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Inflation Stabilization and Nominal Anchors

by

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Abstract

This paper analyzes the choice of a nominal anchor in disinflation programs in chronic inflation countries. A review of both theory and evidence suggests several key considerations. First, the recessionary effects associated with disinflation appear in the early stages of money-based programs, but only in the late stages of exchange rate-based programs. Second, lack of credibility is more disruptive under fixed exchange rates than under floating exchange rates. Third, attempting to pursue a disinflationary policy while maintaining a given level of the real exchange rate is likely to be self-defeating. Fourth, a high degree of currency substitution favors the exchange rate as the nominal anchor.

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Contents

I. Introduction

With the abandonment of commodity or convertible monies after World War I, inflation quickly burst onto stage as the monetary financing of large fiscal deficits brought about hyperinflation in several European countries. Ever since, the question of how to stop inflation has kept busy policymakers and researchers alike. In particular, policymakers in many developing countries--most notably Latin America and Israel--have been involved in a long battle with an inflation breed which, in spite of being much less spectacular than hyperinflation, has proved to be a much tougher enemy: chronic inflation.

Chronic inflation is characterized by high--relative to OECD countries--and persistent inflation. Unlike hyperinflation, whose duration is measured in terms of months and exhibits an explosive nature, chronic inflation may last several decades and is relatively stable. 1/ As Figure 1 illustrates, countries such as Argentina, Brazil, and Uruguay have lived with high inflation for the last three decades. With one exception (Argentina in 1969), inflation has never been below 10 percent. Moreover, three-digit inflation has been the rule in Argentina since 1975 and in Brazil since 1981. In contrast, with a few exceptions, inflation in the United States has always been below 10 percent. Repeated attempts in all three countries--Argentina, Brazil, Uruguay--to get rid of the scourge of chronic inflation have met with only temporary success, and inflation has come back with a vengeance. However, chronic inflation is by no means undefeatable: major stabilization programs in Chile (1978), Israel (1985), and Mexico (1987) succeeded in bringing inflation down to about 20 percent

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1/ The key distinction between chronic inflation and hyperinflation goes back to Pazos (1972) (see Végh (1992) for a fuller discussion).

per year (Figure 1). 1/ Unfortunately, further reducing inflation to international levels has proved to be quite an elusive goal.

More often than not, the failure of stabilization programs simply reflects the lack of a lasting fiscal adjustment. Clearly, a strong and sustained fiscal adjustment which eliminates the need for inflationary finance is a necessary condition for a successful inflation stabilization plan. However, even fiscally-sound programs have faced unsurmountable hurdles. In the Southern-Cone programs of the late 1970's, for example, the substantial real appreciation of the domestic currency proved to be fatal because it fueled speculation of nominal devaluations and eventually forced policymakers to abandon the plans. 2/ The initial boom that accompanied the implementation of the programs also caught policymakers by surprise, and made the reduction in the inflation rate of non-traded goods particularly difficult. The recessionary effects that, according to conventional wisdom, are associated with inflation stabilization came only later in the program. The Southern-Cone programs thus gave rise to the intriguing idea--captured by the expression "recession now versus recession later"--that the choice between using the money supply as the nominal anchor (money-based stabilization) or the exchange rate (exchange rate-based stabilization) may imply choosing the timing of the recession. Under money-based

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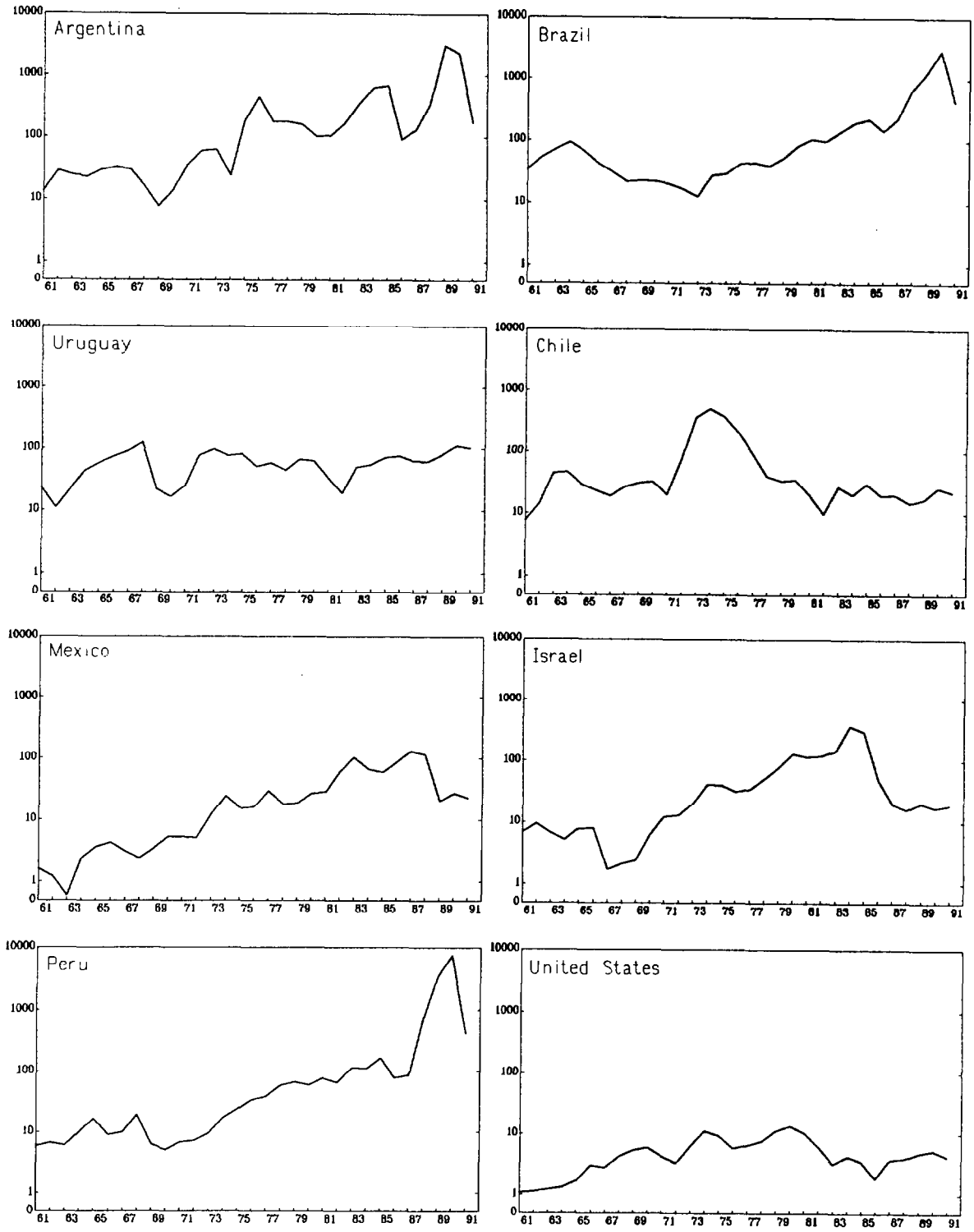
1/ The current Convertibility plan in Argentina, implemented in March 1991, has also met with initial success, and inflation is projected to fall to 20 percent during 1992.

2/ The Southern-Cone programs comprise the orthodox stabilization plans in Argentina, Chile, and Uruguay in the late 1970's. These programs are usually referred to as the "tablitas" (little table), after the table published in local newspapers that contained the preannounced path of the exchange rate for several months in advance.

Figure 1. Inflation Rate in Selected Countries, 1961–1991

(Percent per year, logarithmic scale)



Source: IMF, International Financial Statistics.

stabilization, the output costs would be paid upfront (recession now), whereas under an exchange rate-based stabilization, the costs would be paid later (recession later). 1/

The choice of the nominal anchor thus came to be seen as a critical decision which, by dictating the dynamic adjustment of the economy to lower inflation, could affect the success of the disinflationary program. Furthermore, as a result of the substantial inflation inertia observed in the Southern-Cone tablitas, it was also argued that a single nominal anchor might not be enough to ensure a quick disinflation as problems of credibility, backward-indexation, and non-synchronized price setting would generate inflation persistence. These considerations prompted the introduction of additional nominal anchors--most notably incomes policies--in the heterodox programs of the mid-1980's in Argentina, Brazil, Israel, and Mexico.

In order to gain insights into the role of nominal anchors in inflation stabilization programs in chronic-inflation countries, this paper reviews the evidence on the dynamic adjustment of disinflationary policy under exchange rate and money supply rules (Section II), and interprets the evidence in terms of an analytical framework (Section III). This basic analytical framework offers a convenient benchmark for the analysis of multiple anchors (Section IV), since what motivates policymakers to impose multiple anchors is the desire to affect the dynamics of the adjustment. The discussion puts special emphasis on the role played by lack of

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1/ Rodriguez (1982) first formalized the idea of an initial boom and later recession in exchange-rate based stabilizations.

credibility. The analytical framework suggests that lack of credibility may have markedly different effects on disinflationary programs depending on the nominal anchor. Hence, the credibility that a program may command in its inception should be taken into account when choosing a nominal anchor. Finally, the paper closes by discussing policy conclusions that may be drawn from the analysis as well as other related issues (Section V). In particular, the analysis focuses on how the choice of a nominal anchor may be affected by the presence of currency substitution--a widespread phenomenon in high inflation countries.

II. Stylized Facts of Inflation Stabilization

This section discusses the main stylized facts associated with both money-based and exchange rate-based stabilizations in chronic-inflation countries.

1. Exchange rate-based stabilization

In chronic-inflation countries, the exchange rate has been used much more frequently as the nominal anchor than the money supply. Therefore, the evidence on the outcome of exchange rate-based stabilizations is by now abundant. 1/ Exchange rate-based stabilizations in chronic-inflation countries have been characterized by: (1) a slow convergence of the inflation rate to the devaluation rate; (2) a sustained real appreciation of the domestic currency; (3) a deficit in the trade and current account

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1/ See, for instance, Kiguel and Liviatan (1992), Végh (1992), and the references therein.

balances; (4) an initial expansion of real activity followed by a later contraction; and (5) an ambiguous response of the real interest rate. 1/

(1) Inflation converges only slowly to the rate of devaluation. The slow convergence of inflation to the devaluation rate was particularly apparent in the Southern-Cone programs of the late 1970's (Argentina, Chile, and Uruguay), as illustrated for Argentina in Figure 2. This lack of convergence prompted the use of incomes policies in the heterodox plans of the mid-1980's in Argentina, Brazil, Israel, and Mexico. Inflation converged quicker in these plans but, as illustrated in Figure 3 for Israel, still remained above the devaluation rate.

(2) There is a sustained real appreciation of the domestic currency. Given the slow convergence of the inflation rate, it is hardly surprising that the real exchange rate (defined as the relative price of traded goods in terms of home goods) fell substantially throughout the programs. The real appreciation was particularly pronounced in the Southern-Cone programs. In the Argentine tablita, for instance, the real exchange rate had halved by the end of the program (Figure 2). As a result, the heterodox programs of the mid-1980's usually included an initial devaluation to provide room for the inevitable real appreciation. 2/ The sustained real appreciation has often proved to be the Achilles' heel of major programs, as it fuels speculation of maxi-devaluations (i.e., large discrete devaluations). In

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1/ The Argentine 1978 tablita (Figure 2) and the Israeli 1985 plan (Figure 3) will be used to illustrate the outcome of exchange rate-based stabilizations. Vertical bars indicate the beginning and, in the case of the Argentine tablita, the end of the programs.

2/ In the Israeli plan, the depreciation of the dollar in the international capital markets that started in February 1985 prevented the initial real appreciation (Figure 3).

successful programs such as those in Israel and Mexico, there have been adjustments of the nominal exchange rate along the way. 1/

(3) The trade balance and the current account deteriorate. As Figures 2 and 3 illustrate for the Argentine tablita and the Israeli plan, the current account balance usually worsens, reflecting a widening trade deficit. 2/ In particular, imports of durable goods have soared in most episodes. The current account imbalances have typically been financed by substantial capital inflows.

(4) Real activity (i.e., real private consumption and real GDP) increases at the beginning of the program and later contracts. The pattern of an initial boom and later recession in exchange rate-based stabilization was brought home by the Southern-Cone tablitas of the late 1970's (see Figure 2 for the Argentine tablita). In Chile and Uruguay, the recession took place even before the programs came to an abrupt end. The same pattern was observed in the heterodox programs of the mid-1980's. The Israeli case was particularly striking because the late recession occurred in spite of the success of the program (Figure 3). Based on 12 exchange rate-based

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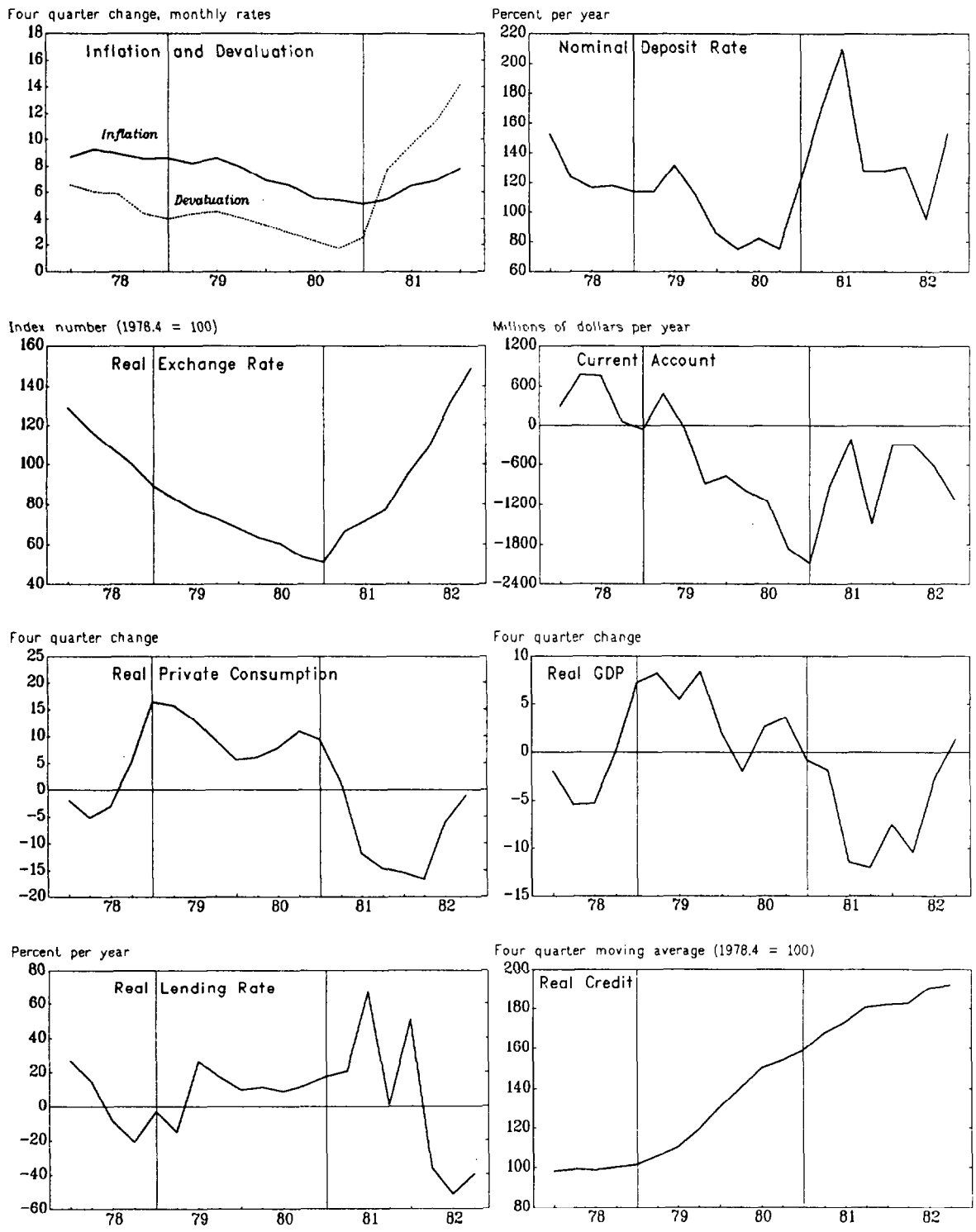
1/ In Israel, the domestic currency was first devalued by 9.2 percent in January 1987 (the plan was implemented in July 1985). Two more devaluations of 4.8 and 8.0 percent followed in December 1988 and January 1989, respectively. An exchange rate band around a fixed central rate was then adopted. In December 1991, the authorities announced a devaluation of the central parity of nine percent during the following 12 months. In Mexico, the exchange rate remained fixed during the first year of the program (until December 1988) after which a crawling peg was established, with the peso being devalued by about 16 percent during 1989. The rate of devaluation was reduced over time reaching 5 percent during 1991. Since November 1991, the domestic currency has been fluctuating within a band the upper end of which is adjusted at an annual rate of 2.4 percent.

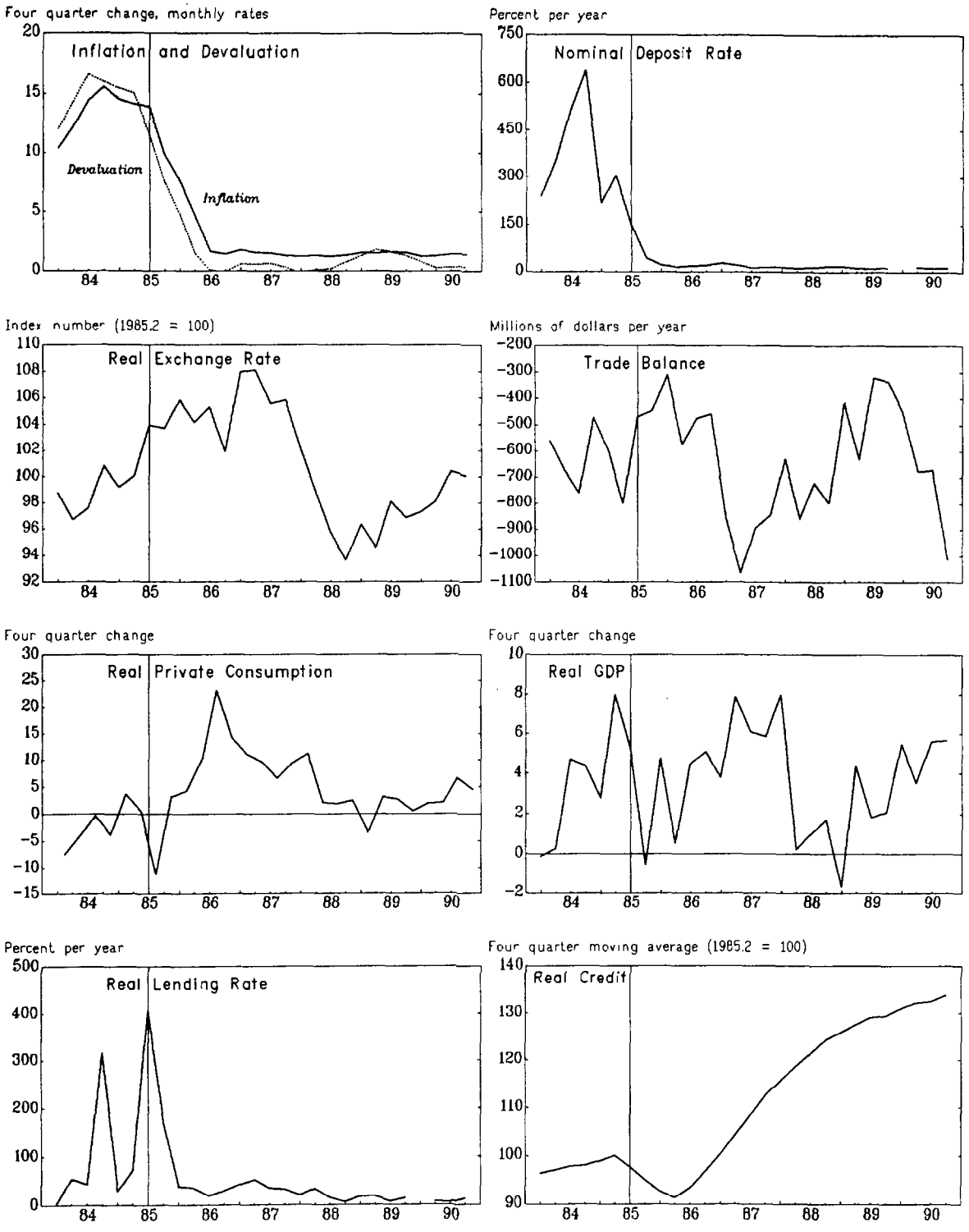
2/ For Israel, the trade balance is depicted because the presence of grants distorts the current account figures.

Figure 2. Argentine 1978 Plan (Tablita)



Source: IMF, International Financial Statistics, Fund staff estimates, and national sources, as reported in Vegh (1992).

Figure 3. Israeli 1985 Plan



Source: IMF, International Financial Statistics, Fund staff estimates, and national sources, as reported in Vegh (1992).

stabilizations in chronic inflation countries (which include the cases mentioned here), Kiguel and Liviatan (1992) conclude that this boom-recession cycle remains the norm even when characterized with respect to a trend. 1/

(5) Domestic real interest rates may rise or fall. In the case of the Southern-Cone "tablitas," domestic real interest rates fell (Figure 2). In fact, the fall in real interest rates was viewed at the time as the key factor behind the initial expansion (see Rodriguez, 1982). In contrast, in the heterodox programs of the mid-1980's, real interest rates appear to have increased (Figure 3). As discussed below, the explanation for the different behavior of real interest rate may be related to the use of additional nominal anchors (for instance, a credit aggregate, as in the case of Israel).

2. Money-based stabilization

Stabilization plans based on the control of the money supply (thus letting the exchange rate float) have been much less common in chronic-inflation countries than those based on the control of the nominal exchange rate. The most notable one is the August 1990 Peruvian program, which will

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1/ The Mexican program, which began in December 1987, has so far proved an exception in that no late recession has occurred.

be used for illustrative purposes. 1/ Money-based stabilizations seem to be characterized by: (1) a slow convergence of inflation; (2) a real appreciation of the domestic currency; (3) an improvement in the trade balance and the current account; (4) an initial recession; and (5) high real interest rates.

(1) Slow convergence of inflation to the rate of monetary growth. The slow convergence of inflation to the rate of growth of the nominal anchor is certainly not unique to exchange rate-based stabilizations (Figure 4). 2/ In fact, inflation persistence was one of the main reasons behind the decision to switch nominal anchors (from the money supply to the exchange rate) in Argentina and Chile in the 1970's.

(2) Real appreciation of the domestic currency. It is argued sometimes that, under floating exchange rates, the real appreciation that takes place in exchange-rate-based programs can be avoided. However, the evidence (as well as the theory, as discussed below) suggests that this is not the case. In the case of Peru, the domestic currency appreciated sharply in real terms following the implementation of the programs (Figure 4). From the third quarter of 1990 to the first quarter of 1992,

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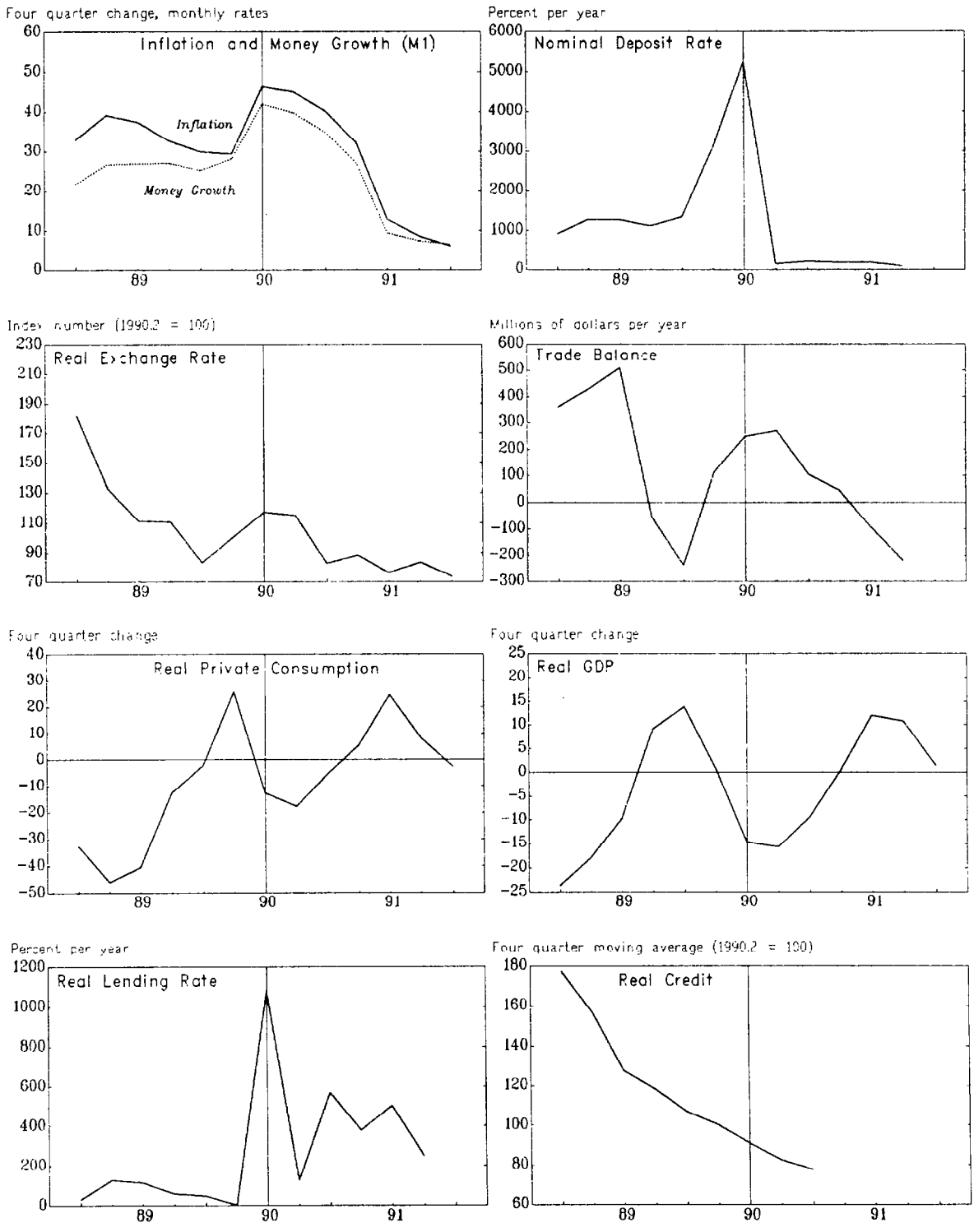
1/ Other programs include those undertaken in Argentina and Chile before the tablitas, the Bonex plan in Argentina (December 1989), and the August 1990 plan in the Dominican Republic. It should be noted, however, that the latter program is not a "pure" money-based plan because there was a dual exchange rate regime during the first year of the program before a single, floating rate was established. In a dual rates regime, the money supply still acts as a nominal anchor. Hence, the effects of a stabilization program under dual rates should not be much different from those that arise under a money-based program (see Calvo and Végh (1991a)). In fact, the plan in the Dominican Republic was characterized by a recession, real appreciation, and an improvement in the current account, as has been the case of other money-based programs (see below).

2/ The vertical bar indicates the beginning of the program.

Figure 4. Peruvian 1990 Plan



Source: IMF, International Financial Statistics and Fund staff estimates.

the real appreciation totaled 37.2 percent. During the Bonex plan in Argentina, the real appreciation totaled 159.1 percent in the first twelve months, as the exchange rate remained basically flat from February 1990 to December 1990 while inflation never fell below 10 percent a month.

(3) The trade balance and the current account improve. In the Peruvian program, for instance, both the trade balance and the current account improved in the first two quarters of the program (Figure 4). Beginning in the third quarter of the program, however, the trade balance began to deteriorate as the real appreciation began to "bite," and output recovered. During the Bonex plan in Argentina, both the trade balance and the current account improved markedly.

(4) An initial recession. Money-based stabilization appears to cause a sharp contraction in economic activity at the beginning of the programs, as Figure 4 illustrates for the case of Peru. The contraction was particularly severe in the case of Peru: in the four quarters before the plan was implemented, real GDP was basically flat; in the third and fourth quarters of 1990 (the program was initiated in August 1990), real GDP fell by 14.5 and 1.7 percent (quarterly rates) respectively.

(5) Real interest rates increase. The liquidity "crunch" associated with a money-based stabilization typically results in high real interest rates. 1/ In Peru (Figure 4), the real lending rate shot up to an annual rate of 1,080 percent in the quarter in which the program was implemented, and has remained above 200 percent per year through the fourth quarter of

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1/ The usual caveat regarding the fact that ex-post real interest rates may be a bad indicator of ex-ante real interests rate applies here.

1991. In Argentina, the real interfirm market rate, which averaged 4.9 percent per month in the four months prior to the Bonex plan, rose to an average of 48.6 percent per month in the four months after the program.

III. A Basic Analytical Framework

Given the evidence presented in the last section, a basic analytical framework for studying inflation stabilization policies should be able to capture, inter alia, (1) the notion of "recession now versus recession later" in choosing between the exchange rate and the money supply as the nominal anchor, (2) the real appreciation that accompanies a fall in inflation under either regime, and (3) the often contrasting behavior of real interest rates. Such a framework could then be taken as a benchmark for addressing other issues, such as the use of multiple nominal anchors and the presence of backward indexation.

1. The model

Since the model has been formally developed elsewhere (Calvo and Végh, 1990, 1991b), we will review the assumptions very briefly and then proceed to explain the results intuitively. Consider a small open economy where perfect capital mobility prevails. On the demand side, the public consumes two goods: traded and non-traded (or home) goods. Consumers must use money to purchase goods, which implies that the opportunity cost of holding money (i.e., the nominal interest rate) affects the effective price of

consumption. 1/ Hence, a fall in the nominal interest reduces the effective price of consumption because it reduces the opportunity cost of holding money.

On the supply side, it is assumed that (1) there is an exogenously-given endowment of the traded good, and (2) the supply of the home good is demand-determined. Firms that produce the home good set prices in a non-synchronized way taking into account the expected path of aggregate demand and the aggregate price level. This non-synchronization in price-setting implies that the aggregate price level is fixed at each point in time. The inflation rate, however, is free to adjust instantaneously. Hence, there is no inflation rate-stickiness in the model, as the pricing policy of firms is forward-looking.

2. Exchange rate-based stabilization

Suppose that policymakers announce a reduction in the rate of devaluation. 2/ It is crucial to distinguish between credible and non-credible policy:

(i) Suppose that the announcement is credible, in the sense that the public believes that the reduction in the devaluation rate will be permanent. Then, inflation falls instantaneously to its new equilibrium value, given by the lower rate of devaluation. There are no real costs

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1/ To simplify the analysis, it will be assumed that only domestic money is used (i.e., there is no currency substitution). The important considerations introduced by the presence of currency substitution will be discussed in the last section.

2/ The analysis implicitly assumes that the fiscal situation has been brought under control so that inflationary finance is no longer needed. There is little disagreement on the fact that a sustained fiscal adjustment is a pre-requisite for a successful stabilization plan.

associated with eliminating inflation at one fell swoop. Two critical assumptions lie behind this painless and immediate fall in inflation: no backward-looking behavior and full credibility. These two conditions are likely to be satisfied in plans designed to stop hyperinflation, which may explain why, as the model would predict, hyperinflation has been reduced almost overnight with only minor output costs (see Végh, 1992). In chronic inflation countries, however, a history of failed stabilizations makes the public highly skeptical of any new attempt.

(ii) Suppose that the announcement is not credible, in the sense that the public expects the higher rate of devaluation to resume at some point in the future (i.e., the stabilization plan is viewed as temporary). 1/ 2/ Then, the fall in the nominal interest rate that accompanies the reduction in the devaluation rate (due to perfect capital mobility) is viewed as temporary. The temporarily lower nominal interest rate reduces the cost of present consumption relative to future consumption, which results in an increased demand for both traded and home goods. The higher demand for traded goods leads to a trade deficit, while the higher demand for home goods causes an output expansion.

1/ The analytical framework used in this paper takes credibility (or the lack thereof) as exogenous. We believe that this is a convenient and non-misleading device because we would expect that both history and political factors weigh heavily in the first stages of the program. As a result, there will always be some exogenous component in the public's expectations. However, credibility is likely to be affected in important ways by the evolution of different variables during the program (see, for instance, Dornbusch (1991) and Guidotti and Végh (1992)).

2/ It should be stressed that this lack of credibility is unrelated to fiscal problems and thus to the "unpleasant monetarist arithmetic" stressed by Sargent and Wallace (1981). The dynamics that may arise from anticipated changes in fiscal policy have been addressed by Drazen and Helpman (1990).

Since excess aggregate demand for home goods rises at the beginning of the program, the inflation rate of home goods falls by less than the rate of devaluation. Therefore, the inflation rate (which is an average of the inflation rate of home goods and that of traded goods) also falls by less than the rate of devaluation. The model thus explains inflation persistence as a result of lack of policy credibility. The "inertia" displayed by the rate of inflation of home goods results in a sustained real appreciation of the domestic currency (i.e., the relative price of home goods increases throughout the program). 1/ The higher relative price of home goods reduces excess aggregate demand for home goods, thus causing output to decline. Eventually, the economy falls into a recession (i.e., output of home goods falls below its full-employment level). This recession may occur before the program is expected to end. The boom-recession pattern occurs independently of whether the program is eventually abandoned--as the public expected--or not. Hence, the model is also able to rationalize recessions occurring in successful programs, such as the Israeli one.

The predictions of the model regarding inflation, output, the trade (and current account) balance, and the real exchange rate are consistent with the four stylized facts described above. 2/ With respect to the real domestic interest rate (i.e, the nominal interest rate adjusted by the inflation rate of home goods), the model predicts that it will fall at the beginning of the program (recall that the nominal interest rate falls one-to-one with the devaluation rate, while the inflation rate of home goods

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1/ For simplicity, external inflation is assumed to be zero.

2/ See Reinhart and Végh (1992) for a quantitative analysis of the predictions of the model regarding private consumption.

does not). While real interest rates fell in the Southern-Cone programs, they rose in the heterodox programs of the mid-1980's. As argued in Section IV, the explanation for this different behavior may lie in the use of additional nominal anchors.

In sum, lack of credibility plays a critical role since the real effects of the program follow from the public's belief that the program will not be sustained. Furthermore, the lower is credibility, the more accentuated become all real effects. The reason is that the lower nominal interest rate is expected to prevail for a shorter period time, which induces the consumer to buy more goods at the present time. Therefore, using the exchange rate as the nominal anchor can be viewed as a risky move in the following sense: under high credibility, inflation falls considerably and the real effects are minor; under low credibility, however, the fall in inflation is small while the real effects are substantial. 1/

3. Money-based stabilization

Suppose that policymakers announce a credible reduction in the rate of growth of the money supply (i.e, the lower rate of money growth is expected to be permanent). Since inflation will be lower in the new steady-state, the long-run demand for real money balances increases. Hence, inflation must fall below the rate of monetary growth to generate higher real money balances over time. The initial fall in inflation reduces the nominal interest rate, which in turn increases real money demand on impact. Since the real money supply is given on impact (recall that the price level is

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1/ A substantial boom would thus be indicating that the program has little credibility.

sticky), there is an excess demand for real money balances. Money market equilibrium can only be restored by a recession that reduces the demand for real money balances. 1/ This recession is brought about by higher real interest rates (which reduce today's demand for home goods relative to tomorrow's) and a rise in the relative price of home goods (which reduces the demand for home goods relative to traded goods). Thus, the initial fall in inflation is accompanied by a recession, real appreciation, and high real interest rates, which is consistent with the stylized facts discussed above. 2/

Lack of credibility does not affect the outcome from a qualitative point of view: the initial fall in inflation still comes at the cost of a recession and real appreciation. The reason why lack of credibility does not play a critical role is that, with exogenous money supply and sticky prices, the results are driven by the fact that the real money supply cannot change on impact (i.e., at the time the plan is implemented). 3/ Quantitatively, however, credibility is still crucial. The less credible is the program, the smaller is the initial fall in inflation, which may explain inflation persistence. However, lack of credibility also mitigates the initial recession and real appreciation. The reason is that the nominal

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1/ In theory, this initial recession could be avoided simply by engineering an initial once-and-for-all increase in the level of the nominal money supply, at the same time that the rate of change of the money supply is being reduced. In practice, however, the initial increase in the level of the money supply is likely to be perceived as a signal of lack of commitment to a tight money-supply policy, which would severely undermine the credibility of the program.

2/ In the model, the trade balance remains in balance since consumption of traded goods does not change. The reason is that the utility function is separable in consumption of home and traded goods. Otherwise, consumption of traded goods would also be affected.

3/ Naturally, the real money supply may still vary over time.

interest rate remains high since it is not "anchored" exogenously at a lower level as in an exchange rate-based stabilization. Hence, lack of credibility is not costly in the sense that lower benefits go hand in hand with lower costs.

IV. Multiple Anchors

This section discusses the rationale behind the use of multiple nominal anchors. The most relevant additional anchors generally fall under (a) money or credit constraints and (b) price and wage controls. The idea behind using multiple nominal anchors is that one anchor per itself may not be sufficient to "tie down" nominal variables in the short run, which could endanger the whole stabilization process.

1. Tight monetary policy

Choosing the exchange rate over the money supply as the nominal anchor has a distinct advantage: the nominal money supply is endogenous and can adjust immediately to changes in real money demand. Hence, the real effects that follow from disequilibrium in the money market can be avoided. As in other aspects of life, however, too much of a good thing (in this case, liquidity) may turn out to be as devastating as the lack of it. Since, in the model, purchasing goods requires money (through the cash-in-advance constraint), the ready availability of liquidity allows consumers to finance as large a consumption binge as they wish (subject, naturally, to the constraint imposed by their wealth). Thus, the intertemporal distortion imposed by lack of credibility can take full effect. Furthermore, the expansion in aggregate demand prevents inflation from falling as much as it

would otherwise, which puts the program in danger by exacerbating the initial real appreciation. In this light, therefore, it is not surprising that policymakers have frequently attempted to put a lid on the forces unleashed by too much liquidity by introducing additional anchors.

The Israeli 1985 plan provides an excellent example of the use of an additional monetary anchor to prevent the expansionary effects of an initial increase in liquidity (see Barkai (1990) for a discussion). The plan included an explicit target for bank credit, which was to be implemented by higher reserve requirements, a higher discount rate, and a tightening of existing controls on short-term capital flows. As a result of the tight credit policy, real credit to the private sector declined by 11.3 percent in the first two quarters of the program (Figure 3 shows the four-quarter change in real credit, which should be contrasted with that of Argentina in Figure 2). 1/ This liquidity "crunch" provoked a sharp initial increase in real interest rates (Figure 3). The initial (albeit brief) downturn in economic activity that preceded the consumption boom can probably be attributed to high real interest rates. 2/

A popular method of insulating the domestic money stock from the expansionary effects of capital inflows at the beginning of program is to engage in sterilized intervention. By reducing the supply of money and thus

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1/ During the first year of the Israeli program, real credit to the private sector declined by 5.7 percent. In contrast, in the first year of the Southern-Cone tablitas, real credit increased by 32.0 percent in Argentina, 26.1 percent in Chile, and 24.0 percent in Uruguay.

2/ Tight monetary policy might be easier to implement in countries--such as Eastern European and former-USSR countries--where there is imperfect capital mobility and an underdeveloped banking system. In particular, Calvo and Coricelli (1992) argue that tight credit policy played a key role in the output contraction associated with the Polish 1990 stabilization.

raising interest rates, policymakers hope that such a policy will dampen aggregate demand and hence lower inflation and prevent a large real appreciation of the domestic currency. Even if it proves effective in temporarily controlling the money supply, sterilized intervention may impose a severe fiscal burden, as the government is forced to pay higher interest rates on its debt than it receives on the world market for its reserves. 1/

Analytically, the use of an additional monetary anchor can be captured by assuming that the stock of money is predetermined at each point in time (see Calvo and Végh, 1991a) due to the presence of capital controls. The model suggests that this additional nominal anchor may be effective in curtailing the initial boom in consumption precisely because of the resulting liquidity "crunch." However, the stabilization is still costly because the real appreciation cannot be avoided, which causes a recession. The real interest rate in terms of traded goods increases at the beginning of the program and the domestic real interest rate is also above its initial value during the adjustment process. Hence, the model is able to rationalize high real interest rates at the beginning of the program as the result of tight monetary policy.

2. Price and wage controls

Inflation inertia (defined as inflation of home goods remaining above the rate of growth of the nominal anchor) was a key characteristic of the Southern-Cone tablitas of the late 1970's. Inflation inertia, however, is not unique to exchange rate-based stabilization and can also be present in

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1/ See Calvo, Leiderman, and Reinhart (1992) for a detailed discussion.

money-based stabilization, as the case of Peru suggests. In the model described above, inflation inertia results from lack of credibility. Alternatively, inflation inertia may follow from widespread backward indexation (see Pazos (1972) and Dornbusch and Simonsen (1987)), as was particularly evident in the case of the Chilean tablita (see Edwards (1991)). 1/ The use of price and wage controls has usually been advocated on the belief that it would help fight inflation inertia. This was a key motivation in the heterodox programs of the mid-1980's discussed above. However, the jury is still out as regards the effectiveness of such controls. It has been argued that imposing price controls may contribute to making the program more credible. Edwards (1991) attributes the relative ease with which Mexico brought down inflation beginning in 1988--as compared to the Chilean case--to the presence of price and wage controls. However, the short-run benefits of price and wage controls may be more than offset by the resulting distortion of relative prices and problems with the so-called "flexibilization" stage (i.e., the question of "when" and "how" to remove controls). Too early a removal of price controls may unleash the same credibility or inertial problems that such controls were supposed to address in the first place. Too late a removal may result in highly distorted relative prices with the ensuing real costs.

1/ Backward-looking behavior (in the form of adaptive, as opposed to rational, expectations) is the key to explaining the initial consumption boom in Rodriguez's (1982) model. However, when backward-indexation is modeled in a rational expectations, optimizing model, Rodriguez's (1982) results hold only under a particular parameter configuration (see Calvo and Végh, 1992a). Hence, backward-looking behavior per se may not be capable of accounting for the initial boom.

It seems fair to conclude that, following an initial euphoria as a result of the success of the Israeli and (though short-lived) of the Austral plan, the use of price and wage controls has been put once again into perspective. They may certainly help in combatting inertial elements at the beginning of a program, but these benefits should be weighed against the costs in terms of distorted relative prices and the risks associated with the "flexibilization" stage. More fundamentally, though, the use of price and wage controls does not seem to alter the dynamic adjustment of an economy to an exchange-rate-based stabilization: both orthodox and heterodox plans have shared similar characteristics, as discussed in Section II. This suggests that price and wage controls cannot solve the underlying fundamental problems relating to lack of credibility. The case of Israel has been particularly revealing because the recession at a late stage in the program could not be avoided in spite of being a highly successful heterodox program. Thus, even if one were to agree that price and wage controls are a good policy measure--which in itself is arguable--the benefits from imposing them have probably been overstated. Rather than resorting to price controls, the best hope is probably to switch from backward-looking to forward-looking indexation; that is, to adjust wages at the beginning of the program according to expected inflation, rather than past inflation.

V. Policy Conclusions

This section first examines the main policy conclusions that may be drawn from the preceding discussion. It closes by discussing how the presence of currency substitution may affect the main conclusions.

(i) The choice of a nominal anchor (i.e., the exchange rate or a monetary aggregate) is a key policy decision. Theory suggests and the evidence seems to confirm that the dynamic adjustment of the economy is radically different under each regime. In particular, although under imperfect credibility a recession seems unavoidable, the timing of the downturn seems to depend critically on the choice of the nominal anchor.

(ii) The effects of imperfect credibility differ drastically under each regime: lack of credibility is more disruptive under fixed exchange rates than under floating exchange rates. In a money-based stabilization, lower credibility reduces the benefits (i.e., inflation falls by less) but the real effects tend to vanish as well. In contrast, under exchange-rate-based stabilization, lower credibility also reduces the benefits (inflation may even increase) but the real disruptions are magnified. This would suggest that, if the public is perceived as being highly skeptical, a money-based strategy may be less risky. On the other hand, if credibility is high (because, say, there is a new administration taking over which is perceived as representing a sharp break with past policies), the exchange rate should probably be favored as a nominal anchor, as it allows for a quicker adjustment of real money balances.

(iii) Attempting to pursue a disinflationary policy while maintaining a given level of the real exchange rate is likely to be self-defeating.

Both theory and evidence suggest that real appreciation is an unavoidable byproduct of lowering inflation. Moreover, the public's perception that the authorities may be pursuing both objectives at the same time is bound to undermine credibility further and make the fall in inflation even more difficult. Furthermore, the experience of Israel and Mexico suggests that, in exchange rate-based programs, adjustments in the nominal exchange rate (i.e., devaluations or changes in the rate of devaluation) aimed at correcting real appreciation should be postponed, if possible, until the fundamentals are perceived to be well under control. Such adjustments in exchange rate policy may be unavoidable but need not create havoc if the fiscal situation is perceived as fundamentally sound. Initial large devaluations aimed at making room for the inevitable real appreciation also proved helpful in the cases of Israel and Mexico. 1/

(iv) It is important to stress the fact that the dynamics associated with disinflationary policy that have been discussed in this paper are unrelated to fiscal problems. This is particularly worrisome because it illustrates the vulnerability of stabilization programs with respect to the private sector's beliefs about the economic or political sustainability of a program. Thus, a serious fiscal adjustment may not be enough to ensure the success of the program if, for some reason, the public believes that the plan will be eventually abandoned. The mere fact that the public believes that a plan will fail may very well become a self-fulfilling prophecy. It is thus key for the authorities to be able to convince the public that the

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1/ The initial devaluations in Israel and Mexico were 25 and 22 percent, respectively.

policy will be sustained over time and avoid giving conflicting signals.

(v) High inflation usually leads to currency substitution, a phenomenon which is particularly widespread in Latin America (see, for instance, Savastano (1992)). Hence, it is important to ascertain the effects of a high degree of currency substitution on the choice of a nominal anchor. As we suggest elsewhere (Calvo and Végh (1992b)), the presence of currency substitution appears to tilt the balance in favor of predetermined exchange rates. Conceptually, two cases should be distinguished. If the elasticity of substitution between foreign and domestic currency is very high--which is bound to the case after many years of high inflation--then the system may be left without a nominal anchor under flexible exchange rates. The reason is that the relevant money supply, which includes the domestic value of foreign currency circulating in the economy, will be consistent with any price level depending on the value of the exchange rate. 1/

If the elasticity of substitution is not very high, then floating rates do provide a nominal anchor to the system. However, the presence of currency substitution still has important consequences. Specifically, as the public attempts to switch from foreign to domestic money, the initial "liquidity crunch" that characterizes a money-based stabilization gets exacerbated. As a result, the initial recession is more severe because output needs to fall by more to equilibrate the money market. Also, the initial appreciation of the domestic currency (both in nominal and real

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1/ Formally, this argument is strictly valid only if the two monies are perfect substitutes (see Kareken and Wallace (1981)).

terms) is larger, due to the attempt by the public to adjust the proportion of domestic money relative to foreign money. Under predetermined exchange rates, however, the presence of currency substitution does not alter in any essential way the dynamic adjustment just described, simply because developments in the money markets are irrelevant given the endogeneity of the money supply. 1/ In conclusion, other things being equal, the presence of currency substitution seems to favor the exchange rate as the nominal anchor.

1/ We are ignoring a wealth effect that results from the fact that seigniorage payments to the country that issues the foreign country will be lower. We feel that this effect is not important in practice.

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