Volume Title: International Aspects of Fiscal Policies

Volume Author/Editor: Jacob A. Frenkel, ed.

Volume Publisher: University of Chicago Press

Volume ISBN: 0-226-26251-0

Volume URL: http://www.nber.org/books/fren88-1

Publication Date: 1988

Chapter Title: Expansionary Fiscal Policy and International Interdependence

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Chapter URL: http://www.nber.org/chapters/c7928

Chapter pages in book: (p. 229 - 272)

7 Expansionary Fiscal Policy and International Interdependence

Linda S. Kole

7.1 Introduction

In the 1980s, the large magnitude of current and expected U.S. budget deficits has led to renewed interest in the effects of fiscal expansion in an open, macroeconomic environment. We have witnessed a fascinating episode of real dollar appreciation, high real interest rates, and growing U.S. current account deficits. Many elements of this experience are well-explained by economic theory. For instance, the classic Mundell-Fleming analysis of fiscal expansion in a large country leads one to the conclusion that the exchange rate will appreciate while the trade balance deteriorates and world real interest rates rise. Given the size of the U.S. fiscal expansion, it is not particularly surprising that we have observed these effects. What is difficult to explain is the precise magnitude of the changes and the pattern of events that occurred.

The steady rise in the dollar and the serious deterioration of the trade balance from 1980 to 1985 prompted many observers to assert that the dollar had become overvalued. If the dollar was indeed overvalued, it is important to gauge how much of its overvaluation stemmed from the expansionary fiscal stance in the United States. Another related question is: How much of the rise in real interest rates, at home and abroad, resulted from the increase in government borrowing? The fact

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Financial support from the University of Maryland General Research Board is gratefully acknowledged. Also, the author thanks Margarida Mateus for excellent research assistance. This work represents the views of the author, and should not be interpreted as representing the views of the Board of Governors of the Federal Reserve System.

that the United States has become the largest net international debtor in the world indicates the large volume of capital inflows occurring in recent years. Can fiscal policy explain the U.S. experience of steady appreciation along with a massive decumulation of net foreign assets? This chapter approaches these questions by examining both the domestic and foreign effects of a large country's fiscal expansion.

We focus here on the real exchange rate and real interest rates as the major economic mechanisms that transmit easy U.S. fiscal policy to the other developed nations of the world. To the extent that a fiscal expansion induces dollar appreciation, foreign countries will benefit from increased trade competitiveness. Also, as expansionary fiscal policy affects U.S. aggregate demand, a portion of the change in domestic absorption will spill over abroad. Asset markets represent another important channel through which the foreign economic outlook is dependent on U.S. fiscal policy. If assets are good substitutes, much of an increase in domestic real interest rates caused by a fiscal expansion will eventually show up abroad, leading to some degree of foreign crowding out. Furthermore, because international capital flows respond to both current and future expected events, even anticipated changes in U.S. fiscal policy may cause economic ripples abroad.

The future economic prospects of many developing nations, especially those with huge dollar-denominated debts, are also crucially affected by U.S. fiscal policy. Although appreciation of the dollar from 1980 to 1985 may have improved the competitiveness of some developing countries whose currencies were not pegged to the dollar, it had adverse effects as well. The high value of the dollar caused an increase in the real debt burden during a period in which the prices of many of the primary commodities exported by debtor nations were falling in real and dollar terms. Compounding this problem was the fact that higher world real interest rates, due in part to large U.S. budget deficits, considerably bloated the debt service payments these countries had to make. The combination of these unhappy events virtually guaranteed that debt problems would be recurrent.

Most economic analyses of fiscal policy are performed in a small country framework that takes foreign prices and interest rates as exogenous.[1] Models that assume that foreign variables are fixed are clearly inappropriate for the examination of a large country's fiscal expansion. This chapter examines the repercussion effects caused by a large country that embarks on a fiscal expansion. It is shown that the impact effect, dynamics, and the new long-run steady state equilibrium can be substantially different when one relaxes the assumption that the country undergoing expansion is small.

The conventional small country analysis of expansionary fiscal policy, where an initial appreciation is followed by a period of depreciation and net foreign asset decumulation, is contrasted with the two-country case, in which the subsequent dynamics are not as clear-cut. It is shown that if assets are imperfect substitutes, or if there exists a large degree of initial capital market integration, then an increase in government spending can lead to quite a different path of dynamic adjustment. After the initial appreciation at the moment of the fiscal expansion, the exchange rate may continue to appreciate while current account surpluses cause accumulation of net foreign assets. This type of adjustment path is consistent with the current account being primarily determined by the service account instead of by the conventional predominance of the trade balance.

The next section of this chapter develops a two-counry model tailored to accentuate some of the channels through which a fiscal expansion in a large, open nation can affect the rest of the developed world (here proxied by the second country). The major focus of the analysis is the effects of fiscal policy on the real exchange rate, real interest rates, and the balance of payments. The results of both an unanticipated and an anticipated balanced budget expansion are discussed in section 7.3. In section 7.4, a bond-financed fiscal expansion is analyzed by presenting simulation results. Finally, in sections 7.5 and 7.6 we comment on the recent experience of the United States and draw some tentative conclusions.

7.2 The Model

The model developed below is quite similar to that of Sachs and Wyplosz (1984). However, their model was specific to the small country case, so it did not provide a mechanism for analyzing the international effects we are interested in. We consider two countries which produce distinct composite goods. Output is assumed to be fixed in each country in order to abstract from cyclical phenomena, and for increased tractability. This assumption allows us to highlight the interdependent nature of world interest rates and the exchange rate, leaving other repercussion effects aside. The model is a fairly standard macro model of goods markets; it is simplified considerably by omitting the money market. For analytical convenience, we impose symmetry on many parameters of the model across countries.

Table 7.1 presents the model in its simplest form. Equation (1) is the national income identity which states that domestic real income, y, equals private absorption, a, plus government spending on goods and services, g, plus the trade balance, T. The trade balance has been defined as the domestic country's exports less its imports, in domestic real terms, and thus T appears negatively in the foreign equation and is deflated by the real exchange rate, $X = eP^*/P$.

Table 7.1 The Model

(1)	$y = a + g + T = \bar{y}$	$y^* = a^* + g^* - T/X = \bar{y}^*$
(2)	$a = (1 - \sigma)y_d + \delta w - \phi r$	$a^* = (1 - \sigma)y_d^* + \delta w^* - \phi r^*$
(3)	$y_d = rb_d + r^* X b_d^* + \bar{y} - z$	$y_d^* = rb_f/X + r^* b_f^* + \bar{y}^* - z^*$
(4)	$w = \bar{m} + b_d + Xb_d^*$	$w^* = \bar{m}^* + b_f^* + b_f/X$
(5)	$T = -\epsilon a + X\epsilon^* a^* + \eta X$	
(6)	$b = b_d + b_f = b_d^d(r - (\dot{X}/X)^e - r^*)w + Xb_f^d(r - (\dot{X}/X)^e - r^*)w^*$	
(7)	$\dot{X} = \tilde{r} - \tilde{r}^* + \Omega[\Theta\tilde{b}_d^* + \Theta^*\tilde{b}_f^* - (1 - \Theta)\tilde{b}_d - (1 - \Theta^*)\tilde{b}_f + (\Theta b_{d0}^* + \Theta^* b_{f0}^*)\tilde{X}]$	
	where $\Theta = b_{d0}/w_0 = b_d^d(0)$	$\Theta^* = b_{f0}/w_0^* = b_f^d(0)$
	$0 \leq \Omega = [b_d^{d\prime} w_0 + b_f^{d\prime} w_0^*]^{-1} < \infty$	
(8)	$\dot{b} = \dot{b}_d + \dot{b}_f = rb + g - z$	$\dot{b}^* = \dot{b}_d^* + \dot{b}_f^* = r^* b^* + g^* - z^*$
(9)	$\tilde{z} = \tilde{g} + b_0\tilde{r} \quad (\dot{b} = 0)$	$\tilde{z} = b_0^* \tilde{r}^* \quad (\dot{b}^* = 0)$
(10a)	$\dot{b} = \mu(\bar{b} - b)$	
(10b)	$\tilde{b}_t = (\bar{b} - b_0)(1 - e^{-\mu t})\ \tilde{g}_t = \mu(\bar{b} - b_0)$	$\tilde{z}_t = b_0\tilde{r}_t + (\mu + r_0)\tilde{b}_t$
(11)	$(X\dot{b}_d^*) - \dot{b}_f = T + Xr^* b_d^* - rb_f$	
(11′)	$\dot{nfa} = \dot{b}_d^* - \dot{b}_f = \tilde{T} + r_0^* b_{d0}^* \tilde{X} + r_0^* \tilde{b}_d^* + b_{d0}^* \tilde{r}^* - r_0\tilde{b}_f - b_{f0}\tilde{r} - b_{d0}^* \dot{X}$	

Note: All starred variables are in foreign currency terms. Variables with a tilde, $\tilde{x}$, represent deviations from the initial steady state, so that $\tilde{x} = x - x_0$. Variables with a bar, $\bar{x}$, represent constants while a variable $\dot{x}$, represents the time derivative, dx/dt. The first derivative of a function $f(x)$ with respect to x is denoted as f'.

Private absorption in each country is defined in equation (2), where y_d is real disposable income, w is real wealth, and r is the real interest rate. The inclusion of disposable income in the absorption equations introduces the implicit assumption that some agents in the economy are liquidity-constrained, so that a unit increase in current disposable income will be met by an increase in consumption of $(1 - \sigma)$. Equation (3) defines disposable real income as real income plus interest earnings less taxes, where b_d (b_f) represent real domestic (foreign) holdings of domestic bonds, and b_d^* (b_f^*) are real domestic (foreign) holdings of foreign bonds. For simplicity, taxes, z, are represented as a lump sum.

Absorption is specified as a negative function of the real interest rate. The implicit assumption is that savings respond positively to an increase in the real interest rate. Physical capital investment was excluded from the model to decrease the dimensionality of the dynamic system. However, a part of absorption in this model could be thought of as investment, in the form of inventory or durable goods investment. Private absorption in each country is also a positive function of real wealth. The marginal propensity to consume out of wealth, δ, can be thought of as a discount rate.[2] Wealth is defined in equation (4) as real money balances, $\bar{m}$, plus the real value of domestic and foreign bonds.

Two crucial assumptions are embedded in this definition of wealth. The inclusion of domestic bonds as a component of domestic wealth involves the assumption that households are not effectively immortal and/or do not discount the future tax liabilities associated with domestic bonds.[3] Secondly, we assume that the demand for real balances depends only on real income, which in this model implies that the real stock of money remains constant in each country. In essence, this assumption allows us to ignore the effects of changing price levels on real wealth and the real exchange rate. Although the joint assumption of output and price fixity is unrealistic, it accentuates the role of interest rate and exchange rate interaction in response to fiscal policy. A fuller model which allowed both price and output flexibility was developed in Kole (1984), and it was shown that the results were not crucially dependent on the stringency of the assumptions. Later, we will discuss how relaxing these assumptions alters the results.

The domestic trade balance is specified in equation (5) to depend negatively on domestic absorption and positively on foreign absorption and the real exchange rate. For simplicity, ϵ and ϵ^* are assumed to be constant so that, ceteris paribus, a constant share of absorption in each country is devoted to imports. The substitution effect is thus entirely contained in the parameter η. Also, in equation (5) it is assumed that neither government spends on imports.

Equations (1) through (5) describe the markets for the domestic and foreign composite goods. One can see on inspection that the short-run response to an increase in government spending will be a combination of an increase in r to crowd out domestic absorption and a decrease in X to crowd out foreign demand through the trade balance. In this fixed price version of the model, an appreciation has another side effect: it increases real foreign wealth while decreasing real domestic wealth, helping to crowd out domestic demand.[4]

Asset markets are described by a simple portfolio balance model in which residents of each country hold two assets: domestic and foreign bonds. Walras's Law allows us to ignore one of these markets, so we'll concentrate on the equilibrium condition in the domestic bonds market, given by equation (6). For asset market equilibrium, the total outstanding real stock of domestic bonds must be equal to the amount demanded by domestic investors, $b_d^d(\cdot)w$, plus the amount demanded by foreign investors, $Xb_f^d(\cdot)w^*$. The demand for domestic bonds in each country depends positively on the real return on domestic bonds relative to foreign bonds, $(r-(\dot{X}/X)^e-r^*)$, where $(\dot{X}/X)^e$ is the expected rate of real depreciation, hereafter assumed to be identical to the actual rate of depreciation.[5]

Linearizing equation (6) around the initial steady state and doing a bit of rearranging brings us to equation (7), the portfolio balance condition which governs the dynamic behavior of the real exchange rate given perfect foresight. In this equation, X_0 has been set equal to one for convenience. The parameters θ and θ^* represent the initial share of domestic bonds in domestic and foreign wealth respectively. Ω is the inverse of a wealth-weighted measure of the degree of asset substitutability. Note that as assets approach perfect substitutability Ω approaches zero, and equation (7) becomes a statement of real interest parity. However, as assets become less substitutable and $\Omega > 0$, their relative supplies start to matter.[6] For instance, an increase in the stock of domestic bonds at home must, ceteris paribus, cause an appreciation ($\dot{X} < 0$) to decrease the real domestic return on foreign bonds and eliminate excess supply in the domestic bond market.

Next, we consider the public sector in each country by examining the governments' budget constraints given by equation (8). Government spending and interest payments on outstanding bonds is financed by taxes or by issuing new bonds. In equation (9), we assume that the foreign country pursues a passive fiscal policy and does not change government spending ($\tilde{g}^* = 0$). Foreign taxes are always adjusted to cover the government's interest burden on outstanding bonds, so that the stock of foreign bonds remains constant. In contrast, we assume that the domestic government engineers a fiscal expansion. The evolution of taxes in the case of a balanced budget expansion is given by equation (9).

On the other hand, suppose that the government undertakes a fiscal expansion without initially raising taxes. Then the ensuing deficit will be financed by bond creation. However, the government cannot increase the bond supply forever or the model would be unstable.[7] To rule out this possibility, we need a terminal condition to guarantee that eventually the government's budget will be balanced. We adopt the condition proposed by Sachs and Wyplosz, equation (10a). This bond supply rule is convenient because it means that the domestic stock of bonds evolves independently of the other dynamic variables in the system. Equation (10a) implies that there is some target stock of outstanding bonds, $\bar{b}$, which the government shoots for. If this target exceeds the existing stock of bonds, the government will continue to increase the supply of bonds up to $\bar{b}$. However, if $\bar{b} < b$, the government will retire the debt at the rate μ. Under this rule, a permanent fiscal expansion will lead to the evolution of bonds, government spending, and taxes described by equation (10b).

When government spending increases, it is initially financed solely by bond creation. By assumption, taxes also increase automatically to cover the increase in debt service stemming from the fiscally induced increase in the real interest rate.[8] Over time, less of the increase in g is financed by bond creation and more is financed by raising taxes. By the time the stock of outstanding bonds reaches its target level, taxes will have risen enough to cover both the increased government spending and the larger service on outstanding debt. Note that given rule (10) and the government budget constraint (8), the government's choice of $\bar{g}$ and $\bar{b}$ will determine μ. For a given fiscal expansion, the higher $\bar{b}$, the lower μ, the rate of adjustment to the new steady state level of domestic bonds.

Finally, the third dynamic relationship, the balance of payments in real domestic currency terms, is presented in equation (11). The left hand side of equation (11) is the change in net foreign assets held domestically. Under a perfectly flexible exchange rate regime, this capital account deficit must match the current account surplus, which is the trade balance plus the service account on the right hand side of equation (11). The linearized version of equation (11) is given by equation (11′). Note that the last term on the right hand side of equation (11′) represents capital gains on initial domestic holdings of foreign bonds. A real depreciation causes domestic residents to reap a capital gain of $\dot{X}b^*_{d0}$. If we assume that these gains are capitalized at each instant of time, then real depreciation will lead to a decumulation of net foreign assets as domestic investors cash in foreign bonds to realize their capital gains. It is difficult to know how one should treat capital gains because in actuality, they are not continuously capitalized and, in the short run may be more important to central banks' accounting balances than to the balance of payments. In small country models capital gains are usually left out by defining the balance of payments and its components in foreign currency terms. However, in a two-country model, capital gains are difficult to ignore, except in the special case where initial holdings of foreign assets are nonexistent. A capital gain for one country represents a capital loss for the other; a capital gain in domestic currency terms is a capital loss in foreign currency terms. In the analysis that follows, we ignore the capital gains term because of the uncertainty involved with its treatment, but we do comment on how its inclusion would affect the results.

Short-run goods market equilibrium of the system is described by solving equations (1) through (5) for r and r^* as a function of X, g, and all asset stocks. Explicit algebraic treatment is given in the Appendix. We have assumed that initially the current account is in balance and that $r_0 = r^*_0$, $b^*_{d0} = b_{f0}$, $T_0 = 0$, and $X_0 = 1$ to further simplify the analysis. Equilibrium is then described by:

$$r = \overset{(+)}{r}(\overset{(+)}{X}, \overset{(+)}{g}, \overset{(+)}{nfa}, b) \qquad r^* = r^*(\overset{(-)}{X}, \overset{(?)}{g}, \overset{(-)}{nfa}, \overset{(+)}{b}). \tag{12}$$

A real depreciation improves the domestic trade balance and increases domestic real wealth so that with fixed output, it must be crowded out by an increase in the domestic interest rate. The exact opposite results obtain abroad; real depreciation causes a fall in the foreign real interest rate to eliminate excess foreign supply. An increase in government spending raises the domestic real interest rate to crowd out domestic demand, whereas the effects of a domestic fiscal expansion abroad are ambiguous. The condition that a fiscal expansion has a net expansionary effect abroad which causes a short-run increase in r^* is: $\sigma(1 - \sigma)b_{f0} > \phi\epsilon'$.[9] If this condition holds, the increase in foreign demand due to the fiscal expansion outweighs the negative effect of the direct crowding out of the domestic trade balance. An increase in net foreign assets increases domestic wealth (decreases foreign wealth), which increases domestic demand (decreases foreign demand) and causes an increase in r (decrease in r^*). Because an increase in domestic bonds increases domestic wealth and exerts upward pressure on r, it will also increase foreign interest income and thereby foreign demand and r^*.

The short run effects of a fiscal expansion on the endogenous variables of the system: r, r^*, and X, are well known. When assets are perfect substitutes, an increase in government spending causes an excess demand for domestic goods, and thus an increase in the real interest rate and/or an appreciation is required to clear the domestic goods market. The relative magnitudes of the decrease in X and the increase in r and r^* depend on the net effect of domestic fiscal policy on foreign absorption. A foreign expansion requires less of an appreciation and more of an increase in r^* than a foreign contraction. Excess supply in the foreign goods market puts downward pressure on r^*, and thus r, so the real exchange rate must crowd out more of the domestic excess demand.

These short-run results hold in either the balanced budget expansion or the bond-financed case. Increased government spending must cause appreciation and increased interest rates. However, short-run equilibrium tells us little about the new long-run steady state associated with higher domestic government spending, or about the dynamic path by which we arrive there. To analyze the dynamics of the system, we'll start by considering a balanced budget expansion, thus setting $\dot{b} = \dot{b}^* = 0$. In this case, equations (7) and (11′) reduce to:

$$\dot{X} = \tilde{r} - \tilde{r}^* + \Omega[(\theta - \theta^*)\tilde{nfa} + (1 + \theta - \theta^*)b^*_{d0}\tilde{X}], \text{ and} \tag{7a}$$

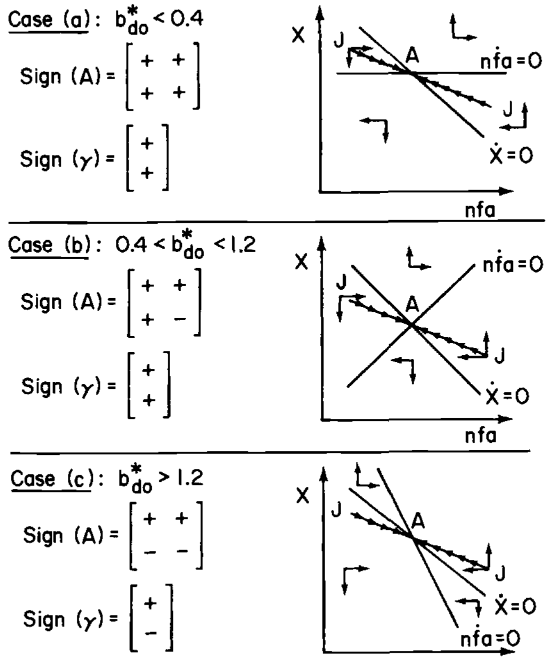
$$\dot{nfa} = (\eta' + r^*_0 b^*_{d0})\tilde{X} + r^*_0\tilde{nfa} + b^*_{d0}(\tilde{r}^* - \tilde{r}) + \epsilon'\tilde{g}. \tag{11a}$$

Below we present the system in abbreviated matrix form. The values of all of the coefficients in terms of the parameters of the system can be found in the Appendix; here we will only concern ourselves with the signs.

$$(13)\quad \begin{bmatrix} \dot{X} \\ \\ \dot{nfa} \end{bmatrix} = \underset{(A)}{\begin{bmatrix} \overset{(+)}{a_{11}} & \overset{(+)}{a_{12}} \\ (?) & (?) \\ a_{21} & a_{22} \end{bmatrix}} \begin{bmatrix} \tilde{X} \\ \\ \tilde{nfa} \end{bmatrix} + \underset{(\gamma)}{\begin{bmatrix} \overset{(+)}{a_{13}} \\ (?) \\ a_{23} \end{bmatrix}} \tilde{g}.$$

Because we have one jump variable, X, and one predetermined variable, nfa, we need the determinant of A to be negative for stability. If assets are perfect substitutes, the condition for a negative determinant reduces to: $\sigma r_0^* < \delta$.[10] This is likely to hold because $\sigma < 1$ and in equilibrium, $r^* = d$.[11] In the case of imperfect substitutability with $b_{d0}^* = 0$, we have a condition which is even more likely to be satisfied: $\sigma r_0^* < \delta + \Omega(\theta - \theta^*)\phi/2$. As long as the domestic investors hold more domestic bonds than foreigners do as a share in wealth, the second term on the right hand side of the inequality is positive. The general condition for a negative determinant can be found in the Appendix. As is noted in system (13), the signs of the coefficients in the equation describing net foreign asset accumulation are ambiguous. To better understand the dynamics of the system, it is useful to examine how the signs of a_{21}, a_{22}, and a_{23} depend on the values or the model's parameters. One crucial parameter in the dynamic system is the amount of foreign bonds held domestically (and vice versa—they are assumed to be equal here).

In figure 7.1, we present a hypothetical example of how the magnitude of initial cross-country asset holdings affects the phase diagram of the system. The other parameter values used for this example are the same ones that will later be used for the simulations.[12] For simplicity, we analyze the perfect substitutes case so that equation (7a) collapses to $\dot{X} = \tilde{r} - \tilde{r}^*$. Figure 7.1a presents the dynamic phase diagram for the small country case that obtains when initial domestic holdings of foreign bonds are small or nonexistent. The $\dot{X} = 0$ schedule describes asset market equilibrium when there is no expected appreciation or depreciation. The schedule slopes down because a depreciation raises the rate of return differential and must be accompanied by a decrease in net foreign assets to decrease $r - r^*$ and maintain $\dot{X} = 0$. Above the schedule, $r > r^*$, so there is portfolio imbalance unless depreciation prevails. Below the schedule, appreciation is necessary for asset market equilibrium. The $\dot{nfa} = 0$ schedule is the locus of points for which the current account is balanced. This schedule slopes



$\phi = .8$, $\sigma = .2$, $\Omega = 0$, $\delta = r_0 = r_0^* = .05$, $\epsilon = \epsilon^* = .3$, $\eta = .12$.

Fig. 7.1 Examples of possible phase diagrams

down because a depreciation which improves the trade balance requires a decrease in net foreign assets and thus the service account to eliminate the current account surplus. To the right of the schedule, we have accumulation of net foreign assets through the service account, and to the left, we have decumulation. Here the stability condition of a negative determinant implies that the $\dot{X} = 0$ schedule must be steeper than the $\dot{nfa} = 0$ schedule with the stable trajectory *JJ* between them.

In the second panel of figure 7.1, we illustrate the dynamics of the system for a slightly higher range of initial foreign bond holdings. For this intermediate range of b^*_{d0}, the $\dot{nfa} = 0$ schedule is positively sloped. A depreciation still has a positive effect on the current account, but now the net effect of an increase in net foreign assets on the current account is negative. As b^*_{d0} rises, the interest component of the current account becomes more important; the increase in the service account caused by $r_0\tilde{nfa}$ is more than compensated for by the decrease due to $-b^*_{d0}(\tilde{r} - \tilde{r}^*)$. Over the range applicable to case (b), when b^*_{d0} is higher, the slope of the $\dot{nfa} = 0$ schedule is steeper.

The third case shown is for relatively large initial asset holdings. When $b_{d0}^* > 1.2$, the slope of the $\dot{nfa} = 0$ schedule again becomes negative, but becomes steeper than the $\dot{X} = 0$ schedule. Now a depreciation actually worsens the current account; the trade balance improvement caused by depreciation is swamped by the service account deterioration associated with the increase in $(r - r^*)$.[13] Is case (c) simply a theoretical curiosity or is it a real possibility? The service account is often ignored in international models, but here it plays the overwhelming role in dynamic adjustment. The lower η, or the less responsive the trade balance to a change in the real exchange rate, the likelier it is that this case will obtain. When the trade balance is inelastic with respect to the real exchange rate, the service account may become the dominant determinant of the current account.

The predominant influence of the service account may be a short-run phenomena in many developed nations. Any country confronting a J curve may experience periods in which a depreciation initially worsens the balance of payments by deteriorating the service account without appreciably improving the trade balance. Eventually, one would expect the trade balance to improve enough to outweigh the negative service account and improve the overall balance of payments.[14] In contrast, in less-developed debtor nations which export primary commodities with low demand elasticities, a depreciation may deteriorate the current account for a longer period of time.

At this point we should comment on the impact of capital gains. If capital gains are continuously capitalized, then the likelihood that the economy is characterized by case (b) or (c) increases. Given the parameter values used in figure 7.1, in order for case (a) to be relevant b_{d0}^* must be less than .143, while case (b) obtains when initial domestic holdings of foreign bonds are in the range: $.143 < b_{d0}^* < .625$. Therefore, the more important the capital gains in the balance of payments, the less likely it is that the dynamics of the system will parallel the small country case.

7.3 A Balanced Budget Expansion

The dynamic behavior of the economy in response to a balanced budget expansion depends on the degree of asset substitutability, the responsiveness of trade to changes in absorption and the real exchange rate, and on the initial degree of capital market integration. We will start with the standard case; assets are assumed to be perfect substitutes, and initially residents of each country hold only assets denominated in their own currency ($b_{d0}^* = b_{f0} = 0$). Figure 7.2a depicts the dynamic path of the economy following a permanent balanced budget expansion. Both the $\dot{X} = 0$ and the $\dot{nfa} = 0$ schedules shift inward;

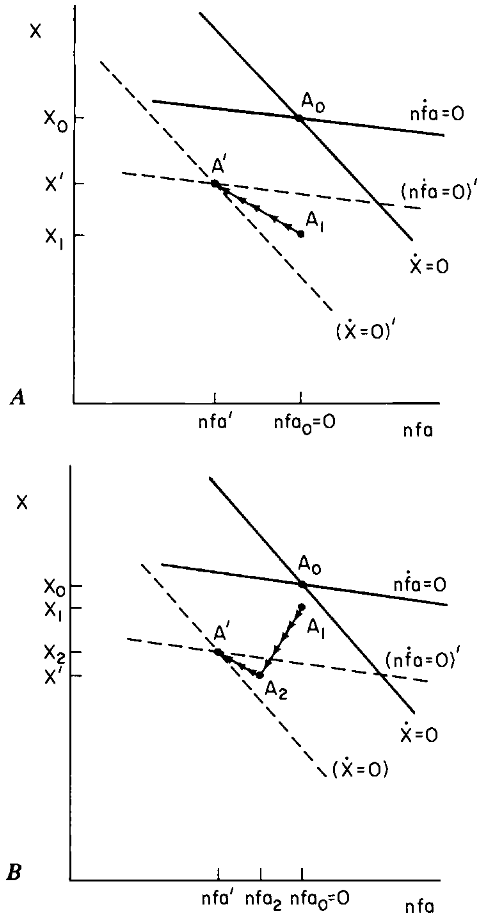


Fig. 7.2 Balanced budget expansion (BBE) when assets are perfect substitutes ($\Omega = 0$) and $b^*_{d0} = b_{f0} = 0$. *A*, an unanticipated BBE. *B*, an anticipated BBE

the former because the increase in government spending causes an increase in the real rate of return differential, requiring an appreciation and/or a decrease in net foreign assets to restore steady state portfolio equilibrium. The current account schedule shifts inward because an increase in g directly improves the trade balance by shifting domestic demand from foreign to domestic goods, so either an appreciation or a decumulation of net foreign assets is necessary to restore current account balance. The instantaneous effect is an appreciation to clear the home goods market by choking off foreign demand. The exchange rate jumps from A_0 to A_1, a point which is located on the trajectory to the new steady state equilibrium, A'. From that point on, the domestic country runs a current account deficit and undergoes depreciation until arriving at A'. In the long run, the expanding country experiences a loss in net foreign assets and probably an appreciation. The long-run changes in the level of net foreign assets and the real exchange rate are:

(14a) $$\overline{nfa} - nfa_0 = -[\sigma/2(\delta - \sigma r_0^*)]\bar{g}, \text{ and}$$

(14b) $$\bar{X} - X_0 = [(\sigma r_0^* - 2\delta\epsilon)/2\eta(\delta - \sigma r_0^*)]\bar{g}.$$

Given that $\delta = r_0^*$, the condition for long-run real depreciation is $\sigma > 2\epsilon$. If this condition holds, the net effect of the increase in government spending on the current account is negative and a long-run real depreciation is necessary. This condition is unlikely to hold unless a country has quite a high propensity to save and a low marginal propensity to import out of absorption.[15]

When $b_{d0}^* = b_{f0} = 0$, the portfolio balance schedule becomes steeper as assets become less perfect substitutes. A given balanced budget expansion will cause less loss of net foreign assets and more appreciation. The higher the Ω, the higher the risk premium, $\bar{r} - \bar{r}^*$, needed to induce foreign investors to hold more domestic bonds. At the same time, the current account requires more appreciation because an appreciation only affects the trade balance; with initial asset stocks equal to zero, there are no service account effects generated by a change in the real exchange rate.

Figure 7.2b illustrates the effects of a balanced budget expansion that is anticipated several periods before its occurrence. As soon as the expansion is foreseen, the exchange rate appreciates to X_1, as investors expecting future increases in the domestic real interest rate raise their demands for domestic assets. Since the expansion has yet to materialize, the system follows the dynamics dictated by the original dynamic schedules and further appreciation occurs. In this region there is a current account deficit due to the appreciation, so net foreign assets decumulate over this period. The appreciation has a contractionary effect on the domestic economy, while demand increases abroad. To clear both goods markets, r declines while r^* increases so that $\tilde{r} - \tilde{r}^*$ is negative and equal to the expected appreciation over the period. By the time of the implementation of the fiscal expansion, the economy has arrived at A_2 on the stable trajectory to the new equilibrium. From then on the economy evolves as in the unanticipated case described above. With the fiscal expansion in place, r increases so that it exceeds r^* until the new equilibrium is reached.

When initial asset holdings are large enough to ensure that the current account balance schedule is upward-sloping, a balanced budget expansion will again shift the portfolio balance schedule down and to the left, but will shift the current account schedule down and to the right. Higher government spending crowds out domestic demand for foreign goods. To keep the current account in balance, there must be an appreciation to depress the trade balance and/or a higher level of net foreign assets to worsen the service account.

If assets are perfect substitutes, the dynamics of the system are similar to those shown in figure 7.2. At the new steady state equilibrium, we again have an appreciated exchange rate, as long as condition (14b) holds, and a lower level of net foreign asset holdings than in the initial steady state. The model yields the familiar result that the steady state real exchange rate does not depend on initial asset stocks in a world of perfect capital mobility. Also, it can be shown that the new level of net foreign asset holdings is positively associated with the initial stock of foreign bonds held domestically because of the service account benefits derived from them.

If assets are less than perfect substitutes, then we may end up with the different dynamics shown in figure 7.3. As before, an unanticipated balanced budget expansion causes a jump appreciation to clear goods markets. However, the magnitude of the initial appreciation is less than in the perfect substitutes case. Initially, the domestic interest rate increases, but unlike the perfect substitutes case, the foreign interest rate decreases. The net effect of the increase in government spending and the appreciation on the current account is positive, resulting in foreign excess supply that causes r^* to fall. After the initial appreciation, the economy undergoes steady appreciation and accumulation of net foreign assets until the new equilibrium is reached. During the adjustment period, there is a current account surplus along with an excess demand for foreign assets at the prevailing interest rate differential. Even though $r - r^*$ increases, which in itself raises the demand for domestic assets, this effect is overwhelmed by the wealth effect caused by appreciation. The initial decrease in X causes portfolio disequilibrium by decreasing (increasing) the proportion of foreign (domestic) bonds in the domestic (foreign) portfolio below (above) desired levels. To eliminate the net excess demand for foreign assets, appreciation must be expected.

The dynamic effects of an anticipated balanced budget expansion for this case are shown in figure 7.3b. The jump appreciation caused by the anticipation of expansion and higher returns on domestic bonds engenders a current account deficit by worsening the trade account. Initially, r decreases and r^* increases to clear both the domestic and foreign goods markets, which experience a decrease and increase in demand respectively. Appreciation and decumulation of net foreign assets occur until the day of the expansion, at which point the economy arrives at the stable trajectory to the new long-run equilibrium.

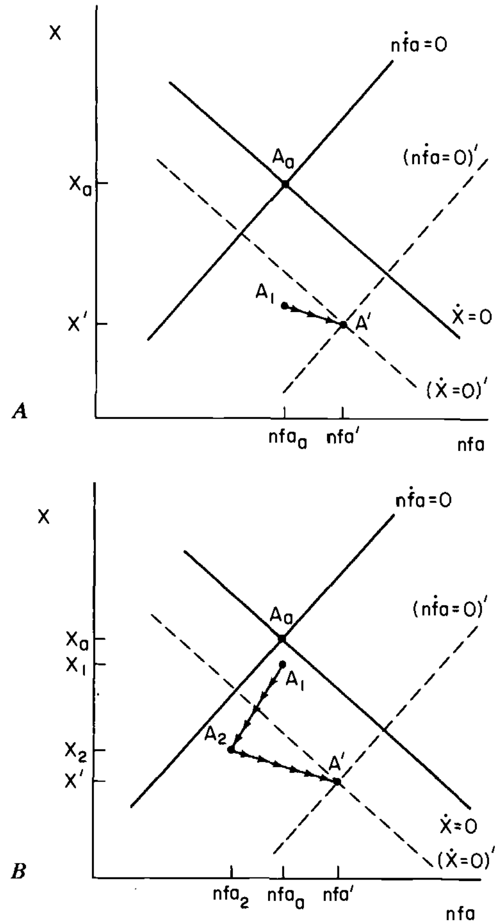


Fig. 7.3 BBE when $\Omega > 0$ and $.4 < b^*_{d0} < 1.2$. *A*, an unanticipated BBE. *B*, an anticipated BBE

Here, the new steady state is characterized by an appreciated real exchange rate and a *higher* level of net foreign assets. The new steady state exchange rate is higher when assets are less substitutable due to the familiar result that $\partial(\bar{r} - \bar{r}^*)/\partial\Omega > 0$. As assets become less substitutable, the interest rates in each country are freer to diverge from each other, so that they can bear more of the burden of equilibrating both goods markets. Given some degree of imperfect asset substitutability, the exchange rate is also higher when initial holdings of foreign assets are higher. In the new steady state, a positive relative return differential will have a negative impact on the service account because more debt service must be paid abroad, while less interest is received domestically. Therefore, for a given increase in g, less appreciation is necessary to eliminate the current account surplus due to crowding out of private domestic demand. In the long run, the trade balance suffers less deterioration, whereas the service account deteriorates by more as $b^*_{d0} = b_{f0}$ are increased.

When $.4 < b^*_{d0} < 1.2$, the level of net foreign assets in the new steady state is positively related to the degree of imperfect asset substitutability. As assets become less substitutable, the portfolio disequilibrium caused by a given change in the exchange rate grows larger. The fiscally induced appreciation causes investors to reshuffle their portfolios toward foreign bonds. Finally, the new steady state level of net foreign assets is negatively related to the initial foreign position of domestic investors. The higher b^*_{d0}, the more net debt service will flow abroad, increasing the tendency to decumulate net foreign assets.

Next, we examine possible dynamic responses to a balanced budget expansion when initial foreign asset holdings are relatively large. Under this scenario, a balanced budget expansion shifts both schedules down and to the left. Here, the increase in government spending has a negative impact on the current account; although the trade balance improves, the service account deteriorates by a larger amount. Therefore, either a decrease in net foreign assets and/or an appreciation is needed to restore current account balance.

If domestic and foreign assets are perfect substitutes, the new long-run steady state is likely to be characterized by a lower real exchange rate as well as an increase in net foreign assets held domestically.[16] The dynamic path to the new equilibrium is quite similar to that of figure 7.3a and is thus not shown here. However, the underlying dynamics of the economy are quite different. The impact effect of the fiscal expansion is appreciation and an increase in interest rates, but the foreign interest rate increases by more than the domestic rate does. This increase in the relative return to foreign bonds improves the service account, and along with the direct crowding out due to the increase in g, outweighs the deterioration of the current account due to appreciation. Persistent current account surpluses generate net foreign asset accumulation for the domestic country while appreciation matching $\bar{r} - \bar{r}^*$ maintains portfolio equilibrium. The domestic country ends up with a higher level of net foreign assets in the new steady state because of the service account surpluses experienced in the adjustment period. This result is in contrast to the usual loss of net foreign assets through persistent trade balance deficits following a permanent fiscal stimulus.

The dynamics of an anticipated fiscal expansion in this case are shown in figure 7.4a. After a small appreciation of the exchange rate as soon as the expansionary policy is expected, the exchange rate appreciates while capital flows abroad. Initially, the domestic real in-

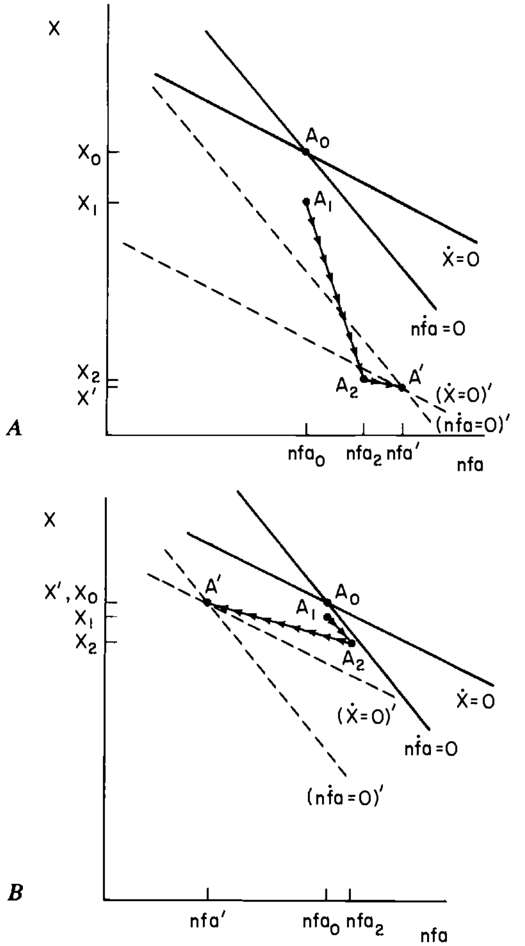


Fig. 7.4 Anticipated BBE when $b^*_{d0} = b_{f0} > 1.2$. *A*, perfect substitutes case. *B*, imperfect substitutes case

terest rate declines while the foreign real rate rises, so $\dot{X} < 0$ is essential for portfolio balance. Meanwhile, a current account surplus, primarily caused by a service account surplus, guarantees net foreign asset accumulation. On the day of the expansion, the economy arrives at A_2 on the stable path to a new steady state.

When assets are imperfect substitutes and investors initially hold relatively large amounts of international assets, it is possible that the dynamic and long-run results of the small country case are restored. The larger the Ω, the larger the $\bar{r} - \bar{r}^*$, so the greater the cumulative losses in net foreign assets through the service account over the transition period. Also, note that the higher the degree of imperfect asset substitutability and b^*_{d0}, the more likely it is that there will be a long-run depreciation to restore current account balance.[17] Figure 7.4b shows the dynamic response to an anticipated balanced budget expansion for this case. The usual initial appreciation when the policy is announced coincides with a fall in r and an increase in r^* to clear both goods markets. Before the policy comes into effect, the exchange rate continues to appreciate to ensure portfolio balance while net foreign assets accumulate through service account surpluses. When the fiscal impetus occurs, the economy reaches A_2, and there is a large jump in the domestic interest rate to eliminate excess demand at home. From then on, the current account is in deficit and depreciation accompanies capital inflows.

Above, we have focused primarily on the parameters Ω and b^*_{d0} while ignoring the others in the system. Let us turn to a brief discussion of the other parameters. We will approach the analysis from a simplified angle by considering the case of perfect asset substitutability. A balanced budget expansion in a nation with a higher marginal propensity to save out of disposable income will lead to a higher real exchange rate and a lower level of net foreign assets in the new steady state. In the long run, disposable income is lower domestically and higher abroad. This causes a decrease in domestic absorption, which relieves pressure on the real exchange rate to crowd out the foreign component of demand. The higher the savings rate, the more of a decrease (increase) in savings will occur in the domestic (foreign) country. Over time, larger domestic current account deficits will lead to a lower long-run level of net foreign assets.

The higher the absorption responsiveness of the trade balance, ϵ, the lower the $\bar{X}$ and the higher the $\overline{nfa}$. A higher magnitude of ϵ causes a given fiscal expansion to crowd out more domestic demand for foreign goods, and thus the real exchange rate must appreciate by more to ensure current account balance. The larger improvement in the trade balance also engenders a long-run gain in the net foreign asset position. The more elastic the trade balance with respect to the real exchange rate (the higher η), the less the real appreciation needed for current account balance. In the long run, the terms-of-trade elasticity is also positively related to the level of net foreign assets.

An increase in the initial level of the real interest rate leads to a higher $\bar{X}$ and a lower $\overline{nfa}$. Due to the fiscally induced loss of service account income, there will be more of a tendency for net foreign asset decumulation, and current account balance will require a more competitive level of the real exchange rate. Finally, increases in δ will be associated with further appreciation and more capital outflows in response to the increase in g. If absorption is more elastic with respect to wealth, long-run real appreciation has a more negative (positive) effect on domestic (foreign) absorption.[18] Therefore, a lower $\bar{X}$ and higher $\overline{nfa}$ will be necessary to equilibrate the current account.

At this point, a comment on the simplifying assumptions employed above is in order. In Kole (1984), the model was revised to account for output and price flexibility by including standard money demand equations and allowing price changes based on excess supply or demand. These changes resulted in a four by four dynamic model upon which simulations were performed. When output is allowed to deviate from its full employment level, the impact of fiscal expansion on the exchange rate and interest rates is reduced in magnitude, but the basic direction of movement remains the same. The adjustment process takes longer in the fuller model, probably because of the less dramatic nature of the events occurring in the initial periods following an expansion.

Also, the assumption that the expanding country was initially neither a net debtor nor creditor was relaxed. It was shown that the debt situation is likely to deteriorate following a fiscal stimulus in a lender country if the initial level of debt is large and/or domestic and foreign bonds are imperfect substitutes. Under these conditions, the negative impact of increased world interest rates on a debtor nation's service account far outweighs any trade balance improvement derived from the real depreciation of its currency.

7.4 A Bond-Financed Increase in Government Spending

Next, we analyze the dynamic adjustment to a permanent increase in government spending which is originally financed by bond creation. For any given spending increase, there are unlimited combinations of $\bar{b}$, the target stock of outstanding bonds, and μ, the rate of adjustment to that target, that are consistent with equation (10). We will look at two cases to examine what different dynamic and long-run effects can be expected as the rate of adjustment increases and the amount of bonds created decreases.

The short-run effect of a bond financed fiscal expansion will be an increase in the domestic real interest rate and a discrete appreciation, both occurring to clear the home goods market. In general, the initial amount of appreciation and increase in the interest rate will be larger in magnitude than in the balanced budget case. In the initial period, domestic taxes increase to cover higher debt service, but the increase in government sending is entirely financed by the issuance of new domestic bonds. The budget deficit creates a larger initial boom in demand than that caused by a balanced budget expansion. Because more crowding out is needed in the first period, X and r must move by more.

In the long run, the results of a bond-financed increase in government spending are similar to those of a balanced budget expansion with some qualifications. In the new steady state, the larger the increase in the stock of domestic bonds created to temporarily finance budget deficits, the higher the steady state real exchange rate and the domestic real interest rate.[19] In the case of perfect asset substitutability, an increase in the stock of bonds boosts world interest rates by raising world wealth. The higher supply of domestic bonds must be matched by an increase in world saving which can only be accomplished through a higher equilibrium interest rate.

When assets are imperfect substitutes, the steady state real interest rate differential is positively related to the amount of bond creation. Because the relative supply of domestic bonds is higher in the new steady state, they must carry a permanently higher return to induce investors to hold them. As before, there is a negative relationship between the amount of long-run real interest rate adjustment and real exchange rate adjustment. Therefore, the real exchange rate will be higher, when $\bar{b} - b_0$ is higher. Another reason for the positive association between the long-run real exchange rate and the amount of bond creation is that eventually government debt service has a negative impact on disposable income. With a higher long-run stock of bonds, more taxes will have to be levied to cover the government's debt service. If there were no capital mobility, the increase in the domestic government's debt service would not affect disposable income; all of the interest payments on the increased stock of bonds would be received and taxed away domestically. However, as long as foreigners hold some of the increased stock of domestic bonds, domestic residents will suffer a long-run real income loss. This result contrasts with the classic Diamond model (1965), in which swapping external for internal debt raises utility in the efficient case.[20]

When assets are close or perfect substitutes, the steady state level of net foreign assets resulting from a bond-financed increase in g will be lower, the higher the degree of bond creation. The larger initial appreciation and rise in r associated with bond finance increase the likelihood that the current account will be in deficit during the transition to a new equilibrium. The cumulative effect of the current account deficits is a lower domestic net foreign asset position. If instead domestic and foreign bonds are poor substitutes and b^*_{d0} is small, then it is possible that bond creation will enhance the ultimate external position. The larger the increase in the stock of bonds, the larger the equilibrium increase in the domestic real interest rate. When initial cross-country bond holdings are small, the negative service account effect of an increase in r will also be small. Consequently, the major effect associated with the large increase in r will be a decrease in domestic absorption and a current account improvement.

The dynamic adjustment to a bond-financed increase in government spending cannot be represented diagrammatically because both of the schedules shift each period due to the changing stock of government bonds. The equations of motion in the bond financed case are:

$$\text{(7b)} \qquad \dot{X} = \tilde{r} - \tilde{r}^* + \Omega[(\theta - \theta^*)\tilde{nfa} - (1 - \theta)\tilde{b} + (1 + \theta - \theta^*)b^*_{d0}\tilde{X}], \text{ and}$$

$$\text{(11b)} \qquad \dot{nfa} = (\eta' + r^*_0 b^*_{d0})\tilde{X} + r^*_0\tilde{nfa} + b^*_{d0}(\tilde{r}^* - \tilde{r}) + \epsilon'\tilde{g}.$$

During the adjustment period, $\tilde{r} - \tilde{r}^*$ depends positive on $\tilde{b}$. Also, when $\Omega \neq 0$, progressive increases in the stock of domestic bonds have the additional effect of raising the steady state risk premium associated with them.

Simulations were performed to analyze the dynamic paths of the forcing variables on the way to the new equilibrium. We focus on a 10% rise in government expenditures and examine two combinations of μ and $(\bar{b} - b_0)$:

Case (a)	$\mu = .1$	$(\bar{b} - b_0) = 1$	Slow adjustment, high bond target
Case (b)	$\mu = .5$	$(\bar{b} - b_0) = .2$	Fast adjustment, low bond target.

The other parameter values assumed for the simulations are: $X_0 = 1$, $nfa_0 = 0$, $\phi = .8$, $\sigma = .2$, $\delta = r^*_0 = r_0 = .05$, $\theta = .7$, $\theta^* = .3$, $\epsilon = \epsilon^* = .3$, $\eta = .12$, and $T_0 = 0$. We consider the cases of perfect asset substitutability ($\Omega = 0$) and mild imperfect asset substitutability ($\Omega = .2$). For now we leave aside the case of strong imperfect asset substitutability, because these simulations implicitly assume that the two countries are of roughly equal size. Modern experience between large developed countries suggests that strong imperfect asset substitutability is unlikely to hold. We also look at various different values for initial international bond holdings: $b^*_{d0} = b_{f0} = .3$, .8, and 2.0. Table 7.2 summarizes the results of the simulations.

With perfect asset substitutability, the adjustment paths with low or medium initial cross-country bond holdings are fairly similar to each other. After an initial appreciation, depreciation and decumulation of net foreign assets take place until the new equilibrium is reached. Figure 7.5 depicts the paths of the real exchange rate, the real return differential, and the level of net foreign assets following a domestic fiscal expansion at time $t = 15$, for the case where $b^*_{d0} = .3$ and $\Omega = 0$. For reference, the paths of the variables for both cases (a) and (b) are compared to the paths which result from a balanced budget expansion of equal magnitude.

One can see from figure 7.5 that the initial jump appreciation and increase in the real return differential is larger in both bond-financed cases due to the higher domestic demand pressure caused by a gov-

Table 7.2 **Simulation Results for a Bond-Financed Fiscal Expansion**

	$\Omega = 0$					
	$b^*_{d0} = .3$		$b^*_{f0} = .8$		$b^*_{d0} = 2.0$	
	$\mu = .1$	$\mu = .5$	$\mu = .1$	$\mu = .5$	$\mu = .1$	$\mu = .5$
$X(0)$	.645	.682	.694	.731	.768	.797
$r(0)$	.119	.129	.118	.124	.116	.119
$nfa(1)$	−.041	−.035	−.038	−.036	−.031	−.034
$\bar{X}$	.896	.813	.896	.813	.896	.813
$\bar{r}$	.094	.069	.094	.064	.094	.064
$\bar{r} - \bar{r}^*$	0	0	0	0	0	0
$\overline{nfa}$	−.845	−.319	−.792	−.225	−.667	0
Adjustment Path	$\dot{X}>0$ $\dot{nfa}<0$	$\dot{X}>0$ $\dot{nfa}<0$	$\dot{X}>0$ $\dot{nfa}<0$	$\dot{X}>0$ $\dot{nfa}<0$	$\dot{X}>0$ $\dot{nfa}<0$	$\dot{X}>0$[a] for $t<21$, $\dot{nfa}<0$ for $t<20$.

	$\Omega = .2$					
	$b^*_{d0} = .3$		$b^*_{d0} = .8$		$b^*_{d0} = 2.0$	
	$\mu = .1$	$\mu = .5$	$\mu = .1$	$\mu = .5$	$\mu = .1$	$\mu = .5$
$X(0)$	.708	.732	.825	.837	.940	.942
$r(0)$	.135	.142	.141	.144	.137	.137
$nfa(1)$	−.031	−.027	−.031	−.030	−.045	−.045
$\bar{X}$	.862	.799	1.036	.881	1.208	1.025
$\bar{r}$	.135	.085	.136	.089	.117	.085
$\bar{r} - \bar{r}^*$	.082	.032	.084	.041	.047	.032
$\overline{nfa}$	−.134	−.041	−.400	−.033	−1.291	−.425
Adjustment Path	$\dot{X}>0$[a] for $t<21$, $\dot{nfa}<0$ for $t<35$.	$\dot{X}>0$[a] for $t<44$, $\dot{nfa}<0$ for $t<21$.	$\dot{X}>0$ $\dot{nfa}<0$	$\dot{X}>0$[a] for $t<22$ $\dot{nfa}<0$ for $t<21$.	$\dot{X}>0$ $\dot{nfa}<0$	$\dot{X}>0$ $\dot{nfa}<0$

(a) After an initial period of depreciation and decumulation of net foreign assets, the adjustment path to steady state is characterized by $\dot{X}<0$ and $\dot{nfa}>0$.

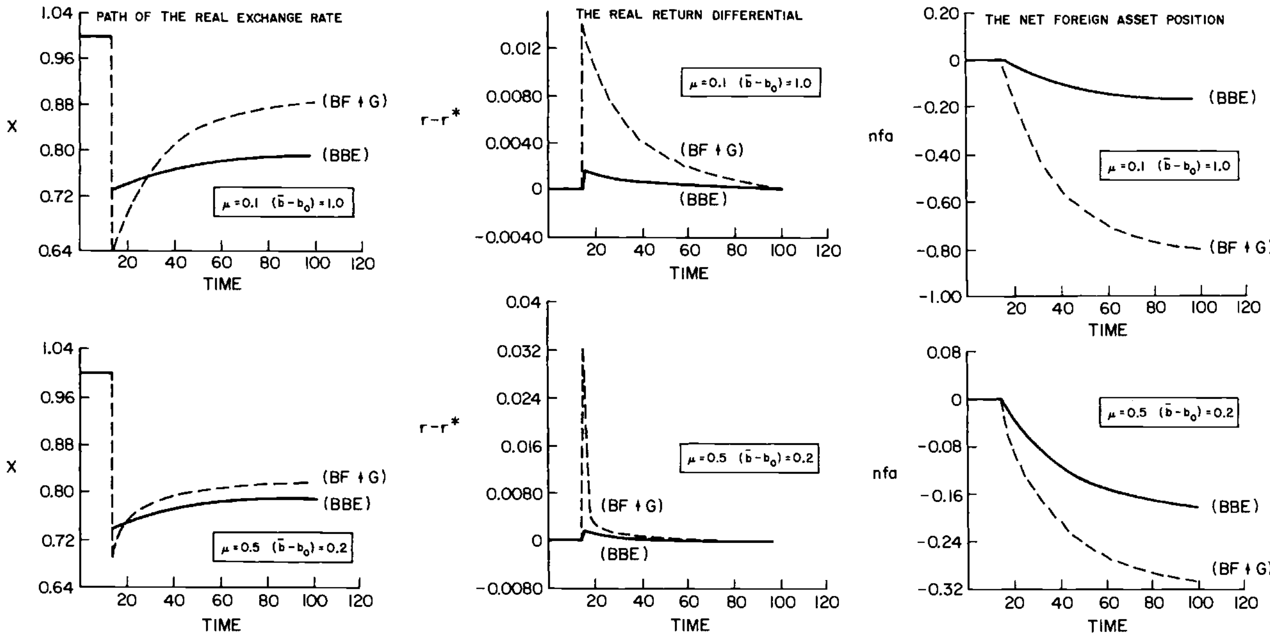


Fig. 7.5 Dynamic adjustment to a balanced budget expansion (BBE) vs. a bond-financed expansion (BF ↑ G) when $\Omega = 0$ and $b^*_{d0} = .3$

ernment deficit. Comparing case (a) and (b), we can see that the initial appreciation is larger for the slow adjustment case. In contrast, the initial jump in $r - r^*$ is larger for the fast adjustment case. Even though the long-run stock of domestic bonds is lower in case (b), the initial increase in r is greater because the bonds are expected to arrive in the economy sooner.

Figure 7.5 also shows that after the initial period, the rates of net foreign asset decumulation and depreciation are higher for bond-financed expansions. This result indicates that the current account deficits induced by the initial appreciation are much larger than in the case of a balanced budget expansion. As the level of domestic bonds approaches its target level and we near a balanced budget position, the rates of depreciation and net foreign asset decumulation slow down. The faster the rate of adjustment (μ) or the lower the change in the supply of government bonds due to the expansion, the more quickly the system returns to the dynamics associated with a balanced budget expansion.

If initial international bond holdings are large, then a bond-financed expansion may yield more interesting dynamics, especially in the high adjustment case. Figure 7.6 shows that in both cases a jump appreciation is initially followed by depreciation and net capital inflows. However, in case (b) the situation shortly changes, and appreciation and accumulation of net foreign assets occur until the new equilibrium. What causes the real exchange rate to initially move away from its long-run equilibrium value? The deficit financed increase in government spending has its most expansionary effect in the initial period. Because of short-run demand pressure, both the real exchange rate and the real interest rate overshoot their long-run levels. A current account deficit is inevitable in the short run; the trade balance deteriorates in response to the appreciation while the service account worsens as higher interest payments are sent abroad.

The large increases in the stock of domestic bonds which occur in the periods immediately succeeding the increase in g contribute to the high level of the domestic interest rate and the negative service account. Eventually, as the domestic stock of bonds approaches its target level, taxes increase and the budget deficit is reduced. The corresponding decrease in demand pressure allows r to fall. Subsequent adjustment is then characterized by gradual appreciation and capital outflows. In contrast, in the slow adjustment case, by the time the stock of domestic bonds is near $\bar{b}$ and the increase in taxes has relieved demand pressure on the interest rate, the stock of domestic bonds has grown enough to keep interest rates from falling. Thus, the entire path to equilibrium is characterized by $r > r^*$ and depreciation.

If assets are less than perfect substitutes, then the dynamic paths are more likely to be characterized by smooth adjustment when initial

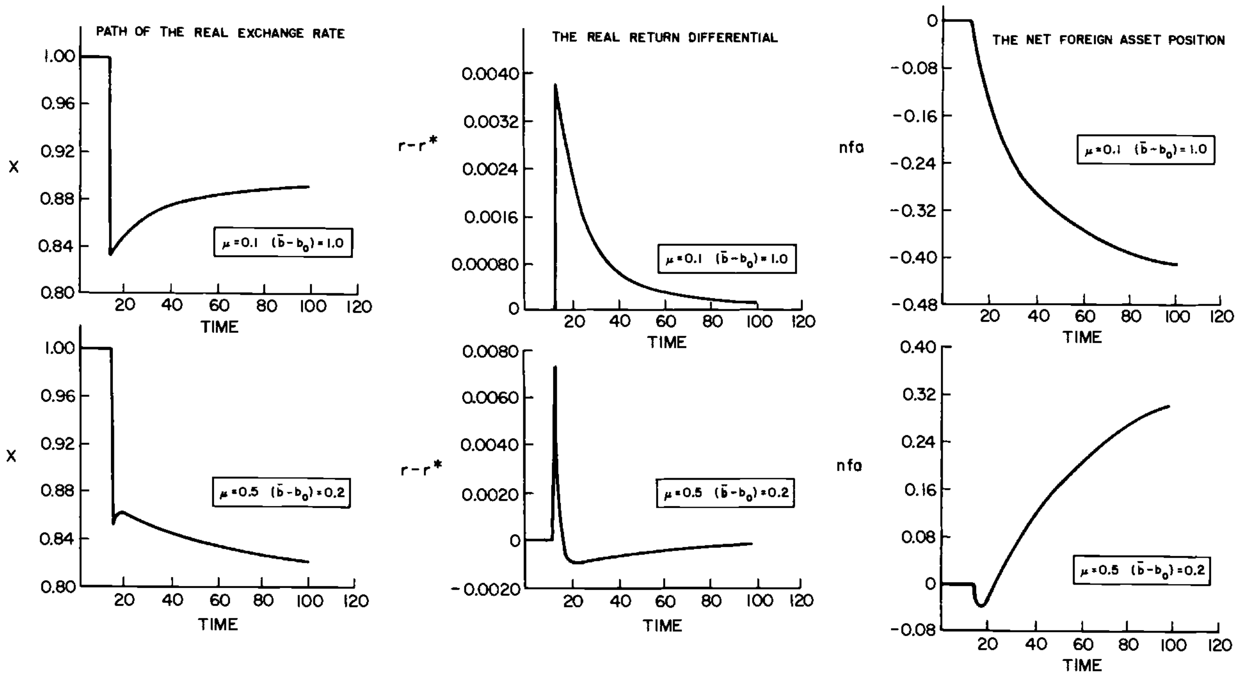


Fig. 7.6 Dynamic adjustment to a bond-financed expansion when $\Omega = 0$ and $b^*_{d0} = 4.0$

cross-country asset holdings are high. Imperfect asset substitutability allows a much larger jump in the domestic real interest rate, so the service account will play a more dominant role. The initial negative impact of the service account on the balance of payments will be larger when b^*_{d0} is larger. Consequently, the likelihood that net foreign asset decumulation accompanies depreciation along the adjustment path increases with initial domestic holdings of foreign bonds. If instead b^*_{d0} is small, the initial deficit in the current account is eventually replaced by a surplus as interest rates moderate and the exchange rate depreciates.

The differences between a balanced budget and a bond-financed fiscal expansion can be summarized as follows. On impact, the exchange rate appreciates and the domestic interest rate shoots up, both changes being larger in the case of temporary bond finance of government spending. In cases where a balanced budget expansion leads to depreciation and current account deficits, subsequent dynamics are characterized initially by a higher rate of net foreign asset decumulation and depreciation when bond finance is employed. When a balanced budget expansion is instead associated with appreciation and the accumulation of net foreign assets on the path to the new steady state, using bond finance initially causes the opposite dynamics, but may eventually be associated with similar dynamics as long as the increase in the stocks of bonds occurring over the period is not too large. And finally, for a given fiscal stimulus, the new steady state levels of the domestic real interest rate and the exchange rate will be higher and the level of net foreign assets lower when bond finance is initially used instead of taxes.

7.5 Comments on Recent U.S. Experience

What can be said about the recent U.S. experience of large bond-financed deficits and steady real appreciation in light of the above theoretical framework? A thorough empirical investigation of the impact of the domestic fiscal expansion on the international economy is beyond the scope of this study. However, we can take a brief look at the data to try and determine whether or not the above model helps explain the course of events. In the following discussion, we will focus on the United States and the other major countries, Japan, Germany, France, and the United Kingdom.

The U.S. fiscal expansion of the 1980s occurred in conjunction with fiscal contractions of varying magnitudes in the other major developed nations. Organization for Economic Cooperation and Development (OECD) estimates of general government structural budget balances indicate that between 1981 and 1985, the U.S. structural balance deteriorated by approximately 2.9% of nominal GNP. In contrast, over this period, the structural budget balances of most of the other nations improved: Japan's by 2.7%, Germany's by 3.1%, and France's by 3% of nominal GNP or GDP. The United Kingdom's structural budget balance is estimated to have worsened by about .2% of GDP from 1981 to 1985. Changes in inflation-adjusted structural budget balances show similar trends.[21]

Both the nominal and real value of the U.S. dollar rose in the early 1980s. If one measures the real exchange rate as an index of U.S. manufacturing wholesale prices relative to those of other industrial nations, adjusted for nominal exchange rates, then by the third quarter of 1981 the United States experienced 22.1% real appreciation over the 1980 average.[22] After a brief respite in late 1981 real appreciation continued steadily, but at a slower rate, through 1982 and 1983. By the end of 1982, the index of relative wholesale prices had risen 28.1% from its 1980 average; by the end of 1983 this index had risen by 32.0%. After the second quarter of 1984, both nominal and real dollar appreciation sped up again, so that by the end of 1984 U.S. manufacturing wholesale prices relative to other industrial countries had increased 44.2% from the 1980 average. By the end of the second quarter of 1985, this index had declined slightly to 43.9% above the 1980 level.

Figure 7.7 shows the U.S. *ex post* real interest rate on 3-month Treasury bills. We use *ex post* real rates as a very rough proxy for short-term *ex ante* real rates. Note that the U.S. real interest rate reached its highest levels in 1981 and 1982, declined during the recession, and rebounded strongly in 1984. Also, notice that between the first quarter of 1981 and that of 1985, the real interest rate was above, and often substantially above 4%. Figure 7.7 also shows that *ex post* short-term real interest differentials $r - r^*$ between the United States and the four other countries under consideration have usually been positive since 1980. When the differentials are averaged over each year, the years 1981 and 1984 stand out as being the periods of the largest real interest rate discrepancies.[23] These years both correspond to large increases in U.S. real interest rates as well as considerable real appreciation of the dollar.

High real interest rate differentials and real appreciation can be explained by a bond-financed fiscal expansion in the context of our model. However, there were undoubtedly other important factors at play. The course of monetary policy in the United States vis-à-vis the other major countries, portfolio, savings, and investment shifts, and the different speed and strength of recovery from the last recession between nations also influenced the path of the real exchange rate and real interest rates.[24] It is also possible that during some periods the dollar was on a bubble path. We leave to future research the difficult problem of empirically separating all of these diverse effects.

Let us now consider U.S. current account developments in the 1980s. Figure 7.8 depicts the current account along with the trade balance and

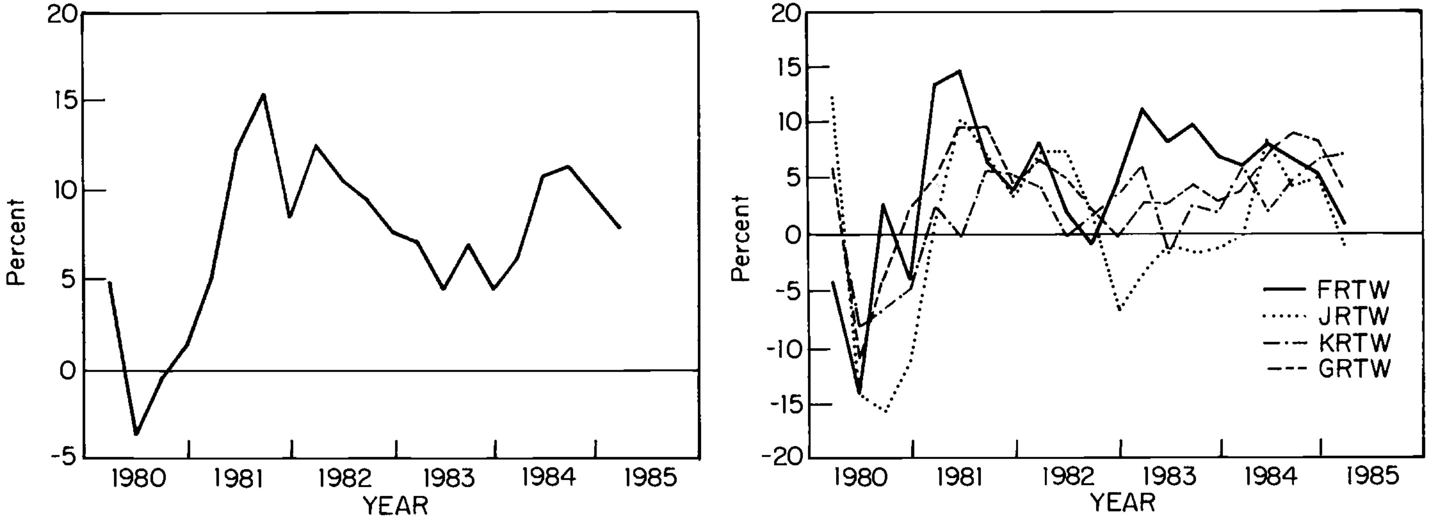


Fig. 7.7 U.S. ex post real interest rate, 1980I–1985I (*left*); and Ex post real interest rate differentials, 1980I–1985I (*right*).
Source: All data is from the IMF International Financial Statistics.
Note: The short-term ex post real interest rates were calculated as follows: 3-month nominal interest rates for each country were adjusted by subtracting the wholesale or industrial price inflation occurring over the subsequent quarter. The nominal rates used were the U.S. Treasury Bill rate, the West German, Japanese, and French call money rates, and the Eurodollar rate in London. The wholesale price index was used to calculate inflation in the U.S. and Japan. For Germany and France, industrial goods price indexes were used, and the manufacturing output price index was used for the U.K.

Ex post real interest rate differentials are the U.S. rate minus the foreign rate or, $r - r^*$. FRTW, JRTW, KRTW, and GRTW denote the U.S.–French, U.S.–Japanese, U.S.–U.K., and U.S.–West German real interest rate differentials, respectively.

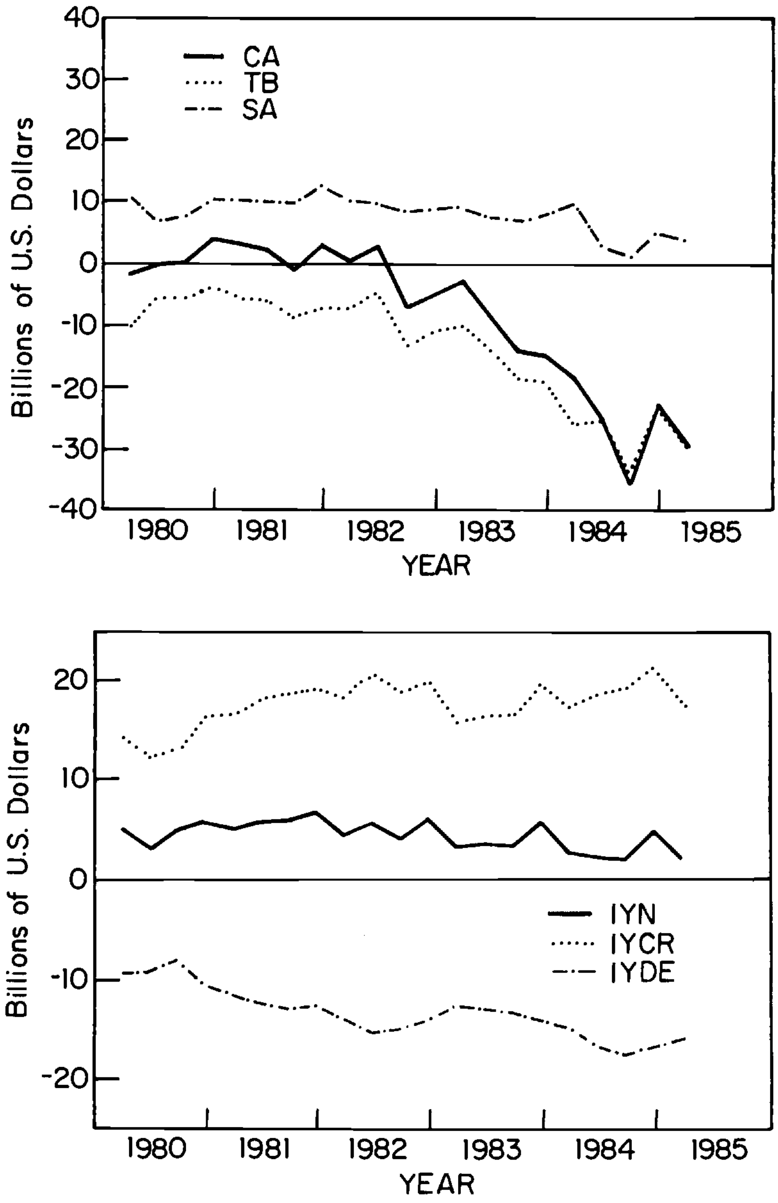


Fig. 7.8 U.S. current account developments, 1980I–1985I
Source: IMF Balance of Payments Statistics.
Note: Top panel represents U.S. current account (CA), trade balance (TB), and service account, excluding transfers (SA) for 1980I–1985I. Bottom panel represents other U.S. investment income—net (IYN), credit (IYCR), and debit (IYDE) transactions for 1980I–1985I.

the service account excluding transfers. In addition, the lower panel of Figure 7.8 shows the component of the service account which reflects dividends, interest, and other investment income; this part of the service account is the most relevant in terms of the model described above. The current account was either positive or roughly in balance until the third quarter of 1982, when it began its steady decline to substantial deficit levels. It is interesting to note that the large real appreciation of 1981 did not considerably worsen the current account; the service account improvement more than compensated for the mild deterioration of the trade balance. The 1981 experience of real appreciation accompanied by current account surpluses is a pattern which could be predicted by the above model. One might expect a fiscal expansion to improve the current account through the service account, especially if one included a mechanism which allowed a gradual response of the trade balance to real exchange rates.

After 1982, however, this pattern clearly broke down. The dramatic decline of the trade balance was accompanied by a gradual worsening of the service account. Net investment earnings (excluding reinvested earnings) have fallen every year since 1981, reflecting to some extent the loss of net foreign assets held in the United States. While U.S. current account deficits grew to unprecedented levels, real appreciation of the dollar continued. This pattern of events can only be described well in the above framework with an anticipated future fiscal expansion beyond the expansion that was already in place. Although in the early 1980s future U.S. budget deficits were expected to remain high throughout the rest of the decade, it is unlikely that in 1984 or 1985 economic agents anticipated an expansion of a magnitude large enough to explain the behavior of the dollar. Therefore, it is safe to conclude that fiscal policy was not the only culprit behind the evolution of the current account, real interest rates, and dollar exchange rates that the United States witnessed in the first half of the 1980s.

7.6 Concluding Remarks

Expansionary fiscal policy in an open economy can have dramatically different results depending on whether the expanding country is large or small. Within a simple two-country framework, this chapter has demonstrated that the initial amount of international capital market integration is a crucial factor in the dynamic adjustment path and the long-run steady state associated with a permanent increase in government spending. The high degree of capital mobility in the world today suggests that the initial asset market conditions explored above may be quite important.

As countries hold more of each other's assets, the service account and capital gains become more important in the adjustment process.

A balanced budget expansion in a small country leads to an appreciation on impact followed by steady depreciation and decumulation of net foreign assets through trade balance deficits. However, under certain circumstances this standard result is modified. A large country that increases its government spending has the ability to raise world interest rates. When initial cross-country bond holdings or the degree of imperfect asset substitutability are relatively large, dynamic responses to a fiscal expansion may be characterized by appreciation and accumulation of net foreign assets. This result pertains to both a balanced budget expansion and a bond-financed expansion that eliminates budget deficits over time. However, if deficit finance is resorted to for too long of a period, or if the increase in the stock of domestic bonds associated with a given increase in government spending is too large, then the standard dynamics are restored.

Several extensions of the analysis presented above would improve our understanding of the international effects of a large country's policies. The model lends itself nicely to the analysis of the presence of a "safe haven" in international asset markets. Also, a comparison of various tax policies such as an increase in income taxes or the imposition of an import tax surcharge could be considered in a similar framework. Finally, the addition of a physical investment sector could shed light on the extent of international crowding out associated with expansionary fiscal policy.

The international interdependence of the world's economies has increased markedly in recent decades. Many repercussive effects of a large country's stabilization policies are often ignored. This chapter has analyzed just a few of the channels through which one nation's fiscal expansion spill over abroad. Further theoretical work and empirical investigation in this area is crucial to both economists and policymakers.

Appendix

The linearized version of equations (1) to (5) is:

(1′) $\tilde{y} = \tilde{a} + \tilde{g} + \tilde{T} = 0 \qquad \tilde{y}^* = \tilde{a}^* - \tilde{T} = 0;$

(2′) $\tilde{a} = (1 - \sigma)\tilde{y}_d + \delta\tilde{w} - \phi\tilde{r} \qquad \tilde{a}^* = (1 - \sigma)\tilde{y}_d^* + \delta\tilde{w}^* - \phi\tilde{r}^*;$

(3′) $\tilde{y}_d = r_0^*\tilde{b} + r_0^* n\tilde{f}a + b_0\tilde{r} + b_{d0}^*(\tilde{r}^* - \tilde{r}) + r_0^* b_{d0}^*\tilde{X} - \tilde{z};$

$\tilde{y}_d^* = b_{d0}^*(\tilde{r} - \tilde{r}^*) - r_0 n\tilde{f}a - r_0 b_{f0}\tilde{X};$

(4′) $\tilde{w} = \tilde{b} + n\tilde{f}a + b_{d0}^*\tilde{X} \qquad \tilde{w}^* = -n\tilde{f}a - b_{f0}\tilde{X};$ and

(5′) $\tilde{T} = \epsilon'\tilde{g} + \eta'\tilde{X}$ where $\epsilon' = \epsilon/(1 - \epsilon - \epsilon^*)$ and $\eta' = \eta/(1 - \epsilon - \epsilon^*)$.

Here we present the algebra for the balanced budget case. As in the text, we assume an initial curent account balance and that $r_0 = r_0^*$, $b_{d0}^* = b_{f0}$, $T_0 = 0$, and $X_0 = 1$. For convenience, we define two parameters: $\phi' = \phi + (1 - \sigma)b_{d0}^*$ and $\delta' = \delta + (1 - \sigma)r_0$. Using equations (1′) through (5′), we can express short-run equilibrium as a system in r and r^*:

$$\underset{(A')}{\begin{bmatrix} \phi' & -b_{d0}^*(1-\sigma) \\ -b_{d0}^*(1-\sigma) & \phi' \end{bmatrix}} \begin{bmatrix} \tilde{r} \\ \tilde{r}^* \end{bmatrix} = \begin{bmatrix} \eta' + \delta' b_{d0}^* & \sigma + \epsilon' & \delta' \\ -(\eta' + \delta' b_{d0}^*) & -\epsilon' & -\delta' \end{bmatrix} \begin{bmatrix} \tilde{X} \\ \tilde{g} \\ \tilde{nfa} \end{bmatrix}.$$

Solving this system, we have:

$\text{Det}(A') = |A'| = \phi^2 + 2(1 - \sigma)\phi b_{d0}^*$ and
$\tilde{A} = |A'|/\phi = \phi + 2(1 - \sigma)b_{d0}^*$;

$\tilde{r} = (\eta' + \delta' b_{d0}^*)\tilde{X}/\tilde{A} + [\phi(\sigma + \epsilon') + \sigma(1 - \sigma)b_{d0}^*]\tilde{g}/|A'| + \delta'\tilde{nfa}/\tilde{A}$;

$\tilde{r}^* = -(\eta' + \delta' b_{d0}^*)\tilde{X}/\tilde{A} + [\sigma(1 - \sigma)b_{d0}^* - \phi\epsilon']\tilde{g}/|A'| - \delta'\tilde{nfa}/\tilde{A}$; and

$\tilde{r} - \tilde{r}^* = 2(\eta' + \delta' b_{d0}^*)\tilde{X}/\tilde{A} + (\sigma + 2\epsilon')\tilde{g}/\tilde{A} + 2\delta'\tilde{nfa}/\tilde{A}$.

In the case where the fiscal expansion is initially bond-financed, the equilibrium rate of return differential evolves as follows:

$$\tilde{r} - \tilde{r}^* = 2(\eta' + \delta' b_{d0}^*)\tilde{X}/\tilde{A} + (1 + 2\epsilon')\tilde{g}/\tilde{A} + 2\delta'\tilde{nfa}/\tilde{A} + [\delta - (1 - \sigma)\mu]\tilde{b}/\tilde{A}.$$

The dynamic system described by equations (7a) and (11a) in the text is:

$$(13)\qquad \begin{bmatrix} \dot{X} \\ \dot{nfa} \end{bmatrix} = \underset{(A)}{\begin{bmatrix} \overset{(+)}{a_{11}} & \overset{(+)}{a_{12}} \\ (?)\ a_{21} & (?)\ a_{22} \end{bmatrix}} \begin{bmatrix} \tilde{X} \\ \tilde{nfa} \end{bmatrix} + \underset{(\gamma)}{\begin{bmatrix} \overset{(+)}{a_{13}} \\ (?)\ a_{23} \end{bmatrix}} \tilde{g};$$

$a_{11} = \Omega(1 + \theta - \theta^*)b_{d0}^* + 2(\eta' + \delta' b_{d0}^*)/\tilde{A}$; $a_{12} = \Omega(\theta - \theta^*) + 2\delta'/\tilde{A}$;

$a_{21} = \eta' + r_0 b_{d0}^* - 2b_{d0}^*(\eta' + \delta' b_{d0}^*)/\tilde{A}$; $a_{22} = r_0 - 2\delta' b_{d0}^*/\tilde{A}$;

$a_{13} = (\sigma + 2\epsilon')/\tilde{A}$; and $a_{23} = \epsilon' - 2b_{d0}^*(\sigma + 2\epsilon')/\tilde{A}$.

Note that the inclusion of capital gains causes the second row of the system to be more likely to be negative. Denoting the coefficients of the system with capital gains as a_{ij}', we have:

$a_{21}' = a_{21} - b^*_{d0}a_{11}$; $a_{22}' = a_{22} - b^*_{d0}a_{12}$; and $a_{23}' = a_{23} - b^*_{d0}a_{13}$.

The determinant of the system is clearly the same, with or without capital gains:

$$\mathrm{Det}(A) = |A| = 2\eta'(\sigma r_0^* - \delta)/\tilde{A} + \Omega b^*_{d0}(\phi r_0^* - 2\delta b^*_{d0})/\tilde{A} + \Omega\eta'(\theta - \theta^*)(2\sigma b^*_{d0} - \phi)/\tilde{A}.$$

For stability, a sufficient condition is that $|A| < 0$.

Notes

1. For an excellent review of the literature on the effects of expansionary fiscal policy in an open economy, the interested reader is referred to Penati 1983. Dornbusch 1984 also provides a good summary of various models of exchange rate determination, with a particular emphasis on disentangling the various causes of the overvaluation of the dollar in the early eighties.

2. As Sachs and Wyplosz point out, the analysis in Blanchard 1985 indicates that with finite-lived consumers, δ is likely to be more than r. In steady state equilibrium, with infinitely-lived agents, δ must be equal to r. Note that these results apply when taxes are a lump sum; if instead one introduced a more sophisticated method of taxation, then the relevant interest rate would be the after-tax real rate of return.

3. Blanchard 1985 formalizes this assumption by introducing individuals who are devoid of a bequest motive and face a given probability of death. Recent work by Buiter 1984 and Frenkel and Razin 1984 has incorporated this departure from Ricardian equivalence into the analysis of fiscal policy.

4. In general, this wealth effect is ambiguous; while an appreciation decreases the value of domestically held foreign bonds, it also decreases the home consumer price index. The net wealth effect will then depend on the relative share of foreign bonds in the domestic portfolio vis-à-vis the relative share of imports in domestic absorption.

5. Since there is no stochastic uncertainty in the model, the assumption of rational expectations is equivalent to perfect foresight.

6. See Dornbusch 1982 for a capital asset pricing model in a utility-maximizing framework which nicely demonstrates this result.

7. A good discussion of this instability problem can be found in Blinder and Solow 1973. Also, see Blanchard 1984.

8. This assumption seems reasonable given that in many developed countries interest income is part of taxable income.

9. This condition is equivalent to the condition: $(\partial a^*/\partial r)(\partial r/\partial g) > \partial T/\partial g$. Foreign absorption increases because of the increase in foreign interest income earned on domestic bonds $(\partial a^*/\partial g = (1-\sigma)b_{f0}\partial r/\partial g)$, while the foreign trade balance deteriorates by ϵ' due to the crowding out of domestic absorption to the magnitude of ϕ. See the Appendix for the algebra underlying this result.

10. This condition guarantees that the system evolves along a unique saddle path which converges to the steady state. Holding r and r^* constant, the condition implies that $\partial \dot{nfa}/\partial nfa < 0$ or that the state variable evolves according

to the unique stable root of the system. This can be seen by setting $g = 0$ in equation (1). An increase in net foreign assets causes an increase in absorption of $(1-\sigma)r_0 + \delta$, meaning that the trade balance must decline by this amount for goods market equilibrium. If we also look at equation (11), we see that an increase in net foreign assets increases the service account by r_0. Thus, $\partial \dot{nfa}/\partial nfa = r_0 + \partial T/\partial nfa = r_0 - (1-\sigma)r_0 - \delta = (\sigma r_0 - \delta) < 0$.

11. Again, if one believes that an equilibrium is characterized by $\delta > r$, as in Blanchard 1985, the condition for a negative determinant is even more likely to hold.

12. For the most part, the parameter values chosen are the same as those used by Sachs and Wyplosz. However, they assumed that domestic residents of a small country held one-half of its assets in foreign bonds ($\theta = .5$), which is probably too high for the large country case. Also, because they neglected to include interest income in disposable income, their stability condition in the case of perfect asset substitutability required that $\delta > r_0$; thus they assumed $\delta = .1$ and $r_0 = .05$.

13. The intuition behind the relative slopes of the schedules is as follows. An increase in net foreign assets leads to excess demand, and as the real exchange rate and the real return differential decrease to clear the goods market there is a magnified effect on the current account. Note that $(\tilde{r} - \tilde{r}^*)$ appears with a multiple of $-b^*_{d0}$ in equation (11a); thus we need more appreciation to clear the current account than to maintain portfolio balance.

14. An interesting extension of the model would include dynamic adjustment in the trade balance. For instance, it would be interesting to consider the case in which the coefficient η was actually a distributed lag, with η growing over time.

15. It would be interesting to do an empirical analysis which focused on this condition. One country in which the condition may actually apply is Japan, which has a fairly high savings rate and a low proportion of imports in consumption.

16. The condition for long-run appreciation (14b) remains the same, but now equation (14a) becomes:

$$(14a') \qquad \overline{nfa} - nfa_0 = [b^*_{d0}(2\epsilon\delta - \sigma r^*_0) - \sigma\eta]\bar{g}/2\eta(\delta - \sigma r^*_0).$$

17. When net capital inflows occur between the two steady states, domestic wealth decreases while foreign wealth rises. In addition, r unambiguously increases from r_0, while r^* can go either way. These two effects may depress domestic demand and cancel out the positive effect of the balanced budget expansion. Furthermore, both of these effects have a negative impact on the current account. Therefore, a long-run depreciation is necessary to eliminate excess supply (demand) at home (abroad) by restoring current account balance. The dynamics of this case can be quite similar to those of figure 7.2a, except that in the long run the new equilibrium may be at a point such that a real depreciation has occurred.

18. The higher δ, the more important the effect of the redistribution of assets between countries through the current account.

19. In other words,

$$\partial\bar{X}/\partial(\bar{b} - b_0) > 0, \quad \partial\bar{r}/\partial(\bar{b} - b_0)\Big|_{\Omega=0} = \partial\bar{r}^*/\partial(\bar{b} - b_0)\Big|_{\Omega=0} > 0, \text{ and}$$

$$\partial(\bar{r} - \bar{r}^*)/\partial(\bar{b} - b_0)\Big|_{\Omega\neq 0} > 0.$$

20. Diamond's result is due to the fact that when debt is issued externally there is no displacement of capital domestically, so there is less of a loss in efficiency associated with issuing government debt. Because capital accumulation is not considered in this model, we capture only the negative effect of interest payments flowing abroad.

21. Cumulative changes in inflation-adjusted structural budget deficits as a percent of nominal GNP or GDP between 1981 and 1985 are estimated by the OECD to be as follows: U.S., −3.6%; Japan, 2.4%; Germany, 2.7%; France, 1%; and the United Kingdom, −2.5%. The source of these data is the *OECD Economic Outlook*, issues 38 through 41.

22. The exchange rate adjusted index of manufacturing wholesale prices for the United States relative to other major industrial countries is from the *IMF International Financial Statistics*, series 63ey 110.

23. For instance, the U.S.–German average real interest differential was 7.08% in 1981, 3.30% in 1982, 3.08% in 1983, and 6.98% in 1984. The pattern is similar for the U.S.–U.K. and the U.S.–Japan differential. The U.S.–French differential was quite high in 1981 and 1984 but was also relatively high in 1983.

24. See Blanchard and Summers 1984 for an excellent discussion of the various economic factors contributing to high U.S. and world real interest rates.

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Comment Robert J. Hodrick

The large real appreciation of the dollar during the 1980s is surely one of the most surprising economic events of the decade. How much of the appreciation is attributable to the change in government fiscal policy in the United States? Is there a role for monetary explanations?

There are difficult questions to address because the United States is so large. Analysis of the issues therefore requires some type of two-country model, but these models are notoriously difficult to solve because they are analytically complex. Also, where explicit models have been done, it is often found that the results are not terribly different from the analysis of the small country case. Linda Kole has made some

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progress in understanding these issues with a two-country framework by making a number of simplifying assumptions. Her results are interesting because they are quite different from the results of small country analyses of these issues.

Unfortunately, I find some of the simplifying features of the Kole model to be less desirable than others. In order to set the stage for these criticisms, I want to discuss how the model differs from the results of the small country model developed in Boyer and Hodrick (1982). After this discussion, I explain how a monetary sector could be added to the Kole model, and I conclude by suggesting some features of the real world that ought to be modeled in developing a deeper understanding of the questions posed above.

A Small Country Model

The small country model of Boyer and Hodrick (1982) can be presented in two equations. The first is an expression of money and international capital market equilibrium given by

(1) $$m_t - s_t = -\alpha(r_t^* + \dot{s}_t) + b_t,$$

where m_t is the logarithm of the nominal money supply, s_t is the logarithm of the exchange rate of domestic currency for foreign currency, r_t^* is the foreign nominal interest rate, and b_t is the logarithm of net foreign assets. A dot over a variable indicates its time derivative, and all Greek letters are constant positive parameters. The specification of (1) assumes purchasing power parity with a normalized foreign price level set equal to one, and uncovered interest rate parity with the domestic nominal interest rate equal to the foreign nominal interest rate plus the expected rate of change of the exchange rate. The second equation provides the evolution of the net foreign assets of the country, which reflects a Metzleric savings function with a target real wealth that depends on the disposable income of the country. The specification is

(2) $$\dot{b}_t = \gamma_0 - \gamma_1 g_t - \gamma_2 \mu_t - \beta_1(m_t - s_t) - \beta_2 b_t,$$

where g_t is the logarithm of government expenditure, and μ_t is the rate of growth of the nominal money supply.

The general solution for the exchange rate for arbitrary time paths of the exogenous processes is

(3) $$s_t = \int_t^{\infty} [r_\tau^* + \lambda_1 m_\tau + q_2(\gamma_0 - \gamma_1 g_\tau - \gamma_2 \mu_\tau)] e^{-\lambda_1(\tau - t)} d\tau + q_2 b_t,$$

where λ_1 is the positive root of the system and q_2 is a negative normalized eigenvalue. Expression (3) is particularly convenient for analyzing the initial effects of a change in policy. Since q_2 is negative, the coefficients of current and future government spending and the rate of money growth are both positive. Consequently, an unexpected increase in the profile of government spending depreciates the domestic currency.

For constant values of the government policies and the foreign interest rate a steady state exists. A permanent increase in the level of government spending causes inflation and a decumulation of foreign assets as the new steady state is approached. Agents attempt to smooth their consumption streams in the face of higher taxes to finance the expenditures. This causes a current account deficit and the loss of foreign assets. If the economy has time to prepare for the increase in government spending, there will be foreign asset accumulation accompanying the depreciation of the currency. Agents know that they will be poorer in the long run, and they attempt to save today to offset the decrease in wealth in the future.

How does the Kole analysis differ from these results? Consider her figure 7.2. An unanticipated permanent increase in government spending that is financed by taxes causes a real exchange rate appreciation and a current account deficit. During the transition to the new steady state, the real exchange rate depreciates. Does the nominal exchange rate also appreciate?

To address this question I added a monetary sector to the Kole model. The logarithm of the real exchange rate can be written as

$$x_t = s_t + p_t^* - p_t, \tag{4}$$

where p_t^* is the logarithm of the foreign currency price of the foreign good and p_t is the logarithm of the domestic currency price of the domestic good.[1] Define the logarithms of the domestic and foreign price levels as π and π^*, where

$$\pi_t = (1 - \theta)(s_t + p_t^*) + \theta p_t = s_t + p_t^* - \theta x_t, \text{ and} \tag{5a}$$

$$\pi_t^* = (1 - \theta^*)p_t^* + \theta^*(p_t - s_t) = p_t^* - \theta^* x_t, \tag{5b}$$

where θ and θ^* are the consumption shares of the domestic good in the home and foreign countries. Assume that the money market equilibrium in the home and the foreign countries depends only on the nominal interest rate of the country, as in

$$m_t - \pi_t = -\alpha i_t; \text{ and} \tag{6a}$$

$$m_t^* - \pi_t^* = -\alpha i_t^*. \tag{6b}$$

1. In the Kole model there is no difference between the real exchange rate and the terms of trade. Such distinctions arise when there are nontraded goods and the real exchange rate is defined in terms of price levels of the foreign and domestic countries.

The monetary sector of the model is completed by defining the nominal interest rate in each country to be a weighted average of the real interest rates on the two goods plus the expected rate of change of the price level, as in

(7a) $$i_t = (1 - \theta)r_t^* + \theta r_t + \dot{\pi}_t, \text{ and}$$

(7b) $$i_t^* = (1 - \theta^*)r_t^* + \theta r_t + \dot{\pi}_t^*.$$

Taking the difference of the money market equilibriums in (6) and substituting for the nominal interest differential from (7) and the price level differential from (5) gives

(8) $$(m_t - m_t^*) - [s_t - (\theta - \theta^*)x_t] = -\alpha[\dot{s}_t + (\theta - \theta^*)(r_t - r_t^* - \dot{x}_t)].$$

In (8) the real interest differential is equal to the expected rate of change of the real exchange rate if the assets are perfect substitutes, hence the solution for the nominal exchange rate can be found to be

(9) $$s_t = \int_t^\infty (1/\alpha)[(m_t - m_t^*) + (\theta - \theta^*)x_t]e^{-(1/\alpha)(\tau - t)}d\tau,$$

which indicates that a nominal appreciation coincides with a real appreciation when $\theta > \theta^*$. The decrease in the real exchange rate in response to a balanced budget increase in government spending found above translates into a permanent appreciation of the domestic currency, even in nominal terms.

Kole also analyzes the general case in which assets are not perfect substitutes. In this case the level of net foreign assets also enters the determination of the nominal exchange rate, as would be true if expenditures were included in the money market equilibriums in (6). Since this variable is predetermined, the prediction of an initial nominal appreciation still holds, but the fall in net foreign assets along the approach to the new equilibrium opens up the possibility that the domestic currency may depreciate in the new steady state.

At a casual empirical level, Kole's model seems to capture the major features of the current real appreciation of the dollar. Massive federal budget deficits have been accompanied by a real appreciation and a large current account deficit. But can a nonstochastic model really match the stylized facts?

Mussa (1985) documents that real exchange rates have been near random walks under flexible exchange rates. If the real exchange rate were a random walk, its expected rate of change would be zero, and the expected rate of change of the nominal exchange rate would be the expected inflation differential. Cumby and Obstfeld (1984) investigate this latter proposition empirically and find strong evidence against it.

The hypothesis really makes little sense economically since it implies that one country's output can become infinitely valuable in terms of the other country's output. The point is that we really have very little experience with the flexible rate regimes, and the near random walk nature may reflect more about price stickiness that is absent from the Kole model and those discussed above, than it does about underlying dynamic processes.

Another feature of the world that is missing from the Kole model is investment in physical assets. It is hard to explain the strong performance of the U.S. economy in recent years, in spite of high real interest rates, without some discussion of good investment possibilities and changes in the tax treatment of depreciation. Making the real output of the economy endogenous raises the issue of tractability of the model, but it would be much more interesting if there were international business cycles and growth.

Finally, I would be negligent in my duty as a discussant if I did not raise the issue of Ricardian equivalence. Much more work must be done in order to determine the extent to which future taxes are reflected in the current behavior of the agents in the economy. Outstanding quantities of government bonds are almost surely not fully regarded as wealth by the population as they are in the Kole model. Yet what fraction of the bonds is considered wealth? This is certainly an area where much interesting work remains.

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Comment Alessandro Penati

A stylized result of open economy macromodels is that an expansionary fiscal policy causes an instantaneous appreciation of the real exchange rate, which is then followed by a steady real depreciation

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and a current account deficit. The predictions of these models, however, seem at variance with the U.S. experience between 1981 and 1985, when a sharp initial real appreciation of the dollar was followed by further appreciations. Can standard portfolio models account for the recent dynamics of the dollar real exchange rate? Linda Kole's analysis shows that the answer is yes, provided that a two-country model is used instead of the more common small open economy framework.

The particular model utilized to study the impact of fiscal shocks on the real exchange rate is a two-country extension of the portfolio model developed by Sachs and Wyplosz (1984). In the model, the demand for real cash balances is always constant, given that it depends only on full employment output. The increase in real interest rates following the fiscal expansion is thus determined by the desired proportion between domestic and foreign bonds and by the crowding out of private domestic absorption, which is equal to consumption in the model. I have some queries about the specification of the consumption function that plays a key role in the transmission of fiscal shocks to the real exchange rate. Consumption is assumed to be linear in income, wealth, and the real rate of interest: income appears because of the liquidity constraints faced by consumers, while a constant relative risk-aversion utility function is all that is needed to include wealth and the real interest rate (Merton 1971). With this utility function, however, these two last variables would be highly nonlinear in the consumption function. The function's linearization around steady state values would make it difficult to carry out comparative static exercises between steady states. In addition, the coefficient of wealth is set equal to the rate of time preference in the numerical simulations, a condition that would result from a logarithmic utility function. In such a case, however, the real interest rate would drop out of the consumption function. Finally, the numerical value chosen for the coefficient of the real interest rate, .8, equal to that of disposable income, seems to me unreasonably high in view of the available empirical evidence.

The model is used to investigate the trajectory of the real exchange rate when one country adopts an expansionary fiscal policy. Several cases are considered: a balanced budget and a debt-financed fiscal expansion, an anticipated and an unanticipated expansion, perfect and imperfect substitution between domestic and foreign bonds, zero and large holdings of foreign currency denominated bonds, and fast-growing and slow-growing government debt—perhaps too many cases, as a reader may forget the main objective of the analysis in a myriad of phase diagrams and simulations.

One may recall that the purpose of the study is to find the conditions under which a fiscal expansion causes a steady appreciation of exchange rate determination in portfolio models. The key element turns out to be the wealth effect of the capital gains and losses due to exchange rate movements. Panel 'a' in figure 7.3 illustrates this point well. In the model represented by that figure, domestic residents hold a large fraction of their wealth in the form of foreign bonds, while foreigners hold only bonds denominated in their currencies. A domestic balanced budget fiscal expansion increases the real interest rate to crowd out domestic demand and appreciates the real exchange rate to crowd out foreign demand; the appreciation, in turn, reduces domestic wealth by imposing capital losses on domestic investors. If the wealth effect of capital losses outweighs the relative price effect due to the increase in the real interest rate, there will be an excess demand for foreign bonds immediately after the fiscal expansion so that an expected appreciation will be needed to achieve bond market equilibrium. With perfect foresight, the real rate will actually appreciate in the transition to the new steady state, along with the desired accumulation of net foreign assets that originates from a stable current account surplus.

Theoretically, therefore, a fiscal expansion can result in a steady appreciation of the real exchange rate in portfolio models. I do not think, however, that the model can help us to understand the recent U.S. experience. On empirical grounds, the wealth effect of exchange rate capital gains and losses must be minimal given the industrial countries' propensity to invest the vast majority of their wealth within national boundaries (Penati and Dooley 1984). On theoretical grounds, stability conditions in portfolio models generally impose that appreciations be accompanied by a current account surplus in the transition to the steady state. Indeed, portfolio models owe part of their popularity to this characteristic, which can account for the steady appreciations experienced by the surplus countries in the second half of the seventies. In the recent case of the dollar, however, the puzzle is precisely the opposite; namely, why did the dollar appreciate in real terms for five consecutive years when the U.S. current account was increasingly moving into deficit? I doubt that the solution to this puzzle can be found in traditional portfolio models.

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