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9 Trying to Stabilize: Some Theoretical Reflections Based on the Case of Argentina

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During the period of 1976–1980, the Argentine peso suffered a "real" appreciation against the U.S. dollar of about 100 percent (see table 9.1). This phenomenon is also noticeable if one takes into account the estimates of Rodriguez and Sjaastad (1979), which suggest that part, but not all, of the reason is that the "long-run" equilibrium real exchange rate also appreciated during the same period.

One possible reaction to these facts is to interpret the difference between the actual and long-run equilibrium exchange rate as an indication of short-run "disequilibrium," and then build up models to explain it. This was the course followed by Rodriguez (1979) and Dornbusch (1980). The former assumed adaptive (nonrational) expectations, while Dornbusch assumed that there is inertia in the actual rate of inflation or, more formally, that the rate of inflation is a "state" variable. In both models a reduction in the rate of devaluation (the policy explicitly undertaken since January 1979) appreciates the real exchange rate. This is so because the papers assume that the price of tradables is proportional to the nominal exchange rate; thus, in Dornbusch (1980) the implication is immediate because the growth rate of the price of tradables would be reduced, whereas the price growth rate of nontradables is, by assumption, given in the short run; in Rodriguez (1979), on the other hand, perfect capital mobility implies that a lower rate of devaluation results in a lower domestic nominal rate of interest. Since inflationary expectations

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Table 9.1 **Real Exchange Rates**

	(a)	(b)		(a)	(b)
1977	162.8	144.0	1979	92.0	92.9
1978	137.5	114.0	1980	74.0	82.4

Source: Same as table 9.2; (a) U.S. Wholesale Price Index times the peso/dollar exchange rate divided by CPI of Argentina; (b) same denominator as in (a), but numerator is 0.7 times Agriculture-Cattle Raising Price Index *plus* 0.3 times Import Price Index.

are given in the short run, we also have a fall in the real interest rate that, by stimulating aggregate demand, appreciates the real exchange rate.

Another way of reacting to these facts is to search for "general equilibrium" explanations where behavioral equations could, in principle, be derived from optimization processes and where individuals have rational expectations (in the sense used in the current macroeconomic work; see, e.g., Sargent and Wallace 1975).[1] This is the type of model that we will discuss in this paper.

To familiarize the reader with the Argentine economy from March 1976 (when the military coup took place), section 9.1 will be an outline of the main policies and the available empirical evidence for that period. This will also serve as background and motivation for the models of the next section.

Section 9.2 will start with a brief review of the important work of Rodriguez and Sjaastad (1979) on which, as noted before, rests the idea that the real value of the peso lies above its long-run level. Then we will present essentially three types of models. The first one studies the impact of a portfolio shift from dollars to domestic capital (land); the second model emphasizes the substitutability of domestic and foreign monetary assets. Finally, the third model examines the effects of the announced exchange rate policy's lack of credibility on the minds of the public.

The main message of this paper is that there are simple, realistic, general equilibrium models that have the potential to account for at least some of the divergence between the actual and the long-run equilibrium real exchange rates. How much these models can explain, however, is an open question that must await further study.

9.1 Some Stylized Facts

The explicit objectives of the military government were to substantially reduce the rate of inflation from world-record levels and to start a process of trade and banking liberalization. All of this was supposed to take place

1. Dornbusch (1980) would also belong to this class of models if one could find a rationale for his price-setting equation.

without causing a sizable increase in the rate of unemployment.[2] To carry out these almost-impossible sounding objectives, J. A. Martínez de Hoz was put at the helm of the Ministry of Economics; he, in turn, appointed Adolfo Diz as head of the central bank.[3]

Despite the stability of the economics team and a visible trend toward fulfilling the original objectives, economic policy was not always clearly understood by the public. Part of the reason for this "lack of clarity" was, of course, that at the beginning the new administration was engaged in both dismantling long-inherited price distortions and trying to substantially cut a large budget deficit (the fiscal deficit in 1975 was over 12 percent of GNP and revenue was less than 25 percent of expenditure), a program that was hard to carry out by means of across-the-board, clear-cut measures, especially given the above-mentioned unemployment constraints. But, in addition, there is some consensus among economic observers that an important source of private-sector confusion also had to do with the minister's admitted bias toward discretionary policy ("pragmatism" in the Argentine jargon).

The period from March 1976 to December 1978 was by far the most turbulent in terms of radical changes; the one that was most completely accomplished was the decontrol of the banking system. The latter developed from a system with very negative interest rates, where the central bank was the only "owner" of deposits (except for savings banks, "financieras," that were heavily controlled), to a situation where interest rates on time deposits were left to fluctuate in response to market forces, banks were free to choose their loan portfolios, and barriers on international capital mobility were substantially lifted.

The second important change during that period (1976–1978) was the (partial) elimination of wage, price, and trade controls. Price controls were practically removed in April 1976. Guidelines on minimum wages were kept, but by all accounts, the latter became nonbinding (i.e., the market equilibrium wage lay above the minimum). Subsidies on nontraditional exports were phased out as was also the case with taxes on traditional exports (meat, wheat, etc.). Import tariffs were substantially reduced with the exception of steel, which is considered to be a strategic sector. Apparently, however, by December 1978, tariff reductions did little more than just eliminate redundant protection.

Monetary policy was perhaps the least clear aspect of the economic program during this period. It started with an inexplicitly defined "crawl-

2. Apparently unemployment was seen as a potential breeding ground for the guerrilla groups that were still very active and powerful in 1976.

3. They, as most of the other officials appointed in 1976, kept their positions until the official end of their appointments (March 1981), a fact that, as noted by De Pablo (1980), makes this by far the longest-lived economics team in recent Argentine history. According to De Pablo, from 1945 to 1976 the average term of a minister of economics was 347 days, and only eleven out of thirty-two ministers lasted for more than a year.

ing peg" system and finally converged, in 1978, with an equally unclear "dirty float" regime. These points are worth keeping in mind, for while we observe a decline in the fiscal deficit and in the growth rate of the monetary base, these otherwise important components of a stabilization program are bound to lose their effectiveness, or to operate in perverse ways, if economic agents do not understand the (implicit) policy rules.[4]

The period from January 1979 to December 1980 was relatively calm in terms of fundamental structural changes. In addition, in contrast to the previous period (1976–1978), monetary policy became relatively transparent. Beginning in January 1979, the government announced the future exchange rate until October of that year (with a declining rate of devaluation) and *promised* to continue with that type of policy until March 1981 (when a new administration would take charge). Although in January 1979 a prefixed schedule for the dollar exchange rate was not set for after October, it was understood that from then on the rate of devaluation was going to steadily decline until it reached zero by March 1981. Restrictions on capital mobility were relaxed further, although an important imperfection was kept: except for some minimal amounts, foreign capital could not be repatriated until it had been in the country for a year. This is important because the administration never prefixed the exchange rate for more than six months. In July 1980, however, free capital mobility was allowed (practically). Until November 1980 the prefixed rate was fully honored. From December, there was a slight upward revision of the "rate" of devaluation relative to that announced in July 1980 (it went from 1 percent to about 2 percent a month).[5]

As seen in table 9.2, from 1977 to 1980 the annual (November-to-November) CPI inflation rate fell from 177 percent to 89 percent, the sharpest decrease being in 1980 (particularly in the last months). This contrasts with the rate of devaluation that went from 117 percent to 27 percent. As a result, all reasonable estimates of the "real" exchange rate show a marked decline over the entire period (see table 9.1). For future reference, the appreciation of the real rate started before January 1979.

4. Here we come across an example of the "pragmatism" that prevailed, especially during the 1976–1978 period.

5. A more precise chronology is as follows (I owe this to De Pablo): On December 20, 1978, the government announced the dollar exchange rate for the period from 1-1-79 to 8-31-79; on April 10, such schedule was extended up to the end of 1979. In October 1979, the rate was announced up to (virtually) March 1980, after which it was understood that the rate of devaluation of a given month was going to be the same of the previous one minus 0.2 percent. September 1980 marks what, with the benefit of hindsight, we might call "the beginning of the end," because contrary to what was declared in December 1978, the rate of devaluation for October and succeeding months was announced to be 1 percent per month; however, in December the "ask" rate was allowed to grow at 2 percent, while the "bid" rate was kept as 1 percent per month. Finally, toward the end of the Videla-Martínez de Hoz administration (2-2-81 to be exact), the peso was unexpectedly devalued by 10 percent and a rate of devaluation of 3 percent per month was announced for the "future" (see section 9.3).

Table 9.2

Year	CPI Rate of Inflation	U.S. Dollar Rate of Devaluation
1977	177.5	117.4
1978	165.5	73.9
1979	150.1	66.1
1980	88.9	26.8

Source: C.E.M.A., *Seminario de discusión sobre economía Argentina*; data compiled on the basis of information of the Central Bank of Argentina, Instituto Nacional de Estadísticas y Censos, International Finance Statistics, and other sources. These are percentage rates as of November of each year.

As measured by published GDP figures, the cost of the program in terms of lost output appears to be quite substantial. The annual growth rate during the 1974–1980 period dropped to 1.1 percent compared to a secular 4 percent (see table 9.3). However, these figures are not very reliable because the base is 1960—a fact that may have tended to underestimate changes in output associated with the above-mentioned structural changes—and because the rate of unemployment apparently fell from 4.8 percent in April 1976 to 2 percent in April 1980 (De Pablo 1980).[6]

A remarkable development over most of the period was the sizable increase of international reserves held by the central bank. As seen in table 9.4, reserves increased more than seven times from April 1976 to April 1978. The rate considerably diminished over the next two years but was still relatively large (over 12 percent per annum). However, from April to October 1980, a period that started with the collapse of three major private banks, reserves fell by about 12 percent; this declining tendency continued toward the end of the year.

Two forces seem to be operating here. During 1976–1977 there is likely to have been a portfolio shift from foreign to domestic assets, because the government made it very clear from the beginning that private property would be fully respected; later the interest rates were decontrolled, thus widening the set of attractive domestic assets. Prior to March 1976 the menu of assets held by the public consisted mainly of goods and foreign assets (for most people just dollars in safety boxes). With this in mind, it is not implausible that a large proportion of the less than 5 billion dollar increase of reserves from April 1976 to April 1978 just came from private portfolios of Argentines, since it only represents about 20 percent of

6. It should be noted, however, that even leaving capital accumulation effects aside, one could conceive of a situation where GDP stagnates while unemployment falls. This would be the case, for example, if wages became downward flexible (by the elimination of labor unions) and firms were price setters which preferred to underutilize capacity. See section 9.2.3 for further discussion.

Table 9.3

GDP (millions of 1960 pesos)			
1970	15,284.5	1976	18,186.9
1971	16,182.37	1977	19,085.4
1972	16,798.29	1978	18,429.7
1973	17,589.4	1979	19,972.6
1974	18,664.9	1980	19,940.9
1975	18,502.9		

Source: Central Bank of Argentina.

Table 9.4

	(a) Reserves (million dollars)	(b) Claims on Government (billion pesos)	(c) Real High-Powered Money
1976	1,812	477	6,193
1977	4,039	1,089	8,370
1978	6,037	1,324	7,097
1979	10,480	1,352	5,757
1980	7,683	7,744(d)	6,547

Source: International Financial Statistics and Central Bank of Argentina; (a), (b), and (c) as of December of each year; (c) deflated by the Wholesale Price Index; (d) as of October.

GNP.[7] Another possible reason for the accumulation of reserves is that, especially after 1978, the rate of growth of the central bank's credit to the government (the main component of domestic credit) was held considerably below the rate of inflation and, more fundamentally, also below the prefixed rate of devaluation (see tables 9.2 and 9.4).[8]

After the banking reform (last quarter of 1977), interest rates skyrocketed; the real lending rate for December 1977 reached the record equivalent annual level of 194 percent (see table 9.5). The real rate was positive for 1978 and 1980 and near zero for 1979.

9.2 The Road to an Explanation

In view of the previous description, it is clear that the central question we ought to answer is: What are the main reasons for the slow convergence of the inflation rate to the prefixed inflation rate (plus the international inflation rate)? This question has already been partially answered in an important paper by Rodriguez and Sjaastad (1979). They start from the observation that the equilibrium real exchange rate is, inter alia, a

7. To get this estimate, we conservatively assumed that per capita income was $1,000 (U.S.).

8. The opposite happened in 1981, thus explaining the loss of reserves over that period.

Table 9.5 **Real Interest Rate**

Month	1977	1978	1979	1980	1981
January	—	3.18	−2.45	2.43	3.94
February	—	5.86	−0.90	1.85	2.84
March	—	0.23	−1.03	1.74	5.66
April	−1.25	−0.74	0.61	1.44	—
May	−1.82	−0.81	−1.87	0.03	—
June	0.79	3.51	−3.22	−0.94	—
July	1.47	3.11	0.08	4.17	—
August	−4.37	−0.85	−6.54	3.19	—
September	1.89	0.68	2.85	2.62	—
October	−1.30	−2.55	6.95	−0.11	—
November	5.76	−0.93	3.56	2.76	—
December	9.39	1.50	4.38	5.51	—

Source: Same as table 9.1, obtained by subtracting the monthly rate of growth of wholesale prices from the nominal interest rate of table 9.5.

function of the domestic terms of trade (i.e., international terms of trade adjusted by tariffs and subsidies), and thus, they run a regression of the latter against the former. An implication of their estimates is that, for instance, the removal of an export tax will tend to appreciate, while the reduction of a binding import tariff will tend to depreciate the equilibrium real exchange rate. As noted earlier, both experiments were tried. If, as argued above, tariffs were reduced to eliminate redundant protection, then their paper would imply that there was a downward shift in the real exchange rate. In a fixed exchange rate regime this would take the form of an increase in the inflation rate. As reported by the authors, and by extrapolations for 1980 made by C. A. Rodriguez, however, the price level appears to be even higher than warranted by their formulas. Estimates vary, but their analysis suggests that by the end of 1980 the price level was at least 15 percent above its long-run, equilibrium level.

Another, more fundamental, reason why the Rodriguez-Sjaastad analysis could not tell us the whole story is that their estimates are based on Cochrane-Orcutt techniques, suggesting that there exist some other, perhaps slow-moving, variables crucial to the process.

In what follows we will present several models that try to account for some of the "missing" variables in a general-equilibrium, rational-expectations context. It should be made clear from the outset that the models do not intend to capture all the aspects of the Argentine experience.

9.2.1 The Portfolio Shift Model

The first model tries to capture the impact effect of a portfolio shift, like the one mentioned in section 9.1. More specifically, here we will be

concerned with shifts away from foreign and toward domestic physical assets.

Let us assume that there are three assets: land (inelastically supplied), domestic money, and foreign money (M and f, respectively). Thus, wealth in terms of foreign exchange, a, satisfies

$$a = z + q, \tag{1}$$

where

$$z \equiv \frac{M}{E} + f \tag{2}$$

is "financial" wealth, q is the price of land in terms of foreign exchange, and E is the exchange rate (i.e., price of foreign currency in terms of domestic money). We assume the existence of tradable and nontradable goods, no international inflation, and that the country is "small" in international markets; thus, the domestic price of tradables could be identified with E.

Given that we wish to emphasize the substitutability between land and foreign assets and that, as shown in table 9.4, the stock of real, high-powered money was relatively constant, we will assume that the demand for money is inelastic with respect to the interest rate(s). Assuming that the relevant price level is the price of nontradables,[9] P, we get

$$\frac{M}{P} = \alpha, \text{ a constant}. \tag{3}$$

Furthermore, we assume that

$$q/f = k. \tag{4}$$

This is simply a portfolio demand equation. To simplify the exposition, we will assume k to be exogenous. However, straightforward extensions will be briefly mentioned at the end.

We assume (see Calvo and Rodriguez 1977 for a similar procedure):[10]

$$\underset{- \ +}{C_H(p, a)} = \text{demand for nontradable (or "home") goods},$$

$$\underset{+ \ +}{C_T(p, a)} = \text{demand for tradable goods},$$

$$\underset{+}{y_H(p)} = \text{supply of nontradables},$$

$$\underset{-}{y_T(p)} = \text{supply of tradables}.$$

9. Results are qualitatively the same as long as in the relevant "price level" P has a positive weight.

10. Signs underneath an argument indicate those of the corresponding partial derivatives.

In equilibrium,

$$C_H(p, a) = y_H(p), \tag{5}$$

and thus, at equilibrium,

$$p = v(a). \tag{6}$$
$$+$$

We will study the case where E is prefixed (although it may vary over time). Thus, assuming that foreigners do not demand domestic land,[11] it follows that financial wealth, z, is at any time, t, a "state" or predetermined variable at t. Hence, by (1)–(6),

$$a = z + fk = z + (z - \alpha p)k = z(1 + k) - \alpha v(a)k. \tag{7}$$

By equations (6) and (7), a is a function of z and k at equilibrium, and if f, $k > 0$ (the relevant case for our analysis),

$$\frac{\partial a}{\partial z} > 0, \tag{8a}$$

$$\frac{\partial a}{\partial k} > 0. \tag{8b}$$

We immediately see, by (7) and (8b), that a shift way from foreign exchange and into land increases p, that is, appreciates the real exchange rate. Furthermore, since initially z is predetermined, (1) implies that the value of land will rise. Also, by (2) and (3),

$$z = \alpha p + f, \tag{9}$$

and thus, the rise in p implies a fall in f: the private sector will have exchanged foreign for domestic currency leading to accumulation of reserves by the central bank.

In other words, in trying to shift from foreign exchange to land, the public raises the price of land and, consequently, wealth goes up. The latter, in turn, increases the demand for nontradables, leading to an increase in the price level, and thus, to a rise in the demand for domestic currency. The end result is that the central bank accumulates reserves even when originally the public was interested in land, not in domestic money.

To study the dynamics, let us assume that domestic credit grows at the rate ϵM (where $\epsilon \equiv \dot{E}/E$ = rate of devaluation). Thus,

$$\dot{z} = y_T(p) - C_T(p, a). \tag{10}$$

Recalling (6), our assumptions have the plausible implication that p is

11. This is not an important constraint unless foreigners *own* all the land.

invariant across steady states.[12] Since, by equation (6), p is an increasing function of a and, by equation (8a), a is an increasing function of z, we can use (10) to obtain a closed stable system. Thus, after the initial appreciation of the real exchange rate, p will start to fall back to its long-run equilibrium.

Let us denote by R_t the stock of reserves at the central bank at t. Let us denote by R^- and M^- the stocks of reserves and money supply, respectively, before the portfolio shift, which is the subject of our analysis (i.e., the increase of k). Hence, under our assumptions we have

$$\frac{M_0 - M^-}{E_0} = R_0 - R^-, \tag{11a}$$

and

$$\dot{R}_t = \frac{\dot{M}_t}{E_t} - \epsilon \frac{M_t}{E_t} = \frac{d}{dt}\left(\frac{M_t}{E_t}\right). \tag{11b}$$

Therefore,

$$R_t = R_0 + \frac{M_t}{E_t} - \frac{M_0}{E_0}. \tag{12}$$

However, by (3),

$$\frac{M_t}{E_t} = \alpha p_t. \tag{13}$$

But since a change in k was shown to leave steady state p unchanged, it follows that, if the system started at steady state,

$$\frac{M_t}{E_t} \to \frac{M^-}{E_0}, \text{ as } t \to \infty. \tag{14}$$

Consequently, by (11a), (12), and (14),

$$R_t \to R^-, \text{ as } t \to \infty. \tag{15}$$

The above arguments have shown, assuming that before the increase of k the system was at a rest point, that the stock of reserves at the central bank will in the long run be invariant with respect to k. Since it can be shown that long-run z decreases with k, it follows, by (9) and steady state invariance of p, that f will fall. Therefore, in the long run the country as a whole will hold less foreign currency than prior to the portfolio change.

To summarize, the model shows that a portfolio shift as suggested by the data explains a temporary appreciation of the real exchange rate and an accumulation of reserves on the part of the central bank (also tempo-

12. This is plausible in the present context because these models are intended to explain temporary departures from the long-run levels of the real exchange rate.

rary). One could also show in this model that, even at steady state, reserves would accumulate (decumulate) if the rate of expansion of domestic credit is held below (above) the rate of devaluation (another feature of the Argentine plan).

Notice that in this model a change in the rate of devaluation has no "real" effect. This is essentially the result of our assuming that the demand for money is inelastic with respect to the nominal interest rate. This type of effect, however, will be captured by our next model.

Before closing this section, we would like to sketch a possible extension to the case where k is variable. A simple way would be to make k a function of the rate of return of land in terms of foreign exchange. With rationality, the latter is a function of land rental (a function of p in a two-sector model) and capital gains, $\dot{q}$. In this fashion, the system can now be expressed by a pair of differential equations in z and q, where q_0 is determined by the usual saddle-path condition. The analysis now proceeds along similar lines as those in Calvo and Rodriguez (1977).

9.2.2 The Currency Substitution Model

In this model we assume, together with the "currency substitution" literature (see Kouri 1976; Calvo and Rodriguez 1977), that the menu of assets consists only of domestic and foreign currencies (M and f). We have in mind a situation where the two monies can be used for transaction purposes, but because of, say, legal constraints they are not perfect substitutes.

A possible model strategy is to assume that monies are arguments in utility functions and to proceed from there. This line was extensively explored in Calvo (1980). For the sake of simplicity, and without losing the central qualitative features of the above-mentioned model, I will "tell the story" starting from demand functions.

The production side is assumed to be the same as in section 9.2.1. The demand side is slightly changed in the following manner:

Let us define income, y by

$$y = y_T + y_H p, \tag{16}$$

and "liquidity adjusted" disposable income, y^d, by

$$y^d = H(m, f) + y - \epsilon m + q, \tag{17}$$

where

$$m \equiv M/E, \tag{18a}$$

$$\epsilon = \dot{E}/E, \tag{18b}$$

g is government lump-sum transfers, and H is a function reflecting the "liquidity services" of the two monies. Johnson (1967) appears to be the first one to suggest that liquidity services should be included in the

concept of disposable income (see also Fischer 1972). We assume H to be concave and increasing in both arguments and to exhibit decreasing marginal "productivities."[13] The term ϵm accounts for the depreciation of domestic money in terms of foreign currency.

At each moment of time individuals are assumed to maximize y^d subject to the wealth constraint that now becomes

$$a = m + f. \tag{19}$$

The next step is to assume that the demand functions depend negatively on p, as in section 9.2.1, and positively on (maximum) y^d (previously we assumed that a was the other argument besides p). Home market equilibrium is now obtained when

$$C_H(p, y^d) = y_H(p), \tag{20}$$

which implies that at equilibrium

$$p = V(y^d) \tag{21}$$
$$\qquad +$$

(compare this with equation [6]).

Now we are ready to study the effect of a once-and-for-all fall in ϵ (a dramatization of the Argentine plan that started January 1979). Obviously, by the "envelope theorem" initial y^d will take an upward jump if $m>0$ (which we, of course, assume) and g remains unchanged. By equation (16), this leads to an appreciation of the real exchange rate. However, if in order to preserve the invariance of steady state p we assume, as in section 9.2.1, that

$$\epsilon m = g, \tag{22}$$

the impact effect on p becomes ambiguous. Although one could follow the lines of Calvo (1980) to resolve the ambiguity in terms of empirically meaningful concepts, we will content ourselves here to point out a special, but interesting, case where initial g goes up when $d\epsilon<0$.

Suppose we start from a steady state where inflation (ϵ) is so high that seigniorage from inflation (ϵm) increases when inflation is diminished. This is the type of situation emphasized by Friedman (1971). That is to say,

$$\partial(\epsilon m)/\partial\epsilon<0. \tag{23}$$

As before, $d\epsilon<0$ implies $dy^d>0$, if g is constant. But now since (22) holds, we have by (23) that g rises, implying a further increase in y^d—all of which results, by (21), in a rise of initial p.[14]

13. More generally H should also be made a function of p to reflect the use of monies to transact home goods.

14. This is not intended to be a rigorous proof. However, the reader can easily convince himself of this result by laying out the dynamics of the model.

Another interesting experiment is to study the implications of lowering minimum cash reserves of banks which, as indicated above, was one of the ingredients of Argentina's financial reform.

A simple way to handle the question is to think of m as high-powered money (in terms of foreign exchange). Letting λ denote the "money multiplier," it is natural to rewrite the "liquidity services" function, H, as follows:

$$H(\lambda m, f). \tag{24}$$

Using the latter in equation (17), we can answer the question we posed.

Clearly, again by the "envelope theorem," a rise in λ leads ceteris paribus to an increase of initial y^d and, hence, p. One can show that the latter holds true if (17) is assumed and if H is homogeneous of degree one (not an unreasonable assumption).

9.2.3 The Credibility Model

In section 9.1 we put a great deal of emphasis on the lack of clarity and credibility that seemed to have prevailed during several subperiods of the stabilization plans. In 1980, for example, there is a sizable spread between the U.S. prime rate plus actual devaluation and the domestic nominal interest rate, suggesting that people were expecting a rate of devaluation larger than had been announced (see table 9.6). So far, however, our models have not incorporated these features.

To keep the discussion within reasonable limits, we will discuss only a special case of the credibility problem where people do not believe that the preannounced rate of devaluation will actually be made effective.

Table 9.6 **Risk Premium: Spread between Domestic and International Interest Rates**

Month	1977	1978	1979	1980	1981
January	—	5.47	1.36	2.57	3.45
February	—	3.69	1.30	2.03	−5.23
March	—	2.67	1.40	1.59	3.75
April	−2.08	2.02	1.48	1.46	—
May	−1.24	3.51	1.61	2.01	—
June	1.71	6.04	1.93	3.51	—
July	0.99	5.54	2.54	4.47	—
August	1.93	4.41	3.14	3.66	—
September	1.54	2.81	3.28	3.15	—
October	2.78	2.30	3.33	3.07	—
November	4.36	1.20	2.38	3.04	—
December	5.08	1.86	2.54	3.57	—

Source: Same as table 9.1. Calculated by subtracting from table 9.5 the ten-day prime rate plus the rate of devaluation.

Furthermore, we will assume that this is the only aspect of the stabilization "package" which is subject to disbelief.

In the first place, disbelief about preannounced ϵ does not necessarily have real effects. One example is the model of section 9.2.1. Another, which is perhaps more interesting because it does not make the assumption that the demand for money is inelastic, is as follows:

Imagine that the demand for home goods takes the following form:

$$C_H(\underset{-}{p}, \underset{-}{r}), \tag{25}$$

where r, the (ex ante) "real" rate of interest, satisfies

$$r = i - (\dot{P}/P)^e, \tag{26}$$

where i is the nominal interest rate, and $(\dot{P}/P)^e$ is the expected rate of inflation of home goods. Assuming perfect capital mobility, we get

$$i = i^* + \epsilon^e, \tag{27}$$

where i^* and ϵ^e are the rest-of-the-world nominal interest rate and the expected rate of devaluation. Thus, denoting the expected growth of p by $(\dot{p}/p)^e$ we get, in equilibrium,

$$C_H[p, i^* - (\dot{p}/p)^e] = y_H(p). \tag{28}$$

Making the natural assumption that

$$p = p^e, \tag{29}$$

we can, by (28) and (29), obtain a differential equation for expected p; if, as usual, we single out the stationary solution as the one corresponding to "rationality," then we see that the real exchange rate is not affected by changes in the expected rate of devaluation (incidentally, notice that the stationary solution is locally unstable, yielding uniqueness).

Intuitively, what happens in this economy when people expect a higher rate of devaluation, for example, is that the nominal interest rate and the expected rate of inflation will rise in the same amount as ϵ^e does. Hence, the real interest rate remains constant and equilibrium p does not change.

Furthermore, in the context of section 9.2.2, a rise in ϵ^e has ambiguous results for the same reasons that a change in ϵ had ambiguous implications. In fact, one can show that if parameters are such that an increase in ϵ lowers initial p (the case we emphasized in section 9.2.2), then a higher ϵ^e (the relevant case for Argentina) would produce the same type of impact on p as an increase in ϵ—it will go down, a movement opposite to the one we want to be able to explain.

We would get a different implication in a world of price setters for home goods and price takers for tradable goods. Imagine a situation where

(30) $$P_{it} = \alpha E_t^e + (1 - \alpha) P_t^e,$$

where P_i is the price set by firm i in the home goods sector. It is assumed that P_{it} has to be determined prior to knowing the price of tradables (E_t) and the average for nontradables (P_t). The index e indicates expectations at $(t - 1)$, when prices are set. (This model is similar to the one discussed in Phelps 1979, except that there money supply takes the place of E). Now, assuming rationality, we get

(31) $$P_t \equiv \int_0^1 P_{it} di = P_t^e$$

(where, for simplicity, we assume that each firm is a point in the interval [0, 1]). Hence, by (30) and (31), we get

(32) $$P_t = E_t^e.$$

Therefore, if, say, $E_t < E_t^e$ (i.e., authorities devalue by less than expected) then P_t/E_t will be larger than 1, that is, the equilibrium value of P/E if E is fully anticipated.

Consequently, according to this model, if all of a sudden individuals expect that a devaluation will occur sometime in the future, but they do not know exactly when, there will be an appreciation of the real exchange rate as long as devaluation is not made effective. The model can even explain a steady increase in observed (P/E) if, in the perception of individuals, devaluation becomes more likely with the passage of time.

Notice that, if we superpose the assumption that wages are perfectly flexible, the model implies full employment and excess capacity (or unwanted inventory accumulation), which is not inconsistent with the Argentine experience. If, in addition, we append the model with a demand-for-money function like (3), we also find that the appreciation of the real exchange rate would be accompanied by an accumulation of reserves at the central bank.

Independently of whether unfulfilled expectations of the sort examined above affect the ex post determination of the real exchange rate, there is also an effect on the ex post real interest rate that appears to have played an important role in the last stages of the Martínez de Hoz administration. Take, for instance, the first model discussed in this section (equations [25]–[29]). By using equation (28) and recalling that the solution requires $(\dot{p}/p)^e = 0$, the ex ante expected real interest rate would be i^*. However, again because ex post p is a constant, $\dot{P}/P = \epsilon$ (the actual rate of devaluation). Consequently, by equation (27) the ex post real rate of interest is equal to $i^* + \epsilon^e - \epsilon$.

Therefore, by simply making the expected rate of devaluation larger than the actual we can increase the actual interest rate over the expected. Various conditions existed to make this likely to happen during 1980. In the first place, the closing of major banks in April together with the

Table 9.7 Twenty-Nine-Day Lending Rate

Month	1977	1978	1979	1980	1981
January	—	18.42	7.59	6.70	6.40
February	—	11.14	7.06	6.00	8.00
March	—	9.30	7.03	5.60	10.30
April	4.49	8.34	7.06	5.30	—
May	4.49	8.17	7.14	5.40	—
June	7.43	8.30	7.26	6.40	—
July	7.17	8.02	7.60	7.10	—
August	8.20	7.79	8.10	6.10	—
September	9.17	7.35	8.10	5.50	—
October	12.23	7.38	8.00	5.30	—
November	13.66	7.58	7.00	5.40	—
December	13.58	7.87	6.90	6.30	—

Source: Same as table 9.1.

widespread belief that the peso was overvalued led people to think that the economy was out of control of de Hoz's team, and that any reasonable successor would most likely devalue to restore some kind of "equilibrium" parity. The second, and perhaps most crucial, factor that operated during 1980 was the nomination (by the junta) of a new president (R. Viola) whose term would start on March 29, 1981. It was immediately transparent that Viola disagreed with de Hoz's policies, and to make things worse, he made no clear policy statement before taking over, except for saying that he supported the (loosely defined) basic principles of the 1976 revolution (freer markets, etc.), but it was likely that there would be changes in "instrumentation." This together with the perception that the peso was overvalued led to a belief of an imminent and substantial devaluation (this is dramatically shown in table 9.7 for March 1981).[15] The effect on the real interest rate for the last stretch of the Martínez de Hoz period agrees with the implication of the above theory (see table 9.5).

9.3 Epilogue

The devaluation pressures by the end of the Martínez de Hoz period were practically insurmountable. As indicated above, de Hoz was prompted to make an unexpected 10 percent devaluation in February 1981. The new administration, however, confirmed what almost everybody had predicted by further devaluing the peso by 30 percent a few days after taking the oath of office. The prefixed rate system was continued but it did not stop the outflow of capital. As a consequence, another 30 percent

15. As indicated in note 5, the peso suffered an unannounced 10 percent devaluation in February 1981.

devaluation, this time highly unexpected, was carried out the first week of June 1981. Credibility was lost, capital outflow gathered additional momentum, and a few weeks later the government announced a "dual" exchange rate system: a prefixed rate for most commercial transactions and long-run capital flows; a floating rate for short-run capital and some commercial transactions (like some nontraditional exports and tourism). Taking into account the average of the floating rate for June, the upshot of all this was that the peso was devalued by over 200 percent since January 1981, in striking contrast with the plan of December 1978 that had anticipated a completely fixed rate after March 1981. It is worth noting, however, that over that period the price level (CPI) increased by slightly less than 50 percent and that, for the first time since 1976, the rate of unemployment appears to have overshot the 6 percent mark.

Like physicians, economists should learn from the catastrophes of some economies to try to improve the welfare of many others. In this light, the models discussed in this paper have to be seen as only tentative explorations of a mysterious disease that will require many able researchers to diagnose it adequately.

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Comment

Herminio A. Blanco

The internal consistency of the first and second models presented by the author is beyond dispute. However, since the empirical motivation of the third model is that agents made a significant forecasting error in 1980, the "natural assumption" made in equation (29) (i.e., $p = p^e$) is inappropriate. Instead the formulation of a fully stochastic model is called for. Such a model should specify if the forecasting error was fostered by an unexpected change in the parameters of the underlying stochastic processes, or if it was generated under a stable structure.

My main comment centers around the validity of developing a series of models to "capture" each of the highlights of the Argentine experience during the 1976–1980 period. Is the author listing alternative hypotheses to be tested in a stepwise regression, or is he groping toward a general model?

My general impression is that the answer would be negative to the first question and affirmative to the second. If the author is trying to formulate a general model, he should have developed the implications of each one of the models for the whole period under consideration. Instead of following this initial "testing" procedure, the author only considered the capacity of each model to replicate a particular historical episode.

As a final comment, I would like to stress that one of the most intriguing pieces of evidence presented in the historical background was not incorporated in any of the models. What is the relation between the collapse of the three major banks and the decrease in foreign exchange reserves which occurred in 1980?

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Comment

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The Argentine case offers an interesting example of a new set of economic policies recently being implemented in several developing countries. (LDCs). The set includes the following among its most distinctive features: a reform of the domestic financial market in the direction of liberalizing interest rates and the allocation of credit and of reducing reserve requirements; the freeing of capital flows; a trend toward a fixed unified exchange rate; a generalized relaxation of price controls; the demobilization of labor unions; a public sector increasingly passive on economic matters; and, most often, an authoritarian regime. Actual experiences in LDCs toward an "open economy" have tended to be associated with "closed politics" and repressed social organizations.

This set of economic policies—frequently called orthodox, neoconservative, or free market experiments—is well illustrated by the economic models implemented in the Southern Cone countries, especially Argentina and Chile. They conform better than, for instance, South Korea or Singapore, to a textbook "free market" model. Moreover, Argentina (until mid-1980) and Chile (still by the end of 1981) were exhibited by the supporters of these policies as highly successful and promising cases.

The Southern Cone experiments do not begin from a steady state situation. Actually, they are initiated in a framework characterized by high and variable inflation, large fiscal budget deficits, arbitrary trade restrictions, and a distorted price system. The Southern Cone experiments are intended to "normalize" the domestic economies. But, in contrast with previous stabilization programs, they have also been directed to introduce "structural" changes in the economic organization that was built in previous decades. It is obvious that the title of "market economy" or free market is too vague and general to describe these new experiments.

Guillermo Calvo takes one significant feature of the Argentine case, which was the growing gap between domestic inflation and international rates of inflation (plus variations of the exchange rate) that resulted, between 1977 and 1980, as the rate of devaluation was reduced in the search for a fixed exchange rate. This issue is also quite relevant for Chile, where the formal implementation of a "monetarist approach to the balance of payments" or an open-economy global monetarism has also resulted in a significant appreciation of the real exchange rate.

Calvo sketches some of the relevant features of the implementation of the model imposed in Argentina. Then he presents three models framed

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in a general-equilibrium, rational-expectations context. They are intended to explain the real appreciation of the peso against the U.S. dollar, which was close to 100 percent in the period discussed. Model 1 focuses on the impact of a portfolio shift by Argentinians from foreign currency to domestic land; model 2 studies the effects of substitutability between domestic and foreign monetary assets; and model 3 examines the implications of the noncredibility of the official announcements with respect to exchange rate policy.

Here, for the sake of brevity, I will make only two brief comments related to the sketch of the implementation of the Argentine model, and then I will refer briefly to Calvo's discussion of models 1 and 3.

Calvo asserts that the economic policy was not always clearly understood by the public. He rightly says that this "lack of clarity" was partly the result of the dismantling of long-inherited price distortions. But one can go further by following the track of this fact. One can hypothesize that even if the public were able to understand the policy, it might be unable to identify correctly (a) the direction of changes in relative prices and the corresponding reallocative signals, and (b) the range of feasible trends in the effort to stabilize the price level. Many economists place in these two implications a significant explanatory power of the low investment rates or the persistence of domestic inflation with a stagnant or depressed economic activity (see, e.g., Ffrench-Davis 1979; Foxley 1980; and Ramos 1978 on Chile's case). It is a very relevant question whether the reduction of some (not all, of course) "distortions," especially in the conjunctural framework characterizing the Southern Cone countries, has been generating costs overwhelmingly larger than the present value of potential benefits to be reaped sometime in the future.

Second, I want to touch on one point relating to restrictions on capital movements. Calvo calls the maintenance, until July 1980, of the minimum one-year period of permanence for capital inflows an *imperfection*. It can be argued that some sort of intervention in capital movements might be required to improve the performance of the market and to avoid speculative flows. As Dornbusch (1981) puts it, "There is no reason whatsoever to establish linkages to the world capital market for the benefit of speculators," and imbalances "can as well be financed by sterilized central bank intervention or by changes in public sector net foreign assets." In fact, there seem to have been too many experiences in Latin America disturbed by destabilizing capital flows. Free flows, rather than discouraging the mismanagement of policies such as the exchange rate, appear to foster it. That has been the case of the recent experiments of Argentina and Chile: capital inflows larger than the actual current account deficit have pressed for a clearly excessive appreciation of the exchange rate; for a while, the process of appreciation has encouraged further capital inflows.

Now let us refer briefly to model 1. First, it must be recalled that Calvo states clearly that the models have the potential to account for *at least some* of the divergence between the actual and the long-run exchange rates, but *how much* is an open question.

There has clearly been a demand shift from foreign currency to land. (It was subsequently reversed in both countries.) The open questions are how large has this shift been, and how significant is its effect on "wealth," the core variable in model 1; and then how strong is its transmission to the price of nontradables (p). In Argentina's case, we are dealing with differences between the annual changes of CPI and of the exchange rate (plus international inflation) as large as 80 percent (158 percent versus 80 percent, in average, for 1978–1979). And it is not a one-year phenomenon, but it lasted for four years. I think that the strength of "inertia" in inflation and the weakness of the capacity of the exchange rate either to influence inflationary expectations or to influence directly the market of nontradables, are notably more relevant as explanatory variables of the persistently large net domestic inflation.

The boom of the price of land and of other forms of wealth have probably been more significant in contributing to the diversion of investment and mental efforts from "productive" uses to "speculative" uses. These problems of transition introduce complications in the return of p to an "invariant steady state" and most probably modify to a significant degree the long-run equilibrium.

Finally, just two comments in relation to model 3. First, disbelief in preannounced exchange rate schedules, rather than the consequence of the lack of clarity of the government, appears to be the result of the increasing appreciation of the exchange rate and the subsequent effects on the trade balance (Frenkel 1981). Both in Argentina and Chile evidence seems to show that disbelief came after appreciation, not vice versa.

Second, it is true that disbelief about the preannounced path for the exchange rate, in some cases, may not have real effects. Calvo discusses some interesting examples that illustrate this possibility. But that, for sure, has not been the case of Argentina and Chile in their recent experiments. The data suggest that, as a consequence, real interest rates became more unstable, the spread between domestic and foreign interest rates increased, and investment in tradables was discouraged. It is one thing to know that the real exchange rate will be devalued sometime and another to know when it will be done. The actual market exchange rate is a factor that has been affecting the short-run profitability of producers of tradables and actually pushing many to bankruptcy. The actual working of capital markets is not guided by distant horizons, particularly after the sort of financial reforms that have been implemented with these experiments.

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