5

Policy Issues and Model Simulations

This chapter presents simulation results for several policy experiments, using the expanded model described in the previous chapter. These results generalize those obtained from the experiments conducted in chapter 3, not only in the sense that they emerge from a much more complete model, but also in that the full dynamic path, rather than just impact and steady-state effects, will be explored. Expectations are "consistent" in the sense that they are formed using the future simulated values from the model itself.[1] Agents are "rational" in that they know the model, all past and current data, and the values of all future exogenous variables – although some shocks may come as "surprises" – and use this information to form their expectations. With the use of consistent expectations, current effects of anticipated policies can be appraised, and the dynamic effects of policy changes that alter the time pattern of key macroeconomic variables can be determined. In principle, this simulation procedure does not imply that the model is immune from the "Lucas critique" (see Lucas, 1976), according to which a policy change sufficiently atypical as to amount to a change in "policy regime" could well induce behavioral responses by private sector agents that shift the parameters of the model's equations. However, the analysis of policy changes that lie within a short range of policy variations would not be subject to this critique.[2]

Using the parameter set, as well as the starting values of exogenous variables shown in table 4.1 above, a baseline which approximates the steady state solution of the model is first calculated. Once the baseline is established, the properties of

the model are examined by subjecting it to a variety of shocks. We study here the effects of four domestic policy shocks, affecting variables which have featured prominently in stabilization programs in developing countries. These consist of a fiscal shock, in the form of a change in government expenditure on home goods, two monetary policy shocks considered in chapter 3, consisting of increases in central bank credit to commercial banks and in the interest rate on bank loans, and a devaluation of the official exchange rate. The first two shocks are assumed to be transitory in nature, the interest rate shock is maintained during five periods, and the exchange rate change is assumed to be permanent.[3] The results reported here refer to anticipated shocks which, although announced in period t, are implemented in period $t + 5$ and are fully credible.[4] For the first three experiments, the nominal wage is maintained at its market-clearing level calculated in the baserun solution. This assumption allows us to focus on transmission mechanisms to the real sector other than wage flexibility *per se*. For the exchange rate experiment, wages are assumed to adjust rapidly – but not completely – to their new equilibrium level, due to the permanent nature of the shock. Finally, in the initial steady state, it is assumed that:

$$L^p_{-1}/D^p_{-1} > [(1-\mu)i_L - i_d]/(i_L - i_c), \qquad (5.1)$$

that is, using (4.31), $L^p_{-1}/D^p_{-1} > (1-\mu)$, so that interest rate ceilings indeed provide a net subsidy, rather than imposing a tax, to households, allowing our simulations to take into account the existence of a "quasi-fiscal" deficit (an excess of expenditure over income in the financial public sector), which is a common phenomenon in many developing countries.

1 Effects of Government Spending on Home Goods

Consider first a temporary (one-period only), fully anticipated increase by 10 percent in government spending on home goods G_h, financed by central bank credit. Figure 5.1 depicts deviations from baseline values for some key endogenous variables in the model: real output of home goods, the domestic price level, the parallel exchange rate, the stock of net foreign assets of the central

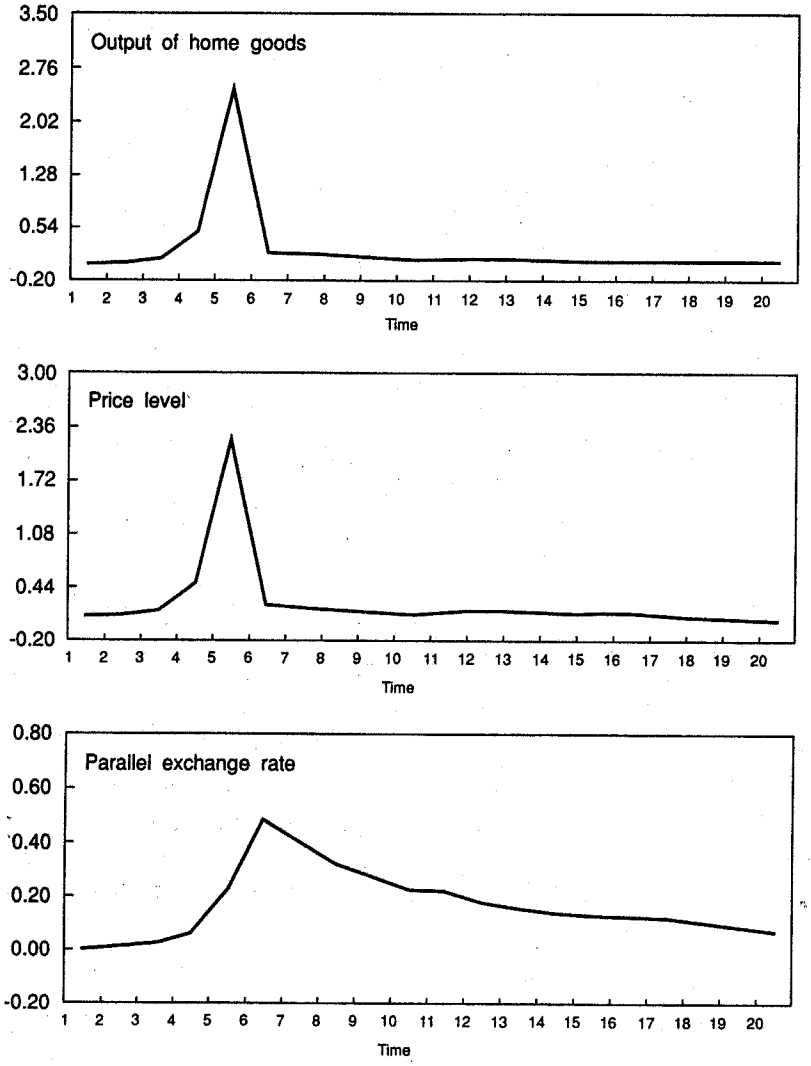


Figure 5.1(a)

Figure 5.1 Temporary increase in spending on home goods of 10 percent (percentage deviations from baseline)

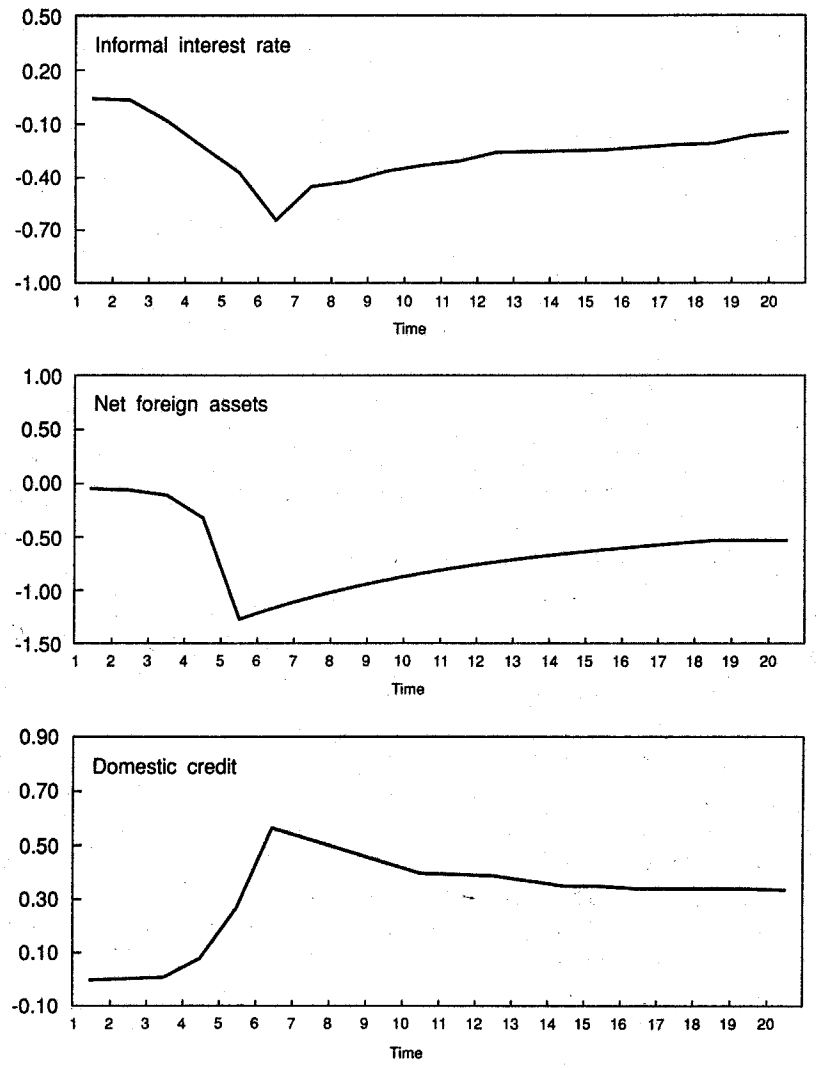


Figure 5.1(b)

bank, the informal interest rate, and total domestic credit (which is endogenous in the model).

The anticipation of a future credit-financed increase in government spending on home goods has macroeconomic consequences before the shock itself actually occurs, as shown by the behavior of the variables between period t and $t + 4$. The price of home goods rises prior to the policy change. Since the nominal wage is maintained at its baseline level, the real product wage unambiguously falls and this, in turn, stimulates domestic supply. This last effect is rather weak initially, but increases in the period preceding the implementation of the spending shock.

These initial effects operate largely through the informal markets – the parallel exchange rate depreciates and the curb interest rate falls prior to implementation. The expected rate of return on foreign currency-denominated assets rises, as a result of an anticipated future depreciation of the parallel exchange rate associated with the forthcoming increase in the domestic money supply, due to the increase in credit-financed government spending. This gives agents the incentive to switch away from domestic assets and towards foreign currency assets before the shock occurs. As a consequence, the parallel rate depreciates. The rise in the premium induced by the increased demand for foreign exchange reduces the private sector's demand for deposits, causing households to shift assets into the informal loan market, which leads to a fall in the curb market interest rate. These phenomena exert income and wealth effects which increase private demand prior to the implementation of the fiscal shock. The future expected rise in domestic prices reinforces the drop in the nominal interest rate, causing the real rate of interest to fall initially. In turn, the fall in the real rate further stimulates private expenditure, contributing to the anticipatory increase in the domestic price level.

The short-run reduction in the rate of interest in the informal loan market has two offsetting effects. On the one hand, it reduces the implicit subsidy provided by controls and decreases real disposable income. On the other, it magnifies the size of the decline in the real interest rate associated with expected inflation, as indicated above, and this stimulates private expenditure, offsetting in part the demand-reducing effect coming through disposable income. The net short-run effect through informal

markets on private spending, operating through both the premium and the informal loan rate, is expansionary prior to implementation of the spending shock.

Upon implementation, the rise in government spending is expansionary both directly and through its monetary effects. The increase in the money supply reinforces the direct expansionary impact of the fiscal shock, and operates again through the informal market for foreign exchange, that is, through a sharp increase in the premium. Although the curb interest rate falls when the policy is implemented, the real interest rate actually rises, because the removal of the fiscal stimulus in the next period produces an expected price decline. Thus the transitory nature of the shock diminishes its expansionary effect with forward-looking agents. After the shock is removed, the system returns to its initial equilibrium only gradually, since the monetary effects of the once-and-for-all credit infusion take time to dissipate through the balance of payments. Finally, smuggled exports increase the flow of foreign exchange channeled illegally in the economy, but this is more than offset by a rise in smuggled imports, implying that the stock of foreign currency-denominated assets decreases over time. The portfolio implications of this tend to sustain the initial rise in the curb interest rate, keeping upward pressure on the premium and prolonging the return to the original equilibrium.

2 Effects of Central Bank Credit to Commercial Banks

Consider now a fully anticipated, transitory increase by 10 percent in central bank credit to the commercial banks L^b, implemented in period $t + 5$. Figure 5.2 shows deviations from baseline values for some of the key endogenous variables in the model.

Because the fiscal expansion considered previously was credit-financed, the outcome of this exercise resembles in many respects that of the fiscal policy experiment, except that the credit infusion is now removed after one period. As before, the anticipated increase in central bank credit generates output and price effects before the shock actually takes place. The anticipated rise in the premium leads to an immediate depreciation of the parallel

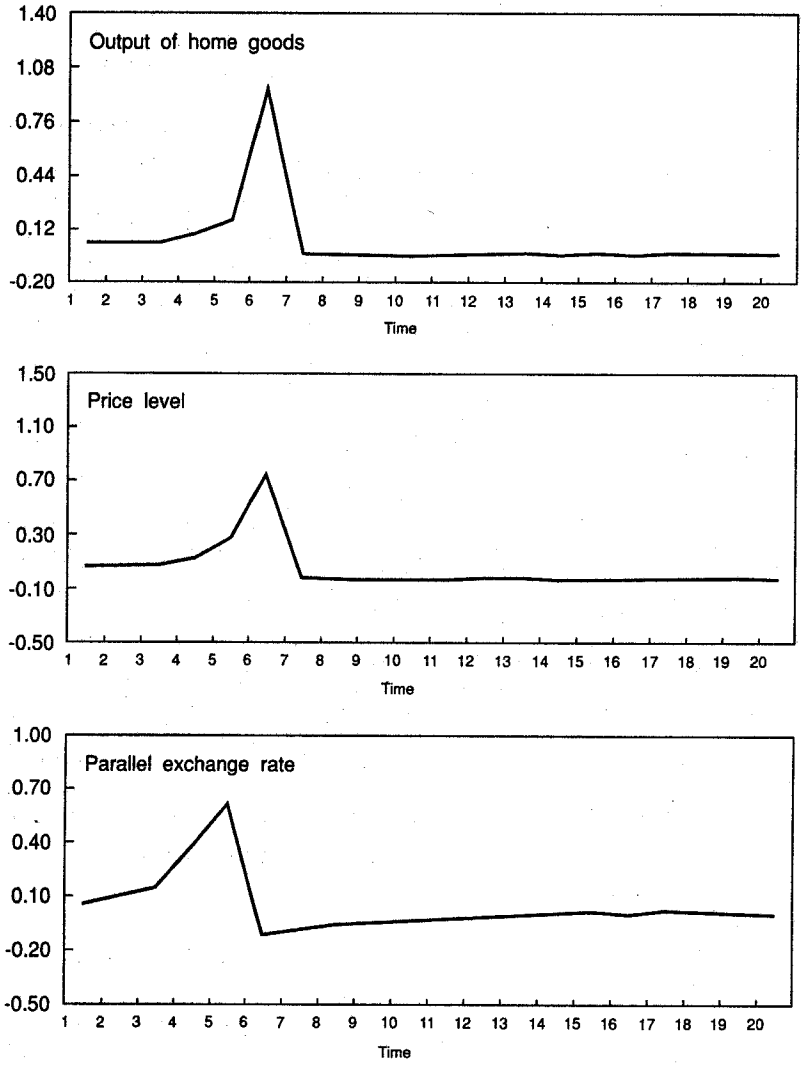


Figure 5.2(a)

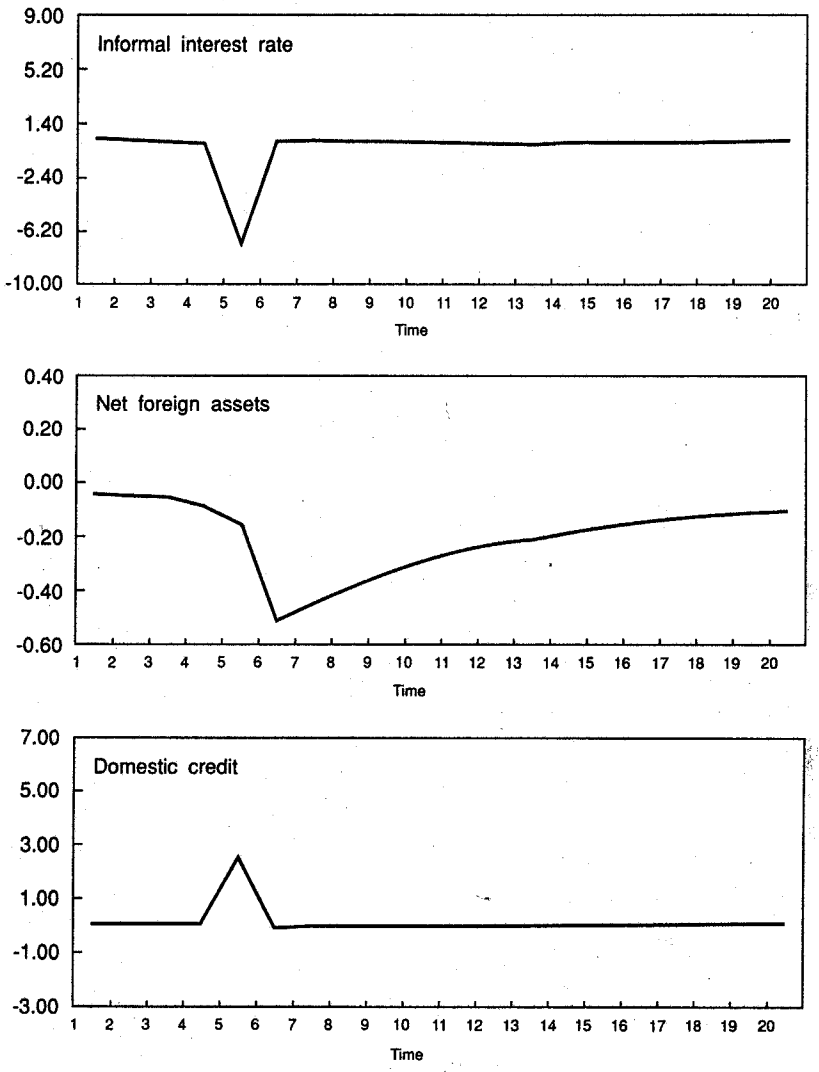


Figure 5.2(b)

Figure 5.2 Temporary increase in central bank lending of 10 percent (percentage deviations from baseline)

exchange rate. This raises the domestic price of imported goods, and together with a wealth-induced expansion in aggregate demand, leads to an increase in the price level and to an output expansion in the home goods sector. Net foreign assets of the central bank fall, as a consequence of the higher level of domestic activity (which raises imports), and the increase in under-invoicing of exports (resulting from the higher premium). During the transition period $(t, t + 4)$, output and prices rise, the parallel exchange rate depreciates continuously, and the curb interest rate falls for the same reasons as those indicated for the fiscal shock.

When the increase in central bank credit actually occurs (in period $t + 5$), loans to the private sector by commercial banks expand. As a result, the demand for credit in the informal market falls, and the curb interest rate drops sharply (by about 7 percentage points, or 21 percent in relative terms). The reduction in the financial repression tax lowers the implicit subsidy provided by controls on interest rates, therefore reducing disposable income – since households are net debtors – and this has a negative effect on private spending. But the fall in the curb rate also reduces the real interest rate, which has a positive effect on private expenditure. The net effect is as in the simple model of chapter 3 – i.e. an expansion of private spending, which stimulates output and raises prices.

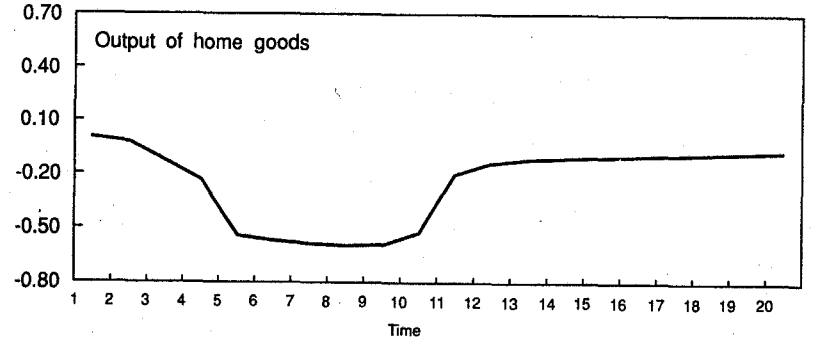
The fall in the curb market interest rate gives agents the incentive to switch towards foreign currency-denominated assets, leading to a sharp spike in the premium. As the stock of foreign assets held by the private sector increases prior to period $t + 5$, the undoing of the credit expansion leaves the private sector with a portfolio more heavily weighted toward foreign exchange than initially, and the parallel exchange rate appreciates beyond its initial level in the process of restoring portfolio equilibrium. The appreciation of the free exchange rate reduces the propensity to under-invoice exports, increases the flow of foreign exchange channeled through the official market, and reduces the rate of accumulation of foreign-currency denominated assets. Overall, therefore, the short- and long-term effects of a credit expansion are qualitatively quite similar to those resulting from an expansion of government expenditure on home goods described above.

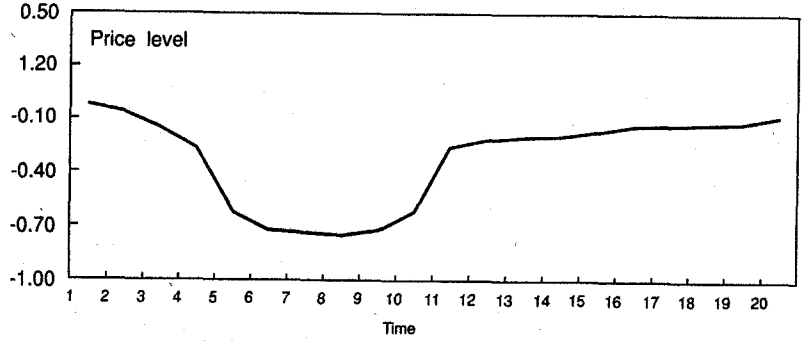
3 Interest Rate Liberalization

An alternative monetary policy tool frequently employed in developing countries, and discussed extensively in the previous chapters, is an increase in administered interest rates. This measure, which – as indicated previously – has been advocated by the McKinnon-Shaw school, is intended to attract funds into the organized financial system, thereby making them available for lending to private agents. The effects of such a policy on aggregate economic activity are *a priori* indeterminate since, on the face of it, this policy would seem to increase the cost of credit while at the same time increasing credit availability. Nonetheless, in the analytical model of chapter 3 the policy proved to be contractionary on impact.

Consider, then, a fully anticipated increase in the interest rate that banks charge on their loans to domestic agents i_c) by one percentage point (equivalent to a 20 percent rise, in relative terms), implemented in period $t + 5$ and left in place until period $t + 10$. Figure 5.3 summarizes the results.

This measure affects economic activity through a number of channels. As in the analytical model of chapter 3, however, a key step in this transmission mechanism is the portfolio reallocation to which this policy gives rise. An increase in the bank lending rate also raises (in the proportion $1 - \mu$) the interest rate paid on bank deposits. This rise in interest rates in formal financial markets causes individuals to attempt to move funds from both the informal loan market and from foreign-asset hoards into domestic deposits. As a result, the curb interest rate rises when the measure is implemented, and the free-market exchange rate appreciates, both on impact and, as is now familiar, when the measure first becomes anticipated. The magnitude of both effects depends, as in the model of chapter 3, on the degree of substitutability among these assets. As the parallel exchange rate appreciates, the domestic-currency value of financial wealth falls, to an extent that depends on the weight of foreign currency assets in private portfolios. The reduction in the nominal value of wealth causes a secondary reallocation of portfolios, since the demand for interest-bearing assets is linearly homogeneous in (non-





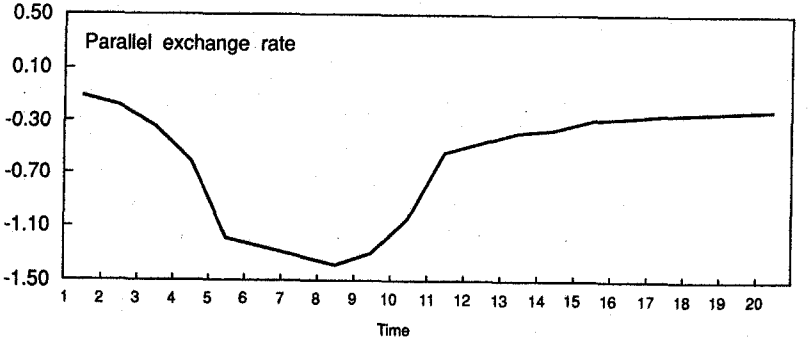
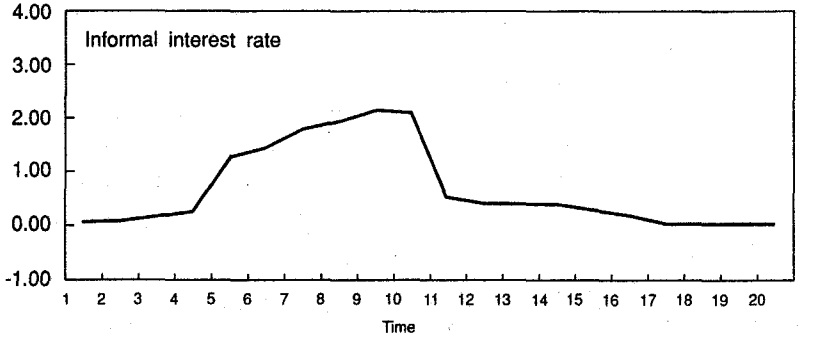
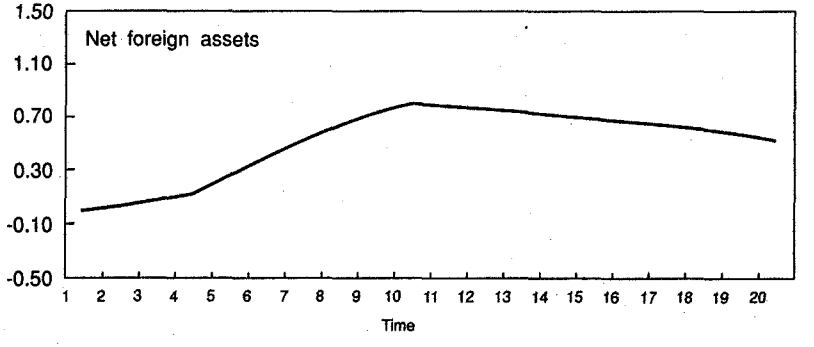


Figure 5.3(a)

Figure 5.3 Increase in bank lending rate of 1 percentage point (percentage deviations from baseline)





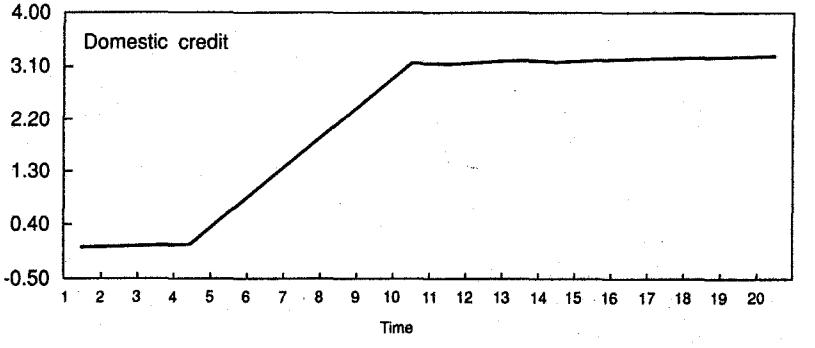


Figure 5.3(b)

currency) financial wealth. Because of this wealth effect, the demand for domestic deposits may, indeed, rise or fall in net terms. In this model, the combination of fairly high substitution elasticities between domestic deposits and foreign exchange (i.e., the currency-substitution setting) and an important share of foreign assets in private portfolios leads to large wealth effects, and a *reduction* in domestic bank deposits at the announcement period which persists even after the administered interest rates in the domestic financial system are raised.

This measure once again has contractionary effects on prices and output for a number of reasons. First, the appreciation of the parallel exchange rate reduces the real value of private wealth. Second, the exchange rate appreciation also reduces the producer price for domestic exports. Third, the implicit subsidy provided by controls on interest rates falls, as the proportional increase in the controlled interest rate exceeds that in the curb market. The increase in the informal interest rate exerts direct contractionary effects on spending as well. Consequently, output and domestic prices fall when the measure is implemented. Note that only the last of these effects figures prominently in existing (in this case, Neo-Structuralist) models.

It is worth noting that the anticipation of these effects brings the contractionary impact of this measure forward to the first period – that is, to the period in which the policy change is first announced. The reason is the combination of a negative wealth effect from the reduction in the premium and the fact that the anticipated price decrease in the fifth period raises the real interest rate in the fourth period, which reduces output and the price level in that period, which then affects price expectations and the real interest rate in the third period, and so on. The contractionary effects of the anticipated measure increase over time as the date of implementation approaches. However, in similar fashion, the anticipated reversal of the interest rate increase exerts an expansionary effect before it occurs. The increase in the bank lending rate is removed in the eleventh period, and thus the peak contraction occurs in periods six and seven.

The mechanisms through which an increase in bank lending and deposit rates could lead to a contractionary effect have not been thoroughly treated in the literature, in the sense that general

equilibrium interactions of the types described above have typically been neglected.[5] The model developed here highlights the importance of informal market linkages and wealth effects in the determination of macroeconomic outcomes. These results suggest that the short-run macroeconomic effects of McKinnon-Shaw financial liberalization policies may prove to be problematic.

4 The Contractionary Devaluation Controversy

This sub-section examines the short- and long-run effects of a devaluation of the official exchange rate – an issue which, in the past few years, has been the subject of renewed controversy in developing-country macroeconomics.[6] We consider a 10 percent devaluation which, as before, is announced in period t and implemented in period $t + 5$, so that both the timing and the magnitude of the devaluation are known with certainty. Devaluation profits are retained by the central bank, rather than transferred to the government. As mentioned above, wages are assumed to adjust endogenously, with a coefficient of adjustment $\Psi = 0.8$, to their new equilibrium level. Figure 5.4 summarizes the results of this experiment.

At the outset, it should be noted that in our model a mechanism frequently cited through which devaluation may adversely affect real output, that is, automatic wage indexation to price level movements, is absent. Nevertheless, an official devaluation has indeed a contractionary effect on domestic real output at the announcement and implementation periods. It should also be emphasized that this is a *net* effect and thus a function of the model's parameter values and initial conditions. Expansionary effects are also present (and indeed prevail in intervening periods), but are simply dominated in this case.

The channels through which a devaluation of the official exchange rate affects real activity in our model are complex. The most important negative channel is through an increase in the real price of imported inputs, which functions as a negative supply shock. Second, the official devaluation directly increases the domestic price level (through its impact on the domestic price of imported goods), increasing thereby the demand for currency.

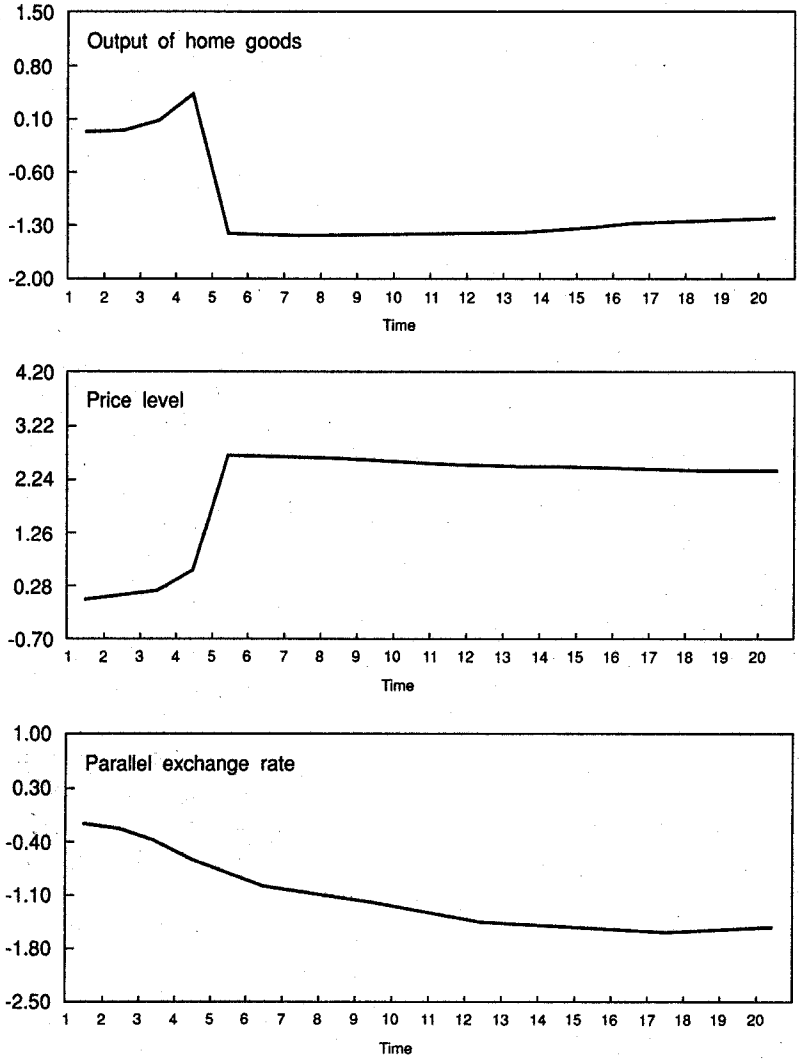


Figure 5.4(a)

Figure 5.4 Devaluation of the official exchange rate of 10 percent (percentage deviations from baseline)

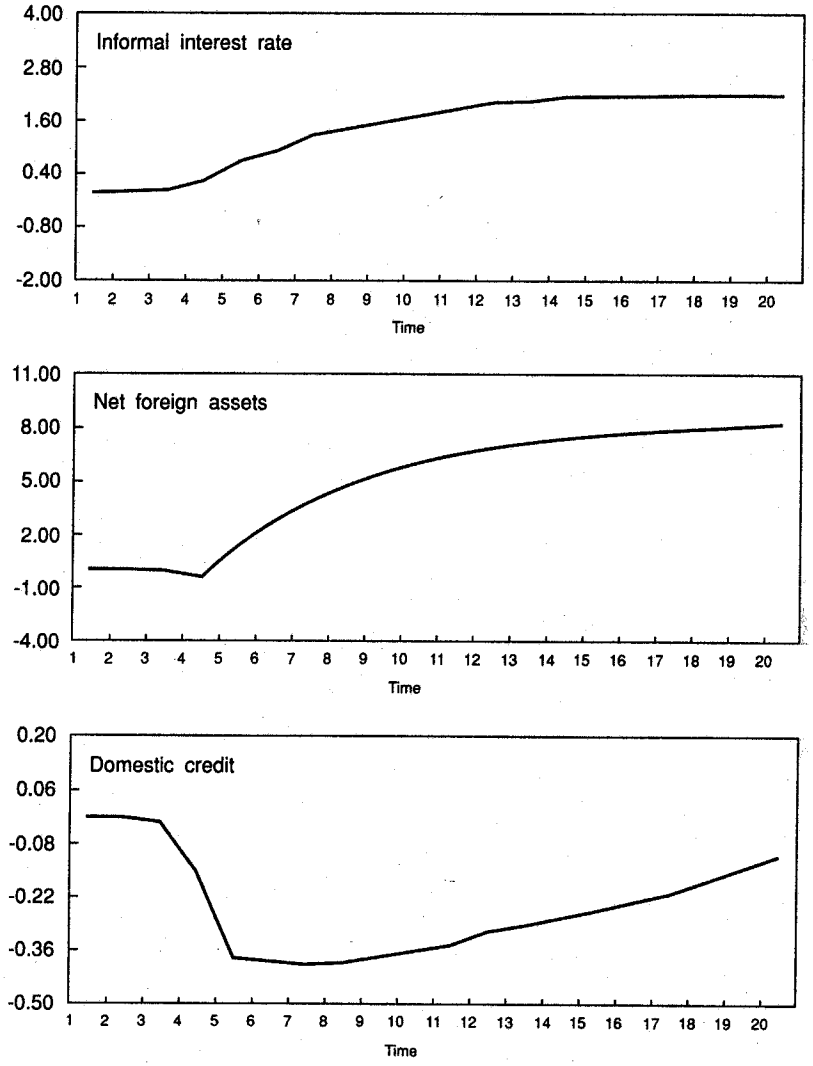


Figure 5.4(b)

Since monetary policy is unchanged, this causes households to shift funds out of deposits, curb market loans, and foreign currency assets. The result is a higher informal interest rate, and an appreciation of the parallel exchange rate.[7] The higher curb interest rate has a direct contractionary effect on private spending, as does the reduction in private real wealth brought about by a reduced domestic-currency value of foreign assets and a higher price level. Moreover, export production falls because the increase in the demand price of exports is dampened by the appreciation in the parallel exchange rate, while the supply price of exports bears the full impact of the increase in the price of imported intermediate goods. On the other hand, the induced increase in the curb market rate raises the implicit financial repression subsidy and thus real private disposable income. This has a positive effect on the demand for home goods, as does the switch in expenditure due to (officially-measured) real exchange rate depreciation. At the same time, positive supply effects arise from a reduction in the real wage. In our model, however, these expansionary effects are overwhelmed by the contractionary effects outlined earlier.

Interestingly, the effects of an anticipation of an official devaluation are the reverse of those produced by the devaluation itself, that is, they are expansionary. Output rises in period $t + 4$ because the anticipated price increase and parallel exchange rate appreciation in period $t + 5$ combine to lower the real interest rate in period $t + 4$. The anticipated appreciation of the unofficial exchange rate lowers the rate of return on foreign assets, causing individuals to shift into more lending through informal markets, thereby lowering the equilibrium curb market rate initially. Together with an expected price level increase, this lowers the real interest rate and increases domestic demand in period $t + 4$. Because the induced price level change in this period is much smaller than the price level jump induced by the devaluation in period $t + 5$, however, these effects become progressively weaker as one moves backward in time before the devaluation is implemented, and are overwhelmed at the announcement period by the negative wealth effects resulting from the appreciation of the unofficial exchange rate. These results help underline the importance of a proper account of dynamic features and expectational phenomena in assessing the macroeconomic consequences of

devaluation, as emphasized by Buffie (1984), and Lizondo and Montiel (1989).

The official devaluation proves to be very effective in improving the current account in this model. The reason is clear – conventional expenditure-switching effects are here strongly reinforced by expenditure-reducing effects. In addition, the fall in the parallel market premium reduces the propensity to underinvoice sales abroad, resulting in a higher level of recorded exports. Because the resulting reserve inflow is only partially monetized and since other financial policies are unchanged, the real effects of the official devaluation are slow to dissipate.

5 Summary and Conclusions

The four shocks that have been considered above were not chosen arbitrarily. They represent the most important macroeconomic policy measures undertaken in developing countries, so understanding the macroeconomic effects of such measures and the mechanisms through which they are brought about is central to the design of appropriate macroeconomic policies in such countries.

In this chapter we have examined the effects of such instruments on the standard macroeconomic target variables in a model which incorporates informal credit markets and parallel currency markets in a systematic way. The results of the exercises conducted here are supportive of our contention throughout this book that the existence of informal financial markets cannot be ignored in developing country macroeconomics. In each of the four policy shocks considered, informal financial markets play a key role in determining the timing, direction, and magnitude of macroeconomic effects.

To give full scope to the role of such markets, we have restricted our attention to shocks which, though they take effect in the future are announced – or become anticipated – immediately. This highlights an important role of informal financial markets in developing countries which is parallel to that of well-functioning asset markets in industrial countries – i.e., because such markets are forward-looking, anticipations of future policies themselves have macroeconomic effects. Such effects are first felt when the

anticipations are formed not when the policies themselves are implemented. Thus, informal financial markets bring the future into the present in developing countries.

While the timing of macroeconomic effects is important, the central concern of policymakers will inevitably be with the direction of these effects. Among our four simulations, the model with informal markets does not yield surprising or controversial results in two of them – i.e., fiscal and monetary policies affect the economy in the direction typically assumed. An increase in government spending and an expansion of credit to the private sector are both expansionary (we shall have more to say about the magnitude of their effects below, however). On the other hand, we find that both an official devaluation and an increase in administered interest rates are contractionary on impact, effects which we had previously established in the simpler analytical model of chapter 3.

Informal financial markets play crucial roles in each of these results. An increase in administered formal sector interest rates raises the interest rate in the informal credit market and causes the exchange rate in the free market to appreciate. The first of these affects the interest-sensitive components of aggregate demand adversely since, as pointed out in chapter 2, in the presence of informal credit markets the informal interest rate represents the marginal source of funds. The second affects demand negatively through several channels. First, there is an adverse wealth effect on spending. In the analytical model of chapter 3, this wealth effect was critical to establishing a contractionary effect for this policy, and it plays a similar role in the expanded model as well. Moreover, when wealth effects on portfolio allocation are taken into account, it is no longer clear that such a policy would have the net effect of attracting funds into the formal financial system. Second, the appreciation of the parallel rate removes an incentive for the production of exportables, to the extent that some of these were previously smuggled out of the country. Finally, while the degree of financial repression is indeed reduced by such measures, it must be recognized that the loss of implicit subsidies for some private agents with privileged access to the formal credit market will also affect aggregate demand.

Official devaluation also has effects which are mediated partially

through informal markets, and while there are a variety of ways to construct models of contractionary devaluation without relying on informal markets, the latter tend to aggravate these potential contractionary effects. This is so because the increased demand for currency due to a higher domestic price level tends to draw funds out of both the informal credit and the free foreign exchange markets, raising the interest rate charged for informal loans and causing the parallel exchange rate to appreciate. These phenomena exert contractionary effects on domestic output, through the channels already specified above.

Finally, it is worth emphasizing that although the presence of informal markets does not alter the direction in which fiscal and credit policies affect the economy in our model, the magnitudes of their effects are altered since such markets tend to complicate the transmission mechanism for both fiscal and credit policies. Since expansionary fiscal policy is often financed by borrowing from the central bank in developing countries, we can discuss these effects simultaneously by examining how an expansion of credit by the formal sector affects the economy in the presence of informal financial markets, whether the credit expansion is directed to the public or private sectors. The key is that an expansion of credit will simultaneously lower the informal loan rate and cause the free exchange rate to depreciate, putting in reverse the mechanism described above. Again, these mechanisms are of the type associated with expansionary monetary policy in an industrial country operating with flexible exchange rates. The point is that the presence of informal credit and foreign exchange markets make such mechanisms operative in financially-repressed developing countries as well.

Notes

1 The consistency between expectations and solution values is enforced by a Fair-Taylor type iterative process. The solution period is set to 40, and terminal conditions take the form of a "no change" assumption whereby expectations formed for periods beyond the terminal date are equal to the last solved values. For a description of this type of algorithm, see for instance Taylor (1986) and Haque, Montiel and Symansky (1991).

2 Sims (1987) has argued that Lucas's critique of econometric policy evaluation – at least in it usual interpretation – is logically flawed. If the parameters of the policy "rule" are subject to change, as they must be if it makes sense to evaluate changes in them, then the public must recognize this fact and have a probability distribution over the parameters of the rule. But then these parameters are themselves policy variables, taking on time series of values drawn from some probability law. Predicting how the economy will behave if the parameters of the rule are set at some value and kept there ("conditional" projections) is logically equivalent to predicting the behavior of the economy conditional on a certain path of a policy variable. Yet this is precisely the kind of exercise that Lucas claims to be meaningless.

3 Transitory shocks are better suited to the analysis of stabilization issues and have the convenient computational feature that the steady-state values of the expectational variables remain unchanged. However, interest rate and exchange rate changes have often a more permanent character, and they are modeled as such here.

4 The experiments were also performed with unanticipated shocks. As a consequence of the assumption of no wage indexation, the major difference with the results reported below is that real output effects are higher, and price effects lower, at the announcement period. Qualitatively, however, the dynamics are basically identical to those discussed in the text for the periods following implementation of policies.

5 In a different context, Lorie (1988) developed a disequilibrium macroeconomic model with fixed prices and credit rationing in which an increase in deposit interest rates (which leads, under profit maximization, to a rise in lending rates) becomes potentially expansionary because it lessens the financing constraint faced by domestic firms.

6 See, for instance, Lizondo and Montiel (1989), and Rojas-Suárez (1987).

7 Note that the parallel market premium therefore falls as a result of both the devaluation of the official exchange rate and the appreciation of the free exchange rate. This is in contrast to what is normally observed in dual exchange market models, in which the reduction of the premium is brought about strictly by changes in the official exchange rate. Our results differ due to the presence of the curb loan market. The informal interest rate is affected by the price level effects of the devaluation.

6

Epilogue

The purpose of this book has been to examine the macroeconomic implications of the coexistence of formal and informal markets – a phenomenon that has been observed in many developing countries. Specifically, we have analyzed the effects of several macroeconomic policy instruments in the presence of informal markets. Along with presenting a fairly comprehensive survey of much of the available literature on informal financial markets and of recent theoretical advances in developing country macroeconomics, we have attempted to show how these markets affect macroeconomic outcomes in developing countries. We have made two important advances in this regard. First, we developed an analytical approach to analyzing how the effects of various shocks are transmitted to the rest of the economy in the presence of informal markets. Second, we developed a detailed macroeconomic model that incorporated a number of features considered "typical" of developing countries including, most importantly, the presence of informal markets.

1 The Analytical Model

The analytical model, which is based on an open-economy, portfolio-balance framework, suggests that informal loan and foreign exchange markets play important roles in transmitting the effects of financial policy instruments to aggregate demand. In addition to interest-rate effects through the informal loan market, the effects of these markets operate through changes in household