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Chapter Author: Maurice Obstfeld

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6 Capital Flows, the Current Account, and the Real Exchange Rate: Some Consequences of Stabilization and Liberalization

Maurice Obstfeld

6.1 Introduction

This paper develops a dynamic model of inflation and external capital flows that incorporates some key macroeconomic features of the more advanced industrializing economies. Although the model is quite general, it is motivated by recent events in the Southern Cone of Latin America, where wide-ranging economic reforms initiated in the 1970s produced dramatic—and ultimately unsustainable—movements in external accounts and real exchange rates. As observed by Díaz-Alejandro (1981), the measures undertaken in Argentina, Chile, and Uruguay coincided initially with steep increases in the prices of nontraded goods relative to tradables, with weak current-account balances and with massive foreign reserve accumulation. A goal of this study is to analyze the channels through which policy initiatives of the type undertaken in the Southern Cone influence the economy's long-run position and its transitional behavior.[1]

On the price side the economy studied here is characterized by a crawling-peg exchange rate regime and sluggish nominal wages that adjust to labor market disequilibrium and inflation expectations. Nontradable goods use imports as intermediate production inputs, and so there is an immediate pass-through of exchange rate changes to domestic goods prices. On the asset side there may be restrictions on private capital-account transactions, but the model encompasses both

Maurice Obstfeld is a professor of economics at the University of Pennsylvania and a research associate of the National Bureau of Economic Research.

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polar cases—free capital mobility and complete capital immobility—within a single framework.[2] This facilitates study of the macroeconomic effects of capital-account liberalization. Under capital mobility the model traces the dynamic path of the real exchange rate (the price of tradables in terms of nontradables) and the economy's net external assets. Similar paths are traced for cases in which private capital is immobile, but the economy's external assets are then owned entirely by the public sector.[3]

The plan of the paper is as follows. Section 6.2 sets out the basic structure of the model. The real exchange rate occupies a central position, for its level affects both production and consumption decisions while its time path influences the real domestic interest rate.

Section 6.3 works out the model's dynamics under perfect foresight.[4] Asymptotically, the economy approaches a long-run equilibrium characterized by simultaneous internal and external balance. The nature of the path leading there depends, however, on whether a rise in the relative price of tradables improves or worsens the current account. The dynamics of the economy will not generally display the monotonic relationship between external assets and the real exchange rate characterizing the transition paths of most flexible-price, portfolio-balance models. In particular, the approach to long-run equilibrium may be oscillatory.

Liberalization of the capital account is taken up in section 6.4. The key result of this section concerns the short-term effect of liberalization on the real exchange rate. When the prereform domestic interest rate exceeds the depreciation-adjusted world rate, the removal of impediments to private capital movement causes an initial period of real appreciation. A current-account deficit emerges upon removing those impediments, but boom turns into slump as the economy converges to a steady state in which the level of external claims is lower than it was before liberalization. In the long run there is a real depreciation, an example of a more general principle that is also established in section 6.4: Any disturbance that leads to a long-run decline in external assets must also depreciate the long-run real exchange rate (assuming that the domestic capital stock is held constant). A similar result has been noted in other contexts by Bruno (1976) and Obstfeld (1985).

Section 6.5 studies the effects of devaluation and disinflation, with the latter defined as a permanent, credible lowering of the rate of currency depreciation. Devaluation is nonneutral in the long run, leading to an eventual rise in external claims and a long-run real appreciation. In the short run devaluation may occasion a current-account deficit or a domestic contraction, however. When capital is immobile disinflation has effects that are the opposite of those realized under a capital-account liberalization: an initial real depreciation and slump, followed by a long-run real appreciation and increase in net foreign assets. But in the model set out below, a change in the crawl rate is neutral when capital is fully mobile, even though the price of nontraded goods is temporarily fixed. The section concludes by considering possible sources of nonneutrality suggested in the literature.

Section 6.6 summarizes the main results and briefly discusses some limitations of the analysis in the light of actual events in the Southern Cone. An appendix contains technical details concerning the model's dynamics.

6.2 A General Model

This section describes a small, open economy characterized by a crawling-peg exchange rate regime and short-run inflexibility of nominal wages. Two goods are produced: a composite tradable priced exogenously in the world market, and a nontradable good whose price reflects the cost of domestic labor and imported intermediates. The response of the real wage to labor market pressure provides a first component of the economy's intrinsic dynamics. A second source is private saving, which drives the stock of net foreign assets to its long-run level. Detailed discussion of the economy's dynamic behavior is deferred until section 6.3. Here, I merely set out the structure of the economy.

Under a crawling peg the exchange rate follows a path determined by the central bank. To maintain the announced exchange rate when there is free capital mobility, the bank must accommodate any shift in domestic money demand through foreign exchange intervention. When capital controls are in place, however, residents may not purchase foreign currency assets and exporters must sell to the monetary authority any foreign exchange earned. To peg the exchange rate under private capital immobility, therefore, the central bank need intervene only to cover any trade imbalance.

It is not necessary to specify the degree of capital mobility in this section. The model's generality in this respect will prove useful when the liberalization of the capital account is studied in section 6.4 below.

6.2.1 Goods Prices and Production

On the production side the country examined here is a variant of the dependent economy studied by Salter (1959) and many subsequent writers. Let E denote the exchange rate (the domestic money price of foreign money) and P^{T*} the foreign currency price of the composite tradable good. Under the small-country assumption P^{T*} is parametric; arbitrage guarantees that in the absence of trade impediments and transport costs, the corresponding domestic money price of tradables is given by:

$$P^T = EP^{T*}. \tag{1}$$

A useful generalization of this framework would differentiate between imports and exports and allow for commercial restrictions that separate domestic from world prices. That generalization is forgone here in order to focus on the effects of financial policies. The normalization $P^{T*} = 1$ is adopted, so that $P^T = E$ according to equation (1).

Tradable commodities are produced using capital and labor. Capital operates only in the tradable sector, but labor is free to move between both sectors of the economy. If W denotes the resulting economywide nominal wage, the supply function for tradables is:

$$y^T = y^T(P^T/W), \qquad y^{T\prime} > 0. \tag{2}$$

The derived demand for labor, also increasing in its argument, is denoted:

$$n^T = n^T(P^T/W). \tag{3}$$

Output in the nontradables sector is produced using labor (n^H) and imported intermediate materials (m^H) according to a fixed-coefficients technology. The production function for these domestic goods is:

$$y^H = \min\{n^H, am^H\}, \tag{4}$$

where intermediate imports are indistinguishable from final tradables. The parameter $1/a$ is the amount of the intermediate material that must be combined with a unit of labor to produce a unit of the domestic good. Constant returns to scale prevail in the nontradables sector according to equation (4), so that output y^H is demand determined. Factor demands are given by:

$$n^H = y^H, \qquad m^H = y^H/a. \tag{5}$$

In equilibrium the price of domestic goods is given by the zero-profit condition:

$$P^H = W + (P^T/a) = W + (E/a). \tag{6}$$

6.2.2 Asset Markets

Residents hold in their portfolios domestic high-powered money, M; domestic bonds paying an interest rate R; and (when private capital mobility is permitted) foreign bonds, B^*, having a face value fixed in foreign currency terms and paying the world interest rate R^*. The domestic banking system is not explicitly modeled here. In addition to base money and bonds, there is an exogenous nonmarketable component of domestic wealth that can include, for example, titles to capital operating in the tradables sector. This exogenous component of wealth has a fixed, strictly positive value, k, in terms of tradables (that is, in terms of foreign currency); the determination of k is outside the scope of the model. Under a regime of capital controls, B^* is taken to be equal to zero.[5]

Foreigners do not participate in the domestic bond market. Under free capital mobility, $R = R^* + DE/E$, where D is the time-derivative operator and perfect foresight is assumed. In words, domestic and foreign bonds are assumed to be perfect substitutes, so that interest parity holds when capital is mobile. When capital controls are in place the domestic credit market is essentially a curb market and R generally differs from the depreciation-adjusted world rate (see Bruno 1979; McKinnon and Mathieson 1981; van Wijnbergen 1983b).

Foreigners do not hold domestic money. Because it is assumed that there is no outside domestic government debt, aggregate domestic nominal assets, A, are given by:

$$A = M + EB^* + Ek. \tag{7}$$

The money market equilibrium condition is:

$$M = L(R)A, \qquad L' < 0. \tag{8}$$

Under capital immobility M is a predetermined variable that changes only as a result of current-account imbalances and domestic credit creation by the central bank. (The current account, of course, equals the balance of payments when there is no private international borrowing or lending.) As equation (8) shows, continuous asset market equilibrium is in this case maintained through adjustments in the domestic nominal interest rate, R.

Under capital mobility, however, the domestic interest rate is the sum of the exogenous world interest rate, R^*, and the policy-determined devaluation rate, DE/E. The money stock is now the jumping variable that adjusts instantaneously to preserve asset market equilibrium: for a given rate of currency depreciation, the central bank can peg the level of the exchange rate only if it automatically supplies to the public the money stock dictated by the right-hand side of equation (8). A is predetermined in the model whether capital is immobile or mobile.

6.2.3 Consumers

Let z denote the level of private domestic expenditure measured in nontraded or domestic goods. Define the real exchange rate, q, by:

$$q = E/P^H. \tag{9}$$

By equation (6), the real exchange rate must be smaller than the technological coefficient a in equilibrium if W and P^H are always positive, or in symbols:

$$q < a.$$

A fraction $\sigma(q)$ of expenditure z falls on tradables, where σ is a decreasing function of q. Final consumption of tradables may therefore be written:

$$c^T(q, z) = \sigma(q)z/q, \qquad \sigma' < 0; \tag{10}$$

and the demand for nontradables takes the form:

$$c^H(q, z) = [1 - \sigma(q)]z. \tag{11}$$

Let γ be the average share of tradables in the overall consumer price index. (γ can be thought of as a long-run average value of σ [q].) The expected local inflation rate under perfect foresight is then γ (DE/E) + $(1 - \gamma)$ (DP^H/P^H). (The derivatives are right-hand derivatives, as always.) Private absorption, z, is a function of real domestic wealth and the real interest rate, such that:

$$z = z[A/E^{\gamma}(P^H)^{1-\gamma}, R - \gamma(DE/E) - (1 - \gamma)(DP^H/P^H)]. \tag{12}$$

As usual, an increase in real assets stimulates absorption, while an increase in the real interest rate depresses it. In symbols, $z_1 > 0$ and $z_2 < 0$. (f_i denotes the partial derivative $\partial f[x_1, \ldots, x_s]/\partial x_i$.)

6.2.4 The Labor Market and Price Adjustment

The nominal wage is taken to be a predetermined, or nonjumping, variable that can adjust only gradually. The determinants of nominal wage inflation are excess labor demand and expected consumer price inflation, as in Obstfeld (1982).

Let n_0 denote the "natural" level of aggregate employment, which is assumed to be constant. If perfect foresight is assumed, the wage evolves according to:

$$DW/W = \phi(n^T + n^H - n_0) + \gamma(DE/E) + (1 - \gamma)(DP^H/P^H). \tag{13}$$

From equation (6), the wage and the domestic goods price are related by $W = P^H - (E/a)$. Equation (13) may therefore be manipulated to yield:

$$DP^H/P^H = \pi(q)(n^T + n^H - n_0) + DE/E, \tag{14}$$

where

$$\pi(q) = \phi/[a/(a - q) - (1 - \gamma)] > 0. \tag{15}$$

Equations (14) and (15) show how currency depreciation and excess labor demand govern price inflation in the nontradables sector.

6.2.5 The Monetary and Fiscal Authorities

It is convenient to consolidate the budget constraints of the monetary and fiscal authorities. All domestic liabilities of the central bank take the form of high-powered money. On the asset side the bank holds domestic credit, C, and foreign bonds, whose foreign currency value is denoted F^*. The balance-sheet identity of the central bank is:

$$(16) \qquad M_t = C_t + E_t F_t^* - \int_{-\infty}^{t} DE_s F_s^* ds.$$

The last term on the right-hand side of equation (16) is the sum of past capital gains on official reserves, which inflate the domestic money value of bank assets without increasing monetary liabilities. As will be seen below in section 6.5, equation (16), which corrects for smooth movements in E, can easily be modified to take account of capital gains resulting from discrete major devaluations.

The fiscal authority levies personal taxes to help finance its consumption of tradables (g^T) and nontradables (g^H). An additional source of revenue is the interest earned on the central bank's reserves, equal to ER^*F^* in terms of domestic money. Any fiscal deficit is financed through domestic credit creation (the government issues no interest-bearing debt). Let T denote nominal taxes and G, nominal government consumption (equal to $Eg^T + P^H g^H$). The monetized deficit is then given by:

$$(17) \qquad DC = G - ER^*F^* - T.$$

The rate of domestic credit creation implied by equation (17) may exceed or fall short of the rate at which domestic money demand increases (the time derivative of the right-hand side of equation [8]). Let M^d denote nominal money demand. According to equation (16), continuous money market equilibrium then requires that:

$$(18) \qquad EDF^* = DM^d - DC.$$

Domestic credit growth in excess of money demand growth leads to a balance-of-payments deficit, so that part of the fiscal deficit is effectively financed through central bank borrowing abroad. After substituting equation (18) into equation (17), integrating forward, and applying the appropriate transversality condition, one obtains the intertemporal budget constraint of the public sector:

$$(19)\quad \int_t^\infty [g_s^T + (g_s^H/q_s)]e^{-R^*(s-t)}ds \leq F_t^* + \int_t^\infty [(T_s/E_s) + (DM_s^d/E_s)]e^{-R^*(s-t)}ds.$$

Constraint (19) limits the present foreign exchange value of government consumption to that of government revenue from taxes and seigniorage, plus initial foreign reserves. Seigniorage revenue is in turn limited by the public's willingness to add to its nominal balances.

It is assumed that the central bank follows the domestic credit rule:

$$(20)\quad DC = (DE/E)M$$

to avoid protracted payments imbalances. To ensure that credit creation covers the government's cash-flow needs when equation (20) is followed, the government adjusts taxes, T, endogenously according to:

$$(21)\quad T = G - ER^*F^* - (DE/E)M.$$

It can be shown that under the foregoing assumptions, constraint (19) will necessarily hold as an equality, provided the economy is dynamically stable (see Obstfeld 1985).

6.3 Dynamics of the Model

It is now time to pursue the dynamic implications of the structure described in section 6.2. To do so, I reduce the model to a system of two differential equations: one for the real exchange rate, q, and one for the net external asset stock of the economy as a whole, $K^* = F^* + B^*$. Because the nation's foreign assets are given by the history of the current account, K^* is a predetermined variable. Because the nominal wage is predetermined and the exchange rate is pegged, the zero-profit condition of equation (6) implies that q is predetermined as well.

Equation (14) gives the time derivative of q:

$$(22)\quad Dq/q = -\pi(q)(n^T + n^H - n_0).$$

Equations (3), (6), and (9) imply that:

$$(23)\quad n^T = n^T(q), \qquad n^{T\prime} > 0.$$

The equilibrium condition for the domestic goods market is:

$$(24)\quad y^H = c^H(q, z) + g^H.$$

By equation (5), labor demand in the nontradables sector, n^H, is equal to $c^H + g^H$.

To complete the derivation of the dynamic law for q, I must also show that absorption, z, can be expressed in terms of q and K^*. The definition of the real exchange rate, q, allows an expression of the real interest rate as:

$$R - (DE/E) + (1 - \gamma)(Dq/q).$$

A rise in the expected rate of real depreciation, all else equal, implies a rise in the real interest rate. Equation (7) can be used to write (12) as:

$$(25) \quad z = z\{q^{1-\gamma}[(M/E) + B^* + k], R - (DE/E) + (1 - \gamma)(Dq/q)\}.$$

Next, note that $D(M/E) = DM/E - (DE/E)(M/E) = DF^*$ (by equations (16) and (20)), and so $(M/E) = F^* + \chi$, where χ is a constant that can be calculated from equation (16).[6] Finally, equation (8) can be solved for the equilibrium domestic interest rate, such that:

$$(26) \qquad R = R(K^* + \chi), R' \leq 0.$$

Under perfect capital mobility, $R(K^* + \chi) = R^* + (DE/E)$, and so $R' = 0$. But when private capital is immobile, $K^* = F^*$ and $R' < 0$. In the latter case a rise in K^* is simply a rise in international reserves that increases domestic liquidity, depressing the local rate of interest.

The foregoing observations lead to the equation:

$$(27) \quad z = z[q^{1-\gamma}(K^* + \chi + k), R(K^* + \chi) - (DE/E) + (1 - \gamma)(Dq/q)].$$

With the aid of equations (11), (23), and (27), equation (22) may now be written:

$$(28) \quad Dq/q = -\pi(q)\{n^T(q) + [1 - \sigma(q)]z[q^{1-\gamma}(K^* + \chi + k), R(K^* + \chi) - (DE/E) + (1 - \gamma)(Dq/q)] + g^H - n_0\}.$$

From this equation, one can obtain the reduced-form law of motion:

$$(29) \qquad Dq/q = \Gamma(q, K^*).$$

It is assumed that:

$$(30) \qquad \Gamma_1 < 0, \qquad \Gamma_2 < 0.$$

Thus, a rise in q raises the demand for labor in both the tradable and the domestic goods sectors, leading in turn to an increasing real wage and, through equation (6), a falling (that is, appreciating) real exchange rate. Similarly, a rise in K^*, by stimulating the demand for nontradables, leads to excess labor demand in the domestic goods sector and, again, an appreciating real exchange rate.[7] The appendix spells out the mathematical conditions under which the inequalities in (30) hold. One condition worth mentioning here is that overall wealth, $K^* + \chi + k$, be positive. This is assumed from now on, although it is stronger than necessary for (30).

Let us now turn to the dynamic equation for K^*. The growth of nominal private assets equals private saving out of disposable income, and so by equation (7):

$$(31) \qquad \begin{aligned} DA &= DM + DE(B^* + k) + EDB^* \\ &= Ey^T + P^H y^H + ER^* B^* + DE(B^* + k) - T \\ &\quad - Ec^T - P^H c^H - Em^H. \end{aligned}$$

Equation (23) implies that y^T can be written as an increasing function of the real exchange rate, q. After the use of equations (5), (10), (11), (16), (20), (21), (24), (27), and (29), equation (31) therefore becomes:

$$(32) \qquad \begin{aligned} DK^* &= y^T(q) + R^* K^* - g^T \\ &\quad - \sigma(q) z[q^{1-\gamma}(K^* + \chi + k), R(K^* + \chi) \\ &\quad - (DE/E) + (1 - \gamma)\Gamma(q, K^*)]/q \\ &\quad - (1/a)\{[1 - \sigma(q)] z[q^{1-\gamma}(K^* + \chi + k), R(K^* + \chi) \\ &\quad - (DE/E) + (1 - \gamma)\Gamma(q, K^*)] + g^H\} \\ &= \Omega(q, K^*). \end{aligned}$$

Equation (32) displays the current-account balance as the difference between the national production of tradables (including services) and the national absorption of tradables. The relative-price effect of a real depreciation tends to improve the current account by increasing the output of traded goods and by discouraging their consumption. But by shifting demand toward nontradables, a rise in q leads directly to increased imports of intermediate materials. The overall relative-price effect is summarized by the Marshall-Lerner condition for the model, which states that with absorption held constant, a real depreciation has a positive effect on the current account, given by:

$$(33) \qquad y^{T\prime} - \{[1 - (q/a)]\sigma' - (\sigma/q)\}(z/q) > 0.$$

Inequality (33) must hold in equilibrium because q can never exceed a (see the discussion following equation (9) above). But although the expenditure-switching effect of a real depreciation is always positive, it is weakened by the need for imported intermediates in the domestic goods sector.

The absorption effects of a rise in q do tend to worsen the current account: a real depreciation raises the real value of private wealth (under my assumptions) and lowers the expected real interest rate, thereby raising expenditure z. It follows that the sign of Ω_1 is indeterminate. The same is true of the sign of Ω_2, but there are sound theoretical reasons for assuming that a rise in net foreign assets, K^*, causes the current account to deteriorate. Accordingly:

(34) $$\Omega_1 \lesseqgtr 0, \qquad \Omega_2 < 0.$$

Again, the appendix discusses the precise mathematical conditions underlying the inequalities in (34).

Figures 6.1 and 6.2 show the two possible stable configurations of the dynamic system consisting of equations (29) and (32). The long-run or steady-state levels of the real exchange rate and net foreign asset stock are denoted q_∞ and K^*_∞, respectively. (The existence and uniqueness of these two are assumed.) In the first of these diagrams (corresponding to the case $\Omega_1 > 0$) the economy cycles during its approach to long-run equilibrium. In the second (corresponding to the case $\Omega_1 < 0$) the economy's transition path is either monotonic or a half-cycle. An interesting feature of the dynamics is the possibility that a depreciating (appreciating) real exchange rate will accompany a current-account surplus (deficit) along portions of the transition path. This conjuncture is not typical of flexible-price, portfolio-balance models (for example, Calvo and Rodriguez 1977).

Because $\Gamma_1 < 0$ and $\Omega_2 < 0$, the stability condition for the system's linear approximation near (q_∞, K^*_∞) is:

(35) $$\Gamma_1\Omega_2 - \Gamma_2\Omega_1 > 0,$$

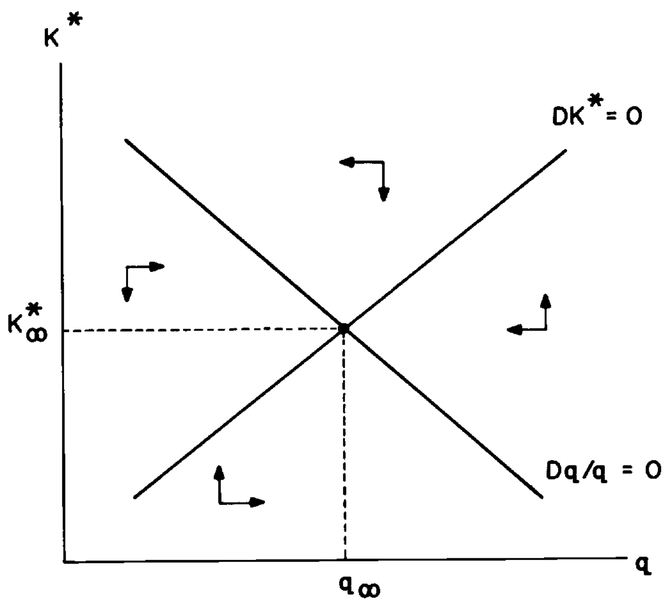

Fig. 6.1 Adjustment to the steady state ($\Omega_1 > 0$).

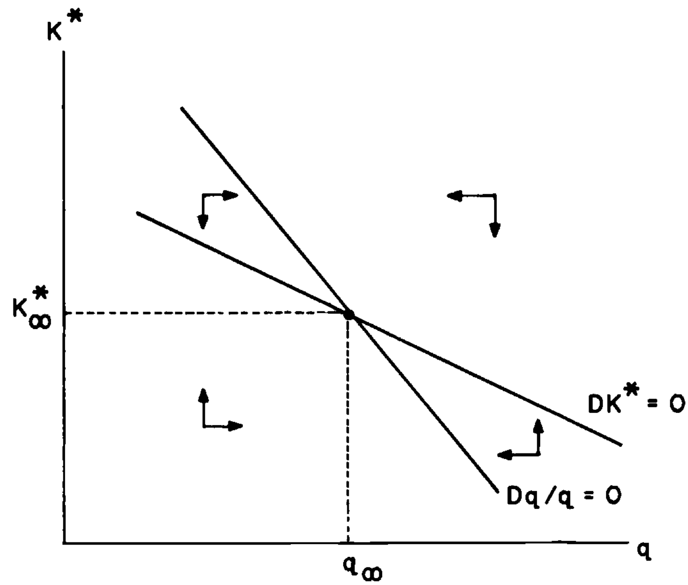

Fig. 6.2 Adjustment to the steady state ($\Omega_1 < 0$).

where all functions are henceforth evaluated at long-run equilibrium. From expressions derived in the appendix, stability condition (35) is equivalent to:

$$(36)\quad \begin{aligned} 0 < {} & -R^*[n^{T'} - \sigma' z + (1 - \sigma)(1 - \gamma)q^{-\gamma}z_1(K^* + \chi + k)] \\ & + (q^{1-\gamma}z_1 + z_2R')\{(n^{T'} - \sigma' z)[(\sigma/q) + (1 - \sigma)/a] \\ & + (1 - \sigma)[y^{T'} - \{[(1 - (q/a)]\sigma' - (\sigma/q)\}(z/q)]\}. \end{aligned}$$

The stability of the system does not require that Ω_2 be negative, as is assumed in equation (34). When $\Omega_2 > 0$, equation (35) holds, and the trace condition $q\Gamma_1 + \Omega_2 < 0$ is satisfied, the model has a stable configuration in which the $Dq/q = 0$ and $DK^* = 0$ loci have negative slopes but (contrary to figure 6.2) the slope of the latter is greater in absolute value than the slope of the former. In the interest of conserving space, this possibility is pursued no further.

Although the dynamic behavior of the economy appears qualitatively unaffected by the degree of capital mobility, the interpretation of the model and any predictions based on it hinge on the regime one assumes.[8] When there are no private capital movements, $B^* = 0$ and K^* coincides with the central bank's reserve stock, F^*. In this case all net external lending takes the form of reserve movements, so that the current-account equation (32) can be interpreted as describing either the balance of payments or the evolution of domestic money holdings measured in tradables. Under capital mobility, however, $K^* = B^* + F^*$, where $B^* + F^*$ equals the consolidated external assets of the private and public sectors. Equation (32) again describes the current account, but it no longer applies to the balance of payments. Even though K^* is predetermined, its components B^* and F^* are not when private capital is mobile. Private portfolio shifts will force foreign exchange intervention by the central bank that is recorded in the balance of payments. That intervention redistributes the ownership of K^* between the private sector and the central bank, but it cannot cause an instantaneous jump in the economy's overall external claims.

6.4 Liberalization of the Capital Account

The first policy action considered is the liberalization of the capital account.[9] Initially, there is no trade in private external assets, and the domestic interest rate is a function of the predetermined money supply. Liberalization takes the form of a complete removal of barriers to financial capital movements. The economy is assumed to be at its long-run equilibrium when the liberalization takes place.

The effect of the liberalization depends on the relationship between the interest rate prevailing before the liberalization and the depreciation-adjusted world rate. It is most natural to assume that the domestic interest rate exceeds $R^* + (DE/E)$ prior to the reform, so that there is a fall in the cost of credit when the reform goes into effect.[10] The initial and long-run effects of the policy change can be visualized with the aid of figures 6.3 and 6.4.

The fall in the domestic interest rate raises absorption for every level of q and K^*. Accordingly, the $Dq = 0$ and $DK^* = 0$ schedules shift downward: for a given real exchange rate, a lower level of wealth is now required for both internal balance (labor market equilibrium) and external balance (current-account equilibrium).[11] The real exchange rate begins to appreciate in the face of excess domestic demand, and a current-account deficit emerges. As wealth and expenditure subsequently fall, the real appreciation ceases and is reversed. The underemployment that appears at this point is gradually eliminated (perhaps with oscillations) as the economy approaches its new long-run equilibrium. What is most noteworthy here is that in spite of its eventually deflationary effects, liberalization of the capital account may cause the economy to undergo a protracted initial phase of currency overvaluation.

On the asset side the fall in the domestic interest rate raises money demand. The private sector reaches portfolio equilibrium by borrowing foreign exchange from abroad and selling it for domestic money. Because the central bank must purchase this foreign exchange to hold the exchange rate fixed, private borrowing leads to an instantaneous rise in the aggregate money supply. The financial capital inflow results in

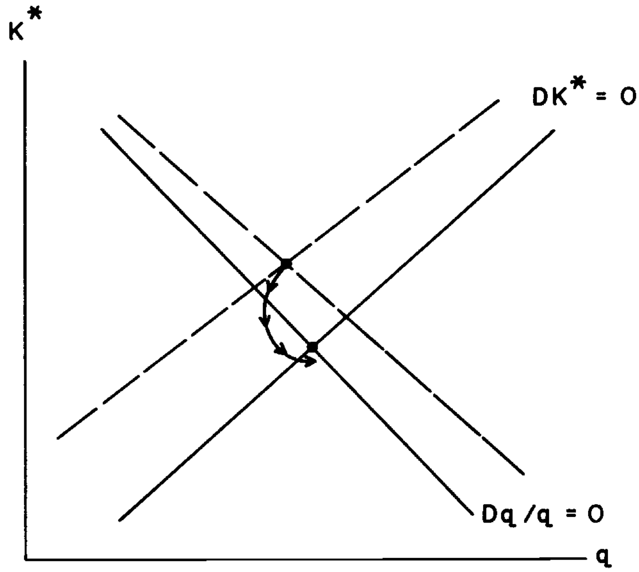

Fig. 6.3 Capital-account liberalization ($\Omega_1 > 0$).

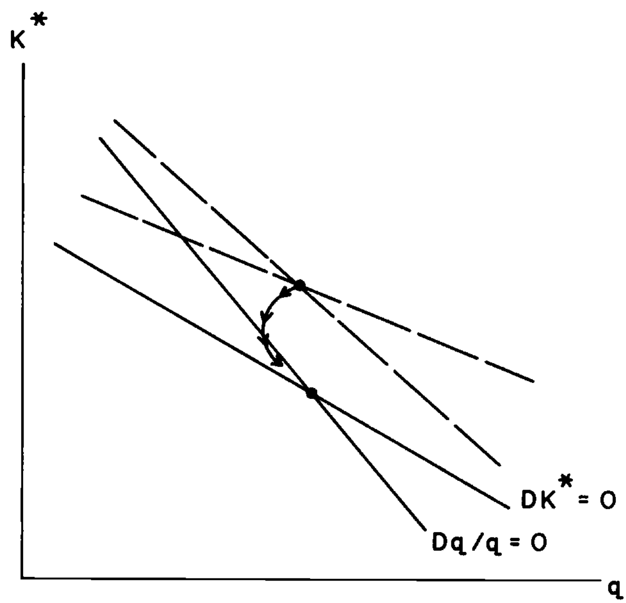

Fig. 6.4 Capital-account liberalization ($\Omega_1 < 0$).

a transfer of external claims from the private sector (which becomes indebted to foreigners) to the central bank (which enjoys an offsetting increase in reserves). K^*, however, cannot jump upon the institution of the reform. As external assets begin to fall in the wake of the liberalization, the balance of payments swings into deficit.

The model suggests that in Argentina, Chile, and Uruguay, the easing of capital controls in the 1970s may have contributed to the real appreciations, external deficits, and capital inflows that accompanied the economic reform programs in those countries. Capital-account liberalization is likely to serve as only part of the explanation, however. In Chile, for example, the beginning of real appreciation certainly predated the relaxation of external financial restrictions (see Edwards 1985).

Figures 6.3 and 6.4 suggest two results that have not yet been demonstrated. First, they suggest that the long-run external debt necessarily increases, a result that is obvious only in the case $\Omega_t > 0$ shown in figure 6.3. Second, they imply that liberalization necessarily entails a long-run depreciation (in contrast to the real appreciation that clearly emerges in the short run). It is an implication of the system's stability (as will be shown later) that the long-run external asset stock declines. On the assumption that it does, I will now argue that the real exchange rate, q, must rise in the long run. The argument made is of independent interest in that it establishes a rather general proposition: Provided the domestic capital stock does not change, *any* disturbance that causes a decline in steady-state external claims must also cause a rise in the steady-state real exchange rate.

For a given long-run foreign asset stock, figure 6.5 shows the determination of long-run absorption, z, and the long-run relative price of tradables, q. The II, or internal balance, schedule in the figure shows combinations of q and z that clear the labor market (that is, that satisfy (28) with $Dq = 0$). The slope of the schedule is given by:

$$(37) \qquad (dz/dq)|_{II} = -(n^{T\prime} - \sigma' z)/(1 - \sigma) < 0.$$

Points above II are associated with an excess demand for labor. The XX, or external balance, schedule shows q-z combinations consistent with a zero current account for a fixed value of K^*. Its slope is:

$$(38) \qquad (dz/dq)|_{XX} = [\![y^{T\prime} - \{[1 - (q/a)]\sigma' - (\sigma/q)\}(z/q)]\!]/[(\sigma/q) + (1 - \sigma)/a] > 0.$$

Points above XX are characterized by external deficits, and XX shifts upward along an unchanging II schedule as K^* rises. Point A, at the intersection of the two schedules, is the sole point consistent with both internal and external balance.

Under the maintained assumption that K^* falls in the long run as a result of liberalization, suppose that long-run absorption returns to its

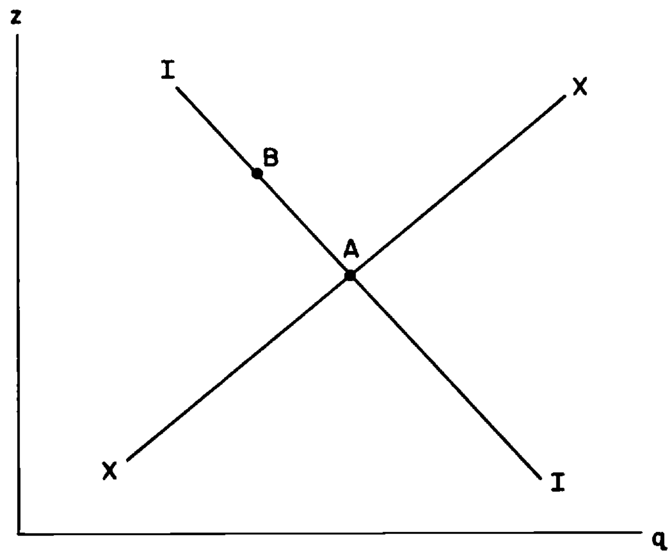

Fig. 6.5 Absorption and the real exchange rate in the long run.

prereform level. Internal balance would then require that long-run q also be at its prereform level, q_{∞}. But with K^{*} (and, hence, national income) lower, such a position, shown as point B in figure 6.5, would not be consistent with external balance; in fact, there would be a deficit. To restore full equilibrium with a lower steady-state external asset stock, z must fall and q must rise from q_{∞}. This downward movement along II brings the economy to point A. It follows that if the external debt rises in the long run, the real exchange rate, after falling in the short run, must ultimately rise above its initial level.

It remains to establish that the stock of foreign claims does indeed fall in the long run. Direct calculation shows that long-run foreign assets move in the same direction as the sign of the expression:

$$(39) \quad z_2[\![(n^{T\prime} - \sigma' z)[(\sigma/q) + (1 - \sigma)/a] + (1 - \sigma)[y^{T\prime} - \{[1 - (q/a)]\sigma' - (\sigma/q)\}(z/q)]]\!]/(\Gamma_1\Omega_2 - \Gamma_2\Omega_1).$$

Because $z_2 < 0$, stability condition (35) implies that expression (39) is negative.

6.5 Devaluation and Disinflation

This section discusses the effects of abrupt changes in both the level and the rate of change of the exchange rate. An unanticipated discrete devaluation may or may not occasion an initial contraction, but in the long run it appreciates the real exchange rate and increases the foreign asset stock. Disinflation, defined here as a permanent, unanticipated reduction in the rate of currency depreciation, is neutral under perfect capital mobility and rational expectations, price rigidities notwithstanding. But when private capital movements are prohibited, a fall in DE/E causes an initial slump followed by a cumulative balance-of-payments surplus and an eventual real appreciation.

6.5.1 Devaluation

The effects of a sharp rise in E are illustrated in figures 6.6 and 6.7. The monetary authority is assumed to deviate from rule (20) when it devalues, failing to match the exchange rate increase with a compensating increase in domestic credit. Devaluation therefore affects the economy in part by decreasing the foreign exchange value of assets denominated in domestic currency—here, the high-powered money stock. The private sector capital loss, in turn, reduces absorption. In the model this effect takes the form of a change in the relationship linking foreign reserves and the exchange rate–deflated money stock M/E.

Prior to devaluation, $M/E = F^* + \chi$, where, by equation (16):

$$\chi = (1/E_t)(C_t - \int_{-\infty}^{t} DE_s F_s^* ds). \tag{40}$$

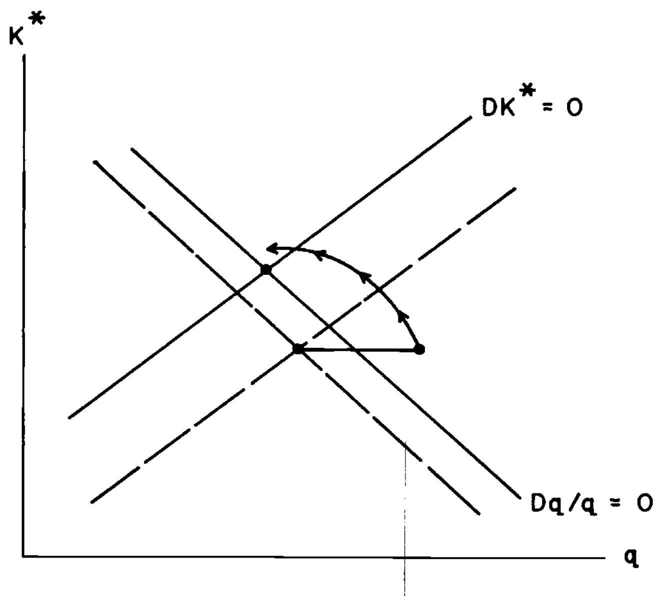

Fig. 6.6 The effects of devaluation ($\Omega_1 > 0$).

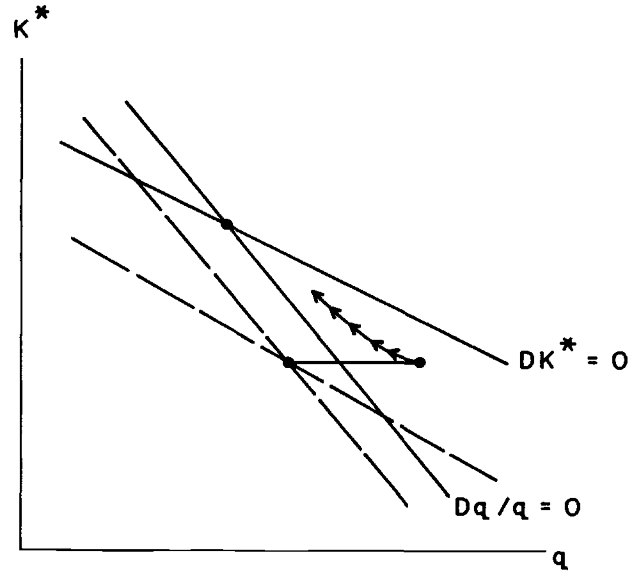

Fig. 6.7 The effects of devaluation ($\Omega_1 < 0$).

Devaluation-induced capital gains on foreign reserves are not automatically reflected in the monetary base but instead lead to the creation of artificial offsetting accounting liabilities on the central bank's balance sheet. Let the exchange rate rise at time t from E_t^- to E_t^+; let $\epsilon = (E_t^+ - E_t^-)/E_t^+$ denote the percentage devaluation; and let M_t^- be the level of the nominal money supply (and F_t^{*-} the level of reserves) just before the devaluation takes place. For all $v \geq t$, the central bank's balance sheet becomes:

$$(41)\quad M_v/E_v = F_v^* + (1/E_t^+)[C_t - \int_{-\infty}^{t} DE_s F_s^* ds - (E_t^+ - E_t^-)F_t^{*-}]$$

or

$$(42)\quad M_v/E_v = F_v^* + \chi - \epsilon(M_t^-/E_t^-)$$

in the absence of further unanticipated devaluations (compare equation [40]). Equation (42) implies that for any level of external assets, devaluation lowers the foreign exchange value of private wealth by the amount of the concomitant capital loss on domestic money holdings. (See Obstfeld 1986 for further discussion.)

Devaluation lowers private wealth for any value of K^*, so the two loci in figures 6.6 and 6.7 shift upward because, given q, a higher level of foreign claims will be necessary for internal as well as external balance. As in section 6.4 above, dynamic stability implies that the long-run level of foreign claims must increase. (This is obvious in the case illustrated in figure 6.6.) The arguments made in the previous section therefore imply that the real exchange rate falls in the long run. This real appreciation is coupled with a rise in steady-state absorption relative to the initial equilibrium of the economy.

What can be said about the economy's transitional behavior? In addition to shifting the economy's steady state, devaluation also causes an instantaneous initial rise in the real exchange rate. Since the wage is predetermined, equation (6) yields the relative-price effect:

$$dq/dE = [1 - (q/a)]/P^H > 0. \tag{43}$$

It is clear from this equation (since $P^H = E/q$) that the elasticity of q with respect to devaluation is smaller, the greater the import content of nontradables (that is, the smaller is a); to the extent that devaluation raises costs in the domestic goods sector, its effect on relative final-goods prices is reduced.

In figure 6.6, devaluation shifts the real exchange rate to the right of the new $Dq/q = 0$ locus, so that initially there is an expansion of employment and a current-account surplus. Over time foreign assets rise and the real exchange rate appreciates, with the economy approaching its new resting point in a cyclical fashion. There is no reason in general why the initial postdevaluation position of the economy cannot be to the left of the new $Dq/q = 0$ schedule. This last possibility is the case of a contractionary devaluation, the initial effect of which is a slump in employment and a depreciating real exchange rate. Even in this case, increasing wealth eventually reverses these short-run effects. The probability that devaluation is contractionary is directly related in the present model to the importance of intermediates in the production of nontradables (see also Krugman and Taylor 1978 and Buffie 1986). It is worth reiterating that if a is low, a large *nominal* devaluation may achieve only a minor *real* devaluation because of the substantial and immediate pass-through of import price changes to domestic costs. In this case the short-run expansionary effects of the associated rise in q will be small relative to the contractionary wealth effects that shift the two schedules in figure 6.6 upward.

Under capital immobility there is an initial liquidity squeeze and a rise in the domestic interest rate. But if the capital account has already been liberalized, there is a sharp capital inflow that immediately expands central bank reserves and the monetary base so as to maintain the domestic interest rate at the depreciation-adjusted world level.

Similar dynamics arise in the case shown in figure 6.7, although the economy's approach to its long-run position is direct when $\Omega_1 < 0$. In this case, it is possible that a devaluation will occasion a temporary external deficit that shrinks and is reversed as foreign assets fall and the real exchange rate appreciates. Contractionary devaluation is possible here, too, but only an expansionary devaluation can cause an initial deficit.

The long-run nonneutrality of devaluation contrasts sharply with the asymptotic neutrality results stressed in the monetary approach to the balance of payments (Frenkel and Johnson 1976). The result is in part a consequence of the assumption that central bank reserves earn interest. Under capital immobility individuals save to rebuild their real balances after the sharp initial rise in prices. Steady-state foreign reserves rise as a result, and because these reserves earn interest, national income and private absorption increase in the long run as well. When capital is mobile the liquidity effect of devaluation can be counteracted by capital inflows, but the negative wealth effect induces an initial fall in consumption and a long-run effect on national income similar to that arising when there are capital controls.

It is noteworthy that in models incorporating the Ricardian equivalence of government borrowing and taxation, the wealth effect of devaluation disappears in the mobile-capital case. This is because the increase in private external liabilities associated with the initial capital inflow is exactly offset by a rise in the present discounted value of expected future transfer payments from the government. These additional transfer payments are simply the increased interest earnings on the higher stock of central bank foreign reserves. It is therefore possible for the private sector to rebuild its real balances instantaneously through foreign borrowing without changing its lifetime consumption possibilities. For an analysis of these questions in models based on individual intertemporal maximization, see Obstfeld (1981; 1986) and Stockman (1983).

6.5.2 Exchange Rate Oriented Disinflation

Let us now consider the consequences of a credible, permanent reduction in the rate of devaluation, DE/E. In light of the Southern Cone experiences surveyed by Díaz-Alejandro (1981), it is of particular interest to ask under what circumstances an exchange rate based disinflation scheme causes a real appreciation of the currency. The two cases of internationally immobile and mobile capital are examined in turn.

Under capital immobility the domestic nominal interest rate is predetermined. A fall in DE/E increases the real interest rate (all else equal), leading to underemployment and a current surplus at the initial levels of q and K^*. As (28) and (32) show, both the $Dq/q = 0$ and $DK^* = 0$ schedules therefore shift upward (see figure 6.8). Model stability requires that when $\Omega_1 < 0$, as is the case in figure 6.8, K^* rises in the long run. This is clearly so when $\Omega_1 > 0$, so that the $DK^* = 0$ locus slopes upward. By the results of section 6.4, the steady-state real exchange rate appreciates. Indeed, an *increase* in the devaluation rate has dynamic effects that are qualitatively identical to those of capital-account liberalization.

In figure 6.8 there is an initial period of real depreciation as the increase in the real interest rate leads to underemployment. An external surplus emerges, and spending rises over time while real money holdings are built up and the domestic nominal and real interest rates fall. Excess demand for labor arises as the economy crosses the new $Dq/q = 0$ schedule. The real exchange rate appreciates, and external assets continue rising during the subsequent approach to the steady state. In the alternative configuration of the model (not pictured here), the medium-term dynamics are similar, but the approach to long-run equilibrium is oscillatory.

When capital is mobile the nominal interest rate is given by $R^* + (DE/E)$, and the domestic *real* rate is simply $R^* + (1 - \gamma)(Dq/q)$. A fall in DE/E leaves this real interest rate unchanged, for, as equations (28) and (32) show, it does not affect either of the schedules defining the system's dynamics. With rational expectations, therefore, a permanent and credible reduction in the rate of devaluation is neutral, in spite of the rigidity of domestic prices.

It is instructive to ask why a change in the depreciation rate is neutral with capital mobility. There are two reasons for this. First, the central

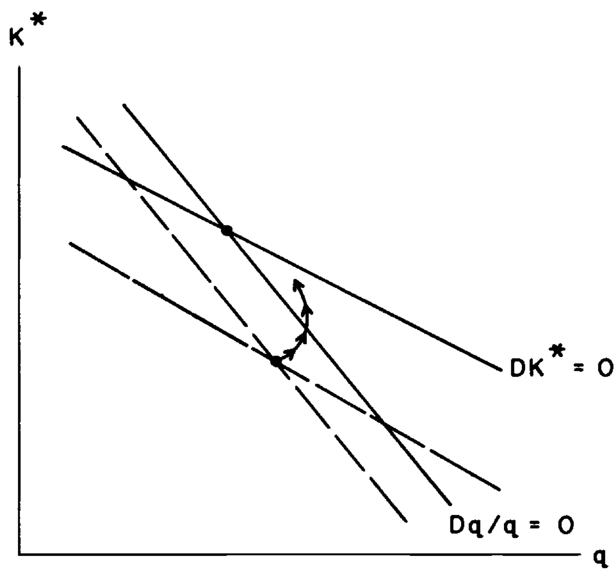

Fig. 6.8 Reducing the rate of devaluation ($\Omega_1 < 0$).

bank's commitment to peg the exchange rate forces it to accommodate fully the private-portfolio shift caused by the change. A fall in DE/E lowers the nominal interest rate and raises money demand. But the public can increase its nominal money holdings immediately by borrowing foreign exchange abroad and selling it to the central bank. This transaction raises official reserves but causes no change in the economy's overall income, wealth, or spending. The second factor ensuring neutrality derives from the assumptions regarding expectations and wage behavior. Because the rate of wage inflation can adjust instantaneously, the fall in DE/E is matched immediately by an equal fall in DW/W, so that no subsequent change in employment need occur. The overall result is a sharp, permanent fall in the domestic inflation rate with no transitional variation in spending or employment.

Neutrality would not hold if the exchange rate were floating and disinflation took the form of a reduction in trend monetary growth. Asset market equilibrium would then require a currency appreciation that would raise real wealth and expenditure. For a discussion of this effect, see Calvo and Rodriguez (1977).

Regardless of the degree of capital mobility, the model as formulated gives little support to the notion that a reduction in the rate of upward crawl is itself a cause of real appreciation. Brief consideration of some mechanisms not included in the present model is therefore worthwhile. (The following list is, of course, not exhaustive.)

Disinflation may lead to real appreciation if expectations of inflation in the nontradables sector are adaptive, as noted by Rodriguez (1982). When uncovered interest parity holds, a widely recognized fall in DE/E lowers the domestic nominal interest rate immediately but leaves DP^H/P^H unchanged in the short run. The associated fall in the real interest rate encourages expenditure and so lowers the relative price of tradables. This fall in the real interest rate is to be contrasted with the increase that occurs in the present model when expectations are rational but capital is internationally immobile.

Dornbusch (1982) suggested that the *rate* of domestic price inflation, like the level of domestic prices, is sluggish. If this is so, a fall in the depreciation rate tautologically forces an initial period of real appreciation. The rate of domestic price inflation must eventually fall to match that in the tradables sector, but the dynamics of this process are likely to be complex.

Buffie (1985) constructed a model in which banks hold nontradable claims to capital that are imperfectly substitutable for foreign bonds and endogenously priced. A reduction in DE/E raises banks' demand for this asset, driving up its price (Tobin's q) and thus investment demand. The result is again a short-run real appreciation.

The present model has assumed for simplicitly that disposable income does not influence absorption. In a similar setting, van Wijnbergen (1983a) showed that this neglected channel may lead to real appreciation if disposable income is defined properly so as to reflect the inflation tax on real balances. Because a lowering of the devaluation rate also lowers domestic price inflation, the inflation tax falls and disposable income rises. The resulting increase in consumption falls partially on nontradables, driving their relative price upward. Calvo (1983) also discussed this mechanism.

Yet another channel of nonneutrality is suggested in the optimizing framework of Obstfeld (1981), which incorporated Ricardian equivalence and Metzlerian target-wealth saving behavior. Disinflation causes a rise in desired nominal balances matched by a capital inflow and an increase in interest-bearing official reserves. Because individuals capitalize expected government transfers, there is an increase in the public's perceived consumption possibilities and a rise in expenditure. Although the model does not explicitly encompass nontradables, this rise in expenditure is consistent with a real appreciation.

The foregoing models all consider a permanent, unanticipated fall in DE/E rather than the preannounced, phased decline in the devaluation rate that was a hallmark of the Southern Cone plans. In Obstfeld (1985) I employed an intertemporal maximizing model to study those kinds of schemes. Anticipated disinflation affects the economy by raising the path of an expenditure-based real interest rate reflecting expected changes in the prices of nontradables and liquidity services. If intertemporal substitution is sufficiently low, the immediate result is a rise in spending, an external deficit, and a real appreciation. The temporary real appreciation gives way to a long-run decline in the relative price of nontradables.

A final observation has to do with the question of credibility. As Calvo (1983) and others have emphasized, much depends on the public's belief in official promises to avoid major discrete devaluations. If the public views a discontinuous jump in the exchange rate as a possibility, it will adjust its inflation expectations and subsequent wage settlements accordingly. A persistent belief in a maxi-devaluation that does not materialize will therefore lead to an extended period over which domestic prices rise more quickly than the exchange rate. Even if the initial fear of devaluation was in some sense unjustified, the resulting real appreciation is likely to force the government's hand.[12]

6.6 Conclusion

This paper has constructed a dynamic framework in which liberalization and stabilization measures of the type recently instituted in Latin America's Southern Cone can be studied. The model represents an attempt to capture some salient features of advanced industrializing economies by postulating a crawling-peg form of exchange rate system, slow labor market adjustment, and an important role for imported production inputs. Because the model encompasses economies with closed and open capital accounts as special cases, the impact of capital-account restrictions on the effects of policy decisions is highlighted. A further advantage of this general framework is its ability to delineate the macroeconomic consequences of opening the capital account.

Liberalization of the capital account leads not to an initial period of real exchange rate appreciation but to a real depreciation and an increase in foreign debt over the long run. The economy passes through alternating phases of boom and slump in the transition process. Devaluation is nonneutral even in the long run and may be contractionary in the short run. Even though this measure entails an initial real depreciation effect, it drives the economy to a new stationary position in which the relative price of tradables is lower than it was initially. Finally, attempts to disinflate by manipulating the rate of currency devaluation may have minimal effects under capital mobility. When capital is immobile, however, disinflation has effects qualitatively similar to those of closing the capital account.

Although these results are certainly suggestive regarding the Southern Cone experience, the limits of the model's applicability should be recognized. There is no explicit description of the domestic banking sector, so that the effects of any liberalization there—and of its timing relative to liberalization elsewhere—are not studied. Similarly, the model assumes that the trade account is open and that the fiscal deficit is under control. In reality, the order of liberalization and the degree of consistency of macroeconomic policies differed among the Southern Cone countries. The consequences of these differences have been discussed elsewhere by a number of writers and are surveyed in Edwards (1984).

In this context, an important omitted variable of the model is imperfect credibility: public disbelief in the permanence of reform initiatives and in official promises not to inflict capital losses through devaluation or other measures. There can be little doubt that incredulity played a central role in both the unfolding and the unraveling of the Southern Cone stabilization programs. Our understanding of this phenomenon is incomplete at this time, but it is at the top of the agenda for future research.

Appendix

The purpose of this appendix is to supply a detailed discussion of the assumptions underlying the model's dynamics. Let (q_∞, K^*_∞) denote the steady state of the system described by equations (29) and (32) in the text. The linear approximation to the system near its steady state is:

$$Dq = q_\infty \Gamma_1 (q - q_\infty) + q_\infty \Gamma_2 (K^* - K^*_\infty),$$

$$DK^* = \Omega_1 (q - q_\infty) + \Omega_2 (K^* - K^*_\infty),$$

where all functions are evaluated at (q_∞, K^*_∞). Since the two dynamic variables are predetermined, the linearized system is stable if its two characteristic roots are negative. Necessary and sufficient conditions for this are the trace condition $q_\infty \Gamma_1 + \Omega_2 < 0$ and the determinant condition (35).

Direct calculation using (28) and (32) shows that in the neighborhood of the steady state,

$$\Gamma_1 = -\pi[n^{T'} - \sigma' z + (1 - \sigma)(1 - \gamma) z_1 q^{-\gamma} \times (K^* + \chi + k)]/[1 + \pi(1 - \sigma)(1 - \gamma) z_2],$$

$$\Gamma_2 = -\pi(1 - \sigma)(z_1 q^{1-\gamma} + z_2 R')/[1 + \pi(1 - \sigma)(1 - \gamma) z_2],$$

$$\Omega_1 = y^{T'} - \{[1 - (q/a)]\sigma' - (\sigma/q)\}(z/q) - (1 - \gamma)[(\sigma/q) + (1 - \sigma)/a][z_1 q^{-\gamma}(K^* + \chi + k) + z_2 \Gamma_1],$$

$$\Omega_2 = R^* - [(\sigma/q) + (1 - \sigma)/a]\{z_1 q^{1-\gamma} + z_2[R' + (1 - \gamma)\Gamma_2]\}.$$

The inequalities (30) and (34) are predicted on the assumption that the economy is near its long-run equilibrium. Those in (30) also rely on the assumption that $1 + \pi (1 - \sigma) (1 - \gamma) z_2 > 0$. For a discussion of this condition, and a theoretical rationale, see Obstfeld and Rogoff (1984). Once it is assumed that $1 + \pi (1 - \sigma) (1 - \gamma) z_2 > 0$, the additional assumption $K^* + \chi + k > 0$ (which is clearly stronger than necessary) yields (30). The inequality $\Omega_2 < 0$ in (34) is simply the standard requirement that an increase in wealth raise absorption by more than it raises income at a constant real exchange rate. As was mentioned in the text, the assumption that $\Omega_2 < 0$ is needed for brevity rather than for stability.

Inequality (36) follows immediately from the partial derivatives listed above and from the assumption that $1 + \pi (1 - \sigma) (1 - \gamma) z_2 > 0$.

Notes

1. For discussions of individual countries, see Foxley (1982), Harberger (1982), Buffie (1985), Calvo (1983; 1986), Dornbusch (1985), and Edwards (1985). See also the papers and discussion collected in Ardito Barletta, Blejer, and Landau (1983). A full account of the collapse of the Southern Cone reform programs is beyond the scope of this paper. Calvo (1986), Díaz-Alejandro (1984), Dornbusch (1985), and Edwards (1985) have addressed that topic. Edwards (1984) surveyed some of the relevant analytical questions.

2. A single exchange rate regime, the pegged rate, is assumed throughout. Bruno (1983) discussed interactions between the degree of capital mobility and the exchange rate regime.

3. Related models have been developed by Blejer and Mathieson (1981), Calvo (1982), and van Wijnbergen (1983a). Blejer and Mathieson (1981) stressed the role of the domestic banking system. The setup in Calvo (1982) is similar to that of the present paper; but whereas a simple Phillips curve governs the wage dynamics described below, Calvo assumed that the domestic price level was an index of firms' predetermined output prices, set at staggered intervals. Another related model, in Buffie (1985), incorporated a banking system and a richer menu of assets but did not pursue the intrinsic dynamics arising from asset accumulation. Khan and Knight (1981) estimated and simulated a fairly detailed macro model of a developing country.

4. By assuming perfect foresight I am pushing aside undoubtedly important questions about the credibility of government policies and the speed with which the public's expectations adjust to new policy regimes. See section 6.5.2 below for a further discussion.

5. The immobile capital model could be modified to allow for a fixed positive level of foreign asset holdings. Unfortunately, this change would lead to considerable additional complexity. Under strict capital controls the market price of domestically held foreign assets is the (dual) financial foreign exchange rate, an endogenous variable determined within the model. It is the wealth effect of financial exchange rate movements that makes the introduction of a parallel financial foreign exchange market a nontrivial task. See Cumby (1984) and the chapter in this volume by Dornbusch for dual exchange rate models of this type, and Obstfeld (1986) for an optimizing analysis. An alternative dual exchange rate regime is one in which the authorities peg the financial rate to allow some target level of private external asset accumulation (Adams and Greenwood 1985).

6. See equation (40) below. The parameter χ can be altered by certain government policies, for example, a discrete devaluation, ΔE, of the currency not matched by a "helicopter" domestic credit increase, ΔC, satisfying equation (20), or by an increase in domestic credit not matched by the appropriate devaluation. Along this model's perfect-foresight paths, however, official transfer payments always compensate the private sector for the depreciation of its money holdings against foreign currency. (Of course, any individual takes these transfers to be parametric and so does not view them as a function of his or her own portfolio decisions.) The effect of an "uncompensated" devaluation on the relationship between M/E and $F^{\cdot}$ is discussed in section 6.5.

7. It should be kept in mind that under rule (20), the experiment of raising q corresponds to a rise in E (a devaluation) coupled with a compensating increase in domestic credit. (See note 6.) More simply, q can be viewed as rising through a fall in the predetermined nominal wage.

8. Note that both loci are flatter when there is no capital mobility.

9. Khan and Zahler (1983) used a detailed simulation model to evaluate the effects of opening the capital account. The dynamic adjustment produced by their model is quite similar to that found below. Dorlhiac (1984) studied the effect of financial opening on the real exchange rate in an intertemporal maximizing model. Calvo (1982) also studied capital-account liberalization, identifying its effects with those of an increase in domestic wealth. He obtained dynamics similar to those obtained here, but his long-run results were different because he ignored the service account. See Calvo (1983) and Edwards (1984) for alternative, less formal discussions of liberalization.

10. Strictly speaking, the use of the diagrams for this experiment is valid only for small changes. This implies that the difference between the pre- and postreform nominal interest rates cannot be too great.

11. The broken lines in figures 6.3 and 6.4 are, of course, the loci describing prereform internal and external balance. The assumption that $\Omega_2 < 0$ is what permits the assertion that a fall in $K^{\cdot}$, all else equal, improves the current account.

12. Under capital mobility, the nominal interest rate will fully and immediately reflect the possibility of devaluation. This may explain why in Argentina, for example, the difference between the local and world nominal rates generally exceeded the preannounced rate of devaluation in the period after January 1979. As Calvo (1983) observed, however, expected devaluation should not affect the expected real interest rate, for it raises the nominal rate and expected inflation by the same amount.

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Comment Marcelo Selowsky

Maurice Obstfeld has developed a well-specified structure, able to trace the dynamics and steady-state values of an economy experiencing a liberalization of its capital account. Given the world's interest rate, a specified rate of crawl in the nominal exchange rate, and an assumption of perfect foresight, the model traces the dynamics of the real exchange rate and the economy's net external assets. The model shows that the removal of impediments to capital movements causes an initial period of real appreciation, followed in the long run by a real depreciation

Marcelo Selowsky is an advisor of the Operations Policy Staff of the World Bank.

and an increase in the country's foreign debt. When capital is fully mobile, a change in the rate of crawl is neutral; it does not affect the steady-state values of the real variables.

The central issue raised by the paper is whether the model can be useful in addressing the typical welfare questions that have arisen from the experiences of Argentina and Chile, where the liberalization of the capital account during the 1970s was a major determinant of the substantial increase in private external debt. (The case of Chile better fits the initial conditions of the model, namely, internal equilibrium made possible by the ability of Chile to control its fiscal deficit.)

Two major questions can be raised in this regard: concerns about the nonoptimality of the size of the debt, that is, whether the private sector overborrowed, even after we have corrected for the influence of unanticipated external factors (movements in dollar interest rates and the terms of trade); and concerns about whether the rate of crawl is truly neutral, that is, to what extent alternative nominal exchange rate regimes during the period of liberalization conveyed different real signals to the capital and current accounts. In other words, what nominal exchange regime institutes the best system of intertemporal signals when the capital account is opened?

These welfare questions do not arise if perfect foresight is assumed. By definition, this assumption rules out the possibility of over- or underborrowing. The assumption implies that private agents are always able to foresee the oscillation and convergence of the *real* interest rate and adjust their external borrowing accordingly. Given dollar interest rates, it also means that agents are able to foresee the oscillation and convergence of the *real* exchange rate. And given the rate of crawl in the nominal exchange rate, it ultimately means that agents are able to foresee the oscillation and convergence of the price level of nontraded goods that will result from the opening of the capital account. These are indeed strong assumptions.

At issue here is what type of nominal exchange rate regime is most successful in helping private agents better predict the oscillation of the real rate—particularly its ultimate depreciation. A failure to foresee the ultimate real depreciation can generate excessive foreign borrowing and excessive reallocation of resources from the traded to the nontraded sector during the period of liberalization. Additional complications arise when alternative nominal regimes induce a differential "nonoptimality" in the movement of the capital and current accounts. In other words, there might be a trade-off in the efficiency with which a particular nominal regime conveys the proper signals to the capital and current accounts. A floating nominal exchange rate, for example, might increase the short-run appreciation of the real rate. This might lead, in turn, to an excessive movement of resources from the traded to the nontraded sector, or it might increase the *expectations* of a future real depreciation, thus restraining external borrowing. A fixed nominal rate, on the other hand, might dampen the short-run real appreciation if there are lags in the upward movement of nontraded goods prices. This fixed rate will dampen the movement of resources from the traded sector; but, it might also lower the expectation of a future real depreciation, thus encouraging an excessive amount of ex ante borrowing. These issues should be incorporated into future extensions of Obstfeld's paper.

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