

## THE PATTERN OF CURRENCY SUBSTITUTION IN LATIN AMERICA: AN OVERVIEW

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### Abstract:

*This paper identifies the stylized facts and common features of recent currency substitution episodes in Bolivia, México, Perú and Uruguay. It discusses the relationship between macroeconomic policies and the pattern of currency substitution in these countries and investigates the effects that the presence of foreign currency deposits had on their demand for domestic money and on their ability to conduct monetary and exchange rate policy. The paper argues that the decision to allow foreign currency deposits in the domestic financial system tends to increase the inflationary impact of fiscal imbalances and exchange rate adjustments and jeopardizes the sustainability of a managed exchange rate regime.*

### 1. Introduction

The phenomenon of currency substitution, broadly defined as the demand for foreign money above and beyond the requirements of international trade and tourism by domestic residents of a country, has received a great deal of attention from the economic literature in the last decade and a half. However, far from providing a unifying benchmark, this literature has shown a striking diversity regarding both the theoretical treatment and the policy implications of the phenomenon. One of the main reasons for this confusion is that the same term, currency substitution (CS), has been employed for analyzing the consequences generated by the presence of foreign money in economies with different institutional characteristics and exchange rate regimes.

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The concept of CS was first developed in the late 1970s as an alternative explanation for the excessive variability experienced by the floating exchange rates of the major currencies after the abandonment of the Bretton Woods system. In this context the papers by Miles (1978), Boyer (1978), Bilson (1979), Brillembourg and Schadtler (1979), Giron and Roper (1981), Bordo and Choudhri (1982), McKinnon (1982), and others, emphasized the role that the potential substitutability among currencies of developed nations could play in determining their floating exchange rates. Making use of several variants of the portfolio approach advanced by Kouri (1976), most of these studies claimed that the observed instability of the income velocity and, thus, of the nominal exchange rates of these countries was mainly a consequence of the increased currency substitutability brought about by the new international monetary arrangement.

As opposed to this "symmetrical" notion of CS (McKinnon (1985)), another branch of the literature has focused on the determinants and characteristics of CS in less developed countries (LDCs)<sup>1</sup>. Taking into consideration the lack of development of the financial markets of these economies, their most common exchange rate regimes and of the CS phenomenon in this type of countries is different from the one analyzed by the literature on the industrialized nations. In particular, in LDCs the CS process tends to be "asymmetrical", because domestic residents usually include (or want to include) foreign currency assets in their portfolios, but, even in stable periods, there is no foreign demand for the inconvertible domestic currency.

Besides establishing this crucial distinction regarding the nature of CS, the literature on the subject has made little progress in determining and testing the precise causes and implications of the widespread "dollarization" of several developing countries, in designing the appropriate policies to deal with this phenomenon, or even in agreeing on the most adequate measures for it. In fact, these studies have employed the term CS very loosely, using it indistinctively to describe the occurrence of capital flight (Canto (1985), Márquez (1987), Rivera-Batiz (1987)), a process of financial liberalization (De Melo (1986)) and/or the private sector's holdings of foreign money in the form of cash or bank deposits in the domestic economy (Ortiz (1983), Ramírez-Rojas (1985)). In addition, these studies have generally failed to test—or even to discuss thoroughly—the implications that the statistical regularities found by them (supportive of a broadly defined "CS hypothesis") might have had on the evolution of the other macroeconomic variables of the "dollarized" economy under analysis.

One possible cause for this somewhat confusing state of affairs is that most of the literature has underestimated the role played by the institutional framework in determining the nature and extent of CS in developing countries. A common feature of most of the LDCs that have experienced periods where foreign money replaced some of the natural currency deposits (FCDs) in their domestic financial system. These deposits were usually allowed by the monetary authorities with the (sometimes explicit) objectives of inducing the repatriation of capital that had previously flown from the country, improving the external position of the central bank, and/or strengthening the process of financial intermediation.

Understanding a process of CS in a developing country requires, then, a thorough analysis of the authorities' rationale for implementing this particular kind of financial reform and of the restrictions that it imposes on monetary, fiscal and exchange rate policies. In this regard, it is important to perceive the "dollarization" of the financial system and the occurrence of capital flight as two different instances of a broader

process of CS that have opposite effects on the foreign exchange holdings of the country's central bank (see Savastano (1990)). It is also important to investigate the factors that determine the allocation of the public's foreign currency assets between the domestic and foreign banking systems, as well as the consequences that the existence of FCDs has on the demand for domestic money, the domestic rate of inflation, the effectiveness of devaluation and, in general, the sustainability of the exchange rate regime.

Although some of these effects may be strongly influenced by factors specific to each experience, there are indications that all "dollarization" episodes in developing countries share many crucial features. This has been particularly true in several Latin American countries, where the U.S. dollar has progressively displaced the domestic currency in the public's portfolio. The purpose of this paper is precisely to identify the stylized facts and the common features of the CS process experienced by four Latin American countries: Bolivia, México, Perú and Uruguay. The sample was determined mainly by institutional and data considerations. Of all the countries in the region where the authorities allowed the private sector to hold FCDs in the domestic banking system, these four are the ones where these deposits represented a significant proportion of total financial assets<sup>2</sup>. Of course, this does not mean that other Latin American countries have not experienced a phenomenon of CS. Even when FCDs are not allowed the public will manage to hold foreign currency assets abroad or to maintain them domestically in an illegal way. This substitution process will be more pervasive and notorious the more unstable the macroeconomic environment, as the recent high inflation episodes in Argentina (1988-1990), Bolivia (1984-1985) and Perú (1988-1990) have illustrated. However, when the only channels through which the private sector can diversify its portfolio require the circumvention of the existing foreign exchange controls, the dynamics of the CS process will be different, and will have to be analyzed indirectly by focusing on the behavior of the parallel (black) market exchange rate and the domestic rate of inflation.

The rest of the paper is structured as follows. Section II provides a preliminary examination of the pattern of the CS process in the four Latin American countries mentioned above. The section presents several indicators of the extent of substitution between domestic and foreign currency assets in these countries and discusses the evolution of the foreign currency portfolio of domestic residents. Section III presents a brief analysis of the macroeconomic environments in which those episodes took place. In particular, it tries to assess, at a preliminary level, the effects of macroeconomic policies adopted by these countries on their CS process. Section IV investigates the effects that the presence of FCDs had on these countries' demands for domestic money. It analyzes the stability of these financial reform for the conduct of monetary policy and assesses the implications of this financial reform for the role of exchange rate policy and the collection of seigniorage. Section V discusses the evolution of the real exchange rate in the presence of CS. It then analyzes the evolution of the real exchange rate in the four countries and investigates the effects of the Uruguayan devaluation of 1982. The last section summarizes the findings of the paper and presents some concluding remarks.

## II. A Preliminary Examination of the Pattern of Currency Substitution in Latin America

This section will analyze the pattern of the CS process experienced by Bolivia, México, Perú and Uruguay. Two of the most salient features of the "dollarization" episodes that took place in these countries highlight the importance of institutional

factors in shaping the CS process. In the first place, in all these countries the authorities decided to allow the public to maintain FCDs within the domestic banking system in the aftermath of a period of serious external imbalances. Thus, the measure was either preceded or accompanied by a large devaluation aimed at restoring macroeconomic equilibrium and that helped to protect the countries' international reserves from the speculative attack induced by the portfolio recomposition associated with the lifting of foreign exchange controls. In fact, Bolivia eliminated all restrictions on the holding of FCDs in October of 1973, 3 quarters after its fixed peg was interrupted by a 68 percent devaluation; Mexico did the same in March of 1977, following the 37 percent devaluation of September 1976; Peru enacted the reform in 1978, 3 months after the sol was left to float freely and depreciated by more than 60 percent; and Uruguay devalued the peso by 70 percent in October of 1974, the quarter when FCDs were allowed. In all cases the authorities expected that this measure would induce the repatriation of capital that had flown from the countries during the crisis period<sup>3</sup>.

In the second place, in three of the countries this peculiar financial reform ended abruptly when the authorities *de facto* converted into domestic money the stock of FCDs that was being held by the private sector. Bolivia and Mexico carried out this conversion in 1982 (in November and August, respectively), while Peru did it in July of 1985. In the three cases the reimposition of foreign exchange controls was coupled with a large devaluation and the subsequent adoption of a fixed exchange rate<sup>4</sup>. Moreover, in two of these episodes the change in the foreign exchange regime was strongly related to the country's political process. In Mexico the conversion into domestic money of FCDs was one of the last measures of President López Portillo, while in Peru President García outlawed these deposits in his first address to Congress.

However, besides their duration, there are some important differences in the pattern of the CS process experienced by these countries. As can be noticed in Figures 1.A-1.D, the extent to which these financial systems became "dollarized" was far from homogeneous. For instance, during most of the ten years of reform in Bolivia, the stock of FCDs constituted less than 20 percent of the broadly defined money supply, M2 (see Figure 1.A). Only in the 3 quarters preceding the prohibition did this "dollarization" ratio shoot up, reaching more than 40 percent of M2 in October of 1982.

In Mexico, on the other hand, although the private sector was partially allowed to maintain FCDs in the domestic financial system since 1933, these assets constituted less than 5 percent of M2 until 1977. The measure that prompted a noticeable and rapid increase in the extent of domestic "dollarization" was the liberalization of the so called "Mex-Dollar" deposit rate and the lifting of other exchange restrictions in March of 1977. After this deregulation, which is considered as the starting date of the reform<sup>5</sup>, the FCDs represented consistently more than 15 percent of the broad money supply, reaching a peak of 36 percent of that aggregate in June of 1982, the quarter before the confiscation (see Figure 1.B).

In the case of Peru the "dollarization" of the domestic financial system was much more rapid and pronounced. As can be seen in Figure 1.C after the capital controls were relaxed, in March of 1978, the ratio of FCDs to M2 grew almost steadily during the seven years that the episode lasted. By mid-1982 this "dollarization" ratio was already 50 percent and it became larger than 100 percent since December 1984. However, the pace at which the financial system became "dollarized" was even more abrupt in the case of Uruguay. In fact, one of the main components of the broad liberalization measures undertaken by this country in the mid-1970s was the elimination of all the restrictions to holdings of foreign exchange by domestic residents<sup>6</sup>. As a result of this

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FIGURE 1.A

BOLIVIA: DOLLARIZATION RATIO 1  
(FCDs/M2)

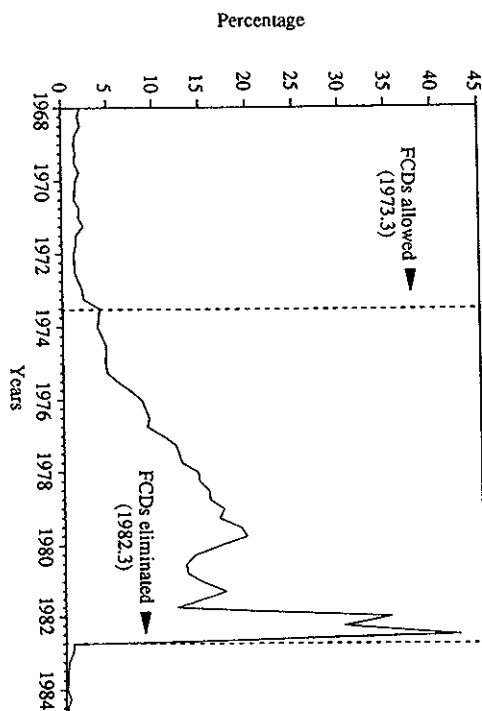


FIGURE 1.B

MEXICO: DOLLARIZATION RATIO 1  
(FCDs/M2)

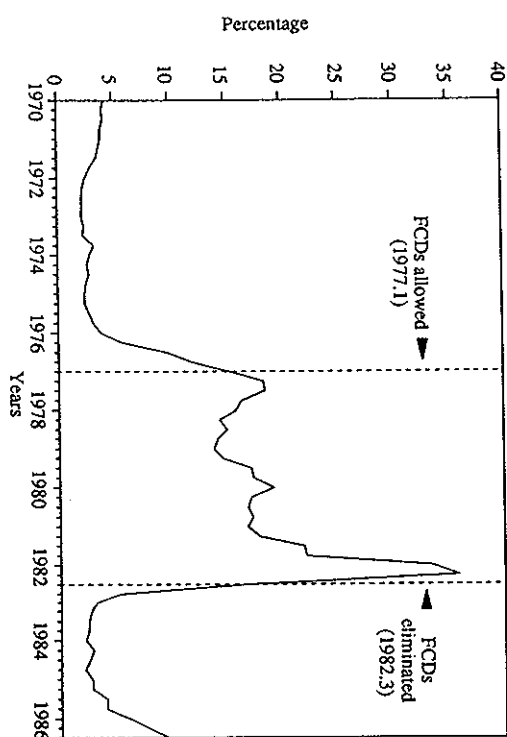
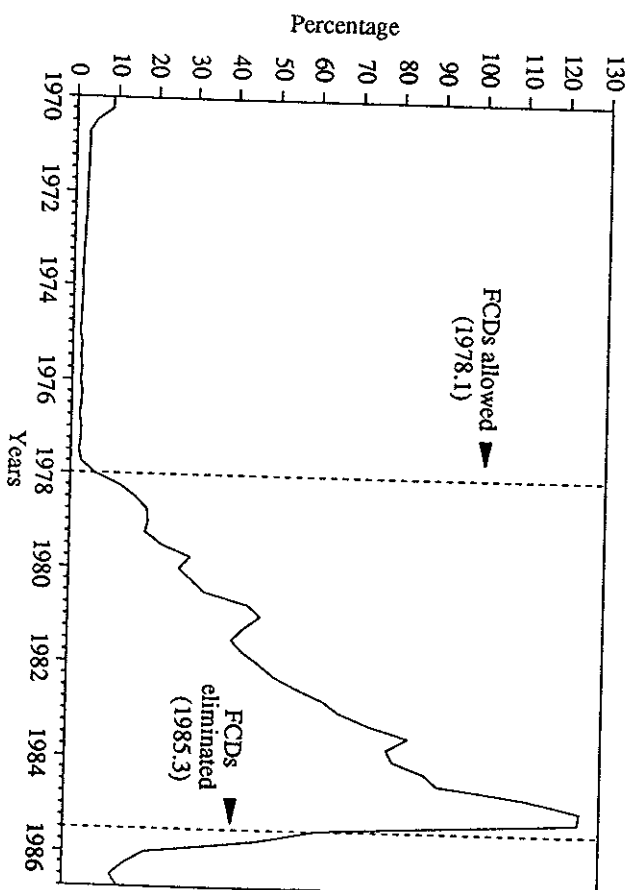


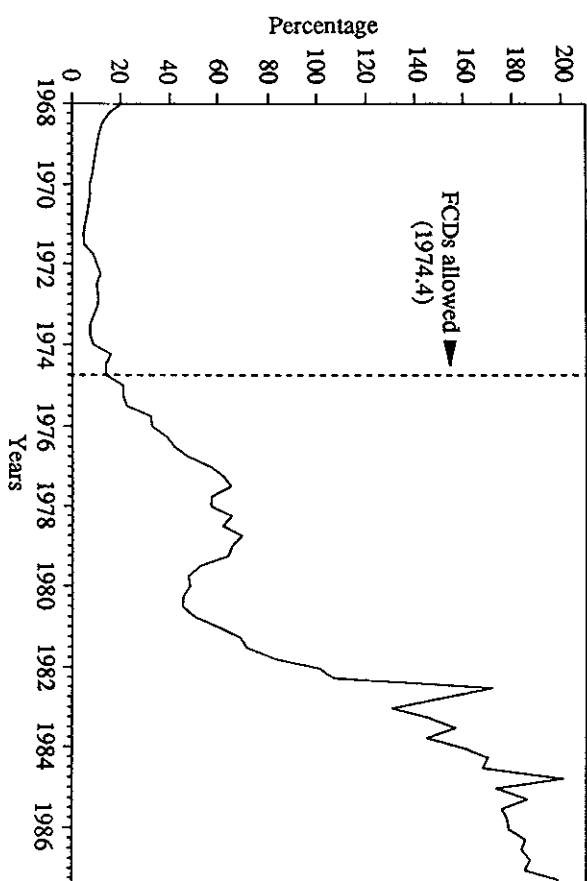
FIGURE 1.C

PERU: DOLLARIZATION RATIO 1  
(FCDs/M2)

reform the share of FCDs in domestic banks' liabilities experienced a sustained increase, constituting more than 60 percent of M2 by the end of 1982. As is shown in Figure 1.D, after a short-lived decline in the extent of domestic "dollarization" at the beginning of the experiment with a preannounced exchange rate (that lasted from October 1978 to November 1982), the ratio FCDs/M2 shot up after a drastic devaluation marked the abandonment of this regime in the third quarter of 1982, and has remained around the 200 percent range since 1985. The duration of this episode of significant "dollarization" of the domestic financial system (almost 18 years) and the fact that it has not ended with the confiscation of FCDs despite the considerable changes in the country's political regime, provides an interesting contrast with the other three experiences that will be discussed below.

It should be noted that using the ratio of FCDs to M2 as the only indicator of the overall extent of substitution between domestic and foreign money in an economy, as has been the norm for most of the empirical studies on the subject mentioned in Section I (footnote 1), has some serious shortcomings that can lead to erroneous conclusions regarding the duration and magnitude of the CS phenomenon. First, the ratio does not capture the amount of foreign currency bills held by domestic residents; and second, it restricts the portfolio of foreign currency assets available to the public to the deposits maintained within the domestic banking system. However, it is quite reasonable to

FIGURE 1.D

URUGUAY: DOLLARIZATION RATIO 1  
(FCDs/M2)

expect that domestic residents will maintain some fraction of their financial wealth in foreign currency even when the authorities do not allow the existence of FCDs domestically. Moreover, it has been argued before that the creation of FCDs responds precisely to the authorities' attempt to induce the agents to bring those assets back to the domestic financial system.

There is, thus, a need for more comprehensive indicators that would reflect better the extent of domestic "dollarization" of an economy, on one hand, and the overall dimension of its CS process, on the other. The first of these indicators would have to consider, in addition to the FCDs, the foreign currency notes held domestically outside the banking system, while the second would also have to include all the foreign currency assets maintained abroad by the private sector. Of course, in periods where FCDs are not allowed in domestic banks, holding foreign currency in either of these two ways will require the circumvention of the foreign exchange and capital controls imposed by the country's authorities.

Unfortunately, a reliable estimate of the amount of foreign currency bills circulating domestically is practically impossible to obtain for any developing country<sup>7</sup>. The amount of foreign currency assets maintained overseas is not much easier to estimate. The funds that leave the domestic economy in the form of "capital flight" can be allocated in several financial and non-financial assets of different countries (see Lessard and

Williamson (1987)). Although it is reasonable to think that the U.S. will represent the natural "safe-haven" for Latin American residents, there are no data on the total investment by foreigners on real estate, bonds and stocks in that country. The only reliable and relatively long series that can be obtained is the one on the deposits in U.S. banks held by foreign nationals that is reported in the U.S. Treasury Bulletin<sup>8</sup>. These data were used to construct better, albeit imprecise, indicators of the overall extent of CS for México, Perú and Uruguay<sup>9</sup>.

Figures 2.A-2.C show for each of these countries the evolution of the *proxy* for the total share of foreign currency assets on private sector's financial wealth,  $(F/(M2+F))^{10}$ . The figures reveal three important features of the pattern of the CS process in these countries that are not captured by the ratio of FCDs to M2 shown before. First, the private sector maintained abroad a non-negligible proportion of its financial wealth in foreign currency even before the authorities lifted the restrictions for opening FCDs in domestic banks. As is also shown in Tables 2-4 (Section III) Mexican residents held, on average, almost 8 percent of their financial wealth in foreign currency from 1971 to 1976. In Perú the average share was around 6 percent from 1971 to 1977, and in Uruguay it reached a striking 24 percent from 1968 to 1974.

Second, in every country the lifting of restrictions on the holding of FCDs seems to have provoked an upward shift in the share of *total* foreign currency assets in private sector's wealth and not just a replacement by FCDs of foreign currency assets held

FIGURE 2.A

MEXICO: DOLLARIZATION RATIO 2  
( $F/(M2+F)$ )

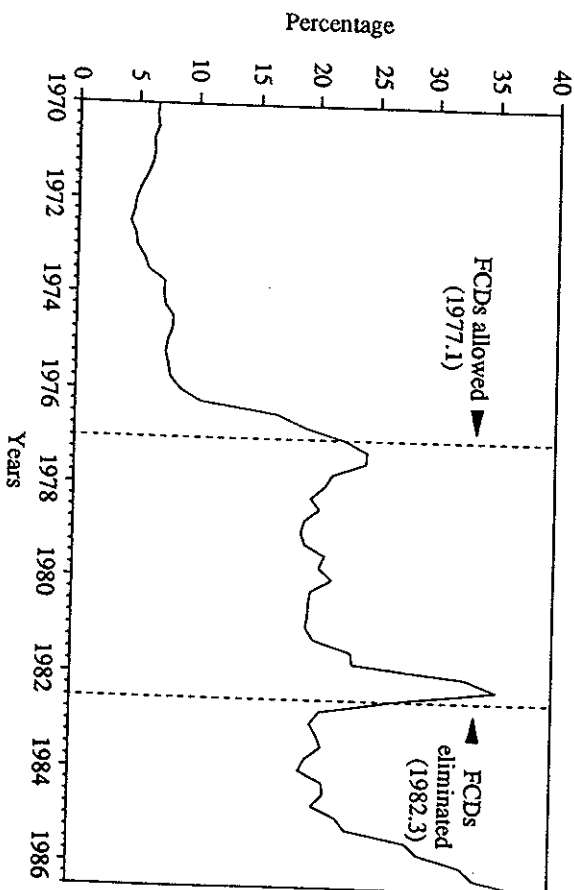
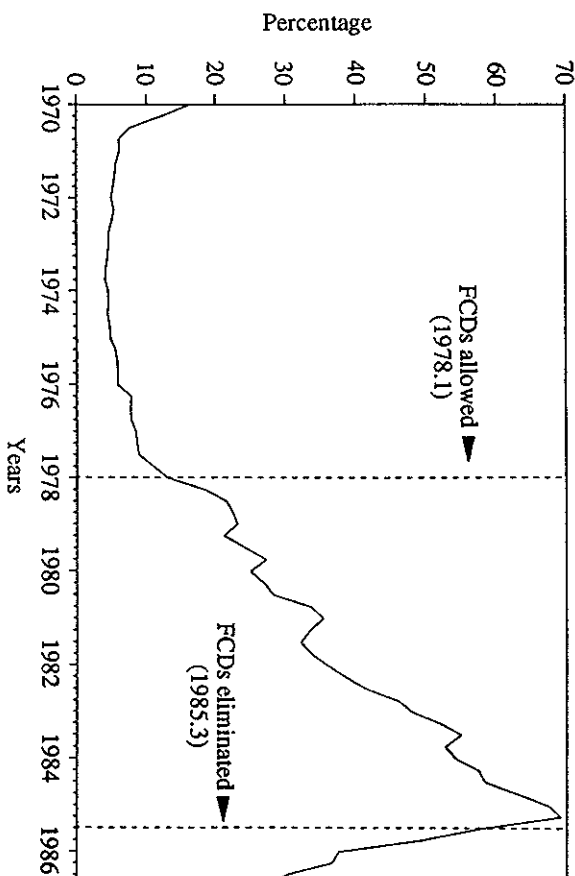


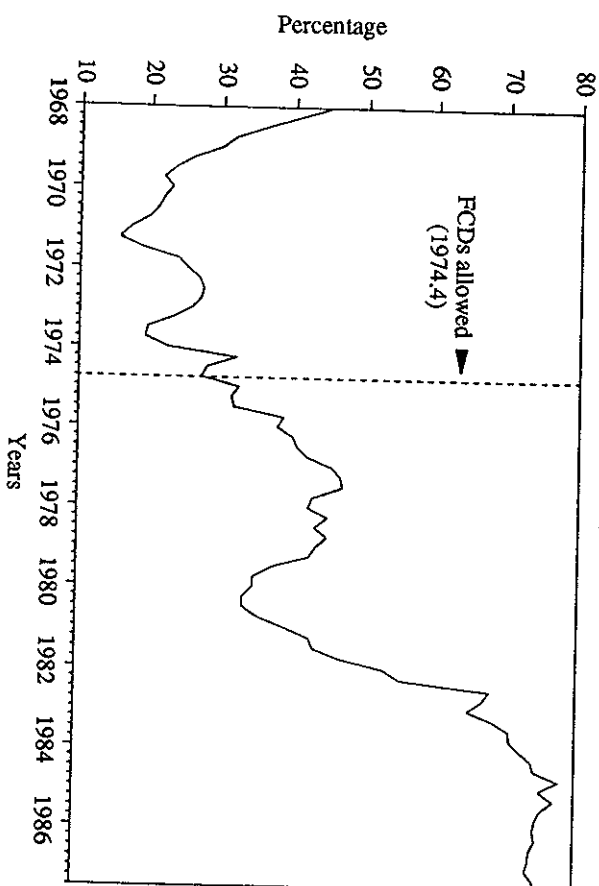
FIGURE 2.B  
PERU: DOLLARIZATION RATIO 2  
( $F/(M2+F)$ )



abroad. The average value for this ratio in the two years that followed the reform was 21 percent in México, 24 percent in Perú and 35 percent in Uruguay. Moreover, this share rose almost steadily in Perú until 1985 and in Uruguay during the whole episode, while in México it remained stable around the 23 percent plateau until the end of 1981. And third, the recorded extent of CS in México and Perú after the authorities converted into domestic money the FCDs was substantially larger than it had been in the period preceding the reform. Of course it would be necessary to control for the evolution of the other factors that influenced this ratio, in particular the expected depreciation of the domestic currency, in order to establish whether this increase in the holdings of foreign money overseas is an indication of some inertia in the process of reflow into domestic money after the capital controls were reimposed.

Another revealing indicator of the pattern of the CS process in these countries is the allocation of the public's foreign currency assets between the domestic and foreign financial systems. In the absence of foreign exchange controls, the composition of the public's foreign currency portfolio will depend on the transaction costs of keeping the foreign currency assets abroad and on the confiscation risk perceived by domestic residents. This confiscation risk, in turn, will be influenced by all those factors that provide information to the public regarding the authorities' preferences and objectives. Specifically, domestic residents can be expected to be particularly alert of the changes

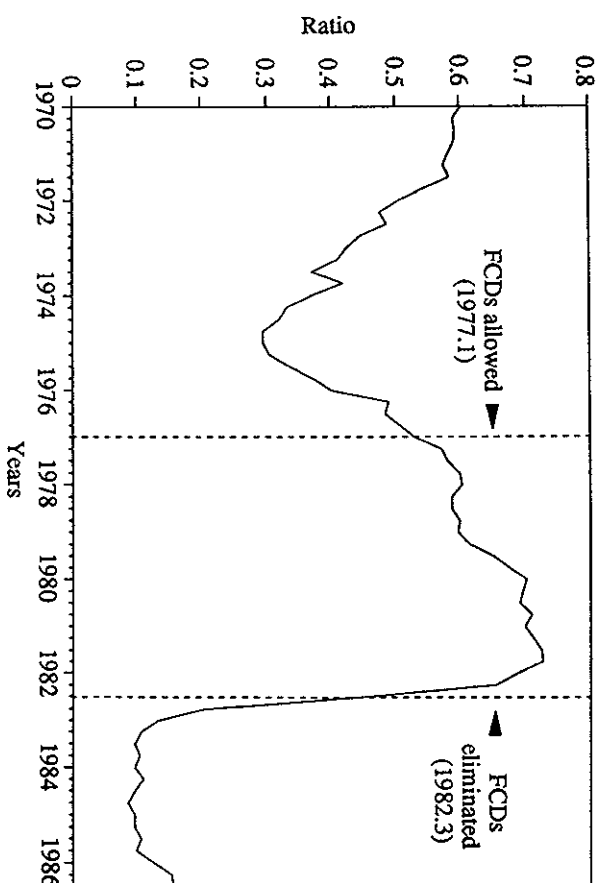
FIGURE 2.C  
URUGUAY: DOLLARIZATION RATIO 2  
(F/(M2+F))



in the external position of the central bank (as part of their assessment of its minimum desired level of international reserves) and to withdraw their FCDs from the banking system whenever the authorities seem unwilling to correct rapidly a given macroeconomic imbalance (see Savastano (1990)).

The actual evolution of the proxy for this ratio in the cases of México, Perú and Uruguay is shown in Figures 3.A-3.C. Notice that the ratio of FCDs to total foreign currency assets increased rather gradually after the restrictions were lifted, particularly in México and Uruguay, suggesting that the measure did not provoke a rapid repatriation of the "capital flight" that was maintained in the form of deposits in U.S. banks. Another important regularity captured by these figures is that in none of the episodes the public ever decided to maintain all its foreign currency assets within the domestic banking system. The maximum value of this ratio was 0.73 in the case of México (in the fourth quarter of 1981), 0.88 in Perú (in the fourth quarter of 1980) and 0.92 in Uruguay (in the fourth quarter of 1981). Considering that the data on foreign deposits abroad (FDA) underestimates the amount of assets held overseas, these figures clearly indicate that domestic residents continued to diversify their foreign currency portfolio during the reform period. Finally, notice that in México and Perú the ratio started to decline some time before the authorities reimposed the foreign exchange controls, and that in Uruguay it experienced significant fluctuations since early 1982, i.e., the period

FIGURE 3.A  
MEXICO: FOREIGN CURRENCY PORTFOLIO  
(FCD/(FCD+FDA))

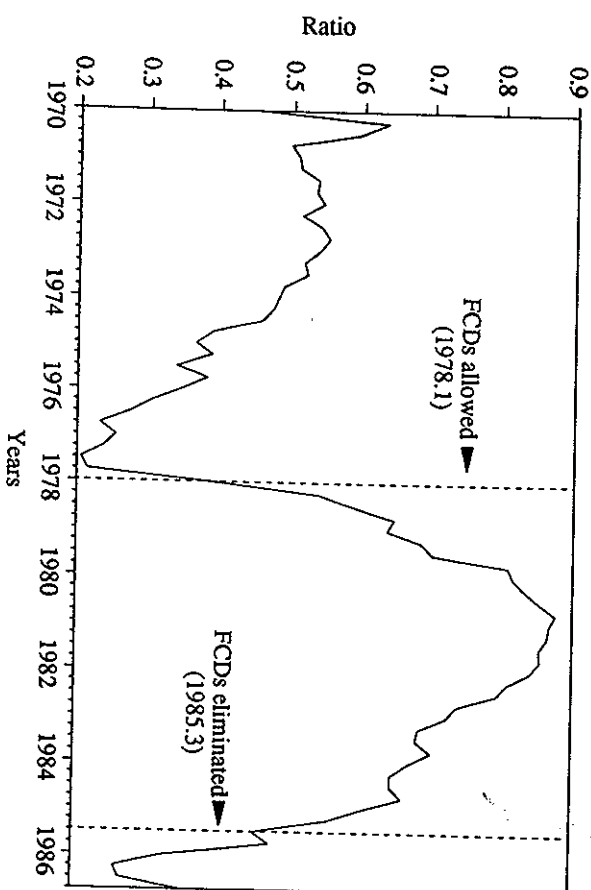


that preceded the abandonment of the "tablita" regime. In a way, the last two features suggest that the two foreign currency assets were less than perfect substitutes and that the public tried to hedge against the confiscation of FCDs but was unable to anticipate the exact timing of the measure. Furthermore, the evolution of the ratio during the three episodes suggests that an economy that allows FCDs may be prone to experience recurrent fluctuations in its international reserves—associated to allocation shifts in the public's foreign currency portfolio—that would tend to have deleterious effects on the stability of the exchange rate regime.

### III. Macroeconomic Policies and Domestic "Dollarization"

In order to delineate the pattern of the CS process experienced by these four Latin American countries it is extremely important to take into account the macroeconomic environment in which each of the "dollarization" episodes took place. Doing this would require a detailed analysis of the fiscal, monetary and exchange rate policies undertaken in each of these countries before and after the enactment of the FCDs reform. Due to space considerations, however, this section will only point out some major differences in the institutional features of these countries and discuss briefly the basic macroeconomic data corresponding to their "dollarization" episodes.

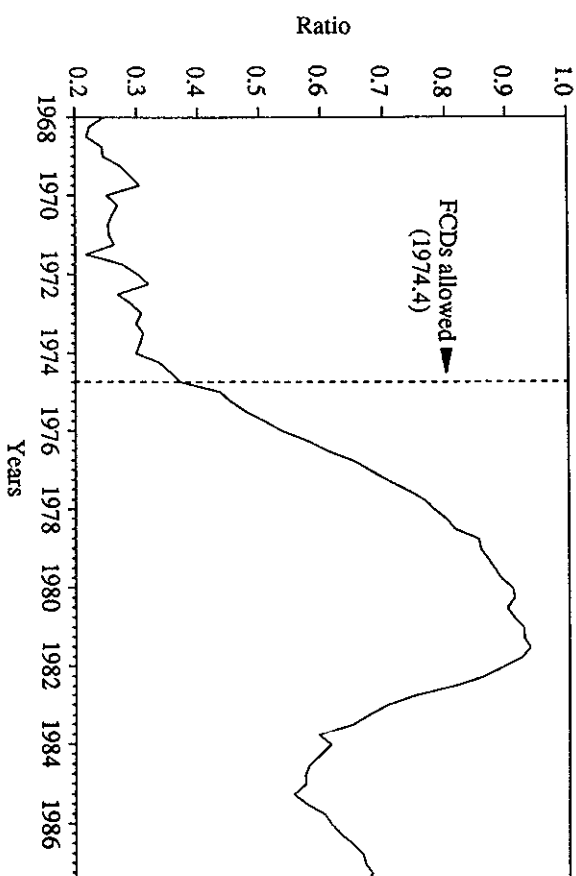
FIGURE 3.B  
PERU: FOREIGN CURRENCY PORTFOLIO  
(FCD/(FCD+FDA))



Two important (and interrelated) factors that have to be considered in comparing the pattern of the CS processes experienced by these countries are their previous inflationary history and the stage of development of their domestic financial market. With respect to the first one, it should be noted that Peru, and especially Uruguay, had experienced several outbursts of high inflation shortly before the FCDs reform was implemented (see Harberger (1984)). In Bolivia and México, however, the adoption of this reform followed the abandonment of a long-lasting period with fixed exchange rates and price stability. On the other hand, the degree of financial intermediation was much higher in México and Uruguay than in the other two countries. A futures market for the Mexican peso existed until 1982 and the government issued negotiable bonds that paid competitive interest rates to the private sector since 1977<sup>11</sup>. Likewise, the extensively documented liberalization program implemented in Uruguay in October of 1974 opened considerably the country's capital account and freed the domestic market from most of the quantitative and interest rate regulations characteristic of the "financially repressed" economies, such as Bolivia and Peru. Taken together with the specific macroeconomic policies implemented during the reform period, these two factors should help explain the different pace at which the CS process evolved in the four countries.

Some selected macroeconomic indicators of these countries are presented in Tables 1-4. The episodes have been broken down into sub-periods of 2 to 4 years, and the tables present the averages of the variables over each sub-period expressed in annual

FIGURE 3.C  
URUGUAY: FOREIGN CURRENCY PORTFOLIO  
(FCD/(FCD+FDA))



terms. The tables show several interesting features of these "dollarization" episodes. First, the figures on the official rate of devaluation and the domestic rate of inflation seem to indicate that the presence of FCDs coincided with the adoption of a more flexible exchange rate policy. Indeed, following the initial (stepwise) devaluation the authorities of México, Peru and Uruguay adopted different variants of a crawling peg rule to adjust periodically the nominal exchange rate. In Bolivia, however, the exchange rate was kept fixed during most of the reform period, except for two discrete devaluations in the fourth quarter of 1979 and in the first quarter of 1982<sup>12</sup>.

Second, the data show that in every case the average premium of the black (or parallel) market rate over the official exchange rate declined substantially in the years that followed the creation of FCDs. Moreover, in Peru and Uruguay this premium stayed at fairly low levels during the entire "dollarization" episode, and the depreciation of the parallel rate did not differ too much from the official rate of devaluation. These two features suggest that, with the exception of Bolivia, it can be assumed that these experiences took place in countries with a (de-facto) unified foreign exchange market and a crawling exchange rate.

Third, the tables also reflect the worsening of the fiscal and external accounts that characterized the period preceding the lifting of controls on the holding of FCDs in these countries. México and Peru had a large fiscal deficit, and all the countries exhibited a high rate of inflation, a slight appreciation of their real exchange rate, a low level of

TABLE 1

BOLIVIA: SELECTED MACROECONOMIC INDICATORS 1969-1985  
(Annual Averages for the Period)

Years	fed/M2 (%)	F/W (%)	fed/F (%)	Capital Flight (\$ mill.)	Int. Reserves (\$ mill.)	Ex. Rate Devaluat. (%)	B.M. Deprec. (%)	B.M. Premium (%)	Inflation (%)	RER Index (1975 = 100)	Fiscal Def/GDP (%)	Inflation Tax 1/GDP (%)	Inflation Tax 2/GDP (%)	Seig/GDP (%)	Seig/Taxes (%)
1969-1972	1.6	-	-	192.3	46.4	0.0 c/	11.1	46.2 c/	3.9	70.1 c/	-3.4	0.4	0.5	1.5	17.7
* 1973-1976	5.5	-	-	252.9	166.9	68.4	1.7	10.2	26.9	81.2	n.a.	2.2	2.4	2.5	22.6
1977-1979	15.2	-	-	191.7	173.3	0.7	3.1	9.8	12.7	69.9	-5.5	1.3	1.3	1.6	14.5
+ 1980-1982	20.4 a/	-	-	413.4	131.3	60.6	119.9	64.6	67.6	56.5 a/	-13.7	6.1	6.1	5.4	98.9
1983	0.5	-	-	-71.5	2,047.0	258.3	356.8	172.6	279.9	67.6	-20.7	-	16.1 d/	8.7	285.0
1984	0.3	-	-	12.0	210.1	846.4	1,120.1	253.4	1,282.6	47.3	-35.7	-	15.4	14.7	562.5
1985	0.5 b/	-	-	-187.9	179.3	20,190.7	8,512.0	237.7 b/	11,749.0	39.5 b/	-25.9	-	11.3	7.2	103.1

\* FCDs are allowed (1973).  
+ FCDs are confiscated (1982.3).  
a/ Until 1982.3.  
b/ Until 1985.3.  
c/ Until 1972.3.  
d/ From Campbell - McCandless (1989).

Sources: IFS tapes.  
Campbell - McCandless (1989).  
Sachs (1986).  
Sangines (1987).

fed = Foreign Currency Deposits.  
fda = Foreign Currency Deposits Abroad.  
F = fed + fda.  
W = M2 + F.  
Capital Flight = Cumulative Sum of Errors and Omissions, (-): Inflow.  
B.M. Deprec. = Depreciation of the Black Market Exchange Rate.  
RER = Real Exchange Rate.  
Inflation Tax 1 = Average Inflation x Base.  
Inflation Tax 2 = Average Inflation x M1.  
Seig = Seigniorage (Annual Change in Monetary Base).

TABLE 2

MEXICO: SELECTED MACROECONOMIC INDICATORS 1971-1986  
(Annual Averages for the Period)

Years	fed/M2 (%)	F/W (%)	fed/F (%)	Capital Flight (\$ mill.)	Int. Reserves (\$ mill.)	Ex. Rate Devaluat. (%)	B.M. Deprec. (%)	B.M. Premium (%)	Inflation (%)	RER Index (1977 = 100)	Fiscal Def/GDP (%)	Inflation Tax 1/GDP (%)	Inflation Tax 2/GDP (%)	Seig/GDP (%)	Seig/Taxes (%)
1971-1973	2.8	5.5	48.0	177.0	895.8	0.0	0.0	0.1	8.0	81.7	-2.6	0.6	0.8	2.5	25.0
1974-1976	4.4	9.7	37.0	4,678.0	1,246.1	7.8	13.8	4.5	18.2	78.4	-4.5	1.9	1.7	2.0	17.5
* 1977-1979	15.9	21.0	60.0	-514.0	1,728.7	15.8	10.5	2.1	21.3	93.7	-3.1	2.6	2.0	5.6	41.7
* 1980-1982.2	21.4	23.5	68.0	...	2,582.2	...	...	9.2	...	79.2	...	...	...	...	...
1980-1982	20.1	23.5	64.0	17,321.0	2,436.5	45.8	75.8	15.6	39.4	85.2	-8.4	6.4	3.5	7.1	44.8
1982.3-1986	4.0	24.5	12.0	...	4,505.2	...	...	44.5	...	104.9	...	...	...	...	...
1983-1986	3.9	24.6	11.0	2,887.0	4,749.9	86.0	95.4	34.1	78.0	103.7	-8.0	9.7	4.7	4.5	27.0

\* Interest rate on "Mex-dollar" deposits is deregulated (1977).  
+ FCDs are confiscated (1982.2).

Sources: Indicadores Económicos. Banco de México.  
U.S. Treasury Bulletin.  
IFS Tapes.  
Picks Currency Yearbook.

fed = Foreign Currency Deposits.  
fda = Foreign Currency Deposits Abroad.  
F = fed + fda.  
W = M2 + F.  
Capital Flight = Cumulative Sum of Errors and Omissions.  
B.M. Deprec. = Depreciation of the Black Market Exchange Rate.  
RER = Real Exchange Rate.  
Inflation Tax 1 = Average Inflation x Base.  
Inflation Tax 2 = Average Inflation x M1.  
Seig = Seigniorage (Annual Change in Monetary Base).

TABLE 3

PERU: SELECTED MACROECONOMIC INDICATORS 1971-1987  
(Annual Averages for the Period)

Years	fcd/M2 (%)	F/W (%)	fcd/F (%)	Capital Flight (\$ mill.)	Int. Reserves (\$ mill.)	Ex. Rate Devaluat. (%)	B.M. Deprec. (%)	B.M. Premium (%)	Inflation (%)	RER Index (1978 = 100)	Fiscal Def/GDP (%)	Inflation Tax 1/GDP (%)	Inflation Tax 2/GDP (%)	Seig/GDP (%)	Seig/Tax 1 (%)	Seig/Tax 2 (%)
1971-1974	2.6	4.8	51.0	30	469.2	0.0	2.5	67.4	10.1	66.5	-3.9	1.0	1.5	1.8	...	...
1975-1977	2.2	7.3	30.0	909	409.1	31.6	15.1	41.3	31.7	69.5	-9.9	2.6	3.6	1.9	13.8	5.1
* 1978-1980	23.2	23.7	70.0	-127	980.0	53.3	50.4	7.1	61.6	95.4	-4.0	4.7	5.2	4.2	25.2	8.8
1981-1982	48.9	37.0	83.0	-1,109	1,294.1	54.9	55.1	1.1	69.9	81.6	-8.9	4.8	5.3	2.0	12.0	4.0
+ 1983-1985.2	92.2	57.7	66.0	...	1,444.6	...	...	3.7	...	97.7	...	...	...	...	...	...
1983-1985	85.9	57.0	63.0	1,822	1,483.9	153.3	166.8	6.7	128.3	100.6	-7.6	7.4	7.5	6.0	40.1	11.4
1985.3-1986	31.8	41.5	40.0	...	1,647.5	...	...	25.4	...	92.6	...	...	...	...	...	...
1986-1987	18.9	31.3	35.0	172	1,305.5	28.9	88.9	83.4	81.9	67.3	-7.3	4.5	3.6	6.1	49.6	16.8

\* FCDs are allowed (1978.1).

+ FCDs are confiscated (1985.2).

Sources: BCRP (Memoria Anual and other Publications).  
U.S. Treasury Bulletin.  
IFS Tapes.  
Picks Currency Yearbook.

fcd = Foreign Currency Deposits.  
fda = Foreign Currency Deposits Abroad.  
F = fcd + fda.  
W = M2 + F.  
Capital Flight = Cumulative Sum of Errors and Omissions, (-): Inflow.  
B.M. Deprec. = Depreciation of the Black Market Exchange Rate.  
RER = Real Exchange Rate.  
Inflation Tax 1 = Average Inflation x Base.  
Inflation Tax 2 = Average Inflation x M1.  
Seig = Seigniorage (Annual Change in Monetary Base).  
Tax 1 = Tax Revenues.  
Tax 2 = Total Revenues of the Public Sector.

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TABLE 4

URUGUAY: SELECTED MACROECONOMIC INDICATORS 1969-1987  
(Annual Averages for the Period)

Years	fcd/M2 (%)	F/W (%)	fcd/F (%)	Capital Flight (\$ mill.)	Int. Reserves (\$ mill.)	Ex. Rate Devaluat. (%)	B.M. Deprec. (%)	B.M. Premium (%)	Inflation (%)	RER Index (1975 = 100)	Fiscal Def/GDP (%)	Inflation Tax 1/GDP (%)	Inflation Tax 2/GDP (%)	Seig/GDP (%)	Seig/Tax 1 (%)	Seig/Tax 2 (%)
1969-1971	7.7	22.6	26.0	61.5	192.1	4.1	28.7	28.5	20.4	80.1	-3.3	2.5	2.7	3.5	35.2	26.4
1972-1974	10.4	25.1	30.0	157.4	230.8	84.8	59.6	27.9	83.5	95.6	-2.8	8.5	8.9	4.6	44.0	33.6
* 1975-1978	43.5	39.7	62.0	-149.5	469.6	40.0	36.0	2.0	58.7	87.9	-2.4	4.7	4.8	3.8	35.4	27.9
x 1979-1982	72.0	43.1	89.0	1,312.8	822.8	23.1	24.8	1.6	45.8	60.7	-2.1	3.3	3.4	2.2	20.1	14.3
1983-1985	163.8	72.4	62.0	195.5	698.5	97.1	99.1	6.8	58.9	110.2	-4.0	4.6	3.2	3.9	37.4	26.5
1986-1987	186.9	74.3	65.0	140.7	1,246.2	49.5	49.9 a/	11.2 a/	70.0	90.8	-1.2	5.5	3.7	4.3	36.2	27.3

\* FCDs are allowed (Sep. 1974).

x Preannouncement period.

a/ Until 1987.1.

Sources: Banco Central del Uruguay (Boletín Estadístico Mensual and Other Publications).  
IFS Tapes.  
Picks Currency Yearbook.

fcd = Foreign Currency Deposits.  
fda = Foreign Currency Deposits Abroad.  
F = fcd + fda.  
W = M2 + F.  
Capital Flight = Cumulative Sum of Errors and Omissions.  
B.M. Deprec. = Depreciation of the Black Market Exchange Rate.  
RER = Real Exchange Rate.  
Inflation Tax 1 = Average Inflation x Base.  
Inflation Tax 2 = Average Inflation x M1.  
Seig = Seigniorage (Annual Change in Monetary Base).  
Tax 1 = Tax Revenues.  
Tax 2 = Total Revenues of the Public Sector.

THE PATTERN OF CURRENCY SUBSTITUTION IN LATIN AMERICA

international reserves, and an abrupt increase in the magnitude of capital flight<sup>13</sup>. These disequilibria seem to have been somewhat corrected during the first sub-period that followed the devaluation and the enactment of the reform. The fiscal deficit was reduced and capital flight apparently stopped in the aftermath of the reform in México, Perú and Uruguay. The first two countries also managed to sustain a more depreciated real exchange rate.

On the external front, the tables seem to indicate that the reform had a favorable effect on the balance of payments position of these countries. The stock of (gross) international reserves increased substantially in the sub-period following the lifting of foreign exchange controls. A similar pattern is captured by Figures 4.A-4.D. They show that the initial inflow of FCDs was reflected in the evolution of the total external assets maintained by these countries' central banks, particularly in Perú and Uruguay. Of course, the direct effect that these inflows actually had on the stock of international reserves depended on the average and marginal reserve requirements imposed on FCDs by the monetary authorities. As is captured clearly by Figure 4.C, these requirements were particularly high in the case of Perú. Additionally, in order to assess precisely the total effect of the reform on these countries' external position it would be necessary to control for all the other variables that influenced the behavior of their balance of payments, such as the rate of expansion of domestic credit, the external terms of trade, the inflows of foreign debt and the real exchange rate (see Savastano (1990)).

FIGURE 4.A

BOLIVIA: RESERVES AND FCDs

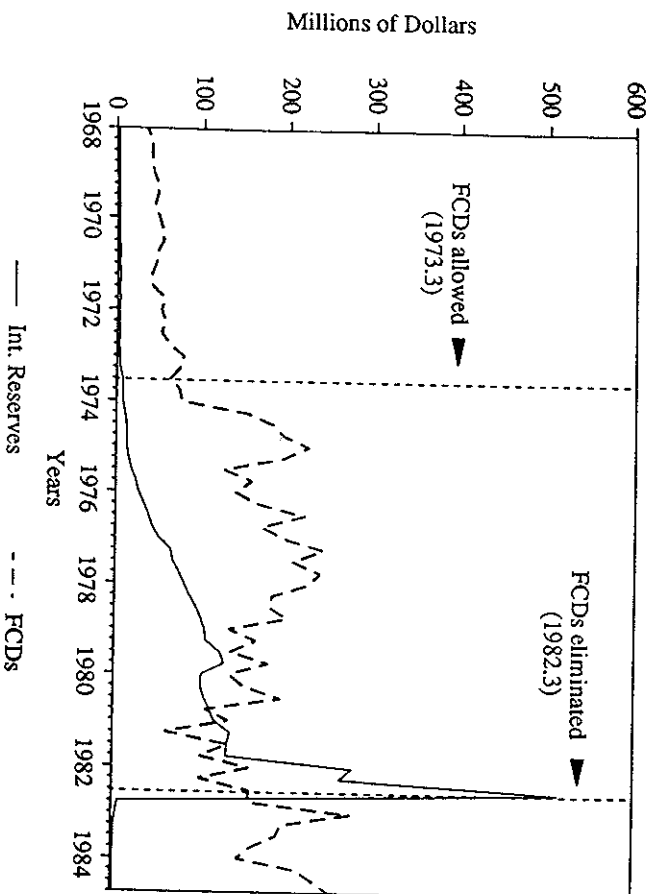
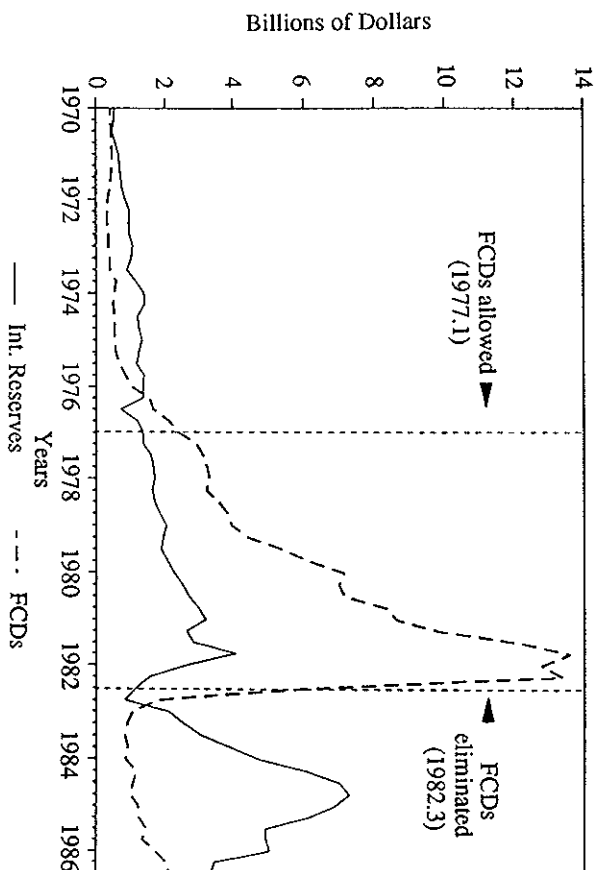


FIGURE 4.B

MEXICO: RESERVES AND FCDs

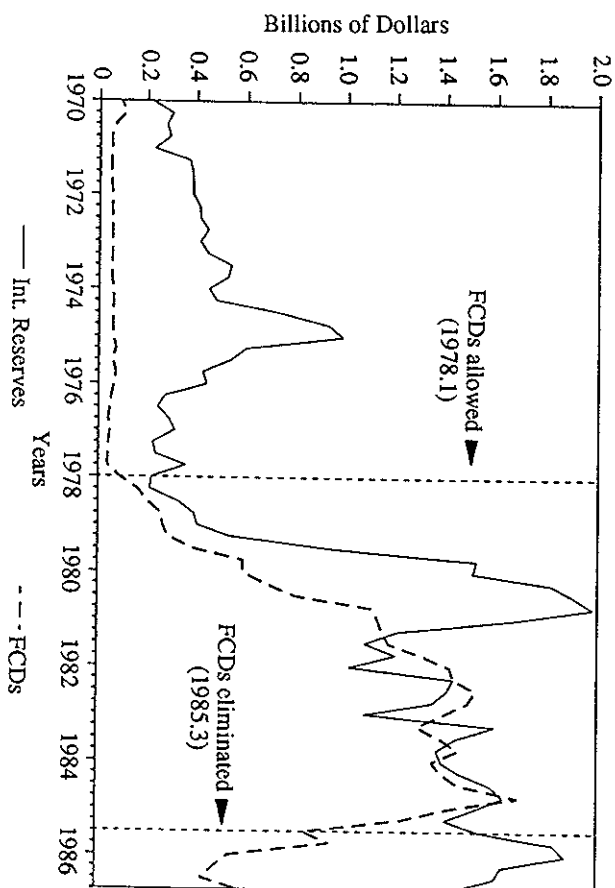


The relative macroeconomic stability that accompanied the introduction of FCDs did not last for long in Bolivia, México and Perú. After a few quarters these governments lost control of their respective fiscal deficits, which rose, in percent of GDP, from 5.5 percent to 13.7 percent in Bolivia, from 3.1 percent to 8.4 percent in México, and from 4.0 percent to 7.6 percent in Perú. Simultaneously, these countries' real exchange rates experienced a noticeable appreciation (particularly in Bolivia and México), and the pressures on their external accounts, as measured by the proxy for capital flight, started to mount. In the absence of foreign financing (provoked by the almost coincident bursting of the debt crisis of 1982), these disequilibria led to an increased reliance on the inflation tax (Tables 1-4), which in turn reinforced the flight from the domestic money.

Even after considering the burden imposed by the debt crisis, however, the lack of fiscal discipline appears to have been the fundamental determinant of the eventual abandonment of the FCDs reform and the reimposition of capital controls in Bolivia, México and Perú. In fact, the conversion into domestic money of the FCDs not only represented a one-time gain of international reserves for these countries' central banks, but was followed in each case by a large devaluation and the subsequent fixing of the exchange rate. In this sense, the measure could be interpreted as an attempt of the authorities to stop the by then incipient drainage of foreign currency assets and to recover some (temporary) control over their diminished inflation tax base (see Section IV).

FIGURE 4.C

PERU: RESERVES AND FCDs



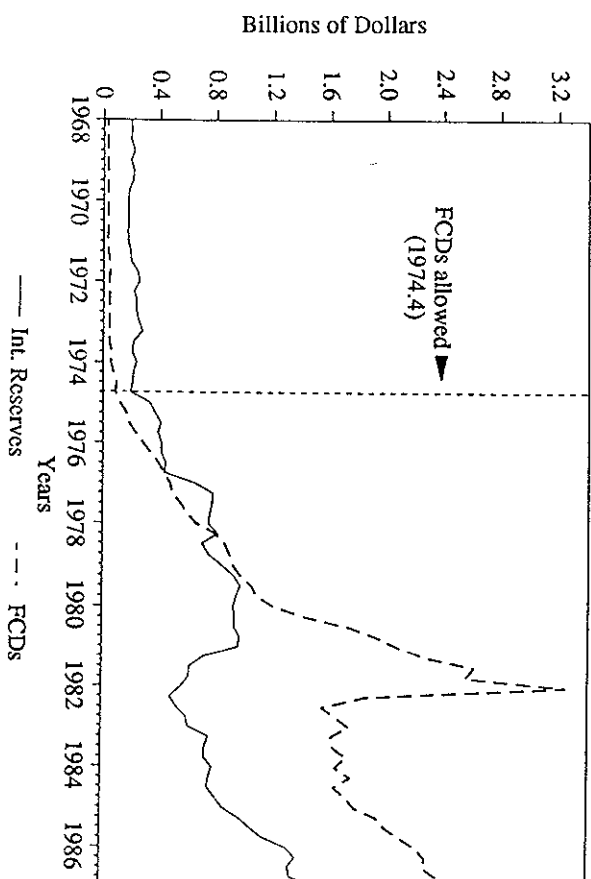
It is illustrative to compare these episodes with the case of Uruguay. Facing the same adverse external conditions as the other countries of the region, the Uruguayan authorities seem to have had enough flexibility for bringing the fiscal deficit down to relatively manageable levels and for honoring their commitment to respect the convertibility of the FCDs. This is even more remarkable when it is considered that, in addition to the external shocks related to the debt crisis, the authorities of this country had to deal with the confidence crisis brought about by their unsuccessful experiment with the "tablita". Indeed, rising public sector pressures created a serious inconsistency with the use of the exchange rate as the anchor of the price system in this country; as a result, the Uruguayan "tablita" ended with an abrupt 110 percent nominal devaluation and with the adoption of an aggressive exchange rate policy in November 1982. This measure halted the reallocation of foreign currency assets abroad and provided a sustained depreciation of the real exchange rate (Table 4). The effectiveness of this regime change for arresting the flight from domestic money and the mechanisms through which this real depreciation took place in the highly "dollarized" Uruguayan economy will be assessed in the following two sections.

#### IV. "Dollarization" of the Financial System and the Demand for Domestic Money

One of the most important implications of the decision to allow the holding of FCDs in the domestic financial system of these countries is that it provided the public

FIGURE 4.D

URUGUAY: RESERVES AND FCDs



with an easily accessible substitute for seigniorage-yielding assets. This, in turn, made it difficult for the authorities to conduct monetary policy and, as mentioned in Section III, tended to increase the inflationary impact of the existing fiscal deficit and of subsequent fiscal imbalances. In this regard, it should be noted that the upward shift of the total share of foreign currency assets in the public's portfolio shown in Figures 2.A-2.C constitutes only an indirect indicator of the shrinkage of these countries' inflation tax base during the reform periods. This is because there are many other factors in addition to a decline in the demand for domestic money balances that can cause an increase in the ratio  $(F/(M+F))$ . For instance, the ratio will increase when residents decide to open a banking deposit with foreign currency notes that were circulating domestically or when they repatriate from abroad funds that were maintained in the form of assets different from the ones included in  $F$ , such as foreign bonds and stocks. These arguments suggest that the most appropriate way of identifying the consequences for the conduct of monetary policy and the collection of the inflation tax of the widespread process of CS experienced by these countries is by investigating directly the effects of this phenomenon on the specification and stability of the demand for domestic money balances.

A common procedure used by earlier empirical studies to test for the presence of CS in a particular country was to include the expected rate of depreciation of the domestic currency as an additional explanatory variable in a demand for money equation. Following this methodology several authors claimed to have found significant evidence

of the presence of CS in both industrialized and developing countries. These inferences were mainly based on the negative sign and statistical significance obtained for the expected depreciation coefficient in the estimated money demand equations<sup>14</sup>.

However, there are serious problems with using this procedure as a test of the existence of CS. In countries with well-developed financial and foreign exchange markets and high capital mobility, Cuddington (1983) has argued convincingly that the expected depreciation of the domestic currency will tend to be negatively related with *any* money demand function, even when residents do not demand foreign currency balances. He supports this claim with evidence from four industrialized countries that shows that the "CS coefficient" is no longer significant when the money demand equations control for the existence of foreign bonds. In developing countries with rudimentary financial markets, on the other hand, Savastano (1990) has shown that the inclusion of a proxy for the expected rate of devaluation in addition to that for expected inflation would hardly add any information to a money demand function. The main reason for this is that the collinear nature of the two opportunity cost variables would make it very difficult to isolate the different effects they are supposed to capture (i.e., the substitution towards inflation hedges expressed in domestic and foreign currency) and would affect the statistical significance of their estimated coefficients<sup>15</sup>.

Based on these considerations, the effects that the ready availability of FCDs had on the stability of the demand for domestic currency during the four "dollarization" episodes under study were investigated using a money demand specification that included the expected inflation rate as the only indicator of the opportunity cost of holding money balances. A conventional short-run semi-logarithmic money demand function:

$$\ln \left( \frac{M}{P} \right)_t = \beta_0 + \beta_1 \ln(Y)_t + \beta_2 \pi^e_t + \beta_3 \ln \left( \frac{M}{P} \right)_{t-1} + \varepsilon_t$$

was estimated using quarterly data from Bolivia, México, Perú and Uruguay. In the estimation process  $M_1$  and  $M_2$ , deflated by the country's consumer price index,  $P$ , were used as alternative monetary aggregates;  $Y$ , represented an indicator of the evolution of economic activity in each country<sup>16</sup>, and the "substitution method" (whereby the expected variables are replaced by forecasts derived from unrestricted reduced forms) was employed to obtain estimates of the expected rate of inflation,  $\pi^e_t$ , based on the actual changes in domestic prices<sup>17</sup>.

The stability of the demand for domestic money in the four countries was examined using the methodologies recently suggested by Hafer and Hein (1982, 1984) and Miller (1986, 1989)<sup>18</sup>. These two procedures are more appropriate than the conventional Chow (1960) F-tests for analyzing the stability of the demands for real money balances during the "dollarization" episodes. First, these methods do not restrict in advance the number and location of the shifts in the money demand equations. Second, while the Hafer-Hein method permits to identify *discrete* shifts in the estimated money demand regressions, the procedure proposed by Miller allows to capture gradual drifts in those functions; thus, the results of these alternative methods can provide a fairly precise picture of the way in which the presence of FCDs affected the overall stability of the residents' demand for domestic money in these countries. And third, both methods make use of a first-differenced specification of the demand for money that, according to recent empirical work on the subject, is supposed to dominate the log-level specification on statistical grounds<sup>19</sup>.

The first step required by these two methods consists of estimating regressions of the first differences of the money demand specifications. The idea is that the error structure of these regressions would reflect the drifts in the intercept of the structural equations, while the estimated parameters would capture the possible changes in the coefficients of the explanatory variables. Although both procedures use conventional techniques (F-tests and dummy variables) for analyzing the stability of the slope coefficients, they suggest different methods for detecting drifts in the intercept of the demand for money. Hafer and Hein (1982) propose the identification of all the residuals from the full-sample first-differenced regression that exceed twice the regression's standard error. These "outliers" then become the potential candidates for intercept shifts that should be introduced as dichotomous dummy variables in the structural equation. Miller (1986), however, argues that this procedure is only appropriate for detecting discrete shifts in the money demand equation and suggests as an alternative the identification of sequences of  $n$  quarters (where  $n$  is greater than or equal to four) in which the errors of the first-differenced regressions have the same sign and their sum is significantly different from zero. These grouped observations should then be included as dummy variables that are turned on slowly (taking values from 1 to  $n$  during the transition period) in the money demand equations. Once the identified intercept shifts have been included in the original specification, both methods require an additional test of the stability of the coefficients of the explanatory variables.

The Hafer-Hein and the Miller procedures were applied to the estimation of the money demand equation using  $M_1$  and  $M_2$  as alternative monetary aggregates and all the quarterly observations available for each country. The inflation estimates obtained from the "substitution method" and the actual rate of inflation were employed as proxies for the expected inflation,  $\pi^e_t$ . Two regressions of the first differences of the Cagan-type money demand were estimated for each monetary aggregate, and the (group of) observations that represented potential candidates for drifts in the intercept according to the two methods were identified. Preliminary evidence of both gradual (Miller) and discrete (Hafer-Hein) intercept shifts in the periods when the institutional restrictions to hold FCDs were lifted and when they were reimposed was found in almost every case<sup>20</sup>. However, the stability tests applied to the estimated parameters of these auxiliary regressions rejected in most cases the hypothesis that the *slope* coefficients of the demands for money had been affected by the existence of FCDs.

The dummy variables corresponding to the observations identified by each method as candidates for structural shifts in the intercept of the money demand were then included in separate regressions. In order to compare the explanatory power of the discrete-shift equations with that of the gradual-drift specifications, non-nested tests were computed<sup>21</sup>. These tests provided the information needed for selecting one of the two alternative specifications obtained for each monetary aggregate in most of the cases. The final step consisted on testing again the stability of the slope coefficients of the selected equation through the introduction of interactive dummy variables for the periods in which FCDs were allowed.

The money demand equations obtained from this selection process are reported in Tables 5-8. The tables present estimates of the chosen demand functions for  $M_1$  and  $M_2$  in Bolivia, México, Perú and Uruguay for the two alternative measures of the expected rate of inflation. They also indicate the periods in which intercept (and slope) shifts were identified by the procedure selected in each case and, when applicable, report the t-statistic corresponding to the "J" non-nested test that assumed the chosen specification as the null hypothesis (i.e., the t-statistic of the weight assigned to the

alternative specification). Of course, it was expected that the estimated coefficient of the dummy variables identified for the periods immediately following the introduction of FCDs would be negative, while those of the dummy variables that (loosely) coincided with the abandonment of the reform would be positive. This would provide strong evidence of an association between the "dollarization" of these countries' financial systems and changes in their inflation tax base.

In general terms, the tables show that there is not much empirical support for the hypothesis that the presence of FCDs provoked, at some point, a *gradual* drift in these countries' demands for domestic money. Only in 2 of 16 cases—one equation for M2 in Perú and one for M1 in Uruguay—the non-nested tests indicated that the equation obtained using Miller's procedure was to be preferred over the one estimated following Hafer-Hein's method. Another important finding of this selection process is that most of the shifts experienced by the money demand equations during these episodes seem to have affected the intercepts, but not the slopes of these functions. The interactive dummy variables included in the selected equations turned out to be statistically significant, taken as a whole, in only four of sixteen regressions: the two demand equations for M2 in México and the demands for M2 in Perú and for M1 in Uruguay that used the actual rate of inflation as the proxy for the opportunity cost of holding money.

It is also clear from the tables that the identified shifts in the demands for domestic money did not always coincide with the precise periods in which the restrictions to hold FCDs were lifted and/or reimposed. Furthermore, it appears that some of these shifts were not related to the ongoing "dollarization" of these countries' financial systems. The effects of the presence of FCDs, however, were captured quite accurately by the estimated demands for broad monetary aggregates: the enactment of the reform almost coincides with a downward shift in the estimated demand for M2 in Bolivia (Dum1, Table 5), Perú (Dum2, Table 7) and Uruguay (Dum2, Table 8), while its abandonment seems to have provoked an increase in this function in Bolivia (Dum3, Table 5), México (Dum3, Table 6) and Perú (Dum5, Table 7).

The estimates of these countries' demands for M1 do not reflect as clearly the consequences of the "dollarization" of their domestic financial systems. Only in the case of Perú does the availability of foreign currency assets appear to have provoked a rapid decline in the demand for narrow monetary aggregates that was reversed when capital controls were reimposed (Dum2 and Dum3, Table 7). The results from Bolivia find evidence of successive downward shifts in that function—the first of which (Dum1, Table 5) corresponds closely to the period in which FCDs were allowed—but do not capture any effects from the forced conversion of FCDs into domestic money. The estimates for Uruguay suggest that the demand for M1 in that country experienced a decline only after the "tablita" collapsed, i.e., eight years after the FCDs were permitted (Dum2-Miller method, Table 8). Lastly, the pattern of the shifts identified in the equations for México was precisely the opposite of the one expected: the demand for M1 seems to have increased after the FCDs were allowed and to have experienced a downward drift when they were converted into domestic money (Dum2 and Dum3, Table 6).

Finally, note that most of the other estimated coefficients of these money demand equations had the expected signs and were statistically significant at conventional levels. In fact, except for the estimates of the demands for M1 in Bolivia and Uruguay, the results obtained from the regressions were quite satisfactory and fairly robust to the choice of the proxy for the expected inflation rate. Moreover, the inclusion of the dummy variables identified by the stability procedures is likely to have improved the

TABLE 5  
BOLIVIA: SELECTED MONEY DEMAND EQUATIONS

Money Aggregate	M1		M2	
	Hafer-Hein Coc. Orc.	Hafer-Hein 2S-Coc. Orc.	Hafer-Hein Coc. Orc.	Hafer-Hein 2S-Coc-Orc.
Selected Procedure Estimation Method				
Period (year, quarter)	70.1-84.4	71.1-84.4	70.1-84.4	71.1-84.4
Intercept	-0.8093 (-0.4880)	-0.0315 (-0.0162)	-2.1487 (-1.3089)	-2.5594 (-1.2284)
$\log y$	2.6670 (6.2603)	2.3898 (5.1383)	2.2265 (4.5571)	2.5553 (4.8857)
Expected Inflation	0.0637 (1.1517)	0.0672 (1.2341)	-0.1545 (-2.5075)	-0.0969 (-1.6817)
$\log (M/P)_{t-1}$	-0.3221 (-2.0764)	-0.2669 (-1.7439)	0.1006 (0.4626)	-0.0238 (-0.1188)
Dum 1	-0.3390 (-3.8036)	-0.3134 (-3.4370)	-0.2797 (-3.0629)	-0.3100 (-3.1283)
Dum 2	-0.1640 (-2.1537)	—	-0.1574 (-2.2310)	-0.1773 (-2.2231)
Dum 3	-0.2904 (-3.6647)	-0.2802 (-3.8923)	0.1455 (1.8855)	0.1431 (1.7106)
Dum 4	0.1643 (2.2353)	—	-0.1958 (-1.5798)	-0.3127 (-2.6614)
Dum 5	-0.4491 (-3.6826)	-0.4172 (-3.6439)	—	—
$R^2$	0.8728	0.8413	0.9077	0.8841
SEE	0.0778	0.0845	0.0812	0.0867
RHO	0.6991 (4.0475)	0.7085 (4.6400)	0.6531 (2.7319)	0.6878 (3.0845)
J-Test	2.2156	n.a.	1.2604	1.2756
Identified Drifts (Periods when Dum = 1)				
Dum 1	74.1-84.4	74.1-84.4	74.1-84.4	74.1-84.4
Dum 2	80.1-84.4	—	81.1-84.4	81.1-84.4
Dum 3	81.1-84.4	81.1-84.4	82.4-84.4	82.4-84.4
Dum 4	81.4-84.4	—	84.1-84.4	84.1-84.4
Dum 5	84.2-84.4	84.2-84.4	—	—

\* t-statistics in parenthesis.

TABLE 6

## MEXICO: SELECTED MONEY DEMAND EQUATIONS

Money Aggregate	M1		M2	
	Hafer-Hein Coc. Orc.	Hafer-Hein 2S-Coc. Orc.	Hafer-Hein Coc. Orc.	Hafer-Hein 2 (2SLS)
Selected Procedure Estimation Method				
Period (year, quarter)	70.2-87.4	71.1-87.4	70.2-86.3	71.1-86.3
Intercept	0.9688 (2.4225)	1.1284 (2.4134)	0.3841 (1.7151)	0.5306 (1.5929)
log y	0.2404 (2.5483)	0.3304 (2.7457)	0.4617 (2.9100)	0.5144 (2.7587)
Dum 1* (log y)	—	—	-0.4556 (-2.7965)	-0.5075 (-2.5767)
Expected Inflation	-0.6637 (-3.1948)	-0.7466 (-3.0342)	-0.8637 (-3.8452)	-0.7944 (-2.9891)
Dum 1* (Inflation)	—	—	-0.1152 (-0.4649)	-0.2209 (-0.7019)
log (M/P) <sub>t-1</sub>	0.5728 (6.3541)	0.4510 (3.4949)	0.5330 (3.5550)	0.4648 (2.6030)
Dum 1* (log (M/P) <sub>t-1</sub> )	—	—	0.4061 (2.8264)	0.4498 (2.5897)
Dum 2	0.0881 (2.3052)	0.0935 (2.2995)	0.0651 (3.2443)	0.0530 (1.7870)
Dum 3	-0.2126 (-4.1623)	-0.2090 (-3.7870)	0.2117 (5.6723)	0.2331 (4.5702)
Dum 4	—	-0.0896 (-1.9387)	-0.1850 (-7.9869)	-0.1802 (-6.2450)
R <sup>2</sup>	0.8715	0.8777	0.9691	0.9474
SEE	0.0887	0.0868	0.0319	0.0363
RHO	-0.3550 (-2.4340)	-0.3076 (-1.7668)	-0.2843 (-2.0331)	—
J-Test	n.a.	n.a.	1.1286	0.3597
Identified Drifts (Periods when Dum = 1)				
Dum 1	—	—	70.1-76.4, 82.3-86.3	—
Dum 2	77.4-87.4	77.4-87.4	77.4-86.3	77.4-86.3
Dum 3	83.1-87.4	83.1-87.4	82.3-86.3	82.3-86.3
Dum 4	—	84.4-87.4	83.1-86.3	83.1-86.3

\* t-statistics in parenthesis.

TABLE 7

## PERU: SELECTED MONEY DEMAND EQUATIONS

Money Aggregate	M1		M2	
	Hafer-Hein Coc. Orc.	Hafer-Hein 2S-Coc. Orc.	Miller Coc. Orc.	Hafer-Hein 2S-Coc. Orc.
Selected Procedure Estimation Method				
Period (year, quarter)	70.2-86.4	71.1-86.4	70.2-86.4	71.1-86.4
Intercept	0.6758 (0.8515)	1.6196 (1.8246)	0.6820 (1.3516)	2.9654 (2.4503)
log y	0.3135 (1.6269)	0.3269 (1.5610)	0.4601 (3.2362)	0.2471 (1.0695)
Dum 1* (log y)	—	—	0.2637 (2.0302)	—
Expected Inflation	-1.1501 (-5.8416)	-1.4217 (-4.9550)	-1.4573 (-8.7886)	-0.8679 (-4.3358)
Dum 1* (Inflation)	—	—	0.7190 (3.3304)	—
log (M/P) <sub>t-1</sub>	0.6657 (10.2983)	0.4924 (3.4748)	0.6195 (8.3267)	0.3719 (3.3286)
Dum 1* (log (M/P) <sub>t-1</sub> )	—	—	-0.2009 (-2.1712)	—
Dum 2	-0.0879 (-1.8574)	-0.1324 (-2.5463)	-0.0441 (-5.1451)	-0.1295 (-2.5880)
Dum 3	0.1803 (4.2797)	0.2209 (4.2891)	—	-0.1395 (-2.6948)
Dum 4	—	—	—	-0.1647 (-2.8622)
Dum 5	—	—	—	0.3129 (5.2907)
R <sup>2</sup>	0.9492	0.9426	0.9770	0.9587
SEE	0.0663	0.0713	0.0392	0.0536
RHO	0.3219 (2.2795)	0.4700 (4.2597)	0.3355 (2.3556)	0.8046 (6.8613)
J-Test	-1.3976	-1.3609	2.1942	-0.4778
Identified Drifts (Periods when Dum = 1)				
Dum 1	—	—	78.1-85.2 = 0	—
Dum 2	75.2-86.4	78.2-86.4	Dum 2 (Miller)	78.2-86.4
Dum 3	85.3-86.4	85.3-86.4	= 0, 70.1-75.1	84.1-86.4
Dum 4	—	—	(1-5); 75.2-76.2	85.1-86.4
Dum 5	—	—	= 5; 76.3-86.4	85.3-86.4

\* t-statistics in parenthesis.

TABLE 8  
URUGUAY: SELECTED MONEY DEMAND EQUATIONS

Money Aggregate	M1		M2	
	Hafer-Hein OLS	Miller 2 SLS	Hafer-Hein OLS	Hafer-Hein 2SLS
Selected Procedure Estimation Method				
Period (year, quarter)	69.1-87.4	70.1-87.4	69.1-87.4	70.1-87.4
Intercept	1.1899 (1.4824)	4.0014 (3.6607)	-0.1861 (-0.5739)	-0.0098 (-0.0255)
log y	0.5771 (3.1779)	-0.5311 (-2.5830)	0.3518 (4.2830)	0.1848 (2.3100)
Dum 1* (log y)	-0.6877 (-3.9918)	—	—	—
Expected Inflation	0.2764 (0.9503)	-1.5083 (-4.8753)	-0.5473 (-4.9939)	-0.6265 (-3.4568)
Dum 1* (Inflation)	1.0066 (-2.5901)	—	—	—
log (M/P) <sub>t-1</sub>	-0.0862 (-0.6186)	0.6243 (8.4717)	0.6932 (12.8907)	0.8237 (16.6148)
Dum 1* (log (M/P) <sub>t-1</sub> )	0.9283 (4.4917)	—	—	—
Dum 2	-0.3790 (-5.6486)	-0.0380 (-4.2879)	-0.0424 (-2.1622)	0.0614 (1.9564)
Dum 3	0.1087 (2.4804)	—	0.1078 (4.2489)	-0.0857 (-2.1688)
Dum 4	—	—	—	0.0708 (2.0071)
R <sup>2</sup>	0.9073	0.8748	0.9176	0.8965
SEE	0.0919	0.1045	0.0542	0.0604
RHO	—	—	0.2267(h)	—
J-Test	n.a.	2.2640	0.5336(h)	0.5256(h)
			1.1751	1.8738
Identified Drifts (Periods when Dum = 1)				
Dum 1	69.1-74.2	Dum 2 (Miller)	—	—
Dum 2	83.2-87.4	= 0: 70.1-80.4	75.2-87.4	73.4-87.4
Dum 3	85.4-87.4	(1-7): 81.1-82.3	78.4-87.4	75.2-87.4
Dum 4	—	= 7: 82.4-87.4	—	76.2-87.4

\* t-statistics in parenthesis.

efficiency of the point estimates of the other regressors, as evidenced, for instance, by the relatively high speed of adjustment of the demands for M2 in México, Perú and Uruguay.

The consequences that the money demand shifts identified with the above methodology might have had on the actual proceeds from the inflation tax collected by the authorities, and, thus, on the evolution of the inflation rate in these countries, depends, of course, on the governments' reliance on this source of revenue. Only in those cases where the fiscal deficit remained constant, or increased, after these shifts occurred and the authorities were not able to use more intensively other sources of financing—such as external or domestic debt—should an increase in the rate of inflation have been required in order to satisfy the government's budget constraint.

In this sense, it has already been mentioned that the decision of allowing FCDs was followed by a period of fiscal retrenchment in these countries. It was also seen that the authorities of Bolivia, México and Perú followed expansionary fiscal policies mostly in the years that preceded the abandonment of the reform and that these disequilibria did not always imply a stronger reliance on seigniorage or the inflation tax. Figures 5.A-5.D provide additional evidence on the inflation tax effects of the "dollarization" episodes experienced by these four countries. They show the government revenues from the inflation tax (expressed as percentage of GDP) plotted against the annual average rate of inflation, i.e., they depict the yearly location of the points from each country's inflation-tax Lafter curve<sup>22</sup>.

The figures illustrate clearly that the structural changes identified before for the demands for M1 in Perú and Uruguay during the "dollarization" period (Tables 7 and 8) were eventually associated with shifts in their "Lafter curves" and, thus, prompted an upward adjustment in their inflation rates. Compare, for instance, the location of the points from the midst of the reform period in Perú (1982-84, Figure 5.C) with those corresponding to the preceding decade and to those of the period that followed the abandonment of the reform (1985-86). Similarly, notice that the three sub-groups of points that could be identified in the case of Uruguay (corresponding to the years 1969-73, 1974-82 and 1983-87 in Figure 5.D) suggest the existence of a drift in the demand for money which almost coincides with the lifting of controls to hold FCDs; a drift that is not captured by the econometric estimates reported in Table 8. The figure also shows that the change in the exchange rate regime that followed the abandonment of the "tablita" in late 1982 affected considerably the government's ability to collect revenues from domestic money holdings (see also Section V).

Note, however, that the effects of this reform on the domestic rate of inflation were more difficult to capture in the two countries whose financial systems were relatively less "dollarized". Figure 5.B seems to confirm that the decrease in the demand for M1 in México only took place about one year after the restrictions to hold FCDs were reimposed, when the general economic situation deteriorated markedly. In the case of Bolivia, on the other hand, the money demand shifts identified by the econometric analysis do not appear to have affected the stability of the inflation-tax Lafter curve (see Figure 5.A).

Overall, then, the evidence reported in this section suggests that the presence of FCDs affected the overall stability of these countries' demands for domestic money. In this regard, the results show that the authorities' decision to allow FCDs in the domestic banking system did not provoke an immediate and once-and-for-all shift out of domestic currency balances from part of the public. Instead, it seems that in most of these episodes residents initially built up their holdings of FCDs by substituting out of banking

FIGURE 5.A

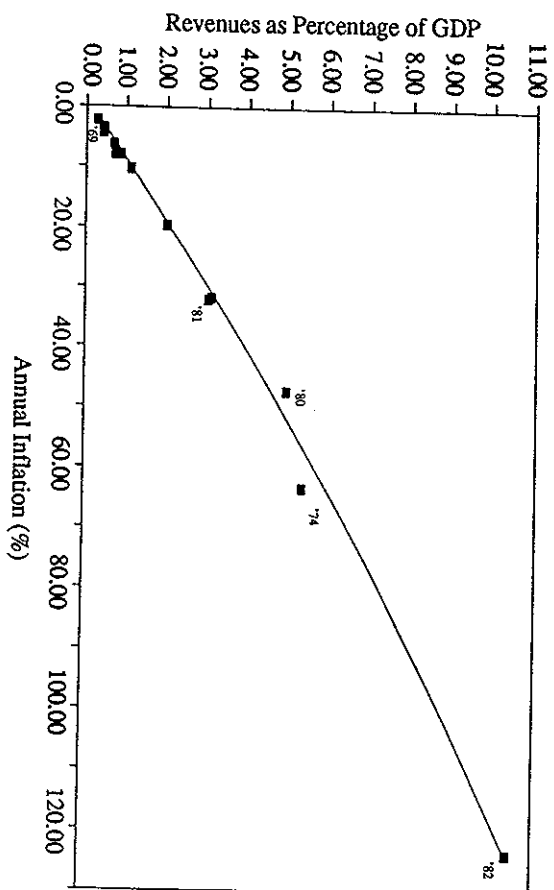
BOLIVIA: INFLATION TAX LAFFER CURVE  
(1969-1982)

FIGURE 5.B

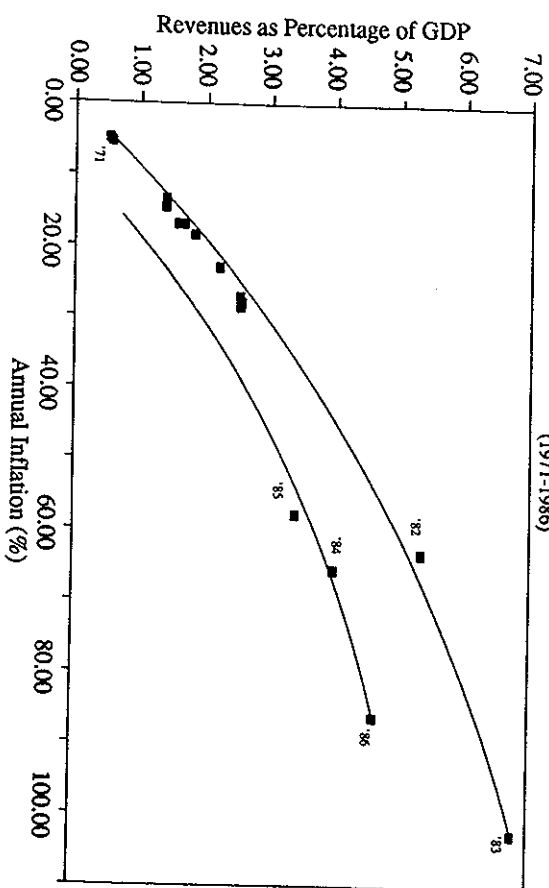
MEXICO: INFLATION TAX LAFFER CURVE  
(1971-1986)

FIGURE 5.C

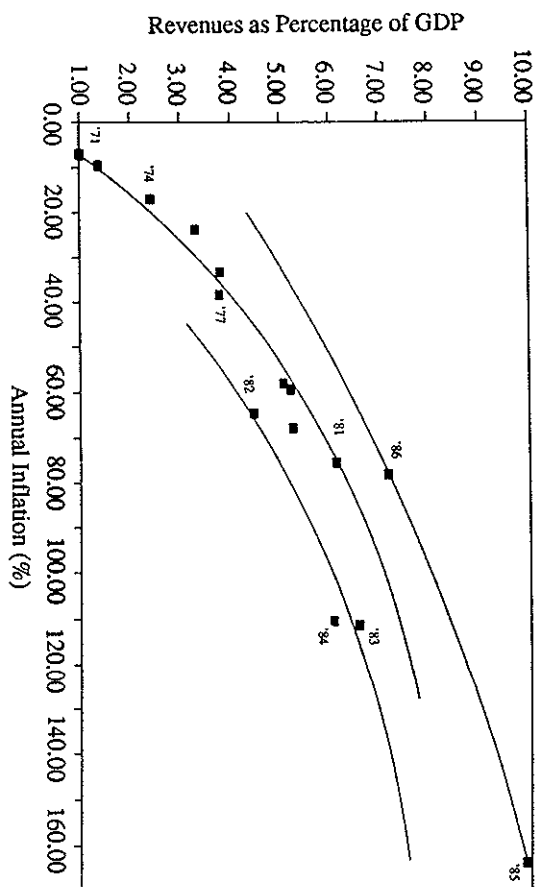
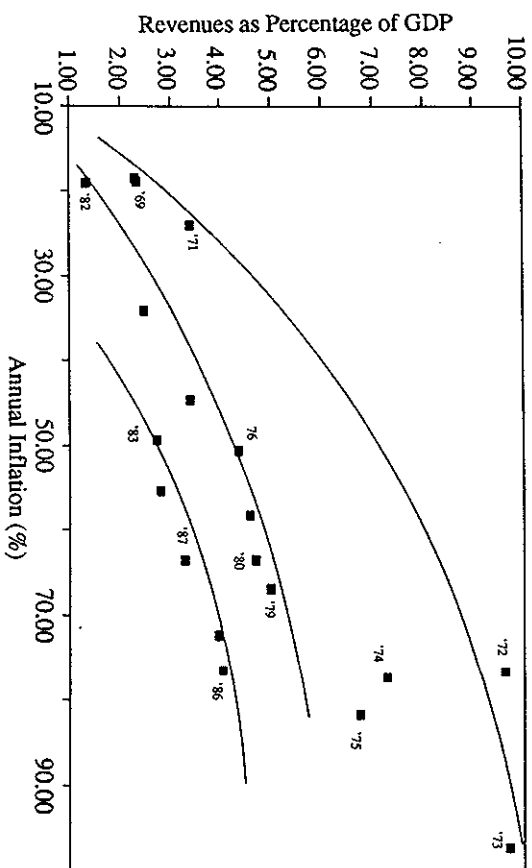
PERU: INFLATION TAX LAFFER CURVE  
(1971-1986)

FIGURE 5.D

URUGUAY: INFLATION TAX LAFFER CURVE  
(1969-1987)

deposits and other low-return assets in domestic currency and by repatriating foreign currency assets maintained abroad (or outside the domestic banking system).

The ready availability of foreign currency assets, however, ended up impairing the authorities' ability to conduct monetary policy. In fact, the results obtained from the stability analyses clearly indicate that these "dollarization" episodes eventually culminated with a discrete, rather than gradual, decline in the agents' holdings of domestic money balances. This decline, in turn, determined that the reimposition of controls to the maintenance of FCDs represented for the governments of Bolivia, México and Perú a significant and abrupt increase in their base of the inflation tax. It has also been shown that the fluctuations in these demands had noticeable effects on the inflation tax revenues and, thus, on the evolution of the inflation rate in Perú and Uruguay, the countries that experienced the most acute "dollarization" processes.

#### V. Real Exchange Rate Behavior and Exchange Rate Adjustments in "Dollarization" Episodes

An important development of the recent literature on exchange rate economics is the distinction between equilibrium and disequilibrium movements of the real exchange rate (RER) and the role of nominal and discrete (stepwise) devaluations for correcting situations of RER misalignment. This literature has shown that in order to analyze the behavior of the RER it is necessary to define a (long-run) equilibrium level of the real exchange rate as a benchmark (see Edwards (1989)). This equilibrium level represents the relative price of tradable to nontradable goods that, for given values of the "fundamentals" (i.e., the country's tariff structure, its expenditures composition, its sustainable capital flows, etc), permits the simultaneous attainment of external and domestic equilibrium in the economy. Sustained departures of the actual RER from its equilibrium level characterize situations of RER misalignment. These departures, in turn, can be caused either by a change in the fundamental determinants of the RER (structural misalignment), or by a change in the stance of macroeconomic policies followed by the country (macroeconomic-induced misalignment).

By definition, a situation of RER misalignment is not sustainable in the medium run, and its emergence calls for the implementation of corrective measures. In this sense, the literature seems to agree that the most effective policy to deal with a disequilibrium appreciation of the RER is a (discrete) devaluation of the nominal exchange rate. On one hand, it is conventionally argued that the devaluation will exert a negative wealth effect, reducing the excessive level of absorption of the economy (expenditure-reducing effect). On the other, by increasing the relative price of tradable to nontradable goods, it will induce a substitution in consumption away from tradables and a substitution in production toward tradables (expenditure-switching effect). Thus, both effects will contribute to eliminate the aggregate pressures on the economy's current account. However, the literature also emphasizes that in those cases where the RER appreciation reflects a macroeconomic-induced misalignment, the favorable consequences of the devaluation will only be long-lasting if they are supported by a new set of fiscal and monetary policies consistent with the chosen level for the exchange rate.

In a dollarized economy, however, the sign of the wealth effect brought about by a devaluation will depend on the share of foreign currency assets in the portfolio of the private sector. The larger the share of foreign currency assets in the public's financial

wealth, the lower the expenditure-reducing effect prompted by a given (discrete) devaluation and the larger its short-run effects on the price level.<sup>23</sup> In the presence of a high degree of CS, then, the effectiveness of a devaluation for eliminating a situation of RER misalignment will depend, to a large extent, on the macroeconomic policies followed by the authorities and on the degree of expenditure-switching in response to the exchange rate adjustment. Moreover, the devaluation will tend to have non-trivial inflationary consequences, particularly if it is undertaken in a crawling peg regime with sizable periodic adjustments of the nominal exchange rate. All these considerations should be kept in mind when examining the evolution of the RER in the four Latin American countries under study.

Figures 6.A-6.D depict the evolution of a bilateral index of the RER for these countries. As customary, the indexes were constructed dividing the product of each country's official exchange rate and the U.S. wholesale price index by the corresponding consumer price index; thus, an increase in the index represents a real depreciation and a decrease a real appreciation.<sup>24</sup> The first noticeable feature of these figures is that in all the cases the RER depreciated substantially as a result of the devaluation that accompanied (or preceded) the decision to allow FCDs in the domestic system.

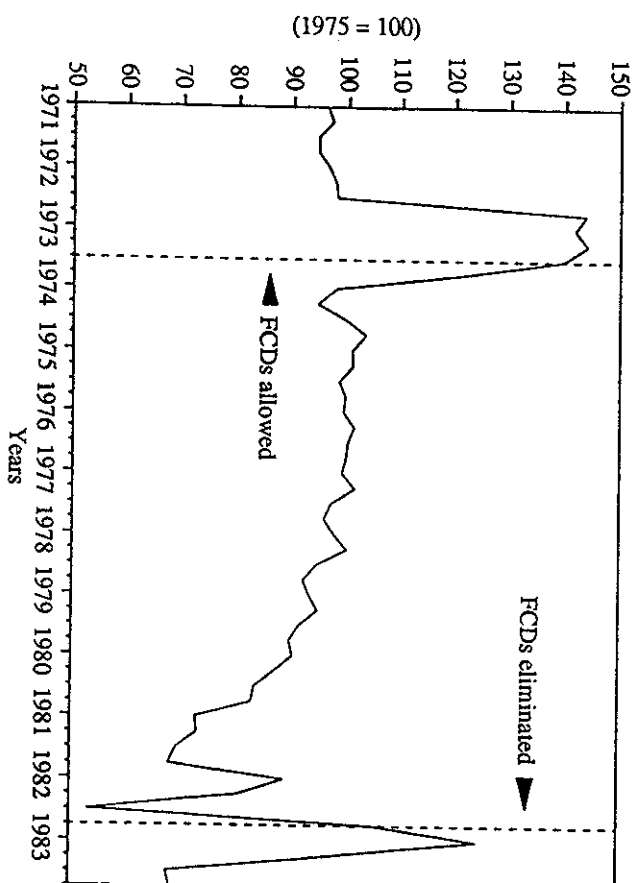
Following the initial devaluation, the RER indexes of México, Perú and Uruguay appreciated slowly during the first years of the reform (see Figures 6.B-6.D), while the one for Bolivia returned rapidly to (approximately) the same level it had before the exchange rate adjustment. As shown by Edwards (1989), the abrupt appreciation of the Bolivian peso in this period was caused by the adoption of inconsistent macroeconomic policies. In the other three countries, however, it is quite difficult to assess *a priori* whether the gradual appreciation of the RER was the reflection of an excess of aggregate demand or an equilibrium movement of that relative price.

In principle, it can be argued that not all the appreciation experienced by the currencies of these three countries represented a disequilibrium phenomenon. First, the discussion of Section III and the data reported in Tables 2-4, have shown that the macroeconomic environment was relatively stable in the initial years of these "dollarization" episodes. And second, the positive wealth effect associated with the lifting of controls to holding FCDs may have prompted an equilibrium appreciation of their RER. In spite of these factors, when the subsequent evolution of the financial and exchange rate policies followed by México, Perú and Uruguay is taken into account, it seems fairly evident that, at some point during the episode, their RER became overvalued.

For instance, the data summarized Section III indicate that in México the average quarterly rate of crawl during 1980-1981 was 1.7 percent, while the average quarterly rate of inflation reached 6.6 percent and the fiscal deficit increased from 3.1 percent of GDP to 6.7 percent of GDP in those two years. In Perú, on the other hand, the authorities devalued the exchange rate by less than the rate of inflation from the end of 1979 until mid-1982; precisely the years when they were implementing a trade liberalization program that required a depreciated RER. Lastly, it has been documented extensively that the exchange rate-based disinflation scheme adopted in Uruguay since 1978 had serious adverse effects on the country's external competitiveness.<sup>25</sup>

The figures also show clearly that the four countries implemented policies aimed at reversing the appreciating trend of the RER during their "dollarization" episodes. In Perú, the aggressive acceleration of the rate of crawl that was put into effect starting with the second quarter of 1982 resulted in a gradual depreciation of the RER (and a concomitant increase in domestic inflation) until the date in which the reform was

FIGURE 6.A  
BOLIVIA: REAL EXCHANGE RATE  
(Period 1971.1-1984.4)



abandoned. In Bolivia, México and Uruguay, however, each government tried to realign its overvalued RER through a discrete (and large) adjustment of the official exchange rate. Bolivia and México devalued their currencies in the first quarter of 1982, by 76 percent and 42 percent respectively, and in November of the same year Uruguay abandoned the "tablita" and prompted a drastic 110 percent devaluation of the peso.

It would be interesting to examine the macroeconomic effects of these devaluations, particularly since the three countries were highly dollarized when the measure was undertaken. Notice, however, that Bolivia and México reimposed capital controls and converted into domestic money the FCDs shortly after the exchange rate adjustment. On one hand, this fact suggests that the devaluation in these two countries was not sufficient to solve the external disequilibrium and confidence crises that ultimately led to the abandonment of the FCDs reform. On the other, it indicates that the effectiveness of this policy in the presence of a widespread "dollarization" process can only be investigated appropriately in the case of Uruguay.

In this regard, Figure 6.D reveals that the RER depreciation that resulted from the breakdown of the "tablita" could be sustained in the following three years. In order to identify the specific policies that supported this RER realignment, Table 9 presents some macroeconomic indicators for the periods that preceded and followed the 1982 devaluation. The information included in the table supplements the one reported in

FIGURE 6.B  
MEXICO: REAL EXCHANGE RATE  
(Period 1975.1-1983.4)

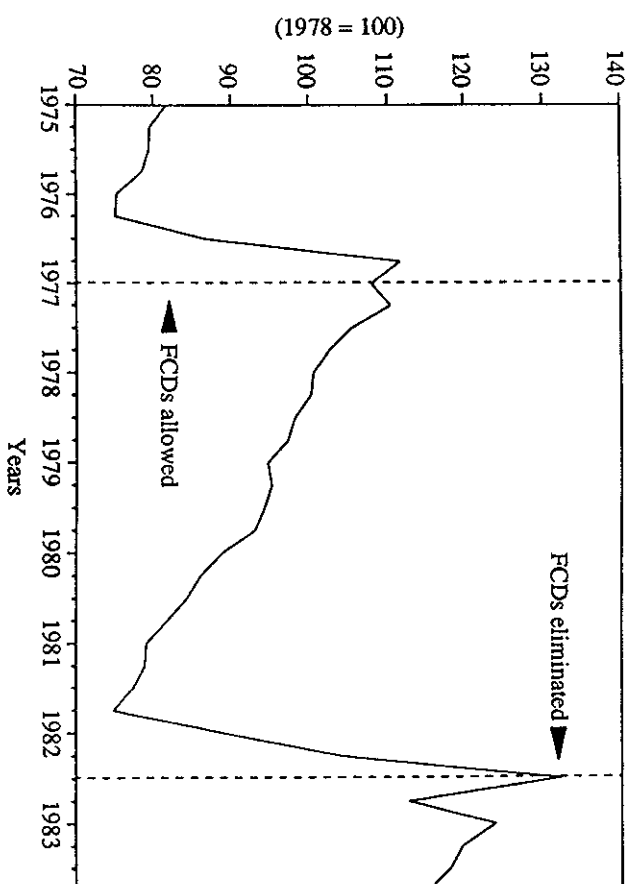
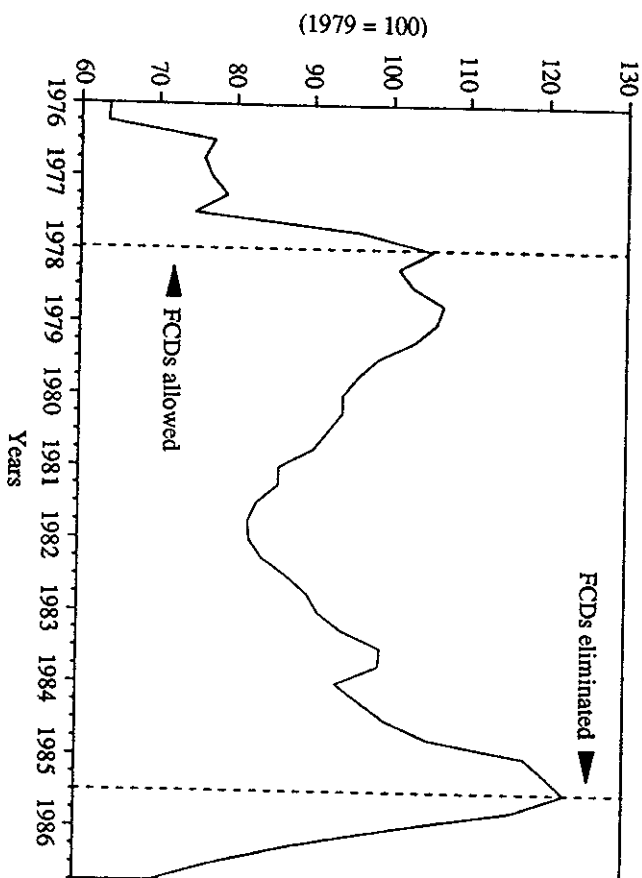


Table 4, and permits to compare the evolution of the most important variables of the Uruguay:an economy before and after the devaluation<sup>28</sup>.

The first thing to notice is that the elimination of the "tablita" constituted a clear change in the country's exchange rate regime. Since 1983, a substantial increase in the periodic rate of adjustment of the exchange rate was required in order to sustain the RER at its depreciated level. The initial objective of this aggressive exchange rate policy was to avoid the erosion of the RER that would have been caused by the inflationary repercussions of the November 1982 devaluation. However, it is quite possible that the extensive "dollarization" of the country's financial system gave rise to a perverse real wealth effect that frustrated a faster return to price stability, especially considering the continuous decline in the demand for domestic money identified in the previous section.

The "Effectiveness Index" reported in the table provides some indication of the relative success of the new exchange rate policy in preventing an appreciation of the RER. The index was constructed as the ratio of the (cumulative) percentage change in the RER to the (cumulative) devaluation of the nominal exchange rate in the years that followed the devaluation, and measures what proportion of the latter got translated into a real devaluation (see Edwards (1989)). The high but declining values of this index reflect that the periodic devaluations were progressively less effective in avoiding the

FIGURE 6.C  
PERU: REAL EXCHANGE RATE  
(Period 1976.1-1986.4)

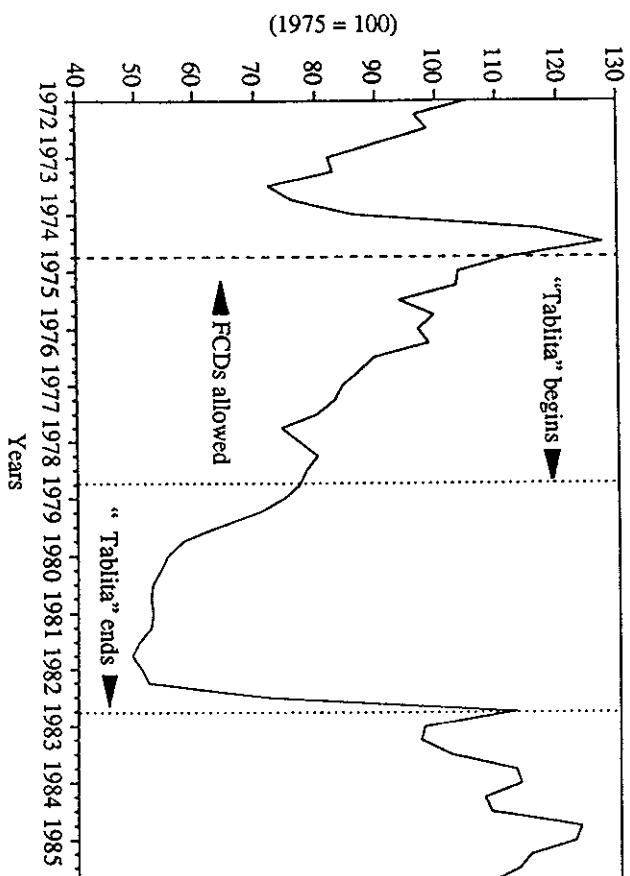


erosion of the RER. This, in turn, could mean that the cost of maintaining RER stability in the dollarized Uruguayan economy was the unleashing of (formal and informal) indexation mechanisms that induced a sustained increase in the rate of inflation.

The above possibility was investigated further through the estimation of exchange rate pass-through regressions. The main objective of this exercise was to compare the dynamic relationship that existed between the country's (monthly) rate of devaluation and its inflation rate under the three different exchange rate rules adopted during the "dollarization" episode: the passive crawling peg that followed the enactment of the reform (1974-78); the exchange rate preannouncement (1978-82); and the aggressive exchange rate policy implemented after the "tablita" collapsed in November of 1982.

The results obtained for two alternative specifications (with and without a time trend) of these admittedly simple equations are presented in Table 10. They show that the three exchange rate rules had different pass-through characteristics. In particular, the table clearly reveals that the periodic adjustments of the exchange rate had their largest and most significant effects on domestic inflation after the 1982 devaluation. According to these estimates, since 1983 approximately 25 percent of every change in the rate of crawl was passed on to the price level after one month. This figure contrasts with the contemporaneous pass-through coefficient of about 10 percent found for the first sub-period and with the trend-dominated link between exchange rate and prices

FIGURE 6.D  
URUGUAY: REAL EXCHANGE RATE  
(Period 1972.1-1985.4)



that seems to have prevailed during the preannouncement period. Notice, however, that the fact that the pass-through coefficient in the latest sub-period lies well below unity confirms that the extensive "dollarization" of the Uruguayan financial system did not preempt the possibility of engineering a real devaluation.

The evidence from this episode, then, seems to suggest that the nominal exchange rate can be used to correct a situation of RER misalignment as long as two conditions are met: i) that the rate of inflation prevailing in the economy is not "extremely high"; and ii) that the measure is accompanied by consistent macroeconomic policies. With respect to the first condition, and recognizing the enormous difficulties involved in defining with some precision what constitutes an "extremely high" inflation<sup>7</sup>, it is fairly evident that the Uruguayan authorities had ample room for increasing the 19 percent annual inflation of 1982 without provoking an uncontrollable inflationary explosion. The second condition was also satisfied: Table 9 shows that the dramatic increase in the fiscal deficit and in the growth rate of domestic credit to the government that characterized this devaluation episode were corrected fairly rapidly. This adjustment was remarkable considering the particularly adverse circumstances under which it was undertaken.

Indeed, as pointed out by Ramos (1986) and Larrain (1986), the Uruguayan devaluation of 1982 had two distinctive features: first, it was not caused by persistently expansive fiscal policies; and second, it required a massive bail-out of domestic debtors

TABLE 9

## URUGUAY: INDICATORS OF 1982 DEVALUATION

	Average "Tablita" Period	1 Year Before (1981)	Devaluation Period (1982-4)	1 Year After (1983)	2 Years After (1984)	3 Years After (1985)
Real Exchange Rate Index	59.6 a/	43.5	100.0 c/	99.9	109.4	96.1
Domestic Inflation						
Rate (%)	47.9 a/	34.1	19.0	49.2	55.3	72.2
Exchange Rate						
Devaluation (%)	22.8 a/	16.6	117.3 c/	49.6	69.1	72.8
Effectiveness						
Index	-	-	0.93 c/	0.62	0.40	0.20
Real Borrowing Rates d/						
Peso Loans (%)	22.5 b/	48.9	10.9	9.3	1.6	26.1
Dollar Loans (%)	-1.1 b/	23.7	22.4	-1.3	0.6	-5.6
Net Errors and						
Omissions (\$ mill.)	16.8 b/	-163.0	-1,221.0	-294.0	-143.9	242.4
Deposits Abroad						
(\$ mill.)	162.3 a/	139.0	514.0	864.0	1,100.0	1,262.0
Fiscal Deficit/GDP						
(%)	0.7 b/	1.5	9.1	3.9	5.3	2.9
Growth Credit						
Public Sector (%)	26.9 b/	373.3	7,099.3	146.8	51.3	49.5

a/ Quarterly averages for the period 1978.4-1982.3 expressed in annual terms.

b/ Annual averages for the period 1978-1981.

c/ Indicators for the quarter of the devaluation (1982.4).

d/ From Larrain (1986).

Source: See Table 4.

from the part of the government in order to avoid the breakdown of the financial system. The instability of this system, in turn, was the result of the overborrowing induced by the negative real interest rates in dollar loans provoked by the lack of regulations on capital account movements and the preannounced exchange rate. Following the devaluation, the authorities stepped up their control over the financial system, absorbed the enormous losses of the banks and quickly eliminated the credit subsidies that had been introduced as a result of the crisis, all of these while honoring their commitment to preserve the full convertibility of the FCDs. In spite of the severe adjustment carried out in this period, however, the fiscal deficit could not be brought down to the low levels maintained during the early "tablita" years, mainly because of the huge quasi-fiscal losses resulting from the bail-out of financial institutions. Moreover, the continuous (but slower) increase in the stock of foreign currency assets held abroad (Figures 2.C and 3.C) and the decline in the demand for domestic money identified before suggest that the measures did not restore fully the public's confidence in the sustainability of the Uruguayan exchange rate regime.

TABLE 10

URUGUAY: EXCHANGE RATE PASS-THROUGH REGRESSIONS  
Dependent Variable: Monthly Inflation Rate

Period	N	Estimated Coefficients a/						χ <sup>2</sup> (2) b/	R <sup>2</sup>	SEE
		Intercept	Time Trend	Inflation (t-1)	E.R. (t)	Devaluation (t-1)				
1975.3	43	0.0363 (5.0266)**	—	0.0510 (0.3246)	0.1123 (2.4510)**	0.0232 (0.4735)		6.52**	0.087	0.019
1978.9	43	0.0556 (4.9311)**	-0.0005 (-2.1655)**	-0.0727 (-0.4521)	0.0941 (2.1113)**	0.0138 (0.2930)		4.91*	0.166	0.018
1975.3- 1978.9	43	0.0076 (0.9091)	—	0.4509 (3.6212)**	-1.1032 (-2.6288)**	1.6805 (2.5471)**		7.97**	0.316	0.017
1978.10- 1982.11	50	0.0932 (3.9392)**	-0.0009 (-3.8065)**	0.0592 (0.3943)	-0.5268 (-1.3207)	0.2378 (0.3432)		2.85	0.471	0.015
1982.11- 1983.3	46	0.0292 (3.0613)**	—	0.1477 (0.9369)	-0.1047 (-1.0121)	0.2609 (2.8008)**		7.94**	0.141	0.019
1983.3- 1986.12	46	-0.0293 (-0.9983)	0.0006** (2.0095)	0.0077 (0.0467)	-0.1309 (-1.3126)	0.2440*** (2.7295)		8.08**	0.215	0.017

a/ t-statistics in parentheses: \*, (\*\*), (\*\*\*) significant at 90%, (95%), (99%).

b/ The χ<sup>2</sup> statistic tests the hypothesis that both coefficients on current and lagged devaluation are zero.

## VI. Summary and Concluding Remarks

This paper has provided an overview of the main features of the "dollarization" episodes experienced by Bolivia, México, Perú and Uruguay in the past two decades. Section II showed that the authorities of these countries allowed the private sector to hold FCDs in their domestic financial systems in an attempt to induce the repatriation of capital that had flown during previous periods of large macroeconomic and external imbalances. In all the cases this measure was supplemented by a nominal devaluation, and in three of the countries it also was followed by a more flexible exchange rate policy. The reform was shown to have caused a noticeable increase in the amount of total foreign currency assets maintained by domestic residents as well as a temporary improvement in the foreign exchange position of the central banks. The repatriation of foreign currency balances held abroad, however, was neither immediate nor complete in these episodes, and the foreign currency portfolio of the public experienced pronounced fluctuations along the reform periods.

The discussion of Section III suggested that the implementation of inconsistent and expansionary macroeconomic policies led to the abandonment of the reform and the forced conversion into domestic money of the stock of FCDs in Bolivia, México and Perú. In contrast, it was argued that the duration of the "dollarization" episode in

Uruguay could be explained by the authorities' capacity to adopt quick corrective measures in the face of adverse external and domestic shocks. The empirical analysis of Section IV found that the presence of FCDs had adverse effects on the stability of the demand for domestic money in these countries. Although the creation of FCDs did not prompt an immediate and abrupt flight from domestic money, it was found that the "dollarization" of these financial systems eventually reduced the residents' holdings of domestic money balances. In addition to diffculting the conduct of monetary policy, these fluctuations in the demand for money were shown to have affected significantly the government's proceeds from the inflation tax in Peru and Uruguay, the countries that experienced the most acute "dollarization" processes.

Section V examined the behavior of the real exchange rate in the four "dollarization" episodes and discussed the role of nominal devaluations for correcting situations of RER misalignment in the presence of a widespread process of CS. It was argued that the existence of foreign currency assets in the portfolios of domestic residents imperiled the expenditure-reducing effect of a given nominal exchange rate adjustment. Thus, it was claimed that the effectiveness of a large nominal devaluation in a "dollarized" economy not only would depend on the strength of the expenditure-switching effect and on the accompanying macroeconomic policies, but would also tend to shift the economy (at least temporarily) to a higher inflation plateau. This was confirmed by the analysis of the Uruguayan devaluation episode of 1982. It was shown that the misalignment of this country's real exchange rate was eliminated through a fairly rapid fiscal adjustment and an aggressive exchange rate policy, but that the extent of "dollarization" of the domestic financial system determined that the adjustment be accompanied by a sustained (but not explosive) increase in domestic inflation.

Overall, the evidence presented in this paper suggests that the decision to allow the residents of a developing country to hold FCDs in the domestic banking system with the objective of improving the external position of the central bank and/or fostering financial intermediation can involve serious and dangerous policy trade-offs. In particular, if macroeconomic imbalances are not likely to be eliminated rapidly and the domestic financial system lacks the necessary flexibility, this type of reform will jeopardize the regime's stability. The existence of an easily accessible substitute for seigniorage yielding assets will facilitate the flight from national money and tend to increase the inflationary impact of any given fiscal disequilibrium and of exchange rate adjustments. These effects will reinforce the government's incentives to recover the lost inflation tax base through the forced conversion of the dollar deposits into domestic money, which, in turn, will prompt a reallocation of the public's foreign currency assets and threaten the sustainability of the exchange rate regime.

## Notes:

- <sup>1</sup> The theoretical foundations for analyzing CS in developing countries were developed by Calvo and Rodríguez (1977) and Frenkel and Rodríguez (1982). The most representative empirical studies on the subject are the ones by Ortiz (1983), Camo (1985), Ramírez-Rojas (1985), Fasano-Filho (1987), Márquez (1987), Camo and Nickelsburg (1987), El-Erian (1988) and Melvin (1988).
- <sup>2</sup> Other Latin American countries where these deposits were allowed at some point between 1970 and 1990 are Argentina, Chile and Dominican Republic. However, due to the lack of confidence on the convertibility of the deposits or to the existence of alternative assets with a higher return, these countries' financial systems did not become "dollarized" during this period.

- <sup>3</sup> See Beckerman (1987), Ortiz and Solís (1981), Edwards (1989), Ramos (1986) and De Melo (1986) for a more detailed description of these episodes.
- <sup>4</sup> Note, however, that Bolivia reintroduced the possibility of opening FCDs domestically after the hyperinflation of 1984-85 was ended. A similar measure was adopted by the Peruvian authorities as part of their recent (August 1990) attempt to regain price stability. An interesting feature of these two attempts to re-enact the FCDs-reform is that the governments used an external collateral as a signal of their willingness to honor the convertibility of the deposits and to increase the (understandably low) confidence of the public. In both cases this measure fostered a rapid re-dollarization of the financial system.
- <sup>5</sup> See Ortiz and Solís (1981) and Ortiz (1983).
- <sup>6</sup> For details on the wide-ranging liberalization experience in Uruguay see Larrain (1986), De Melo (1986), Ramos (1986) and Corbo and De Melo (1987).
- <sup>7</sup> Some authors have tried to obtain estimates of the stock of foreign currency bills maintained outside the financial system in certain LDCs (see, for instance, Melvin and Archa (1989)). However, the usefulness of these exercises is questionable given the extremely restrictive assumptions that have to be made with regard to the behavior of the velocity of circulation of domestic money balances and the evolution of other variables that affect the CS process.
- <sup>8</sup> Since the mid-1980s the International Financial Statistics compiled by the IMF also report data on foreign currency deposits held abroad by country of origin of residents. However, since the starting date of these series is 1981 they could not be used in the analysis of the four episodes covered in this study. A recent work by Agénor and Khan (1992) employs these series to investigate the effects of foreign currency deposits abroad on the demand for domestic of ten developing countries.
- <sup>9</sup> The Bulletin does not report disaggregated data for the deposits of Bolivian residents in U.S. banks. Notice also that Lessard and Williamson (1987) consider these series as a lower bound indicator of the magnitude of capital flight from Latin American countries.
- <sup>10</sup>  $P$  is equal to the sum of FCDs and foreign currency deposits maintained abroad (FDA), both valued at the official exchange rate.
- <sup>11</sup> The future quotation of the peso in the International Money Market was interrupted by the nationalization of the Mexican banking system in 1982. The market for the peso reopened in 1985-1986.
- <sup>12</sup> The potential effectiveness of this type of exchange rate adjustment in a "dollarized" economy is discussed in Section V.
- <sup>13</sup> Notice that the tables report a proxy for capital flight different than the one used in the construction of the Dollarization Ratio 2 of Figures 2.A-2.C. According to Lessard and Williamson (1987) this alternative proxy (the cumulative sum of the Errors and Omissions item of the country's balance of payments) provides a rough upper bound to the actual capital flight from Latin American countries.
- <sup>14</sup> See, for example, the results reported by Miles (1978), Blejer (1978), Abel, *et al.* (1979), Alexander (1981), Brittain (1981) and Bordo and Choudhri (1982).
- <sup>15</sup> The problems associated with finding a plausible empirical estimate for the expected rate of devaluation in developing countries are also discussed in Tanzi and Blejer (1982) and Edwards and Khan (1985).
- <sup>16</sup>  $Y_t$  was proxied by the industrial production index in the cases of México and Uruguay and by quarterly indicators of the GDP in Bolivia and Peru. The raw series were obtained from publications of the corresponding central banks, except for the case of Bolivia where the annual series of GDP was interpolated.
- <sup>17</sup> See McCallum (1976), Pessar (1988) and Cuthbertson (1990) for a discussion and criticism of this procedure. The list of instruments employed in the unrestricted reduced forms corresponding to this variable are available upon request.
- <sup>18</sup> These two methods represent a small subset of the extensive empirical literature on money demand stability that emerged as a response to the apparent instability of that function in the U.S. since the mid-1970s. For an early survey of this literature see Judd and Scadding (1982); see also Gordon (1984), Roley (1985) and Raasche (1987).
- <sup>19</sup> It should be noted, however, that the short-run money demand equations that are finally obtained from these procedures are still subject to most of the criticisms aimed at the conventional method of estimating these relationships posed by Hendry's "general-to-specific" approach. See Hendry (1986) and Hendry and Ericsson (1989).
- <sup>20</sup> In one of the equations for M1 in Bolivia and Uruguay and in the two equations for M2 in México the Miller procedure could not be implemented because no sequence of (more than) four errors of the same sign from the first-differenced regression was found to be significantly different from zero.
- <sup>21</sup> By assuming one of the specifications, say the discrete-shift one, as the null hypothesis, these tests basically consist on assigning "weights" to both structural equations and comparing the adjusted residuals of their joint estimation using different procedures. If the null hypothesis is "correct", then the estimated

- weight of the alternative specification will not be significantly different from zero. See Davidson and MacKinnon (1981) and Godfrey and Pesaran (1983).
- <sup>22</sup> The series of inflation tax revenues were obtained by multiplying the annual average inflation rate by the yearly average stock of M1 in each country and dividing this product by the corresponding nominal GDP. A similar pattern was obtained when the monetary base was used as the monetary aggregate.
- <sup>23</sup> See the discussion on this issue in Khan and Lizondo (1987) and Edwards (1989). See also Rodríguez (1978).
- <sup>24</sup> See Harberger (1986) and Edwards (1989) for a discussion of the theoretical and statistical properties of alternative RER indexes.
- <sup>25</sup> See, for instance, Ramos (1986) and Corbo and De Melo (1987).
- <sup>26</sup> This "before and after" approach relies heavily on Edwards' (1989) methodology for studying the outcome of 39 devaluation episodes in developing countries.
- <sup>27</sup> It should be admitted that the existence of an inflation threshold at which domestic money is almost completely displaced and most of the prices become de-facto indexed to the (by then floating) exchange rate is an observed regularity of hyperinflation episodes that has a diffuse theoretical explanation. What is known is that in such contexts a nominal adjustment of the official exchange rate is likely to have pervasive consequences (see Kharras and Pinto (1986)).

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## HOW MUCH TO COMMIT TO AN EXCHANGE RATE RULE? BALANCING CREDIBILITY AND FLEXIBILITY\*

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### Abstract:

There are different ways in which policy-makers back their commitment to a fixed exchange rate. A regime where countries can devalue unilaterally represents a weaker commitment than one where a devaluation needs to be agreed upon with other parties (e.g. the European monetary system). Full dollarization, understood here as full replacement of the domestic currency by the U.S. dollar, is an extreme commitment to a fixed exchange rate. Indeed, it is a special case of a fixed exchange rate.

The central message of this paper is that the cost of reneging is a key reason holding policymakers back from making strong commitments on their exchange rate policy. The stronger the commitment to an exchange rate rule, the more costly it is to deviate from it. The paper develops a Barro-Gordon type model in which the policymaker has to decide the degree of commitment under uncertainty.

It is shown that, even for policy makers that have a strong preference for maintaining the fixed exchange rate, there are circumstances under which they will choose to devalue. This will happen when the economy is hit by an adverse shock, and the costs of adhering to the fixed exchange rate are larger than those associated with devaluing.

The model provides useful insights to understand why many high inflation economies have not adopted full dollarization as a way to stabilize prices. Our emphasis on the cost of reneging stands in contrast with most existing works, which single out the desire to rely on seigniorage as the main motive for stopping short of full dollarization. Strong commitments will only be made once there is a good chance that the policy maker will not renege, and by then they might not be necessary. We illustrate the main points of the paper with examples from Latin American countries.

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