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# Exchange Rate Policy, the Real Exchange Rate, and Inflation

## Lessons from Latin America

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Attempts to achieve real depreciation through continuous devaluation or by accelerating the rate of crawl — when not supported by changes in other policies and in the underlying conditions — usually end up increasing inflation, yet remain ineffective in changing the real exchange rate.

This paper — a product of the Macroeconomic Adjustment and Growth Division, Country Economics Department — is part of a larger effort in the department to study the macroeconomic implications of exchange rate policies. This paper was prepared for the Conference on “La dinamica de los mercados internacionales y politicas comerciales para el desarrollo,” El Escorial, Spain, July 1991. Copies are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Raquel Luz, room N11-059, extension 34303 (April 1992, 22 pages).

Exchange rate policy is usually driven by two different, often conflicting, objectives: to support a competitive real exchange rate and to serve as a nominal anchor for low inflation.

A competitive real exchange rate is pursued to support expansion of the exportable and import-competing sectors — and to ensure a strong balance of payments position. Using the exchange rate as a nominal anchor for low inflation is important to the extent that low inflation and macroeconomic stability create a favorable environment for long-term growth.

Kiguel focuses on whether exchange rate policy can affect the real exchange rate in the longer run, and he examines the trade-offs that typically arise between real depreciation and inflation.

He argues that exchange rate policy has only a limited ability to achieve durable real depreciation. Devaluations can be effective in the short run (because prices and wages do not adjust as quickly), but has a limited impact in the longer run (once prices and wages adjust), when the underlying factors affecting demand and the supply of foreign exchange dominate. Attempts to achieve real depreciation through continuous devaluations, or by accelerating the rate of crawl — when not supported by changes in other policies and in the underlying conditions —

usually end up increasing inflation, yet remain ineffective in changing the real exchange rate.

As a rule of thumb, Kiguel argues that maxi-devaluations are most effective in economies with low and moderate inflation (below 20 percent a year), especially when the underlying causes call for real depreciation. In these circumstances, a devaluation can reduce the costs in terms of the unemployment and lower growth associated with achieving the desired real depreciation through deflation.

Latin America is a rich laboratory in which to study different exchange rate regimes. The real exchange rate varies over time in countries that have adopted the crawling peg (such as Colombia and Brazil) and in those that use the exchange rate more actively for disinflation.

Colombia in the mid-1980s is an example of successful real depreciation. Colombia achieved a 40 percent real depreciation in two years with no significant increase in inflation. It achieved this by avoiding maxi-devaluations (instead it accelerated the rate of crawl) and by limiting the size of the desired real depreciation.

In Mexico in 1987, by contrast, aggressive exchange rate policies backfired in the sense that they led to an acceleration of inflation while failing to achieve a sustained real depreciation.

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by  
**Miguel A. Kiguel\***

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I. Introduction

Exchange rate policy is usually driven by two different, and many times conflicting objectives: first, to support a competitive real exchange rate, and second, to serve as a nominal anchor for low inflation. The former objective is generally pursued to support the expansion of the exportable and import competing sectors, and as a way to ensure a strong position in the balance of payments. The latter objective is important to the extent that low inflation and macroeconomic stability create a favorable environment for long term growth.

Exchange rate policy is particularly important at times when countries enter a process of trade liberalization in which import tariffs and quotas are reduced or eliminated. The transition from a relatively closed to a more open economy can be costly, and some of the costs can be mitigated if the countries are able to maintain a slightly undervalued exchange rate during this process.<sup>1</sup> Some of the costs arise because it takes time to move resources from those sectors that are contracting at the new set of relative to those are expanding. In addition, firms need time to restructure, and this transition can be easier if they get a cushion from an undervalued real exchange rate.

This paper will examine the effectiveness of alternative exchange rate policies and regimes in achieving these two objectives. In particular, it will try to explain why some countries have been more successful than others in maintaining more stable and competitive real exchange rates, and to what extent the success in these countries is associated with the choice of an appropriate exchange rate policy or regime.

The main message of this paper is that exchange rate policy has a limited effect on the real exchange rate. Efforts to achieve a real

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<sup>1</sup> This type of policy is recommended in Papageorgiou, Choksy, and Michaely (1990) among others.

depreciation not only depend on the choice of an appropriate exchange rate policy but also on the overall environment in which this policy is used. The real exchange rate, understood as the relative price of tradeable to non-tradeable goods, is an endogenous variable that depends on the underlying factors affecting supply and demand. Thus, the evolution of external factors such as the terms of trade, external demand, and domestic factors, such as the budget deficit, and the share and overall level of government expenditure on both goods are as important as exchange rate policy in determining the real exchange rate.

Exchange rate policy can only affect the real exchange rate in the short run, because domestic prices and wages are more rigid. The larger the rigidity in domestic prices and wages, the more effective will exchange rate policy be. Hence, devaluations are less (more) useful in high (low) inflation countries, where prices and wages adjust relatively quickly (slowly).

The paper will be organized as follows: section II reviews the Salter-Swan-Corden model which is then used to examine the effectiveness of exchange rate policy to affect the real exchange rate. Section III examines the experience with alternative exchange rate regimes and rules in Latin America. Section IV analyzes the ability of different exchange rate policies to change the real exchange rate. Section V examines the experience with the use of the exchange rate as nominal anchor in disinflation programs, while section VI examines cases where the exchange rate was destabilizing force for inflation. The main conclusions of the paper are presented in section VII.

## II. ANALYTICAL FRAMEWORK

### i. Long Run Determinants of the Real Exchange Rate

We will now use a simple version of the familiar dependent economy model which will be helpful to analyze the long run determinants of the real exchange rate (RER) and the role of exchange rate policy. We assume an

economy that produces two goods: tradeables (T) and non-tradeables (N). The economy is small in the sense that it takes as given the international prices of the tradeable goods. The economy is at full employment, and prices and wages are fully flexible. In this last respect, the model is useful to understand some of the long run determinants of the RER.

The main features of the model can be illustrated with the help of figure 1. The vertical axis shows the RER, defined as the relative price of tradeables to non-tradeables. The horizontal axis, shows the aggregate levels of income (Y) and domestic expenditure (D). The NN schedule shows the combinations of RER and D that are consistent with equilibrium in the market for non-tradeable goods. It is downward sloping because starting from any given point along NN, an increase in D would create an excess demand for N and hence the RER will have to fall (or appreciate) in order to restore balance between demand and supply. The BB schedule shows the combinations of RER and D that maintain external balance. It is upward sloping because an increase in the D will deteriorate the trade balance, hence require an increase in RER (a real depreciation) to restore external balance. Equilibrium in this economy takes place at point E, where the BB and NN schedules intersect, which determines the equilibrium RER (or ERER), associated with a given set of exogenous and policy variables.

The model is useful to clarify an important point; exchange rate policy does not play a role in determining the RER in the long run.<sup>2</sup> The ERER only depends on policy variables that affect aggregate demand --such as fiscal policy--, or on those that affect the composition of expenditure --such as the share of government expenditures that falls on T and N, or specific taxes, and exogenous variables such as the terms of trade, and the availability and cost of external financing. A devaluation would have no effect on the RER as long as prices and wages are fully flexible.

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<sup>2</sup> A devaluation can affect the equilibrium RER indirectly, by affecting the budget deficit. For example, the additional income associated with the increases in reserves resulting from a devaluation, will reduce the budget deficit and hence could lead to a depreciation in the ERER. However, this is in general only a second order effect.

A second, related issue is that in this set up a real appreciation can not be corrected through exchange rate policy. Consider, for example, an increase in the budget deficit resulting from higher government expenditure. Aggregate demand will also rise from  $D_0$  to  $D_1$ . In terms of figure 1, this implies that the new equilibrium will be at a point to the right of E along the horizontal axis. If we assume that the market for non-tradeable goods adjusts instantaneously, the new equilibrium will be at a point like E' on the MN schedule.

In this case, the real appreciation results from an expansionary fiscal policy. At E' the economy also experiences an external imbalance because domestic spending exceeds national income. Efforts to correct this imbalance through devaluations will be continuously frustrated by increases in domestic prices. The external imbalance and the real appreciation will stay in place as long the government maintains its expansionary policies.

#### ii. Short Run Determinants of the Real Exchange Rate

One important distinction between the short and long runs is the degree of flexibility of prices and wages. While they typically display significant rigidities in the short run, they are usually reasonably flexible in the longer term.

In the short run, exchange rate policy can recover its effectiveness, and in fact, it can be an extremely useful tool to restore macroeconomic balance. The potential usefulness of exchange rate policy is larger when a real depreciation is called for, and prices and wages display significant downward rigidity. In the absence of a devaluation, the real depreciation needs to be effected entirely by keeping domestic inflation below international levels --a costly and lengthy process-- or by deflation --an unlikely event. The usefulness of devaluation in these cases is illustrated with the help of figure 1. We can assume that the economy is now at point E' with an appreciated RER and a trade balance deficit. The government perceives the deficit as unsustainable and hence decides to undertake the necessary reduction in government expenditure so that the economy will

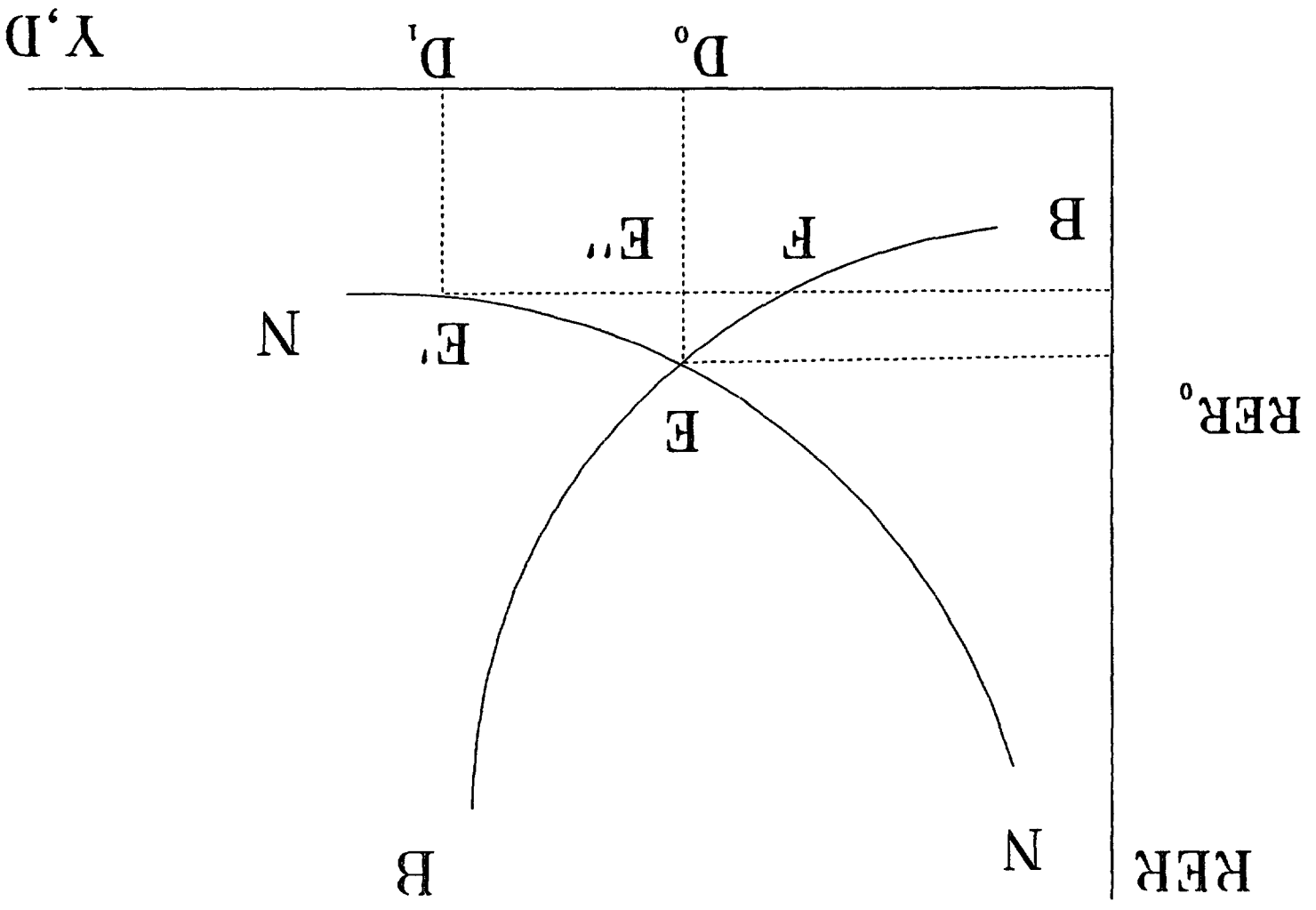


FIGURE 1



eventually go back to point E, where there is external balance, a higher RER and full employment. With price and wage rigidities, the economy cannot go to point E, instead, the economy will move to a point like E". At this point, the trade balance deficit will persist (though it will be smaller) and there will be an excess supply of non-tradeable goods and unemployment.

A devaluation can help to restore internal and external balance by moving the economy from E" to E. Once the economy reaches its new equilibrium it will tend to rest there, and there will be no further inflationary or deflationary pressures. A devaluation works in this case because it helps to overcome price and wage downward rigidities that would otherwise result in a protracted period of unemployment. It is worth noting that if the economy had to restore external balance (starting from point E') quickly and without devaluating, then the short run equilibrium would need to be at a point like F, in figure 1. This will require an overadjustment on the fiscal side, and will be associated with larger unemployment.

### iii. The Scope for Exchange Rate Policy

The above discussion shows that exchange rate policy matters in the short and medium terms, but not so much in the longer run. There are indeed many examples when adherence to a wrong exchange rate policy led to a balance of payments crisis or when a timely devaluation facilitated external adjustment. Many periods of real appreciation are related to a reluctance to devalue rather than to long term fundamental causes. On the other hand, it is important to understand that there are the limits to how much can be achieved through exchange rate policy, and that to a large extent there is a need to maintain consistency between exchange rate policy and other policy instruments.

The evaluation of exchange rate policy is usually complicated by the variety of roles that the exchange rate has in macroeconomic adjustment. In particular, exchange rate rules are not only devised to deal with external balance. In many cases, the exchange rate is assigned an important role in

maintaining price stability and/or in reducing inflation (as nominal anchor).<sup>3</sup> This variety of roles and objectives means that the evolution of the real exchange rate in the short and medium term is likely to be influenced by factors that are quite independent of the long run fundamentals discussed above. Thus, a real appreciation could result, for example, from an expansion in fiscal policy --and in this case is consistent with the long run fundamentals-- or alternatively, it could result from a disinflation policy based on keeping the rate of devaluation below the ongoing rate of inflation --and in this case it would be linked to transitional factors.

### III. EXCHANGE RATE POLICY IN LATIN AMERICA

#### Exchange Rate Regimes

There is large variety regarding the use of exchange rate regimes across countries in Latin America, a feature that extends to specific countries over time. Broadly speaking there were five main exchange rate regimes: (i) countries with fixed exchange rates where devaluations are a rare event (e.g. Venezuela till 1982), (ii) countries with fixed exchange rates but with periodic devaluations (e.g. Chile, Colombia, Peru and Uruguay in the fifties and sixties); (iii) countries with a preannounced devaluation (the famous Tablitas in the late seventies in the Southern Cone and the exchange rate rule in Mexico more recently), (iv) countries with a passive crawling peg (Brazil between 1968 and 1986, Colombia since 1967); (v) countries that for a short span adopted a flexible exchange rate (e.g. Venezuela in 1989 and Peru in 1990). In many cases the regimes were not "pure", since the basic regime was supplemented by the inclusion of multiple official exchange rates or the adoption of capital controls that led to the emergence of a black market for foreign exchange.

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<sup>3</sup> Corden (1990) presents an excellent discussion of the dual roles of the exchange rate in macroeconomic adjustment.

Exchange rate policy has undergone major changes during the last four decades in Latin America. By and large, the region has moved from a policy of fixed exchange rates --with periodic devaluations-- in the fifties and sixties, to more flexible exchange rate policies starting in the late sixties and early seventies (with the adoption of the crawling peg), and maxi-devaluations in the early eighties. More recently, there seems to be a tendency to move back towards more exchange rate stability.

The evolution of exchange rate policy over time is best understood when considered in conjunction with other macroeconomic objectives and policies (especially those related to inflation). The predominance of fixed exchange rates during the early period was mainly associated with the notion that low inflation (close to international levels) was a feasible objective of paramount importance. A fixed exchange rate was a "signal" that the economy was operating under these rules, and to the extent that it was supported by appropriate demand management policies, the policy could be maintained. On the other hand, the adoption of the crawling in the late sixties in Colombia and Brazil, was part of a deliberate effort to accommodate exchange rate management to an inflationary economy. In other words, the exchange rate ceased to perform the role of "nominal anchor" and instead became one instrument that to validate inflation.

The predominance of the fixed exchange rate system in Latin America during the fifties and sixties can be readily noticed from table 1.a, which shows the exchange rate regimes prevailing in the sixties in some Latin American countries. Devaluations were sporadic events in most countries to deal with balance of payments of crisis. At the same time, many countries did not have any devaluation during that period. Inflation was also much lower at the time, and closer to international levels. Countries such as Costa Rica, Mexico, and Ecuador were low inflation countries during the sixties. Nevertheless, there was also a group of countries where inflation was starting to set its roots. Many of them later became the high inflation countries of the seventies and eighties. Argentina, Brazil, Chile, and

Ia. EXCHANGE RATE TYPES, NO. OF DEVALUATIONS, AVG DEVALUATION, AND INFLATION  
(1955-71)

COUNTRY	EXR TYPE	YEAR W/ DEVAL.	DEVALUATION AVERAGE	MEDIAN	AVERAGE INFLATION
Argentina	fixed w/ adjustment	10	47.80	25.00	27.80
Bolivia	fixed w/ adjustment	3	1344.50	39.00	27.50
Brazil	fix until 68 when crawling peg starts	3	335.00	69.37	37.56
Chile	fix until 73 with adjustment	14	42.50	29.19	30.94
Colombia	fix until 67 when crawling peg starts	9	29.32	16.74	10.04
Costa Rica 1/	fixed w/ adjustment	1	17.75	17.75	2.23
Dominican Republic	fully fixed	0	0.00	0.00	1.44
El Salvador	fully fixed	0	0.00	0.00	0.77
Ecuador	fixed w/ adjustment	2	29.44	29.44	3.17
Guatemala	fully fixed	0	0.00	0.00	0.52
Haiti	fully fixed	0	0.00	0.00	2.09
Honduras	fully fixed	0	0.00	0.00	1.75
Mexico	fully fixed	0	0.00	0.00	4.61
Nicaragua	fully fixed	0	0.00	0.00	-
Panama	fully fixed	0	0.00	0.00	0.83
Paraguay 2/	fixed w/ adjustment	6	30.70	10.67	7.29
Peru	fixed w/ adjustment	3	28.75	13.11	8.62
Uruguay 3/	fixed w/ adjustment	7	78.05	49.36	37.00
Venezuela 4/	fully fixed	1	38.20	38.20	2.11

## Notes:

- 1/ Costa Rica had only one devaluation in 1961 (in the period 1955-71)  
 2/ End of period not available, used average  
 3/ Based on data starting 1961 (vs. 1955) - end of period exr not available before 1961.  
 4/ Venezuela had only one devaluation in 1964 (in the period 1955-71)

Ib. EXCHANGE RATE TYPES, NO. OF DEVALUATIONS, AVG DEVALUATION, AND INFLATION  
(1975-89)

COUNTRY	EXR TYPE	YEAR W/ DEVAL.	DEVALUATION AVERAGE	MEDIAN	AVERAGE INFLATION
Argentina	flexible	15	1186.90	263.76	452.99
Bolivia	fix but shift in '82	9	2416.80	22.55	925.45
Brazil	crawling peg starts '68	13	301.80	103.30	226.83
Chile	crawling peg starts '73	13	201.28	21.42	64.37
Colombia	crawling peg starts '67	15	18.84	18.99	23.56
Costa Rica	fixed until 1980, then crawling peg	9	45.68	12.65	20.75
Dominican Republic	fix w/ adj. from '85 onwards	4	71.92	27.82	17.63
El Salvador	fix w/ one adj. in '86	1	100.00	100.00	16.74
Ecuador	fix until 83, then crawling peg	8	51.49	51.19	26.71
Guatemala	fix w/ adj. in 1986, '88, and '89	3	61.30	25.69	11.77
Haiti	fixed	0	0.00	0.00	7.13
Honduras	fixed	0	0.00	0.00	7.57
Mexico	crawling peg since 1976	11	76.08	49.18	52.40
Nicaragua 1/	fix w/ major adj. in 1985,86,88,& 89	5	263720.00	150.00	867.00
Paraguay	fix w/ adj. in 84-88, c.p. starts 89	4	79.28	71.88	17.61
Peru	crawling peg starts 1976	14	238.98	95.21	335.52
Uruguay	crawling peg since 1972	15	55.29	55.29	58.50
Venezuela	fix w/ adj. in 84,86,89; floating starts 1989.	3	121.62	93.33	18.38

- 1/ Costa Rica: fixed exr until 1980, fully flexible thereafter.  
 2/ Nicaragua had an end of period devaluation of 1,314,185.71% in 88 and 4046.74 in 89, average devaluations for these 2 years were 262,675.34% and 5,704% respectively.

Uruguay, and to a lesser extent Colombia and Peru already had rates of inflation that were clearly higher than in the rest of the region. These were also the countries that resorted more frequently to maxi-devaluations to correct appreciations in the real exchange rate.

The exchange rate regimes had already changed dramatically by the end of the eighties (as shown in table 1.b). This was a decade of turmoil, with many changes in exchange rate policy. Most countries switched towards more flexibility in the exchange rate regime, with the adoption of some variant of the crawling peg system as the preferred option. Colombia is the classical example of this regime, where it was in fact adopted in the late sixties. But the crawling peg became popular in the region and by the mid-eighties in one way or another it was also in place in Chile, Mexico, and Uruguay among others. There were also few, brief experiences with flexible exchange rates (in Venezuela, Argentina and Peru in late eighties and in 1990). Finally, there are many examples of countries that fixed the exchange rate for a relatively short time, mainly as part of disinflation programs, that used the exchange rate as the main nominal anchor. The nature of the fixed exchange rate system in these cases is different from the sixties and fifties, because they were clearly seen as a transitory regime to bring down inflation. The exchange rate was fixed in Argentina, during the 1985 Austral plan and follow-ups, in Brazil, during the 1986 Cruzado plan and follow-ups and in Mexico, during the Pacto in 1988, where it remained fixed for almost a year. In the first two examples, the fixed exchange rate was followed by maxi-devaluations, while in Mexico there was a smoother switch to a preannounced crawl.

The choice of exchange rate regime (or rule) has in general been related to the macroeconomic objectives being pursued at the time. For example, the use of the crawling peg has been characteristic of countries that were more willing to tolerate inflation and were concerned about reducing short term fluctuations in the real exchange rate. The use of a preannounced exchange rate, on the other hand, has been characteristic of

cases where the main objective was to bring down inflation. The choice of exchange rate regime and rules must be made on the basis of their ability to achieve a given macroeconomic objective, and the costs that they might impose on other, less pressing objectives. For example, a trade off is likely to arise between exchange rate rules that help to reduce inflation, and those that help to maintain the competitiveness of the export and import competing sectors. The need to establish clear priorities is thus necessary to design the best exchange rate policy.

In the next sections we will examine the role of exchange rate rules and regimes in two important aspects of macroeconomic management: (i) their importance to affect the real exchange rate (or the level of competitiveness), and (ii) their impact on inflation in the short and long term.

#### IV. Exchange Rate Policies and the Real Exchange Rate

The evolution of the RER is many times critical for the success of a trade liberalization process. Countries generally prefer to have undervalued exchange rates during these processes as they help the performance of the tradeable sector, and fortify the balance of payments. However, as we argued in section II, the RER is an endogenous variable and its evolution can not be solely determined by exchange rate policy. Devaluations that are not accompanied by appropriate demand management policies are largely eroded by inflation and end up having little or no impact on the RER.

##### When do Devaluations Work?

There is an extensive literature trying to assess the effectiveness of devaluations to affect the RER. Kamin (1988) is particularly useful in this respect. His analysis is based on 72 devaluations in developing countries, where he compares the levels of the real exchange rate one before and three years after the devaluation. While cross country analysis of this type usually has a number of limitations, the main finding is surprising: on

average, devaluations did not lead to sustained real depreciations. Likewise, Edwards (1989) takes a comprehensive look at the experiences with devaluation in developing countries and finds that the evidence is mixed.

We perform a similar exercise here for devaluations in Latin American countries in the sixties and seventies. We use a small sample which is restricted to countries that did not have another devaluation three years after the initial one.<sup>4</sup> This was done in order to separate the high inflation countries, where devaluations were a frequent event, from the low inflation countries, where devaluations were sporadic. The results of the computation are presented in table 2. As can be seen from there, in most cases devaluations have only a temporary effect on the real exchange rate. There are only four cases where the devaluations were clearly effective in achieving a real depreciation after three years: Venezuela in 1964, Costa Rica in 1964 and again in 1974, and Ecuador in 1970.

The contrast between successful and unsuccessful devaluations is illustrated in figure 2, which shows the evolution of the log of domestic prices and the exchange rate for Venezuela Argentina, and Peru. The 1964 devaluation in Venezuela was effective in changing the RER permanently. On the other hand, both the evolution of the exchange rate in Argentina and Peru displays a see-saw pattern, as governments needed to effect recurrent devaluations to avoid a real appreciation resulting from persistent inflation.

One should not conclude from the above evidence that devaluations can not affect the RER. In fact, devaluations usually have a large effect on the RER in the short run. On the other hand, the effectiveness of devaluations on the RER in the longer term largely depends on the initial conditions -- especially the initial degree of overvaluation in relation to the fundamentals, the prevailing rate of inflation, etc.-- and the policy measures that accompany the devaluation.

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<sup>4</sup> The data is obtained from the International Financial Statistics, and hence we only include official devaluations in the "primary" rate.

Table II. EFFECT OF NOMINAL DEVALUATION ON REAL EXCHANGE RATE

COUNTRY/YEAR	NOMINAL DEVALUATION		REAL EXR						
			t-3	t-2	t-1	t	t+1	t+2	t+3
Argentina (1971)	25.00	(B) <sup>1/</sup>	104.17	100.00	104.17	100.00	66.67	45.83	43.75
		(M)	111.05	106.40	106.98	100.00	76.16	55.81	54.65
Bolivia (1972)	68.35	(B)	60.56	60.56	60.56	100.00	85.92	63.38	63.38
		(M)	80.00	80.91	84.55	100.00	143.64	104.55	90.91
Brazil (1958)	69.32	(B)	n.a.	n.a.	n.a.	100.00	71.97	55.62	41.54
		(M)	-	-	-	-	-	-	-
Costa Rica (1961)	17.75	(B)	87.97	87.90	87.29	100.00	97.62	94.59	91.73
		(M)	-	-	96.10	100.00	109.09	106.49	103.90
Costa Rica (1974)	28.87	(B)	86.47	86.32	84.95	100.00	93.07	94.12	95.88
		(M)	90.11	92.31	90.11	100.00	101.10	102.20	107.69
Ecuador (1961)	20.00	(B)	88.06	88.33	86.95	100.00	97.44	91.74	88.35
		(M)	-	-	94.12	100.00	106.86	101.96	100.00
Ecuador (1970)	38.89	(B)	76.07	74.75	73.05	100.00	95.34	92.26	92.38
		(M)	94.95	91.92	88.89	100.00	118.18	117.17	121.21
El Salvador (1986)	100.00	(B)	91.03	83.42	67.93	100.00	82.34	71.47	63.59
		(M)	84.52	76.19	64.29	100.00	89.29	73.81	59.52
Nicaragua (1979) <sup>2/</sup>	43.03	(B)	100.00	88.89	88.89	100.00	88.89	77.78	66.67
		(M)	-	-	-	-	-	-	-
Peru (1959)	13.11	(B)	85.74	82.15	99.43	100.00	88.95	83.85	78.56
		(M)	-	-	-	-	-	-	-
Peru (1967)	44.30	(B)	91.34	80.00	75.92	100.00	86.11	84.20	83.06
		(M)	120.97	106.45	100.00	100.00	109.68	106.45	106.45
Venezuela (1964)	38.20	(B)	74.17	74.69	73.64	100.00	100.18	101.76	101.93
		(M)	80.00	80.00	80.00	100.00	102.35	102.35	103.53

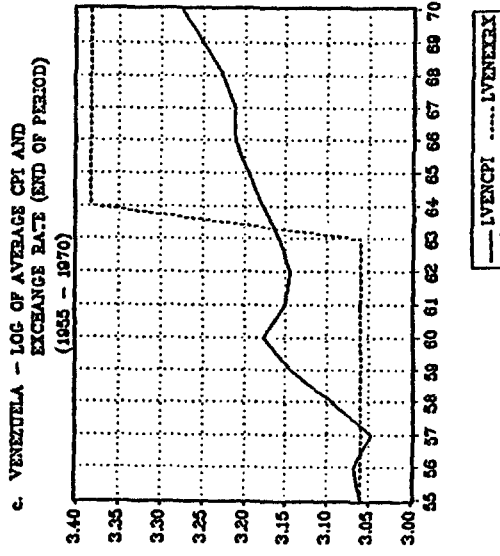
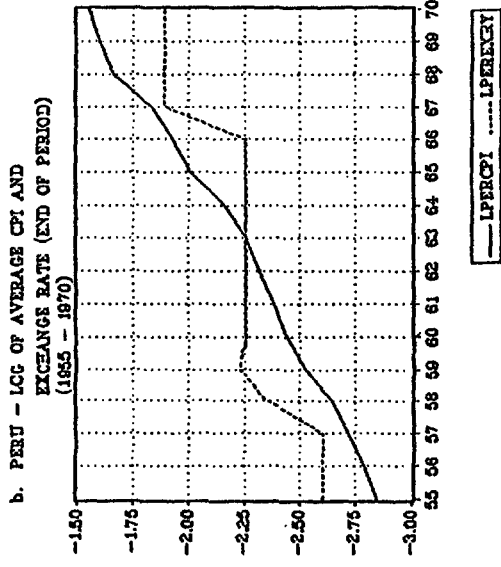
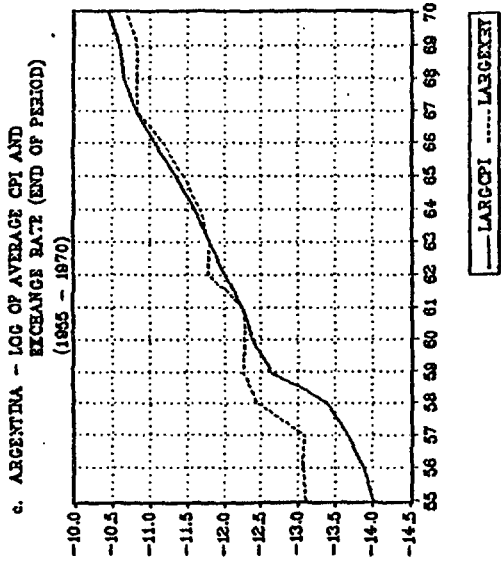
## NOTES:

1/ (M) and (B) stand for the Multilateral and Bilateral (against the US dollars).

2/ Nicaragua also had a one-time nominal devaluation of 3% in 1958, but CPI and therefor real exr is not available for these early years.



Figure 2



### The Real Exchange Rate Under the Crawling Peg

The crawling peg is often presented as the "ideal" system to maintain stability in the RER. True, a country that adheres persistently to the crawling peg will avoid very short run fluctuations in the RER, especially those that are associated with maxi-devaluations. At the same time, the crawling peg system did not, and can not be expected to avoid longer term fluctuations in the RER, which in some cases are quite substantial.

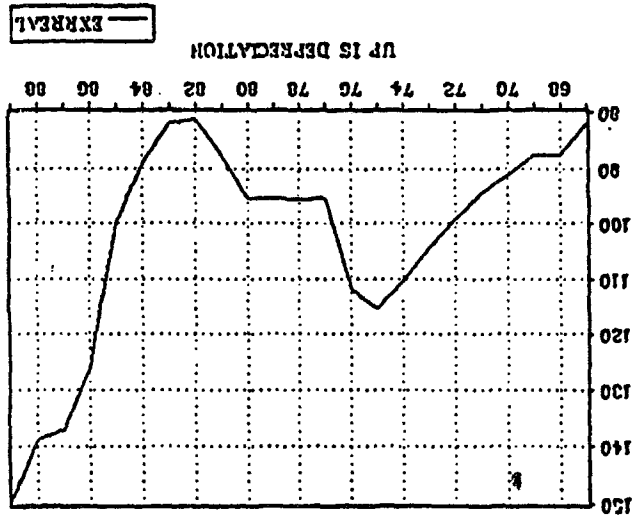
Colombia is the Latin American country that has had the longer experience with the crawling peg. It was initially adopted in 1967, precisely to avoid short term fluctuations in the RER. Prior to this period, the economy was functioning under fixed exchange rates with periodic devaluations. Because domestic inflation rates were in excess of international levels, there was a continuous tendency for the RER to become overvalued. Recurrent devaluations were used to restore competitiveness, giving rise to pronounced cycles in the RER. There has not been any maxi-devaluation in Colombia since the adoption of the crawling peg.

The underlying rule for the crawling peg never became explicit and has changed over time. A recent study on the subject has concluded that there were four main factors determining the rate of crawl: i. the differential between domestic and international inflation, ii. the evolution of the terms of trade, iii. changes in international reserves, and iv. the target for the real exchange rate.<sup>5</sup> This last element is difficult to quantify, and clearly changed over time. While the first factor favored a stable exchange rate, the other three allowed for some flexibility.

While the RER did not display large fluctuations in the short run, it certainly moved significantly over the years. The evolution of the real exchange rate for Colombia since 1967 is shown in figure 3.a. There are two distinctive periods within the sample. The first one, from 1974 till 1982, is characterized by a continuous real appreciation. The second one, from 1983 onwards, is characterized by a continuous, and quite sharp real

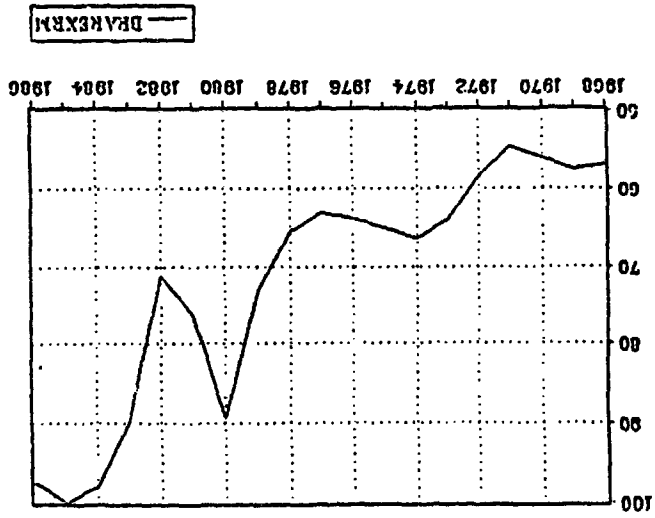
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<sup>5</sup> These results are reported in Gracia Garcia (1990)



COLOMBIA - REAL EXR INDEX (1985=100)

(b)



BRAZIL - REAL EXCHANGE RATE (1968 - 1986)

(a)

Figure 3

depreciation. On the whole, the RER has moved slowly in both directions, but the difference between the highest and lowest RER is quite large.

Most of the fluctuations in the real exchange rate can be explained by changes in the fundamentals. Easterly (1991) develops and estimates a simple model for the determination of the RER. He finds that most of the variance in the RER is explained by the variance in the terms of trade, in the trade balance and in government expenditure. The 1974-82 real appreciation, for example, was initially driven by an improvement in the terms of trade and trade balance surpluses, which later on were reinforced by an increase in government expenditure. On the other hand, the real depreciation that is taking place since 1983, has been driven by a reduction in government expenditures, and a deterioration in the terms of trade. Easterly's analysis assumes that exchange rate policy did not have a major role in the determination of the RER.

It is worth pointing out that, especially in 1985 and 1986, the real depreciation was certainly facilitated by a more aggressive policy of nominal devaluations. The rate of crawl in 1985 accelerated to 50 percent, and remained high (28 percent) in 1986. In the absence of an appropriate exchange rate policy the required real depreciations would have had to be effected by keeping domestic rates of inflation well below international levels. This would have been very difficult, given the significant downward rigidity that inflation displays in most countries, and in all likelihood it would have led to a deep recession.

Brazil is a second example of a country that adopted the crawling peg, although not as successfully as Colombia. The system was adopted at around the same time, in 1968, and it has been maintained for almost two decades.<sup>6</sup> The crawling peg was discontinued in 1986, when an exchange rate freeze was established as part of the Cruzado stabilization plan. Although Brazil is typically presented as an example of a country that has continuously adhere

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<sup>6</sup> In fact there was a 30 percent maxi-devaluation in early 1983. However, this was an isolated event, and after that the country went back to the crawling peg.

to a purchasing power parity (PPP) exchange rate rule, the real exchange rate has displayed, as in Colombia, significant variability during the period of the crawling peg. There were clear large real depreciations in the aftermath of the two oil shocks (in 1973-74 and again in 1979-80), and another coinciding with the outbreak of the external debt crisis in 1983. True, because of the daily adjustments in the nominal exchange rate, Brazil did not experience the large fluctuations on a day to day basis. However, the crawling peg did not prevent (as should be expected) the necessary fluctuations over the medium term to accommodate changes in domestic policies and the external macroeconomic environment.

#### V. The Exchange Rate as a nominal anchor in Disinflation

The exchange rate has played a pivotal role in disinflation in many stabilizations programs (the so called exchange rate based stabilization programs). In these programs the exchange rate is used as the nominal anchor. The government announces an exchange rate rule (in the form of a fixed exchange rate or of a predetermined rate of devaluation) with the objective of achieving a convergence of inflation to the rate of depreciation embodied in the exchange rate rule. The use of the exchange rate as the nominal anchor in disinflation has been criticized mainly because it has usually led to a period of real appreciation, which in some cases was very pronounced.

There are a number of reasons that led governments to prefer the exchange rate over money, as the nominal anchor in disinflation.<sup>7</sup> These reasons are especially relevant in countries starting with high rates of inflation. First, the exchange rate has a direct impact on the price of tradeable goods, while money affects prices only indirectly, through aggregate demand. Second, it is easy for the public to monitor the exchange rate at every point

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<sup>7</sup> They are discussed in more detail in Fischer (1986), and Bruno (1990) among others.

in time, since there is typically a well functioning foreign exchange market which quotes the exchange rate almost by the minute, while it is difficult to know precisely the stock of the money supply with the same frequency. Third, changes in monetary aggregates are more difficult to interpret than changes in the exchange rate. Money demand will increase with a reduction in inflation, and hence the target for the money supply should be larger than the target for inflation during the stabilization phase. Finally, because there is usually high uncertainty regarding the size and speed of the increase in the money demand, the public can never be sure whether money supply is growing too fast or too slow relative to money demand. Moreover, there is an almost endless controversy regarding the choice of monetary aggregate that the authorities should target during disinflation, it could be the monetary base, M1, M2 or even a broad liquidity aggregate, while there is only one exchange rate that is relevant for disinflation.

The best known exchange rate based programs are the experiments with the preannounced exchange rate in the Southern Cone of Latin America in the late seventies (the famous "Tablitas" in Argentina, Chile and Uruguay). The main element in this strategy was the announcement of a schedule with the daily exchange rates for the near future (say six months), which embodied rates of devaluation which were below the ongoing rates inflation. The objective was to achieve a convergence of domestic inflation to the preannounced rate of devaluation. The outcomes of these programs have been extensively discussed in the existing literature.<sup>6</sup> For our purposes, it is useful to point out that inflation did not come down as fast as was expected by the designers of the programs, and hence that there was a sustained real appreciation throughout the disinflation period. The persistence of inflation, which produced the real appreciation, appears to be independent of the effort on the fiscal side, as it was similar in Chile, which had a fiscal surplus, and in Argentina, which had large budget deficits. The causes for

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<sup>6</sup> These experiments are analyzed in more detail in Corbo and de Melo (198?), and Ramos (198?) among others.

the real appreciation were primarily related to persistence in inflation, much of which was caused by lack of credibility on the ability of the policies to bring down inflation. The credibility problem was not necessarily related to the fiscal side, after all Chile had a fiscal surplus, instead, it was caused by some skepticism regarding whether or not the government would deviate from the pre-announced path for the exchange rate. It is useful to point out that the three countries eventually faced an unsustainable real appreciation and were forced to devalue, thus abandoning the Tablitas. The abandonment of the tablitas in Argentina and Uruguay led to a permanent rekindle of inflation while in Chile the devaluation had only a temporary effect on inflation, which then came down to around 20 percent per year.

Mexico, more recently, also relied on a preannounced exchange rate to bring down inflation. The Economic Solidarity Pact of 1987-88 (el Pacto) was launched in response to an acceleration in inflation in 1987. The initial package included a fixed exchange rate and a freeze in some prices and wages. In its second year, the government switched from a fixed to a pre-announced exchange. The basic arrangement has been maintained, and the government has announced lower rates of devaluation over time. The Pacto has been very successful in bringing down inflation from the high rates of 1987, to the 20 percent range. Nevertheless, as in the Tablitas of the Southern Cone, the real exchange rate has continuously appreciated, mainly because inflation has been much more persistence than it was anticipated.

There are of course, many other programs in Latin America that used the exchange rate as the nominal anchor in stabilization. In most cases the rule was a fixed exchange rate (rather than a preannounced crawl). Representative programs are the 1967 stabilization program in Argentina, the 1968 stabilization program in Uruguay, the 1985 Austral Plan in Argentina and

the Bolivian program of 1985.<sup>9</sup> A common feature to these programs was the real appreciation during the span in which the exchange rate remained fixed.

The above experiences with exchange rate based stabilizations make quite clear that in the short to medium term exchange rate policy can make a difference for the evolution of the RER. The real appreciation that is common to all these stabilizations cannot be primarily explained by the evolution of the fundamentals. A sharp reduction in the rate of devaluation will in general result in a temporary real appreciation.

A second, related point, is whether a real appreciation can be avoided in exchange rate based stabilizations. Kiguel and Liviatan (1990) argue that when the exchange rate policy is not fully credible (in the sense that there is some speculation that the government will deviate from its preannounced exchange rate rule), then inflation is likely to be more persistent leading to some real appreciation. A real appreciation is not necessarily the result of "wrong" policies, in fact, in general it represents the unavoidable cost of bringing down inflation.

The reader might wonder whether ERBSs are an option worth pursuing. A full answer to this question certainly goes beyond the scope of this paper. Nevertheless, it is useful to point out a few ideas which will bring new ammunition to the debate. While some of the ERBS failed in a dramatic way, others were successful in bringing down inflation. While in Chile the period of real appreciation was certainly "excessive", inflation came down substantially and has remained low since, except for a short burst in 1982. Experiences from other countries, such as Denmark and Ireland, suggest that it would be a mistake to discard this option altogether.

## VI. Undervalued Real Exchange Rates and Inflation

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<sup>9</sup> The two programs of the sixties are examined in Kiguel and Liviatan (1989), the Bolivian program is analyzed in Sachs (1986) and the Austral plan is examined in Kiguel (1991) among others.



Attempts to maintain an undervalued real exchange rate mainly through a policy of aggressive devaluations can backfire on the inflation side. In fact, there are many examples where inflation increased as a result of an aggressive policy of devaluations aimed at achieving a high real exchange rate. While the problems associated with the adoption of aggressive exchange rate policies have received less attention than its counterpart (discussed in the previous section), their impact for sustaining long term macroeconomic stability are certainly equally significant. Two recent examples of accelerations that can be tied to aggressive exchange rate policies: Mexico in 1987, and Colombia in 1990.

The evolution of the macroeconomic situation in Colombia since the mid-eighties is summarized in table 3. These indicators show that before 1990, Colombia had a strong external situation with surpluses in the trade balance and in the current account of the balance of payments. As a result, the country had been accumulating international reserves, and between 1987 and 1989 they exceeded six months of imports. On the fiscal side, the government ran relatively small budget deficits of around 1.5 percent of GDP, which were small by historical standards and certainly much lower than during the first half of the eighties. Seigniorage remained relatively stable and close to 2 percent of GDP. The real exchange rate depreciated continuously throughout this period. The successful real depreciation of 1985-86, was followed by further, though smaller, real depreciations till 1988. The tendency continued in 1989 and 1990 (as the real exchange rate depreciated respectively by 8 and 13 percent), as a result of an aggressive policy of devaluations that were undertaken in anticipation of a major trade liberalization effort. On the monetary side, the growth of monetary aggregates basically accompanied the increases in inflation.

It is difficult to explain this increase in inflation on fiscal arguments, since, paradoxically, there was an improvement in the fiscal position in 1990. At the same time, there is no indication that higher seigniorage was a cause for inflation either. In fact seigniorage fell from

Table IIIa: MEXICO MACRO INDICATORS 1980 TO 1989

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
<b>NATIONAL ACCOUNTS</b>										
GDP GROWTH (%)	8.32	7.95	-0.55	-5.27	3.67	2.78	1.97	1.50	1.10	2.89
<b>RELATIVE PRICE</b>										
REAL EFFECTIVE EXCH '85	93.40	82.00	110.53	124.37	106.14	100.00	132.29	139.40	115.31	107.10
BILATERAL REL EXR/1	83.38	75.89	112.11	119.71	103.58	100.00	124.17	123.90	99.25	93.96
<b>NOMINAL VARIABLES (%)</b>										
DEVALUATION (AVG EXR)	0.64	6.81	130.07	112.93	39.75	53.06	138.16	125.28	63.47	8.15
WPI INFLATION	24.43	24.52	56.08	107.34	70.33	53.56	88.39	135.63	107.82	16.08
CPI INFLATION	26.31	28.00	58.87	101.88	65.46	57.75	86.23	131.83	114.20	20.01
M1 GROWTH	32.13	33.12	62.36	40.35	59.99	49.55	67.24	118.08	67.82	35.63
M2 GROWTH	36.67	49.04	58.04	61.87	68.49	43.25	78.44	147.22	42.20	43.00
SEIGNORAGE (%) /2	4.68	5.27	10.44	6.47	5.61	1.74	3.45	3.09	1.63	0.41
<b>RATIOS</b>										
M1/GDP	10.67	10.36	10.52	8.09	7.86	7.30	7.30	6.54	5.33	5.53
M2/GDP	29.02	31.55	31.18	27.66	28.27	25.18	26.84	27.29	18.70	20.60
RESERVE MONEY/GDP	16.15	17.05	21.11	18.04	16.55	12.04	10.64	7.46	5.25	4.43
PRIMARY DEFICIT/GDP /3	-3.02	-8.03	-3.54	4.84	5.46	3.89	2.58	5.66	7.89	8.29
OPERATIONAL DEFICIT/GDP /3	-6.55	-13.01	-15.55	-8.14	-7.15	-8.04	-14.45	-14.40	-9.15	-4.73
<b>INTERNATIONAL TRANSACTIONS (\$)</b>										
EXPORTS	15570	20102	21230	22312	24196	21663	16031	20655	20566	22765
IMPORTS	18896	23948	14435	8550	11255	13212	11432	12222	18898	23410
TRADE BALANCE	-3326	-3846	6795	13762	12941	8451	4599	8433	1668	-645
CURBAL	-8162	-13899	-6218	5419	4239	1237	-1673	3967	-2443	-5449
TOTAL CHANGE IN RESERVES	-1079	-1333	3542	-2183	-2355	2972	232	-5684	6789	3658
INT RESERVES/IMPORTS /4	6.8	6.8	5.9	17.0	26.3	21.2	18.8	45.8	28.7	12.0

1/ Against the US dollars.

2/ Defined as change in reserve money over GDP.

3/ World Bank Estimate

4/ In weeks of imports, Source: Yearly IFS.

around 2 percent of GDP in 1989 to just 1.5 percent of GDP in 1990, close to the lowest levels seen in Colombia.

A third, and probably more plausible reason for the acceleration of inflation emphasizes the aggressive exchange rate exchange rate policy followed in recent years. The evolution of the real exchange rate and inflation in Colombia is shown in figure 4.a. The most striking feature in the diagram is the sizeable real depreciation that took place since 1985, which by 1990 had yielded a real exchange which was very high by historical levels.

The acceleration of inflation in Mexico in 1987 is another example of this phenomenon.<sup>10</sup> Table 3.b summarizes the evolution of the main macroeconomic indicators during the 1980s. It is clear that there was a continuous reduction in the budget deficit since the beginning of the debt crisis (especially in terms of the primary balance, perhaps the best indicator of the fiscal effort). There was also a significant improvement in the trade balance and the current account of the balance of payments, and by 1987 both were in surplus. Nevertheless, inflation continued to be a problem. To a large extent, inflation was related to the management of the nominal exchange rate.

The evolution of the real exchange rate, the rate of devaluation and inflation in Mexico is presented in figure 4.b. Notice that there were two big increases in inflation, the first in 1982-83, and another in 1987. Both episodes coincided with times in which the government undertook large devaluations in order to achieve real depreciations. In both episodes, to a large extent, these efforts were in the end partially frustrated by an increase in domestic inflation which eroded most of the initial gains. While on average the real exchange rate depreciated after 1982-82 relative to previous levels, the real depreciation was much smaller than the peaks observed in 1983 and 1987.

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<sup>10</sup> The increase of inflation in Yugoslavia in 1988 has also been linked to large devaluations. Rocha (1991) provides an excellent discussion of this episode.

Figure 4

a. COLOMBIA - CPI INFLATION AND REAL EFFECTIVE EXR

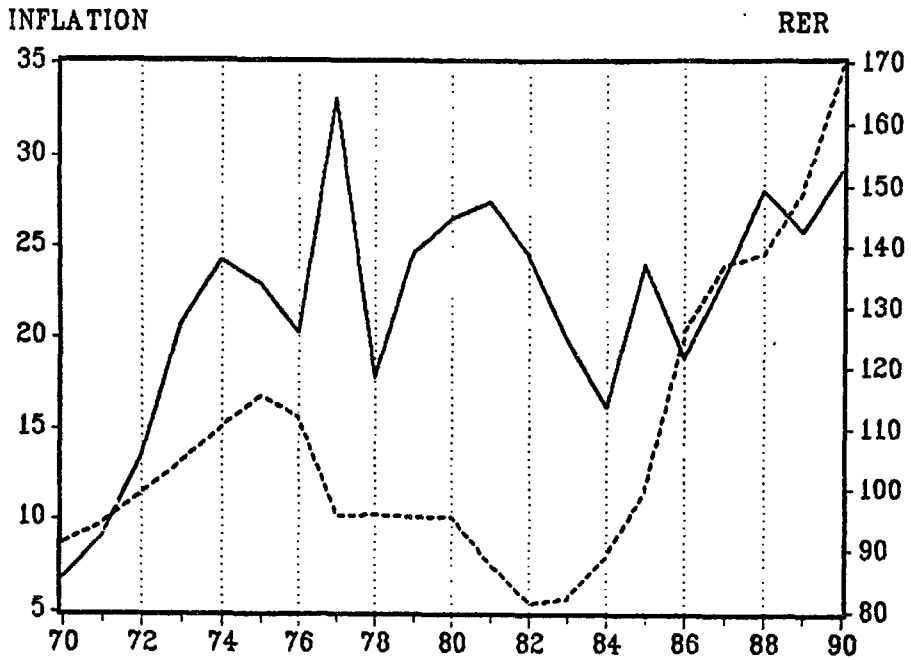


FIGURE 4

b. MEXICO - REAL EXR, CPI INFLATION, AND EXR DEPRECIATION

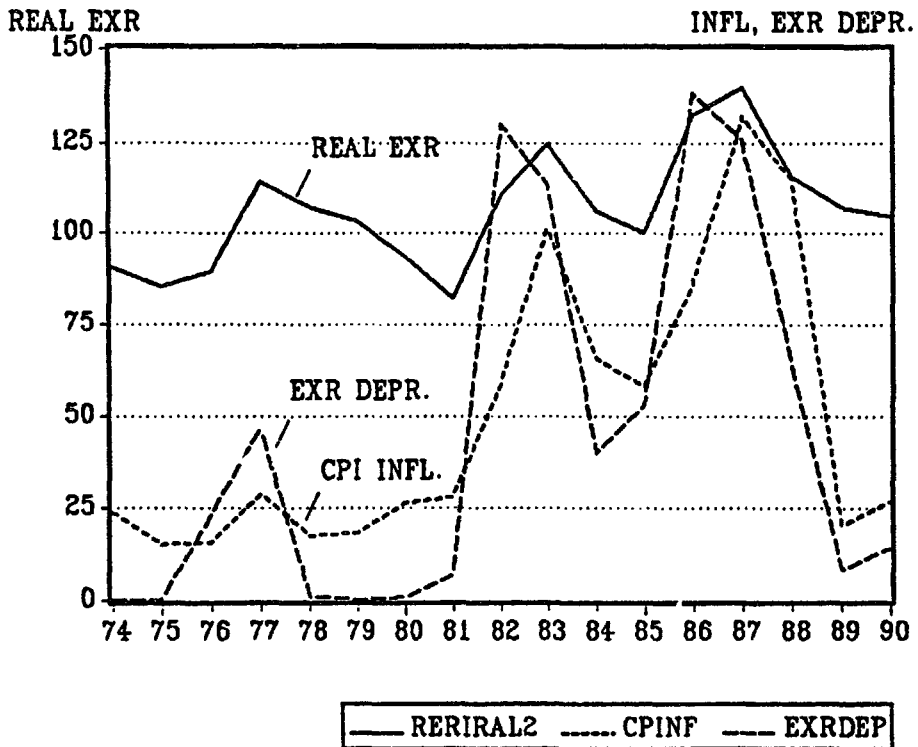


TABLE III. COLOMBIA MACRO INDICATORS 1984 TO 90

	1984	1985	1986	1987	1988	1989	1990
<b>NATIONAL ACCOUNTS</b>							
GDP GROWTH (%)	3.35	3.11	5.82	5.53	4.44	3.24	3.70
<b>RELATIVE PRICE</b>							
REAL EFFECTIVE EXCH '85	89.06	100.00	125.74	137.17	138.84	149.25	169.40
BILATERAL REL EXR/1	84.89	100.00	111.01	122.93	123.04	131.06	140.43
<b>NOMINAL VARIABLES (%)</b>							
DEVALUATION (AVG EXR)	27.85	41.16	36.50	24.89	23.32	27.87	31.28
CPI INFLATION	16.14	24.04	18.88	23.30	28.11	25.84	29.12
WPI INFLATION	18.30	24.90	22.00	24.90	28.30	28.20	26.52
M1 GROWTH /2	24.11	10.74	35.80	37.69	25.74	29.10	25.80
M2 GROWTH /2	23.91	20.23	35.60	36.31	21.11	31.40	29.90
MONETARY BASE GROWTH /2	23.54	17.41	30.60	34.40	19.88	30.40	23.20
SEIGNORAGE/3 (%)	2.03	1.44	2.18	2.46	1.44	2.03	1.53
<b>RATIOS</b>							
M1/GDP	12.77	10.98	10.91	11.55	10.93	10.88	10.35
M2/GDP	21.18	19.78	19.62	20.57	18.74	18.98	18.65
RESERVE MONEY/GDP	10.68	9.74	9.30	9.62	8.67	8.72	8.12
TOTAL DEFICIT/GDP /4	6.30	3.50	-0.20	1.40	2.60	1.60	0.90
<b>INTERNATIONAL TRANSACTIONS (\$)</b>							
EXPORTS FOB*	4273	3650	5331	5661	5343	6029	7105
IMPORTS FOB*	4027	3673	3409	3793	4516	4548	5102
TRADE BALANCE	246	-23	1922	1868	827	1481	2003
CURBAL*	-1401	-1809	383	336	-200	42	446
CHANGE IN NET INT'L. RES.	-1261	284	1464	-22	360	163	585
INT RESERVES/IMPORTS/5	12.3	14.3	24.3	33.8	32.8	32.8	33.0

1/ Against US dollars

2/ Source: IFS and Banco de la Republica, Colombia

3/ Defined as change in reserve money over GDP.

4/ Source: World Bank

5/ In weeks of imports, source: Yearly IFS, 1990 IS Estimate.

\* 1990 figures are estimates from Colombia CEM

The reader might wonder whether fiscal factors were an additional, important determinant of inflation in Mexico in these two cases. The answer to this question is that fiscal factors had a secondary role in 1982-83 acceleration, while they did not seem to have any in the acceleration of 1987. The increase in inflation in 1982-83 took place in conjunction with a significant reduction in the primary fiscal balance.<sup>11</sup> The drastic acceleration of inflation towards the end of 1987 took place while the government was running surpluses in its primary and operational fiscal balances.

There are additional similarities in the overall macroeconomic conditions that prevailed in Mexico in 1987, and those that prevail now in Colombia. First, Mexico was running a very large surplus in the current account and accumulated over US\$ 6 billion during that year. This provides indirect evidence that the exchange rate was undervalued. In addition, Mexico was also implementing an aggressive trade liberalization program. It is useful to point out that the trade liberalization program has remained on track despite a continuous real appreciation since the peak observed in 1987.

## VII. Main Findings

This paper evaluated the effectiveness of exchange rate policies to affect the evolution of the real exchange rate. The issue is particularly important for countries that try to secure an undervalued real exchange rate in support of trade liberalization. The discussion was illustrated with examples from Latin America. The main points argued in this paper are the following:

1. Exchange rate policies only have a limited effect in affecting the real exchange rate. Their success ultimately depends on the consistency between

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<sup>11</sup> This episode is analyzed in more detail in Kiguel and Liviatan (1988). Although there was an important fiscal imbalance in the late seventies in 1980-81, the acceleration in inflation coincided with the correction of these imbalances.

exchange rate policy and other macroeconomic policies, and external developments. In the longer term (i.e. once prices and wages adjust) the real exchange, as any relative price, is primarily determined by the fundamental factors affecting the supply of and demand for foreign exchange, and in this respect it is primarily independent of the exchange rate policy.

2. Devaluations, or accelerations in the rate of crawl affect the real exchange rate in the short run. To the extent that the adjustment of domestic prices and wages is sluggish, it is possible to affect the real exchange rate through nominal policies. Nevertheless, attempts to achieve real depreciations through continuous devaluations or by accelerations in the rate of crawl which are not supported by the underlying fundamentals, usually end up increasing inflation while being ineffective in changing the real exchange rate. On the other hand, a devaluation is likely to be effective in facilitating a real depreciation when the exchange rate is overvalued relative to the fundamentals.

3. Countries can only maintain a stable real exchange rate when they follow stable macroeconomic policies, and when they are not subject to large external shocks. The adoption of a "realistic" exchange rate policy can help in smoothing short term fluctuations in the real exchange rate. In particular, short term fluctuations will be smaller under a crawling peg than under a fixed (with periodic devaluations) or a flexible exchange rate.

4. There is typically a trade-off between policies aimed at maintaining "undervalued" exchange rates and those aimed at keeping low inflation. Countries have a basic choice: either they use the exchange rate as a nominal anchor (and hence the exchange rate has an active role) to bring down or maintain low inflation, or alternatively, they adopt an exchange rate rule that accommodates inflation (in which case the exchange rate takes a passive role). While the exchange rate can be an effective instrument in a disinflation program, its usefulness ultimately depends on the accompanying macroeconomic policies and the commitment to low inflation.

## References

- Bruno, Michael (1990). "High Inflation and the Nominal Anchors of an Open Economy," NBER Working Papers, No. 3518.
- Corden, W. Max (1990). "Exchange Rate Policies in Developing Countries," PRE Working Paper Series No. 412, The World Bank.
- Corbo, V. and J. de Melo. (1985). "Liberalization with Stabilization in the Southern Cone of Latin America," World Development, special issue, August.
- Easterly, William R. (1991). "The Macroeconomics of Public Sector Deficits: The Case of Colombia," PRE Working Paper Series No. 626, The World Bank.
- Edwards, Sebastian (1989). Real Exchange Rates, Devaluation and Adjustment: Exchange Rate Policy in Developing Countries, Cambridge, MA.: MIT Press.
- Stanly Fischer (1986) "Exchange Rates Versus Monetary Targets in Disinflation," in Indexation, Inflation and Economic Policy, Cambridge, MA: Mit Press, pp.147-61.
- Garcia-Garcia, Jorge (1990). "Macroeconomic Crisis, Macroeconomic Policies and Growth: Colombia 1950-86," mimeo, The World Bank.
- Kamin, Stevn B. (1988). "Devaluation, External Balance, and Macroeconomic Performance: A Look at the Numbers," Princeton Studies In International Finance, No 62, August.
- Kiguel, Miguel A. (1991). "Inflation in Argentina: Stop and Go Since the Austral Plan," World Development, July.
- Kiguel, Miguel A. and Nissan Liviatan. (1988). "Inflationary Rigidities and Orthodox Stabilization Policies: Lessons From Latin America," The World Bank Economic Review, Vol. 2, No.3, September, pp.273-298.
- Kiguel, Miguel A. and Nissan Liviatan (1989). "The Old and the New in Heterodox Stabilization Programs, Lessons from 1960s and 1980s," PRE Working Paper Series, No. 363, The World Bank.
- Kiguel, Miguel A. and Nissan Liviatan (1990). "The Business Cycle Associated with Exchange Rate Based Stabilization," PRE Working Papers Series, No. 513. (Forthcoming World Bank Economic Review).
- Papageorgiou, Dimetrious, Ameane Choksi and Michael Michaely (1990). Liberalizing Foreign Trade in Developing Countries, Lessons From Experience, The World Bank, Washington D.C.
- Ramos, Joseph. (1986). Neo-conservative Economics in the Southern Cone of Latin America, 1973-83. Baltimore: The John Hopkins University Press.
- Rocha, Roberto de Rezende (1991). "Inflation and Stabilization in Yugoslavia," PRE Working Paper Series, No. 752, The World Bank.
- Sachs, Jeffrey D. (1986). "The Bolivian Hyperinflation and Stabilization", NBER Discussion Paper No. 2073.



Appendix

The model is described by the following equations:<sup>1</sup>

$$(1) \quad e = P_T/P_N$$

$$(2) \quad D_T = D_T(e, D)$$

$$(3) \quad D_N = D_N(e, D)$$

$$(4) \quad Y_T = Y_T(e)$$

$$(5) \quad Y_N = Y_N(e)$$

$$(6) \quad Y = Y_N + eY_T$$

$$(7) \quad D = D_N + eD_T$$

$$(8) \quad Y = D$$

$$(9) \quad Y_N = D_N$$

$$(10) \quad B = Y_T - \tau_T$$

Equation (1) is definition of the real exchange rate. Equations (2) and (3) are respectively the demand functions for the traded and non-traded goods, while equations (4) and (5) are the corresponding supply functions of both goods. Equation (6) defines the domestic level of output in terms of the non-tradeable good, and (7) is aggregate demand in terms of non-tradeables. Finally, equation (8) presents the familiar conditions that domestic income equals domestic expenditure, equation (9) denotes the equilibrium condition in the market for nontradeables, and (10) is the trade balance (or external balance condition).

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<sup>1</sup> In this section we follow closely the model developed in Dornbusch (1980).

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