Demand Management and Exchange Rate Policy: The Italian Experience

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DURING MOST OF THE 1970s ITALY presented many characteristics—namely, high inflation rates, large depreciations of the exchange rate, real growth rates insufficient to absorb the increase in the labor force, and an unstable growth pattern of real gross domestic product (GDP)—of what have côme to be known as "vicious circle" countries. These developments have often been attributed to institutional features, such as the openness of the economy, the high degree of formal wage indexation, and the very low mobility of labor between sectors as a result of the legal difficulties of laying off workers. [1]

Even though Italy may be characterized by unfavorable institutional features, it is generally recognized that high inflation rates, rapid depreciation of the exchange rate, and low growth are not invariant with respect to the economic policy that a country chooses to follow. [2] This paper tries to shed some light on the role of monetary, fiscal, and exchange rate policies in a vicious circle country by analyzing the Italian experience under

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[1] The importance of these institutional factors in connection with vicious circles has been analyzed in detail by Bond (1980). See also Artus and Young (1979), Bilson (1979), and Goldstein (1980).

[2] As Goldstein (1980, p. 23) put it, "there is insufficient recognition that exchange rate depreciation and domestic inflation are both endogenous variables that often respond to the same driving force, namely an excessive rate of domestic monetary expansion."

flexible exchange rates. In particular, the main issues addressed in the paper are (i) the role of discrete exchange rate changes in Italy and their effects on prices, wages, trade flows, and the growth of real GDP under specific monetary policy rules, and (ii) the role of monetary policy for a given level of government expenditure in Italy and its efficacy in affecting the level of real GDP in the short run and in the long run. Finally, since policymakers, especially in countries that have been plagued by rapid depreciation of the currency and high inflation rates, have rightly maintained that it is more difficult to control the money supply in the presence of high budget deficits, (iii) the role of fiscal policy under present-day conditions in Italy and its effect on the growth of monetary aggregates, the exchange rate, financial wealth, and the growth of real GDP are studied.

It is proposed to deal with these issues by means of policy simulations performed with a 29-equation model of the Italian economy specified in continuous time and estimated with quarterly data from the third quarter of 1960 to the fourth quarter of 1978, using Wymer's programs (1976). The fiscal and monetary policy simulations are performed separately under the assumption of flexible and temporarily fixed exchange rates in order to gain useful insights into the efficacy of monetary and fiscal policies in stimulating real growth under the two exchange rate regimes. Even since the advent of flexible exchange rates, countries have had the option of pegging the exchange rate at a desired level for substantial periods, provided that the balance of payments deficits could be financed. Two versions of the model have been estimated for this purpose: one version has been estimated for the whole sample period (1960–78) with the exchange rate exogenous, and the other from 1973 to 1978 with the exchange rate made endogenous via an intervention function of Italian monetary authorities.

Policy prescriptions that seem to be suggested by the simulation are pointed out. Some might be relevant for other vicious circle countries. Qualitative conclusions about the effects of an exchange rate devaluation and about the efficacy of monetary and fiscal policies under flexible and temporarily fixed exchange rates in Italy might also carry over to countries that are not normally considered as vicious circle countries.

To keep the paper within manageable proportions, the detailed presentation of the two versions of the model is provided in Table 2 and the parameter estimates in Tables 3–5 in the

Appendix, while only the major aspects and novel features are discussed in the text. Section I briefly describes the broad features of the model. Section II is devoted to the simulation of the effect of an exogenous devaluation of the effective exchange rate of the lira of 10 per cent on consumer prices, wages, and other economic magnitudes, such as real income, employment, the trade balance, and reserve movements. The money supply is left endogenous in this exercise, thus emphasizing the aspects normally associated with the vicious circle hypothesis. In other words, the model includes an estimated reaction function of Italian monetary authorities who have been following at least partially accommodating policies in the face of accelerations of inflation. After the initial 10 per cent change, the exchange rate is held at the new level and hence is treated as exogenous in this simulation. This treatment makes it possible to isolate more sharply the economy-wide effects generated by exogenous exchange rate disturbances, which are assumed by many policymakers to initiate the vicious circle. The exchange rate simulation shows that, despite the partially accommodating behavior of the authorities and the high indexation of wages, there is ample room for a real exchange rate depreciation that lasts for several years and that the trade and reserve flows are quite elastic in response to the devaluation.

Section III presents the monetary policy simulations under flexible and temporarily fixed exchange rates; it also tests the hypothesis that flexible exchange rates have shortened the time lag between money supply changes and domestic price changes by simulating the effect of monetary policy on inflation under flexible exchange rates and temporarily fixed exchange rates. If flexible rates speed up the transmission of money supply changes onto price changes, as implied by the vicious circle literature, the power of monetary policy to raise the level of real income could be extremely short lived.

Monetary authorities in many countries feel that growing fiscal deficits make monetary management consistent with low inflation rates considerably more difficult. In particular, the Italian monetary authorities believed that financing the large budget deficits of the 1970s largely by nonmonetary means would have required high and politically unacceptable real interest rates. The analysis of the efficacy of policy instruments under present-day conditions is therefore completed in Section IV by simulating the effect of an expansionary fiscal policy

on the exchange rate and the other key economic magnitudes in the economy. [3] The same fiscal simulation is also performed under fixed exchange rates to compare the effect of fiscal policy under fixed and flexible exchange rates. Concluding comments are presented in Section V.

I. Structure of the Model

The main emphasis of the model (presented in detail in the Appendix) is on the interaction between stocks and flows, and hence between the monetary and financial side of the economy, on the one hand, and the real side, on the other hand. It is therefore particularly suited to study the transmission mechanism of monetary and fiscal policies.

The exchange rate was initially assumed to be exogenous, and the 29-equation model was estimated for the whole sample period under this assumption. Two more stochastic equations were then added to the model—one making endogenous the exchange rate and the other the interest rate on treasury bills, whose market became large only during the 1970s in connection with unprecedented levels of the Government's budget deficits. The enlarged model was then re-estimated for the flexible exchange rate period (first quarter of 1973 to third quarter of 1978) by constraining the parameters of most equations to be equal to the estimated values obtained from the smaller model for the whole period. In this way, despite the problem of insufficient observations relating to the flexible exchange rate period, the exchange rate could be made endogenous in the model and the effects of fiscal and monetary policies on the exchange rate could also be simulated.

Since the Italian economy is highly integrated with the rest of the world, the model places particular emphasis on the explanation of the balance of payments and the exchange rate. The theoretical long-run framework underlying the analysis of movements in these variables is derived from the recent reformulations of classical and neoclassical contributions, [4] which have

[3] With the money stock endogenous, as in the exchange rate simulation already mentioned.

[4] In the English literature, among the most quoted authors are Richard Cantillon (1755) and David Hume (1752). Forerunners of contributors to the

been termed the monetary approach to the balance of payments and the exchange rate.[5] However, drawing on the work of Bergstrom and Wymer (1976), reduced form equations of the type normally used in simple models of the monetary approach are avoided, and primary emphasis is placed on the dynamics of adjustment of the economy from one equilibrium position to the other. This makes it possible to allow for short-run disequilibrium phenomena, such as deviations of the exchange rate from purchasing power parity or J-curve effects on the current account.

Two features of the model presented here are particularly worth noting because of their novelty in empirical work. First, the sum of physical capital and financial net (outside) wealth[6] is used as the main scale variable in both the financial sector and the real sector of the economy. Second, a series of expected inflation rates based on sample surveys is used in the model, and the mechanism of formation of expectations is explored.

The first feature allows disturbances in financial markets to have a direct impact on consumption and hence on the level of economic activity. For example, changes in the effective exchange rate, which alter the valuation of the stock of foreign assets owned by domestic residents, and changes in the current account are both allowed to affect consumption. Recent theoretical developments in the field of long-run exchange rate determination consider changes in wealth arising from changes in the exchange rate and in the current account as the central mechanism of adjustment.[7] This idea is quite old, however; it was central to the analysis of the adjustment of the balance of payments of some Italian economists of the eighteenth century.[8] Their recognition of the important role of assets in the

monetary approach in the Italian literature include Antonio Serra (1613) and Pietro Verri (1772).

[5] See Mundell (1971), Frenkel and Johnson (1976), and International Monetary Fund (1977).

[6] Net financial wealth is defined as the sum of all financial and monetary assets of the private sector *minus* its financial liabilities, mainly liabilities that are claims of foreigners and commercial banks. (See Table 2, equations (24) and (25).)

[7] Kouri (1976); Branson (1976).

[8] For instance, Verri wrote (1772, p. 179): "the country in which yearly consumption has been higher than annual production has reduced its wealth, and one can say of it what one says of a family, when besides its annual rent (income), it spends its capital."

analysis of the balance of payments allowed them to infer that external surpluses and deficits were self-adjusting and temporary.[9]

The second feature involves use of a series for the expected rate of inflation of wholesale prices constructed on the basis of sample surveys that exist in Italy.[10] These expectations have been made endogenous in the model with the change in expectations being explained by the rate of growth of import prices and by a cyclical term (Table 2, equation (14)). Inflationary expectations affect investment, consumption, and asset demands and are therefore an important channel of transmission of monetary policy, in addition to changes in the stock of wealth.

Four sectors interact in the model: the private sector, commercial banks, the foreign sector, and the government sector, which includes the Bank of Italy. The version of the model with the exchange rate exogenous is composed of 18 stochastic equations *plus* 11 identities.

The financial system explains the following endogenous variables: (i) currency in circulation (equation (2)), (ii) total deposits at commercial banks (equation (1)), (iii) postal savings deposits (equation (3)), (iv) government bonds held by the private nonbank sector (equation (4)), (v) net foreign assets held by the private sector (equation (5)), (vi) net foreign assets held by commercial banks (equation (6)), (vii) government bonds and bills held by banks (equation (21)), and (viii) the interest rate on government bonds (equation (17)). There are 2 identities, one defining the wealth of the private sector (equation (24)) and another for the balance sheet of commercial banks, which is assumed to determine bank credit to the private sector (equation (25)). The scale variable in all asset demand functions of the private sector is total net wealth in real terms, except in the demand function for currency, where the transactions motive is assumed to prevail. Total net wealth is the sum of the stock of real capital in industry *plus* all financial assets held by the private sector *minus* advances by commercial banks to the

[9] Another quotation from Verri (1772, p. 176): "and the value of all imported commodities must necessarily be equal to the value of all exported commodities after a certain period of time."

[10] The survey allows for six classes of expectation of the actual percentage change of wholesale prices in the semester ahead: −5 or less, −4 to −2, −1 to +1, 2 to 4, more than 5, and no expectations. The series obtained is believed to be fairly accurate. See Visco (1976).

private sector. All these financial variables are deflated by the general price level. Furthermore, the stock of assets held abroad is included as part of wealth and is corrected for capital gains and losses resulting from exchange rate changes. [11] Financial wealth results also from the cumulation of the current account and the government budget deficit and could therefore also be defined accordingly in the model. This additional identity is implicit in the model (Table 2); if introduced explicitly it could determine the stock of financial wealth, and equation (24) would then determine one of the financial assets that are kept exogenous here.

All demand functions for asset holdings are assumed to be homogeneous of degree one in prices (*ex ante* homogeneity). The actual nominal rate of growth of total bank deposits is assumed to depend on the discrepancy between desired and actual real deposits and on the actual rate of inflation. Expected inflation is assumed to affect the demand for bank deposits positively because periods of expected high inflation are also periods of greater uncertainty.

Also part of the financial block is the equation determining the interest rate on government bonds (equation (17)), which is assumed to adjust with a lag to the foreign interest rate corrected for the expected inflation differentials between Italy and the rest of the world. The ratio of net reserves to imports is also assumed to affect the level of the interest rate. This equation could be interpreted as a reaction function of the Bank of Italy. Under this interpretation, the Bank of Italy is assumed to adjust the interest rate to movements in foreign rates and inflation differentials and to reserve movements. Alternatively, the interest rate could be considered as market determined. Yet the first interpretation appears more realistic, owing to the occasionally heavy intervention of the Bank of Italy in the market for government bonds. In the version of the model estimated from 1973 to 1978, the interest rate of treasury bills is endogenous (equation (19)). Thus, the term structure of interest rates, albeit in a simple form, is endogenous in the second version of the model.

Turning to expenditure, output, and the labor market, the model retains the Keynesian feature that output is demand

[11] The stock of assets held abroad was obtained by cumulating the capital account of the balance of payments. It is therefore net of financial assets owned by foreigners in Italy, which are small compared with the stock of financial assets owned by Italians abroad.

determined in the short run. The endogenous components of gross domestic product are (i) private consumption expenditure (equation (7)), (ii) private investment in machinery and equipment (equation (8)), [12] (iii) exports of manufactured goods (equation (9)), (iv) imports of manufactured goods (equation (11)), and (v) imports of raw materials and other nonmanufactured goods (equation (12)). By contrast, exports of nonmanufactured goods, [13] exports and imports of services, public and private construction, and government expenditure are all exogenous. Since the industrial sector is the leading sector in the Italian economy, [14] real value added in industry—which appears in the demand for labor (equation (16)), in the equation determining expectations of inflation (equation (14)), in both import demand functions and the investment function—is also endogenous (equation (27)).

In the investment function, the difference between the average product of capital in industry and the real interest rate on government bonds is assumed to determine desired investment. Actual real gross investment is assumed to adjust in turn with a lag to the discrepancy between desired and actual investment. The model is based on the production function for Italian industry being Cobb-Douglas, [15] which implies that the average product of capital is equal to the marginal product. [16]

The consumption function (equation (7)) depends on wealth and the real interest rate, following Metzler (1951). It represents a key function in the system because it links stocks to flows. As has been pointed out earlier, in a model of the balance of payments and the exchange rate this link is believed to be particularly important. Especially for an economy in which wages and salaries are indexed, the real rate was thought to be a better measure of the price of today's consumption in terms of

[12] Italian data on inventory accumulation are believed to be rather unreliable, and no attempt was made to explain inventory accumulation.

[13] They are less than 10 per cent of total exports of goods.

[14] See Sylos-Labini (1969) for a small disaggregated model of the Italian economy with industry as the leading sector.

[15] The assumption of a Cobb-Douglas production function also underlies the price formation equation and the demand for labor in industry.

[16] Gross investment in machinery and equipment is linked to the net stock of capital in industry via an identity (equation (22)) in which the residual item includes depreciation of the capital stock and the discrepancy between the sources of the investment series (the national accounts) and the series of the stock of capital (an annual survey sponsored by the Confederation of Italian Industries).

future consumption, because money illusion is likely to be smaller in such a system.

Consumer price inflation is assumed to depend on the discrepancy between the partial-equilibrium and the actual price levels and on a cyclical term (equation (13)). The partial-equilibrium price level is assumed to depend on the nominal hourly wage cost in industry *divided by* the average hourly product of labor in industry, and on import prices. Therefore, the determination of the price level assumed here is consistent with the flexible markup theory. Since the average hourly product of labor is equal to the marginal product of labor if one assumes a Cobb-Douglas production function, the approach adopted here is also consistent with a neoclassical framework.[17]

The expected rate of inflation of wholesale prices (equation (14)) is assumed to depend on the rate of change of import prices and a cyclical term, which is measured by the ratio of real value added in industry to its trend level. It is assumed that inflationary expectations adjust with a lag to a change in their determinants. This lag can be justified on the grounds that data on import prices and the position of the economy in the cycle are not known immediately.

The labor market comprises two stochastic equations—one determining nominal hourly wage rates in industry (equation (15)) and the other, the demand for labor by firms in the industrial sector (equation (16)).

The nominal hourly wage rate is assumed to be determined by labor unions independently of demand and supply conditions in the labor market. They are assumed to adjust wages, net of social security contributions and direct taxes, according to past inflation and a trend. Thus, fiscal policy has a direct effect on wage formation by creating a wedge between the nominal cost of labor for industry, which is a determinant of inflation, and the net wage, which ultimately interests the worker. Also, the mechanism of indexation of wages, which has become a more important feature of Italian wage formation since 1975, enters the equation.

The demand for labor in industry (equation (16)), adjusted for the number of hours worked, is assumed to depend on the real

[17] The price level explained is the consumer price level, not the GDP deflator. The former can be thought of as a weighted average of the GDP deflator and the import price level. (See Table 2, equation (13).)

wage rate inclusive of all costs (social security contributions) and on real value added in industry. A demand for labor of this sort is derived from a Cobb-Douglas production function. (See also the investment function and the price determination.)

As far as the foreign sector is concerned, imports and exports have been split into three categories: services, manufactured goods, and other goods. Services have been considered as exogenous along with exports of nonmanufactures, which are a small fraction of total exports. The division into three categories was made in order to avoid aggregation problems and to obtain a better estimate of price elasticities in Italian foreign trade. This is of particular importance in connection with any J-curve effects that might be observed. The demand for exports of manufactures (equation (9)) is quite standard. Export unit values in manufacturing (equation (10)) are assumed to adjust to export unit values of industrial countries expressed in lire on account of the close substitutability of Italian and foreign goods. Desired imports of manufactured goods (equation (11)) and other goods —largely raw materials—(equation (12)) depend on real value added in industry and on a cyclical term measured by the ratio of value added in industry to trend level, and on the relevant import unit values deflated by the domestic price level. Imports of raw materials depend in addition on deviations of the Italian price level from purchasing power parity, which serves as a proxy for expectations of devaluation of the lira. Changes in the net international reserves of the Bank of Italy are determined by the balance of payments identity (equation (23)).

Turning to the government sector, real government expenditure and nominal transfers are assumed to be exogenously determined. Total revenues are instead assumed to depend, with a lag, on nominal GDP (equation (18)). An important identity in the model is the government budget constraint (equation (21)). The government budget deficit is assumed to be financed by sales of bonds and bills to the public and the banks, by issuing postal deposits, and by borrowing from the central bank.

In the Italian institutional setting, the assumption that real government expenditure is exogenous and not the dependent variable of a policy reaction function is quite realistic, since government expenditure has not been actively used as an anticyclical tool. By contrast, monetary policy has been widely used as an instrument to control the cycle.

II. Effect of Exchange Rate Devaluation on Prices and Wages

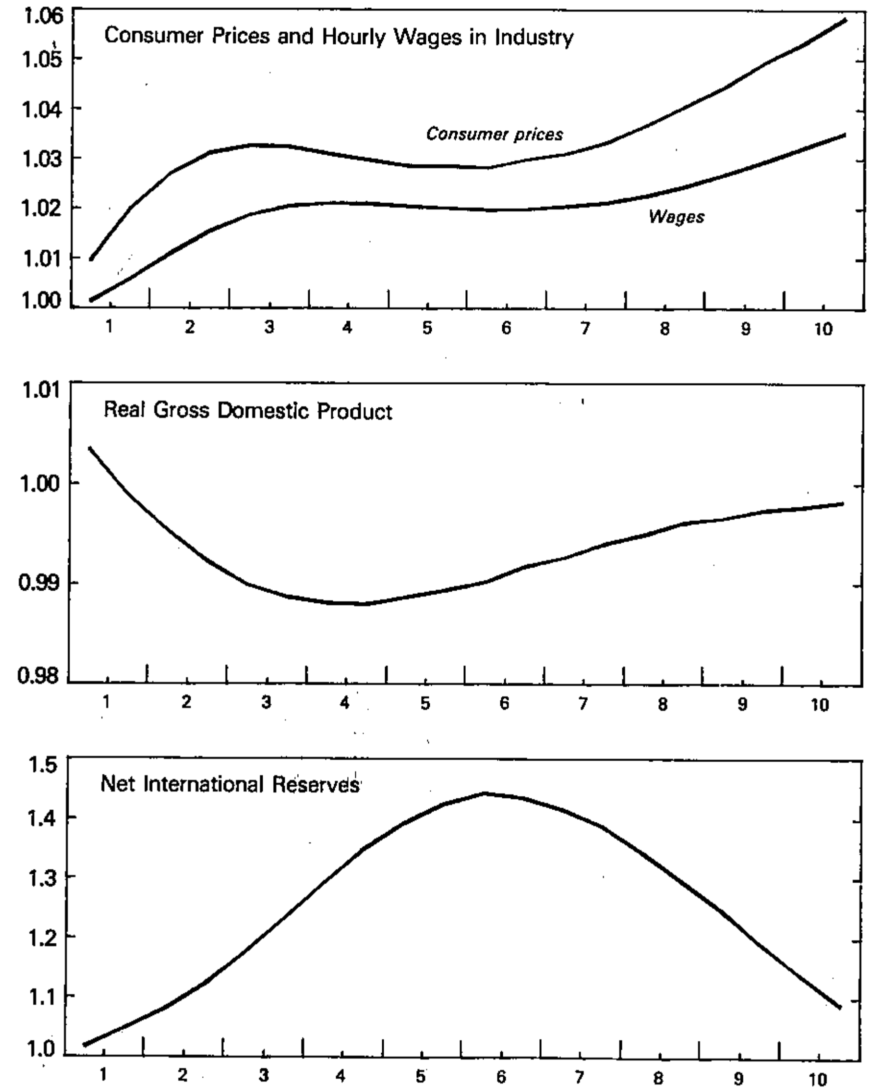
Two important parameters in the analysis of the efficacy of an exchange rate devaluation are the short-run elasticities of consumer prices and wages with respect to the exchange rate. If prices and wages are affected quickly by the exchange rate, the competitive advantage gained by the devaluation will be short lived and a further round of reductions in the value of the currency might be necessary to keep a competitive margin over foreign producers. In this section, the exchange rate is assumed to be devalued by 10 per cent in the initial period of the simulation, and then the value of the lira is kept 10 per cent below its value in the control solution thereafter. In the control solution, the exchange rate follows its historical path. The version of the model with the exogenous exchange rate is used for this purpose, and the simulation is carried out for 10 years. The initial values of all the variables are those of the first quarter of 1969. Except for the exchange rate, all exogenous variables follow their historical path both in the devaluation simulation and in the control solution. Using for the control solution the historical path of the exogenous variables has the advantage of guaranteeing its internal consistency. In the devaluation simulation, exogenous domestic interest rates were linked to the endogenous interest rate on government bonds in order to avoid shifts in the allocation of the financial portfolio.

The devaluation simulation shows that the Italian consumer price level is about 3 per cent higher after one year (Chart 1) and that it fluctuates around the new level for about 5 years, because a tendency for output to fall slightly by comparison with the control solution checks the further rise in the price level. In the longer run,[18] the consumer price level increases further until, about 15 years after the devaluation, it reaches a new equilibrium level 10 per cent above the level of the control solution. Wages follow a pattern similar to prices. They stabilize at a level that is about 6.5 per cent higher after about 15 years. The fall in real wages results from the fact that in estimation the degree of indexation was found to be smaller than one.

[18] To obtain the effect of the devaluation on the endogenous variables beyond 10 years, the same simulation was carried out starting with 1962. The path of the endogenous variables during the first 10 years turns out to be the same in the two simulations.

CHART 1. ITALY: SIMULATED EFFECTS OF AN EXCHANGE RATE DEVALUATION OF 10 PER CENT, OVER A TEN-YEAR PERIOD

(Ratios of simulated values to control solution)



Real GDP is stimulated to a small extent by the devaluation for about two quarters, then the effect of the devaluation becomes slightly negative for 7 to 8 years after which GDP virtually reaches the level of the control solution. The maximum deviation between the devaluation simulation and the control solution barely exceeds 1 per cent. The initial growth in GDP is caused by the growth in investment fostered by the fall in the real interest rate, and by the increase in real exports and the fall in real imports. The investment expansion lasts one year, and the foreign trade multiplier effect also weakens rapidly as Italian unit export values and inflation rise. After about six months, the negative effects of the destruction of real financial wealth on consumption start dominating the two positive effects, and the growth of GDP is slowed down. The behavior of nominal financial wealth depends crucially on the behavior of the government budget deficit, which is reduced with respect to the control solution by the higher price level, since nominal transfers are not indexed to inflation and since nominal tax receipts have an elasticity to nominal income that is larger than one. The assumption of nonindexation of transfers might not be the most reasonable assumption in the Italian context, but it was felt to be more realistic than the opposite extreme of full indexation. It follows that the nominal additions to financial wealth are smaller under the simulation than in the control solution and, a fortiori, not sufficient to compensate for the negative effect on the existing stock of real financial wealth arising from the higher price level.

The behavior of financial wealth is also affected by the path of the money supply. Monetary authorities are assumed to adjust the nominal interest rate on government bonds to the foreign real interest rate corrected for expected domestic inflation and to the ratio of reserves to imports (Table 2, equation (17)). The behavior of the money stock follows to a large extent from the interest rate policy pursued. The stock of total bank deposits, which is the largest item in the definition of money, falls in real terms, especially during the period of recession.

Real exports grow by about 2 per cent above the level of the control solution in the first semester of the simulation, and real aggregate imports fall by about 2 per cent. Relative price effects play the important role, but for imports of raw materials, a speculative term [19] also contributes to bringing about the change in the volume of trade. The unit values of imports expressed in lire grow immediately by the full amount of the devaluation, while export unit values grow to about 8 per cent above the level of the control solution in the first semester of the simulation and to about 10 per cent in the second. As a result, in the first semester the imports of goods grow in nominal terms at a rate that is about 2 percentage points less than that of nominal exports. Given that the trade balance was not in a large deficit to begin with, there is no J-curve effect. This is so despite the fact that the elasticity of imports of manufactures was not found to be significantly different from zero in the model, probably owing to data problems, and that the price elasticities in the other two equations are significantly smaller than one. As output starts falling below its level in the control solution, the trade balance improves owing to the fall in imports. Net international reserves start rising sharply after the devaluation and reach a peak after about six years (Chart 1). Both the trade balance and capital movements contribute to the initial rapid growth in reserves. The inflow of private capital from abroad turns into an outflow after about six years. After that, the cycle of net international reserves largely parallels the cycle in capital flows.

[19] See Table 2, equation (12).

From the simulation discussed earlier, a number of general conclusions follow with the usual proviso that they are conditional upon the correctness of the structure of the model used to derive them. [20] First, the short-run stimulus to the economy owing to the expansion of investment is short lived and small in magnitude. Second, after a few quarters the depreciation may have a negative effect on output because of the destruction of real financial wealth caused by domestic inflation. This effect, however, is also quite small. The fall in total real wealth is responsible for the prolonged lower level of private consumption expenditure, which outweighs the positive effect on consumption and investment of lower real interest rates. Third, the neoclassical long-run neutrality postulate holds with respect to both real GDP and the price level, but not for wages owing to less than full indexation. Fourth, and of more direct relevance to the vicious circle argument, is the slow adjustment of consumer

[20] An idea of how good the fit of the estimated model is can be obtained by looking at the root-mean-square errors of the *ex post* static and dynamic forecasts, which are reported in Tables 6 and 7 (in the Appendix). These statistics do not, of course, provide a highly reliable test of the correctness of the model.

prices and wages to the devaluation and the high elasticities of trade flows that rule out J-curve effects if the initial change in the exchange rate occurs when the trade balance is in equilibrium or in slight deficit. However, an important point is that the long-lasting negative (albeit small) effects of the devaluation on output may imply that the temptation on the part of the Government to embark on activist monetary and/or fiscal policy is great. Fifth, private capital movements move in an equilibrating direction and contribute strongly to the growth of international reserves. In brief, the conclusions reached so far imply that, on the whole, the exchange rate is a powerful instrument of external adjustment, despite the drawback that it worsens the problem of inflation.

III. Monetary Policy Under Fixed and Flexible Exchange Rates

In this section, the effect of a change in the growth rate of the money stock on the exchange rate is investigated. Also, the hypothesis that under flexible exchange rates the impact of changes in the stock of money on changes in the price level is speeded up, thus making the Phillips curve steeper, is subjected to empirical testing.

All exogenous variables are assumed to grow as in the exchange rate simulation in the previous section, that is, to follow their historical path. The initial values of the exogenous and endogenous variables are those of the first quarter of 1969, and the simulations are carried out for ten years. The stock of total deposits at commercial banks and currency in circulation (a rough definition of M_2) is assumed to grow at 30 per cent a year in nominal terms, while in the control solution it is equal to the actually observed rate of growth of money from 1969 to 1978. During that period, the stock of money, as defined here, grew at an average rate of about 20 per cent. Thus, the shock imported to the system consists of increasing the rate of growth of money by 10 percentage points on average. Exactly the same simulation exercise has been carried out using the two versions of the Italian model—one with the exchange rate kept exogenous and the other with the exchange rate determined endogenously by an intervention function of the Bank of Italy.

The simulation performed under the assumption of flexible

exchange rates gives rise to more realistic long-run behavior. This is to be expected, because in the version in which the exchange rate is endogenous, there is an additional important policy reaction function (the intervention function in foreign exchange markets). Thus, the higher level of output in the simulations performed under the assumption of exogenously determined exchange rates should not be surprising, since the rise in prices is retarded by the pegging of the exchange rate. Despite the artificial stickiness of prices in the simulation performed under fixed rates, output never rises more than 2 per cent above the level of the control solution.

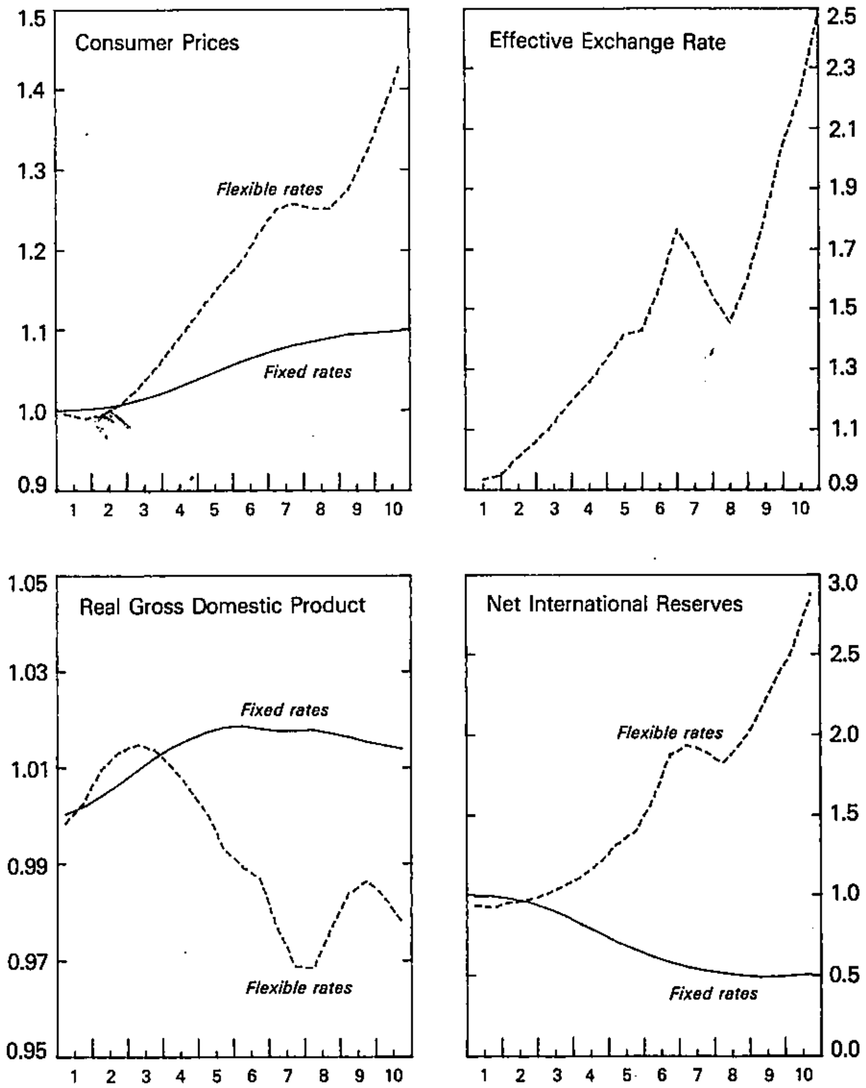
Under fixed exchange rates, monetary authorities could not increase the stock of money if international capital flows instantaneously offset the increase in domestic assets of the central bank. The parameters of the model presented in the Appendix indicate that Italian capital flows adjust quite slowly. This finding is confirmed by previous studies of Italian capital flows (Tullio, 1977; 1981). It follows that Italian monetary authorities have considerable room for influencing the stock of money under fixed exchange rates, at least in the short to medium run.

An average annual increase of 10 percentage points in the growth of the stock of money above the level of the control solution leads after ten years to a growth of the price level of about 43 per cent above the control solution under flexible exchange rates and of about 10 per cent under fixed rates (Chart 2). The different long-run effect on prices under the two systems is due to the higher rate of growth of import prices under flexible exchange rates. The effect of monetary policy on prices is slow to work through the system; after three years consumer prices are about 5 per cent above the level of the control solution under flexible exchange rates and 2 per cent above under fixed exchange rates.

Even under flexible exchange rates, there is no long-run proportionality between money as defined here and prices. This is so because an increase in bank deposits (the largest component of money) may reflect largely an increase in the degree of financial intermediation of banks without a corresponding increase in "outside" or "net" money. In the present model, advances of commercial banks to the private sector are endogenous and increase in the simulation in such a way as to partially offset the effect of the increase in bank deposits on net financial wealth, which is the main scale variable in the consumption

CHART 2. ITALY: SIMULATED EFFECTS OF EXPANSIONARY MONETARY POLICY UNDER FIXED AND FLEXIBLE EXCHANGE RATES, OVER A TEN-YEAR PERIOD [1]

(Ratios of simulated values to control solution)



[1] Money grows at 30 per cent a year in the simulation and at 20 per cent on average in the control solution.

function. This raises interesting questions about the naïve extension of the quantity theory of money to economies with developed bank intermediation and developed financial markets. In the simulations presented in this paper, a much greater link between the total stock of net financial assets and prices was generally found than between money as defined in the paper and prices.

The exchange rate depreciates substantially faster than the internal value of the currency. Real GDP is affected more under fixed rates than under flexible rates, at least in the long run. The main reason for the greater long-run potency of monetary policy under fixed rates is the lower inflation and the smaller destruction of real financial wealth and especially the large accumulation of foreign assets of the private sector that occurs under fixed rates at the expense of official reserves and of the net foreign asset position of commercial banks. In the first three years the behavior of GDP is fairly similar under the two systems, although the peak is reached earlier under flexible rates. Under flexible rates, GDP returns to the level of the control solution after about five years and falls below it thereafter.

The government budget deficit falls less rapidly under fixed exchange rates for most of the simulation period because of a smaller fiscal drag, which contributes to a faster creation of financial wealth. Since real wealth is the main scale variable in the consumption function, real private consumption grows more under fixed exchange rates. Real private investment also grows much faster under fixed exchange rates. Real interest rates fall more under flexible exchange rates, because of both a smaller rise in nominal rates and a greater rise in expectations of inflation. The greater fall in the real interest rate under flexible exchange rates, however, is not enough to compensate for the effect on consumption of the different behavior of real wealth.

The behavior of net international reserves under fixed exchange rates shows clearly that the observed long-run stimulus to real GDP is unsustainable. The reserves fall until by the end of the simulation period they are about 50 per cent below the level of the control solution (Chart 2). Therefore, the monetary simulation under fixed exchange rates has a certain degree of implausibility because no country can be assumed to be able to finance balance of payments deficits indefinitely. However, as pointed out earlier, an important policy reaction function—the intervention function of monetary authorities in the foreign exchange market—is missing in the version of the model with fixed exchange rates. Under managed exchange rates, international reserves rise sharply instead, owing mainly to an inflow of private capital and a fall in real imports. The increase in foreign assets of the central bank thus becomes the major source of money creation, especially in the latter part of the sample period.

In conclusion, monetary policy seems to have a relatively modest and short-lived impact on GDP under flexible exchange rates, but it affects the price level strongly via the fall in the exchange rate. It follows that the short-run trade-off between inflation and unemployment (proxied by real GDP growth) worsened after 1973, since—despite the higher inflation rates—the performance of GDP is worse in the simulations performed under flexible exchange rates. This does not mean, however, that the trade-off has worsened because of flexible exchange rates. Rather, a worsening of the trade-off has been accompanied by higher inflation rates and greater flexibility in exchange rates. Second, monetary policy is more effective in the long run in the simulations performed with fixed exchange rates because of the smaller inflation, and mainly because of the large increase in real private wealth caused by the transfer of officially held international reserves to the private sector (i.e., by capital outflows). The lags of monetary policy seem to be fairly long, especially under fixed exchange rates.

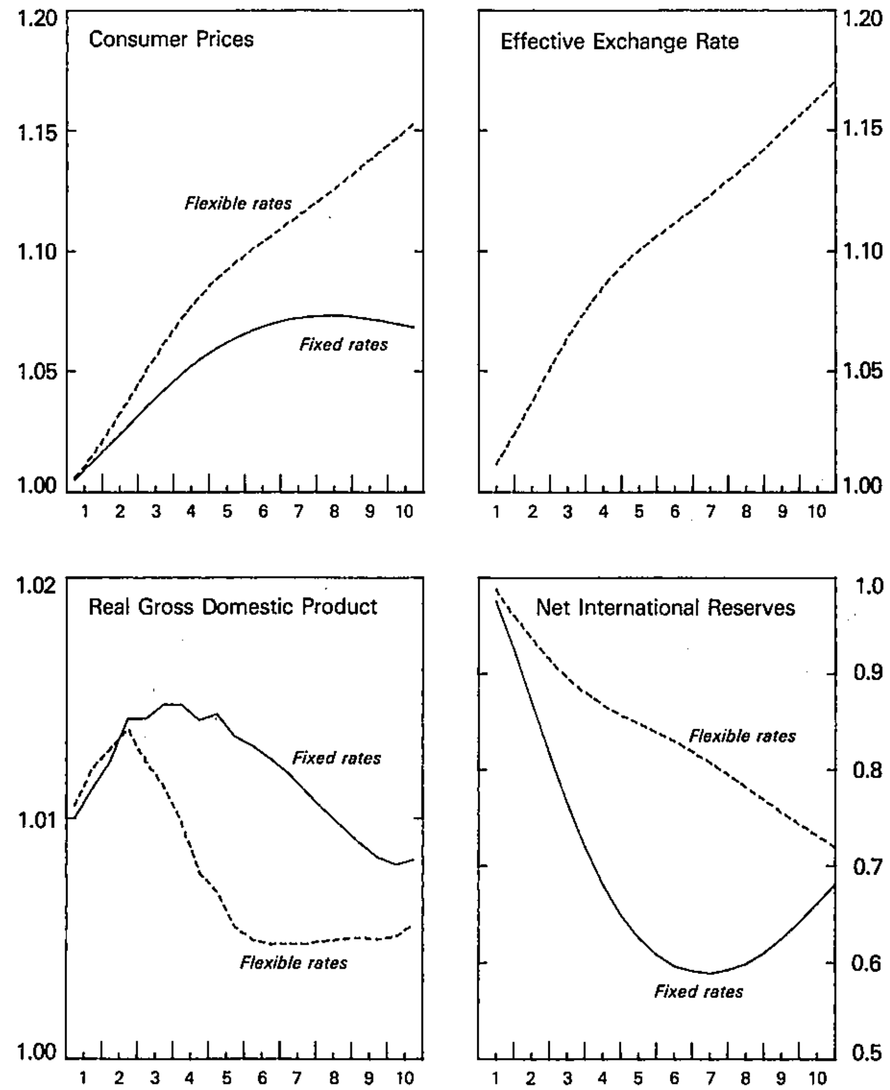
IV. Effect of Fiscal Policy Under Fixed and Flexible Exchange Rates

This section shows the effect on the economy, and in particular on the exchange rate, of keeping real government expenditure on goods and services at 10 per cent above the historical path. The control solution, the initial values of the variables, and the length of the simulation period are the same as in the previous simulations. The money stock is again endogenously determined.

While under fixed exchange rates the consumer price level peaks after about eight years, it grows steadily under flexible exchange rates (Chart 3). Aften ten years the price level is only about 7 per cent higher under fixed rates and about 15 per cent

CHART 3. ITALY: SIMULATED EFFECTS OF EXPANSIONARY FISCAL POLICY UNDER FIXED AND FLEXIBLE EXCHANGE RATES, OVER A TEN-YEAR PERIOD [1]

(Ratios of simulated values to control solution)



[1] Real government expenditure on goods and services is 10 per cent above the level of the control solution.

higher under flexible rates. This is so because the exchange rate depreciates quickly and by more than the internal value of the currency. Net international reserves fall both under fixed exchange rates and under flexible exchange rates. They fall more under fixed exchange rates, as one would expect.

GDP is affected by fiscal policy with shorter lags than by monetary policy under both fixed and flexible exchange rates (Chart 3). In addition, Mundell's conclusion that fiscal policy is more effective in raising the level of income under fixed exchange rates is confirmed by the model, but the difference in potency of fiscal policy under the two exchange rate regimes is slight. Since government expenditure on goods and services was on average about 15 per cent of GDP during the decade 1969–78, an increase of 10 per cent is equivalent to 1.5 per cent of GDP. Hence, the fiscal policy multiplier does not exceed one at its peak under fixed exchange rates and is considerably less than that in the long run. This implies crowding out of private expenditure, despite the partially accommodating monetary policy.

The mechanisms that make fiscal policy more potent under fixed exchange rates are more complex than in Mundell's framework. Mundell was arguing in an IS-LM framework in which the price level was kept constant that the expansionary effect of fiscal policy is checked under flexible rates by the appreciation of the exchange rate, which is brought about by capital inflows attracted by an incipient rise in domestic interest rates. In this model, the effective exchange rate starts depreciating immediately. Thus, the exchange rate itself does not check the growth of real income under flexible rates. In addition, at least in the initial years, real interest rates also would not explain the greater potency of fiscal policy under fixed exchange rates. What checks the growth of income under flexible rates is again the real wealth effect on consumption, as in the monetary policy simulations in the previous section. The higher inflation under flexible exchange rates and the smaller budget deficit check the growth of real wealth and hence of consumption. Real financial wealth is systematically smaller under flexible exchange rates than under fixed exchange rates. As a result of the behavior of real wealth, real private consumption peaks after about five years at a level that is about 3 per cent above the control solution under fixed exchange rates, while under flexible rates it never grows above the control solution level by more than 1.5 per cent.

After about five years, GDP stabilizes at 0.5 per cent above the level of the control solution under flexible exchange rates, while under fixed rates it stabilizes at about 0.8 per cent above the level of the control solution after about nine years (Chart 3).

The results of this section can be summarized as follows. First, the growth of the share of government expenditure in GDP seems to be the single most important factor of inflation and depreciation in a flexible exchange rate world if tax rates are not increased to cover the increased expenditure. It should be borne in mind, however, that the money stock and the interest rate have been assumed to adjust to the growth of government expenditure according to a reaction function of monetary authorities. This assumption seems to be more realistic than keeping the money stock constant in the face of enlarged budget deficits, because the growth in real interest rates necessary to keep the stock of money constant would probably be politically unacceptable. Under flexible rates, the stock of money rises to about 7 per cent above the level of the control solution, and prices to about 15 per cent, by the end of the simulation period. Second, owing to the working of the real wealth effect, fiscal policy is somewhat more potent under fixed exchange rates than under flexible exchange rates. It might be recalled that the same conclusion holds for monetary policy. Thus, the simulations presented in Sections III and IV seem to indicate that, at least for Italy, the efficacy of both monetary and fiscal policies has been reduced under (but not necessarily because of) flexible exchange rates. Third, almost complete crowding out occurs in the long run under both fixed and flexible exchange rates.

V. Summary and Conclusions

This paper has empirically investigated the role of exchange rates and monetary and fiscal policies in a vicious circle country and the efficacy of demand management policy under different exchange rate regimes by making use of a medium-scale econometric model of the Italian economy, whose main features were briefly described in Section I. The main issues that were investigated are (i) the short-run and long-run effects of a once-and-for-all devaluation on prices and wages (Section II), (ii) the degree to which trade flows and capital flows move in an equilibrating direction after the devaluation (Section II), (iii) the time lags between money supply changes and price level changes under fixed and flexible exchange rates and the steepness of the Phillips curve under the two systems (Section III), (iv) the effect of monetary policy on the economy under fixed and flexible exchange rates (Section III), and (v) the effect of fiscal policy on the economy under the two exchange rate regimes, assuming that monetary authorities follow a partially accommodating behavior (Section IV).

The following main conclusions are reached in the paper. First, the lags of consumer prices and wages to exchange rate changes are fairly long, mainly because GDP grows at a rate that is below its rate of growth in the control solution for several years. The slowdown in the rate of growth is set in motion by the effect on private consumption of a fall in real financial wealth. Therefore, there does not seem to be an automatic tendency of the system to develop a vicious circle, despite the fact that monetary policy has been assumed to be at least partially accommodating. However, if an activist policy is followed aiming at keeping real GDP on its potential growth path, then a much higher inflation and even larger depreciations could develop. Second, the overall response of trade flows is such that there is no evidence of a J-curve effect. Third, capital flows are equilibrating and contribute strongly to the sharp rise in net international reserves. Fourth, against these factors that argue against the existence of a vicious circle, the simulations in Section III seem to indicate that a monetary expansion strongly affects the exchange rate and prices, particularly in the medium run to long run and that under (but not necessarily because of) flexible exchange rates the Phillips curve has indeed become steeper. Fifth, fiscal policy also is found to be less effective in raising the level of income under flexible exchange rates because of the effects on real financial wealth of higher inflation and a higher fiscal drag. Thus, there is some evidence in favor of the hypothesis that both monetary and fiscal policy have become less effective in affecting real GDP since 1973. Sixth, the lags of fiscal policy are substantially shorter than those of monetary policy under both exchange rate regimes, which implies that the activist use of monetary policy to keep GDP on its potential path after a depreciation or a devaluation may lead to greater instability in the economy.

APPENDIX

The model

The model that was used for the simulations in the paper is presented in this Appendix. Owing to space limitations, and also to avoid duplications of Section I where the most important aspects of the model are laid out, the description of the model is kept to a minimum. While the results of the stability analysis are not shown, two tables with the root-mean-square errors in the *ex post* static and dynamic forecasts are presented. Suffice it to mention here that both versions of the model—the one estimated without the exchange rate and the treasury bill equation and the one estimated with these two additional equations—are stable. The stability analysis has been carried out using an extended version of Wymer's CONTINEST program. The neglect of formal stability analysis is also justified by the fact that the simulations presented in the paper are already an indirect check for the stability of the system.

The variables of the model are defined in Table 1, and its equations are presented in Table 2. All output and expenditure variables are defined in real terms, while financial variables are expressed in money terms. Real quantities are denoted by small letters, and nominal ones by capital letters. The deflator of all financial assets is the consumer price index. Behavioral equations are generally linear in the natural logarithms of the variables, so that they have constant elasticities; interest rates and inflationary expectations are introduced as natural numbers, so that their coefficients are semielasticities. Most identities are nonlinear in the variables. For economy of notation, the error terms are omitted.

Adjustment parameters are denoted by α, long-run elasticities by β, marginal or average propensities or other desired or partial equilibrium ratios by γ, and exogenously determined rates of growth by λ. Natural logarithms are denoted by "log" and D indicates the derivative with respect to time. A prime above an interest rate indicates that the latter has been corrected for the rate of taxation on interest payments, and a circumflex indicates a desired or equilibrium quantity. Finally, an asterisk indicates that the variable is expressed in the basket of foreign currencies implicit in the construction of the effective exchange rate. A number of a priori restrictions have been imposed upon the parameters of the model. They are mentioned in the discussion of the results of the empirical tests.

The model presented in Table 2 has been estimated from the third quarter of 1960 to the fourth quarter of 1978 by keeping the exchange rate and the interest rate on treasury bills exogenous, that is, with the exclusion of equations (19) and (20). The full model has been estimated instead from the first quarter of 1973 to the third quarter of 1978.

Estimation results

The parameters of a discrete approximation of the continuous model presented in Table 2 have been estimated simultaneously by a full-information maximum-likelihood (FIML) procedure developed by Wymer (1976). The sample period ranges from the third quarter of 1960 to the fourth quarter of 1978. The estimated parameters have an asymptotic normal distribution. The

TABLE 1. ITALY: VARIABLES OF THE MODEL

FINANCIAL VARIABLES

A = bank loans and advances to private sector, including holdings of nongovernment bonds
B = government bonds held by nonbank public
BB = government bonds and bills held by banks
BF = assets held abroad by nonbanks, net, and corrected for changes in exchange rate
BFB = net foreign asset position of commercial banks
C = currency in circulation
f = total real net wealth, where all financial assets are deflated by consumer price index
p = consumer price index
p_i = import unit value index of all goods (in lire)
p_{im} = import unit value index of manufactures (in lire)
p_{io} = import unit value index of other goods (in lire)
p_{xm} = export unit value index of manufactures
p_{xmw} = export unit value index of manufactures of main competitors (in lire)
PSD = savings deposits at post offices
Rn = net international reserves
r_{TIT} = interest rate on government bonds
r_B = interest rate on treasury bills
S = effective exchange rate of the lira (if S goes up, the lira depreciates)
TBD = total commercial bank deposits
w = nominal hourly wages in manufacturing, gross of social security contributions
Π = inflationary expectations

OUTPUT AND EXPENDITURE VARIABLES

d = private consumption expenditure
inv = private investment in machinery and equipment
i_M = imports of manufactures
i_o = imports of goods other than manufactures
K_{ind} = real net stock of physical capital in industry
L = industrial employment, corrected for number of hours worked
T = government revenues
x_M = exports of manufactures
y = real GDP
y_{ind} = real value added in industry

identities that were not linear in the logarithms were linearized by taking a first-order Taylor series expansion about the sample means of the logarithms of the variables. The constraints inherent in the linearization were imposed during estimation along with a number of a priori restrictions within and across equations. The restrictions are $\beta_1 = \beta_{14} = \beta_{23} = \beta_{26} = \beta_{30} = \beta_{39} = \beta_{40} = 1$, $\beta_{27} = 0$. In addition, λ_1 has been calculated by ordinary least-squares methods

TABLE 1 *(concluded)*. ITALY: VARIABLES OF THE MODEL

EXOGENOUS VARIABLES

BOT = treasury bills held by private sector
$costr$ = public and private investment in construction
cs = ratio of total social security contributions to total wage bill
$FINBI$ = discounts and advances of the Bank of Italy to commercial banks
g = real government expenditure
i_s = imports of services
PCD = checking deposits of post offices
p_w^* = consumer price index of rest of the world (average for 13 industrial countries)
r_F = foreign interest rate, average of three-month interest rates of five major currencies and Eurodollar
r'_{PSD} = interest rate on savings deposits at post offices, corrected for tax
r'_{TBD} = interest rate on demand deposits, corrected for tax
RG = residual item in government budget constraint, including mainly financing from the Bank of Italy
t = time trend
tr = ratio of total direct taxes to total disposable income
TR = total government transfer payments (in current lire)
x_O = exports of goods other than manufactures
x_{mW} = world income, proxied by exports of manufactures of industrial countries
x_S = exports of services
y_O = real value added in nonindustrial activities
δ = rate of depreciation of stock of capital
D_{78} = dummy for structural change in Italian economy after 1977
D_{im} = dummy for speculative activity in import function of manufactures
D_{OIL} = dummy for oil crisis in import equation for goods other than manufactures

regressing the logarithm of industrial value added on time. The values of the parameters tend generally to be quite plausible. Table 3 contains the estimated adjustment parameters (the αs), and Table 4 contains the long-run elasticities (the βs). Values marked by an asterisk have been restricted during estimation.

In the asset markets the pattern of the mean time lags is plausible, ranging from about seven months to four years. Deposits at commercial banks, which can be considered the buffer stock of the financial system, have a mean time lag of somewhat less than two years (α_1). The mean time lags increase in the financial markets with the length of the maturity of the asset: the market for currency—the most liquid asset—adjusts the fastest, and the demand for postal deposits and for foreign assets the slowest. A mean time lag of more than three years in the latter market is not implausible if one considers that the outflow of capital has been quite restricted for Italian residents during the sample period, especially in the 1970s.

Table 2. Italy: Equations of the Model

FINANCIAL SECTOR: TOTAL BANK DEPOSITS

$$D\log TBD = \alpha_1\left(\log \hat{tbd} - \log \frac{TBD}{p}\right) + D\log p \tag{1}$$

$$\hat{tbd} = \gamma_1 f^{\beta_1} e^{\beta_2(r'_{TBD} - r_{TIT})} e^{\beta_3(r'_{TBD} - \Pi)} e^{+\beta_4 \Pi} \tag{1'}$$

CURRENCY

$$D\log C = \alpha_2\left(\log \hat{c} - \log \frac{C}{p}\right) + D\log p \tag{2}$$

~~$\hat{c} = \gamma_2 y^{\beta_5} e^{\beta_6 r_{TIT}}$~~ $\hat{c} = \gamma_2 y^{\beta_5} e^{-\beta_6 r_{TIT}}$ (2′)

POSTAL SAVINGS DEPOSITS

$$D\log PSD = \alpha_3\left(\log \hat{psd} - \log \frac{PSD}{p}\right) + D\log p \tag{3}$$

$$\hat{psd} = \gamma_3 f^{\beta_7} e^{\beta_8(r'_{PSD} - r'_{TBD})} e^{-\beta_9 \Pi} \tag{3'}$$

GOVERNMENT BONDS

$$D\log B = \alpha_4\left(\log \hat{b} - \log \frac{B}{p}\right) + D\log p \tag{4}$$

$$\hat{b} = \gamma_4 f^{\beta_{10}} e^{\beta_{11}(r_{TIT} - r_B)} e^{\beta_{12}(r_{TIT} - \Pi)} \tag{4'}$$

NET FOREIGN ASSETS

$$D\log BF = \alpha_5\left(\log \hat{bf} - \log \frac{BF}{p}\right) + D\log p - \beta_{13} D_{78} \tag{5}$$

$$\hat{bf} = \gamma_5 f^{\beta_{14}} e^{\beta_{15} r_F} e^{-\beta_{16} r_{TIT}} (p/p^*_w S)^{\beta_{17}} e^{\beta_{18} t} \tag{5'}$$

NET FOREIGN ASSET POSITION OF COMMERCIAL BANKS

$$D\log BFB = \alpha_6(r_F - r_{TIT}) \tag{6}$$

REAL SECTOR: PRIVATE CONSUMPTION EXPENDITURE

$$D\log d = \alpha_7(\log \hat{d} - \log d) \tag{7}$$

$$\hat{d} = \hat{\gamma_7} f^{\beta_{19}} e^{-\beta_{20}(r_{TIT} - \Pi)} \tag{7'}$$

PRIVATE INVESTMENT

$$D\log inv = \alpha_8(\log \hat{inv} - \log inv) \tag{8}$$

$$\log \hat{inv} = \gamma_8\left[\beta_{21} \frac{y_{IND}}{K_{IND}} - (r_{TIT} - \Pi)\right] \tag{8'}$$

Table 2 *(continued)*. Italy: Equations of the Model

EXPORTS OF MANUFACTURES

$$D\log x_M = \alpha_9(\log \hat{x}_M - \log x_M) \tag{9}$$

$$\hat{x}_M = \gamma_9 (p_{xm}/p_{xmw})^{-\beta_{22}} x_{mw}^{\beta_{23}} \tag{9'}$$

EXPORT UNIT VALUES OF MANUFACTURES

$$D\log p_{xm} = \alpha_{10}(\log \hat{p}_{xm} - \log p_{xm}) \tag{10}$$

$$\hat{p}_{xm} = \gamma_{10} p_{xmw} \tag{10'}$$

IMPORTS OF MANUFACTURES

$$D\log i_M = \alpha_{11}(\log \hat{i}_M - \log i_M) + \beta_{24} \log(y_{IND}/y^*_{IND} e^{\lambda_1 t}) + \beta_{25} D_{im} \tag{11}$$

$$\hat{i}_m = \gamma_{11} y_{IND}^{\beta_{26}} \left(\frac{p_{im}}{p}\right)^{-\beta_{27}} \tag{11'}$$

IMPORTS OF OTHER GOODS

$$D\log i_o = \alpha_{12}(\log \hat{i}_o - \log i_o) + \beta_{28} \log(y_{IND}/y^*_{IND} e^{\lambda_1 t}) - \beta_{29} D_{OIL} \tag{12}$$

$$i_o = \gamma_{12} y_{IND}^{\beta_{30}} (p_{io}/p)^{-\beta_{31}} (p/p^*_w S)^{\beta_{32}} \tag{12'}$$

INFLATION

$$D\log p = \alpha_{13}(\log \hat{p} - \log p) + \beta_{33} \log(y_{IND}/y^*_{IND} e^{\lambda_1 t}) \tag{13}$$

$$\hat{p} = \gamma_{13} \left[\frac{w}{(y_{IND}/L)}\right]^{\beta_{34}} p_i^{(1-\beta_{34})} \tag{13'}$$

EXPECTED INFLATION

$$D\Pi = \alpha_{14}[\beta_{35} D\log p_i + \beta_{36} \log(y_{IND}/y^*_{IND} e^{\lambda_1 t}) - \Pi] \tag{14}$$

HOURLY WAGES IN INDUSTRY

$$D\log w = \alpha_{15}(\log \hat{w} - \log w) \tag{15}$$

$$\hat{w} = w_N(1 + cs)/(1 - tr) \tag{15'}$$

$$\hat{w}_N = \gamma_{15} e^{\beta_{37} t} p^{\beta_{38}} \tag{15''}$$

DEMAND FOR LABOR IN INDUSTRY

$$D\log L = \alpha_{16}(\log \hat{L} - \log L) \tag{16}$$

$$\hat{L} = \gamma_{16}\left(\frac{w}{p}\right)^{\beta_{39}} y_{IND}^{\beta_{40}} \tag{16'}$$

GOVERNMENT SECTOR AND POLICY REACTION FUNCTION: LONG-TERM INTEREST RATE

$$Dr_{TIT} = \alpha_{17}(\hat{r}_{TIT} - r_{TIT}) - \beta_{41} \log(Rn/p_{im} i_M + p_{io} i_o) \tag{17}$$

$$\hat{r}_{TIT} = \gamma_{17}(r_F + \Pi - D\log p^*_w) \tag{17'}$$

TABLE 2 (*concluded*). ITALY: EQUATIONS OF THE MODEL

TAX REVENUES

$$D\log T = \alpha_{18}(\log \hat{T} - \log T) \quad (18)$$

$$\hat{T} = \gamma_{18}(py)^{\beta_{42}} \quad (18')$$

TREASURY BILL RATE

$$Dr_B = \alpha_{19}(\hat{r}_B - r_B) \quad (19)$$

$$r_B = \gamma_{19}(r_F + \Pi - D\log p^*_w) \quad (19')$$

INTERVENTION FUNCTION IN FOREIGN EXCHANGE MARKET

$$D\log S = \alpha_{20}(D\log p - D\log p^*_w) - \alpha_{21}\, D\log(Rn/p_{im}i_M + p_{io}i_o) \quad (20)$$

IDENTITIES: GOVERNMENT BUDGET CONSTRAINT

$$D(BB) = pg - T + Tr - D(PSD) - D(PCD) - D(B) - D(BOT) - RG \quad (21)$$

STOCK OF CAPITAL

$$DK_{IND} = inv - \delta K_{IND} \quad (22)$$

BALANCE OF PAYMENTS IDENTITY

$$D(Rn) = [p_{xm}\, x_M - p_{im}i_M - p_{io}i_o] - D(BFB) - D(BF) + [p_{xs}x_s - p_{is}i_o + p_{xo}x_o] \quad (23)$$

DEFINITION OF WEALTH

$$f = (TBD + C + PSD + B + BOT + PCD + BF - A)/p + K_{IND} \quad (24)$$

BALANCE SHEET OF COMMERCIAL BANKS

$$A = TBD + FINBI - BB - BFB \quad (25)$$

INCOME IDENTITY

$$v = d + inv + costr + g + x_M + x_o + x_s - i_M - i_o - i_s \quad (26)$$

DEFINITION OF VALUE ADDED IN INDUSTRY

$$y_{IND} = y - y_o \quad (27)$$

IMPORT UNIT VALUE INDEX OF ALL GOODS

$$D\log p_i = D\log p^*_i + D\log S \quad (28)$$

IMPORT UNIT VALUE INDEX OF MANUFACTURES

$$D\log p_{im} = D\log p^*_{im} + D\log S \quad (29)$$

IMPORT UNIT VALUE INDEX OF OTHER GOODS

$$D\log p_{io} = D\log p^*_{io} + D\log S \quad (30)$$

EXPORT UNIT VALUE INDEX OF MANUFACTURES OF MAIN COMPETITORS

$$D\log(p_{xmw}) = D\log(p^*_{xmw}) + D\log S \quad (31)$$

Most real markets adjust on average much faster to partial-equilibrium levels than do asset markets. This is also not implausible if one considers that Italian financial markets were, despite their size, very imperfect and that at times the Bank of Italy intervened heavily in the market for bonds in order to peg the interest rate. In addition, owing to the oligopolistic structure of the banking system, nominal interest rates on bank deposits were quite sticky and remained constant for long periods. Finally, only in recent years has the Treasury started to revise nominal interest rates on postal savings deposits more frequently to adjust them for inflation. There might be a sort of dual relationship between the speed of adjustment in asset markets and goods markets, such that if the first are imperfect and controlled, the public reacts by speeding up adjustment in the second set of markets, or more in general in those markets that are not controlled.

For consumption, investment, and imports of manufactures, the mean adjustment lag is between six and ten months, while for imports of raw materials and other nonmanufactured goods, it is about one month. One possible explanation is that firms adjust quite fast to changing circumstances and that the relative weights of firms and final consumers in the two import categories differ.

The mean adjustment lag of Italian exports of manufactures was about two months. This is also a remarkably high speed. Two considerations are in order. First, export unit values have been used here in the place of export prices, which are not available. Since export unit values are a recording of contract prices when the merchandise actually crosses the border, there is a delivery lag between export price changes and changes in unit export values that is not considered in this model. (See Basevi, Pecci, and Steinherr, 1980.) Therefore, the average time lag between changes in Italian exports and changes in actual contract prices is presumably longer. Second, the export sector of industrialized countries has tended more and more toward an oligopolistic structure in which prices are kept stable in the short run and revised only when major cost changes occur. (See Paolo Sylos-Labini (1956) and Steinherr (1981).) In these circumstances, quantities would tend to adjust faster than prices. This has been confirmed for Italy: while the mean time lag of the volume of exports is about 50 days, the corresponding lag for export unit values is instead almost five months.

The speed of adjustment of the wage rate and the demand for labor is quite plausible, being on the order of six to nine months. In interpreting the latter, one must remember that employment in industry has been corrected for the number of hours worked. Owing to the difficulties of laying off workers in the Italian institutional setting, most of the adjustment to changes in output occurs in the number of hours worked, not in employment.

The estimates of the adjustment parameters for the interest rate and for the price level imply a mean time lag of more than three years. Consumer prices in Italy have a larger component of controlled prices than in most other large industrialized countries, and interest rates have been pegged considerably, as already pointed out.

The mean adjustment lag of government receipts is somewhat over a month. One reason is that the weight of indirect taxes in total government revenues is larger than in advanced industrial countries; since 1974, direct taxes have been withdrawn monthly from the gross salary of dependent workers and paid directly by firms to the Treasury. The same holds for social security contributions.