 + \gamma_1\epsilon_{12})}{\Lambda}\bar{y}_1 - \frac{(\gamma_1 + \gamma_2\epsilon_{12})}{\Lambda}\bar{y}_2$$

(13f) $$r_1 = \frac{1}{\Lambda}[\delta_{12}f_2 + \delta_{21}f_1] - \frac{\delta_{12}\gamma_2}{\Lambda}(\tau_1 - \tau_2) + \frac{(\delta_{12}\epsilon_{21} - \delta_{21})}{\Lambda}\bar{y}_1 + \frac{(\delta_{21}\epsilon_{12} - \delta_{12})}{\Lambda}\bar{y}_2$$

(13g) $$r_2 = \frac{1}{\Lambda}[\delta_{12}f_2 + \delta_{21}f_1] + \frac{\delta_{21}\gamma_1}{\Lambda}(\tau_1 - \tau_2) + \frac{(\delta_{12}\epsilon_{21} - \delta_{21})}{\Lambda}\bar{y}_1 + \frac{(\delta_{21}\epsilon_{12} - \delta_{12})}{\Lambda}\bar{y}_2$$

(13h) $$l_1 = \frac{-\lambda_1}{\Lambda}(\delta_{12}f_2 + \delta_{21}f_1) + \frac{\lambda_1\delta_{12}\gamma_2}{\Lambda}(\tau_1 - \tau_2) - \lambda_1\dot{m}_1 + \eta_1 + \left(k_1 - \frac{\lambda_1(\delta_{12}\epsilon_{21} - \delta_{21})}{\Lambda}\right)\bar{y}_1 - \frac{\lambda_1(\delta_{21}\delta_{21} - \delta_{12})}{\Lambda}\bar{y}_2$$

(13i) $$l_2 = \frac{-\lambda_2}{\Lambda}(\delta_{12}f_2 + \delta_{23}f_1) - \frac{\lambda_2\delta_{21}\gamma_1}{\Lambda}(\tau_1 - \tau_2) - \lambda_2\dot{m} + \eta_2 + \left(k_2 - \frac{\lambda_2(\delta_{21}\epsilon_{12} - \delta_{12})}{\Lambda}\right)\bar{y}_2 - \frac{\lambda_2(\delta_{12}\epsilon_{21} - \delta_{21})}{\Lambda}\bar{y}_1,$$

where

(13j) $$\Lambda = \delta_{21}\gamma_1 + \delta_{12}\gamma_2.$$

In the long run (at full employment), fiscal expansion in the United States worsens U.S. competitiveness while fiscal expansion in the ROW causes U.S. competitiveness to improve.[3] Neither changes in the levels nor in the rates of growth of the nominal money stocks affect real competitiveness or real interest rates. Fiscal expansion in the United States or in the ROW raises the world real interest rate. (Note that the United States and the ROW real interest rates differ only to the extent that U.S. and ROW taxes [subsidies] on foreign interest income [payments] differ.) An increase in $\tau_1 - \tau_2$ lowers the U.S. real interest rate and raises that in the ROW. Competitiveness therefore must move against the United States to restore equilibrium in the market for U.S. output. An increase in $\dot{m}_i$ raises $\dot{p}_i$ and the rate of depreciation of country i's currency by the same amount. A higher nominal interest rate reduces the stock of real-money balances demanded in the long run, if the interest-sensitivity of the demand for real-money balances is nonzero. Given the rate of money growth (and thus the rate of inflation), expansionary fiscal policy in either country, by raising the real interest rate, also raises the nominal interest rate and reduces the demand for real-money balances at home and abroad.

An increase in the level of capacity output ($\bar{y}_i$) of a country is associated with an improvement in its long-run competitiveness. This is required in order for the market to absorb the relatively greater supply of that country's output. If we assume that $\delta_{12}\epsilon_{21} - \delta_{12}$ and $\delta_{21}\epsilon_{12} - \delta_{12}$ are both negative, an increase in the level of capacity output in either country lowers the long-run real interest rate in both countries; the lower real interest rates stimulate demand and bring it back to equality with the larger level of full employment output. Both directly, via the income effect on money demand and indirectly, by lowering the nominal interest rate (since real interest rates decline and money growth is held constant), increased capacity output in either country raises the long-run stock of real-money balances in both countries.

4.2.3. The Dynamic Response to Policy Changes and Exogenous Shocks

The three simultaneous state equations of the unrestricted model are available from the author on request. When the restriction is imposed that the two countries or regions have identical structures, it becomes possible to provide an analytical and diagrammatic exposition of the main policy issues (see Aoki [1981] and Miller [1982]). The assumption of identical structures is of course quite restrictive. All differences in country performance must be attributed solely to different policies, different exogenous shocks, or different initial conditions. A full analysis of two- or three-country models that allows for intercountry differences in the specification of major behavioral relationships will require numerical simulation methods. The simplified two-country model does, however, permit a very transparent first pass at the major policy issues. Symmetry in this model means that $k_1 = k_2 = k; \lambda_1 = \lambda_2 = \lambda$; $\gamma_1 = \gamma_2 = \gamma$; $\delta_{12} = \delta_{21} = \delta$; $\epsilon_{12} = \epsilon_{21} = \epsilon$; $\psi_1 = \psi_2 = \psi$.

The three simultaneous state equations of the unrestricted model can be decomposed into two independent subsystems when the restriction of identical structures is imposed. A two-dimensional system involves the real exchange rate and the *difference* between the two countries' real money stocks. Let $l^d \equiv l_1 - l_2$, $\dot{m}^d \equiv \dot{m}_1 - \dot{m}_1$; $\eta^d \equiv \eta_1 - \eta_2$, $f^d \equiv f_1 - f_2$, $\tau^d \equiv \tau_1 - \tau_2$, and $\bar{y}^d \equiv \bar{y}_1 - \bar{y}_2$.

$$\text{(14a)} \quad \begin{bmatrix} \dot{l}^d \\ \dot{c} \end{bmatrix} = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \begin{bmatrix} l^d \\ c \end{bmatrix} + \begin{bmatrix} b_{11} & b_{12} & b_{13} & b_{14} & b_{15} \\ b_{21} & b_{22} & b_{23} & b_{24} & b_{25} \end{bmatrix} \begin{bmatrix} \dot{m}^d \\ \eta^d \\ f^d \\ \tau^d \\ \bar{y}^d \end{bmatrix},$$

where

$$a_{11} = -\psi\lambda^{-1}\gamma(\Omega + \epsilon)^{-1}; \; a_{12} = -2\psi\delta(\Omega + \epsilon)^{-1},$$
$$a_{21} = -\lambda^{-1}(1 + \epsilon)(\Omega + \epsilon)^{-1}; \; a_{22} = 2\Gamma\delta(\Omega + \epsilon)^{-1},$$
$$b_{11} = -\psi\gamma(\Omega + \epsilon)^{-1}; \; b_{12} = \psi\lambda^{-1}\gamma(\Omega + \epsilon)^{-1}; \; b_{13} = -\psi(\Omega + \epsilon)^{-1}$$
$$b_{14} = 0; \; b_{15} = \psi(1 + \gamma\psi(\Omega + \epsilon)^{-1}),$$
$$b_{21} = (1 + \epsilon)(\Omega + \epsilon)^{-1}; \; b_{22} = \lambda^{-1}(1+\epsilon)(\Omega+\epsilon)^{-1};$$
$$b_{23} = \Gamma(\Omega + \epsilon)^{-1}; \; b_{24} = 1;$$
$$b_{25} = \psi(1 - \Gamma\gamma(1 - \Gamma\gamma(\Omega + \epsilon)^{-1}),$$

and

$$\Omega \equiv 1 + \gamma\Gamma,$$
$$\Gamma \equiv \gamma^{-1}k - \psi.$$

A one-dimensional system involves only *averages* or global magnitudes.

Let $l^a \equiv \dfrac{l_1 + l_2}{2}$; $\dot{m}^a \equiv \dfrac{\dot{m}_1 + \dot{m}_2}{2}$; $f^a \equiv \dfrac{f_1 + f_2}{2}$;

$\eta^a \equiv \dfrac{\eta_1 + \eta_2}{2}$; $\tau^a \equiv \dfrac{\tau_1 + \tau_2}{2}$

and $\bar{y}^a \equiv \dfrac{\bar{y}_1 + \bar{y}_2}{2}$.

We have

(14b)
$$\dot{l}^a = -\psi\lambda^{-1}(\Omega - \epsilon)^{-1}\gamma l^a + [-\psi\gamma(\Omega - \epsilon)^{-1} \quad \psi\lambda^{-1}\gamma(\Omega - \epsilon)^{-1} - \psi(\Omega - \epsilon)^{-1} \quad o \; \psi(1 + (\Omega - \epsilon)^{-1}\gamma\psi)] \begin{bmatrix} \dot{m}^a \\ \eta^a \\ f^a \\ \tau^a \\ \bar{y}^a \end{bmatrix}.$$

The "output equations," the equations giving the short-run endogenous variables as functions of the state variables and the exogenous variables are (using self-explanatory notation):

(15a)
$$\begin{bmatrix} y^d \\ i^d \\ \dot{p}^d \end{bmatrix} = \begin{bmatrix} (\Omega + \epsilon)^{-1}\gamma\lambda^{-1} & 2(\Omega + \epsilon)^{-1}\delta \\ -\lambda^{-1}(1 - \gamma\psi + \epsilon)(\Omega + \epsilon)^{-1} & 2\lambda^{-1}k(\Omega + \epsilon)^{-1}\delta \\ (\Omega + \epsilon)^{-1}\psi\gamma\lambda^{-1} & 2\psi\delta(\Omega + \epsilon)^{-1} \end{bmatrix} \begin{bmatrix} l^d \\ c \end{bmatrix}$$
$$+ \begin{bmatrix} (\Omega + \epsilon)^{-1}\gamma & -(\Omega + \epsilon)^{-1}\gamma^{\lambda^{-1}} & (\Omega + \epsilon)^{-1} & 0 & -(\Omega + \epsilon)^{-1}\gamma\psi \\ (\Omega + \epsilon)^{-1}\lambda^{-1}k^{\gamma} & \lambda^{-1}(1 - \gamma\psi - \epsilon)^{-1} & (\Omega + \epsilon)^{-1}\lambda^{-1}k & 0 & -\lambda^{-1}k\gamma\psi(\Omega + \epsilon)^{-1} \\ 1 + (\Omega + \epsilon)^{-1}\psi\gamma & -(\Omega + \epsilon)^{-1}\psi\gamma\lambda^{-1} & (\Omega + \epsilon)^{-1}\psi & 0 & -\psi(1 + (\Omega + \epsilon)^{-1}\gamma\psi) \end{bmatrix} \begin{bmatrix} \dot{m}^d \\ \eta^d \\ f^d \\ \tau^d \\ \bar{y}^d \end{bmatrix}$$ 2/

and

(15b)
$$\begin{bmatrix} y^a \\ i^a \\ \dot{p}^a \\ r^a \end{bmatrix} = \begin{bmatrix} (\Omega - \epsilon)^{-1}\gamma\lambda^{-1} \\ -\lambda^{-1}(1 - \gamma\psi - \epsilon)(\Omega - \epsilon)^{-1} \\ (\Omega - \epsilon)^{-1}\psi\gamma\lambda^{-1} \\ -\lambda^{-1}(1 - \epsilon)(\Omega - \epsilon)^{-1} \end{bmatrix} [l^a]$$
$$+ \begin{bmatrix} (\Omega - \epsilon)^{-1}\gamma & -(\Omega - \epsilon)^{-1}\gamma\lambda^{-1} & (\Omega - \epsilon)^{-1} & 0 & -(\Omega - \epsilon)\gamma\psi \\ (\Omega - \epsilon)^{-1}\lambda^{-1}k\gamma & \lambda^{-1}(1 - \gamma\psi - \epsilon)(\Omega - \epsilon)^{-1} & (\Omega - \epsilon)^{-1}\lambda^{-1}k & 0 & -\lambda^{-1}k\gamma\psi(\Omega - \epsilon)^{-1} \\ 1 + (\Omega - \epsilon)^{-1}\psi\gamma & -(\Omega - \epsilon)^{-1}\psi\gamma\lambda^{-1} & (\Omega - \epsilon)^{-1}\psi & 0 & -\psi(1 + (\Omega - \epsilon)^{-1}\gamma\psi) \\ -[1 - \epsilon](\Omega - \epsilon)^{-1} & \gamma^{-1}(1 - \epsilon)(\Omega - \epsilon)^{-1} & (\Omega - \epsilon)^{-1}\Gamma & 0 & \psi(1 - \Gamma\gamma(\Omega - \epsilon)^{-1}) \end{bmatrix} \begin{bmatrix} \dot{m}^a \\ \eta^d \\ f^a \\ \tau^d \\ \bar{y}^d \end{bmatrix}$$

The long-run comparative statics for the differences and averages can be obtained easily from equations (13a–i):

(16a) $l^d = -\lambda \dot{m}^d + \eta^d + \lambda\tau^d + k\bar{y}^d$

(16b) $c = -\dfrac{1}{2\delta}f^d - \dfrac{\gamma}{2\delta}\tau^d + \dfrac{(1+\epsilon)}{2\delta}\bar{y}^d,$

(16c) $r^d = -\tau^d,$

(16d) $l^a = -\lambda \dot{m}^a + \eta^a - \dfrac{\lambda}{\gamma}f^a + \left(k + \dfrac{\lambda(1-\epsilon)}{\gamma}\right)\bar{y}^a,$

(16e) $r^a = \dfrac{1}{\gamma}f^a + \dfrac{(\epsilon - 1)}{\gamma}\bar{y}^a.$

Global or average economic performance and the difference between the economic performances of the two countries are "decoupled": they can be studied independently of each other, with average outcomes a function only of current and past average policy instrument values and average exogenous shocks, while performance differences are a function only of differences in current, past, and expected future differences in policy instrument values and exogenous disturbances. The "averages" model—equations (14b) and (15b)—can indeed be viewed as a self-contained model of a single closed economy. Because the price deflators are predetermined and the real exchange rate "washes out" through the assumption of symmetrical structures, the "averages" model contains no nonpredetermined, forward-looking or jump variables. Note that after analyzing averages and differences, we can easily retrieve individual country performance, since $l_1 = \frac{1}{2} l^d + l^a$, $l_2 = -\frac{1}{2} l^d + l^a$, etc.

The "averages" economy (equation 14b) with its single predetermined state variable will be stable if and only if $-\psi\lambda^{-1}(\Omega - \epsilon)^{-1}\gamma < 0$ that is i.f.f.

(17a) $\Omega > \epsilon$

The "differences" system (equation 14a) with its predetermined variable l^d and its nonpredetermined variable c, will have a unique convergent saddlepoint equilibrium if and only if $a_{11}a_{22} - a_{21}a_{12} < 0$ that is i.f.f.

(17b) $\Omega > -\epsilon$

Since $\epsilon > 0$, (17a) implies (17b).

Equation (17b) is equivalent to the condition that an improvement in U.S. competitiveness will (given l^d, $\dot{m}^d$, η^d, f^d, and r^d) raise the effective demand for U.S. output relative to output in the rest of the world. It is a weak condition, which amounts to assuming that in a diagram with the nominal interest rate on the vertical axis and output on the horizontal axis, the IS curve (after using the Phillips curve to substitute out the [expected] rate of inflation) is either downward-sloping or upward-sloping and steeper than the LM curve. I assume that (17a) is satisfied. Given (17a) (and thereby [17b]), the saddlepoint equilibrium and the "differences" system either look like figure 4.1a (when the IS curve is downward sloping, $a_{22} > 0$ 3/ and the $\dot{c}=0$ locus is upward-sloping) or like figure 4.1b (when the $\tilde{IS}$ curve is upward-sloping and steeper than the LM curve, $a_{22} < 0$ and the $\dot{c} = 0$ locus is downward-sloping and cuts the $\dot{l}^d=0$ locus from above). Since the phase diagram is qualitatively similar in the two cases, I shall restrict the analysis to the case depicted in figure 4.1a. Figure 4.1c depicts the

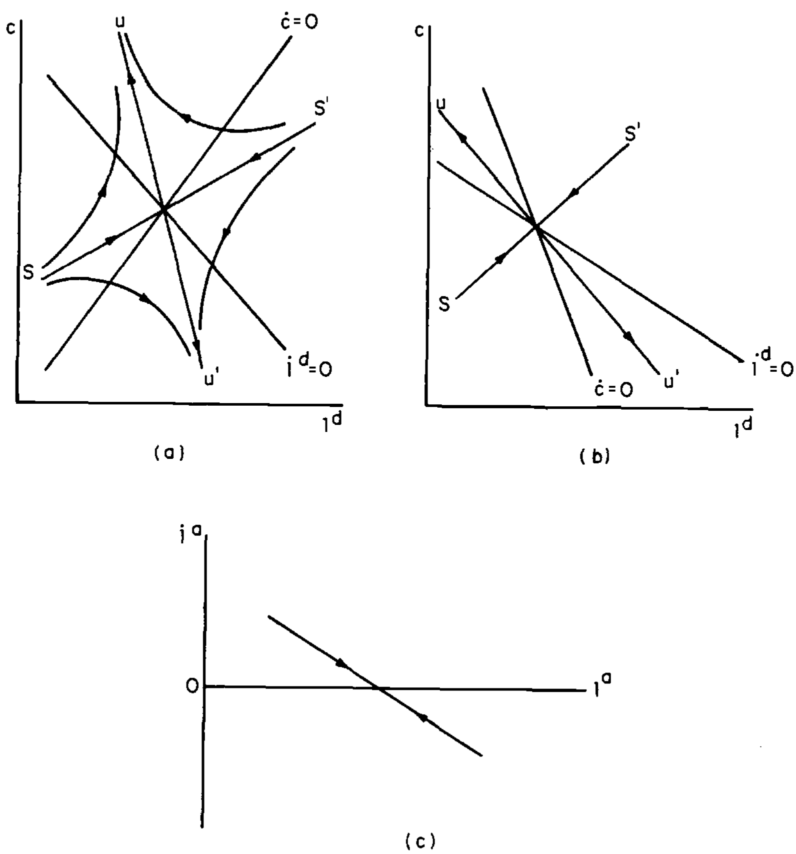

Fig. 4.1 Equilibrium and dynamic adjustment in the symmetric two-country model.

adjustment process of the single predetermined state variable for the "averages" system.

First among the policy issues to be considered now is the proper response in the ROW to a unilateral U.S. fiscal contraction.

4.3 Responses to a Tightening of U.S. Fiscal Policy

4.3.1 U.S. Fiscal Tightening without Fiscal or Monetary Response in the ROW and without Monetary Response in the U.S.A.

A fiscal tightening in the United States without any fiscal response in the ROW is, in the notation of this paper, a reduction in the average fiscal impulse (f^a) and a reduction in the difference between the two countries' fiscal impulses f^d which is twice as large as the reduction in f^a. From equations 16(a–e) it is clear that the long-run consequences of this unilateral fiscal contraction will be the following: (1) an improvement in U.S. competitiveness (c increases); (2) a lowering of the real interest rate in the United States and in the rest of the world; (3) an increase in the world real-money stock because nominal as well as real interest rates are lower in the United States and in the R.O.W.

In figure 4.2a we see that for c and l^d, the full long-run adjustment from E_1 to E_2 occurs instantaneously. Relative U.S.-ROW real-money balances are unaffected by the U.S. fiscal tightening. The required long-run depreciation in the *real* exchange rate can therefore be brought about immediately by a "jump" or step depreciation in the nominal exchange rate of the United States.

In the new long-run equilibrium, the global stock of real-money balances will be larger since lower nominal interest rates raise velocity. Given nominal money growth rates in the United States and the ROW and without any discrete changes in the levels of the nominal money stocks, the process of increasing real balances requires that the rate of inflation be held below the given rates of growth of the nominal money stocks. There will therefore be a temporary global recession: y^a declines. The global recession affects the United States and the R.O.W. equally: y^d is zero throughout the adjustment process. U.S. output declines because of the fiscal tightening but the decline is mitigated as competitiveness improves. The ROW suffers from its loss of competitiveness, which mirrors the improvement in the U.S. competitiveness. The recession is therefore concentrated in the nontraded goods sector of the United States and the traded goods sector of the ROW. Nominal and real interest rates and inflation rates in the United States and the ROW are affected equally by U.S. fiscal contraction: i^d, r^d, and $\dot{p}^d$ are zero throughout. Both nominal and real interest rates decline globally (and in each country). As in the familiar closed econ-

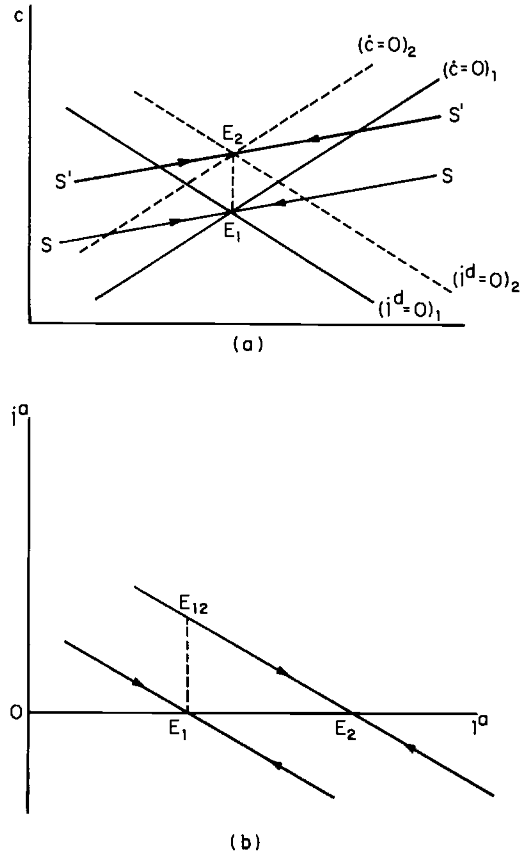

Fig. 4.2

omy IS-LM, augmented Phillips curve model, the decline in nominal and real interest rates mitigates the contraction of aggregate demand but does not undo it completely. There is "crowding out" (in our policy experiment a reversal of crowding out) but less than 100%. Note that because inflation declines during the recession, real interest rates come down by less than nominal interest rates. Figure 4.3 summarizes the response to the unexpected announcement at time t_0 of an immediately implemented permanent tightening of U.S. fiscal policy.[4]

4.3.2 Monetary Policy Stabilizes the Nominal Exchange Rate

One alternative scenario often considered consists of a tightening of U.S. fiscal policy, unaccommodating U.S. monetary policy, unchanged fiscal policy in the ROW, and monetary policy in the ROW geared to interest rate coupling. Given perfect international capital mobility, in-

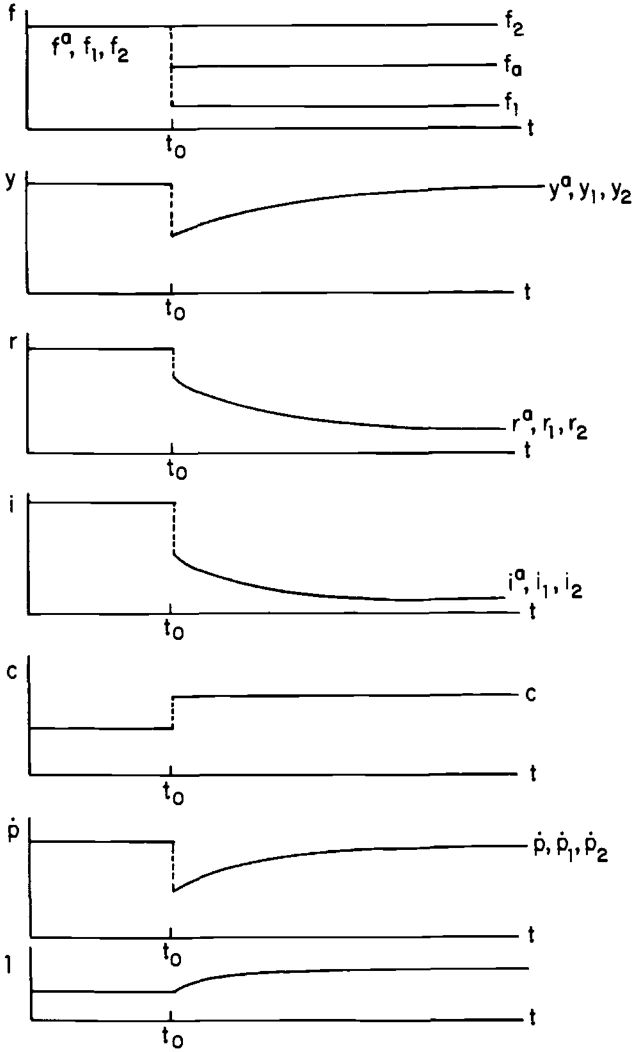

Fig. 4.3 Global and regional response to a unilateral tightening of U.S. fiscal policy.

terest rate coupling amounts to having a fixed nominal exchange rate. Under a fixed exchange rate regime, a fiscal contraction in the United States will, with perfect capital mobility, lead to a stock-shift outflow of capital from the United States, a stock-shift loss of U.S. foreign exchange reserves, and a corresponding contraction in the U.S. money stock. The ROW experiences the counterpart stock-shift inflow of capital, stock-shift gain in foreign exchange reserves, and expansion of its money stock. It is therefore arbitrary whether one assigns the stabilization of the exchange rate to the monetary policy of the ROW or to the United States. Under a fixed exchange rate regime (which is expected to be permanent), there is effectively a single global world money market or world LM schedule. Individual countries can choose their own rates of domestic credit expansion and thus collectively determine the growth of the world money stock. The distribution of this world money stock across countries is determined by the individual countries' money demand functions, with reserve flows making up the difference between changes in domestic money demand and domestic credit expansion.

The formal analysis of the fixed exchange rate regime is very simple. Let the global stock of gold and foreign exchange reserves be constant and, for notational simplicity, equal to zero. The global money stock is therefore the sum of the two countries' stocks of domestic credit. Let m be the logarithm of the global nominal money stock, D_i the logarithm of country i's stock of domestic credit, and ν the share of U.S. domestic credit in total domestic credit.

(18a) $$m \equiv \nu D_1 + (1 - \nu)D_2 \qquad 0 < \nu < 1.$$

Setting the logarithm of the fixed nominal exchange rate equal to zero, we define the global price level, p, as follows:

(18b) $$p \equiv \nu p_1 + (1 - \nu)p_2.$$

The global money demand shock η is similarly defined as:

(18c) $$\eta = \nu\eta_1 + (1 - \nu)\eta_2.$$

and global income as

(19) $$y = \nu y_1 + (1 - \nu)\, y_2.$$

The proportional rate of growth of country i's domestic credit is $\mu_1 \equiv \dot{D}_i$. (Under a free-floating exchange rate regime, $\mu_i \equiv \dot{m}_i$.) The augmentation term in the Phillips curve is taken to be the policy-determined μ_i rather than the endogenously determined $\dot{m}_i$. No fixed exchange rate regime is viable unless inflation rates converge. I therefore impose $\mu_1 = \mu_2 = \mu$. This still permits short-term divergence of inflation rates. I also define $i \equiv i_1 = i_2 + \tau_2 - \tau_1$. The model consists of equations (20)–(23) and (2), (4), (7) and (9). Identical structures are again assumed.

(20) $$l = ky - \lambda i + \eta - (1 - \nu)\lambda(\tau_1 - \tau_2)$$

(21) $$\dot{p}_1 = \psi(y_1 - \bar{y}_1) + \mu$$

(22) $$\dot{p}_2 = \psi(y_2 - \bar{y}_2) + \mu$$

(23) $$l \equiv m - p$$

For algebraic simplicity and in order to retain comparability with the floating exchange rate case, both countries are assumed to be of equal size, so $\nu = 1/2$.

The fixed exchange rate version has two state variables, l and c, which are both predetermined. The equations of motion and the determination of output in the two countries are given in equations (24) and (25) respectively.

$$
(24)\quad \begin{bmatrix} \dot{l} \\ \dot{c} \end{bmatrix} = \begin{bmatrix} -\psi(K_1 + K_2)^{-1}\gamma\lambda^{-1} & 0 \\ 0 & -2\psi(K_1 - K_2)^{-1}\delta \end{bmatrix} \begin{bmatrix} l \\ c \end{bmatrix}
$$

$$
+ \begin{bmatrix} -\psi(K_1 + K_2)^{-1}\gamma & \psi(K_1 + K_2)^{-1}\gamma\lambda^{-1} & -\psi\frac{(K_1 + K_2)^{-1}}{2} & -\psi\frac{(K_1 + K_2)^{-1}}{2} & 0 & \psi\frac{[1 + \psi\gamma(K_1 + K_2)^{-1}]}{2} & \psi[1 + \psi\gamma(K_1 + K_2)^{-1}] \\ 0 & 0 & -\psi\,(K_1 - K_2)^{-1} & \psi(K_1 - K_2)^{-1} & -\psi(K_1 - K_2)^{-1} & \psi[1 + \psi\gamma(K_1 - K_2)^{-1}] & -\psi[1 + \psi\gamma(K_1 - K_2)^{-1}] \end{bmatrix} \begin{bmatrix} \mu \\ \eta \\ f_1 \\ f_2 \\ \tau_1 - \tau_2 \\ \bar{y}_1 \\ \bar{y}_2 \end{bmatrix}
$$

$$
(25)\quad \begin{bmatrix} y_1 \\ y_2 \end{bmatrix} = \begin{bmatrix} (K_1 + K_2)^{-1}\gamma\lambda^{-1} & (K_1 - K_2)^{-1}\delta \\ (K_1 + K_2)^{-1}\gamma\lambda^{-1} & -(K_1 - K_2)^{-1}\delta \end{bmatrix} \begin{bmatrix} l \\ c \end{bmatrix}
$$

$$
+ \begin{bmatrix} (K_1 + K_2)^{-1}\gamma & -(K_1 + K_2)^{-1}\gamma\lambda^{-1} & K_1\Delta^{-1} & -K_2\Delta^{-1} & K_1\Delta^{-1}\gamma - (K_1 + K_2)^{-1}\gamma\frac{1}{2} & -K_1\Delta^{-1}\gamma\psi & K_2\Delta^{-1}\gamma\psi \\ (K_1 + K_2)^{-1}\gamma & -(K_1 + K_2)^{-1}\gamma\lambda^{-1} & -K_2\Delta^{-1} & K_1\Delta^{-1} & -[K_2\Delta^{-1}\gamma + (K_1 + K_2)^{-1}\gamma\frac{1}{2}] & K_2\Delta^{-1}\gamma\psi & -K_1\Delta^{-1}\gamma\psi \end{bmatrix} \begin{bmatrix} \mu \\ \eta \\ f_1 \\ f_2 \\ \tau_1 - \tau_2 \\ \bar{y}_1 \\ \bar{y}_2] \end{bmatrix}
$$

(26a) $$K_1 = 1 + \gamma\left(\frac{1}{2}k\lambda^{-1} - \psi\right)$$

(26b) $$K_2 = \frac{1}{2}\gamma\, k\lambda^{-1} - \epsilon$$

(26c) $$\Delta = K_1^2 - K_2^2 = (K_1 + K_2)(K_1 - K_2)$$

Several points can be made about the fixed exchange rate system. First, stability requires that $K_1 + K_2 > 0$ and that $K_1 - K_2 > 0$. This is equivalent to requiring that $K_1 > 0$ and $\Delta > 0$. Hoever, K_2 could be either positive or negative. With a fixed exchange rate, fiscal contraction in the United States will therefore definitely lower U.S. real output—from (25) $\frac{\partial y_1}{\partial f_1} = K_1\Delta^{-1} > 0$—but it may either raise or lower real output in the ROW—$\frac{\partial y_2}{\partial f_1} = -K_2\Delta^{-1}$. If $K_2 < 0$, the depressing effect on the ROW's export sector of a decline in U.S. demand outweighs the beneficial effect of lower worldwide interest rates—$\epsilon > \frac{1}{2}\gamma k\lambda^{-1}$ in (26b)—and the ROW experiences a slump. If the "crowding in" effect is stronger than the direct demand effect, $K_2 > 0$, then the ROW expands while the United States contracts. Even if output in both countries declines, the decline will be steeper in the United States.

It is easily checked that, if the United States and the ROW are of similar size, total world output always contracts, even in the case where output in the ROW is stimulated by lower interest rates:

(27) $$\begin{aligned} y^a =& (K_1 + K_2)^{-1}\gamma\lambda^{-1}\frac{l}{2} \\ &+ (K_1 + K_2)^{-1}\gamma\mu - (K_1 + K_2)^{-1}\gamma\lambda^{-1}\eta \\ &+ (K_1 + K_2)^{-1} f^a - (K_1 + K_2)^{-1}\gamma\psi\,\bar{y}^a. \end{aligned}$$

Note that average global real liquidity under the fixed exchange rate regime—$\frac{1}{2}\, l$ given in equation (24)—behaves identically to average global real liquidity under the freely floating exchange rate regime—l^a given in equation (14b).[5] The same holds for average world output—compare equation (27) with y^a from equation (15b). That the long-run, steady-state effects of fiscal policy (or other real shocks) are the same under fixed and floating rates is also easy to check.

When therefore we compare the consequences of a tightening of U.S. fiscal policy under a floating exchange rate with that under a fixed exchange rate, holding global monetary policy constant in the sense that the growth rates of domestic credit (and therefore the growth rate of the global stock of nominal money) are the same in the two regimes, the *recession* in the United States following the fiscal contraction will be smaller under a floating exchange rate while in the ROW the recession will be deeper with a floating rate.

The global loss of output is the same under the two exchange rate regimes, but while under a floating rate the recessions in the U.S. and the ROW are identical in magnitude (although in the United States the nontraded goods sector will be hit while in the ROW it will be the traded goods sector), under a fixed rate the United States will always experience a deeper recession. It is even possible that under a fixed rate the ROW would experience a net boost to output.

The short-run behavior of the real exchange rate is quite different under the two regimes. As shown in figure 4.3, under a floating exchange rate U.S. competitiveness, which is a nonpredetermined variable in this case, sharply improves on impact to its new equilibrium level. This jump-depreciation of c reflects a jump-depreciation of e, the nominal exchange rate. While this clearly represents a hard landing for the U.S. dollar, it represents a much softer landing for the U.S. real economy than the alternative scenario in which the nominal exchange rate is kept constant throughout. In the latter case U.S. competitiveness improves gradually after the U.S. fiscal contraction and converges asymptotically to the same level achieved immediately with a freely floating exchange rate. The improvement in competitiveness is due to the U.S. rate of cost inflation falling below that in the ROW because of the relatively deeper recession in the U.S.

An alternative fixed nominal exchange rate scenario that is sometimes considered more likely is the following, which can be called the "non-McKinnon variant." The United States, instead of accepting the stock-shift contraction in its domestic money stock associated with the stock-shift outflow of capital and loss of reserves, engages in domestic open market purchases to maintain the initial level of the money stock, i.e., it sterilizes the stock-shift loss of reserves by a stock-shift expansion of domestic credit. The ROW does not sterilize. This means that the global money stock expands (through a stock-shift U.S. domestic credit expansion) until the now endogenously determined U.S. money stock again assumes its pre–fiscal contraction value.

In contrast with the first analysis of the fixed exchange rate case, there now is a once-off increase in the level of the global nominal money stock path (relative to what happens under a floating rate) accompanying the U.S. fiscal contraction. Global nominal and real interest rates will decline by more than they do both in the fixed exchange rate case without U.S. sterilization and in the floating exchange rate case. It is clear that the recession in the United States will be less deep with sterilization than without and that for the ROW the recession will be less deep or the expansion larger. It is easily checked that with a fixed exchange rate and sterilization in the United States, the impact effects of a fiscal change in the United States on output in the United States and in the ROW is given by:

$$\text{(28a)} \quad \frac{\partial y_1}{\partial f_1} = \frac{1 - \gamma\psi}{(1 - \gamma\psi + \gamma k\lambda^{-1})(1 - \gamma\psi) + \epsilon(\gamma k\lambda^{-1} - \epsilon)},$$

and

$$\text{(28b)} \quad \frac{\partial y_2}{\partial f_1} = \frac{\epsilon - \gamma k\lambda^{-1}}{(1 - \gamma\psi + \gamma k\lambda^{-1})(1 - \gamma\psi) + \epsilon(\gamma k\lambda^{-1} - \epsilon)}.$$

Assuming that the IS curve is downward-sloping ($1 - \gamma\psi > 0$) and that the denominators of (28a, b) are positive, U.S. output declines on impact, while the ROW has a recession if the direct activity spillover effects dominate the "crowding in" effects of lower interest rates ($\epsilon - \gamma k\lambda^{-1} > 0$), a boom if the reverse holds true.

Global economic activity (assuming the United States and the ROW to be of equal size) can either contract (if $1 - \gamma\psi - \gamma k\lambda^{-1} + \epsilon > 0$) or expand (if $1 - \gamma\psi - \gamma k\lambda^{-1} + \epsilon < 0$). This ambiguity is to be expected since, globally, monetary and fiscal policy move in opposite directions. Strong crowding out (high γ and low λ) increases the likelihood of a net expansionary effect.

4.3.3 Policies That Achieve an Improvement in U.S. Competitiveness without a Contraction of World Demand

In this subsection I take as given the fiscal tightening in the United States as well as the achievement of a lasting improvement in U.S. external competitiveness. A floating exchange rate is again assumed.

A ROW Fiscal Expansion to Match the U.S. Fiscal Contraction

In the formal setting of our little model, the transition to improved U.S. competitiveness can be achieved instantaneously and without any contraction of effective demand at home or abroad by having the U.S. fiscal contraction matched by a corresponding ROW fiscal expansion. In terms of the dynamics of equations (14a,b) and (15a,b) and the steady-state conditions of equations (16a–e), this "package" consists of a reduction in f^d with f^a unchanged. Figure 4.4 shows the instantaneous adjustment process.

There is no change in real or nominal interest rates as the effects on the global capital market of the two opposing fiscal impulses cancel each other out. For a given U.S. fiscal contraction, the improvement in U.S. competitiveness is now doubled (in our linear model) because of the fiscal expansion in the ROW. World aggregate demand is unchanged and so is aggregate demand for each country's output.

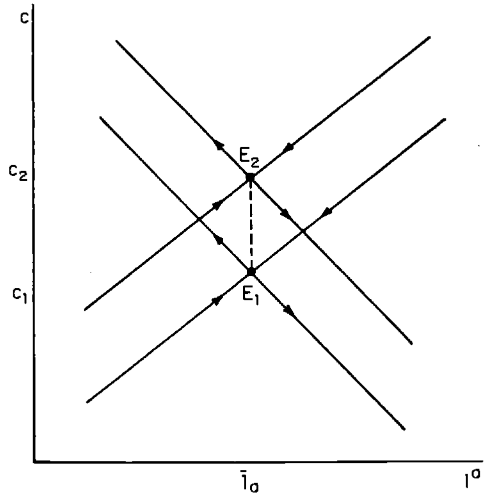

Fig. 4.4 Response to a U.S. fiscal contraction and a matching ROW fiscal expansion.

There are several qualifications to be made before this painless adjustment package is recommended for use in the real world. First, while total output stays constant in each country, there is a shift toward the production of tradeables in the United States and toward the production of nontradeables in the ROW. Steelworkers make poor hairdressers and conversely. The problems associated with changing the sectoral composition of production, employment, and investment are ignored in our simple model.

Second, the selection of dosage and timing for the ROW fiscal expansion is made to look simpler than it is in practice because of the assumption of known, identical structures. While this in no way weakens the case for a flexible policy response *in principle,* it makes the practical task of selecting the right mix, dose, and timing a much more complicated matter than our simple model may suggest.

Third, a fiscal expansion in the ROW may be opposed for *structural* or *allocative* reasons. Increased public spending may be undesirable because of its political irreversibility and because, at full employment, the benefits from the spending are judged to be less than its cost. Lower taxes or higher transfer payments may be undesirable because of possible efficiency losses, undesirable incentive effects, or for distributional reasons.

Fourth, fiscal expansions (other than balanced-budget fiscal expansions) entail larger deficits and, in time, a larger public debt. If the real interest rate exceeds the growth rate of the real tax base, explosive debt-deficit spirals are possible unless the primary (noninterest) deficit is planned (and believed) to become a surplus in due course. If there is no reputation for fiscal rectitude, temporary (increases in) deficits will be extrapolated into the future. Fear of possible future monetization of deficits will raise long nominal interest rates. Increased uncertainty about the future course of inflation may add a further risk premium to the required rate of return on nominal government debt. In extreme circumstances, fear of partial or complete debt repudiation or of special capital levies and surcharges may build a risk premium into the rate of return on all public debt (see Blanchard and Layard eds., Dornbusch [1986] and Buiter [1985b]). A good reputation for underlying fiscal rectitude would, however, avoid the potential crowding-out resulting from such *confidence* effects. It might therefore help if such a program were supervised by or at least coordinated through an international organization or institution that has a reputation for fiscal restraint.

Finally, it may be judged that the global level of effective demand is currently excessive, and that a net deduction in global demand is in order, as well as a realignment of U.S. competitiveness. A unilateral U.S. fiscal contraction might in that case be the right policy. The point would seem to be mainly of academic interest if, as many observers argue, there remains a margin of Keynesian slack in the world economy.

A U.S. Fiscal Contraction Matched by Effective Demand-Maintaining Expansionary Monetary Policy Changes

Calls for a change in the U.S. macroeconomic policy mix, from tight money and loose fiscal policy to looser money and tighter fiscal policy, have been heard from all corners of the profession in recent years. There are two kinds of monetary policy changes that could be used in the present model: changes in level of the nominal money stock and changes in the proportional growth rate of the nominal money stock.

Money-jumps. It is clear from inspection of the steady-state conditions (16a,e) and the equations of motion (14a,b) and (15a,b) that there is only one set of discrete (discontinuous) changes in the levels of the nominal money stocks in both countries that will permit an instantaneous transition at full employment (in both countries) to the new real long-run equilibrium associated with the unilateral reduction in the U.S. fiscal impulse discussed in section 4.3.1. If $df_1 < 0$ is the size of the U.S. fiscal contraction, these nominal money-jumps in both countries are given by

$$dm_1 = dm_2 = -\frac{\lambda}{2\gamma} df_1 \tag{28}$$

At the predetermined price level, this nominal money-jump provides just the right increase in real-money balances demanded as a result of the lower nominal (and real) world interest rate associated with the lower global fiscal impulse. There is no need to force the price level path below the nominal money stock path through a policy of demand deflation and unemployment. The steady-state increase in real-money balances, which in a new-classical model with a nonpredetermined, flexible price level would be brought about by a discrete downward jump in the price level path, is achieved in the Keynesian, predetermined price-level model by a stock-shift open market purchase in each country that increases the nominal money stocks by the required amounts. It is the stickiness of *real* money balances which makes a recession inevitable when there is any exogenous shock or policy change that raises the long-run demand for money balances. This stickiness of the real money stock reflects both the stickiness of domestic costs (assumed to be a policy and exogenous shock-invariant structural property of private market behavior) and the stickiness of monetary policy. If the level of the nominal money stock is a choice variable at any given instant, policy flexibility can make up for and compensate for domestic cost inflexibility.

The great advantage of the kind of once-and-for-all nominal money-stock jumps considered here is that they don't result in any change in the rate of inflation in the short run or in the long run. They do cause the long-run level of the path of prices to be higher than it would otherwise have been, but since welfare costs are associated with the rate of inflation rather than with the level of prices,[6] this is no cause for concern. The major problem with money-jump policies is their effect on inflationary expectations. The obvious analytical distinction between a discontinuous discrete change in the level of the money stock path and a (finite) change in the instantaneous rate of change of that path may not be as obvious in practice, especially when the money stock is sampled at discrete time intervals: a once-and-for-all upward level change at a point in time in the middle of an observation interval t_0 may look much like an increase in the rate of growth between t_0 and $t_0 + 1$. If such an apparent increase in the growth rate is extrapolated into the future, serious instability may result. Governments or central banks with a reputation for monetary rectitude will be able to engineer once-off money-jumps without adverse effects on inflationary expectations. Governments or central banks with a reputation for monetary laxness will be prisoners of the markets' lack of confidence and may have to live with the adverse effects on inflation expectations of any observed increase in the money stock.

Note that if the monetary authorities had nominal income targets rather than monetary targets, there should be no credibility problems associated with a once-off increase in the nominal money stock. Nominal income targets are velocity-corrected monetary targets. They have desirable operating characteristics whenever exogenous shocks or policy changes necessitate a change in velocity.

Changes in money growth rates. The other monetary policy action (in both countries) that can achieve the transition to an improved level of U.S. competitiveness without any output or employment cost is an equal permanent increase in the rate of growth of the nominal money stock in each country. It can again be checked from the steady-state conditions (16a–e) and from the equations of motion (14a,b) and (15a,b) that the following permanent increase in $\dot{m}_1$ and $\dot{m}_2$ will achieve an instantaneous transition at full employment (in both countries) to the new real long-run equilibrium associated with the unilateral reduction in the U.S. fiscal impulse discussed in section 4.3.1.

(29) $$d\dot{m}_1 = d\dot{m}_2 = -\frac{1}{2\gamma}df^1$$

This monetary policy response would, by raising the rate of inflation in both countries, prevent the global *real* interest rate decline resulting from the U.S. fiscal contraction from being translated into a decline in *nominal* interest rates. With nominal interest rates unchanged, there is no increase in the demand for real-money balances and consequently no need for a recession to depress the general price level path below the nominal money stock path. The policy has one obvious undesirable feature: a recession is prevented at the cost of having a permanently higher rate of inflation in the world economy.

4.4 Responses to a Collapse of the U.S. Dollar

A second question addressed by economic policymakers and analysts is the proper response (in the U.S. and in the ROW) to a sudden large fall in the value of a key currency, taken here, for concreteness, to be the U.S. dollar. To determine the nature of the appropriate policy responses, we first must determine what the causes of the sudden depreciation of the currency are. There are two broad classes of possible causes: (a) the bursting of a speculative bubble that caused the dollar to be overvalued in relation to the "fundamentals"; (b) an actual or perceived change in the fundamentals driving the exchange rate. The latter category can be subdivided into a number of cases: (1) A portfolio shift against the dollar that reflects, say, greater uncertainty about the future prospects for U.S. inflation. In the simple model used here, this can be represented by a reduction in U.S. liquidity preference—a fall in η_1. (2) An increase in the *real* risk premium on foreign-owned U.S. assets. This could reflect fear of future increases in taxation of U.S. interest income and, conceivably, a greater perceived risk of repudiation or default. In the model this can be represented by an increase in $\tau_2-\tau_1$—the real risk premium is like a net tax on U.S. interest income. (3) An unexpected increase in the level of the U.S. money stock or in the rate of U.S. monetary growth. (4) An unexpected tightening of the U.S. fiscal stance.

All four events should be thought of in relative terms, e.g., the portfolio shift against the dollar reflects an increase in uncertainty about U.S. inflation relative to uncertainty about inflation in the rest of the world. Similarly, it is looser U.S. monetary policy relative to monetary policy elsewhere or tighter U.S. fiscal policy relative to fiscal policy elsewhere that puts downward pressure on the dollar.

An important issue in determining the appropriate policy response to a sudden drop of the dollar in response to a change in private sector perceptions concerning the likely future course of the fundamentals, is whether the national authorities and the international coordinating agency share these new perceptions. A different approach will in general be called for if the authorities believe they have information superior to that used by private agents in forming expectations, but there is no way of sharing this information with private market participants or of convincing them of its relevance. In what follows, no superior public sector information is assumed.

4.4.1 A Bursting Bubble

It is well known that the solution of rational expectations models with forward-looking, nonpredetermined state variables (such as the nominal and the real exchange rate in our model) may be characterized by a *bubble;* that is, the behavior of the endogenous variables may be influenced by variables that matter only because, somehow, private agents believe that they matter. These bubble processes, which affect expectations in a self-validating manner, may be functions of the fundamental variables (i.e., those variables that enter into the structure of the model other than by merely being part of the information set used to form expectations) or of completely extraneous or spurious variables of the "sunspot" variety (Blanchard [1979]; Azariadis [1981], Obstfeld and Rogoff [1983]). In figure 4.5, it is assumed that all "fundamentals" have constant values, now and in the future, that the steady-state equilibrium corresponding to these constant values for the fundamentals is E_0 and that the associated convergent saddle path is S_0S_0. Suppose, without loss of generality, that the predetermined variable is at its steady-state value l_0^g. The nonpredetermined variable c, however, is on a bubble path EE which overvalues it relative to the path warranted by the fundamentals (S_0S_0). Its value at t_0, the time when the bubble bursts, is c_0. The bursting of the bubble moves c instantaneously to its fundamental value c^*. In a rational world, there must be uncertainty

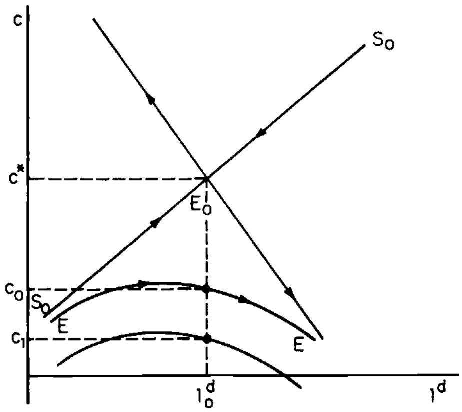

Fig. 4.5 The end of an exchange rate bubble.

about the direction of the discrete jump in the exchange rate at t_0. The instantaneous discrete upward jump in c and e would, if it were anticipated with certainty, promise an infinite rate of return to shorting the dollar the instant before t_0. There could, however, be a set of beliefs that at t_0 attaches some probability Π_0 to a return to the fundamental value ($\Delta c = c^* - c_0$) and some probability $1 - \Pi_0$ to a further discrete downward jump in c to c_1, which puts the exchange rate on a bubble path even further removed from its fundamental value. Provided $\Pi_0(c^* - c_0) + (1 - \Pi_0)(c_1 - c_0) = 0$, there are no expected excess returns from taking an open currency position.[7] It seems self-evident that the right thing to do for policymakers when a bubble bursts is to sit back and enjoy the sight. While we do not have a well-developed theory of the welfare economics of speculative bubbles in a world with uncertain, limited, asymmetrically distributed (insider/outsider) information, there is a strong presumption that they are costly and harmful as well as unsustainable. It may be that the fundamental valuation to which the exchange rate returns when the bubble bursts itself represents an unattractive equilibrium because the fundamentals (especially current and anticipated future policy) are in a mess. That, however, is an argument for doing something about the fundamentals, when the exchange rate once again reflects those fundamentals, a course that would have been desirable even if there had been no bubble and no sudden drop in the exchange value of the dollar.

In reality, the ending of a speculative bubble is likely to be associated both with major redistributions of wealth and with short-term disruption of financial markets, commerce, and production because of bankruptcies and insolvencies. None of these adjustment costs are included in our formal model. I would be surprised, nevertheless, if it could be shown that it is better to end a bubble with a slow puncture than with a quick burst. A hard landing of the dollar under these circumstances does not preclude a soft landing for the world economy. No policy response in the U.S. or in the ROW seems necessary.

4.4.2 A Reduction in U.S. Liquidity Preference

A downward shift in the U.S. liquidity preference schedule (a fall in η_1) has no long-run effects on competitiveness or on real or nominal interest rates. In the short run, the effects are as depicted in figure 4.6. An unexpected, immediate, permanent reduction in η_1 works just like a once-off increase in the level of the U.S. money stock. The nominal and real exchange rate jump-depreciates to E_{01} from E_0. After that the real exchange rate gradually moves back to its initial level and the system converges to E_1. In the U.S. real economic activity booms because of short-run lower nominal and real interest rates and because of the improvement in competitiveness. Average world economic activity also rises (y^a increases) because of the short-run downward pressure on nominal and real interest rates. Activity levels in the ROW are, however, depressed, as the loss of competitiveness outweighs the effect of lower interest rates. If the initial equilibrium was deemed satisfactory, the obvious policy response to the fall in liquidity preference is a matching once-off reduction in the level of the U.S. nominal money stock. This would leave all real and nominal variables (other than l_1) unchanged.

If the shift out of U.S. money represents a stock-shift currency substitution and has as its counterpart a matching stock-shift increase in foreign money demand η_2, the change in competitiveness will be twice as large. Average real-world activity (y^a, i^a, p^a and r^a) is unchanged in the short run and in the long run. The behavior of c and l^d is like that illustrated in the top diagram of figure 4.6, but with a shift up and to the left of the saddle path that is twice as large. The United States experiences a transitional boom that is matched by a transitional slump in the ROW. The obvious way to neutralize this once-off currency substitution and stabilize the exchange rate is to contract the U.S. money stock by $-\Delta\eta_1$ and expand the ROW money stock by $\Delta\eta_2$. Such monetary policy changes in addition may well have favorable effects (not formally modeled here) on the relative changes in inflation uncertainty that may have prompted the money demand shifts in the first place.

An Increase in the Real U.S. Risk Premium

An increase in the relative perceived real risk of foreign investment in the United States will in the long run raise the U.S. real and nominal interest rates and lower the ROW real and nominal interest rates, leav-

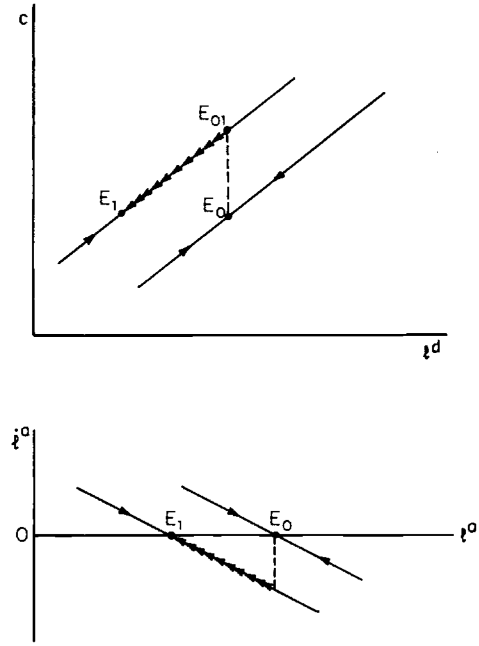

Fig. 4.6 Dollar depreciation as a result of a fall in U.S. liquidity preference.

ing the average world rates unchanged. The increase in U.S. risk and reduction in ROW risk is assumed to apply only to foreign investors, not to domestic capital formation in either country. Figure 4.7 illustrates the dynamic response pattern to this shock. Global (l^a, y^a, i^a, p^a and r^a) are not affected. The U.S. economy experiences an immediate jump-depreciation of the nominal and real exchange rate from E_0 to E_{01}.

Note that the real exchange rate overshoots its long-run equilibrium value. After the initial jump there is a gradual depreciation of the U.S. real exchange rate. The new long-run equilibrium at E_1 represents a net real depreciation relative to the initial one. The U.S. economy experiences a transitory boom which lowers its real stock of money balances. The ROW goes through a transitory slump which raises its real money balances.

One possible policy response that exactly neutralizes this increase in the U.S. foreign investment risk premium is an equal increase in $\tau_1 - \tau_2$, the excess of the U.S. tax rate on interest income accruing from abroad over the ROW's tax rate on interest income accruing from the United States. This would restore the initial equilibrium immediately. Alternatively, a once-off increase in the ROW's nominal money

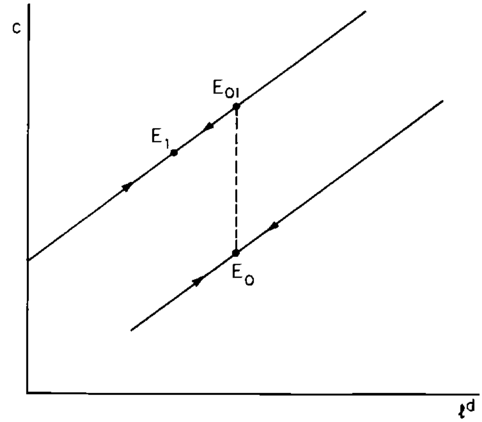

Fig. 4.7 An increase in the relative perceived risk of foreign investment in the United States.

stock by λ times the change in the risk premium and a reduction in the U.S. nominal money stock by the same magnitude, would instantaneously achieve the same long-run change in the real equilibrium shown in figure 4.7, without any transitonal U.S. inflation and ROW contraction. A permanent increase in the U.S. rate of monetary growth and an equal reduction in the ROW rate of monetary growth with $d\dot{m}_1 - d\dot{m}_2 \equiv d\dot{m}^d = -d$(risk premium) would, in figure 4.7, move the economy immediately from E_0 to E_{01}, which would now be the new long-run equilibrium.

Policy-induced Exchange Rate Collapses

The response of the exchange rate to changes in fiscal and monetary policy in the United States and the ROW has already been discussed in section 4.3. The only point worth repeating here is that a hard landing for the U.S. dollar need not represent a hard landing for the U.S. economy or for the ROW. If the initial situation is one characterized by current and anticipated future lax U.S. fiscal policy and tight U.S. monetary policy, these fundamentals are likely to be reflected in a strong (an "overvalued") U.S. real exchange rate. The first-best cooperative, coordinated global policy package to change this unfavorable equilibrium (fiscal contraction in the United States and a once-off money stock increase in the United States and in the ROW to meet the resulting decrease in velocity) is accompanied by a dollar "collapse." It may seem paradoxical that the restoration of confidence in the ability of the U.S. to get and keep its budget under control would be accompanied by a fall in the U.S. dollar, but such a view reflects the mistaken identification of the exchange rate as an index of national economic machismo.

4.5 Policy Responses to a Slowdown in Global Economic Activity

The first question that needs to be answered before one can determine the appropriate U.S. and ROW policy responses to a global economic slowdown concerns the cause(s) of this slowdown. A distinction must be made between a slowdown resulting from an adverse supply-side shock (modeled in our simple model by a temporary or permanent fall in $\bar{y}_1$ or $\bar{y}_2$) and a demand-induced slowdown. In the case of the latter we can again distinguish adverse money-demand shocks (increases in η_1 and η_2) and reductions in private U.S. or ROW demand for goods and services (which can be represented as reductions in f_1 or f_2).

4.5.1 Adverse Supply-Side Developments

Permanent reductions in productive capacity in the U.S. and the ROW raise the long-run real interest rate everywhere and thus bring down demand in line with supply. Nominal interest rates will also rise if money growth rates are unaffected and, both through real-income and interest-rate effects, the demand for real-money balances in both regions will decline in the long run. If productive capacity is affected equally in both countries ($\Delta\bar{y}_1 = \Delta\bar{y}_2 = \Delta\bar{y}$) there is no long-run change in l^d or in c. In this case, as shown in figure 4.8, the world economy

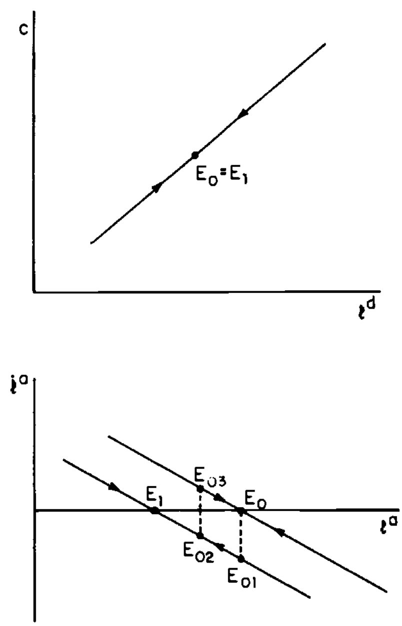

Fig. 4.8 Effects of a common permanent decline in productive capacity in both countries.

undergoes a bout of excess demand and of inflation in excess of the rate of monetary growth (affecting both regions equally) which lowers the long-run stock of money balances. In the very short run, output (which is demand-determined) actually rises because higher inflation reduces the real interest rate (nominal interest rates rise less than one-for-one with the rate of inflation because the LM curve is not vertical).

The policy response that prevents the emergence of excess demand and inflationary pressures during the transition to the lower levels of capacity output involves a contraction of demand which can be achieved either by fiscal or monetary means (or by a combination of the two). If no long-run change in competitiveness is desired, any fiscal contraction should be equal in the two countries. Probably the simplest coordinated policy action that immediately achieves the new long-run equilibrium at E_1 in figure 4.8 is a reduction in m_1 and in m_2 equal to

$$[k + \frac{\lambda(1 - \epsilon)}{\gamma}]\Delta\bar{y}.$$

If the common capacity decline at t_0 is expected to be temporary and to be reversed at t_1, there is still no action in $c - l^d$ space (the top diagram in figure 4.8). The world economy experiences a bout of excess demand between t_0 and t_1 (moving from E_{01} to E_{02}) and a bout of excess supply after t_1 (between E_{03} and E_0). The same reduction in m_1 and in m_2 at t_0 will take the world economy (without excess demand) from E_0 to E_1 where it will stay until t_1. At t_1 both nominal money stocks should be increased again by the same percentage by which they were reduced at t_0 in order to achieve a painless and instantaneous restoration of full equilibrium at E_1.

An adverse permanent supply shock in the United States alone, say, would cause a long-run worsening of U.S. competitiveness (required to choke off global demand for U.S. output), some increase in global real and nominal interest rates (but less than with a common decline in capacity output), a decline in U.S. real-money balances, and a smaller decline in the ROW real-money balances. On impact, there is likely to be a step-appreciation of the dollar. After that the real exchange rate continues to appreciate gradually towards its new long-run equilibrium. Real interest rates in the United States will be below those in the ROW during the transition. A reduction in the U.S. nominal money stock by an amount $[k + \frac{\lambda(1 - \epsilon)}{\gamma}]\Delta\bar{y}_1$, and an increase in the ROW nominal money stock by $-\frac{\lambda(1 - \epsilon)}{\gamma}\Delta\bar{y}_1$, will permit an instantaneous transition to the new, real long-run equilibrium with lower values of c, l^d, and l^a, avoiding the transitory inflation in the United States and the transitory contraction in the ROW that would otherwise occur.

4.5.2 A Demand-induced Slowdown in Economic Activity

When the cause of a disappointing level of economic activity is a decline in some component of private demand, appropriately designed demand management can minimize the damage and, in the present model, can be used to avoid it altogether. Increases in private liquidity preference (η_1 and η_2) can be met with corresponding once-off increases in the levels of the nominal money stocks—m_1 and m_2. A downward shift in the private consumption functions or a collapse of animal spirits can be offset directly by corresponding fiscal stimuli f_1 and f_2. If the balanced-budget multiplier theorem retains some validity, these fiscal stimuli can be provided without increasing the deficit. Supply-side consequences from the tax increase or transfer-payments cuts involved in a balanced-budget expansion should of course be taken into account (the behavioral links, ignored here, between f_i and $\bar{y}_i$).

Note that it is never necessary, in response to any shock, to engineer a permanent change in monetary growth rates. Once-off changes in the levels of the nominal money stocks (or temporary changes in money growth rates) are sufficient.

4.6 Conclusion

This chapter presents a rather old-fashioned study of demand management in an open, interdependent economic system. Three contingencies discussed widely during 1984 and 1985 were analyzed using an eclectic, short-run Keynesian, long-run classical, two-country model. The main conclusion is that an active monetary and/or fiscal response in both countries or regions is in general required to minimize the costs associated with the adjustment process resulting from a variety of demand-side or supply-side shocks. Only in the case of a currency collapse resulting from the bursting of an exchange market speculative bubble did a no-response policy appear desirable. A unilateral U.S. fiscal contraction will cause a temporary slowdown of world economic activity as well as a sudden drop in the nominal and real value of the dollar. Merely preventing the nominal exchange rate from changing does not reduce the magnitude of the global recession or alter the long-run real adjustment that takes place, but it would redistribute the unchanged global unemployment and excess capacity burden towards the United States and away from the ROW. A no-response policy would be appropriate if the initial situation were characterized not only by an undesirable U.S. fiscal-monetary policy mix resulting in a poor U.S. international competitive position but also by global excess demand. An expansionary fiscal move in the ROW or a combined expansionary monetary policy move in both the United States and the ROW could achieve the desired traverse to a better level of U.S. competitiveness without a global slump. These monetary stimuli need not be permanent increases in the rate of money growth. Once-off credible open market purchases raising the levels of the nominal money stocks suffice.

The proper response to a sudden drop in the value of the dollar depends crucially on the reason(s) for this drop. The bursting of a speculative bubble has no obvious monetary or fiscal policy implication. Downward pressure on the value of the dollar resulting from a once-off fall in U.S. liquidity preference calls for a matching once-off reduction in the U.S. nominal money stock. Direct currency substitution away from the dollar calls for open market sales in the United States and open market purchases in the ROW. The consequences of the emergence of a real risk premium on the return from foreign investment in the United States can be neutralized by a matching increase in the difference between the U.S. tax rate on interest income from the ROW and the ROW's tax rate on interest income from the United States. Alternatively, one might accept the depreciation of the nominal and real U.S. exchange rates but avoid the transitional U.S. inflation and ROW contraction by expanding the money stock in the ROW and reducing it in the United States.

The appropriate policy response to a slowdown in global economic activity depends on whether this slowdown reflects a deterioration of the supply side or deficient aggregate demand. To avoid the stagflation that would otherwise result from a global adverse supply shock, demand-reducing measures are called for in both countries. If the supply shock is temporary, the restrictive measures should be reversed when capacity output recovers. The appropriate response to a fall in private demand for goods and services is a fiscal stimulus. The contractionary effects of an increase in liquidity preference can be avoided by an accommodating (noninflationary) increase in the level of the money stock.

The fiscal stimuli discussed in this paper are to be interpreted as "discretionary" changes over and above the automatic changes in tax receipts and transfer payments that reflect the workings of existing tax and benefit laws, rules, and regulations as the level of economic activity varies, and that may dampen but never eliminate such fluctuations.

To provide truly satisfactory answers to the questions raised here the model would have to be extended in a number of directions. Even an analysis that focuses on the industrial world alone, would benefit from a three-region setting: the United States (plus Canada), Europe, and Japan. The complexity entailed in going to three regions virtually obliges one to use numerical rather than analytical methods. The model here ignores all stock-flow asset dynamics, those coming from the government budget identities, those coming from the current account of the balance of payments, and those resulting from real capital accumulation.[8] Again, their incorporation requires the use of numerical methods. Finally, it would be extremely desirable to allow explicitly for uncertainty. Adding some linear stochastic processes with known coefficients to the deterministic model is feasible but does not constitute much of an advance. Anything more complicated, even linear models with stochastic coefficients, let alone nonlinear stochastic models, means that we enter the mathematical or computational stratosphere. The modeling language we would like to use just does not exist yet.

The logic of the model used here, and indeed of any model that permits persistent disequilibrium or non-Walrasian equilibrium, implies that monetary and fiscal policy instruments can be used actively to stabilize output, employment, and the price level in response to a whole range of demand or supply shocks. To argue against such active policy responses, or against the adoption of explicit policy rules that would, for example, make monetary growth (or the deviation of actual monetary growth from its expected value) a function of observable contingencies, one would have to make a case for the technical, political, or institutional impossibility of an active stabilization policy.

The technical impossibility of stabilization policy has been argued on two grounds. There is the Lucas-Sargent-Wallace-Barro argument that in properly specified macroeconomic models only unperceived or unanticipated monetary policy can affect the deviations of actual real variables from their "natural" or full information values. Fiscal policy obviously has allocative effects both in the short run and in the long run, but it too cannot systematically affect the deviation of real output and employment from their capacity, full employment, or natural levels. If debt neutrality prevails, the substitution of lump-sum taxes for current borrowing has no real effects in the short run or in the long run. These policy ineffectiveness propositions for a while engaged the interest of a significant part of the macroeconomics profession but are now generally viewed as theoretical curiosa without empirical relevance.

The second technical argument against the active use of stabilization policy is much older (it goes back at least to Milton Friedman's work in the fifties and sixties) but more relevant. It is a generalization of the "long and variable lags" argument used by Friedman to make the case against active countercyclical use of monetary policy. Clearly, the length of the lag between the policy response and its impact on the variable(s) of interest (the "outside" lag) is irrelevant per se. It is uncertainty about the coefficients in the model, about the order of the lags, and indeed about the total specification of the appropriate model of the economy that forces one to qualify the confident policy prescriptives that emerge from the manipulation of models such as the one advanced here. The length of the "inside lag," the lag between the identification of the need to respond and the moment the policy handle can finally be cranked, puts further constraints on our ability to stabilize the economy through active demand management. Estimates of the "inside lag" for U.S. fiscal policy range from a few years to infinity.

It should be recognized that uncertainty about the way in which the economy works not only renders the consequences of policy activism harder to predict. It also increases uncertainty about the consequences of refraining from policy activism and sticking to preannounced, unconditional (noncontingent or open-loop) rules. It seems highly unlikely that a cautious, safety-first policy of hedging one's bets in the face of great uncertainty would ever involve the economic equivalent of locking the steering wheel and closing one's eyes.

The political or institutional case against active demand management relies in part on alleged observed asymmetries or irreversibilities in monetary and fiscal policy design. Policymakers, according to this view, are happy to cut taxes and raise spending for cyclical reasons during a slump but are reluctant to raise taxes and cut spending when the economy is overheating and a countercyclical quid pro quo is needed. While there is some informal evidence supporting this view, there are counterexamples too (e.g., the increase in the overall British tax burden by 4% of GDP during Prime Minister Thatcher's first term). It would be very valuable to have more systematic evidence on this important issue of political economy.

The conditions under which optimal, conditional stabilization policy rules would be credible (or time-consistent) also are only just beginning to be studied. The study of post–World War II economic history suggests that "stabilizing" monetary and fiscal policy actions have their desired effects only if the monetary or fiscal authorities have "conservative" reputations for underlying monetary soundness and fiscal responsibility and rectitude. Without such reputations, temporary and reversible changes in money growth, tax rates, or spending schedules are likely to be perceived as permanent. Such adverse expectations or confidence-effects may lead to inflation premiums in nominal interest rates, and even to "super-crowding out" or negative multipliers as a result of increased long real rates (see Buiter [1985b]). The coordination of international stabilization policies through international agencies with reputations for monetary and fiscal conservatism could therefore be especially effective.

One set of "cautious" global macroeconomic policy recommendations popular among international officials (see, e.g., International Monetary Fund [1985]) can be summarized as: (1) adherence to unconditional medium-term monetary growth targets; (2) continued downward pressure on structural fiscal deficits; and (3) limited countercyclical responsiveness of actual deficits reflecting the (partial) operation of the automatic fiscal stabilizers. According to the analysis of this chapter, such a policy package will not prevent a global recession if and when the United States tightens its budgetary stance. It is not even sufficient to prevent the slowdown that appears to be underway already. The risks associated with this strategy are very high. Even in the current state of the art it is not impossible to design a more flexible and a superior set of policy recommendations. Not for the first (or the last) time, caution demands, if not action now, then certainly preparation for action should the need arise.

Notes

1. We could specify the demand for real-money balances as a demand for money balances in terms of the country's consumption bundle. Let country 1's consumer price index $\tilde{p}_1$ be a weighted average of the domestic value-added deflator and the domestic currency value of the foreign value-added deflator, i.e. $\tilde{p}_1 = \alpha_1 p_1 + (1 - \alpha_1)(e + p_2)\ 0 < \alpha_1 < 1$. Money demand is a function of real income $y_1 + p_1 - \tilde{p}_1 = y_1 + (\alpha_1 - 1)c$ and the nominal interest rate, i.e.,

$$m_1 - \tilde{p}_1 = k_1 (y_1 + p_1 - \tilde{p}_1) - \lambda_1 i_1, \text{ or}$$

$$l_1 = k_1 \gamma_1 - \lambda_1 i_1 + (k_1 - 1)(\alpha_1 - 1)c.$$

This equals our equation (1) when $k_1 = 1$ or when $\alpha_1 = 1$. The superior alterative specification results in slightly greater algebraic complexity.

2. Adding this would not alter the results qualitatively. Let the money demand functions including direct currency substitution be given by $m_1 - p_1 = \beta_1 \dot{e} - \lambda_1 i_1 + k_1 y_1 + \eta_1$ and $m_2 - p_2 = \beta_2 \dot{e} - \lambda_2 i_2 + k_2 y_2 + \eta_2$. In the "symmetric" case considered below, $\beta_1 = \beta_2 = \beta$; $\lambda_1 = \lambda_2 = \lambda$ and $k_1 = k_2 = k$. For any variable x let $x^d = x_1 - x_2$ and $x^a = \frac{x_1 + x_2}{2}$. It follows that $l^d = -(\lambda + 2\beta)i^d + ky^d - 2\beta(\tau_1 - \tau_2)$ and $l^a = -\lambda i^a + ky^a$. The behavior of "global averages" is completely unaffected by direct currency substitution. "Country differences" are affected through an increased "interest-sensitivity" of l^d, i.e., the coefficient of i^d now is $-(\lambda + 2\beta)$ instead of $-\lambda$. In addition, the last term on the r.h.s. of the l^d equation is absent without direct currency substitution. If we ignore this second (minor) difference, the analysis that follows can be applied to the case of direct currency substitution by replacing λ (in the "differences" model only) by $\lambda + 2\beta$. In the limiting case where the currencies are perfect substitutes ($\beta = +\infty$) only an ex-ante fixed exchange rate regime is viable.

3. This result is quite robust and does not depend on the assumption of a fixed level of capacity output. In Buiter (1984b) I consider the case where capacity output is given by a neoclassical production function with exogenous labor supply and a long-run endogenous capital stock. In the perfectly integrated financial markets, an increase in public spending raises the global real interest rate and thus lowers the steady-state capital stocks at home and abroad and with them domestic and foreign capacity output. If the contraction in capacity output is not biased toward the foreign country and if the increase in public spending is biased toward home goods, then higher public spending still

raises the long-run relative price of home goods. If public debt is not neutral, a lower level of domestic taxes will also (if domestic private spending is, at the margin, biased toward home goods) be associated with an increase in the relative price of home goods.

4. For i^a to decline less on impact than in the long run, we must assume that $1 - \gamma\psi - \epsilon > 0$. For r^a to decline less on impact than in the long run, we must asume that $\epsilon < 1$.

5. Since $K_1 + K_2 = \Omega - \epsilon$.

6. The statement is meant to apply only to a world without uncertainty.

7. The behavior of l^d and c given in equation (14a) can be summarized as

$$\begin{bmatrix} \dot{l}^d \\ E_t\dot{c} \end{bmatrix} = \mathbf{A} \begin{bmatrix} l^d \\ c \end{bmatrix} + \mathbf{Bz},$$

where $\mathbf{A} = (a_{ij})$, $\mathbf{B} = (b_{ij})$, and $\mathbf{z}$ is the vector of exogenous variables.

The general solution for c and l can be shown to be (Buiter [1984a])

$$c(t) = -W_{22}^{-1}W_{21}l^d(t) - W_{22}^{-1}\int_t^{\infty} e^{\lambda_2(t-\tau)}\mathbf{D}E_t\mathbf{z}(\tau)d\tau + W_{22}^{-1}F(t)$$

$$l^d(t) = e^{\lambda_1(t-t_0)}l^d(t_0) + \int_{t_0}^{t} e^{\lambda_1(t-s)}b_1\mathbf{z}(s)ds$$

$$- \int_{t_0}^{t} e^{\lambda_1(t-s)}a_{12}W_{22}^{-1}\int_s^{\infty} e^{\lambda_2(s-\tau)}\mathbf{D}E_s\mathbf{z}(\tau)d\tau ds$$

$$+ \int_{t_0}^{t} e^{\lambda_1(t-s)}a_{12}W_{22}^{-1}F(s)ds.$$

λ_1 is the stable eigenvalue of $\mathbf{A}$ and λ_2 the unstable eigenvalue. $\begin{bmatrix} W_{11} W_{12} \\ W_{21} W_{22} \end{bmatrix} =$ $\mathbf{W} = \mathbf{V}^{-1}$ where $\mathbf{V}$ is the matrix whose columns are the right eigenvectors of $\mathbf{A}$. $\mathbf{D} = [W_{21}b_1 + W_{22}b_2]$.

$\begin{bmatrix} b_1 \\ b_2 \end{bmatrix} = \mathbf{B}$. F is the bubble component. It satisfies $E_t\dot{F}(t) = \lambda_2 F(t)$ but is otherwise arbitrary.

8. For a numerical simulation model which incorporates all three sources of asset dynamics in a two-country, full-employment setting, see Buiter (1984b).

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Comment Maurice Obstfeld

Willem Buiter's chapter extends the literature on international policy coordination by showing how countries can cooperatively manage their monetary and fiscal policies to offset the effects of certain macroeco-

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nomic disturbances. The analytical framework is the celebrated two-country model of Mundell (1968, chap. 18), updated to include gradual price-level adjustment and rational expectations of the economy's transition path. Since its development more than two decades ago, Mundell's model has proven to be one of the most useful tools of descriptive, medium-term, macroeconomic analysis. Buiter carefully notes some important limitations of the model, for example, its failure to follow up the dynamic effects on public- and private-sector debt stocks of sustained international shifts in fiscal stance. The problem of cumulating public debt lies at the heart of the current U.S. macroeconomic problem, and further analysis must recognize that policies designed to offset the short-run effects of shocks may be unsustainable over a longer horizon.

If we leave these long-run issues aside, there is still the question of how best to use Mundell's model as a tool of policy analysis rather than as a purely descriptive framework. Buiter makes two key assumptions in his analysis of optimal policy responses. First, policymakers are assumed to know quite precisely the nature of the disturbance to world equilibrium. Second, there is an assumption that the effects of policy actions can be reliably predicted. Both these assumptions are very strong, and ignore the uncertain environment in which actual policy decisions must be made.

In the short term, policymakers observe asset prices such as exchange rates on a daily basis, but they observe data on trade flows, industrial production, price levels, employment, and other variables with much less frequency. Preliminary estimates of these numbers can be unreliable; the United States government's preliminary "flash" forecasts of quarterly GNP have been so misleading recently that they have been discontinued. Policymakers are always in the position of inferring from available data the causes of economic changes. Does a particular exchange-rate movement reflect a disturbance in asset markets, in goods markets, or in both? As Buiter demonstrates, the appropriate policy response to the exchange-rate movement depends on the nature of the underlying shock.

The second difficulty facing policymakers is uncertainty about how policies will affect the economy. Lucas's (1976) famous critique of econometric policy evaluation highlights the practical difficulties in forecasting the effects of macroeconomic policies when private decisions are based on rational expectations. In extreme cases, policies may become ineffective. I think Buiter goes too far in dismissing policy-ineffectiveness propositions as "theoretical curiosa without empirical relevance," and I am unaware of an empirical basis for this dismissal. While it is implausible that the strongest of the policy-ineffectiveness results are literally applicable to reality, the results do warn us that policy actions may have unexpected and unwanted consequences.

Uncertainty about the nature of shocks and the effects of policies places the policymaker in the type of world studied by Brainard (1967) and by Poole (1970). In that world, sophisticated fine-tuning of the sort Buiter analyzes is impossible, so authorities are likely to focus instead on some class of simple policy rules, choosing the one that tends to yield the best macroeconomic outcomes on average. Here I want to discuss aspects of the comparison between two much-analyzed policy rules: a purely floating exchange rate and an exchange rate fixed by countries' monetary authorities. The analytical literature on which my discussion builds is surveyed by Henderson (1984) and Marston (1985). My 1985 paper contains a more comprehensive comparative examination of exchange-rate regimes.

Small-Country Analysis and International Risk Sharing

The first shock analyzed by Buiter, an unexpected fiscal tightening in the United States, illustrates a central proposition of the literature on fixed versus floating exchange rates: When most shocks to the economy represent aggregate demand movements (shifts in the IS curve), floating exchange rates minimize the conditional variance of output and thus serve as automatic stabilizers. In the presence of some form of wage-price inflexibility, an unforeseen decline in aggregate demand leads to a fall in employment. But if the exchange rate is flexible, the currency will adjust instantly, falling in value against foreign currencies and shifting world demand in favor of domestic products. Compared to a fixed exchange rate, a floating rate results in a smaller decline in employment in the short run because it facilitates a rapid short-run change in relative prices. Under a fixed rate, home unemployment would persist until slowly adjusting home wages and prices had moved downward.

As Mundell (1968) recognized, the foregoing argument in favor of floating rates is primarily distributional. Under fixed rates an adverse aggregate demand shift results in a sharp fall in output. Under floating rates the output decline is dampened, but the deterioration in the terms of trade is sharper than with a fixed rate. When most shocks are to the goods market, the choice of exchange-rate system involves a short-run tradeoff between variability in employment and variability in the terms of trade. Because the incidence of unemployment is presumably less even than that of an adverse terms-of-trade shift, distributional considerations favor currency depreciation.

If most disturbances to the economy originate in asset markets, however, a fixed exchange rate minimizes the variance of output. Changes in money demand, for example, are accommodated entirely through the capital account under a fixed rate, and have no effect on output.

A major shortcoming of these results is that they answer a question posed primarily in the context of a single small country whose choice of an exchange-rate system does not affect the rest of the world's economic performance. But Buiter's analysis of a U.S. fiscal contraction makes clear why the small country's decision problem may be the wrong problem to analyze in a framework that recognizes international policy interactions. The dollar's depreciation softens the effect of the blow to U.S. output and employment. But at the same time the corresponding *appreciation* of foreign currencies against the dollar worsens the situation abroad compared to the fixed exchange rate case. By allowing the U.S. to export some of its unemployment, the dollar's depreciation has a beggar-thy-neighbor effect. The U.S. decision on an exchange-rate regime will clearly affect foreign economies, and it is not clear that what is best for America will be best for the rest of the world. To discuss the "best" exchange-rate system for the world economy, we must reformulate our notion of how a good exchange-rate system performs.

In my 1985 paper I suggest that a global perspective on exchange-rate regime choice must recognize that different exchange-rate systems have different implications for the allocation of macroeconomic risks among the participating countries. In the example discussed above, dollar depreciation shields the U.S. economy from an adverse IS shift but has the opposite effect on U.S. trading partners. In compensation, when IS shifts occur abroad, floating dollar rates allow foreign countries to export some of their own macro instability to the United States. There is a suggestive analogy to markets for insurance. The beggar-thy-neighbor effect of a dollar depreciation can be thought of as a "payment" made by the foreign country to the United States in states of the world where U.S. aggregate demand is relatively low. In the opposite situation, the United States, by allowing its currency to appreciate, compensates foreign countries. It is conceivable that both countries can simultaneously reduce output variability by sharing macroeconomic risks through a floating exchange rate.

In the balance of this discussion, I will therefore concentrate on the following question: Are there conditions under which all countries can simultaneously improve their average macroeconomic performance through the adoption of a particular exchange-rate system? Using an illustrative model, I will show that such conditions can be found, and that they result in criteria of regime choice similar to those that govern an individual country's decision. As in many similar contexts, the implementation of Pareto-improving risk-sharing arrangements may encounter problems of moral hazard and enforcement. These problems are of central importance to our understanding of how actual exchange-rate systems work, but to illustrate the exchange rate's potential role in risk allocation among countries, I will simply assume that individual governments are bound to the policy regime in place.

A Simple Model

To illustrate results, I use a log-linear version of Mundell's two-country model. Even as a medium-term framework, this model is severely limited in its omission of dynamics and expectations. Further, it makes no allowance for the important possibility that the choice of an exchange-rate system may itself lead to changes in institutional aspects of the economy. Nonetheless, the model is useful as an intuition-building device, and as a first step toward more complex analyses.

Like Buiter, I work with a model in which equation parameters are identical across countries. Under a floating exchange rate, the model is described by the equations:

$y = \delta e - \theta i + u$ (home output determination),

$y^* = -\delta e - \theta i^* + u^*$ (foreign output determination),

$m = \phi y - \lambda i$ (home money-market equilibrium),

$m^* = \phi y^* - \lambda i^*$ (foreign money-market equilibrium),

$i = i^*$ (perfect international asset substitution).

Above, variables have the same meaning as in the Buiter model, except that m and m^* are interpreted as random variables reflecting shocks to money supply net of shocks to money demand. The variances of these two monetary disturbances are denoted σ_m^2 and $\sigma_{m^*}^2$, respectively, and their covariance is σ_{mm^*}. The random variables u and u^* are shocks to the aggregate demand functions. The relevant characteristics of their joint distribution are summarized by the variances σ_u^2 and $\sigma_{u^*}^2$ and the covariance σ_{uu^*}. The model reflects the Mundell assumptions of static expectations and rigid nominal output prices, fixed at $p = p^* = 0$. For simplicity, I have also ignored direct spillover effects from one country's output to the other's aggregate demand.

Define

$$\eta \equiv \theta\phi/(\lambda + \theta\phi) < 1.$$

Then the floating-rate output levels in the two countries are

$$(1) \qquad y|_{\text{FLOAT}} = [(1 - \eta)(u + u^*) + (1 + \eta)(m/\phi) - (1 - \eta)(m^*/\phi)]/2,$$

$$(2) \qquad y^*|_{\text{FLOAT}} = [(1 - \eta)(u + u^*) + (1 + \eta)(m^*/\phi) - (1 - \eta)(m/\phi)]/2.$$

Different fixed exchange rate models result from different assumptions about the settlement of payments imbalances by central banks.

To be concrete, I will analyze a "dollar standard" (see my 1985 paper), a system also discussed by Buiter as the "non-McKinnon variant" of a fixed-rate regime. In this system, the foreign central bank intervenes to peg the exchange rate, holding its foreign reserves in the form of interest-bearing home-currency claims on the home treasury or private sector. Official settlements balances affect the foreign money supply but not the home money supply. The model's equations are

$y = \delta e^f - \theta i + u$ (home output determination),

$y^* = -\delta e^f - \theta i^* + u^*$ (foreign output determination),

$m = \phi y - \lambda i$ (home money-market equilibrium),

$i = i^*$ (perfect international asset substitution),

where e^f is the fixed level of the exchange rate.

Because m is not endogenous, the four equations above determine the four unknowns y, y^*, i, and i^*. The foreign money supply, m^*, is determined recursively by y^*, i, and the resulting demand for money in the foreign country.

Output levels under a fixed exchange rate are

$$y|_{\text{FIX}} = (1 - \eta)u + (1 - \eta)\delta e^f + \eta(m/\phi), \tag{3}$$

$$y^*|_{\text{FIX}} = u^* - \eta u - (1 + \eta)\,\delta e^f + \eta(m/\phi). \tag{4}$$

World output depends only on the reserve country's monetary conditions and on the aggregate-demand shocks u and u^*. The latter disturbance does not influence home output in this model because I have assumed away any direct spillover effect from foreign output to home demand.

In each country, policymakers are concerned with minimizing the conditional variance of output. Equations (1) through (4) imply that output variances are complicated functions of the variances of the underlying real and monetary shocks and these shocks' covariances. To illustrate how the joint distribution of shocks determines policymakers' preferences over exchange-rate regimes, I follow a practice common in the literature and look at two extreme cases, the case in which all shocks are real and the case in which all shocks are monetary.

Real Disturbances

Small-country analysis typically yields the result that when all disturbances are real (that is, shifts in u or u^*), a floating-rate regime is preferred. In a two-country setting, we need to ask whether the absence of monetary shocks implies that *both* countries gain from a float, in the sense that the variances of their outputs are lower than under a fixed rate.

Assume that monetary conditions are nonstochastic. Equations (1) and (2) imply that output variances under a floating exchange rate are

$$\sigma_y^2|_{\mathrm{FLOAT}} = (1 - \eta)^2(\sigma_u^2 + \sigma_{u^*}^2 + 2\sigma_{uu^*})/4,$$

$$\sigma_{y^*}^2|_{\mathrm{FLOAT}} = (1 - \eta)^2(\sigma_u^2 + \sigma_{u^*}^2 + 2\sigma_{uu^*})/4.$$

Under a fixed rate, the corresponding variances, implied by (3)and (4), are

$$\sigma_y^2|_{\mathrm{FIX}} = (1 - \eta)^2\sigma_u^2 ,$$

$$\sigma_{y^*}^2|_{\mathrm{FIX}} = \sigma_{u^*}^2 + \eta^2\sigma_u^2 - 2\eta\sigma_{uu^*}.$$

A first implication of these formulas is that policymakers in the two countries may prefer different exchange-rate regimes; it is therefore possible that exchange-rate regimes can not be unambiguously ranked in terms of the Pareto criterion. Imagine, for example, that $\sigma_{uu^*} = 0$ and that $\sigma_{u^*}^2$ is much higher than σ_u^2. In this case the home country may lose by importing macroeconomic stability from abroad through a floating exchange rate; it would prefer a fixed rate that insulates it completely from foreign aggregate-demand shocks. For the same reason, foreign policymakers would prefer a floating rate. A floating rate allows them to export some of their severe macroeconomic instability to the home country while importing relatively little instability from the home country in return.

To obtain clear-cut results, it is useful to impose an additional symmetry condition on the model, the condition that

$$\sigma_{u^*}^2 = \sigma_u^2.$$

Under this additional assumption, the variability disadvantage of a fixed rate for the home country is

$$\sigma_y^2|_{\mathrm{FIX}} - \sigma_y^2|_{\mathrm{FLOAT}} = (1 - \eta)^2\sigma_u^2(1 - \rho_{uu^*})/2,$$

where ρ_{uu^*} is the coefficient of correlation between u and u^*. Notice that the above difference is positive unless u and u^* are *perfectly* correlated. Short of such perfect correlation, therefore, a floating rate, compared to a fixed rate, lowers the variance of the home country's output.

For the foreign country, the corresponding variability difference is

$$\sigma_{y^*}^2|_{\mathrm{FIX}} - \sigma_{y^*}^2|_{\mathrm{FLOAT}} = (1 + \eta)^2\sigma_u^2(1 - \rho_{uu^*})/2.$$

This difference is a strictly positive number if $\rho_{uu^*} < 1$. Thus, the foreign country also gains by moving to a floating exchange rate under the conditions assumed in this section.

The intuition behind these results is that sketched above. Provided aggregate-demand shocks are not perfectly correlated internationally, a floating rate enables each country to avoid more effectively some of the output risk posed by its own demand disturbance. Each country must also increase its exposure to demand shocks that occur abroad. But both countries can gain from this trade of risks when the average magnitudes of home and foreign shocks are similar; and the extent of gains from trade is greater the more highly negative is the correlation between the two countries' demand shocks. This result is the global extension of the proposition that a small country gains from floating when economic fluctuations are mostly due to shifts in aggregate demand.

Monetary Disturbances

Turn next to the second extreme case, that in which all disturbances are monetary (that is, shifts in m or m^*). Small-country analysis indicates that fixed rates are preferable when monetary shocks dominate. Can this result, too, be extended to a global setting?

Equations (1) and (2) imply that when all shocks are monetary, output variances under floating are given by

$$\sigma_y^2|_{\text{FLOAT}} = [(1 + \eta)^2\sigma_m^2 + (1 - \eta)^2\sigma_{m^*}^2 - 2(1 - \eta^2)\sigma_{mm^*}]/4\phi^2,$$
$$\sigma_{y^*}^2|_{\text{FLOAT}} = [(1 + \eta)^2\sigma_{m^*}^2 + (1 - \eta)^2\sigma_m^2 - 2(1 - \eta^2)\sigma_{mm^*}]/4\phi^2.$$

Equations (3) and (4) lead to the corresponding fixed-rate variances

$$\sigma_y^2|_{\text{FIX}} = (\eta/\phi)^2\sigma_m^2,$$
$$\sigma_{y^*}^2|_{\text{FIX}} = (\eta/\phi)^2\sigma_m^2.$$

For the home country, the variability disadvantage of a floating rate is

$$\sigma_y^2|_{\text{FLOAT}} - \sigma_y^2|_{\text{FIX}}$$
$$= [(1 + 2\eta - 3\eta^2)\sigma_m^2 + (1 - \eta)^2\sigma_{m^*}^2 - 2(1 - \eta^2)\sigma_{mm^*}]/4\phi^2.$$

Because $\eta < 1$, this difference is always positive (so that the home country prefers a fixed rate) when the correlation between m and m^* is negative. Under the symmetry assumption

$$\sigma_{m^*}^2 = \sigma_m^2,$$

the variance difference above becomes

$$\sigma_y^2|_{\text{FLOAT}} - \sigma_y^2|_{\text{FIX}} = (1 - \eta^2)\sigma_m^2(1 - \rho_{mm^*})/2\phi^2,$$

where ρ_{mm^*} is the coefficient of correlation between m and m^*. This difference is strictly positive if $\rho_{mm^*} < 1$. So if monetary shocks are of similar average magnitude across countries and imperfectly correlated, home policymakers will prefer a fixed exchange rate.

Foreign policymakers also prefer to peg under these conditions. In general,

$$\sigma^2_{y^*}|_{\text{FLOAT}} - \sigma^2_{y^*}|_{\text{FIX}} = [(1 - 2\eta - 3\eta^2)\sigma^2_m + (1 + \eta)^2\sigma^2_{m^*} - 2(1 - \eta^2)\sigma_{mm^*}]/4\phi^2.$$

Notice that if $1 - 2\eta - 3\eta^2 < 0$ and σ^2_m is large relative to $\sigma^2_{m^*}$, the foreign country may well prefer to float its currency to avoid importing too much monetary instability from abroad. But if the variances of the monetary shocks are equal,

$$\sigma^2_{y^*}|_{\text{FLOAT}} - \sigma^2_{y^*}|_{\text{FIX}} = (1 - \eta^2)\sigma^2_m(1 - \rho_{mm^*})/2\phi^2,$$

a strictly positive number when $\rho_{mm^*} < 1$.

When monetary shocks dominate and are of similar average magnitude across countries, fixed exchange rates produce the better international allocation of macroeconomic risk. Once again, the gains from trading macroeconomic risk through fixing rather than floating are greater the more highly negative is ρ_{mm^*}. These findings generalize, to a global setting, the usual small-country result.

Some Qualifications

My discussion has so far been based on the assumption that, all else being equal, policymakers prefer an exchange-rate regime that dampens fluctuations in output. The justification for this assumption is largely distributional: the incidence of a change in real income caused by a terms-of-trade movement is presumably more even than that of a real-income change taking the form of a change in output and employment.

The models analyzed here and in Buiter's discussion, however, assume that each country is specialized in producing a single homogeneous good. This simplification obscures some important distributional problems that a floating rate can cause even when nonmonetary shocks are dominant. Aggregate-demand disturbances need not fall proportionally on all of the economy's products; so while the exchange-rate's response will cushion overall output, it may worsen the employment imbalance in some sectors compared to the outcome under a fixed rate. At several points, Buiter describes the sectoral implications of the shocks he considers.

Like risk pooling between countries, risk pooling within countries is limited, so any aggregate benefits of a floating exchange rate may be unevenly distributed. Therefore, when real disturbances to the economy are transitory, there is a case for resisting the exchange-rate changes that would otherwise occur. In these circumstances, a fixed exchange rate reduces relocation costs that might be needlessly incurred as factors move between sectors. Pegging may also help reduce political pressure in favor of protectionist trade legislation.

There is no case, however, for pegging in the face of a permanent real disturbance. Monetary intervention cannot prevent eventual adjustment on the real side of the economy. Defending a fixed exchange rate despite a permanent structural shock would only weaken macroeconomic performance while failing to eliminate relocation costs or protectionist pressures.

The case for fixing the exchange rate in response to temporary goods-market disturbances requires an additional premise. Either firms and individuals must be unable to borrow to "ride out" temporary negative shocks, or the market must be unable to distinguish short-lived from long-lived disturbances. Both of these problems arise in practice; and they leave the government with the job of distinguishing permanent from transitory shocks. It is hard to believe that the government can make this distinction more reliably than the private sector.

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Comment Stephen J. Turnovsky

The three questions motivating Willem Buiter's discussion are all important and highlight the growing interdependence between Western economies. Buiter presents a careful analysis of these issues within the

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framework of a two-country Dornbusch model. The basic structure of this model is by now standard. Specifically, two key features are: continuous equilibrium in the money market (the exchange rate being a "jump" variable); disequilibrium in the goods market (prices being "sluggish"). This model has served the profession well for almost a decade now, in analyzing various macroshocks. I am not sure, however, that as it stands the model is the optimal vehicle for addressing all of the issues raised in this paper.

I shall structure my remarks about several issues: the specifics of the model; future anticipated shocks; strategic aspects; an alternative optimizing model.

The Model

As noted, the model is in the Dornbusch tradition and I have little to say about its specification. Like most of the current work being done on two-country models, Buiter's discussion assumes the two economies to be symmetric. This is convenient and not an unreasonable first approximation, since there is no a priori reason for, say, the United States and Europe to differ in terms of their aggregate behavior in any systematic way. The assumption has the enormous advantage of allowing one to exploit Aoki's (1981) technique of the representation of the dynamics in terms of sums and differences of the underlying variables. In the present context, this causes the dynamics of the third-order system to decompose into two subsystems involving: average variables, which follow a stable first-order adjustment; differences and the exchange rate, which follow a second-order system, having a saddlepoint. Not only does this decomposition increase the tractability of the analysis, but it also helps provide economic insight into the dynamic adjustments.

A key feature of the model is that the exchange rate responds only to differences in the variables and that averages are independent of the exchange rate. An important consequence is that averages are independent of anticipation of future shocks. They respond only to the actual shocks, when they occur. The reason for this is simply that all anticipations of future disturbances impact on the present state of the two economies through the current exchange rate. But this does not affect the averages. For the same reason, anticipated future worldwide shocks, which leave differences and therefore the exchange rate unchanged, also have no effect on the economies until the anticipated changes actually take place.

I would like to comment on one specific assumption, which has a more critical bearing on the behavior of the model than is perhaps suggested by Buiter. This concerns the deflation of money balances by the price of domestic output, p_1, rather than by the domestic cost of living, $\bar{p}_1$. As Buiter notes (n.1), the more desirable specification of monetary equilibrium is (for country 1, say)

$$m_1 - \bar{p}_1 = k_1(y_1 + p_1 - \bar{p}_1) - \lambda_1 i_1,$$

or equivalently,

$$l_1 - (1 - \alpha_1)(1 - k_1)c = k_1 y_1 - \lambda_1 i_1.$$

If either $\alpha_1 = 1$ or $k_1 = 1$, this reduces to the equation in the text. If not, there is a relative price effect in the money market, through c, and this gives rise to differences in behavior. While one does not want to quibble over details of specification, in this case the differences in behavior are of sufficient qualitative significance to merit further discussion.

First, the result of section 4.3.1, that a U.S. fiscal tightening without fiscal or monetary response in the ROW and without monetary response in the U.S. leads to an *instantaneous* long-run adjustment in the exchange rate, does not hold with this alternative specification. In general, it can be shown that we can specify the stable locus in $l^d - e$ space by a positively sloped linear equation of the form

(1) $$e - \tilde{e} = \phi(l^d - \tilde{l}^d)$$

where tildes denote steady states and $\phi > 0$. Differentiating this equation at time 0, with respect to the domestic fiscal instrument f_1, and recognizing that because of sluggish prices, l_1, l_2, and hence l^d is predetermined, yields

(2) $$\frac{de(0)}{df_1} - \frac{d\tilde{e}}{df_1} = -\phi\frac{d\tilde{l}^d}{df_1}$$

If we take $0 < \alpha_1 < 1$, it can be shown that

(3) $$\frac{d\tilde{l}^d}{df_1} \lesseqgtr 0 \text{ according to whether } k_1 \lesseqgtr 1$$

Under the assumption considered by Buiter, $d\tilde{l}^d/df_1 = 0$, and hence $de(0)/df_1 = d\tilde{e}/df_1$, implying complete instantaneous adjustment of the exchange rate. If $k_1 < 1$, then $d\tilde{l}^d/df_1 < 0$, so that on impact

$$0 > \frac{de(0)}{df_1} > \frac{d\tilde{e}}{df_1}$$

and we get only partial adjustment to the domestic fiscal contraction. On the other hand, if $k_1 > 1$, then $d\tilde{l}^d/df_1 > 0$, so

$$0 > \frac{d\tilde{e}}{df_1} > \frac{de(0)}{df_1}$$

and we get overshooting of the exchange rate to the fiscal disturbance.

Second, under the alternative monetary specification, the domestic fiscal contraction does not in general cause equal recessions in the U.S. and abroad, in contrast to Buiter's case. The reason is that the fiscal contraction leads to a depreciation of the domestic currency in both nomimal and real terms. This means that c rises to that if $k_1 < 1$, $l_1 - (1 - \alpha_1)(1 - k_1)c$ falls. This puts a squeeze on domestic real-money balances, thereby accentuating the recession in the domestic economy. By the same token, real-money balances abroad increase, thereby moderating the recession and, indeed, it is even possible for foreign output to rise. If $k_1 > 1$, these relative price effects are reversed.

A third result, that a domestic fiscal contraction matched by a foreign fiscal expression enables the improvement in U.S. competitiveness to be achieved without a contraction in output in either country, also depends upon the chosen form of monetary specification. With the alternative specification, we can easily show that while this matched policy will leave total world output unchanged, outputs in the two countries will be affected in exactly offsetting ways; the specific responses will depend upon whether $k_1 \lesseqgtr 1$.

By contrast, the result that employment and output can be maintained in response to a domestic fiscal contraction, by the appropriate balanced increases in the respective money stocks of the two economies, remains true. Again, the relative adjustments in the two economies depends upon whether $k_1 \lesseqgtr 1$.

The difference between these last two results is due to the familiar relationship between instruments and targets. Buiter's discussion focuses (implicitly) on two objectives, the stabilization of domestic and foreign output levels in the face of a domestic fiscal contraction. In general, the foreign fiscal instrument alone cannot stabilize both outputs simultaneously at their respective target levels. On the other hand, the two output objectives can be achieved by the appropriate choice of the two monetary instruments.

I now wish to comment on the application of the analysis to the "collapsing" U.S. dollar. I am not sure that the analysis is appropriate for this, but perhaps my reservation is really in part a semantic one. The analysis deals with two aspects: the bursting bubble; shifts in various kinds.

Buiter considers a situation in which the economy is following an unstable path (a bubble path), which, if pursued forever, will eventually lead to an infinitely overvalued dollar. At some point, t_0, the market recognizes the nature of the bubble path, at which time the exchange rate jumps onto the appropriate stable locus (in this case, straight to the new equilibrium point). While this may characterize a bursting of the bubble, to my mind it does not describe a "collapse" of the dollar. Rather, it represents a realignment of the currency which needs to take place. For example, suppose that the domestic money supply has been increased but that the exchange rate did not undertake the necessary jump immediately at the time the monetary increase occurred. It is clear that the increase in real-money balances will lower the domestic interest rate, which, given interest-rate parity, causes a continuous appreciation of the domestic currency. This adjustment is perverse and the jump in the exchange rate—the bursting of the bubble—is needed to get the exchange rate back on track.

The second aspect Buiter considers is the effects of various shifts in the underlying structural relationships which give rise to a depreciation of the dollar. These all strike me as being very gentle and do not capture the notion of a collapse. Indeed, I am unclear about how, precisely, one can have a collapse of a currency in a perfectly flexible exchange rate regime. The idea of a collapsing currency implies a regime which is no longer sustainable. I think that the kind of analysis first undertaken by Flood and Garber (1984), in which pressures are brought to bear on the exchange rate, bringing about an eventual breakdown of the regime, may be more appropriate for addressing this issue.

Finally, the slowdown of economic activity is also captured by shifts. Here, Buiter distinguishes between shifts on the supply side ($\bar{y}_1$, $\bar{y}_2$) and on the demand side (f_1, η_1). Since the model is dynamic, it would seem more appropriate to capture the notion of a slowdown in terms of a reduction in some underlying growth rate, rather than in terms of once-and-for-all shifts. It should be reasonably straightforward to extend the model to accommodate this.

Anticipations Effects

The shocks in the model are all unanticipated. Models of this structure lend themselves to the analysis of anticipated future shocks on the current state of the economy—so-called announcement effects. These analyses have become standard in rational-expectations models, particularly in the analysis of monetary policy, which has received most of the attention in the literature. While such exercises can always be justified in terms of their intrinsic interest, one can argue that expectational effects are of much more practical relevance in the present context, where the primary focus is on fiscal policy. Cuts in government expenditure programs require legislation and these can take years to be enacted. Yet it is clear, for example, from discussions surrounding current proposals to cut the deficit, that anticipations of their ultimate introduction will have significant immediate effects on the economy.

Under the assumption of symmetry introduced by Buiter, anticipations effects impinge on the economy in a particularly simple way. By operating through the exchange rate, they have no effects on the average variables, as I noted earlier. This means that following an announcement, but before the implementation of a specific change, the domestic and foreign economies move in precisely offsetting ways. For example, suppose that at time 0, the fiscal authorities in country 1 announce a fiscal contraction to take effect at time T. The time paths for y_1, y_2, the outputs in the two economies, are as illustrated in figure 4.9 where for convenience the equilibrium levels are set at zero.

The anticipation of the future fiscal contraction leads to an immediate depreciation of the domestic currency (appreciation of the foreign currency). With sluggish output prices, this leads to a real depreciation of the domestic currency, causing the demand for domestic output, and hence domestic output itself, to increase. This increase in activity causes the price of domestic output to begin rising. The domestic currency continues to depreciate following the announcement. This further increases the demand for the domestic good, thereby continuing to increase domestic output and the domestic rate of inflation.

This pattern continues until time T, when the anticipated contraction occurs. This reduces domestic output to a level below its long-run equilibrium. The short-run inflation is reversed and the price of domestic output starts to fall. This in turn means that the real stock of domestic money starts to rise, thereby providing an offsetting expansionary effect to output, which then gradually rises back to its equilibrium level. As this occurs, the deflation is moderated and the price of domestic output gradually approaches its new, lower equilibrium level.

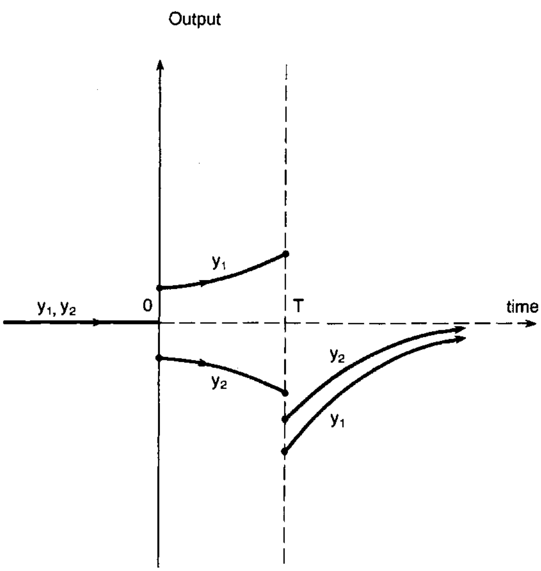

Fig. 4.9 Time paths for output in response to announced domestic fiscal contraction.

We now turn to the foreign economy. As already noted, the aggregate world economy remains stationary until time T, when the fiscal contraction actually takes place. During the period $0 < t \leqq T$, the averages of the domestic and foreign variables all remain fixed at their initial equilibrium levels. Since all adjustments during this phase stem directly from the initial announcement and the jump in the exchange rate this generates, it follows that, given the symmetry of the two economies, the adjustment in the rest of the world is a mirror image of that in the domestic economy.

Thus during the period following the announcement, but prior to the fiscal contraction, the initial rise in domestic output, together with the subsequent continuous rise, is matched by an equivalent initial decrease and continued fall abroad, stemming from the appreciation of the foreign currency. The falling foreign output causes the price of foreign output to begin falling at an increasing rate. At the time of the fiscal contraction, the decrease in domestic activity generates some negative spillover effects onto demand and output in the foreign economy. Output abroad therefore undergoes a modest decrease at time T, decreasing the foreign rate of inflation at that time. The falling foreign price level causes the relative price of foreign goods to decrease, causing foreign output to begin rising.

The interesting point to observe from this figure is that, in the short run, the announcement of the domestic fiscal contraction has a stimulating effect domestically but generates a recession abroad. And although after the implementation of the contraction, the domestic economy is more adversely affected than is the foreign economy, it is quite likely that the accumulated output losses resulting from the domestic fiscal contraction will be greater abroad than in the domestic economy. The appropriate policy responses which the foreign economy might undertake to mitigate these adverse effects is an interesting issue, similar to those discussed by Buiter.

Strategic Aspects

Buiter deals with policy responses to various disturbances. Much of the discussion has tended to focus on, if only implicitly, output stabilization as being the objective. With more than one target in the policymaker's objective, and with fewer policy instruments available than targets, the international stabilization problem introduces questions of strategic behavior. These have been getting increasing attention; see, e.g., Hamada (1976), Canzoneri and Gray (1985), and the papers in Buiter and Marston (1985).

The emphasis in much of this literature has been on the appropriate strategic responses to demand and supply shocks. Most of this discussion has been conducted in terms of monetary policy instruments, where the objective is to stabilize some objective, typically specified as a quadratic loss function in terms of output and price stability. This literature is very closely related to the present analysis and it is therefore of interest to summarize some of the findings; see, e.g., Turnovsky and d'Orey (1986).

1. A negative demand shock in one country (corresponding to a fiscal contraction in that country) calls for a monetary expansion in both countries. The relative amounts by which the adjustments should be borne depends upon the strategic equilibrium.

2. A negative supply shock in one country (corresponding to a reduction in activity in that country) calls for a monetary expansion in that country and probably a monetary contraction abroad.

3. From a welfare point of view, demand shocks are typically less problematical than supply disturbances. Country-specific demand disturbances of a given magnitude give rise to smaller aggregate welfare costs than do supply disturbances of equal magnitude.

4. The welfare costs of a country-specific demand disturbance (for two symmetric economies) are borne equally by the two countries. The welfare costs of a country-specific supply disturbance, on the other hand, are borne primarily by the country in which they occur.

5. The gains from cooperation are relatively small. They are, however, somewhat larger for supply shocks.

Buiter's paper discusses the monetary and fiscal policy responses as alternatives to stabilizing for the various disturbances. This raises an important issue. Most of the existing work on strategic policymaking deals with monetary policy. But an important result in game theory is that in general, even under certainty, the choice of instruments by the agents is important and will affect the equilibrium outcome. This is in contrast to optimal policymaking by a single agent, where under certainty such a choice is unimportant. The reason for the difference is that the policymakers' reaction-functions, which condition the optimization of each of the agents, depend upon the choice of policy instrument. Thus the choice of monetary or fiscal policy is not a matter of indifference in a (deterministic) strategic environment. Which is better? What if one country uses a fiscal instrument, while the other uses a monetary instrument? Does indeed an equilibrium strategy exist in these cases? These are some of the issues that are raised.

Optimizing Models

Without doubt, the Dornbusch framework is a very tractable and attractive one. But it does suffer from one serious limitation. Because it is an ad hoc model, it does not introduce welfare considerations in any explicit way. Yet welfare considerations are presumably what should guide the kinds of policy responses being discussed here.

In response to the limitations of ad hoc models, there is a growing trend to ensure that macromodels are based on some kind of underlying private-agent optimization. The extent to which this removes the arbitrariness of macroeconomic models is questionable, since the nature of the objective function and the precise constraints confronting the agents are themselves arbitrary.

In the area of international macroeconomics, the development of optimization models has been restricted to small open economies. Here a further difficulty is encountered. If one adopts the usual assumptions of uncovered interest parity and a constant rate of time discount, β say, for a steady-state equilibrium to exist, these models require that we choose $\beta = r^*$, the exogenously given foreign real interest rate. Although this restriction is not unreasonable, it typically means that the *only* sustainable equilibrium is the steady state. In other words, the economy must *always* be in steady-state equilibrium, thereby implying instantaneous adjustment to all exogenous shocks. This elimination of all transitional dynamics is obviously a severe shortcoming. There are ways of restoring the transitional dynamics, such as endogenizing the discount rate, but these are somewhat arbitrary.

In a two-country world, this last limitation does not occur. While in steady state, the equality of the world real-interest rate and the rate of time discount must hold, in the short run these rates may diverge. This permits the system to be out of steady-state equilibrium and allows for transitional dynamics. Such a framework provides an interesting line for further research into the kinds of issues analyzed by Buiter. It has the important advantage of providing a natural criterion for evaluating the welfare consequences of the various disturbances and the appropriate policy responses.

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