IV. Concluding Observations

A plausible conjecture is that the analytical results of Section III are applicable to more general specifications of the model. This conjecture cannot be rigorously proved, of course, but it can be well argued heuristically. Observe that the fundamental result which is central to the analysis is the intertemporal equilibrium condition (17) or, equivalently, (16). Dasgupta and Heal [5] have demonstrated that this condition holds in the general case of an arbitrary CES production function and positive rate of utility discount.\(^6\) This would suggest that so long as the resource-exporting country remains incompletely specialized so that (7) holds with equality, whence (17) holds with equality, one should expect to obtain intertemporal equality of domestic interest rates and one or more reversals in the intertemporal pattern of trade and specialization.

This is not to say that there would not be qualitative differences in the analysis. It is easy to show that both the relative price and the interest rate under autarky are bounded from above (respectively, from below) when the elasticity of factor substitution is less than (respectively, greater than) unity. Similarly, the introduction of a positive rate of utility discount may result in the capital accumulation (and composite-good consumption) path to tend to zero asymptotically, instead of tending to infinity asymptotically as in Section III.\(^6\) The fact that countries may possess different rates of utility discount would seem to be unimportant however, since their domestic rates of interest are different anyway. Thus, provided that countries have identical CES production functions, the principal conclusions of Section III concerning interest rate equalization and intertemporal trade patterns should be preserved.

References


\(^6\)See Proposition 4 in [5,15-16]. Their proof requires that the utility rate of discount \(d > q(1 - b)\), where the constant \(q = \min F_k\). Denoting the constant elasticity of factor substitution by \(a\), \(q = 0\) when \(a < 1\) and \(q > 0\) when \(a > 1\).

\(^6\)Dasgupta and Heal [5,15] have shown that \(K_t\) and \(C_t\) asymptotically tend to zero (respectively, infinity) if \(d\) is greater than (respectively, less than) \(q\).
The characteristics of the macroeconomic adjustment during this period certainly constitute one of the most important aspects of these stabilization policies. In particular [2, 4, 5, 6; 7; 8; 9; and 13] are just a few examples of papers dealing with this issue. The present paper extends the existing literature by introducing a model that can successfully explain, in a rational expectations framework, the most relevant stylized facts of the Southern Cone experiences. In section II we present the basic model. Its main features are its emphasis on the short-run adjustment of the economy, the structure of the capital account, and the explicit incorporation of money financed fiscal deficits. The model presents a plausible explanation for the persistence of differentials in the rate of return between domestic and foreign assets that prevailed for the experiences under consideration. In addition, this section highlights the problems that arise when there is an inconsistency between the size of the fiscal deficit and the exchange rate target. In section III we analyze the short-run and long-run effects on the economy of various policy actions that are relevant for the experiences under study. The main findings of this paper and a discussion of their implications for policy issues are presented in section IV.

II. The Basic Model

The Basic Structure of the Model

Consider a small open economy that produces a nontradable good \( y_c \) and an exportable good \( X \). The supply of both goods is assumed to be fixed and exogenous to the model. It is also assumed that domestic expenditure falls entirely on the nontradable good and on the imported good \( I \) while the whole production of the exportable good is sold abroad. The economy is small in the markets for its tradable goods and thus it cannot affect the world prices of \( X \) and \( I \). Let \( P_x \) and \( P_i \) be respectively the prices of the importable and the exportable good in terms of the foreign currency. We further assume that

\[
P_x^* = P_i^* = P^*
\]

Given that \( P^* \) is exogenous and fixed we can normalize it so that \( P^* = 1 \). Let \( E \) be the nominal exchange rate (i.e., the price of foreign currency in terms of domestic money). In the absence of any transport costs and other barriers to international trade the prices of \( X \) and \( I \) in terms of domestic currency will be \( P_x = EP_x^* = EP_i^* = E \).

Government expenditure falls entirely on the domestic good \( Y_c \). It is assumed that the government does not levy any taxes and hence that the budget deficit is entirely money-financed. Denoting \( G \) as nominal government expenditure and \( D \) as domestic credit, in the absence of a commercial banking system, the government budget constraint can be written as

\[
D = G
\]

where \( D = d/dt \). Since government expenditure falls entirely on the domestic good, we can define real government expenditure as \( g = G/P \) where \( P \) is the price of the domestic good.

Throughout the paper we define short-run equilibrium as one in which the economy is in internal and external balance, but in which the current account is not necessarily in balance (i.e., the country is increasing or decreasing its stock of foreign assets). This short-run model can be extended for the case in which the current account is in balance. We analyze this case in an appendix (available from the author upon request) and show that the results presented in this paper should hold in the extended model as well.

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3It should be recalled that this paper is primarily concerned with the medium term equilibrium of the economy. For this reason, it does not seem unreasonable to model the equilibrium flow of capital and set its stock, even if there might be capital inflows or outflows at the stationary equilibrium. Furthermore, it is the specification of the capital account is consistent with a portfolio balance model, in which at the stationary equilibrium the current account is balanced.
The demand for real money balances is a positive function of real income and a negative function of the nominal interest rate (6)

\[ m = l(y_t). \]  

We postulate that the money market continuously clears and hence that equation (7) is always satisfied. We can solve from (7) for the value of the nominal interest rate to obtain

\[ i = h(m, y_t); \quad h_m < 0 \quad \text{and} \quad h_y > 0. \]  

The stock of domestic money, in the absence of a commercial banking system, is formed entirely of high-powered money and equals the assets of the central bank; composed of domestic credit (L) and international reserves (R). As a result, changes in the money supply are given by

\[ M = D + SR. \]  

As discussed in equation (1) changes in domestic credit are tied to the value of the government's budget deficit. Changes in international reserves are determined by the balance of payments surplus or deficit and are given by

\[ R = C_A + K \]  

where C_A is the current account. We assume that the country is a net debtor and hence that an increase in the foreign interest rate will deteriorate the current account. In this model we assume that agents have perfect foresight regarding the behavior of nominal and real variables of the economy. In particular, these assumptions imply that the expected rate of depreciation of the exchange rate will equal the actual one. We can substitute equations (4) and (5) into (9) to obtain

\[ R = C_A [h_e(m, y_t) + \delta (-i - \pi - \sigma)]. \]  

Notice that under this specification the economy can reach balance of payments equilibrium with a surplus (deficit) in the capital account that is offset by a deficit (surplus) in the current account.

Finally, we need to specify the exchange rate rule. We assume that the monetary authority follows a policy of pegging the rate of devaluation of the exchange rate at a rate which is consistent with its other policy targets (i.e., with the size of the fiscal deficit and the steady state rate of inflation). This type of exchange rate policy implies that while the exchange rate is fixed at any point in time, its nominal value is continuously being adjusted through changes in its rate of change. This type of exchange rate rule closely corresponds to the one followed in Argentina, Chile and Uruguay during the late 1970s and early 1980s, a policy generally known as a sliding peg or “La Tabilla”.

The Dynamic Behavior of the System

The dynamics of the system can be described by two differential equations showing the evolution over time of real money balances and the real exchange rate. Differentiating equations (2.6) and (2.8) with respect to time, using the rate of growth of the money supply as the trend rate of inflation and equations (3), (6), (7) and (10) and rearranging

we obtain the following system of differential equations expression for the domestic rate of inflation

\[ \dot{m} = \frac{M}{M} - \frac{\dot{M}}{M} = \beta (P(e, m, y_t, y_e) - y_e) \]  

\[ = -\beta (P(e, m, y_t, y_e) - y_e). \]  

\[ \dot{e} = v - \frac{M}{M} - \dot{m} \]  

\[ = v M - \epsilon - \delta (e, e, m, y_t, y_e) - \epsilon (h(m, y_t) - i - \pi - \sigma). \]  

The reader could easily verify that the stability conditions are always satisfied. It is interesting to note that the stability conditions do not depend—as was the case in [2 and 12]—on the degree of capital mobility (which in the present paper is measured by the parameters \( \delta \) and \( \sigma \)). The main reason for this difference lies on the specification of the price adjustment mechanism. In (2) capital inflows cause an excess supply of money, increase aggregate demand and could lead to a path of ever growing inflation. In our model, it is also true that capital inflows will raise inflation, however, this increase will only be temporary. The higher rate of inflation leads to an initial appreciation of the real exchange rate which reduces the demand for domestic output. Eventually, this contraction in demand will slow down the rate of inflation. As a result, real money balances will increase, put downward pressure on the domestic interest rate and reduce capital inflows.

The system of equations (11) implies that at the stationary equilibrium the following condition must hold,

\[ \frac{\dot{P}}{P} = \frac{\dot{M}}{M} = 0 \]  

However, condition (12) does not imply that the external sector of the economy will be in balance. This condition will be satisfied if and only if \( g = \tau \alpha, \) in other words when the budget deficit is consistent with the steady state value of the cost of holding real money balances (i.e., the inflation tax). Accordingly, when \( \alpha > \tau \) the stationary solution implies that the economy will have a balance of payments surplus.

If we want to restrict our analysis to cases in which at the stationary equilibrium the balance of payments is in equilibrium, then the government cannot view the inflation target and the government budget deficit as two independent instruments. This result becomes apparent if we assume that the demand for money function is similar to the one used by Cagan in the dynamics of hyperinflation. Once we substitute this type of demand for money function into the government budget constraint we obtain the familiar expression

\[ g = (p/p)\dot{m} - (p/p)\alpha \dot{u}. \]  

One could decompose the nominal interest rate such that

\[ i = \tau + \frac{p}{p}, \]  

where \( \tau \) is the real rate of interest. If \( \tau \) remains fixed, then any changes in the rate of inflation will be accompanied by equal changes in the nominal interest rate. The value of the inflation tax revenue depends on the inflation rate and on the semielasticity of the demand for money with respect to the interest rate (\( \alpha \)). Unless otherwise specified we will be assuming that the government adjusts its fiscal policy according to its inflation target. The possibility of an inconsistency between these two policy objectives will be fully discussed in section III.

In figure 1 we use a phase diagram to describe the dynamic behavior of the economy. The \( \dot{m} = 0 \) schedule shows the pairs of real money balances and the real exchange rate such that the market for the domestic good is in equilibrium. It is downward sloping because a larger amount of real money balances increases expenditure and creates an excess demand.
rule embodying a lower rate of devaluation than in previous periods. In the present model a reduction in the rate of devaluation of the exchange rate leads to a proportional reduction in the steady state rates of inflation and of monetary growth. Moreover, when the interest rate elasticity of the demand for money is less than unity, consistency requires that the new exchange rate policy is accompanied by a reduction in government expenditure. In terms of the system of equations (11), the change in (v) will cause an upward shift in both schedules. When the shift in the \( e^* = 0 \) schedule is greater than the shift in the \( e = 0 \) one, then the new equilibrium will be characterized by an appreciated real exchange rate, higher real money balances and a lower nominal interest rate. Moreover, from equations (4), (5) and (10) we can infer the structure of the balance of payments at the new equilibrium. The appreciation of the real exchange rate and the higher level of real money balances clearly deteriorate the trade balance; however, since under the current set of assumptions the balance of payments remains in equilibrium, the capital account must improve. In the present model this improvement is accomplished through an increase in the real rate of interest.

The adjustment process towards the stationary solution is portrayed in figure 3. Point A denotes the initial equilibrium of the economy while B is the equilibrium point that corresponds to the new lower rate of inflation. Initially, there is an increase in capital inflows due to the lower rate of return on foreign assets that results from the fall in (v) while there is no change in the domestic nominal interest rate (because real money balances are predetermined). These capital inflows raise the rate of inflation above the rate of devaluation and cause the appreciation of the real exchange rate. Over time, as real money balances grow, the nominal interest rate falls, and capital inflows decrease until the economy finally reaches the stationary equilibrium at point B.

Actually, the dynamic process just described captures important aspects of the macroeconomic adjustment of the Southern Cone countries during the preannouacement period. During that time the economies experienced continuous capital inflows, a trade balance deficit, and a rate of return on domestic assets that was consistently higher than the return on foreign assets. The model also successfully explains the appreciation of the domestic currency and the high real rate of interest. In this model, as in [6], the initial increase in the rate of inflation stems from the increase in the rate of growth of the money supply that occurs during the early stages of this policy as a result of the capital inflows.

The adjustment process just discussed differs in several respects from other works that studied this subject. It differs from [13] since in that model capital is perfectly mobile; moreover, in [13] a reduction in the rate of devaluation of the exchange rate would lead to an instantaneous fall in the nominal interest rate (due to the interest rate parity condition). As a result, [13] cannot incorporate the possibility of a discrepancy between the rates of return of domestic and foreign assets which appears as one of the most relevant and puzzling features of the Southern Cone experiences. It also differs from [11] not only in the dynamics assumed for the price equation (domestic prices are fully flexible in that model), but more importantly, because that model predicts that a reduction in the rate of devaluation would lead to a depreciation of the real exchange rate as opposed to the real appreciation discussed in the present paper. This opposite behavior also extends to the dynamics of the trade balance, although the predictions regarding capital inflows are the same in both models.

It should also be noted that in the present model capital inflows are the main force driving the appreciation of the real exchange rate. This type of relationship was also discussed in [6]. In that model, capital inflows increase aggregate demand and hence put upward pressure on prices; on the other hand, in the present model, capital inflows affect prices through their effect on the trend rate of inflation. In this respect, the present model also

III. Policy Actions and Their Effects on the Economy

The model presented in section II is particularly valuable for the discussion of short term macroeconomic policy and the analysis of the adjustment process. We will now utilize this model to analyze the stabilization and liberalization policies that were implemented during the late 1970s in Argentina, Chile and Uruguay. Our main objective is to explain the appreciation of the real exchange rate that took place during this period.

A Change in the Rate of Devaluation of the Exchange Rate

The central element of the anti-inflation strategies in these countries was an exchange rate
of the demand for money the value of the inflation tax (and hence the sustainable government budget deficits) can increase or fall. When the interest rate elasticity of the demand for money is very low (as is likely to occur in countries with very high rates of inflation), there will be a reduction in the inflation tax revenues. If the treasury does not reduce the government budget deficit accordingly the country will run a balance of payments deficit. In other words, the government loses part of its revenues from monetizing the deficits through a depletion in international reserves (i.e., $m = g + \delta$).

There are two important differences with respect to the case in which the deficit is actually adjusted. First, since in this case there is a smaller increase in real money balances, we can infer that the surplus in the capital account is going to be greater. Second, as the result of the larger appreciation of the real exchange rate, the deficit in the current account will also be greater. This obviously needs to be so, since there will be a balance of payments deficit in spite of the larger surplus in the capital account.

The solution of the system would certainly be inconsistent in the long run since a non-growing economy cannot finance a permanent imbalance in the foreign sector through reserves or debt. At the same time, it can also be inconsistent in the medium term—which is the time horizon of this paper—if the economy does not have enough resources to finance the elimination of payments deficit. As it usually is the case in semi-industrialized countries, the economy will eventually face a constraint in its external sector and it will be forced to either change its exchange rate policy or to reduce the budget deficit. Under these circumstances it is foreseeable that the policy is bound to fail. Some economists would argue that this discussion provides an plausible interpretation of the failure of the anti-inflationary experiment in Argentina.

IV. Summary and Conclusions

This paper presented a dynamic model of the open economy that, in our opinion, captures the most interesting features of the anti-inflation policies implemented in the Southern cone of Latin America during the late 1970s. The model is able to explain some of the most relevant stylized facts of this period such as the large deficits in the current account, the continuous capital inflows and the persistence of a differential between the returns on domestic and foreign assets.

In this paper we also extensively discuss the adjustment of relative prices. It was shown that in response to a reduction in the rate of devaluation of the exchange rate one would expect an initial appreciation of the real exchange rate—as it actually occurred for the experiences where this policy was followed. In fact, the rate of inflation can initially rise, if the capital inflows are sufficiently large as to increase the rate of growth of the money supply. It is only in this sense that international capital flows were found to represent a potentially destabilizing factor on the economy. As a result the imposition of controls on capital flows might be useful to reduce the extent of the overvaluation of the domestic currency. On the other hand, it was shown that the magnitude of the capital flows cannot lead the economy to an unstable path characterized by increasing rates of inflation. In this respect, the results of the present model sharply differ from the ones found by [2] and [12].

In addition, the model suggests that the favorable terms of trade that the countries faced at the early stages of the anti-inflationary policies and the opening of the domestic financial markets are additional factors contributing to the appreciation of the domestic currency.

The paper also argues that the exchange rate rule should be consistent with the target for the budget deficit. In particular, when the government reduces the rate of devaluation of the exchange rate without adjusting the government budget deficit, rate of growth of domestic credit is likely to remain at the old high levels. Under these circumstances, the monetization
of the deficit will create an excess supply of money and lead to a balance of payments deficit. Eventually, the continuous loss of reserves will make the policy unsustainable. After all, consistency between the various policy instruments is a necessary condition for the success of any stabilization policy.

References


I. Introduction

Money demand equations have gone substantially off track during the 1980s and the impact of the deposit market deregulation mandated by the Depository Institutions Deregulation and Monetary Control Act of 1980 (DICAA) would seem to be the most obvious explanation. But the pattern of money demand forecasting errors does not seem to fit particularly well with this explanation and, as a result, numerous others have been proposed. These range from arguments that recent changes in the public's expectations about, or uncertainties over, inflation have altered the parameters of the money demand relationship to claims that GNP no longer proxies properly for the volume of transactions for one reason or another. This paper presents some preliminary evidence that it is, in fact, deposit market deregulation that has caused standard money demand equations to go off track in the 1980s, but that its impact has been obscured by the seasonal adjustment filters applied to M1, inappropriate measures of households' opportunity cost of holding money, and an aggregation bias in modelling a single demand for M1 rather than separate demands for households and firms.

Section II of the paper presents an analysis of a standard money demand specification and the problems it presents. Section III repeats the analysis using not seasonally adjusted money data. Section IV introduces a simply constructed measure of households' opportunity cost of holding money to the money demand specification. This measure uses data from the Fed's quarterly Demand Deposit Ownership Survey (DDDS) to help quantify households' money holdings. Section V uses the DDDS survey data to model households' money demand separately and tracks the performance of this equation over the 1980s. A brief conclusion follows.

II. The Recent Performance of a Standard Money Demand Equation

While there is ample evidence that a standard Goldfield partial adjustment model of the transactions demand for M1 has broken down during the 1980s, evidence linking the breakdown to deposit market deregulation has been more difficult to find. For example, Hafer [8] shows that while there was a statistically significant change in such an equation after

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