Grupo Financiero Bancomer

MEXICO'S EXCHANGE RATE CRISIS

by

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PRESENTACION

En abril de 1991, el Dr. Arnold C. Harberger preparó un examen de la evolución del tipo de cambio real del Peso mexicano, por encargo de un instituto de investigación económica independiente.

A nuestro juicio, entre las conclusiones de su trabajo quizás las tres más importantes fueron:

1) La revaluación real, detectada en el periodo estudiado, era consecuencia de una entrada autónoma y masiva de capitales.

2) Cuando el flujo se revirtiera o, incluso, se detuviera, habría necesidad de instrumentar una devaluación real del Peso.

3) La presión revaluatoria podría moderarse mediante la aplicación de diversas medidas de política.

En 1994, como se sabe muy bien, el movimiento abrupto de fondos ocasionó una crisis cambiaria de graves proporciones, que se tradujo luego en una caída a plomo de la actividad económica, y en serias dificultades financieras.

Frente a tales circunstancias, la Dirección de Investigaciones Económicas del Grupo Financiero Bancomer consideró conveniente pedir al Dr. Harberger una revisión de su análisis de 1991. El resultado de este nuevo esfuerzo es el presente ensayo, que nos complace ofrecer en circulación limitada, con el único propósito de agregar material que juzgamos valioso a un debate de importancia central en el momento actual.

Es casi ocioso agregar que las opiniones vertidas en el escrito son por completo responsabilidad del autor, y no coinciden necesariamente con las del GFB.

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México, D.F.
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The aim of this paper is to impart an understanding of the fundamental forces underlying the exchange rate crisis that struck Mexico in December, 1994 and through which that country is still passing. The emphasis is on fundamental forces because it is about them that economists can speak with greatest assurance; certainly that is true as far as the author is concerned. Moreover, I feel that there is a need for a deeper grasp of the fundamentals, since a great deal of the ongoing debate either passes over them entirely, or, even worse, is based on serious misunderstandings concerning them. Nonfundamental issues concern, for example, the behavior and policies of the Banco de Mexico during the year 1994. We will show that these policies affected perhaps the precise timing of the onset of the adjustment process, but not the underlying requirement that adjustment take place. Similarly, there is a great deal of debate about how high the peso price of the dollar will have to go in the course of the adjustment, and where it may or may not settle in a new equilibrium. This debate would be far more enlightening if it were focused on the real rather than the nominal exchange rate. Even more, one can speak much more cogently about possible scenarios for the nominal exchange rate once one has established what is likely to be the new equilibrium level for the real exchange rate.

 The author wishes to thank Harald Beyer and Alfonso Guerra de Luna for their valuable help.

I. The Crisis Has Precedents

The most relevant way to establish the fact that fundamental forces are at work, and that they tell a story that we can understand, is to show that this crisis belongs to a "family" of experiences, all of which exhibit similar characteristics. Using the language of medicine, we can say that this combination of characteristics constitutes a syndrome. And just as a syndrome in medicine is usually created as a particular causal factor (the onset of a condition or disease) works to generate a sequence of consequences, so in economics we can look upon a syndrome as a scenario revealing the consequences of a single dominant cause. The single dominant cause in this case is a relatively abrupt decline in the supply of foreign exchange available to a country.

This can happen when an inflow of capital is reversed, i.e., turns into an outflow. It can also happen when a large inflow of capital suddenly becomes a small inflow -- this, too, abruptly reduces the supply of foreign exchange (dollars). Similarly, much the same set of effects can be set in motion by a sharp decline in the world price of a country's principal export good.

The cases which follow all focus on the changing flow of capital into a country. For these purposes, and for reasons which will become clear, it is useful to consider the net flow of dollars to the country -- the so-called net resource transfer -- to be the relevant "causal" variable. This is the trade deficit measured on the basis of trade in goods and non-financial services. It equals (in an accounting sense) the net inflow of capital minus the net payments of interest, dividends, direct profit remittances, etc. Non-capital transfers like foreign aid or remittances from abroad are also included in this net inflow.

The net resource transfer does not have an unequivocal, constant impact on the real exchange rate. Actually many different outcomes may ensue, depending on how the transferred money is spent. Figure 1 shows two extreme cases and one intermediate one. In each panel we have the supply of exports and the demand for imports, measured in units that are each worth a dollar at world prices. The initial crossing point of the solid supply and demand curves is the initial real exchange rate ($RER^e = 100$). Then we have a capital flow of 1000 into the country. In case a) all of this goes to finance, say, the purchase of generating equipment for a new power project or for newly-generated demand for imports (e.g., imports of machinery) for which a manufacturing company borrows abroad. Since the supply of dollars and the demand for dollars are each augmented by 1000 (see the dotted demand and supply curves), there is no change in the equilibrium real exchange rate.

In case b) we have the opposite extreme. None of the borrowed funds is spent on imports, so the demand curve for imports remains unaltered. What happens here is that the borrower (say a farmer) takes those dollars to the foreign exchange market to change into pesos, which he then pays to laborers who, say, clear land and dig irrigation ditches. In this case all the money is initially spent on nontradables. The adjustment of the RER downward from 100 to 75 is what is required to induce others to use the newly-available dollars.

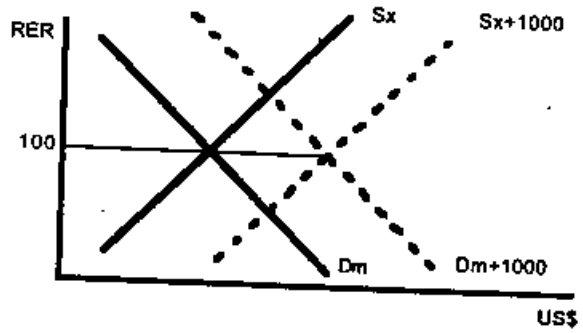
In case c) we have an intermediate case, in which out of the 1000 of borrowed funds, 400 is spent directly by the borrowers for imports,[1] while 600 is spent on nontradables.

---

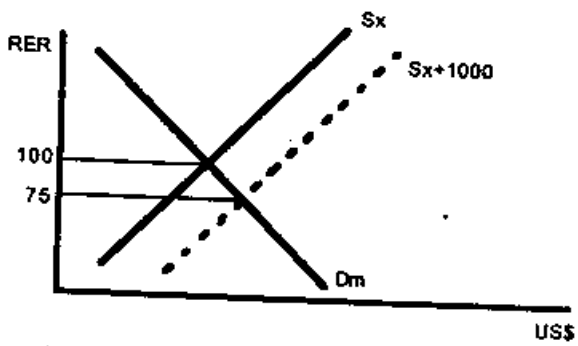
[1]The effect would be similar if part or all of this 400 were spent on exportable goods. The critical distinction is between tradables and nontradables.

Figure 1
Net Resource Transfer and Real Exchange Rate

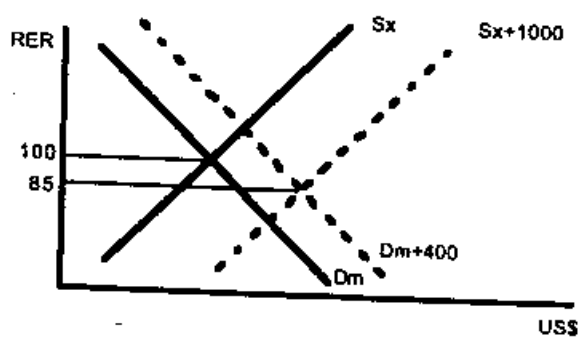
a) Capital flow of 1,000 and all the funds are spent on imports



b) Capital flow of 1,000 and none of the funds are spent on imports



c) Capital flow of 1,000 and 400 of the funds are spent on imports



Not surprisingly, this produces a new equilibrium between those of cases a) and b), in this example at an RER of 85.

The examples of Figure 1 clearly show that no economic principles are being violated if the impact of capital flows on the real exchange rate varies from year to year. It would not be greatly surprising, then, to find a rather poor connection between these two variables.

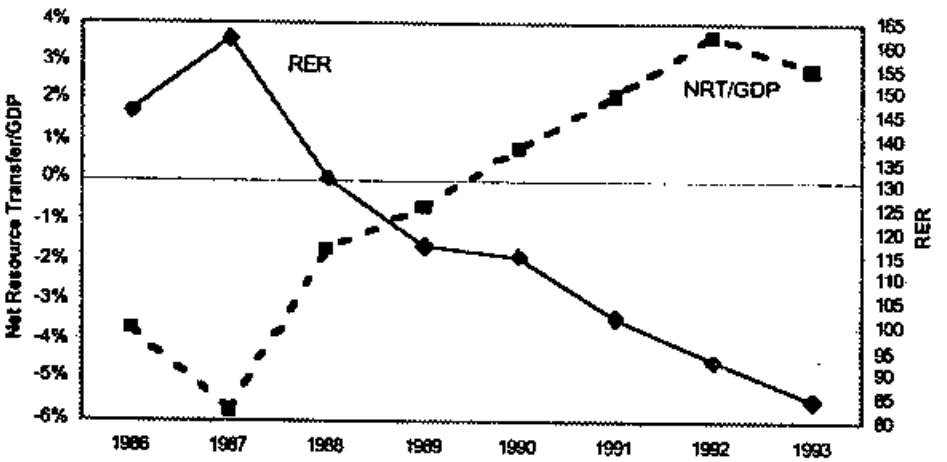
The facts are therefore very impressive, revealing a much closer connection between capital flows (net resource transfer) and the real exchange rate than we have any deep reason to expect. In terms of the examples of Figure 1, this suggests that most capital flows are spent partly on tradables and partly on nontradables, with the proportions not varying much from period to period within an episode. These facts are laid out for Mexico's recent experience in Figure 2.

The story of Figure 2 is so clear that further elaboration seems redundant. When dollars are relatively abundant, they are relatively cheap in real terms. When they are more scarce, they end up being more expensive.

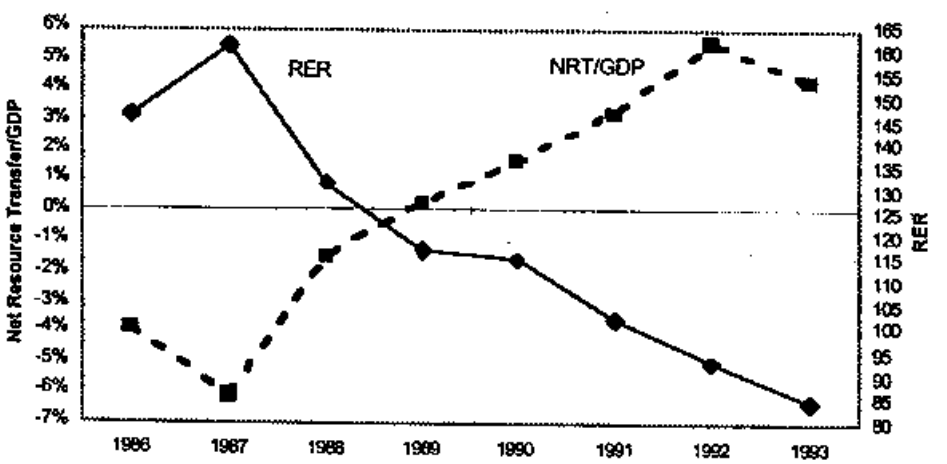
Perhaps a word is in order concerning the mechanisms by which changes in the availability of dollars influences their real price (the RER). The story should be obvious for the case of flexible exchange rates. Greater availability of dollars causes their market price to be lower. By this we mean a lower real price; thus, if an internal inflation is under way, this means a lower price relative to the general level of prices, not necessarily a lower nominal exchange rate.

Figure 2
MEXICO 1986 - 1993
Net Resource Transfer and the Real Exchange Rate

a) Based on Balance of Payments Data



b) Based on National Accounts Data



When the nominal exchange rate is fixed, either absolutely so or contained within a narrow band (as was the case in recent years for Mexico), the adjustment mechanism is more complicated. The variable that we (and most analysts) use for the real exchange rate can be described as "the real price of the real dollar". The formula is RER = $(E/\bar{p}_d) \times \bar{p}^*$, where E equals the nominal price of the dollar, $\bar{p}_d$ is a domestic general price index (we use the consumer price index) in the country in question, and $\bar{p}^*$ is an index reflecting the international price level, expressed in dollar terms. In this formula one can identify E as the "nominal price (in pesos) of the nominal dollar". Then $(E/\bar{p}_d)$ becomes the "real price (in real pesos) of the nominal dollar". And, finally $(E/\bar{p}_d) \times \bar{p}^*$ becomes the "real price of the real dollar".

Now when the equilibrium real exchange rate changes, one or more of these components must move in order to bring that change about. With a flexible change rate this is mainly E, the nominal rate itself. But with a fixed exchange rate the burden of adjustment is put on $\bar{p}_d$, the internal price level. When capital is flowing in, the inflow leads to a situation in which total spending in the receiving country exceeds total production by the amount of the capital inflow. This causes the demand for both tradable and nontradable goods to increase, and for nontradables new money is created as borrowed dollars are exchanged for pesos. This helps drive up the internal price of nontradables relative to tradables, and in our formula, it simultaneously drives up the general price index $\bar{p}_d$. This is the mechanism by which most of the decline in the RER, observed in Mexico from 1987 to 1994, was brought about.

We will soon see that it is easier for this mechanism to work for a falling RER (via a rising internal price level) than for a rising RER (via a falling internal price level). But for the

moment we simply note that it is through the movement of the internal price level that the adjustment process works itself out, leading to a new equilibrium RER.

But we are already at a very important point in our story -- namely, that the upward movements of Mexico's price level over the last several years were not the result of inflationary policies but rather were the natural consequence of the net resource transfers that were taking place. We will return to this point in the next section.

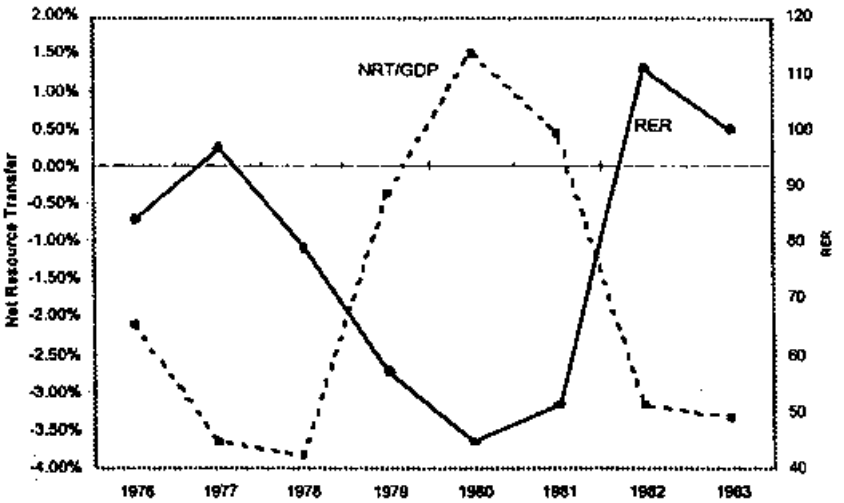
Now we turn to the precedents, which are shown in Figures 3A, 3C, 3P, and 3M. These are built in exactly the same way as Figure 2, and reflect the response of the real exchange rate to changes in the net resource transfer in other cases of the same syndrome. The four cases in question are Argentina (1976-83), Chile (1979-83), Peru (1976-83) and Mexico (1977-83).

It is easy to see in these diagrams that the inverse relationship between the net resource transfer and the real exchange rate holds essentially just as well in these cases as it does for Mexico's recent history as shown in Figure 2.

For each episode recounted in Figure 3, two different panels are provided, just as was done in Figure 2. We now explain the difference between these two panels. Our information on the real resource transfer to a country comes from two principal sources -- the balance of payments of that country as reported in the International Monetary Fund's International Financial Statistics, and the national income accounts of that country. In the balance of payments statistics imports and exports are typically broken down into merchandise, service, and income components.

Figure 3A
ARGENTINA 1976 - 1983
Net Resource Transfer and the Real Exchange Rate

a) Based on Balance of Payments Data



b) Based on National Accounts Data

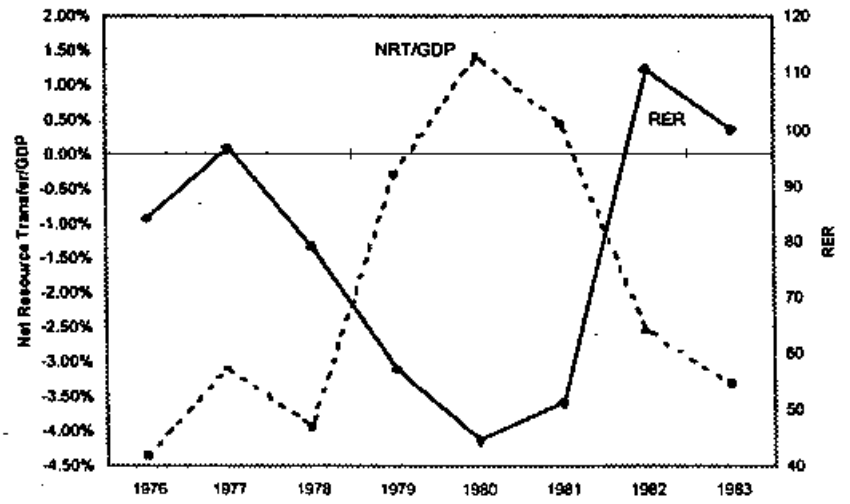
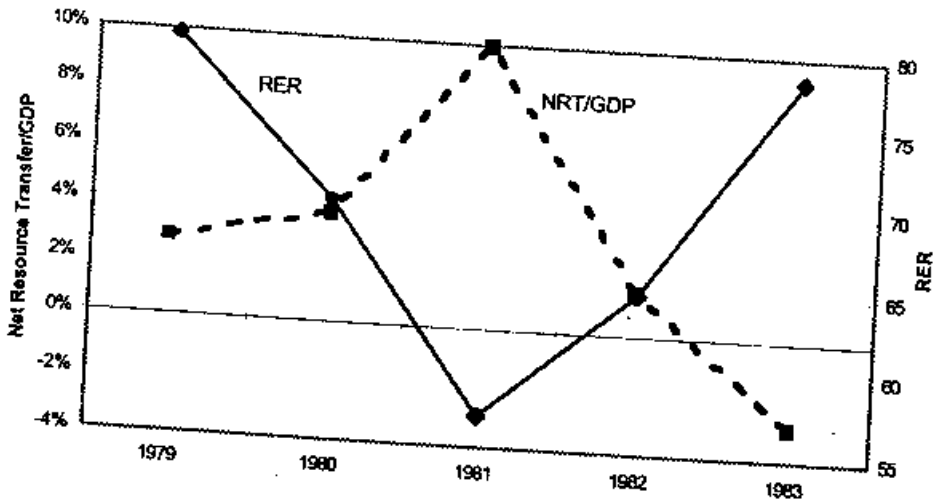


Figure 3C
CHILE 1979 - 1983
Net Resource Transfer and the Real Exchange Rate

a) Based on Balance of Payments Data



b) Based on National Accounts Data

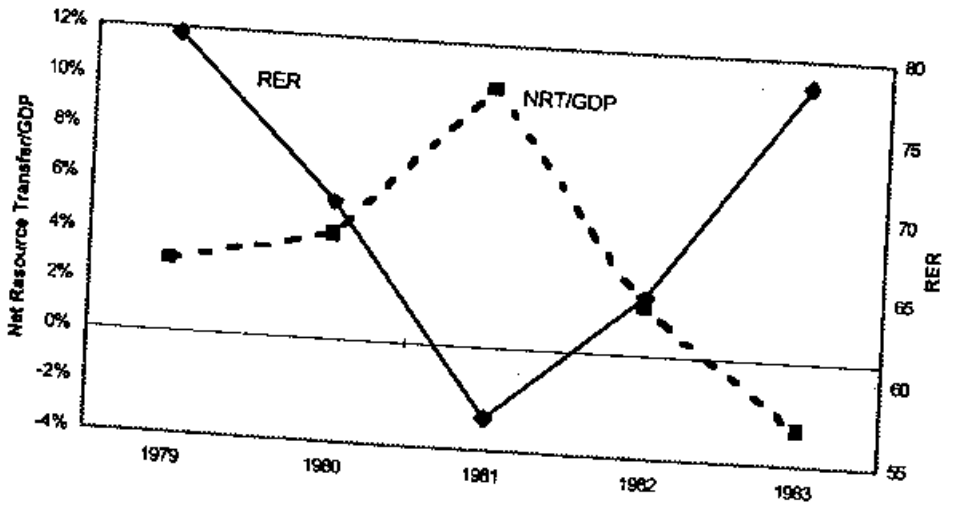
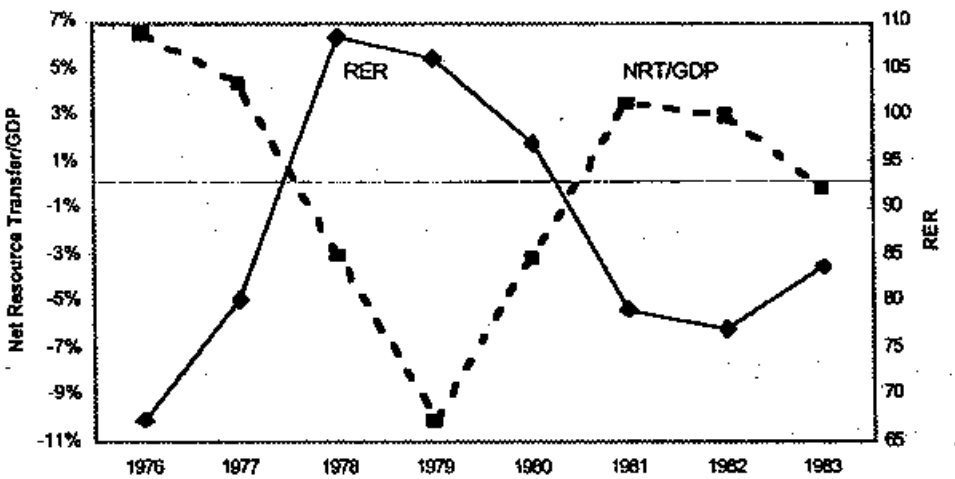


Figure 3P
PERU 1976 - 1983
Net Resource Transfer and the Real Exchange Rate

a) Based on Balance of Payments Data



b) Based on National Accounts Data

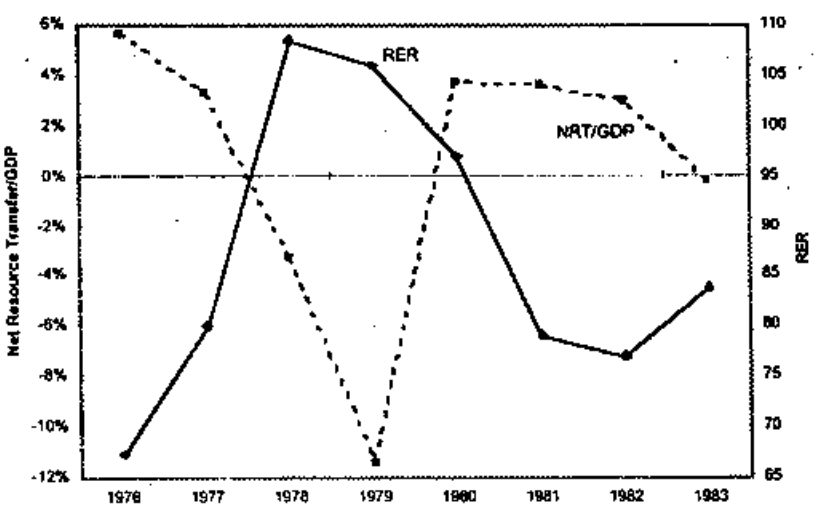
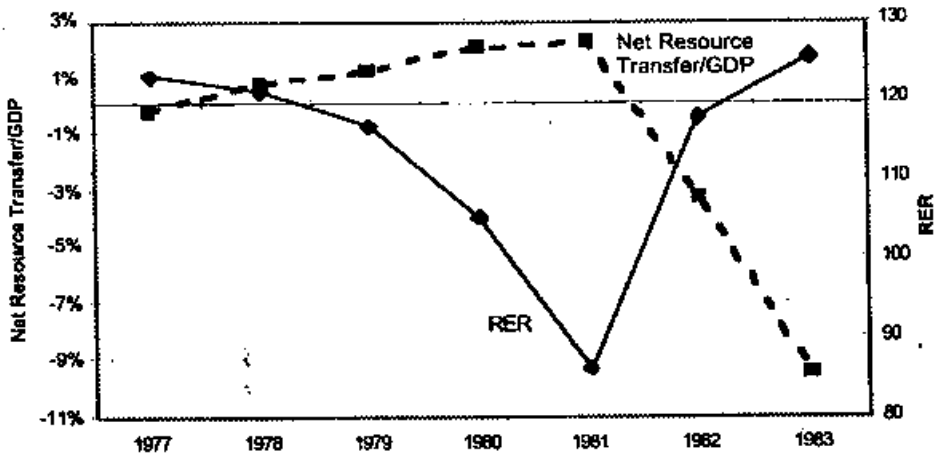
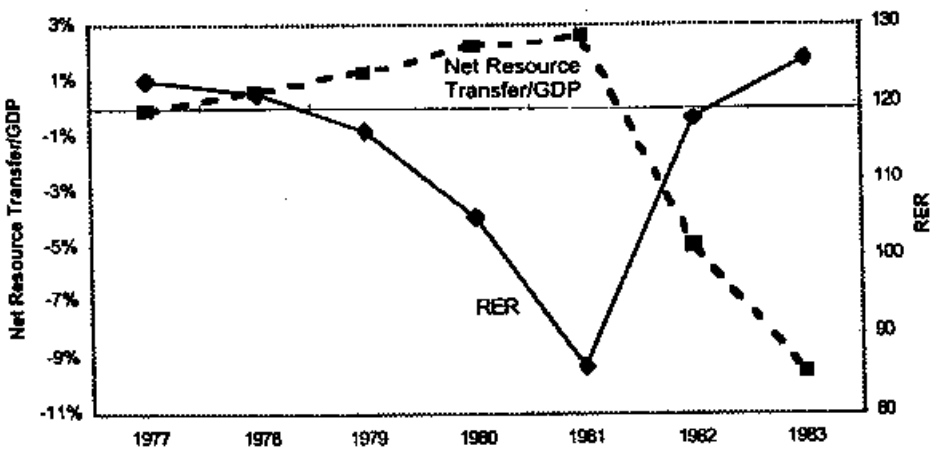


Figure 3M
MEXICO 1977 - 1983
Net Resource Transfer and the Real Exchange Rate

a) Based on Balance of Payments Data



b) Based on National Accounts Data



The income components represent the financial services (interest, dividends, etc.) referred to earlier. Our measure of the net resource transfer excludes these items, and consists of the net deficit in the combined accounts covering merchandise and nonfinancial services (which IFS calls simply services). The net resource transfer thus calculated is converted from dollars to pesos (or other local currency) using the average pesos-per-dollar exchange rate reported by IFS for the year, and the result is then expressed as a fraction of the year's GDP.[2]

The lower panel of each page in Figures 2 and 3 is based directly on the national accounts of each country, measured in its local currency. These accounts report both imports of goods and services and exports of goods and services. We simply take the differences between these two and express it as a fraction of nominal GDP for the year. There are numerous nuances of methodological difference between this procedure and that used for the upper panel. Among them is the fact that we have no easy way of correcting for the overweighting of later quarters relative to earlier quarters, described in the footnote to the preceding paragraph. Thus we distinctly prefer the data based on balance of payments statistics. We nonetheless present the lower panel for each country, simply to give clear visual evidence that the relationship of which we speak is very robust, and is solidly reconfirmed as we pass from one basic source of information to another.

[2]In years of high inflation this procedure gives too much weight to events occurring in the latter part of the year, when all flows are much higher than they were earlier in the year. In order to correct for this bias, the net resource flow is measured quarterly, then converted not to nominal but to real pesos (by multiplying by the average exchange rate and dividing by the average consumer price index of the quarter). These real net resource flows are then added for the year and expressed as a fraction of the year's real GDP (using the same base year as that for the CPI).

A third possible approach would be to measure net resource transfer, also using balance of payments data, but from the other side of the account -- adding up net inflows of long-term capital, short-term capital, grants and donations, and even loss of international reserves of the banking system, and subtracting, of course, net outflows of interest, dividends, etc. In a perfect accounting system, such a procedure would come to exactly the same measure that we obtain using our first approach, and this in turn would render it useless and unnecessary to even consider this third approach separately. However, in the real world there is always a statistical discrepancy (net errors and omissions) which reflects the fact that we get different answers measuring the net resource transfer via the statistics on financial flows than we get using the statistics on trade flows. These errors and omissions are generally considered to reflect unrecorded capital movements (plus gifts and other remittances) rather than unrecorded or mis-stated flows of imports and exports. We accept this interpretation and consequently use the first approach in strong preference to the third, because the latter is basically much less reliable.

A final word is in order on the world price index $\bar{p}^*$ that is used in the calculation of the real exchange rate. The principal index used in this paper for $\bar{p}^*$ is what I call the SDR-WPI. It attempts to measure, in some sense, the "world" purchasing power of a dollar. Its fundamental ingredients are the wholesale price indices of the five countries (the United States, Germany, Japan, the United Kingdom and France) whose currencies comprise the International Monetary Fund's amalgamated currency unit -- the SDR (Special Drawing Right). The SDR-WPI is a measure of the cost, in U.S. dollars, of a "basket of WPI baskets". Each country's own WPI measures the cost, in its own currency, of its own WPI basket. To get the SDR-WPI we first multiply each of the component country WPIs, by the dollar price of that country's currency.

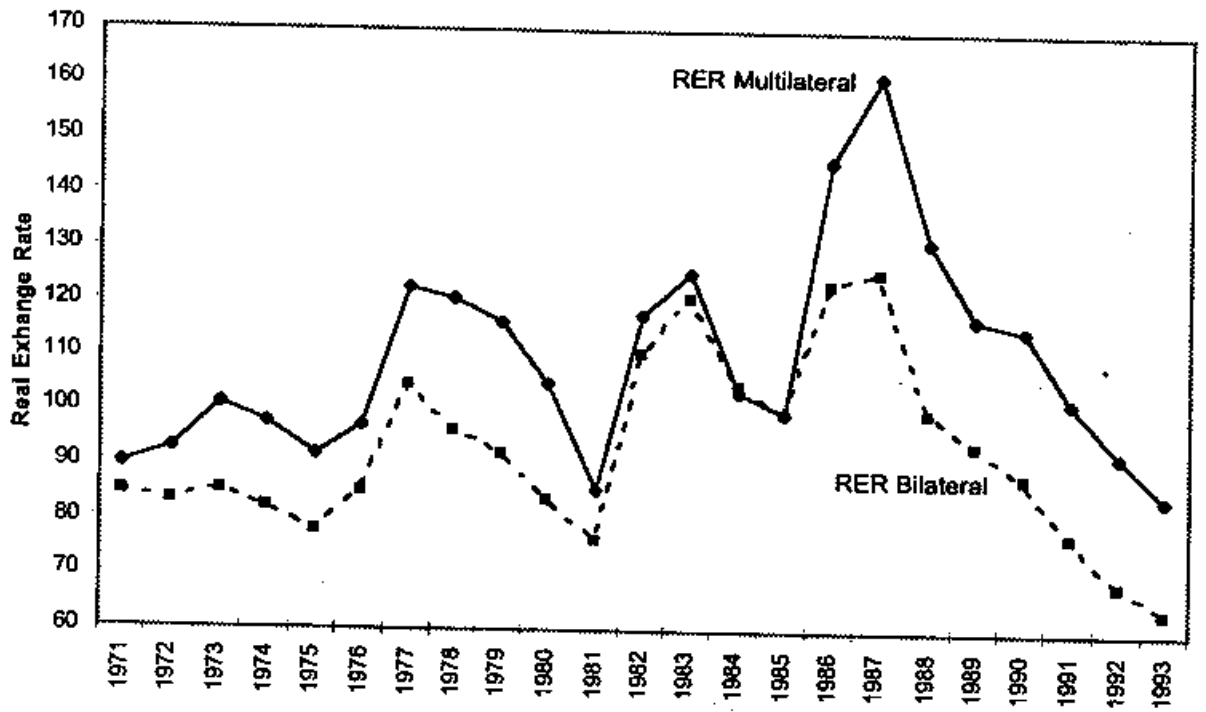
This tells us the dollar price of that country's WPI basket. We then take an average of all five baskets, the weights being the ones the IMF uses in its construction of the SDR. In the present study we have used fixed weights (i.e., weights that stay the same through time) for combining the component five WPIs. The weights are those that the IMF has used since January 1991. They are: .40 for the U.S. dollar; .21 for the German mark; .17 for the Japanese yen, and .11 each for the British pound and the French franc.

There are many reasons why a multi-country index like the SDR-WPI is preferable to a single country index like the U.S. WPI, but most of them have little bearing on the present study. Of principal importance here is the need to guard ourselves against the possibility that a particular movement of the so-called "bilateral real exchange rate" between the Mexican peso and the U.S. dollar might simply reflect a generalized appreciation or depreciation of the U.S. dollar vis-a-vis the other principal currencies. It takes no more than a glance at Figure 4 to see that we have little to worry about on this score. Since 1974, which is the year in which the SDR became an entity distinct from the U.S. dollar, the movements of Mexico's real exchange rate look very similar, regardless of whether the U.S. WPI or the SDR-WPI is used in the construction of the real exchange rate index.

II. The Net Resource Transfer and the Real Exchange Rate

In this section we explore further the empirical relationship between the net resource transfer and the real exchange rate. Figure 5 shows this relationship for Mexico in two different ways.

Figure 4
MEXICO 1971 - 1993
Bilateral Real Exchange Rate and Multilateral Real Exchange Rate
(1985 = 100)



In the top panel the RER is plotted against the real resource transfer (based on balance of payments data), expressed in dollars of constant purchasing power. To obtain this latter figure, the resource transfer of each year, expressed in dollars, is divided by the SDR-WPI, described earlier.

In the lower panel the real resource transfer is expressed as a percentage of GDP, as was done in the previous section. Once again, the real resource transfer is measured from balance of payments data.

Once again in the case of Figure 5, the visual representation of the data speaks for itself. There is no serious possibility that such close relationships would be the product of pure chance. Much less so, when we have a very clear scenario, well founded in economic analysis, that gives us the rationale for what we see.

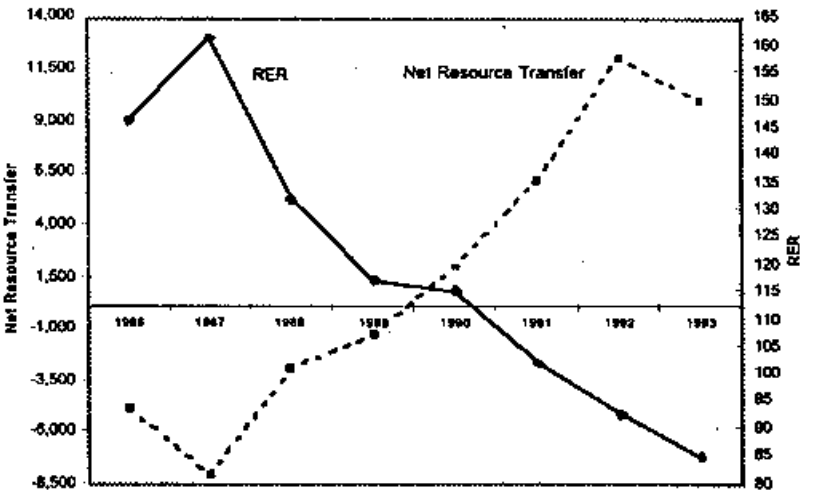
Simply for the purpose of underlining that this phenomenon is not unique to Mexico during the last several years, we present in Figure 6 the corresponding data for the other episodes already recorded in Figure 3. It is again clear from these diagrams that the syndrome characterizing Mexico from 1986 onward has many counterparts at other times and places. In spite of the fact that we cannot establish a clear relationship on purely theoretical grounds (see Figure 1), such a relationship nonetheless exists in the data for all of the episodes recorded here.

III. "Finding" the New Equilibrium Real Exchange Rate

The diagnosis of Mexico's crisis is very simple. What was a net resource transfer of about 5.6% of GDP in 1992 and of nearly that much in 1993 and 1994 is destined to be reduced to a much smaller number in 1995, 1996 and possibly even in subsequent years.

Figure 5
MEXICO 1986 - 1993

a) Net Resource Transfer in Real Mill. US$ and Real Exchange Rate



b) Net Resource Transfer/GDP (based on Balance of Payments Data) and Real Exchange Rate

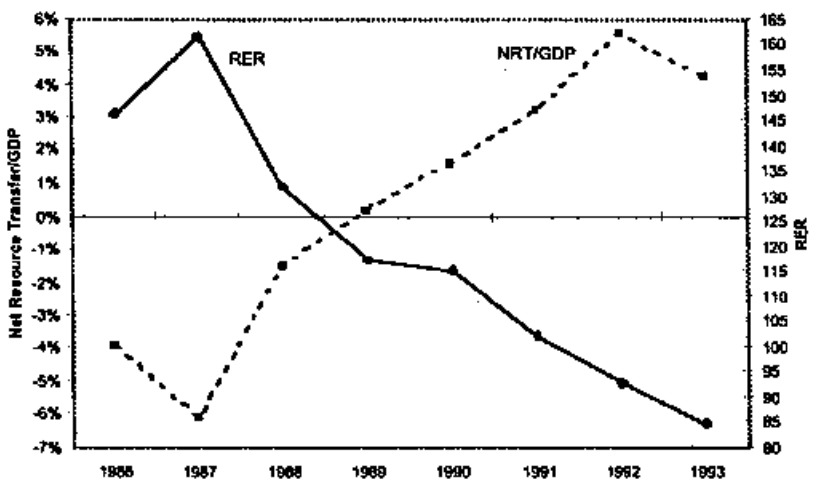
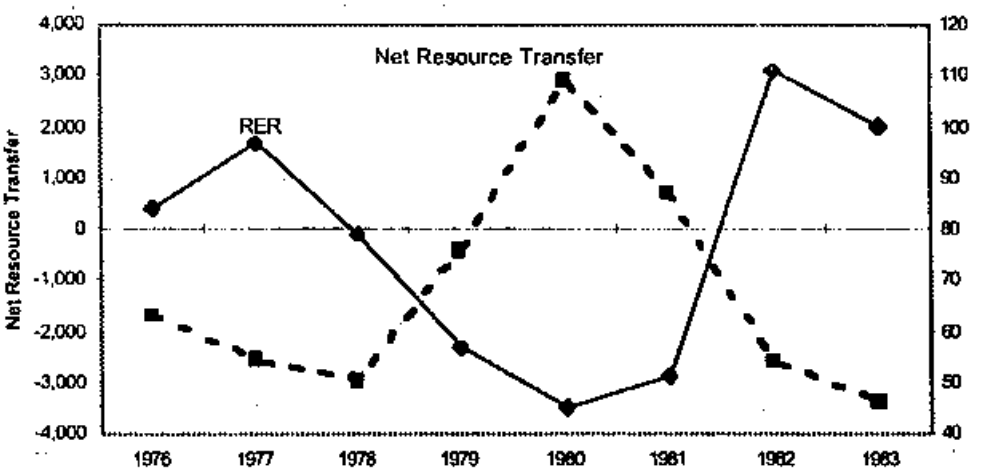


Figure 6A
ARGENTINA 1976 - 1983

a) Net Resource Transfer in Real Mill. US$ and Real Exchange Rate



b) Net Resource Transfer/GDP (based on Balance of Payments Data) and Real Exchange Rate

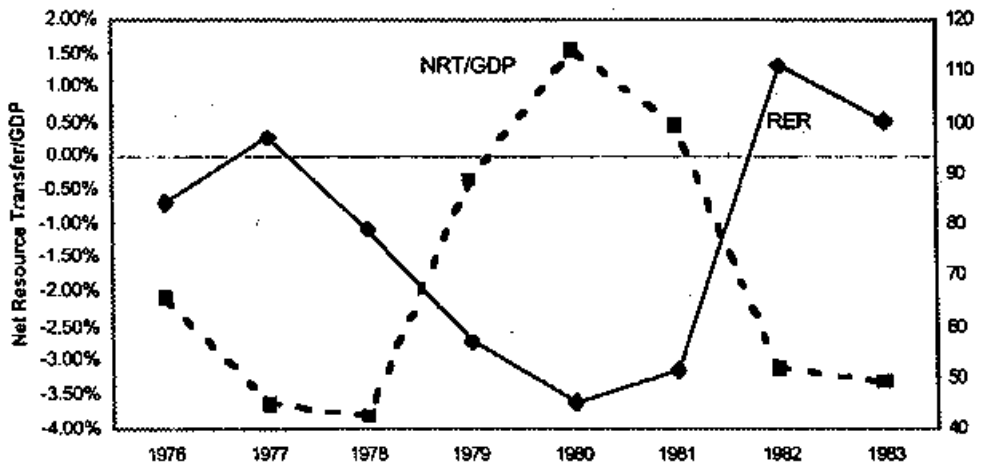
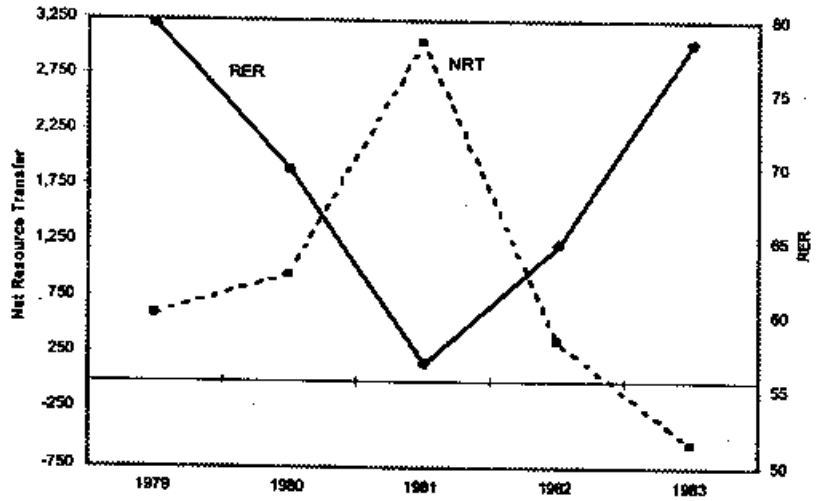


Figure 6C
CHILE 1979 - 1983

a) Net Resource Transfer in Real Mill. US$ and Real Exchange Rate



b) Net Resource Transfer/GDP (based on Balance of Payments Data) and Real Exchange Rate

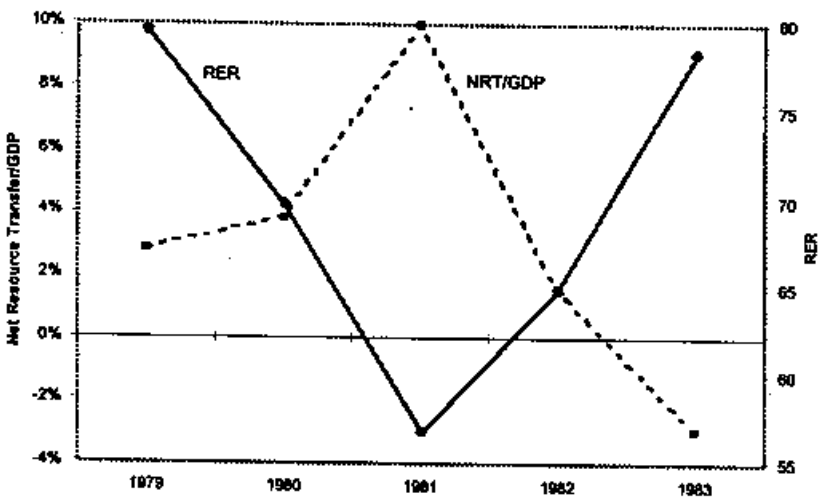
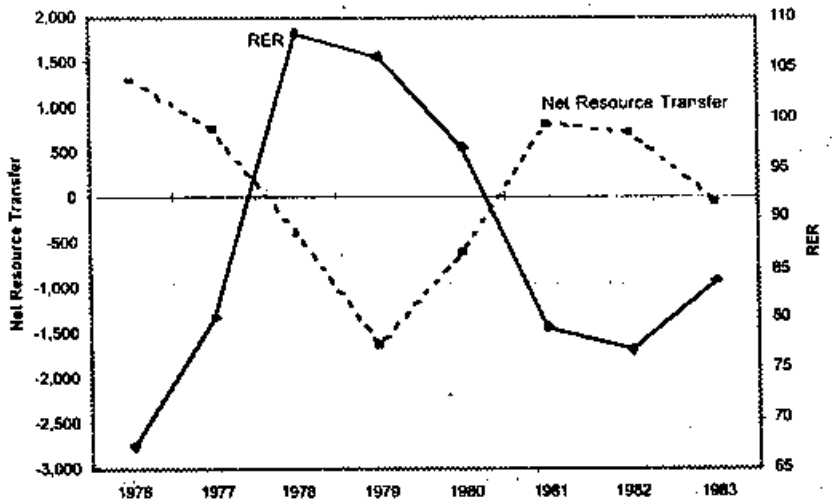


Figure 6P
PERU 1976 - 1983

a) Net Resource Transfer in Real Mill. US$ and Real Exchange Rate



b) Net Resource Transfer/GDP (based on Balance of Payments Data) and Real Exchange Rate

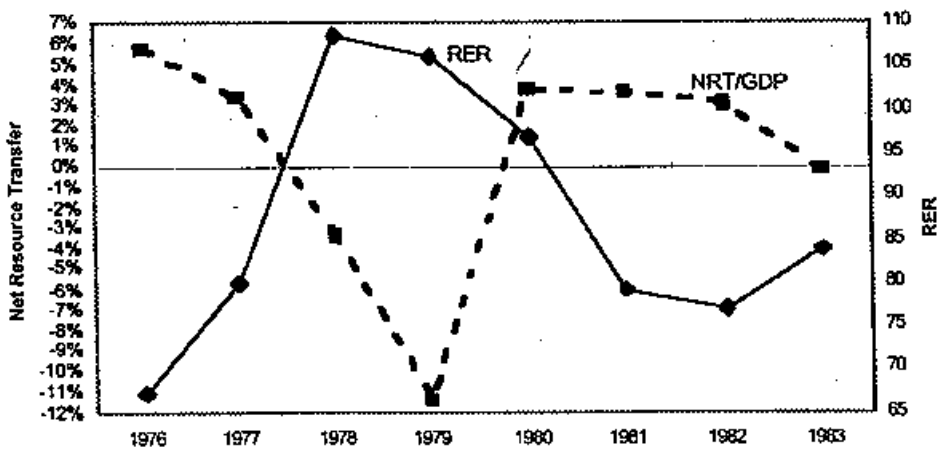
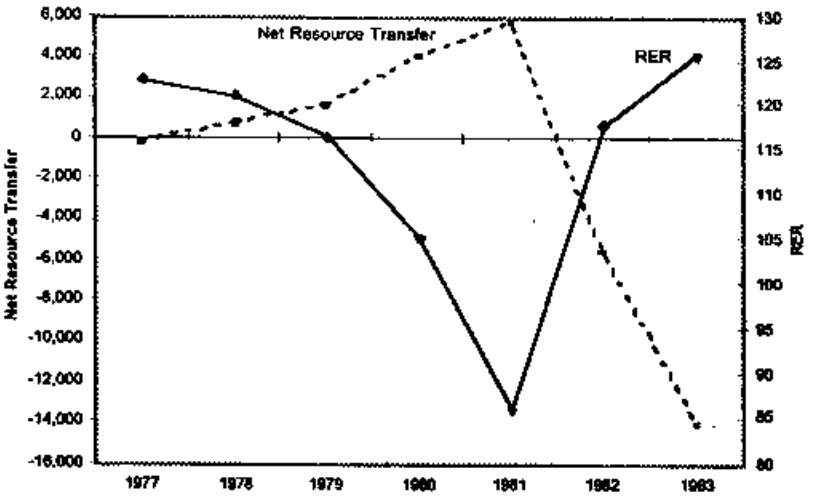
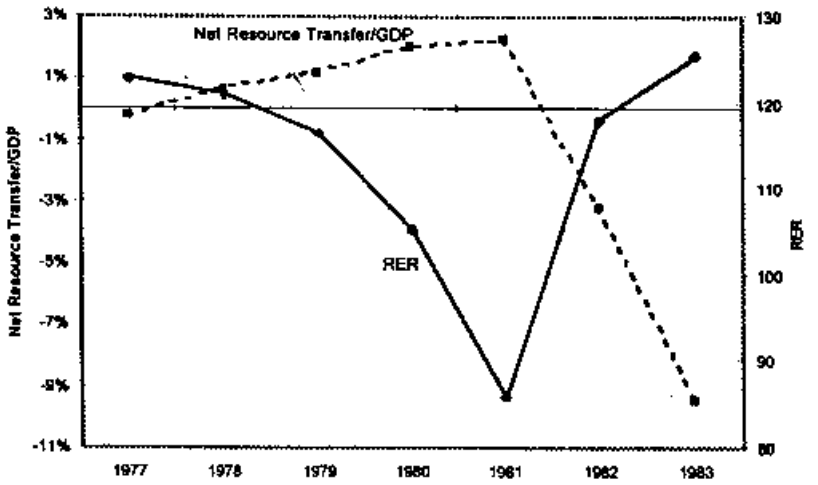


Figure 6M
MEXICO 1977 - 1983

a) Net Resource Transfer in Real Mill. US$ and Real Exchange Rate



b) Net Resource Transfer/GDP (based on Balance of Payments Data) and Real Exchange Rate



This reduction is partly due to the fact that less capital is now flowing into Mexico than what came in 1992 and 1993, and partly due to the fact that interest rates have recently risen, so Mexico is likely to have to pay more on that account. (Recall that the net resource transfer is equal to net inflows of capital and remittances minus net outflows of interest, dividends, etc.)

What we have established in earlier sections is the strong empirical relationship between the net resource transfer and the equilibrium real exchange rate. Here we will make different assumptions about the possible magnitude of the real resource transfer in the immediate future years, and based on the empirical relationships already described (plus a few more) we will be able to make contingent inferences about the likely new equilibrium level of the real exchange rate.

When speaking of capital flows into Mexico, most people focus on the so-called capital account of the balance of payments, which differs from the net resource transfer in that it does not incorporate the offsetting flows of net interest, dividend payments, etc., nor does it count the changes in the international reserve position of the Banco de Mexico. This capital account represented 8.7% of GDP in 1991, 8.2% in 1992, and 8.6% in 1993. In 1994, as we shall see, the capital flow generated by the private sector was much less, but the difference was largely made up by losses of international reserves plus increased international indebtedness on the part of the development banks. This, as was briefly mentioned at the outset, is what in effect helped postpone the real adjustment process from 1994 to 1995 and beyond.

The biggest unknown in this process is what will happen to the net flow of voluntary capital into Mexico. Nearly all experienced observers are in agreement that it will very likely be cut by at least one half. The more pessimistic fear is that it might actually be cut to zero.

In what follows we will take a relatively optimistic point of departure -- namely, that Mexico's net capital inflow will be cut by about a half in relation to GDP, and that the net resource transfer will fall by 4 percentage points of GDP. A second point of reference will be that the net resource transfer will fall to zero. This, too, is a relatively optimistic scenario, amounting to a reduction of the net resource transfer by about 5.6 percentage points of GDP. To get an idea of what might happen in a more pessimistic scenario, we need only consider the experience of various countries as they adjusted to the international debt crisis of the early 1980s. During that period Mexico's real resource transfer turned negative, and stayed negative from 1982 through 1987. The largest net outflow was in 1983, when it reached 9.58% of GDP. In Argentina, there was a net outflow (negative real resource transfer) from 1982 through 1991(!), but the later stages had other important causes (viz., hyperinflation) above and beyond the debt crisis. In Argentina, in the years immediately following the debt crisis, the net outflow ranged from 2.5 to 3.5 percent of GDP, and peaked at about 5.5% of GDP in 1985. Chile did not have any problems with hyperinflation, and executed what many people consider to be a model response to the debt crisis (starting about 1985), but still Chile had a net outward real resource transfer all the way from 1983 to 1991. It peaked in 1988, with a net outflow of nearly 7% of GDP. Finally, Peru's net outward real resource transfer ran from 1983 to 1985, peaking in the latter year at nearly 6% of GDP.

The above experiences in the wake of the debt crisis are reported here simply for the purpose of underlining that the adjustments that we will be simulating are based on an appreciation that Mexico's present crisis is quite minor compared to the seismic shocks that hit Latin America in the early 1980s.

Figure 7 shows the net resource transfer (NRT), to Mexico, expressed as a percentage of GDP. It also shows regression lines of the real exchange rate as a function of such transfers. The basic data on NRT come from balance of payments statistics for the upper panel and from the national accounts (NRT*) for the lower panel. The two regression lines are:

(1) $RER = 117 - 785(NRT/GDP)$ $R^2 = .96$

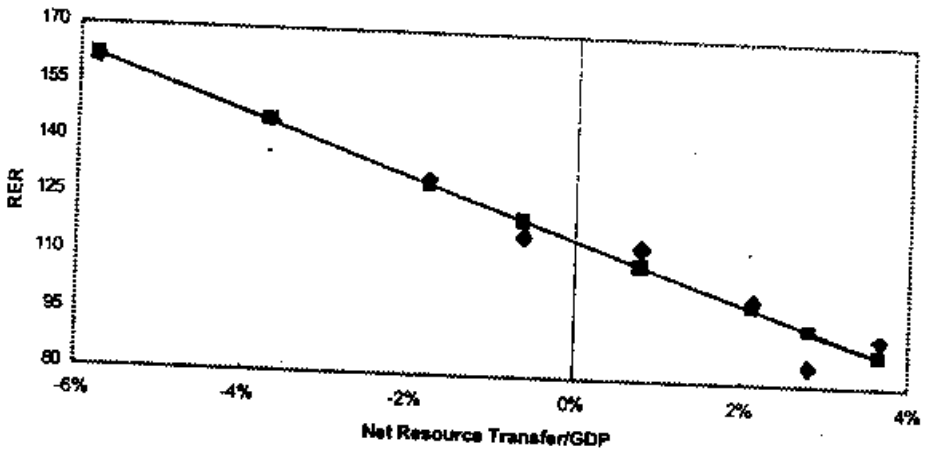
(2) $RER = 122 - 638(NRT^*/GDP)$ $R^2 = .97$

The predictions of these two regressions are very close. For a net resource transfer of 1.6% of GDP, representing a reduction of 4.0 percentage points from a base equal to 5.6% of GDP, the first regression predicts an RER of 104, and the second predicts an RER of 111.5. For a net resource transfer of zero, the first regression predicts an RER of 117, the second an RER of 122. These are to be compared with a level of approximately 82 in the fourth quarter of 1993 and the first quarter of 1994 (the quarters of greatest net inflow of capital).

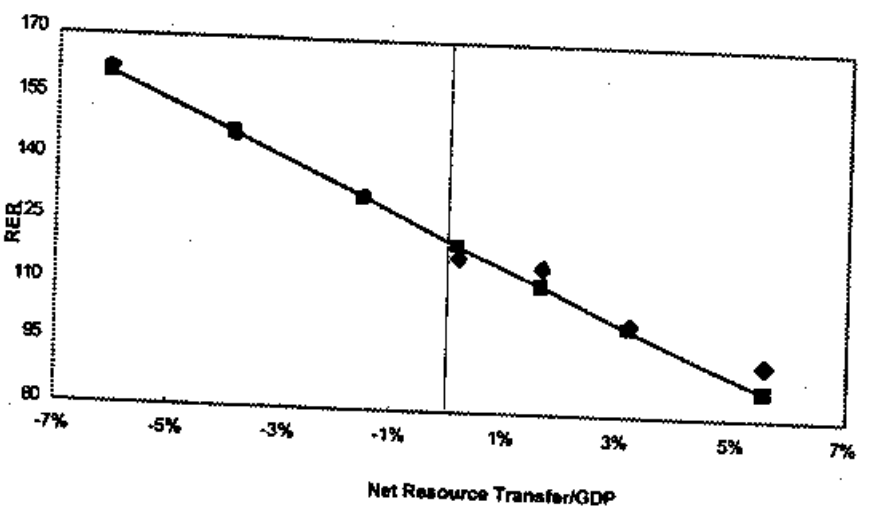
The predicted RER for a net resource transfer (into Mexico) of 1.6% of GDP entails a rise of 27% from its recent observed low point for regression (1) and a rise of 36% for regression (2). The move to a zero net transfer would entail a rise of 43% in the RER for regression (1) and of 49% for regression (2). These are based on the lowest point (82) reached by the RER, in the quarterly data.

Figure 7
MEXICO 1986 - 1993

a) Net Resource Transfer/GDP (based on Balance of Payments Data) and Real Exchange Rate



b) Net Resource Transfer/GDP (based on National Accounts Data) and Real Exchange Rate



IV. "Testing" the Plausibility of Our Results

The judgments reached above concerning the likely range of the new equilibrium real exchange rate, contingent on a net resource transfer of between zero and + 1.6% of GDP, can be tested in different ways. We shall proceed here by looking at the relationships that have been observed in other, somewhat comparable experiences, between changes in the net resource transfer on the one hand and the real exchange rate on the other.

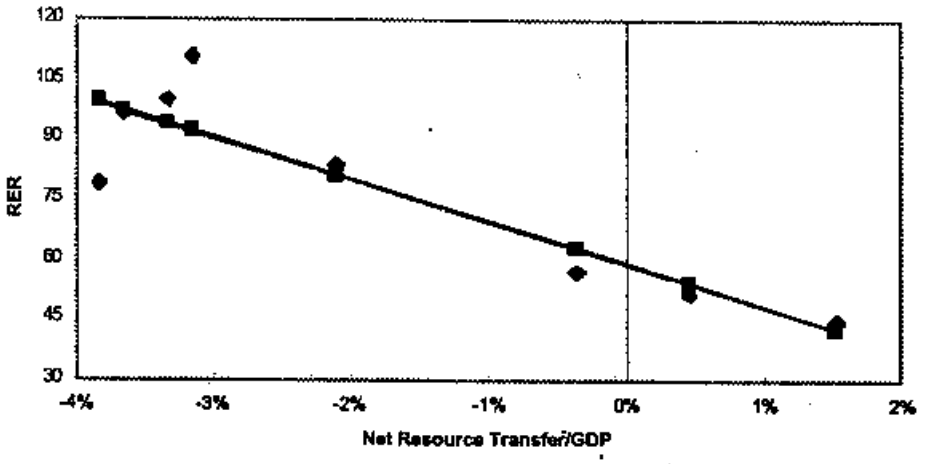
In Figure 8 we present data comparable to those of Figure 7, for the four alternative episodes that we have previously discussed. In the case of Mexico today, the slope coefficient of regression (1) implies a rise of 7.8 index points of the RER, for each change of one percent of GDP in the net resource transfer. Measured from the recent trough of 82 in the RER index, this amounts to a 9.5% rise of the RER, for each one percent of GDP that the net resource transfer falls. The corresponding figure for regression (2) is a 7.8% RER rise for each one percent of GDP.

Some results based on the regression lines presented in Figures 7 and 8 are shown in Table 1. Here the exercise is quite simple. The starting point is the lowest actually observed real exchange rate before the onset of an adjustment process. For Mexico's recent experiences the figures differ from the low of 82 reported above, because that was based on quarterly data, while Table 1 is derived using annual data.

Interpreting the results of Table 1, one should first note that the predicted adjustments for each country are very similar, regardless of whether one uses the regression based on balance of payments data or on the one based on the national accounts.

Figure 8A
ARGENTINA 1976 - 1983

a) Net Resource Transfer/GDP (based on Balance of Payments Data) and Real Exchange Rate



b) Net Resource Transfer/GDP (based on National Accounts Data) and Real Exchange Rate

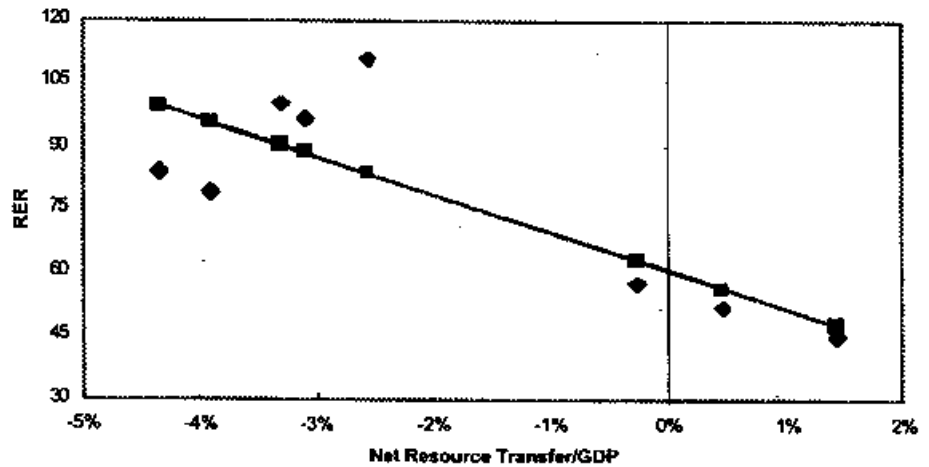
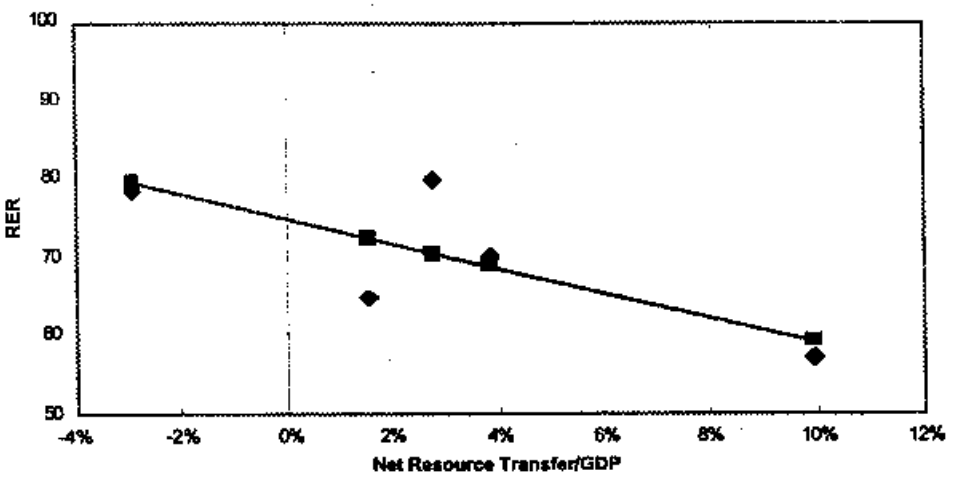


Figure 8C
CHILE 1979 - 1983

a) Net Resource Transfer/GDP (based on Balance of Payments Data) and Real Exchange Rate



b) Net Resource Transfer/GDP (based on National Accounts Data) and Real Exchange Rate

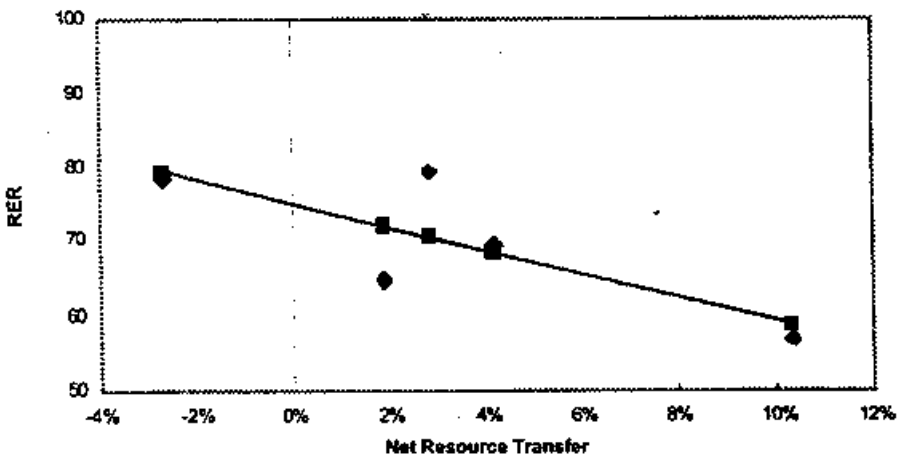
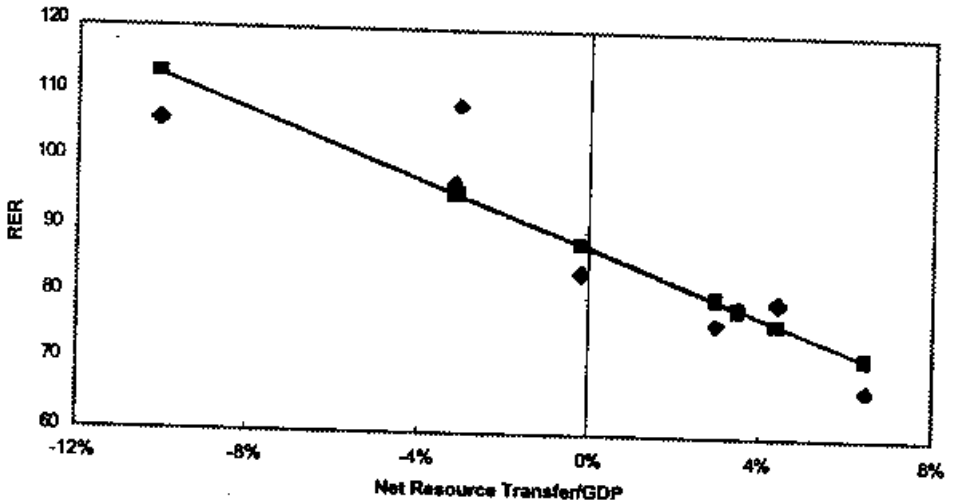


Figure 8P
PERU 1976 - 1983

a) Net Resource Transfer/GDP (based on Balance of Payments Data) and Real Exchange Rate



b) Net Resource Transfer/GDP (based on National Accounts Data) and Real Exchange Rate

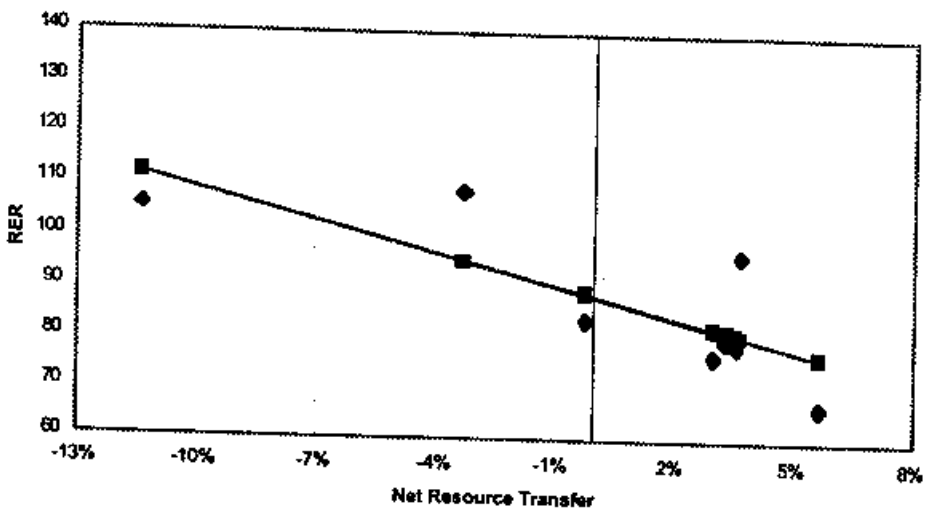
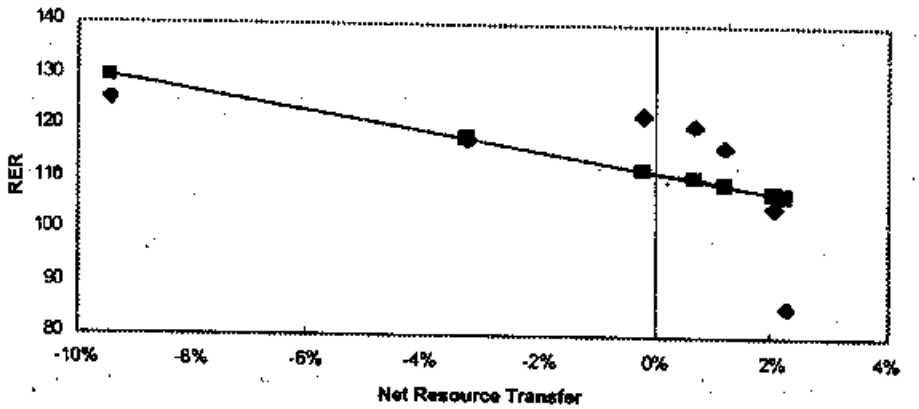


Figure 8M
MEXICO 1977 - 1983

a) Net Resource Transfer/GDP (based on Balance of Payments Data) and Real Exchange Rate



b) Net Resource Transfer/GDP (based on National Accounts Data) and Real Exchange Rate

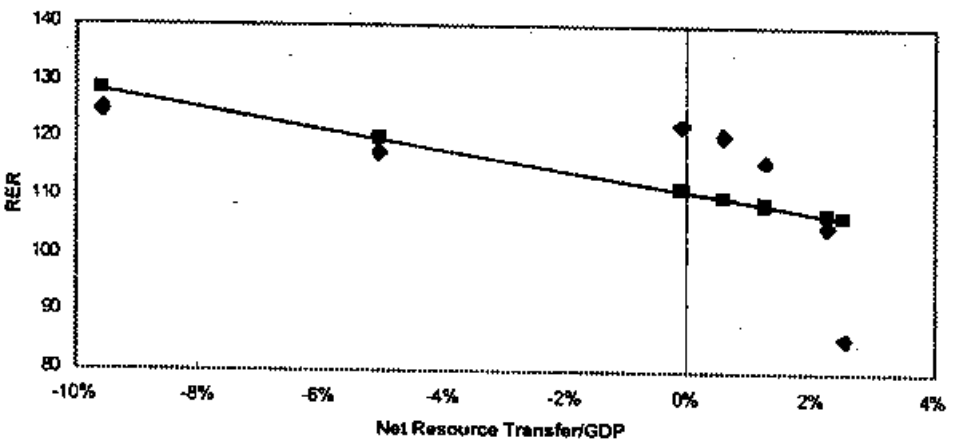


TABLE 1

CHANGES OF RER FROM FALL OF 4 PERCENTAGE POINTS OF GDP

IN THE NET RESOURCE TRANSFER

(RER Change Compares Predicted RER, After Change In NRT

With Actual RER At The Trough Before Crisis)

Episode		Actual RER at Trough (yr.) (1)	Slope Coefficient (2)	Predicted RER With 4% Change In NRT (3) (4)	% Change From (1) to (3)
Mexico	1986-93[bp]	84.9(93)	-785	94.6 + (4 x 7.85) = 116.3	37%
Mexico	1986-93[na]	84.9(93)	-638	94.6 + (4 x 6.38) = 120.1	41%
Mexico	1977-83[bp]	86.0(81)	-191	107.5 + (4 x 1.9) = 115.1	34%
Mexico	1977-83[na]	86.0(88)	-180	107.0 + (4 x 1.8) = 114.2	33%
Argentina	1976-83[bp]	45.0(80)	-1054	42.9 + (4 x 10.5) = 84.9	89%
Argentina	1976-83[na]	45.0(80)	-901	47.5 + (4 x 9.0) = 83.5	86%
Chile	1979-83[bp]	57.0(81)	-157	59.1 + (4 x 1.6) = 65.5	15%
Chile	1979-83[na]	57.0(81)	-158	58.8 + (4 x 1.6) = 65.2	14%
Peru	1976-83[bp]	79.1(81)	-248	79.0 + (4 x 2.5) = 89.0	16%
Peru	1976-83[na]	79.1(81)	-205	81.1 + (4 x 2.1) = 89.5	16%
Peru	1976-83[bp]	67.3(76)	-248	71.7 + (4 x 2.5) = 81.7	25%
Peru	1976-83[na]	67.3(76)	-205	76.9 + (4 x 2.3) = 85.3	27%

bp = based on balance of payments data

na = based on national accounts data

This enhances one's confidence in the inferences to be drawn.

The "prediction" of these regressions for the present situation in Mexico is that a drop of 4 percentage points of GDP in the net resource transfer might entail a rise of about 2/5ths in the real exchange rate. This would bring the RER close to its levels of 1989 and 1990, and also close to those of 1979 and 1982. It would be lower than the levels of 1977, 1978, 1983, 1986, 1987, 1988 and higher than the levels of 1980, 1981, 1984, 1985 and 1991-94.

As a country, Mexico stands in Table 1 somewhere near the middle of the distribution. The regression line for Argentina is much steeper, indicating a much larger RER adjustment per percentage point change in the net resource transfer. On the other side, the regression lines for Chile and for Peru after 1981 are much flatter, suggesting a required adjustment of about half as big as that corresponding to Mexico. Peru's experience of 1976-80 yields predicted adjustments of about the same size as those for Mexico.

In Table 2 a somewhat different experiment is performed. Here no regression data are used. Instead we simply compare the actual changes in RER with actual changes in net resource transfer, starting from the trough point marking the beginning of the adjustment process. The ending point is somewhat arbitrary. Where one can say that the adjustment process was clearly at an end, at least in the sense of being succeeded by a different scenario, there is little problem in setting a terminal date. This was the case for Argentina and Peru. But Mexico and Chile experienced rather protracted adjustment processes, giving us different inferences depending on whether we consider a shorter or a longer period.

TABLE 2

ACTUAL CHANGES IN RER AND IN NET RESOURCE TRANSFER

Episode		Actual RER At Trough (A)	RER After Adjustment (B)	Change in NRT (% of GDP) (C)	Coefficient (D*)	% Change RER (from Trough) with 4% (of GDP) Change in NRT (E**)
Mexico	1981-83	86.0	125.6	12.1	-327	15%
Mexico	1981-87	86.0	161.6	8.6	-879	41%
Chile	1981-83	57.0	78.4	13.1	-163	12%
Chile	1981-86	57.0	115.9	13.9	-424	30%
Argentina	1981-82	45.0	110.9	4.0	-1648	146.4%
Peru	1981-85	76.9	100	8.8	-263	14%
Peru	1976-78	67.8	108.5	9.5	-434	26%

* $D = ((B - A) / C) \times 100$

** $E = (D \times 0.04) / A$

Editor's note: formulas added

Potential doubts were resolved by presenting both. For Mexico the implied change in RER for a 4 points (of GDP) reduction in the net resource transfer is 15% based on the 1981-82 comparison and 41% based on the 1981-87 comparison. For Chile the corresponding implied change in RER is 12% for the 1981-83 comparison and 30% for 1986 as compared to 1981. For each of these two countries the results from Table 1 fall between the limits obtained in Table 2 for the shorter and longer periods, respectively.

V. Drawing Some Inferences From The Analysis To This Point

What can we conclude from what has been reviewed up to this point?

(1) There exists in the real world a genuine economic relation connecting the real exchange rate to the size of the net resource transfer into or out of a country.

(2) This relationship is not exact, even in theory, because it varies depending on how people spend money tht is borrowed (or otherwise transferred). Spending such moneys on tradable goods (typically imports) does not affect the RER, while spending on nontradables has a substantial effect.

(3) Given the theoretical uncertainty, the empirical regularities connecting the NRT and the RER are quite amazing. This is particularly true within a scenario in which movements of the net resource transfer are the dominant causal force at work.

(4) This means that in trying to analyze a situation like the present one in Mexico we have to ask: a) what is likely to be the size of the reduction in net resource transfer to which Mexico will have to adapt over the next few years? and b) what new level of the RER will most likely correspond to the reduced net resource transfer?

(5) The answer to question (a) cannot be based on economic analysis, but it is quite clear that there will be a substantial reduction of the net flow of capital into Mexico. I have taken as a benchmark that this capital flow will be reduced from something over 8% of GDP in 1992 and 1993 to something like 4% of GDP in the near and middle-term future. The exercises that we have done are thus largely based on a reduction in net resource transfer equal to some four percentage points of GDP.

(6) Regression analyses for Mexico suggest that the new level of RER, corresponding to a 4 percentage point change in NRT/GDP, will be between 30% and 50% higher than the pre-crisis low point of the RER. In Table 1 these inferences were compared with comparably based adjustments for other countries as well as for Mexico in the early 1980s. These comparisons were based on regression analyses similar to those used for Mexico.

(7) In Table 2 we dispensed with regressions and relied simply on "before" and "after" comparisons for other episodes and other countries.

(8) In all cases the figures in the last column of Tables 1 and 2 relate to the percentage upward movement of the RER that would be associated with a reduction of 4 percentage points of GDP in the net resource transfer. Our inferences for Mexico, based on Mexican data, lie well within the range of other countries' experiences: They also appear within the range given by our inferences from Mexico's experience of the early 1980s.

(9) From all this I conclude that it is extremely optimistic to think that Mexico will require an RER increase of only 15% to 20% as it adjusts to the present crisis. An adjustment of 30% to 40% seems more likely to be necessary. This would bring Mexico's RER back to roughly where it was in 1989-90.

(10) If the reduction in net resource transfer is significantly more than four percentage points of GDP, the rise in the real exchange rate could easily be greater.

VI. Comparison With Earlier Judgments

At this point it is prudent to introduce an examination of what actually happened during the last four years, in relation to the analysis and judgments that were presented in an earlier paper.[3] That paper was aimed at diagnosing the real exchange rate situation prevailing in Mexico at roughly that time (early 1991). Most of the data series available at the time of its writing ended in early 1990, so we should consider its judgments in that light.

One of the principal conclusions from that paper was the judgment that the real exchange rate then prevailing in Mexico was an "equilibrium phenomenon" -- it was reasonable and appropriate, given the inflow of capital (net resource transfer) that was occurring at that time. It is easy to verify, now with hindsight, that this was indeed the case -- the points from 1989 and 1990 are within five percent of the regression line for both regressions (1) and (2). Looked at in a quite different way, Mexico continued to accumulate international reserves in the years that followed, in an environment of highly liberalized trade -- i.e., the reserve accumulation of 1990-93 can in no way be attributed to an increasing level of trade restrictions; on the contrary,

[3]Arnold C. Harberger, "A Study of Mexico's Real Exchange Rate," (Monterrey, Mexico: Instituto Quantum, March, 1991).

Mexico's important import liberalization measures during this period should have been expected to lead, if anything, to a loss of international reserves as part of the adjustment process.

In one section of the 1991 paper, I attempted to explore certain indicators of whether the real exchange rate might be too low. This section concerned itself with things like construction costs, taxi rides, haircuts, restaurant meals, hotel prices, etc. The conclusion was that at the time -- say the last quarter of 1990 and the first of 1991 these prices were not, on the whole, reflecting a problematically low real exchange rate. One can verify, however, that in the subsequent four years all of these prices (measured in terms of U.S. dollars) increased very significantly with the result that the same type of analysis would have given definite warning signals by 1993 and 1994. These signals would not have indicated that the RER was out of line with the contemporaneous net resource transfers of 1993 and 1994. Rather, they would have warned that transfers of that magnitude (over 8% of GDP) were not sustainable in the long run.

Yet another section of that paper was concerned with assessing the impact that the signing of the NAFTA agreement might have on Mexico's real exchange rate. That analysis stressed the likelihood that the main immediate impact of NAFTA would be to greatly accelerate the flow of capital into Mexico. This would happen, because of the much greater certainty that Mexican goods of virtually all types would enter freely into the United States. This reduction of uncertainty would allow investors to expand their time horizon in taking decisions to invest in real productive capacity. Projects in many different areas, which were judged perhaps too risky before NAFTA, would now become interesting.

Actually, some space was devoted in that paper to inquiring how Mexico might deal with the potential "flood" of new investment that could result from the signing of NAFTA. No

serious proposals were made, but my advice to the Mexican authorities was that they should explore possible mechanisms, not of excluding foreign capital from the Mexican scene or of artificially restricting its total quantity, but of spreading its arrival more smoothly over time -- of converting a potential "flood" of new capital in the wake of NAFTA into a more tranquil steady stream.

It is interesting to note that the actual signing of NAFTA in December 1993 did in fact set off the "flood" of capital to which my 1991 paper adverted. The capital account of the balance of payments in the first quarter of 1994 revealed a net inflow of U.S. $10.8 billion. This was nearly all concentrated in January and February, so that the inflow was taking place at an annual rate of around U.S. $60 billion, or over N$186 billion, or about 18% of GDP. This represented more than double the average rate of inflow of the previous two years.

In point of fact the international assets of the Banco de Mexico increased more than 50% (from N$60.5 billion to N$94.8 billion) in just the three months from November 30, 1993 to February 28, 1994. The nominal exchange rate, far from threatening to break through the top of the band, was near the bottom of the band through December and January and into February. Rumor had it that the authorities were even contemplating modifying the floor of the band downwards, so as to avoid having to issue so many pesos in order to purchase the flood of dollars that was being offered. Indeed, the nominal interest rate on Mexican Treasury Bills (CETES) reached a historic low point of less than 10% during February and the first half of March.

All this changed, of course, with the assassination of Luis Donaldo Colosio, the presidential candidate. It may have changed anyway as a result of the increasing unrest in the

state of Chiapas, but this unrest did not seem to affect markets much during most of the first quarter of 1994.

By the end of April the picture had totally changed. Over $10 billion of international reserves were lost in less than a month in late March and early April. The rate on CETES climbed from less than 10% to over 16% during the same period. The interbank interest rate went from 10% to well over 20%.

Clearly, these events represented a dramatic change of circumstances. The confidence that had characterized January, February and early March was lost, and the chain of events leading to the December crisis had been set in motion.

The 1991 paper concluded with two admonitions. The first (pp. 42-43) was directed to those people, typically associated with industries with an export orientation, who tend to look on a devaluation of the nominal exchange rate as the great solution to all their problems. The admonition is that a devaluation starting from a position of equilibrium in the economy can easily lead to the same equilibrium being restored, just at a new, higher level of prices and costs throughout the economy. Such a devaluation would only have a transitory effect on the real exchange rate; export industries would be stimulated only during a relatively brief transition process. The lesson is that in order for a nominal devaluation to be a sensible solution, something must have happened in order to turn the present situation of the economy into one of disequilibrium.

This is exactly what happened in the Mexican economy between the third quarter of 1993 and the second quarter of 1994. The situation of, say, September, 1993 was one of equilibrium at the old real exchange rate. Then, with the signing of the NAFTA accord, a disequilibrium

was created by a great "flood" of capital inflows, thus would inevitably lead to a new equilibrium exchange rate that was substantially lower than the prevailing one. This was revealed in the tendency of the nominal exchange rate to go to the bottom of the band and in the huge accumulation of reserves that occurred from December through February.

But then, all of a sudden the situation changed dramatically in the other direction. Instead of capital flowing in at the rate of 18% of GDP per year, as in January and February, much private capital (Mexican as well as foreign) started to flee. The country no longer faced the problem of how to absorb a huge increase in the rate of capital inflow; rather, the question now became one of adapting to a large drop in that rate. By now it is clear that this drop is significant and will likely last for several years. Now the real exchange rate that was once in equilibrium has been turned into a disequilibrium rate, and Mexico is in the process of seeking a new equilibrium. The devaluations of recent months are an integral part of that process.

The second admonition of the March, 1991 paper (pp. 44-45) warned against having a blind faith that, under a fixed exchange rate, or tablita, or a narrow band such as that implemented by Mexico over the last few years, an automatic mechanism will always work to bring about the necessary adjustments of the real exchange rate. There do indeed exist in the economy forces that tend to move it to a new equilibrium whenever an old one is disturbed. But these forces do not work equally well in both directions. Recall that our definition of the real exchange rate is $(E/\bar{p}_d) \times \bar{p}^*$. The exchange rate systems of which we are speaking either fix the nominal exchange rate (E) totally, or move it along a prefixed path (the tablita), or confine it to a narrow band. This precludes the economy from achieving any major adjustment of the RER by way of movement in E. Hence all or most of the adjustment must come from $\bar{p}_d$.

For a country to adjust to a big capital inflow, the real exchange rate must move downward. This happens relatively easily as $\bar{p}_d$ moves upward. This is what has been occurring in Mexico over recent years, and what occurred in many countries of Latin America between 1979 and, say, 1981.

It is much more difficult, however, to achieve an upward adjustment of the real exchange rate via movements in the general price level, $\bar{p}_d$. For in this case the requirement is for the general price level to go down -- at the very least, to go down in relation to the level of international prices, $\bar{p}^*_f$. Countries have successfully managed modest upward adjustments of the real exchange rate under systems in which the nominal rate was substantially fixed, but I know of no case in which a major upward adjustment was successfully made.

Chile (1981-82) is a notable example of what happens when a country tries to rely on an automatic adjustment process to bring about a major upward shift of the RER, under a system of fixed (or substantially fixed) exchange rates. What happened there was that the downward pressure on the domestic price level found its outlet not in lower prices but instead in greatly increased unemployment. Tragically, unemployment rose from about 8% in June of 1981 to well over 25% in June of 1982 as the country tried to bring about a major upward adjustment of the real exchange rate without any help from an upward movement of the nominal rate.

> Large drops in the equilibrium RER are easy to handle with a fixed exchange rate or tablita .... It is when a significant real devaluation is called for that the trouble begins; for internal price deflation is the only path to a devaluation of the real exchange rate, if the nominal rate is held fixed.
>
> [One must] recognize that important changes in RER equilibrium can and do in fact happen. Indeed, in my interpretation they have, since the pacto, with the equilibrium RER falling and being accommodated by added inflation. What must be recognized is the fact that the equilibrium real exchange rate can also

> move sharply upward. That is the situation that one must recognize in a timely way. (Harberger, 1991, p. 45)

That represents a call to be on the alert for circumstances such as those that struck the Mexican economy in 1994. That call did not arise out of prescience, nor out of any foreboding of impending troubles. Rather, it cam quite naturally out of an understanding of the basic mechanism by which the equilibrium real exchange rate is determined. That mechanism has been the principal focus of this paper so far. A deep understanding of it is essential if Mexico is to be guided to its new economic equilibrium at minimum cost to its economy and its society.

VII. Implications For The Nominal Exchange Rate

As we shall see later, it is not at all easy -- indeed, it is better described as impossible -- to take a given expected or required real devaluation and derive from it the amount of nominal devaluation that will in fact occur in order to bring that real devaluation about. For example, if one starts with $E = 3.4$ and $\bar{p}_d$ and $\bar{p}^*$ both equal to 100, one can in principle generate a 20% real devaluation by moving E to 4.08, keeping both price levels at 100, or by moving E to 6.12 with $\bar{p}_d$ going to 150, or by moving E to 8.16, with $\bar{p}_d$ going to 200 (assuming $\bar{p}^*$ stays constant). Which of these events would occur in reality depends in part on the strength and wisdom of government policy, and in part on the dynamics of price and wage formation in the private sector of the economy. These elements are not at all easy to predict; indeed, some would say that predicting them requires insights and tools well beyond those that economic science provides.

Thus, one should not consider the exercises of this and the subsequent section as in any way constituting or implying predictions of E, the nominal exchange rate. Rather, they represent explorations of the forces at work in determining E.

In this section we deal with the respective roles that the level of the nominal wage rate (w) and the level of the nominal exchange rate (E) play in influencing the general price level ($\bar{p}_d$). Speaking broadly, and of major movements, one can say that the general price level is composed of two classes of components -- the prices of tradable components (p_T) on the one hand, and those of nontradable components (p_N) on the other. Indeed, one can think of expressing the overall index as a linear combination of its tradable and nontradable components. Thus we have:

(3) $$\bar{p}_d = ap_T + (1-a)P_N.$$

One should realize that these are not necessarily the prices of specific goods and services. For example, the price of a taxi ride incorporates both tradable components (e.g., gasoline) and nontradable ones (the services of the driver). Likewise, a restaurant meal involves food, which consists mostly of tradable goods, plus services, which are on the whole nontradable. Thus as we combine the prices of different real goods and services to form the general index $\bar{p}_d$, as in (3), we will find that parts of certain prices will appear in p_T, and the other parts in p_N.

Now to gain an understanding of the process of price formation during a major RER adjustment such as that which Mexico is now going through, the key step is to use the nominal exchange rate E as a proxy for p_T and the wage rate w as a proxy for p_N. This yields

(4) $\bar{p}_d \approx aE + (1-a)w.$

This relationship is, as indicated, only approximate, but it can serve well in the analysis of episodes like the present, when major movements in E, and probably quite significant ones in w, are involved.

The key assumption to be made at this point concerns a. In small open economies generally, I have found the assumption of a = 1/2 to be reasonable. It is important to realize that p_T concerns all tradables, hence should have a larger weight than just imports and/or exports. In an index based on production the weight of tradables would include the production of goods actually exported (e.g., exports of oil) plus the production of goods (e.g., oil products) that are exportable but in fact are used within the country, plus the production within the country of goods (e.g., refrigerators or television sets) that are close substitutes for imports. In a similar way, an index based on final demand would include imports plus the final demand for import substitutes produced in the country, plus the final demand for exportable goods that were not exported but rather used to satisfy home demand. In a broad sense all agricultural, mineral, and manufacturing production would typically qualify as tradable.

Looking at the specific case of Mexico, I feel that setting a = 0.4 is probably closer to the truth than a = 0.5. Hence in the exercises that follow we shall use that number. Table 3 gives different combinations of nominal exchange rates and nominal wage rate indexes, and draws from them their implication for the nominal and real exchange rates.

It would be easy to extend Table 3 to incorporate percentages of devaluation greater than 150%, but it is not my purpose to sow seeds of pessimism or panic. The seeds I want to sow

are those of realism and prudence -- recognizing the facts for what they are, and acting upon them.

Of the various scenarios depicted in Table 3, only those with an asterisk lead to a real exchange rate that is within the range suggested by our earlier analysis. The facts that our measure of the RER has $\tilde{p}_d$ in the denominator, and that movements in the nominal exchange rate E will automatically have a direct impact on $\tilde{p}_d$, create a situation in which, even with no movement in wages, our measure of the RER will necessarily move by a smaller proportion than E.

Table 3 shows how difficult is the task of achieving the sort of movement in the real exchange rate that present (and foreseeable future) circumstances appear to require. With a 50% increment in wages, it takes close to a 150% increment of the nominal exchange rate, just to achieve a real devaluation of some 30%. Looked at from the other side, if the nominal devaluation is going to be kept within the bounds of 100%, then it is essential that nominal wages rise no more than 20 or 25 percent, if a real devaluation as high as 30% is to be achieved.

TABLE 3

ALTERNATIVE SCENARIOS FOR ADJUSTMENT:

NOMINAL AND REAL EXCHANGE RATES

(based on $\bar{p}_d = .4\ p_T + .6\ p_N$)

	Nominal Exchange Rate Index	Nominal Wage Rate Index	General Price Level	Real Exchange Rate	"Efficiency" of Devaluation (= % Real Dev. % Nom. Dev.)
	(1)	(2)	(3)	(4)	(5)
Initial Position	100	100	100	100	
50% Nominal Dev.	150	100	120	125	.50
(E = 5.1 pesos	150	110	126	119	.38
per dollar)	150	120	132	114	.28
100% Nominal Dev.	200	110	146	137*	.37
(E = 6.8 pesos	200	120	152	132*	.32
per dollar)	200	130	158	127	.27
	200	150	170	118	.18
150% Nominal Dev.	250	120	172	145*	.30
(E = 8.5 pesos	250	150	190	132*	.22
per dollar)	250	180	208	120	.13
	250	200	220	114	.09

VIII. On The "Efficiency" of Devaluations

The last column of Table 3 shows the "efficiency" of devaluation in each of the examples presented. This is a very simple concept, representing the ratio of real devaluation to nominal devaluation. The numbers in column (5) carry a very strong message -- how extremely difficult it is to reach an efficiency of devaluation, even as high as one third (Note that only three of the cases explored there yield an efficiency rate of more than one third).

In this section we present some actual experiences with respect to the efficiency of real-world devaluations. It should be clear that, just as the real exchange rate and the general price level tend to be in continuous movement through time, so the concept of the efficiency of devaluation will yield a different measure as one moves month-by-month through a period following a nominal devaluation, or more generally as one moves through time in a process of adjustment that may itself involve continued movement of the nominal exchange rate. Thus it is that in measuring the efficiency of devaluation for particular episodes, we have to pick one or more points in time for making the comparison. In building Table 4 we have done two things to make the comparison more relevant, and to free it insofar as possible from arbitrariness. In the first place, we have made the comparison on the basis of annual average data, thus focusing on significant stretches of time and ironing out short term oscillations in the data. In the second place, we have, for the cases of Mexico and Chile, made two different comparisons for a single adjustment process in each country -- one dealing with the relatively short term (two years) and the other dealing with a longer span of five or six years.

TABLE 4

MEASURES OF THE "EFFICIENCY"

OF ACTUAL DEVALUATION PROCESSES

Country/Period		Nominal Devaluation (%)	Real Devaluation (%)	"Efficiency" Coefficient
Mexico	1981-83	+390%	+46%	.118
Mexico	1981-87	+5662%	+88%	.016
Chile	1981-83	+102%	+38%	.373
Chile	1981-86	+395%	+103%	.261
Argentina	1980-82	+1311%	+147%	.112
Peru	1982-83	+ 133%	+9%	.068
Peru	1976-79	+303%	+58%	.191

Nominal Devaluation data based on International Financial Statistics, year average nominal exchange rate series (rf or wf).

It is clear from Table 4 that high "efficiency" is not easily achieved in practice. The most successful case, both for shorter-term and for longer-term "efficiency", was that of Chile. It is to be hoped that the Mexican authorities will be as successful in implementing the present real exchange rate adjustment as was the Chilean economic team in the wake of the 1982 devaluation.

IX. On Inflation, Money and Credit

The purpose of this section is to review some of the main impacts that inflation has on the economy, and on the financial sector in particular. Perhaps the most characteristic of such impacts is the effect that inflation has in inducing people to hold lower real money balances. The way the effect functions is very clear, to the extent that money is held in the form of cash, or in the form of demand deposits paying little or no interest (compared with the size of the "tax" which inflation imposes on the holding of such deposits). Inflation simply taxes away a part of the real purchasing power represented by such balances, so it should be no surprise that the demand for them declines as inflation rises.

Before entering into any further analysis, we should pause to make two clarifying observations. The first is that the relevant inflation tax influencing the behavior of economic agents is the expected rate of inflation for the future period(s) over which one expects to be holding money balances. Much has been written about how expectations of inflation can or might be formed. One broad principle that has considerable support from previous studies is that people build on what they remember, but the importance assigned to a given event or observation declines as that event recedes farther and farther into the past. This leads to the use of a weighted average of past inflation rates, with the weights declining as one goes farther back

in time. Some authors choose to experiment with different weighting patterns, allowing the data to influence the choice. I have tended to resist this approach, partly because there are many different variables that the expected rate of inflation helps explain; allowing the data to choose the expected rate could easily yield unacceptable results -- a different expected rate of inflation for each such variable. Moreover, allowing the data to choose sometimes leads to anomalous results in which highly implausible weighting patterns turn out to produce the best statistical "fit". Should one them place credence in such results?

My preference is to work simultaneously with two alternative approaches. The first is to simply use the actual rate of inflation of the period in question, with no remembered input from the past. The second is to impose an arbitrary but highly plausible weighting scheme. My choice (which is both simple and roughly compatible with evidence from other sources) is to give 40% of the weight to the current year's inflation, 30% to the previous year's, 20% to the year before that, and 10% to the inflation of three years ago. Thus we have

(5) $$p = 0.4\, p_t + 0.3\, p_{t-1} + 0.2\, p_{t-2} + 0.1\, p_{t-3}$$

where p = the rate of "expected inflation" governing people's behavior during year t

p_t = the rate of actual inflation during year t. This is obtained from International Financial Statistics data on the Consumer Price Index of each country (P_t) representing the average price level prevailing during the year t. p_t is calculated by taking $(P_t - P_{t-1})/P_{t-1}$.

The use of the concept of expected inflation is justified by the results. The empirical relationships shown in Figures 9 to 12 tend in most cases to become sharper, sometimes

significantly sharper, as we move from an actual inflation concept to an expected inflation concept. (If we were to engage in the "fine-tuning" that we have purposely avoided, this sharpening effect would be enhanced, but at the cost of the problems or dilemmas alluded to earlier.)

The second observation concerns our use of the ratio of money to GDP as our measure of real cash balance holdings. In some ways an econometric relationship would be preferable -- relating real cash balances to a set of determining variables such as real GDP, the expected (or actual) rate of inflation and perhaps a time trend. We have here stuck with the simple ratio because of the ease with which the basic data can be visually communicated. If the underlying relationships are thought of as demand functions for real cash balances, this procedure in effect imposes an income elasticity of one. To the degree that this assumption misses the mark, it is likely to be on the low side -- i.e., the true income elasticity of demand is likely to be greater than one rather than less than one.

The choice of working with the simple ratio of money to GDP stemmed in part from my belief that in the countries treated here changes were taking place over the periods being examined which were more complex than a simple time trend; these changes would tend to cloud any econometric relationship being fitted, just as they cloud the simple scatter diagrams that we present. The advantage of the scatter diagrams is that they reveal the facts as they are, and also invite direct discussion and analysis about the changes that were taking place.

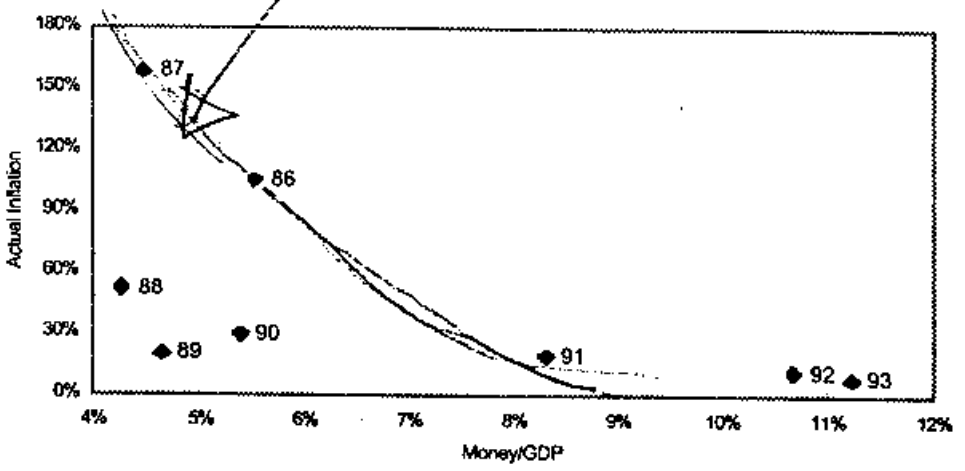
Figures 9 and 10 show the relationships in question for Mexico during the period 1986-92. They reveal very clearly the impact of inflation in inducing people to hold lower real cash balances.

It is evident from comparing Figure 10 with Figure 9 that a closer "fit" is obtained when real cash balances are measured by Money/GDP than when they are measured by (Money plus Quasi-Money)/GDP. The reason for this is that interest rates are usually paid on time and savings deposits, etc. These sometimes compensate the expected inflation to a considerable degree, other times not. The result is a net "inflation tax" (actual or expected rate of inflation minus the interest rate received) which is not by any means collinear with the inflation measure used, yet which is itself very difficult to measure (largely because of our ignorance about the actual interest rates paid, which differ for different components of the aggregate "Money plus Quasi-Money"). This is the principal explanation of the wider scatters of Figure 10 as compared to Figure 9.

Why then present Figure 10 at all? The reason is that Money plus Quasi-Money encompasses the bulk of the liabilities of the consolidated banking system of a country. Its principal assets are: a) Net Foreign Assets, b) Credit to the Public Sector, and c) Credit to the Private Sector. We believe that bank credit to the private sector plays a very important role in facilitating economic activity. In particular, when a crisis such as Mexico's present one strikes, its effects can be seriously exacerbated by a sharp contraction in private sector credit as a fraction of GDP. Unfortunately, that is part of the prospects for Mexico at the present time.

Figure 9
MEXICO 1986 - 1993

a) Money/GDP and Actual Inflation



b) Money/GDP and Expected Inflation

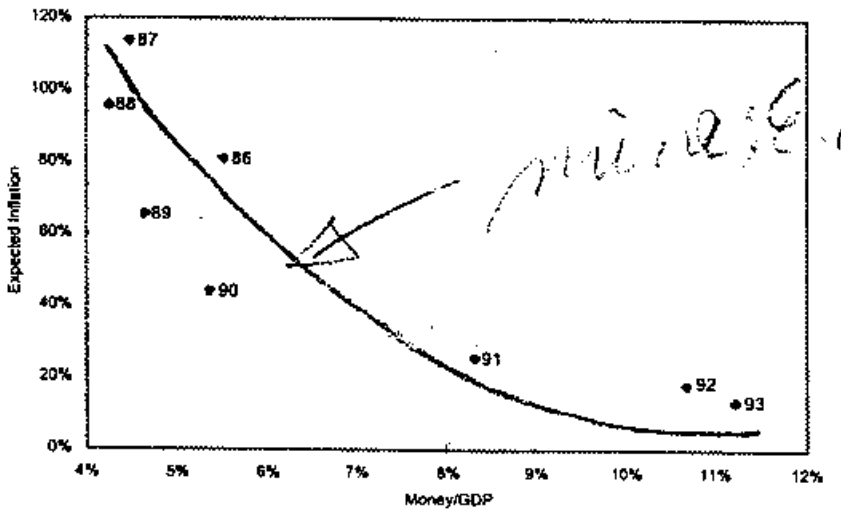
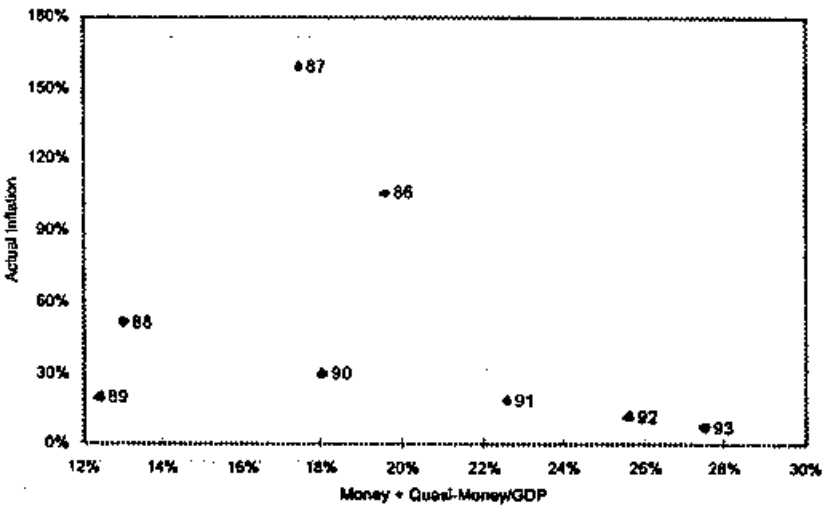
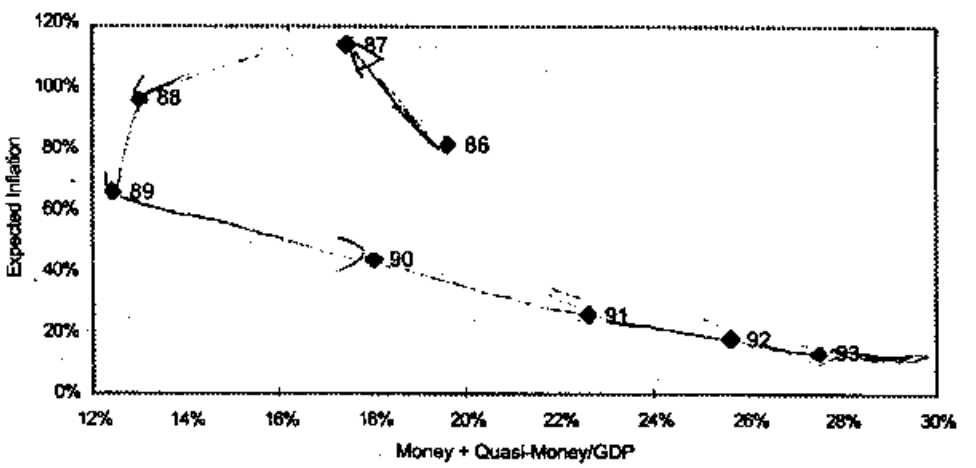


Figure 10
MEXICO 1986 - 1993

a) Money + Quasi-Money/GDP and Actual Inflation



b) Money + Quasi-Money/GDP and Expected Inflation

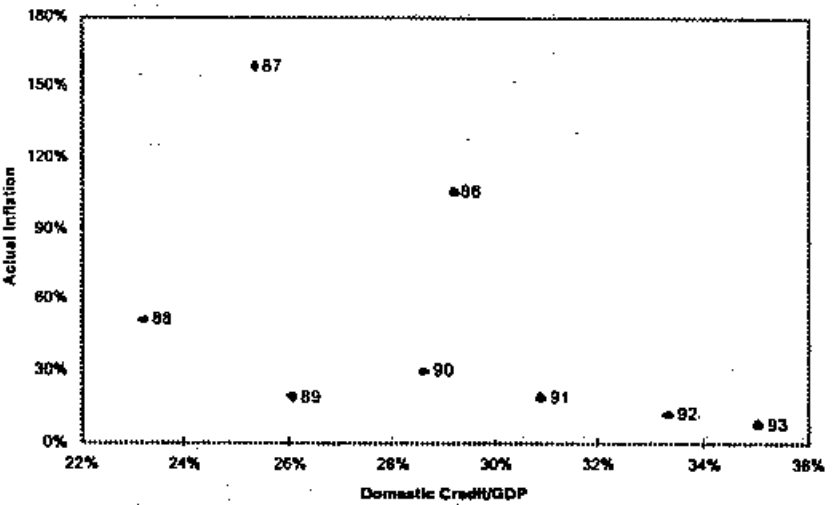


Figures 11 and 12 show the rates of GDP of total domestic credit (i.e., that to both public and private sectors) and of private sector credit, as functions of the actual and expected rates of inflation. The negative slope of the relationships is evident in all the panels, but I would draw particular attention to the lower panel of Figure 12, showing Private Sector Credit/GDP as a function of expected inflation. This panel displays in unequivocal fashion the relationship to which I refer.

I must make clear that the relationship shown in Figure 12 is not what we call a "behavioral relationship", reflecting how a particular set of economic agents reacts to certain stimuli. The demand for real cash balances is such a behavioral relationship, but in order to get from there to the relationship between the rate of inflation and private sector credit/GDP one has to go through the mechanics of the consolidated banking system. An increased rate of expected inflation causes people to reduce their real cash balances, both of Money/GDP and of (Money plus Quasi-Money)/GDP. The latter reduction must be more-or-less matched by a reduction in the assets of the consolidated banking system. In Mexico's case at the present time this almost necessarily means a sharp reduction in credit to the private sector, simply because this credit accounts for close to 90% of the total assets of the consolidated system (including development banks). This means that when the demand for money balances is reduced because of an increase in the expected rate of inflation, credit to the private sector will undergo a significant cut, if for no other reason than the fact that other assets are not important enough to bear a major share of the required reduction.

Figure 11
MEXICO 1986 - 1993

a) Domestic Credit/GDP and Actual Inflation



b) Domestic Credit/GDP and Expected Inflation

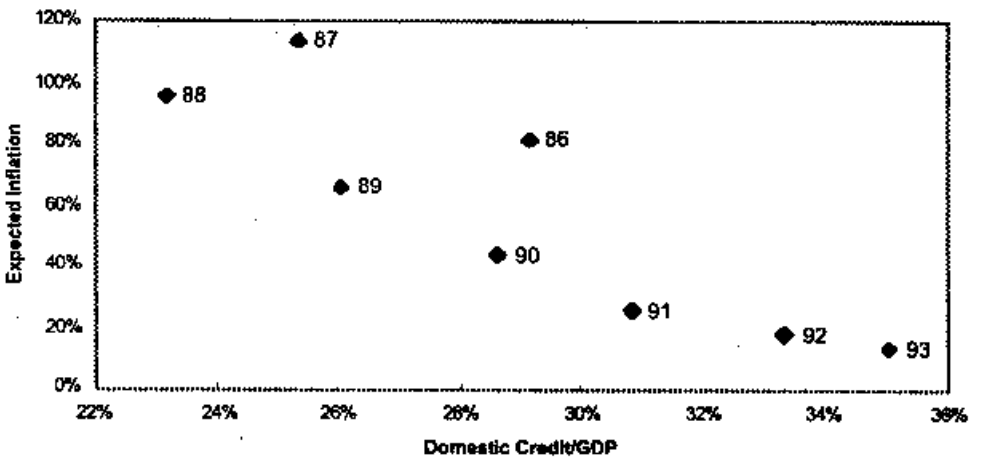
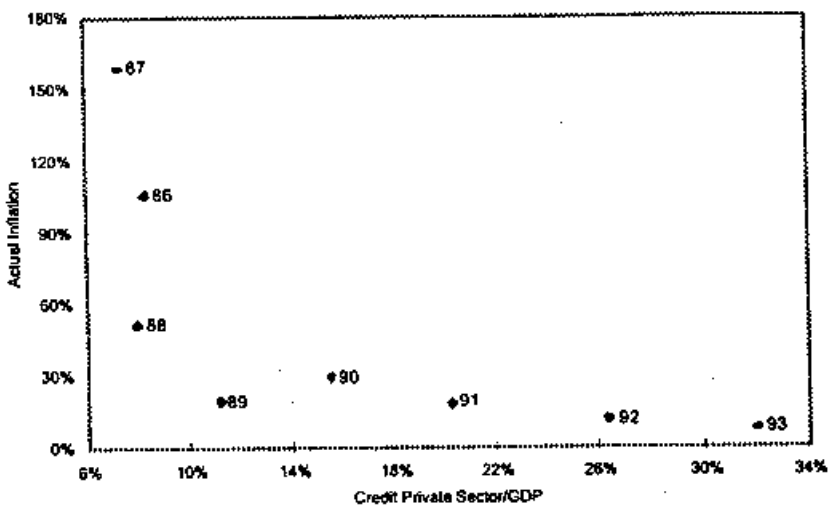
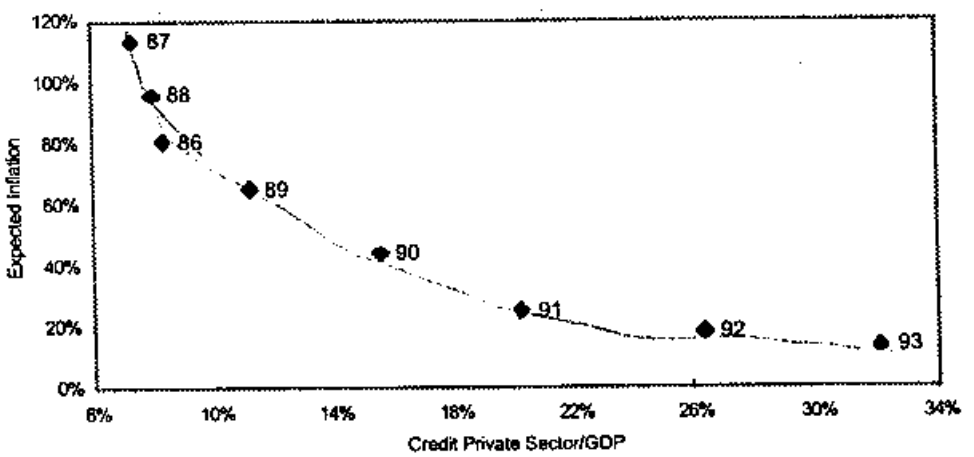


Figure 12
MEXICO 1986 - 1993

a) Private Sector Credit/GDP and Actual Inflation



b) Private Sector Credit/GDP and Expected Inflation



There follow a series of graphs (Figures 13A, 13C, 13P, and 13M) which show, for the same periods covered in our earlier analysis of real exchange rates, the relationships of (Money plus Quasi-Money)/GDP and of Private Sector Credit/GDP, each with the expected rate of inflation. These graphs show that the type of connection seen in Mexico's recent data between inflation and money holdings on the one hand, and through money holdings to private sector credit is not confined to the recent Mexican experience but is reflected in the data of other countries and periods.[4]

X. Some Comments on Interest Rates

No observer of the current Mexican scene can fail to be startled by the incredibly rapid rise in nominal interest rates in the wake of the December 1994 crisis. The rise is even more notable when the period of January and February, 1994 is taken as the base (recall that in those months the nominal rate on Cetes hovered around 10% per annum).

The Role of Expectations

In discussing interest rates it is wise to distinguish between two types of forces working on them: a) expectations of inflation and/or of changes in nominal exchange rates, and b) changes in the relative abundance or scarcity of real credit.

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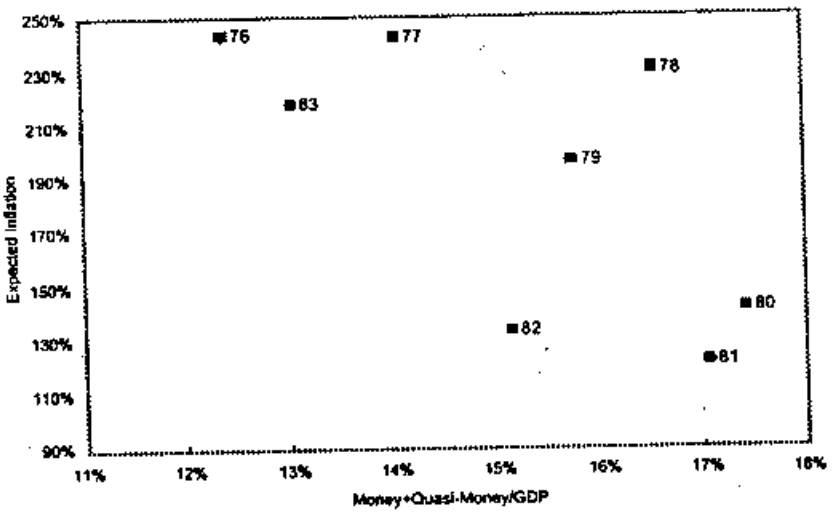
[4]In measuring the relationship of monetary and credit variables to GDP, an attempt was made to reflect averages over the entire year. With this in mind, and recalling that inflation itself creates a bias toward the latter part of the year of nominal data are used, we calculated real money balances at the end of December, March, June, September and December, and divided the result by five. This gave us average real balances over the year. The reported ratios to GDP are the ratios of average balances, thus calculated, to real GDP for the year. Care was taken to be sure that the base year for the price index used in obtaining real balances was the same as the base year for real GDP. A similar procedure was used in calculating the ratios to GDP of domestic credit and credit to the private sector.

Figure 13A
ARGENTINA 1976 - 1983

a) Money + Quasi Money/GDP and Expected Inflation



b) Private Sector Credit/GDP and Expected Inflation

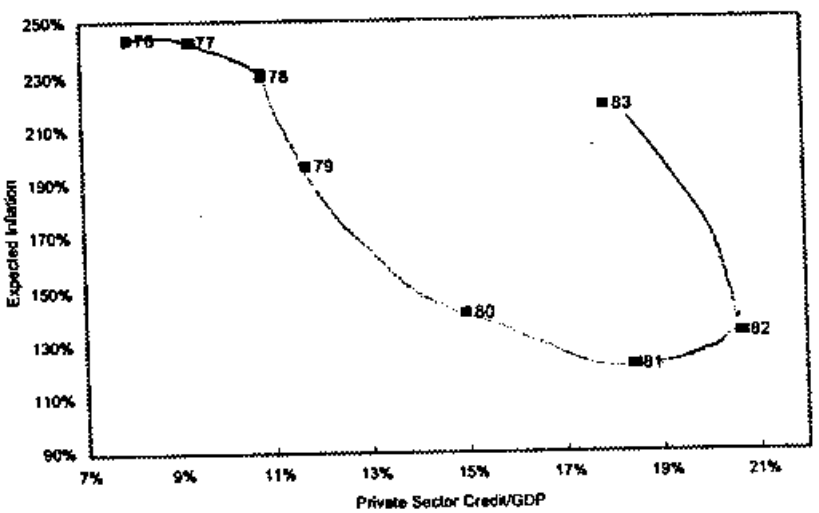
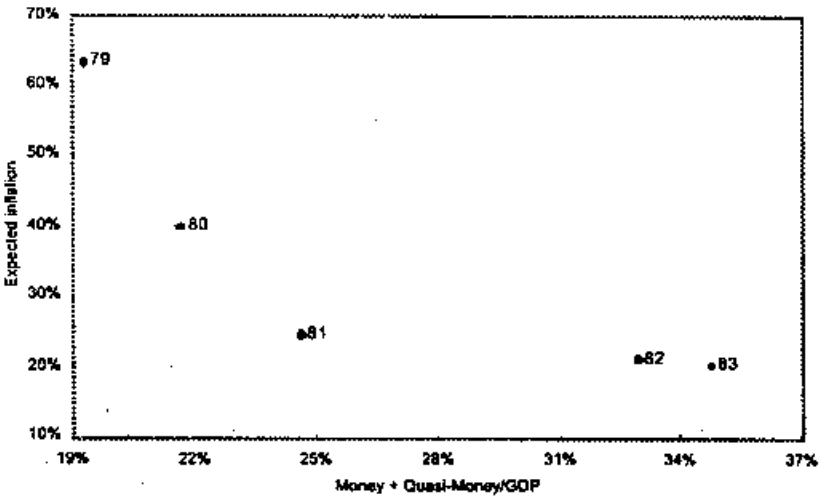


Figure 13C
CHILE 1979 - 1983

a) Money + Quasi Money/GDP and Expected Inflation



b) Private Sector Credit/GDP and Expected Inflation

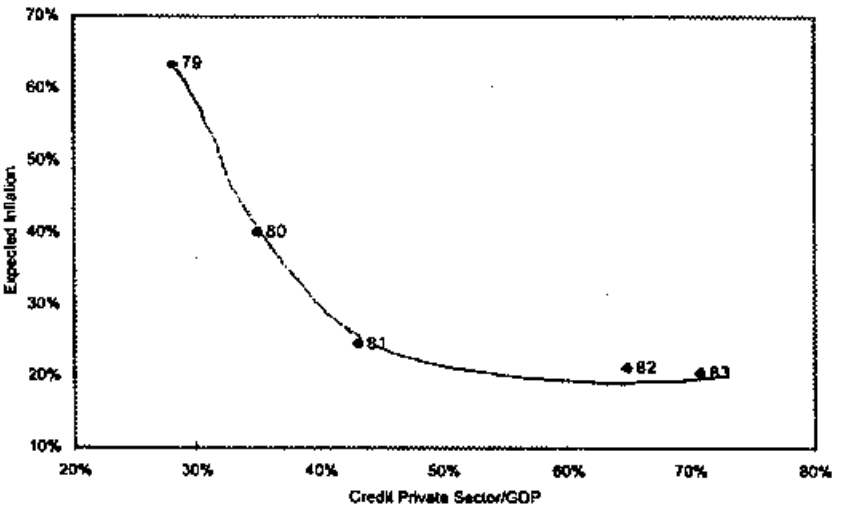
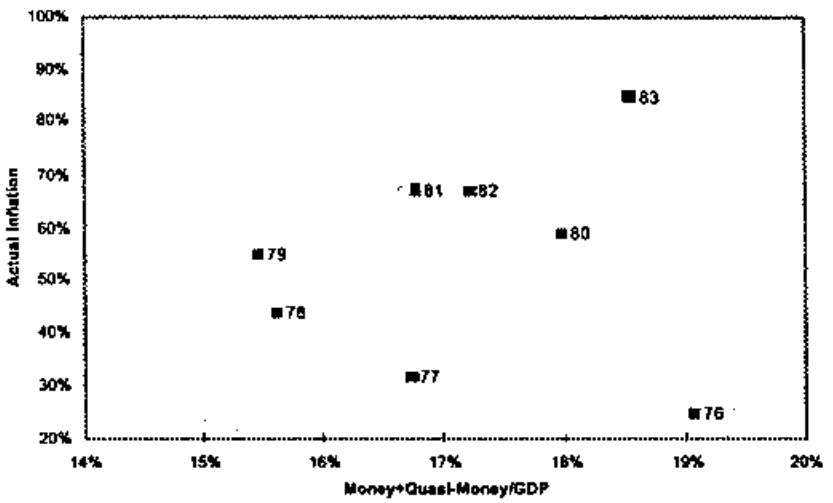


Figure 13P
PERU 1976 - 1983

a) Money + Quasi Money/GDP and Expected Inflation



b) Private Sector Credit/GDP and Expected Inflation

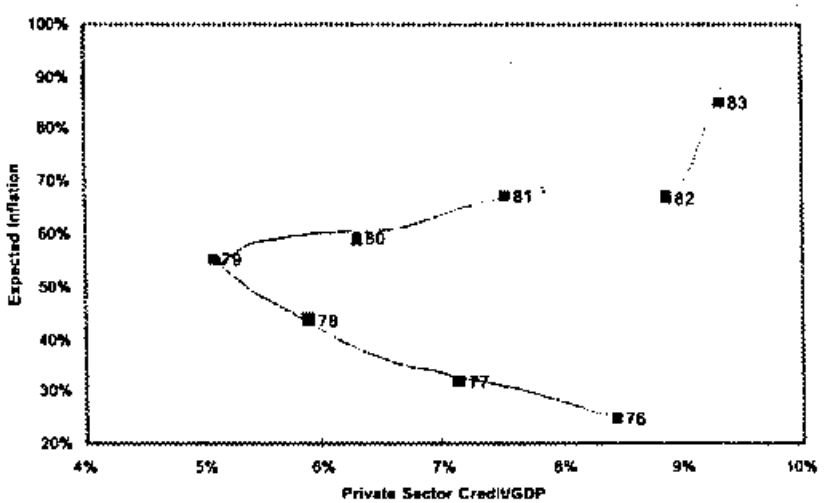
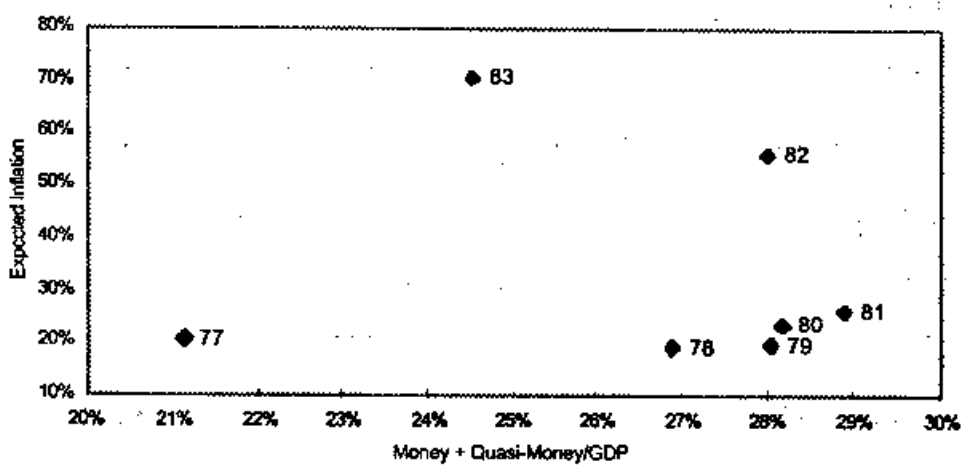
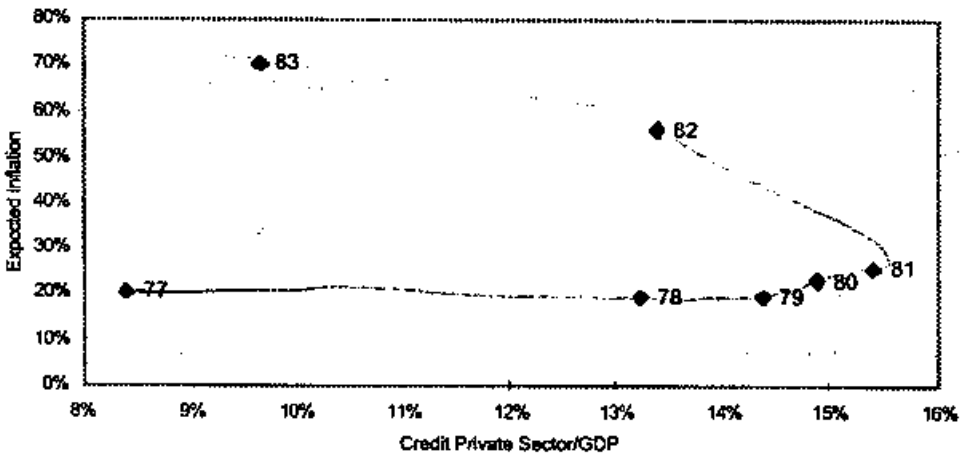


Figure 13M
MEXICO 1977 - 1983

a) Money + Quasi Money/GDP and Expected Inflation



b) Private Sector Credit/GDP and Expected Inflation



I have no doubt that expectational considerations have been responsible for most of the rise in nominal interest rates up to the present time (April, 1995). These considerations come into play immediately when great uncertainty is introduced with respect to the immediate future path of nominal exchange rates and of the general price level. The pressure here comes invariably from the side of lenders who correctly consider that their alternatives include holding their money in the form of dollars (or DM or yen). They also can simply shift to real assets of various kinds (including stock market equities), either at home or abroad.

The arithmetic of uncertainty can be mind-boggling. For simplicity, consider that a potential lender (or bank depositor) is looking to U.S. dollar balances as the relevant alternative. Now consider that, starting from a given point, a probability of 25% is assigned to an increase of 100% or more in the nominal exchange rate. This by itself means that holding a U.S. dollar has an expected yield of at least 25% in Mexican pesos. Say that side-by-side with the above probability there is a 75% probability that the exchange rate will rise by 50%. These two points give an expected minimum yield of at least 62.5%. [(0.75) x (0.50) + (0.25) x (1.00)].

The "remedy" for this situation is to allow the nominal exchange rate to rise to the point where further significant rises are unlikely. This remedy has a good potential if the authorities are in substantial control of both the political and economic situations, for then a high exchange rate (both nominal and real) might even generate an expectation that the nominal exchange rate would fall over the near-term future. The case is not so easy if a significant probability (say 15 or 20 percent) is assigned to a potential massive breakdown of political or economic discipline (or both). That lurking expectation will generate enormous pressure for the nominal interest rate to exceed by a substantial margin the level that is to be expected if no breakdown ensues.

Assuming all goes well, so that there never is a breakdown, borrowers will nonetheless very likely end up bearing the cost of a huge premium in actual (ex post) real interest rates paid -- the "contingency cost" of the breakdown that we are here assuming did not eventuate.

Unfortunately, foreign exchange is not the only alternative that is relevant to the setting of interest rates. Real assets are also part of the spectrum of possibilities. If the Mexican price level is expected to rise, potential lenders/depositors will also consider the option of holding real assets within Mexico. Once again the prospect of a possible general breakdown of political and/or economic discipline adds to willingness of economic agents to hold resources in the form of real assets rather than making them available (either directly or through financial intermediaries) as loanable funds in the Mexican credit market. This pushes up the real interest rates that borrowers will have to pay, especially in the (more likely) eventuality that no general economic or political breakdown takes place. They (the borrowers) will in this case end up paying the lenders the insurance fee (contingency cost) for a general breakdown, without that breakdown actually occurring.

A Possible Solution: Indexed Deposits and Loans

There is a possible solution for the problem just outlined, which emerges as a consequence of contingencies that entail extreme outcomes (very high exchange rates and/or very high price level moves). The solution is to deal with such possibilities via contingent contracts. I have in mind, quite specifically, loans and deposits expressed in purchasing-power units. Chile in particular has had many years of successful experiences with a unit denominated the UF (Unidad de Fomento). There are deposits in UF, loans in UF, bonds in UF, mortgages in UF. For all practical purposes, the UF may be considered the unit in which Chilean tax

liabilities are accrued, calculated, and paid. And the use of such a unit seems not to have placed any serious obstacle in the path of a very successful growth experience (ten years averaging over 6% in real terms) or in the way of a gradual decline in the rate of inflation from over 30% in 1985 to less than 10% in 1994.

The virtue of the UF is that it provides a meaningful store of value for anyone who supplies funds to the Mexican market. High nominal interest rates will be paid in the event of a general breakdown of discipline and a consequently high inflation rate. But they will not be paid in the event that the situation is kept under reasonable control and only moderate inflation eventuates. In this respect loans made in units like the UF have a distinct advantage over loans made in nominal pesos, because interest rates on the latter do not vary according to which contingency turns out to be true. They accordingly are bound to contain a substantial premium to cover the possibility of serious economic and/or political breakdown.

I was pleased to hear recently of the introduction in Mexico of the UDI (Unidad de Inversión), which is the Mexican counterpart of the Chilean UF. This is welcome news even if the new unit has only a restricted range. I would urge, however, that the range of the UDI be made as broad as possible, within the financial sector. In particular, its coverage should extend to permitting (even encouraging) time and savings deposits expressed in UDI, and, most especially, bank loans expressed in UDI.

Table 5 illustrates the point being made. In it the prospects are simplified into a "good contingency" of 4% per month inflation or "bad contingency" of 16% per month inflation. The good contingency is assumed to have a probability of 75%, and the bad contingency one of 25%. Thus, merely to cover themselves for expected inflation, lenders must be compensated in

the amount of 7% [= (0.75 x 4%) + (0.25 x 16%)] per month. To this must be added a real interest rate and a margin of intermediation. Both are here set at 1% per month, for purposes of this example.

The combination of these assumptions leads to a nominal interest rate of 9% per month, independent of which contingency ultimately eventuates. But this implies that if the good contingency is what actually occurs, borrowers will have paid a real interest rate of 5% per month, while if the bad contingency turn out to be the case, the ex post real interest rate will have been a negative 7% per month. This is no way to run an economic system!!!

The story is much more acceptable in the case where the loans are expressed in UDI's. Here the real interest rate is the same regardless of which contingency emerges. In the example, depositors would get 1% per month real interest, borrowers would pay 2% per month, and banks would get a margin of intermediation equal to 1% a month.

If I were to modify the above example to fit the Mexico of 1995 a bit better, I would probably add a premium for default risk to the marginal of intermediation. That might bring the real interest rate on bank loans expressed in UDIs up to 2 1/2% or 3% per month -- which is very high but nonetheless more plausibly compatible with the survival of firms than real interest rate of 5 1/2 or 6 percent per month, which would be the real rate under the good contingency in our example, adjusted for default risk premium, or than the real rates actually experienced by Mexican firms in early 1995.

TABLE 5

Interest Rates With and Without Indexed Credit

(A Hypothetical Example)

	Good Contingency	Bad Contingency
Inflation Rate Per Month	4%	16%
Probability of Contingency	.75	.25
Real Interest Rate Per Month (Supply Price)	1%	1%
Margin of Intermediation	1%	1%
Nominal Interest Rate Per Month On Nominal Loans (= 0.75 x 6% + 0.25 x 18%)	9%	9%
Real Interest Rate if Good Contingency Eventuates	5%	-7%
Real Interest Rate of Loan Expressed In UDIs	2%	2%

The Real Scarcity of Credit

We now turn to the special circumstances highlighted in the previous section. Quite independently of expectational considerations, real interest rates are virtually certain to be high in Mexico for the coming several years. This is practically guaranteed by the fact that an increased inflation rate will induce a significant fall in real monetary balances (both absolutely and relative to GDP), and by the fact that capital flows from abroad will not reach anywhere near their levels of recent years.

I believe that these conclusions apply independently of the monetary and credit arrangements that Mexico may adopt for the near future. But I believe that the reduction in real cash balances will be smaller if Mexico adopts indexed units for time and savings deposits than if it does not. Likewise, I believe that the flow of capital into Mexico will suffer a less sharp fall if UDI deposits are allowed than if they are not. The principle involved is that some, perhaps most of the incremental UDI deposits will come at the expense of nominal peso deposits that would be there in any event, but the likelihood is that an important segment of UDI deposits would be an alternative to fleeing from peso deposits. That is, there will be less of a flight from bank deposits if the UDI option is allowed, than if it is not permitted.

Correspondingly, and apart from the problems connected with expectations treated in the previous section, there would also be lower real interest rates on bank loans if UDI deposits are permitted, simply because there would be a greater total amount of loanable funds present in the marketplace.

XI. Perspectives On The Year 1994

In this section we attempt to put in perspective the answers to two questions: 1) What really happened? and 2) Who, if anybody, committed important errors (of judgment or of policy)?

January and February 1994

We have already discussed (see Section VI) the beginning of 1994, but the message is so important that it bears repeating. None of the problems that emerged later in the year was visible in these early months. The nominal exchange rate oscillated near the bottom of the band (3.11 N$ per dollar in December, January, and February). The rate of interest in 28-day CETES, which averaged 16.44% during the first half of 1993 and 13.59% during July through October, and which stood at 14.38% in November, fell to 11.78% in December, to 10.52% in January and to 9.45% in February of 1994. These were the lowest nominal interest rates seen in Mexico for many years.

Both the exchange rate and the interest rate experience of early 1994 were the result of increased flows of capital into the country. The capital account of the balance of payments went from an inflow of $6.9 billion in the third quarter of 1993, to one of $8.1 billion in the fourth quarter and to $10.9 billion in the first quarter of 1994 (concentrated, as indicated earlier, in the months of January and February).

Much of the incremental capital ended up as extra foreign assets of the Banco de Mexico. As noted earlier, these grew from N$60.5 billion at the end of November, 1993 to N$94.8 billion at the end of February, 1994. These are circumstances which could easily have resulted in a substantial inflationary stimulus to the economy. In point of fact, however, most of the potential inflationary stimulus was absorbed by the banking system. At the level of the Banco de Mexico, while its net foreign assets were growing by N$34.8 billion, the monetary base grew by only N$3.8 billion (from N$40.0 billion at the end of November to N$43.8 billion at the end of February). At the same time M_2 grew by even less, from N$364.9 billion at the end of November to N$366.1 billion at the end of February. It is clear that the huge accumulation of international reserves by the Banco de Mexico was, for all practical purposes, fully sterilized.

March and April, 1994

The assassination of Luis Donald Colosio took place on 23 March, 1994. This was surely the single event that triggered the reversal of Mexico's economic fortunes during the rest of 1994, though there can also be no doubt that the continuing unrest in Chiapas also played a significant role.

The attack on the peso that followed the assassination led to an abrupt drop in international reserves. The net foreign assets of the Banco de Mexico fell abruptly, reaching N$87.8 billion by the end of March and N$58.5 billion by the end of April. On the monetary side, the monetary base barely moved (from N$43.8 billion to N$43.1 billion), M_1 declined (from N$144.8 billion to N$136.9 billion), while M_2 rose about 10% (from N$366.1 billion to N$390.4 billion). Before reaching hasty judgments about the movement of M_2, one should consider that, at the end of April, 1994, it was only 15.9% above its level of a year earlier.

The rise in M_2 during March and April of 1994 was in part influenced by rising interest rates. The 28-day CETES rate, which stood at 9.45% per year in February, averaged 15.79% during April. This was a reflection of the willingness of the Mexican authorities to see a tightening of financial markets generally. The reason why M_2 rose relative to M_1 was quite clearly the interest rate picture. From 8.40% in February, the monthly average interest rate paid on one-month time deposits rose to 13.90% in April. This was clearly enough to lead people to want to hold more of such deposits, relative to cash and demand deposits.

Table 6 permits one to compare the situation, as of the end of April, 1994, with that of November, 1993. The broad picture is quite similar, leading to the conclusion that the forces at work after the assassination had operated to help offset those set in motion by the huge capital inflows of December, January and February. The three series that do not "reverse themselves", moving from February to April (as compared with the prior move from November to February), are those of M_2, of total domestic credit, and of credit to the private sector. These series follow their own course, as it were, revealing little of the tumult that characterized international reserves, interest rates, etc.

A Policy of "Monetary Targets"

Figure 14 presents the key results of Mexican monetary policy during the period 1990-94. Figure 14A shows the raw time series, on a logarithmic scale. In Figure 14B I have superimposed straight lines, designed to show the evolution of monetary policy through time.

TABLE 6

Key Monetary Variables -- November 1993-April 1994

(billions of new pesos)

	November 1993	February 1994	April 1994
Monetary Base	40.1	43.8	43.1
M_1	132.6	144.8	136.9
M_2	364.9	366.1	390.4
Net International Assets			
Banco de Mexico	60.5	94.8	58.5
Total Domestic Credit	418.6	424.6	482.0
Credit to Private Sector	404.0	428.9	452.6
Interest Rate CETES 28 days (rate per yr.)	14.38	9.45	15.79

Figure 14A
MEXICO (January 1990 - September 1994)
Natural Logarithm of Monetary Series

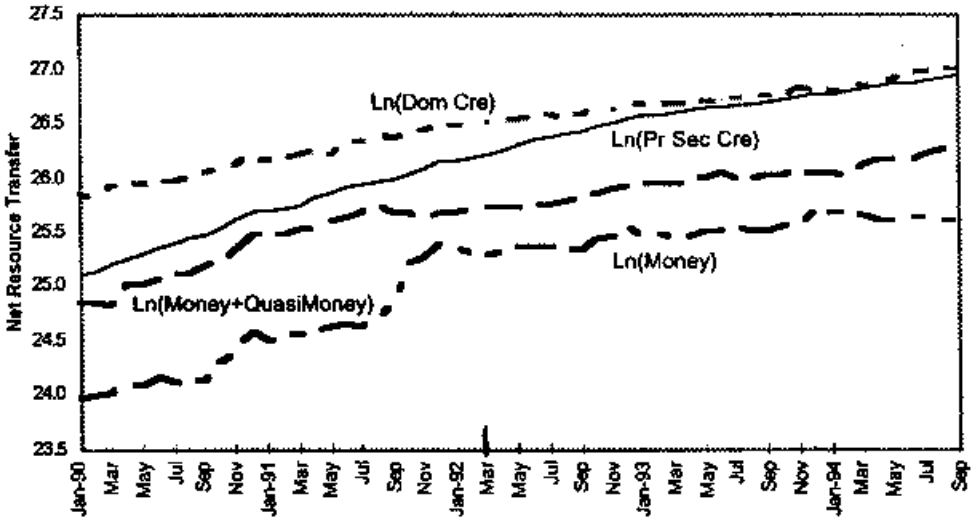
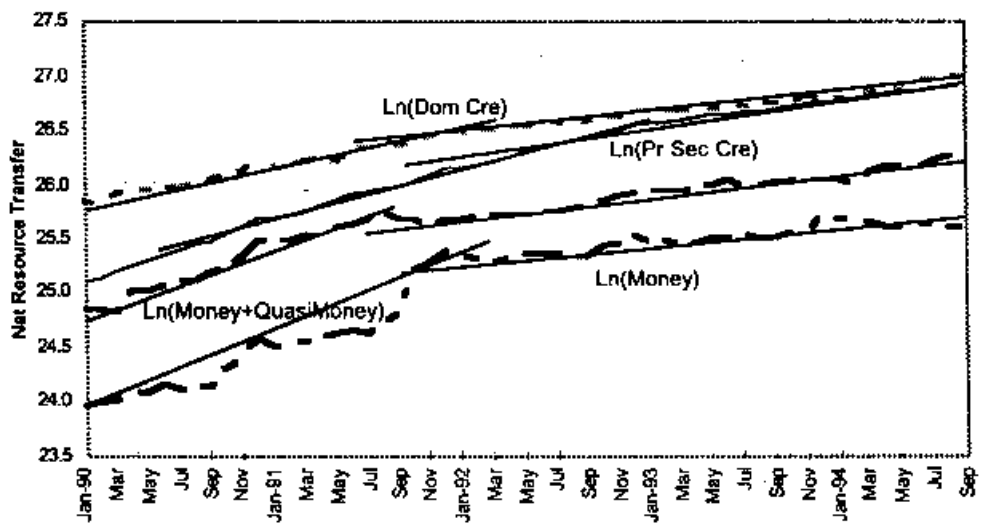


Figure 14B
MEXICO (January 1990 - September 1994)
Natural Logarithm of Monetary Series



The bottom line is: a) that there was, over the course of the period 1990-94, a dramatic reduction in the rate of increase of each of the money and credit variables and b) that, for the latter part of the period, each series is well approximated by a straight line, reflecting a roughly constant rate of increase over that subperiod. This leads one to consider that the Mexican authorities may have been pursuing "monetary targets" during the years 1992-94.

The tasks of monetary policy are anything but easy. Without doubt any Central Bank with a printing press can inflict untold inflationary costs upon the economy; by the same token it can, as it were, put the printing presses in reverse as it fights against inflation, and through this process bring on the miseries of recession and depression. Many simple rules have been suggested as guides to Central Bank policy, and most of them have been shown to work reasonably well under favorable conditions. Yet no rule is without its Achilles' heel -- its own built-in vulnerability to particular varieties of adverse circumstance.

The subtleties of monetary policy are far too great to be dealt with in a brief space here. But one can get a glimpse of them by considering the interplay between "monetary targets" and "reserves targets" in a country with a fixed exchange rate (or a tablita, or a narrow exchange-rate such as Mexico had in 1992-94). Any commitment concerning the nominal exchange rate can be credible only if the country has the means to carry out that commitment. Typically, the instrument at hand is international reserves. If reserves are abundant, credibility can be high; as reserves are depleted to very low levels, credibility can easily be lost.

Some writings concerning fixed exchange rates (and similar systems) make the bold statement that under such systems "the money supply is endogenous" -- i.e., the Central Bank cannot control the money supply. In some broad sense this assertion is true, for the Central

Bank certainly cannot set any arbitrary level for money supply, in the face of its commitment with respect to the exchange rate. But history is very clear on the fact that, especially when it possesses ample international reserves, a Central Bank can operate with considerable latitude to influence the money supply.

In general, the "course of wisdom" for Central Bank policy, under fixed (or similar) exchange rate systems, is as follows. If reserves are "ample", try to provide the economy with a money supply that permits prudent economic growth without lighting inflationary fires. Put on the brakes when either: a) inflation threatens to get out of hand, or b) reserves cease to be "ample". During the period 1990-93, the Banco de Mexico was able to follow such a path. The rate of inflation declined from 30% in 1990 to 19% in 1991 to 12% in 1992 to 8% in 1993. Meantime, international reserves were growing, the rate of interest was falling, and economic growth was modest but acceptable, averaging around 3% per annum, in real terms. Under such circumstances, it would not have been wise for the Banco de Mexico to step on the accelerator, expanding credit so as to stop the accumulation of international reserves, nor would it be sensible to put on the brakes (what purpose would that have served?)

My inference from the data is that the Banco de Mexico was either directly pursuing a monetary target during 1992 and 1993, or, if it had more complicated objectives, these led to results which were broadly consistent with a relatively straightforward monetary target.

My interpretation is that the Banco de Mexico followed this course through 1994 (up to the point in December when the crisis struck), neither permitting the great inflow of capital in January and February to divert the money supply significantly from its course, nor allowing the

subsequent loss of reserves in late March and April to bring about much of a deviation from this course.

Tesobonos: A Danger Signal

One way of describing what probably was the attitude of the Mexican authorities is: "there have been disturbances to the system, but basically everything is normal; people should not lose confidence." The time paths of the money supply and bank credit series are compatible with this view. Some problems appear, however, when one looks at interest rates. As mentioned earlier, the rate on 28-day CETES had fallen below 10% in February and March, but bounced back to around 16% in April, May and June. This is comparable to the average rate that prevailed during 1992 and the first half of 1993, so the sense of normalcy might be considered to be maintained. One can be quite certain that if it had been possible to renew (i.e., roll over) at this rate all the CETES that were coming due during the second quarter of 1993, the Mexican authorities would have been happy to do so. We can infer, however, that this was not the case. The scenario suggested by the data is that the CETES rate would have gone up dramatically above the 16% range, had the rollover been carried out. To prevent this from happening, the market required some additional guarantee. This guarantee was found in the form of Tesobonos which, through peso obligations, were guaranteed against exchange rate risk vis-a-vis the dollar. By issuing Tesobonos in place of CETES, the government was able to keep the CETES rate "within range", and at the same time maintain the total internal government debt on a moderately rising track. Total internal government debt in November, 1994 was N$139.7 billion, compared with N$135.6 billion in December, 1993. Over the same

period Tesobonos debt increased from N$3.0 billion to N$55.6 billion, while the outstanding CETES debt fell from N$81.0 billion to N$45.6 billion.

The switch from CETES to Tesobonos reveals quite a lot about the nature of the market for loanable funds in Mexico. One cannot rationalize what occurred in 1994 on the basis of the assumption, often made on academic studies, of an essentially infinitely elastic supply of funds at the "world interest rate" plus a risk premium. This assumption would lead to one rate for CETES and another one for Tesobonos, the difference reflecting the "risk of devaluation" perceived by the market.

In contrast to the above assumption, the Mexican case seems to reveal a market characterized by more varied tastes, and by upward rising supply curves of funds. The highly plausible scenario that I have in mind is that the rate of interest on CETES would have gotten to be unbearably high, from the point of view of the Mexican authorities, if they had tried to finance the "CETES plus Tesobonos" total, by issuing CETES alone. They could keep the rate on CETES "within range" by issuing enough Tesobonos to satisfy the demands of those who perceived the greatest risk in holding CETES. Comparing 1994's second quarter with the first, the greater risk that appeared after the assassination was absorbed in part by giving dollarized obligations (Tesobonos) to those who would have demanded very high premiums for holding CETES, while using higher (but not astronomical) interest rates to convince the rest of the people involved to continue (willingly) to hold CETES.

Another Signal: Leaning Towards Deficits

The first column of Table 7 tells part of the story. Between, say, August of 1993 and August of 1994 the total of government obligations in circulation rose from N$128.1 billion to

N$145.6 billion. The increase of N$17.6 billion compares with one of N$8.8 billion between August, 1992 and August, 1993. The central government added very little to its borrowing from the banking system, but local governments plus non-financial public enterprises increased their total indebtedness to the banking system from N$16.6 billion in August, 1993 to N$22.0 billion a year later.

Special notice should also be taken of credit expansion on the part of the development banks. These public sector entities expanded credit by over N$50 billion between August of 1993 and August of 1994. This represents an increase of more than 30% in a single year, most of it to financial intermediaries. I am at a loss to "explain" these transactions, but my instinctive reaction looks to the fact that 1994 was an election year. If some element of stimulus was considered necessary in that context, it could be convenient for that element to be rooted in a rather obscure corner of the financial system. It is interesting in these terms to note that more than half of the increment of credit from the development banks was accounted for by an increase of some N$27 billion in their foreign (long-term) obligations.

TABLE 7

Government Obligations Outstanding

(billions of N$, end of period)

	Total Obligations In Circulation (1)	CETES (2)	Tesob. (3)	CETES Plus Tesob. (4)	Interest Rate Per Annum (28-day CETES) (5)
91 Dec.	170.3	59.3	0.9	60.2	16.7
92 Dec.	133.4	81.0	0.9	81.9	16.9
93 Jan.	124.0	51.2	0.2	51.4	15.5
July	125.7	53.9	0.7	54.6	13.9
Aug.	128.1	57.2	1.2	58.4	13.7
Sept.	127.3	59.7	1.9	61.6	13.7
Oct.	126.2	64.2	2.6	66.8	13.1
Nov.	126.8	69.7	3.1	72.8	14.4
Dec.	135.6	81.0	3.8	84.8	11.8
Jan.	136.1	80.2	4.5	84.7	10.5
Feb.	136.6	79.9	5.1	85.0	9.5
Mar.	137.0	80.5	6.0	86.5	9.7
Apr.	130.8	74.7	7.0	81.7	15.8
May	137.9	70.2	18.6	88.8	16.4
June	140.6	67.1	26.1	93.2	16.2
July	146.3	53.1	46.9	100.0	17.1
Aug.	145.6	52.0	47.8	98.9	14.5
Sept.	145.2	51.4	48.7	100.1	13.8
Oct.	143.3	48.9	51.9	100.0	13.6
Nov.	139.7	45.6	55.6	101.2	13.7
Dec.	171.3	39.7	94.7	134.4	18.5

Source: Banco de Mexico.

The 1994 Net Resource Transfer and Its Financing

Table 8 shows Mexico's net resource transfer for the years 1993 and 1994, and quarter-by-quarter from 1993IV through 1994IV. What is notable here is the steady but modest upward progression of the NRT. The net transfer for the year 1994 was one-third larger than that for 1993, and the upward progression is steady, quarter-by-quarter, all through the year. Our hypothesis is that the Mexican authorities were treating the negative shocks of early 1994 as isolated events, causing a lapse of confidence from which economic agents (foreign investors as well as domestic market participants) would soon recover. This is certainly borne out by the data of Table 8. On the good side, exports of goods (including those from maquiladoras) and non-financial services rose by some $9.2 billion over the year, reaching their peak of $19.5 billion in the fourth quarter. On the bad side, imports of the same categories rose by $14.9 billion, peaking at $25.2 billion in the fourth quarter.

To my mind, the fourth quarter is important, because it was totally post-electoral. If the Mexican authorities had wanted to take precautionary steps, they could have instituted a general fiscal and monetary tightening, with the aim of curtailing imports to levels comparable to those of, say, the fourth quarter of 1993. By early 1995, of course, a far greater degree of stringency was, and probably had to be, imposed. The question that probably will never be answered is, would a modest squeeze, instituted, say, in October of 1994, have been sufficient to avert the panic of December 1994?

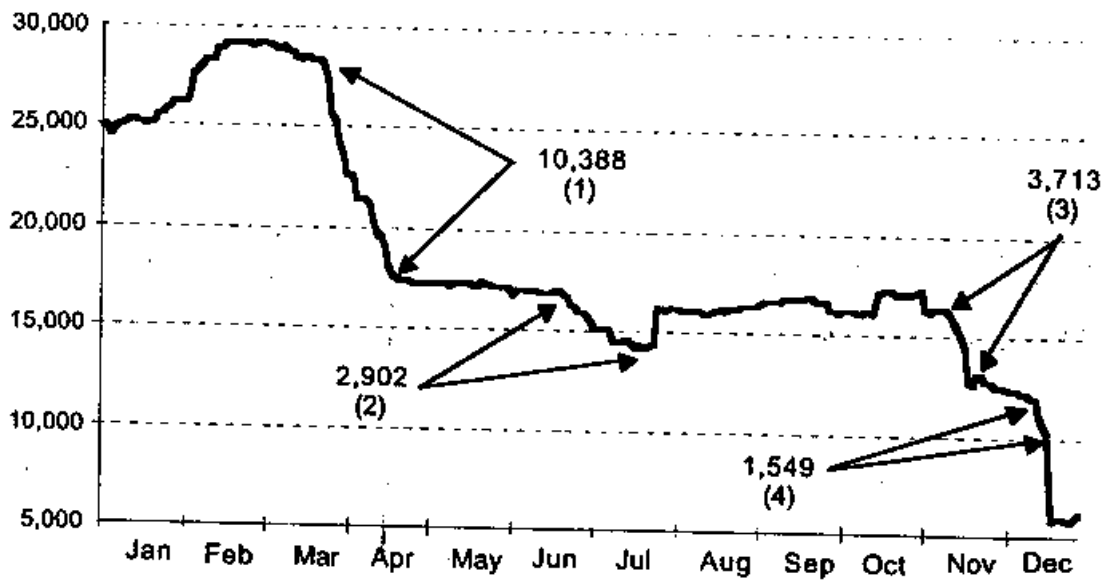
However, the authorities had some reason to be optimistic. As Figure 15 shows, the stock of net international reserves of the Banco de Mexico remained virtually constant from April through October, recovering from a transitory drain of some $2.9 billion in June-July.

The capital account of the balance of payments also improved, from a net positive flow of $0.2 billion in the second quarter to one of $3.3 billion in the third quarter. If, as was suggested earlier, we interpret the statistical discrepancy (errors and omissions) as an unmeasured capital flow, the picture looks even better. On this view, the "true" capital flow shifted from U.S. $-2.0 billion in the second quarter to U.S. $+7.7 billion in the third.

The collapse of December 1994 was exacerbated by the legal situation of foreign mutual and pension funds investing in Mexican securities. It appears that the managers of such funds acted defensively, ordering massive sales of securities once the weakness of the peso was revealed. This brings up a second important question. Would the outcome have been greatly different if the regulations governing such investments had been tighter (for example, requiring that such investments in Mexican securities be carried out only by closed-end funds)? Once again, this is a question to which we will probably never get a firm answer, but which nevertheless merits serious thought and research.

There is one mistake about which there can be little doubt. That was the attempt to approach the December crisis by a simple 15% widening of the exchange rate band. Ex post, we all know that this tactic did not work. It only led to a huge drain of reserves from the Banco de Mexico, forcing that entity to allow the peso to float, just a couple of days later. But I believe that ex ante it was predictable that it was highly unlikely to work, especially in light of the vulnerability of the Mexican system to speculative attack.

Figure 15
Stock of Net International Reserves in 1994
(Millions of Dollars)



(1) Murder of the PRI's candidate for President
(2) Resignation of the Secretary of the Interior
(3) Deputy Attorney General's claims
(4) Intensified hostility of the EZLN

Source: Banco de Mexico

It was a totally known fact that Mexico had an open capital account (no capital controls). It was likewise known that open-ended mutual funds, as well as large pension funds, had significant holdings of peso securities which were vulnerable to capital flight at a moment's notice. There was also the Chilean experience of June of 1982 to refer to. On that occasion an initial devaluation was attempted, from an old rate of 39 pesos to a new rate of 46 pesos per dollar. That devaluation, of more than 15%, proved incapable of containing a situation that was far less vulnerable than that of Mexico in 1994 (viz., Chile in 1982 did not have an open capital account, nor was there significant foreign portfolio investment in Chilean securities). Moreover it was an unbearable unemployment rate of more than 25%, rather than an instantaneous drain of reserves, that was the main motivating force behind the Chilean devaluation. Yet, in spite of all these characteristics (more favorable to Chile in 1982 than to Mexico in 1994), Chile was unable to hold to the 46 peso rate for more than a few weeks.

It is widely thought that the decision to widen the band on 19 December, 1994, rather than to float, was taken at the last minute, and against the advice of the government's own technical experts. But that does not exculpate the government from what turned out to be a costly, and in many ways unjust, decision.

Conclusions Concerning 1994

On our reading of the evidence, the policies of the Mexican authorities during 1994 do not reveal any major errors, except at the very end of the year, when the peso was devalued by 15% (through widening the band), a policy which lasted just a couple of days before an open float became necessary.

Many casual observers of the Mexican scene do not realize what a difference there was between the beginning of 1994 and its ending. At the start of the year, capital was flooding into Mexico, the exchange rate was at the bottom of the band, and interest rates were at historic (for recent years) lows. Fortunately, the Bank of Mexico accumulated huge incremental reserves as a consequence of this capital inflow, and effectively "sterilized" their potential impact on the money supply. This made it relatively easy to cope with the shocks that followed the assassination of Mr. Colosio. What the Banco de Mexico did here was to pay out its recently-accumulated reserves, again without permitting that action to have any significant effect on the money supply. For most practical purposes we can say that the flood of capital into the country in December, January and February was reversed by the flight of capital in late March and in April, leaving the economy at the end of April in a situation not unlike that of the preceding November.

Through the bulk of the year 1994, it was possible for the Banco de Mexico to pursue what was in effect a "monetary target", without either gaining or losing significant amounts of international reserves. This was done keeping internal interest rates reasonably close to their 1993 levels. Had this occurred in a fully "natural" way, the signs would have been very good indeed. But in fact this result was not wholly natural; on our interpretation, Tesobonos were issued in roughly the amounts required to keep CETES interest rates (and with them the whole structure of peso interest rates) in the desired range.

This massive issuance of Tesobonos represents an appropriate response to a fearful market, particularly if the fear is concentrated in only a portion of market participants. As it was, the most fearful of market participants bought Tesobonos bearing a low interest rate, but guaranteed against devaluation risk, while the more confident cones bought CETES with a considerably higher nominal yield.

The events of December, 1994 were obviously not foreseen, either by the Mexican authorities or by the bulk of market participants. We will never know if a crisis would have emerged in the absence of the political unrest in Chiapas. Likewise, we will never know the degree to which the loose restraint of foreign mutual funds and retirement plans exacerbated the crisis. But by my reading, the only huge mistake of policy in 1994 was the failure to float the peso immediately on 19 December 1994, once the need for a change in the exchange rate regime became evident.

The problem of adjustment which the Mexican economy now faces is substantially independent of the nuances surrounding the events of 1994. As I tried to make clear in Sections I to X of this paper, the real problem now is to carry out an adjustment in which the real exchange rate finds its new equilibrium, compatible with the (as yet unknown) new rate of net resource transfer into (or out of) Mexico. But even on relatively optimistic assumptions concerning the new level of net resource transfer, it would appear that a rise of at least 30% in the real exchange rate will be required. To achieve this, a nominal devaluation of 100% (to N$6.8 per dollar) would have to be accompanied by a wage rise of 23% or less. Alternatively, a nominal devaluation of 150% (to N$8.5 per dollar) would have to be accompanied by wage

increases of 45% or less. These figures describe the magnitude of the challenge facing Mexican policymakers, and the Mexican economy, over the next few year.

A Postscript on the "Banking Crisis"

The experience of the early months of 1995 reveals that several of Mexico's banks were in a precarious position. The weakness in their portfolios probably started in 1994, if not earlier. Some recognition of this situation may have underlain some aspects of Mexican monetary (and possibly fiscal) policy during 1994. The authorities may have felt that any sharp contraction of credit and money would have precipitated a chain reaction of business bankruptcies (as loans were not renewed) and possible bank failures. Certainly, considerations of this type, even if based only on partial and inconclusive evidence, would strengthen the case for pursuing a policy of relatively liberal monetary targets, rather than precipitating at the end of April a situation not unlike that which ultimately developed at the end of 1994.