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Macroeconomic Policy with Informal Financial Markets: An Integrated Framework

1 Introduction

As indicated in previous chapters, a key issue that arises in the context of informal financial markets is how the existence of such markets is likely to affect macroeconomic outcomes in developing countries. This chapter and those that follow address this issue in a formal way. Their primary message is that the coexistence of controlled official markets for credit and foreign exchange with the informal financial markets described in chapter 1 affects the workings of macroeconomic policies in fundamental ways. A serious analysis of macroeconomic policy in such countries must take into account the existence of such markets as well as other structural features that distinguish these countries from the textbook industrial-country case. This is done in this chapter and the succeeding one.

The present chapter will focus on financial markets, and a key structural feature to be stressed is that emphasized by the McKinnon-Shaw school – i.e. the limited menu of assets available to private agents in many developing countries. As indicated in chapter 2, organized secondary securities markets in which the central bank can conduct open market operations, for example, typically do not exist. By and large, individuals can hold currency as well as demand and time deposits issued by the banking system, and they can borrow from commercial banks, subject to official restrictions that commonly determine the interest rates paid and

charged by financial institutions. Durable goods such as land and physical capital can be held directly, but organized equity markets are small or nonexistent. As emphasized in chapter 1, capital controls and prohibitions on the holding of foreign exchange limit the extent to which foreign assets may be held by domestic residents. However, as also indicated in chapter 1, parallel markets for credit and foreign currency often emerge in response to such regulations, thereby allowing private agents to circumvent official controls, at least in part.

The financial structure to be analyzed in this chapter, then, is one in which individuals can hold domestic currency, deposits with the banking system, foreign currency, loans extended through a curb market, land, and physical capital. These assets may be financed by the individuals' personal net worth or by borrowing both from the banking system and through the curb market. Financial repression implies that interest rates on the assets and liabilities of the formal banking system are fixed by administrative restrictions, while the price of foreign currency on the parallel market, as well as the interest rate on informal credit market loans, are determined by market conditions.

The objective of this chapter is to examine the connection between the actions of the monetary authorities and the state of aggregate demand in such an environment. The tools of monetary policy in this setting differ from those in the standard textbook industrial-country model. In the absence of organized secondary securities markets, open market operations are out of the question. Nonetheless, the monetary authorities retain four instruments of policy – the level of administered bank interest rates, the required reserve ratio, the amount of credit extended by the central bank to the commercial banking system, and intervention in the parallel exchange market. In this chapter, we focus on how these instruments affect aggregate demand in a simple model with the financial structure described above. The next chapter extends the model by adding more structural features relevant to developing countries and conducting a more complete set of policy experiments.

The analysis conducted here highlights a number of unconventional channels through which not only interest rate policy – which has been a primary concern for both McKinnon-Shaw analysts and Neo-Structuralists – but also the other instruments available

to the monetary authorities in this financial setting, may exert influences on aggregate demand. Our intention is to prepare the ground for the more general model which is introduced in subsequent chapters by first examining general-equilibrium interactions in the context of a simplified analytical model. The chapter is organized as follows: the analytical framework developed to explore these issues is presented in the next section. Section 3 then examines how the various monetary policy instruments work in a partial equilibrium context. The fourth section takes up this issue in a general equilibrium context. A final section summarizes the results.

2 A General Model of Developing-Country Financial Markets[1]

The model developed below involves a portfolio-balance framework expanded to include a commodity market, in the tradition of Tobin (1969). The economy in question is a small open one with four types of agents: households, the government, the central bank, and the rest of the banking system. In keeping with the setting described above, the authorities maintain an official exchange rate for current international transactions, but prohibit private capital movements. To avoid complicating the analysis, the commodity structure is deliberately kept simple – i.e., a standard Mundell-Fleming structure is assumed, with a single domestic and foreign good. Furthermore, since the focus is on exploring how aggregate demand is affected by financial-market policy instruments in such a setting, the model abstracts from supply-side complications by assuming that domestic prices are instantaneously flexible, so that full employment holds continuously. Thus, shifts in aggregate demand will be reflected only in the domestic price level.

In the formal model, private households have access to five assets: domestic currency, bank deposits, curb-market loans, foreign exchange, and bank credit (which is, of course, a liability for households). There is no market for either private or government securities, and the stock of physical capital is assumed to be constant.[2] To simplify the analysis, however, currency is

ignored and bank credit and curb market loans are taken to be perfect substitutes in household portfolios.[3] The latter permits all rationing-induced "spillover" effects (see Barro and Grossman, 1976) of changes in the stock of bank credit to be concentrated in a single market – i.e. the curb loan market – by permitting bank credit and curb loans to be treated as a single asset.

2.1 Structure of the Model

2.1.1 Households

With these assumptions, households' financial portfolios are taken to consist of bank deposits (D^p), curb market loans, bank credit (L^p), and foreign exchange (F^p).[4] The value of households' financial portfolio (A) is given by $A = D^p + bF^p - L^p$, where b is the domestic-currency price of foreign exchange traded in the free (parallel) market. Portfolio balance requires:

$$\frac{D^p}{P} = L(i_L, i_d, \hat{b}), \qquad L_1, L_3 < 0, L_2 > 0 \tag{3.1}$$

$$\frac{-L^p}{p} = H(i_L, i_d, \hat{b}, A/P), \qquad H_1 > 0, H_2, H_3 < 0, 0 < H_4 < 1 \tag{3.2}$$

$$\frac{bF^p}{P} = F(i_L, i_d, \hat{b}, A/P), \qquad F_1, F_2 < 0, F_3 > 0, 0 < F_4 < 1 \tag{3.3}$$

where P is the domestic price level, i_L and i_d are respectively the interest rate on curb market loans and the (controlled) interest rate on bank deposits, and $\hat{b}$ is the expected (and actual) rate of depreciation of the parallel-market exchange rate. Following Turnovsky (1977), we assume that all agents exhibit myopic perfect foresight.[5] The signs of the first three partial derivatives of each function reflect the assumption that all assets are gross substitutes. Money (in the form of bank deposits) is assumed to be held strictly for transactions purposes, so the level of real financial wealth enters as a scale variable to satisfy adding-up constraints in the demand functions for curb market loans and

foreign exchange, but not for deposits.[6] The partial derivatives in (3.1)–(3.3) must satisfy the standard portfolio adding-up constraints:

$$L_k + H_k + F_k = 0; \quad k = 1, 2, 3$$

$$H_4 + F_4 = 1.$$

Notice that this portfolio specification represents the simplest possible one that incorporates the formal, repressed banking sector, an informal credit market, and a parallel market for foreign exchange in a unified analytical setting. Moreover, unlike in Taylor (1986), the market price of the "inflation hedge" F^p behaves like a true asset price.

In addition to choosing the composition of their portfolios, households must also determine their level of expenditure (E^p). The latter is taken to depend on the real loan interest rate and on the level of household resources:

$$E^p = E(i_L - \hat{P}, W/P); \qquad E_1 < 0, E_2 > 0 \tag{3.4}$$

Household resources consist of real financial wealth (W/P) and real factor income. As indicated above, however, real output is constant under present assumptions, so the (unchanging) level of real factor income is omitted from the function $E(.)$.[7]

In addition to its portfolio specification, our model also departs from existing work by incorporating the wealth implications of financial repression. In the context of financial repression, the calculation of real household financial wealth must take into account the implicit taxes and subsidies which interest rate ceilings impose on households as creditors and debtors with the banking system. Letting i_c denote the controlled interest rate on bank credit, individuals with access to such credit receive a subsidy of $(i_L - i_c)L^p$ - i.e., the interest-rate differential between the curb loan and bank credit markets times the amount of bank credit extended to individuals with such privileged access. The present value of this subsidy is given by $(i_L - i_c)L^p/i_L$, and this represents a net addition to household financial wealth.[8] It is convenient to define an index of financial repression, denoted ρ, by:

$$\rho = (i_L - i_c)/i_L, \tag{3.5}$$

that is, ρ is the present value of the subsidy, per unit of bank credit, which is implied by binding legal interest-rate ceilings. Notice that, since $i_L > 0$ and binding interest-rate ceilings imply $i_c < i_L$, ρ is bounded between zero and one. When interest-rate ceilings do not bind, $i_c = i_L$ and $\rho = 0$. As the curb loan interest rate rises relative to the administered interest rate i_c, the constraint becomes more and more binding and ρ approaches unity.

While households are subsidized as debtors under financial repression, they are taxed as banking-system creditors. The present value of this tax is given by $((\tilde{i}_d - i_d)/\tilde{i}_d)D^p$, where $\tilde{i}_d$ is the deposit interest rate that corresponds to a loan interest rate of i_L under the banks' zero-profit condition (equation (3.9) below). This condition can be used to show that $(\tilde{i}_d - i_d)/\tilde{i}_d = \rho$, so the degree of financial repression can be written equivalently as a function of banks' lending or borrowing rates, and the present value of the tax on depositors can be expressed compactly as ρD^p.

Taking these taxes and subsidies into account, households' real financial wealth can be expressed as:

$$W/P = (D^p + bF^p - L^p + \rho L^p - \rho D^p)/P, \tag{3.6}$$

$$= [(1 - \rho)(D^p - L^p) + bF^p]/P,$$

Thus, the wealth effects of financial repression depend on whether households are not creditors ($D^p - L^p > 0$) or debtors ($D^p - L^p < 0$) of the banking system. When $D^p - L^p > 0$, for example, an increase in the degree of financial repression (ρ) reduces household wealth, since the implicit tax imposed on households by interest rate ceilings on deposits exceeds the subsidy received by favored borrowers.

2.1.2 The Banking System and the Central Bank

Bank assets consist of reserves held at the central bank (RR) and credit extended to households (L^p). Bank liabilities consist of deposits held by the public (D^p), and credit received from the central bank (L^b). The balance sheet of the banking system is therefore given by:

$$RR + L^p = D^p + L^b. \tag{3.7}$$

Banks hold no excess reserves. Given a required reserve ratio of μ, reserve holdings are thus given by:

$$RR = \mu D^p. \tag{3.8}$$

Reserves at the central bank pay no interest, but credit extended to the banking system by the central bank carries an interest charge which, for convenience, is set equal to the interest rate which banks charge their customers, i_c. Under these conditions, the zero-profit condition for the banking system is given by:

$$i_c = i_d/(1 - \mu). \tag{3.9}$$

The central bank pegs the official exchange rate at a value $\bar{s}$. All international commercial transactions are settled at this rate. Denoting the central bank's stock of foreign exchange reserves (measured in foreign currency) as R, and the trade balance - measured in units of the domestic good and taken to be an increasing function of the real exchange rate $(\bar{s}/P)$ - as $x(\bar{s}/P)$, the stock of foreign exchange reserves evolves according to:[9]

$$\bar{s}\dot{R} = Px(\bar{s}/P) \tag{3.10}$$

The central bank's assets include both foreign exchange reserves and credit to the banking system, while its liabilities consist of reserves held by the banking system. Thus the central bank's balance sheet is:

$$\bar{s}R + L^b = RR. \tag{3.11}$$

2.1.3 *The Government*

The interest earned by the central bank on its loans to the commercial banking system is assumed to be transferred to the government, which then uses it to purchase domestic goods.[10] Letting g denote real government spending on domestic goods, the government budget constraint implies:

$$Pg = i_c L^b \tag{3.12}$$

2.1.4 *Commodity-market Equilibrium*

The model is closed by the condition that the market for domestic goods must clear. Letting Q denote domestic real output and Ω the excess demand for domestic goods, this condition is:

$$\Omega = E(i_L - \hat{P}, W/P) + g + x(\bar{s}/P) - \bar{Q}, \tag{3.13}$$
$$= 0.$$

2.2 The Model in Compact Form

Before solving the model, it is useful to rewrite its simultaneous portion in a more convenient form. Specifically, let $e(=\bar{s}/P)$ denote the official real exchange rate, $F = R + F^p$ the economy's total net foreign assets, and $p = b/\bar{s}$ the ratio of the free market exchange rate to the official rate, which we shall refer to as the premium. The rate of change in p is denoted $\hat{p}$. Using this notation, the equilibrium condition in the curb loan market (equation (3.2) can be rewritten as:

$$0 = H[i_L, i_d, \hat{p}, e(F + (p-1)F^p)] + el^b + (1-\mu)L(i_L, i_c, \hat{p}). \tag{3.14}$$

In addition to using e and p, several substitutions have been performed in deriving (3.14). Using (3.7) in the definition of A and then substituting from (3.11) enables the term A/P in (3.2) to be replaced by $e(R + bF^p)$ in (3.14). Equations (3.7) and (3.9) together imply that $L^p = L^b + (1-\mu)D^p$ - i.e., the amount of lending that the banking system can undertake consists of deposits net of reserves plus loans from the central bank. Substituting from (3.1) and using the resulting expression to replace L^p in (3.2) yields (3.14), where $l^b = L^b/\bar{s}$. A similar procedure permits (3.3) to be written as:

$$peF^p = F[i_L, i_d, \hat{p}, e(F + (p-1)F^p)]. \tag{3.15}$$

Equations (3.14) and (3.15) are the counterparts in our model of the Neo-Structuralist equation (2.8) in chapter 2. The key difference is, of course, the addition of the asset market for foreign

exchange in our model and its implications for the functions $H(\ )$ and $L(\ )$ in equation (3.14).

Next, by using equations (3.7) and (3.11) in (3.6), real household financial wealth can be written as:

$$W/P = [\bar{s}F^p + \bar{s}R + \rho(L^b - RR)]/P.$$

Thus, the wealth effects of financial repression depend on the excess of central bank lending to the banking system (L^b) over reserves held by the banking system - i.e., on the public sector's net creditor position vis-à-vis the private sector. Using equations (3.8) and (3.1) and letting $w = W/\bar{s}$ and $l^b = L^b/\bar{s}$, we can rewrite the preceding equation as:

$$\begin{aligned} W/P &= ew, \\ &= e(F + (p-1)F^p) + \rho(el^b - \mu L[i_L, i_d, \hat{p}]). \end{aligned} \tag{3.16}$$

Substituting this in the commodity market equilibrium equation (3.13) and using the notation introduced above, yields:

$$\begin{aligned} \Omega &= E[i_L + \hat{e}, ew] + i_c el^b + x(e) - \bar{Q}, \\ &= 0, \end{aligned} \tag{3.17}$$

where use is also made of the government budget constraint (3.12). Equations (3.14)–(3.17), together with the balance of payments equation (3.10) and the definition of the financial repression index ρ given in (3.5), constitute the simultaneous portion of the model. The monetary policy variables are the administered interest rate on deposits i_d, the required reserve ratio μ, central bank lending to the banking system l^b, and central bank intervention in the free market. The latter is captured by the stock of foreign exchange available to the private sector F^p, which can be altered by the central bank subject to the condition $dR = -dF^p$, since the economy's net international indebtedness F is a state variable in the system. When the central bank sells foreign exchange in the parallel market, it may do so either at the parallel rate or the official rate. In the latter case, households will reap a windfall.[11] The endogenous variables in the system are the curb loan interest rate i_L, the degree of financial repression ρ, the balance of payments $\dot{R}$, as well as both the levels of the real exchange rate e and premium p and their expected and actual rates of change $\hat{e}$ and $\hat{p}$. It is important to note that the effects of the monetary policy instruments on aggregate demand are captured by their effects on the official real exchange rate e, since $e = \bar{s}/P$ and changes in P reflect shifts in aggregate demand, given the economy's vertical aggregate supply curve.

3 Partial Equilibrium Analysis

To solve the model, one can begin by solving the portfolio equilibrium conditions (3.14) and (3.15) for the curb interest rate i_L and the rate of change of the premium $\hat{p}$ as functions of the remaining endogenous and exogenous variables. The results are:

$$i_L = i(p, e, F; l^b, i_d, \mu, F^p), \tag{3.18}$$

with:

$$i_1 = \Delta^{-1}\mu L_3 H_4 e F^p < 0,$$

$$i_2 = \Delta^{-1}\{F_3 l^b + (F_3 + F_4\mu L_3)(F - F^p) - \mu L_3 H_4 p F^p\} < 0,$$

$$i_3 = \Delta^{-1}e(F + \mu L_3 F_4) < 0,$$

$$i_4 = \Delta^{-1}eF_3 < 0,$$

$$i_5 = \Delta^{-1}\mu(F_2 L_3 - F_3 L_2) \gtrless 0,$$

$$i_6 = -\Delta^{-1}F_3 L > 0,$$

$$i_7 = -\Delta^{-1}e(F_3 + \mu L_3 + \mu L_3 H_4(p-1)) \gtrless 0,$$

or:

$$i_7 = -\Delta^{-1}e(F_3 + \mu L_3) > 0,$$

and:

$$\hat{p} = p(p, e, F; l^b, i_d, \mu, F^p), \tag{3.19}$$

with:

$$p_1 = \Delta_1^{-1}\mu L_1 H_4 e F^p < 0,$$

$$p_2 = -\Delta_1^{-1}\left[F_1(F-F^p+l^b) - \mu L_1 pF^p\left[1 - F_4\frac{e(F+(p-1)F^p)}{epF^p}\right]\right] \gtrless 0,$$

$$p_3 = -\Delta_1^{-1}e(F_1 + \mu L_1 F_4) < 0,$$

$$p_4 = -\Delta_1^{-1}eF_1 < 0,$$

$$p_5 = \Delta_1^{-1}\mu(F_1L_2 - F_2L_1) > 0,$$

$$p_6 = \Delta_1^{-1}F_1L > 0,$$

$$p_7 = \Delta_1^{-1}e(F_1 + \mu L_1 + \mu L_1 H_4(p-1)) > 0,$$

or:

$$p_7 = \Delta_1^{-1}e(F_1 + \mu L_1) > 0,$$

where:

$$\Delta = \mu(F_3L_1 - F_1L_3) < 0,$$

and the alternative versions of i_7 and p_7 depend on whether central bank sales of foreign exchange in the free market are at the official rate (given as the first alternative) or the free rate (second alternative).

These partial derivatives can readily be given intuitive interpretations. Consider, first, the effects of the three dynamic variables p, e, and F. An increase in the premium reduces the curb interest rate, but increases the rate of depreciation of the free exchange rate. The reason for this is that, at the initial values of i_L and $\hat{p}$, the increase in the premium creates an excess supply of foreign exchange and an excess asset demand for curb market loans. To induce households to hold more foreign exchange in their portfolios relative to curb loans, the expected rate of depreciation in the free exchange market has to rise and the loan interest rate to fall. Turning to the real exchange rate e, a real depreciation (increase in e) corresponds to a reduction in the domestic price level. On impact, this creates an excess asset demand for curb loans, both because the real value of the portfolio of lending households increases and because the real value of the resources provided to the banking system by the central bank is higher. The interest rate on loans therefore falls. The impact effect on the free

exchange market is ambiguous, however, as both the real supply of foreign currency and the real demand for this asset increase. Finally, with regard to F, since an increase in the economy's net international creditor position must be associated with an increased real value of household financial portfolios, households seek to hold both more foreign exchange and more curb loans as assets. Thus, both the curb interest rate i_L and the rate of depreciation of the free exchange rate $\hat{p}$ fall when F increases.

Turning to the monetary policy variables, an increase in bank credit increases the asset demand for loans. The loan interest rate i_L falls, and to prevent the emergence of an excess demand for foreign exchange as households switch out of the loan market, $\hat{p}$ must fall as well. This situation is reversed in the case of an increase in the required reserve ratio μ. As banks' supply of loans is reduced, the loan interest rate rises. This in turn requires an increase in $\hat{p}$ to induce households to hold their existing stock of foreign exchange. The effect of an increase in this stock (through central bank intervention in the parallel market), on the other hand, is to create an incipient excess supply of foreign exchange as households seek to restore their desired portfolio composition. Consequently, an increase in $\hat{p}$ is required to restore equilibrium. The increase in $\hat{p}$ tends to reduce the asset demand for loans. If the foreign exchange is sold at the official rate, however, this will partly be offset by a positive wealth effect on the asset demand for loans due to the windfall reaped by households, rendering the effect on i_L ambiguous. If the currency is sold at the parallel rate, the latter effect is absent (the last term inside the parentheses in the first version of both i_7 and p_7 disappears), and the loan interest rate rises.

The partial derivative which is perhaps of greatest interest, however, pertains to the effects of changes in the administered interest rate i_d. On impact, an increase in i_d will result in an excess supply of foreign exchange, as funds are attracted into the domestic financial system and away from the holding of foreign assets. This is the movement away from "inflation hedges" and other "unproductive" assets implied by the McKinnon-Shaw analysis. However, the net asset demand for loans may rise or fall. Though bank lending will rise as deposits increase, household lending will fall as households shift funds away from the loan

market and into deposits. This is the effect emphasized by Neo-Structuralists. As in Neo-Structuralist models, since banks hold reserves while private lending agents in the informal market do not, each unit moved by households from the loan market into the domestic financial system reduces the net supply of loans. However, to the extent that funds attracted to banks come out of foreign currency holdings instead, the supply of loans rises. Thus the key to the impact effect of changes in i_d is whether households primarily move funds out of the loan market or out of foreign currency - i.e., whether loans, on the one hand, or foreign currency, on the other, are better substitutes for deposits. This determines the sign of $(F_2L_3 - F_3L_2)$ in i_5. In the "currency substitution" case (in which foreign currency and domestic money are close substitutes), the expansion of deposits would primarily be at the expense of foreign currency, rather than loans, and in this case an increase in i_d is likely to result in an incipient excess asset demand for loans, causing i_L to fall ($i_5 < 0$, because F_2 and L_3 are large in absolute value). Notice that whether i_L increases or decreases, the effect on $\hat{p}$ will be positive. This means that, unlike the case when the "unproductive asset" is currency, substitution out of the unproductive asset is muted when this asset is foreign exchange by an increase in its own rate of return.

To explore the determination of real private financial wealth in the model, substitute for ρ in (3.16) from (3.5) and use equations (3.18) and (3.19). This yields:

$$ew = w(p, e, F; l^b, i_d, \mu, F^p), \tag{3.20}$$

where:

$$w_1 = eF^p + (1-\rho)(el^b - \mu L)(i_1/i_L) > 0,$$

$$w_2 = [F + (p-1)F^p] + (1-\rho)(el^b - \mu L)(i_2/i_L) + \rho[l^b - (l^b + F - F^p)] < 0,$$

$$w_3 = e + (1-\rho)(el^b - \mu L)(i_3/i_L) - \rho e > 0,$$

$$w_4 = (1-\rho)(el^b - \mu L)(i_4/i_L) > 0,$$

$$w_5 = (1-\rho)(el^b - \mu L)(i_5/i_L - 1/i_d) > 0,$$

$$w_6 = (1-\rho)(el^b - \mu L)(i_6/i_L - 1/(1-\mu)) < 0,$$

$$w_7 = e(p-1) + (1-\rho)(el^b - \mu L)(i_7/i_L) + e\rho \gtreqless 0,$$

or:

$$w_7 = (1-\rho)(el^b - \mu L)(i_7/i_L) + e\rho < 0.$$

The wealth effects of the variables considered above can be decomposed into three parts: (i) a direct wealth effect; (ii) an effect which operates through changes in the degree of financial repression; and (iii) an effect which operates through changes in the base on which the implicit financial repression tax is levied.

Equation (3.20) indicates that wealth effects are a separate mechanism (in addition to the real interest rate) through which monetary policy instruments may affect aggregate demand. All of the monetary policy instruments under examination here exert such effects. Both an increase in credit to the banking system (l^b) and a sale of foreign exchange in the free market (F^p) lower the portfolio-equilibrium loan interest rate. By reducing the degree of financial repression, this increases real private financial wealth. An increase in controlled interest rates also reduces the degree of financial repression. In the "currency substitution" case ($i_5 < 0$), this is because market interest rates fall while controlled interest rates rise. Even when market interest rates rise ($i_5 > 0$), however, under certain conditions their rise will be proportionately smaller than that of controlled interest rates, so that $i_5/i_L - 1/i_d > 0$ and the degree of financial repression will be reduced - generating positive wealth effects in this case as well.[12] When the required reserve ratio rises, on the other hand, the proportionate increase in the loan interest rate (i_6/i_L) exceeds that of the interest rate on bank credit (given by $1/(1-\mu)$) for small initial values of μ, so the degree of financial repression increases and the wealth effect is negative. This effect is reversed if μ is large, but only the former case is considered below. Notice, finally, that in the case of foreign exchange sales at the official rate the direct wealth effect is positive. In addition, there is a positive wealth effect that arises from lower household deposit holdings, which reduce the base of the financial repression tax. Since the sign of i_7 is ambiguous in this case, the rate of financial repression may

increase or decrease, so wealth effects arising from this source are ambiguous. Finally, if foreign exchange is sold at the free rate, there are no direct wealth effects (the first term in w_7 disappears). Since i_L rises, the degree of financial repression increases and the wealth effect from this source is negative. In this case, the net wealth effect depends on the initial degree of financial repression (ρ), and is more likely to be negative the lower the initial degree of financial repression.

Turning to the remaining variables in equation (3.20), changes in the premium, the real exchange rate, and the economy's net foreign assets all exert direct wealth effects in a straightforward manner, as well as indirect effects similar to those of the monetary policy instruments through their influence on the degree of financial repression. Both the real exchange rate and the stock of net foreign assets also affect the base on which the financial repression tax is levied. In particular, increases in e and F are associated with increases in L^p, which increases the private sector's net creditor position vis-à-vis the public sector. While this effect tends to offset the otherwise positive wealth effects of increases in e and F, inspection of w_2 and w_3 reveals that this offset is only partial, since it is dominated by the direct wealth effect in both cases. Thus w_2 and w_3 are both positive.

The next step is to put these results together to examine how the effects of changes in financial instruments are transmitted to the commodity market in this model. Using equations (3.18), (3.20), and (3.9) in (3.17), equation (3.17) can be written as:

$$e = e(p, \hat{e}, F; l^b, i_d, \mu, F^p), \tag{3.21}$$

with:

$$e_1 = -\Delta_2^{-1}(E_1 i_1 + E_2 w_1) < 0,$$

$$e_2 = -\Delta_2^{-1}/E_1 > 0,$$

$$e_3 = -\Delta_2^{-1}(E_1 i_3 + E_2 w_3) < 0,$$

$$e_4 = -\Delta_2^{-1}[E_1 i_4 + E_2 w_4 + i_c e] < 0,$$

$$e_5 = -\Delta_2^{-1}[E_1 i_5 + E_2 w_5 + (1-\mu)^{-1} e l^b] \gtrless 0,$$

$$e_6 = -\Delta_2^{-1}[E_1 i_6 + E_2 w_6 + i_c e l^b/(1-\mu)] < 0,$$

$$e_7 = -\Delta_2^{-1}(E_1 i_7 + E_2 w_7) \gtrless 0,$$

where

$$\Delta_2 = E_1 i_2 + E_2 w_2 + x' + i_c l^b > 0.$$

This equation describes the relationship between the equilibrium real exchange rate (i.e., the real exchange rate that clears the goods market) and the monetary policy instruments, as well as the endogenous dynamic variables, p, $\hat{e}$, and F. Recall that the effect of changes in the monetary policy instruments on aggregate demand is the inverse of their effect on the real exchange rate e (since $e = \bar{s}/P$ and changes in aggregate demand are reflected one-for-one in changes in P). Consider, for example, an increase in central bank credit to the banking system (l^b). Thus, from (3.21) we can write:

$$\begin{aligned} dP/dl^b &= -de/dl^b, \\ &= -(e_4 + e_2 d\hat{e}/dl^b + e_1 dp/dl^b + e_3 dF/dl^b). \end{aligned} \tag{3.22}$$

Equation (3.22) decomposes the effect of changes in l^b on aggregate demand into two parts. The term e_4 captures the "partial equilibrium" contribution of l^b to aggregate demand – i.e., the effect of, say, an increase in l^b on aggregate demand after allowing for portfolio reallocations, but before allowing for any induced adjustments in the premium p, in the expected future time path of the real exchange rate (that is, $\hat{e}$), or in the economy's net foreign assets F. Changes in l^b will, however, also induce general-equilibrium adjustments in these other endogenous variables. Thus, the term $e_1 dp/dl^b$ captures the effects of l^b on demand which operate through induced changes in p, the term $-d\hat{e}/dl^b$ captures effects which appear through induced changes in $\hat{e}$ (the inverse of the domestic inflation rate), and $e_3 dF/dl^b$ measures effects transmitted through changes in the stock of foreign assets.

These induced effects are taken into account in the next section. For the present, we concentrate on the partial-equilibrium effects. These are given by the partial derivatives e_4 through e_7 under

equation (3.20) for each of the four monetary policy instruments respectively. As these partial derivatives indicate, the partial-equilibrium effect operates through three distinct mechanisms – a real interest rate effect, a real wealth effect, and a fiscal effect.

Consider first an expansion of credit to the banking system (an increase in l^b). From equation (3.18), given p, e, and F an increase in l^b requires a reduction in i_L to restore portfolio equilibrium ($i_4 < 0$). This stimulates private demand through the real interest rate effect ($E_1 i_4 > 0$). Since i_L falls, the degree of financial repression decreases, and this increases real private wealth (equation (3.20)). Thus the wealth contribution $E_2 w_2$ reinforces the interest rate effect. An increase in l^b, finally, increases revenues for the public sector due to the interest charges on the larger stock of credit extended by the central bank, and since this additional revenue, amounting to $i_c e$, is spent by the government on home goods, demand increases for this reason as well.

An increase in the administered interest rate on deposits in principle has an ambiguous effect on demand. Consider, however, the "currency substitution" case mentioned earlier. In this case, $i_5 < 0$ (equation 2.18). The interest rate effect ($E_1 i_5$), which is the source of the ambiguity in the more general case, is therefore positive under these circumstances. Since the degree of financial repression falls ($i_5/i_L - 1/i_L < 0$) whether i_5 is positive (under the conditions mentioned previously) or negative, wealth rises, and the contribution of the wealth effect is therefore always positive. The fiscal effect is also positive, since central bank (and thus government) income is increased when administered interest rates are raised ($el^b/(1-\mu) > 0$). Thus, either the "currency substitution" case or a sufficiently weak positive effect of increases in i_d on the loan interest rate i_L is sufficient to make the partial-equilibrium effect of an increase in i_d on aggregate demand positive.[13]

Increases in the required reserve ratio increase the portfolio-equilibrium loan interest rate, exerting a negative effect on demand through this channel ($E_1 i_6 < 0$). Moreover, the degree of financial repression is increased as well, resulting in a negative wealth effect on demand. Due to the increase in the administered credit interest rate i_c, however, fiscal revenue increases, thus providing

a positive effect which functions as at least a partial offset to the negative demand effects described above. Though e_6 could thus have either sign, only the case $e_6 < 0$ will be considered in the remainder of this chapter.[14]

The monetary authorities can bring about an increase in F^p by selling some of their foreign exchange reserves in the free exchange market. The autonomous effect on demand is ambiguous in sign. If the foreign exchange is sold at the free rate and the initial degree of financial repression is sufficiently low (so $w_7 < 0$), an increase in F^p raises the portfolio-equilibrium loan interest rate, making the interest rate effect $E_1 i_7$ negative. The consequent increase in the degree of financial repression exerts an additional negative wealth effect, which is not offset in this case by the reduction in the base of the financial repression tax.

The remaining partial derivatives can be used to analyze the general-equilibrium effects. As shown in equation (3.22), monetary policy instruments induce changes in aggregate demand through their effects on the parallel market premium, on expectations of inflation, and on the economy's net foreign assets. Increases in the premium and in the economy's stock of foreign assets both decrease the portfolio-equilibrium loan interest rate, which exerts positive interest rate as well as wealth effects (by reducing the degree of financial repression) on demand. They also directly increase real household financial wealth, which supplements the indirect wealth effect through the reduction in financial repression. An increase in the expected rate of inflation, given the loan interest rate, lowers the expected real interest rate and thereby stimulates demand for home goods.

Because of these induced effects operating through p, $\hat{e}$, and F, the total effect of monetary policy instruments on domestic aggregate demand differs from the partial-equilibrium effect described above. In order to determine the net effect of policy instruments on aggregate demand, it is necessary to take these indirect transmission mechanisms into account – i.e., to calculate the total effect of policy instruments including effects transmitted through changes in p, $\hat{e}$, and F. These general-equilibrium effects can be derived from a solution to the model.

4 General Equilibrium Implications

As a preliminary step in this analysis, we use equation (3.21) to derive the dynamic equation for the real exchange rate. Inverting (3.21) and solving for $\hat{e}$ yields:

$$\hat{e} = h(p, e, F; l^b, i_d, \mu, F^p) \tag{3.21a}$$

with:

$$h_1 = -e_1/e_2 > 0,$$

$$h_2 = 1/e_2 > 0,$$

$$h_3 = -e_3/e_2 > 0,$$

$$h_4 = -e_4/e_2 > 0,$$

$$h_5 = -e_5/e_2 \gtreqless 0,$$

$$h_6 = -e_6/e_2 < 0,$$

$$h_7 = -e_7/e_2 \gtreqless 0.$$

The intuition underlying these partial derivatives follows directly from the corresponding derivatives in equation (3.21).

The model can now be represented as a system of three differential equations in p, e, and F. The system consists of equations (3.19), (3.21a), and (3.10) respectively. There is a single predetermined variable in this system (the stock of net foreign assets F), and two "jump" variables (p and e).

To solve the model, the system is first linearized around the steady state defined by $\dot{p} = \dot{e} = \dot{F} = 0$, which is denoted ($p^*, e^*, F^*$). This linearized system is:

$$\begin{bmatrix} \dot{p} \\ \dot{e} \\ \dot{F} \end{bmatrix} = \Pi \begin{bmatrix} p_4 & p_5 & p_6 & p_7 \\ h_4 & h_5 & h_6 & h_7 \\ 0 & 0 & 0 & 0 \end{bmatrix} \begin{bmatrix} l^b \\ i \\ \mu \\ F^p \end{bmatrix} \tag{3.23}$$

where:

$$\Pi = \begin{bmatrix} p_1 & p_2 & p_3 \\ h_1 & h_2 & h_3 \\ 0 & F_2 & 0 \end{bmatrix},$$

and, for symmetry, the function F has been defined as $F(e) = x(e)/e$ (so $F_2 = x'/e > 0$). The properties of this equilibrium can be determined from:

$$Trace(\Pi) = p_1 + h_2 > 0,$$

$$Det(\Pi) = F_2(p_3 h_1 - p_1 h_3) < 0.$$

Since the trace condition implies that the sum of the roots must be positive, the system has at least one positive root. Since the negative determinant means that the product of the roots is negative, on the other hand, the number of negative roots is odd. This establishes that the system contains one negative and two positive roots – i.e., the equilibrium (p^*, e^*, F^*) exhibits saddle-point stability. Let λ denote the negative root. The solution of the model can be written as:

$$F = F^* + (F_0 - F^*)\exp(\lambda t), \tag{3.24a}$$

$$e = e^* + (\lambda/F_2)(F_0 - F^*)\exp(\lambda t), \tag{3.24b}$$

$$p = p^* + [(p_3 + p_2\lambda/F_2)/(\lambda - p_1)]\exp(\lambda t). \tag{3.24c}$$

Taking time derivatives of these expressions yields:

$$\dot{F} = \lambda(F_0 - F^*)\exp(\lambda t), \tag{3.25a}$$

$$\dot{e} = \lambda(\lambda/F_2)(F_0 - F^*)\exp(\lambda t), \tag{3.25b}$$

$$\dot{p} = \lambda[(p_3 + p_2\lambda/F_2)/(\lambda - p_1)](F_0 - F^*)\exp(\lambda t). \tag{3.25c}$$

Equation (3.25a) indicates that when the economy's net foreign assets are below their steady-state level ($F_0 - F^* < 0$), F will be rising (recall that $\lambda < 0$). That is, a trade surplus will emerge. Similarly, from (3.25b), this situation will be characterized by a real appreciation (i.e., expected and actual inflation in excess of the world rate, which has been taken to be zero). With regard to the premium, according to equation (3.25c), its behavior under these circumstances depends on the sign of $(p_3 + p_2/F_2)/(\lambda - p_1)$.

The denominator of this expression is negative, but since the sign of p_2 is ambiguous, so is the sign of the numerator. Some benchmark cases shall be considered below.

To investigate the general-equilibrium effects of monetary policy, begin by deriving the steady-state effects of changes in monetary policy instruments. Setting $\dot{p} = \dot{e} = \dot{F} = 0$ in (3.23) and solving for dp, de, and dF yields:

$$\begin{bmatrix} dp \\ de \\ dF \end{bmatrix} = \frac{-F_2}{Det(\Pi)} \begin{bmatrix} p_3h_4 - p_4h_3 & p_3h_5 - p_5h_3 & p_3h_6 - p_6h_3 & p_7h_3 - p_3h_7 \\ 0 & 0 & 0 & 0 \\ p_4h_1 - p_1h_4 & p_5h_1 - p_1h_5 & p_5h_1 - p_1h_5 & p_7h_1 - p_1h_7 \end{bmatrix} \begin{bmatrix} dl^b \\ di_d \\ d\mu \\ dF^p \end{bmatrix} \tag{3.26}$$

Notice that, since under the assumptions of the model there is a unique real exchange rate compatible with trade-balance equilibrium, monetary policy instruments cannot affect the steady-state real exchange rate (i.e., the second row of the coefficient matrix in (3.26) consists of zeroes). The premium and the economy's stock of foreign assets, however, will be affected in the steady state, and all three variables will deviate from their steady-state values during the transition. The dynamic effects of each of the monetary policy instruments are now investigated in turn.

4.1 Central Bank Credit to the Banking System

The steady-state effects of an increase in l^b are given by:

$$dF^*/dl^b = -F_2(p_4h_1 - p_1h_4)/Det(\Pi) < 0, \tag{3.27a}$$

$$dp^*/dl^b = -F_2(p_3h_4 - p_4h_3)/Det(\Pi) \gtrless 0. \tag{3.27b}$$

Thus, an increase in central bank credit to the banking system reduces the steady-state stock of foreign assets (a result familiar from the monetary approach to the balance of payments), but has ambiguous steady-state effects on the premium.

Equation (3.27*a*) permits the time path of domestic demand in response to the increase in credit to be described. Since the initial stock of foreign assets is predetermined, the initial level of F exceeds its steady-state value F^* (i.e., $F_0 - F^* > 0$). From equation (3.24*b*), this means that $e_0 < e^*$. Since e^* is unchanged, e must appreciate on impact - i.e., the domestic price level must rise when l^b is increased. The general equilibrium effect of an increase in l^b on domestic demand is thus expansionary on impact, that is, the economy's aggregate demand curve shifts to the right.

How is this effect transmitted? From equation (3.22), we know that part of the effect arises from the partial-equilibrium component described earlier. Since F does not change on impact, none of the initial effect on demand arises from a change in the economy's net foreign assets (the fourth term in (3.22)). From equation (3.27*b*), we know that initially $d\hat{e}/dl^b > 0$. This depreciation of the real exchange rate over time implies that the domestic rate of inflation falls below its initial value (zero in this case). In itself, this effect is contractionary (since it contributes to raising the real interest rate), so it does not represent a vehicle for the transmission of positive effects on demand. Unfortunately, it is not possible to establish without further restrictions whether the free exchange rate p depreciates or appreciates on impact. Thus, some portion of the expansionary impulse may be transmitted through an increase in p.

4.2 Changes in Controlled Interest Rates

Using equation (3.26), the steady-state effects of an increase in the controlled interest rate i_d are:

$$dF^*/di_d = -F_2(p_5h_1 - p_1h_5)/Det(\Pi) > 0,^{15} \tag{3.28a}$$

$$dp^*/di_d = -F_2(p_3h_5 - p_5h_3)/Det(\Pi) < 0. \tag{3.28b}$$

Thus, an increase in the controlled interest rate increases the steady-state stock of foreign assets and reduces the steady-state

premium in the free exchange market. These results have an important implication, however. From equation (3.24*b*), the increase in F^* implied by (3.28*a*) means that, on impact, $e > e^*$. That is, the real exchange rate depreciates. Since this can only be brought about by a reduction in the domestic price level, this means that, even in the currency-substitution case in which an increase in the controlled interest rate i_d reduces the loan interest rate i_L, the effect of this measure on aggregate demand is contractionary on impact when general equilibrium interactions are taken into account.

To see how this can happen, notice that in the case of changes in i_d, equation (3.22) becomes:

$$dP/di_d = -(e_5 + e_1 dp/di_d + e_2 d\hat{e}/di_d + e_3 dF/di_d). \quad (3.29)$$

In the "currency substitution" case, e_5 is positive (see equation (3.21)). From equation (3.25*b*), the effect of a change in i_d on $\hat{e}$ on impact will be negative - i.e., domestic inflation will exceed the world rate. As equation (3.29) indicates, this adds a further expansionary mechanism to supplement the partial-equilibrium component e_5. Finally, since F does not change on impact, the last term in (3.29) is zero. Thus, the negative impact on domestic demand must arise from the term $e_1 dp/di_d$. An increase in administered interest rates exerts a contractionary effect on demand on impact because it reduces the premium in the free exchange market. It does so by increasing the relative attractiveness of holding assets in the form of deposits with the domestic banking system, thereby reducing demand for foreign currency.

This example highlights the importance of a comprehensive treatment of the transmission mechanism in developing countries. In this case, taking into account effects that operate through the unconventional mechanism of the free exchange market reverses the sign of the effect of a key monetary policy instrument on aggregate demand.

4.3 Changes in Reserve Requirements

From equation (3.26), the steady-state effects of an increase in the reserve requirement ratio are given by:

$$dF^*/d\mu = -F_2(p_6 h_1 - p_1 h_6)/Det(\Pi) < 0, \quad (3.30a)$$

$$dp^*/d\mu = -F_2(p_3 h_6 - p_6 h_3)/Det(\Pi) \gtrless 0. \quad (3.30b)$$

Equation (3.30*a*) indicates that an increase in the required reserve ratio will increase the steady-state stock of foreign assets. As in the case of administered interest rates, however, the effect on the steady-state premium is ambiguous in sign. Since $(F_0 - F^*) < 0$, equation (3.24*b*) indicates that the real exchange rate depreciates on impact - i.e., the increase in μ has contractionary short-run effects on domestic demand. Since the domestic price level begins to rise immediately (equation (3.25*b*)) and since the country's net foreign assets (F) do not change on impact, this demand contraction represents the net effect of the autonomous component of the transmission mechanism and the component operating through changes in the premium. The autonomous component, which in this case is given by the partial derivative h_6 under equation (3.21), has already been shown to be negative in sign. Though signing the separate contribution of the change in the premium would require additional restrictions, it is clear that general-equilibrium repercussions through this channel can at most dampen the effects of the partial-equilibrium component.

4.4 Intervention in the Free Exchange Market

The steady-state effects of central bank sales of foreign exchange in the free market are given by:

$$dF^*/dF^p = -F_2(p_7 h_1 - p_1 h_7)/Det(\Pi) > 0, \quad (3.31b)$$

$$dp^*/dF^p = -F_2(p_3 h_7 - p_7 h_3)/Det(\Pi) < 0.^{16} \quad (3.31b)$$

Although the magnitudes of these expressions depend on whether the foreign exchange is sold at the official or the market price, their signs do not. A sale of foreign exchange in the free market (increase in F^p) increases the steady-state stock of foreign assets ($dF^*/dF^p > 0$) and reduces the steady-state premium ($dp^*/dF^p < 0$). This measure will thus be contractionary on impact once general equilibrium interactions are taken into account, even though the sign of the partial-equilibrium autonomous component

could not be determined unambiguously (see the partial derivative h_7 under equation (3.21a)). As in previous cases, the short-run contractionary impulse must operate through some combination of autonomous effects tending to raise the real loan interest rate and of the induced change in the premium.

5 Unification of Financial Markets

5.1 Interest Rate Liberalization

The preceding results describe the impact and steady-state effects of changes in various monetary policy instruments in an economy characterized by financial repression and capital controls. For much of the developing world, these characteristics will continue to be relevant for some time. Yet, in several countries, the forceful criticism of financial repression by McKinnon-Shaw analysts has prompted some tentative moves towards financial liberalization, in the form of increases in administered interest rates towards more realistic market-clearing levels and, occasionally, reductions in reserve requirements.[17] The complete freeing of bank borrowing and lending rates, however, remains rare in the developing world and, where adopted, has not always been carried out successfully or retained permanently.

Though strategies for the eventual unification of interest rates or for the liberalization of financial markets have thus gained considerable importance over the years, experience has shown that the initial state of the economy is important to the success of the reform as well as the implementation of the reform in a least-cost manner. In particular, the financial position of the private sector and the banking system, the quality of prudential regulation over the banking system, and the extent of macroeconomic stability in the economy are all factors that will affect the pace of reform.

In low-inflation countries, especially where banking supervision is strong and efficiently enforced, and where demand management remains appropriately tight, a program of gradual interest rate unification that seeks to quickly establish positive interest rates (albeit not necessarily market-clearing) can be implemented.

Villanueva and Mirakhor (1990) have shown that within this group, countries with relatively long periods of economic stability achieved through sound and credible macroeconomic policies are good candidates for full interest rate liberalizations, subject to a strengthened system of prudential regulations over the banking system. On the other hand, in high-inflation countries, interest rate liberalization is better achieved if the economy is first stabilized. In this case the establishment of price stability and an adequate regulatory and supervisory framework for the financial markets becomes the first step necessary for moving towards market-determined interest rates.

In addition to the microeconomic, essentially industrial-organization issues raised by the adjustment of controlled interest rates towards market-clearing levels and reduction of the implicit tax on the formal financial system through the easing of reserve requirements, movements towards financial liberalization have a macroeconomic dimension which must inevitably concern policy-makers contemplating such actions. As always, the nature of the macroeconomic consequences of such policies depends on the structure of the economy in which they are implemented. We have argued previously, and demonstrated analytically in this chapter, that the emergence of informal credit and parallel currency markets represents an important aspect of the economy's macroeconomic structure, and that the nature of the macroeconomic response to policy measures such as steps towards financial liberalization will in part be affected by the existence of such markets.

In this chapter we have found, in particular, that increases in administered interest rates will tend to have contractionary macroeconomic effects on impact. While this need not argue against such policies – which may be chosen on efficiency grounds – policymakers need to be alerted to the possible need to adopt compensating measures to maintain internal balance during the process of financial liberalization. An important observation worth emphasizing, however, is that the contractionary effect of the increase in controlled interest rates is attributed above to a reduction of the premium on impact, not to the more familiar Neo-Structuralist mechanism focusing on the reduced efficiency of financial intermediation when funds are transferred from the informal to the formal market. This is so even though our model

incorporates such reduced efficiency in the form of differential reserve requirements between the two sectors. Thus, the importance of a realistic treatment of the nature of alternative stores of value in financially repressed economies is underlined.

The analysis in this chapter has also shown that a reduction in reserve requirements during the process of financial liberalization provides a potential offset to the adverse effects on aggregate demand of increases in administered interest rates. By reducing the interest rate in the informal market, through the positive wealth effect engendered by reduced financial repression – and possibly through effects on the parallel market premium – reduced reserve requirements are expansionary in this model. If in particular cases the effect is not enough to sustain internal balance during the process of financial liberalization, then the model suggests alternative monetary policy instruments, in the form of expanded credit to the banking system, or the purchase of foreign exchange in the parallel market, that can be employed to this end.

5.2 Unification of Foreign Exchange Markets

Despite some potential gains, the existence of parallel currency markets entails a variety of costs, which have been discussed in chapter 1: high volatility of exchange rates and prices, incentives to engage in rent-seeking activities and to divert export remittances – or unrequited transfers – from the official to the parallel market, etc. The unification of foreign exchange markets has thus been an important objective of macroeconomic policy in countries with sizable parallel currency transactions.

The process of unification has as its ultimate objective to absorb and legalize the parallel market for foreign exchange, eliminating the inefficiencies and market fragmentation associated with a quasi-illegal activity. In practice, unification attempts have often taken the form of adopting a uniform floating exchange rate.[18] The analytical work in this area has shown that the impact of such a policy shift on the short- and long-run behavior of the exchange rate and inflation can be ambiguous. In the long-run, the macroeconomic effects depend on the fiscal impact of the exchange rate reform. As argued by Pinto (1989, 1991), the parallel

market premium represents an implicit tax on exports repatriated through official channels, since governments in developing countries are typically net buyers of foreign exchange from the private sector. For a given fiscal deficit, there exists a trade-off between the premium and inflation, which represents a tax on domestic currency balances. The unification process, which results in the loss of the implicit tax on exports, may therefore entail a substantial (and permanent) rise in the rate of inflation and the rate of depreciation of the exchange rate, if the authorities attempt to compensate for a fall in revenue by an increase in monetary financing of the fiscal deficit and a higher tax on domestic money holdings.[19]

The short-run effects of a pre-announced future adoption of a unified, flexible exchange rate arrangement have been examined by Kiguel and Lizondo (1990), Lizondo (1987), and Agénor and Flood (1992). These authors show that if the unification attempt is fully anticipated, agents will – in order to avoid capital losses – adjust their portfolios towards foreign-currency denominated assets if the uniform floating exchange rate is expected to be more depreciated than the existing parallel rate, and towards domestic-currency denominated assets if it is expected to be more appreciated. As a result of this portfolio adjustment, the parallel market rate will depreciate immediately – at the moment the unification attempt is announced or when expectations are formed – towards the level asset holders expect the post-unification floating rate to be. Under perfect foresight, the parallel market rate will experience an initial jump and will keep depreciating steadily towards that level at the time of unification. The experience of several African countries with floating-rate arrangements during the 1980s tends to corroborate these analytical predictions.[20]

Existing analytical studies of exchange market unification have, however, usually ignored the dynamic effects associated with the existence of informal credit markets – as is, indeed, the case for almost all studies which have dealt with parallel markets for foreign exchange (see chapter 2). Unfortunately, the policy exercises conducted with the model described in this chapter – which does incorporate such markets – are not conducive to a treatment of the issue of full currency unification in the form that is most relevant empirically – i.e., unification to a floating exchange rate

regime. Nevertheless, as in the case of financial liberalization, we can make some observations about the macroeconomic consequences of partial moves towards foreign exchange market unification.

Such partial moves tend to take the form of attempts to reduce the premium of the free exchange rate over the official rate, either by devaluation of the official rate or by selling foreign exchange in the free market. The model explored in this chapter suggests that both measures will be contractionary on impact. A devaluation of the official exchange rate, other things equal, will reduce the real value of credit extended by the central bank to the banking system, l^b. As shown in section 4.1, a reduction in l^b is contractionary on impact. This could be offset, of course, by a proportionate increase in the stock of bank credit, but in this case the devaluation would have no real effects, and in particular would leave the premium unchanged, underlying the futility of pursuing a real target with a nominal instrument.

An alternative measure to reduce the premium is to sell foreign exchange in the free market. As shown in section 4.4, this policy will indeed reduce the steady-state premium p^*, but will also have a contractionary short-run effect on aggregate demand. Again, the authorities may nonetheless choose to undertake such sales (which represent the counterpart, in this model, to open-market sales in industrial-country textbook macroeconomic models), but the maintenance of internal balance will then require additional measures, as in the case of financial liberalization.

6 Summary

The key features of the developing-country financial environment emphasized in this chapter consist of (a) the absence of markets for domestic securities; (b) the presence of capital controls; and (c) the imposition of legally-determined interest rates on bank assets and liabilities. As documented in chapter 1, legal restrictions on foreign exchange and loan transactions have given rise to parallel markets for foreign exchange as well as to informal markets for loans in many countries. The tools of monetary policy in this environment consist of central bank credit to the banking

system, the setting of administered interest rates and required reserve ratios, and intervention in the free exchange market. We have not, in this chapter, taken up the workings of fiscal policy in such a setting. Both the management of monetary policy in this framework and the assessment of the macroeconomic effects of financial reform measures such as lowering reserve requirements or raising controlled interest rates require understanding of how such instruments of monetary policy affect aggregate demand.

The analysis in this chapter suggests that informal loan and foreign exchange markets play important roles in transmitting the effects of financial policy instruments to aggregate demand. They do so through a number of channels, some of which are unconventional. We have divided these channels into partial-equilibrium ones and others which operate through general equilibrium interactions. The former include, in addition to interest-rate effects through the informal loan market, those which operate through changes in household wealth and through the government budget. Wealth effects arise from the recognition that financial repression entails an implicit system of taxes and subsidies on households as creditors and debtors of the banking system. Changes in monetary policy instruments affect the effective degree of financial repression, as measured by the gap between the interest rate in the informal loan market and the officially-administered bank rate, and thus the present value of these taxes and subsidies. They do this both by changing the rate at which financial repression taxes household portfolios of given composition and by altering the composition of portfolios in ways that affect the base to which the financial repression tax applies. Moreover, since monetary policy changes affect the profits of the central bank, the fiscal consequences of these changes represent a separate channel through which the effects of policy on demand are transmitted.

General equilibrium effects emerge through the consequences of policy changes for the parallel market premium, the expected rate of inflation, and the economy's stock of foreign assets. Since all these variables affect the state of domestic demand, induced changes in their values represent important additional channels through which monetary policy may exert aggregate demand effects.

In the model specified here, the direction of change in domestic aggregate demand on impact in response to changes in monetary

policy instruments is determined by a combination of autonomous effects and effects which operate through the premium in the free exchange market. Thus the parallel foreign currency market plays a key role in the transmission of monetary policy shocks. Regarding the other two mechanisms of transmission, the effects of induced changes in the stock of foreign assets are felt only over time (since this stock evolves as a function of cumulative current account surpluses), while expectations of future inflation tend in each case to dampen the demand effects of the policy change. The reason is that expectations of future inflation are expansionary. Since in this model the price level tends to return to its steady-state level, an expansionary shock (one which increases today's price level) will reduce expected future inflation, which in itself has a contractionary influence. Conversely, a contractionary shock will reduce today's price level, but only temporarily, and the expected recovery of prices is itself expansionary.

For two of the monetary policy instruments examined here – central bank credit to the banking system and the required reserve ratio – the short-run general-equilibrium impact on demand is qualitatively the same as the partial equilibrium impact operating through loan interest rate, wealth, and fiscal effects. Whether the general equilibrium repercussions through the free market premium and expected inflation on balance augment or weaken these effects depends on the particular values given to the parameters of the model, as will be seen in subsequent chapters. Thus, in empirical assessments of the likely macroeconomic impacts of prospective monetary policy measures, these general-equilibrium mechanisms must be taken into account.

In the case of changes in administered interest rates and intervention in the free exchange market, the full general-equilibrium effects of the measures differ from what would be predicted on partial-equilibrium considerations. Increases in administered interest rates prove to be contractionary (i.e., aggregate demand for home goods decreases), even in the currency-substitution case in which partial equilibrium demand effects are positive. The reason is that the adverse wealth effects of a lower premium in the free exchange market overwhelm the positive contribution to demand emanating from lower loan interest rates. This has obvious implications for the preservation of internal balance in such an economy during a gradual stepwise transition to financial liberalization. Similarly, though the partial-equilibrium consequences of a sale of foreign exchange in the free market by the central bank are ambiguous, this measure can also be shown to be contractionary when induced general-equilibrium mechanisms of transmission are incorporated into the analysis. Thus, intervention in the free market functions in a manner similar to open-market operations in industrial countries. Again, there are lessons here for the management of aggregate demand in the context of attempts to lower the premium through central bank intervention in the free foreign exchange market.

For the purpose of identifying the nature of the macroeconomic interactions that govern the impacts of monetary policy instruments on aggregate demand in developing countries, the analytical model presented in this chapter must be extended in several directions. First, some stickiness in price adjustment is likely to be empirically important in many cases, and this would affect not only the price-output consequences of changes in demand, but also the role of expectations of inflation in transmitting the effects of monetary policy. Second, the complete separation between official and informal foreign exchange markets assumed in this chapter for analytical convenience is rarely observed in practice. Unfortunately, the introduction of cross-transactions between markets, a widespread phenomenon in developing countries, substantially complicates the analysis, and is best addressed in the context of a complete numerical simulation model. The next chapter turns to the specification of such a model.

Notes

1 The analysis in this section is based on Montiel (1991).
2 As long as the speed of adjustment of the capital stock to its desired value via investment/disinvestment is slow relative to the rate at which financial markets adjust, the analysis of the short-run behavior of aggregate demand presented in this and the subsequent chapter will remain valid under this restriction.
3 The inclusion of currency (as in the Neo-Structuralist models reviewed in chapter 2) would not affect, qualitatively, the results derived below.

4 Alternatively, F^p could be taken to include the stock of land. In essence, F^p is an asset with a flexible, market-determined domestic price which is traded in organized markets by well-informed agents. It is intended to represent "inflation hedges", which figure so prominently in developing-country policy discussions and might best be considered a composite of highly substitutable assets, such as land and foreign exchange.

5 That is, agents observe all current variables and their current rates of change, but cannot necessarily predict levels of variables in the indefinite future.

6 Real output, which tends to shift asset composition among money and all other assets in response to transactions motives, is excluded from the asset demand functions because the assumptions of slow capital-stock adjustment and full employment render its level constant over the time frame of the analysis.

7 Since the real interest rate already appears with a negative sign in equation (3.4), including the present value of factor incomes among the arguments of the function $E(.)$ would not qualitatively affect the analysis. Notice that this specification rules out direct McKinnon-shaw effects of the controlled interest rate i_d on private consumption via intertemporal substitution, reflecting the Neo-Structuralist assumption that the interest rate in the informal credit market represents the marginal cost of funds. The effects of this omission are discussed below.

8 This is actually an approximation to the true present value of the subsidy, which in principle should depend on the entire stream of future interest rates and credit. The formulation adopted here is consistent with our assumption of perfect myopic foresight.

9 This assumes, of course, that foreign exchange reserves do not pay interest.

10 The analysis in this chapter focuses on monetary policy instruments, rather than fiscal policy, so there will be no other role for the government than to dispose of these funds. Fiscal policy is considered in chapter 4.

11 Sales at the official exchange rate may be inadvertent. For example, the case of "leakages" from the official to the parallel market arising from export under-invoicing or import over-invoicing can be treated here as a sale of foreign exchange to the parallel market at the official rate. A dual-market model incorporating such leakages is presented in the next chapter.

12 Essentially what is required is that the semi-elasticity of the demand for deposits with regard to the "own" interest rate i_d does not greatly exceed the cross elasticity with regard to i_L.

13 Notice that, if the direct McKinnon-Shaw effect of i_d on consumption were present, this would contribute to a negative interest rate effect on demand, making the ambiguous case more likely. However, as the next section will show, the presence of i_d in the consumption function will not alter the qualitative nature of the general-equilibrium effects of changes in i_d.

14 The case $e_6 < 0$ is of greater interest both because it is likely to be empirically dominant and because the magnitude of the fiscal effects are tied to essentially arbitrary assumptions about the initial size of l^b and the composition of government spending.

15 This expression can be signed unambiguosly after substituting from equations (2.19) and (2.21*a*).

16 This term can be signed after substituting from equations (2.19) and (2.21).

17 See Fry (1988), Leite and Sundararajan (1990), Villanueva and Mirakhor (1990), and the World Bank's 1989 *World Development Report* for recent discussions of liberalization experiences.

18 Although, in theory, unification could also take the form of adopting a uniform fixed or crawling peg regime – with changes in net foreign assets clearing the official foreign exchange market – few developing countries have opted in recent years to unify their foreign exchange markets in this way.

19 Pinto's analysis is based on a model in which agents are subject to rationing in the official market for foreign exchange. Lizondo (1991) has shown, however, that Pinto's emphasis on the trade-off between the premium and inflation in the unification process remains largely valid if the official market clears through changes in foreign reserves.

20 On these experiments, see Roberts (1989) and Pinto (1989). The data presented in Agénor (1992) indicate that the parallel market premium rose substantially in the months before the reform of the exchange system was implemented and fell sharply afterwards. A significant premium reemerged subsequently in countries where money growth was not kept under control.