Serie documentos de trabajo

SPECULATIVE ATTACKS AND EXCHANGE RATE EVALUATIONS IN MEXICO: WHY IS THE 1994 EPISODE DIFFERENT?

Ángel Calderón Madrid

DOCUMENTO DE TRABAJO

Núm. IX - 1996

Speculative Attacks and Exchange Rate Devaluations in Mexico: Why is the 1994 Episode Different?

by Angel Calderón-Madrid
Centro de Estudios Económicos.
El Colegio de Mexico[1].

After an abrupt devaluation in December 1987, the Mexican monetary authorities succeeded, during seven years, in keeping the nominal exchange rate within pre-announced levels.[2] On december 19, 1994 these were realigned in view of capital outflows that were exhausting the stock of international reserves. This change - which effectively implied a surprise 15% exchange rate depreciation - far from halting the speculative attack to the balance of payments, intensified it. Two days latter, after the lose of almost 50% of the remaining international reserves[3], the Central Bank allowed the exchange rate to float freely. As a result of this a 8% drop in the value of the peso, on top of the initial 15%, occurred immediately and, unlike what happened in previous balance of payments crisis, two and a half months latter, the value of the Mexican Peso continued its downward trend: by march 15, 1995 the real exchange rate exhibited an unprecedented real exchange

---

[1]This Paper was presented at the XIV Latin American Meeting of the Econometric Society. Rio de Janeiro August 5-9, 1996. Preliminary Version. Comments Welcome. Help and suggestions from Hugo Zarco, Cutberto Córdova and Gerardo Esquivel are acknowledged.

[2]As part of a "reputation building" strategy, the monetary authorities used the exchange rate both, as a nominal anchor to reduce inflation and as a signalling device geared towards reducing domestic interest rates by means of lower risk-premiums associated to abrupt unexpected exchange rate depreciations. After a four-year old crawling-peg regime, an exchange rate band was adopted since november 1991.

[3]The lost of international reserves in December 21, 1994, was greater than the total lost of reserves during the period November 18-December 18. As stated by Lustig (1995), typically capital flight occurs before a devaluation and not after. According to this author, "The December devaluation triggered a financial crisis because foreign investors felt tricked and feared a default. In addition, the lack of competence and the absence of a coherent plan at the time the devaluation was announced, added significantly to the climate of uncertainty".

rate depreciation[4] which did not appear to be justified by fundamentals. It was not until the biggest-ever international financial rescue package was offered to Mexico that a perception still prevailed, among market participants, that the financial situation could further deteriorate.

Krugman and Rotemberg (1992) argue that the understanding of how an exchange rate regime works requires the understanding of how it ends. In line with this insight, we posit that balance of payments crises experienced in Mexico during the last ten years provide more than one set of lessons for exchange rate management in emerging economies. In this paper we show that the last three exchange rate crisis (1994-1995, December 1987 and July 1985) do not lend themselves to the same explanation.

In order to explain why the 15% realignment of the exchange rate band at the end of 1994 was bound to result an inadequate policy to reverse the speculative attack to the balance of payments, we rely on the new generation of currency crisis models. As it is explained by Obstfeld (1995), in these kinds of model, speculation against a currency creates objective economic conditions that make liability devaluation more likely. Hence, levels of exchange rates that could be sustained indefinitely in the absence of a speculative attack can succumb to adverse market sentiment.

A key element in the elaboration of these models is that underlying macroeconomic 'fundamentals' are far from irrelevant to the outcome, however, for they determine the range of possible exchange rate equilibria (one of which is an abrupt devaluation followed by a financial debacle). According to the explanation presented here, in the Mexican case this range was determined by two major factors - in turn the result of household savings sustained for more than five years at unprecedented low levels. These were: (a) the prevailing fragility of the Mexican commercial banks and (b) a very low participation of domestic residents in holding Mexican financial assets.

Our explanation for the exacerbation of the 1994-1995 exchange rate crisis -i.e. the reasons that forced the authorities into a free floating exchange rate regime from December 22 onwards and of of why the real value of the peso dropped constantly[5] to reach a of real depreciation of more than 70% in only three

---

[4] Its nominal value had already registered a 100% depreciation in only three months whereas domestic inflation rate was kept under 30% during the same period.

[5] During most of the first half of 1995 the exchange rate was determined by a "bandwagon behaviour" (in which the first depreciation to a market determined level led market participants to want to sell peso assets thereby further inducing peso

months- is not along models that merely explain it as an anticipation of events that would eventually occur because of fundamental disequilibria in the economy (We argue that these kinds of model explain the episodes of 1976, 1982, 1985, but not those of 1987 and 1995).

The argument is based on the conjecture that financial market participants were aware of the following two points a) that in view of the fragile state of domestic commercial banks, the possibility of major bank failures would increase in the event that an unexpected realignment of the exchange rate were followed by further exchange rate depreciations and/or higher domestic interest rates coupled with a slowdown in economic activity and b) that this crisis scenario would become a self-fulfilling event -as the literature on bankruns shows- if a number of Mexican asset-holders, (which were mostly foreign with liquid positions) sharing the fear of this possibility, attempted to seek for safe heaven.

Eichengreen and Wyplosz (1993) use a model along these lines to explain the collapse of the narrow bands of the European Monetary System. As emphasized by these authors, for a model in which a speculative attack provokes events that would not occur in its absence to be compelling, they must fulfill a requirement, namely that there must be an intrinsic reason why monetary policy would shift, towards a more expansionary stance, in the event of an exchange rate depreciation forced by a speculative attack[6].

According to the explanation advanced in this paper, the unsuccesful attemp to maintain an exchange rate band, on december 19, by realigning 15% its upper bound resulted in the possibility of more than one nominal exchange rate

---

depreciations, in spite of increasing levels of domestic interest rates)

[6]In their analysis, the reason follows from the way in which terms for performance were established by the Maastricht treaty. According to these, once an exchange rate is depreciated within the European exchange rate arrangement, other macroeconomic performance requirements for joining the European Monetary Union -fiscal and monetary discipline- provide no benefit to the authorities that could compensate the cost for fulfilling them. Hence, contingent on the fixed exchange rate regime's collapse, the loss of discipline causes the domestic credit growth to increase, thereby the validation of the speculative attack follows. See also Svenson, L.E.O. p.456-457 and Garber, P and Svensson, L. (1994) December.p.37-39.

expectations-led equilibrium adjustment[7]. This change arose as a result of market participants conjecturing a monetary policy contingent on the state of domestic banking industry. That is, in the Mexican episode, a reason for a change towards a more expansionary monetary policy validating a capital outflow due to a feared exchange rate depreciation were bailing out actions by the Central Bank geared towards avoiding widespread domestic banks failures -in turn agravated by the strenght of the effects due to the speculative attack .

This episode is contrasted with the 1985 and the 1987 experiences. We show that whereas the former can be explained as a result of a pessimistic perception of the sustainability of the macroeconomic program, the latter is also a result of selfulfilling expectations of a depreciation. We argue that in 1987, by unexpectedly depreciating the exchange rate faster than markets were anticipating, the monetary authorities signalled, during five consecutive weeks, that the exchange rate was no longer used as nominal anchor to achieve disinflation. As a result, they gave place to the conjecture that the monetary authorities would deliberately trigger an abrupt exchange rate depreciation in an attempt to correct the effect of cumulative domestic inflation on export competitiveness

Fears of asset holders seeking safe heaven against potential capital losses of the Central Bank actions in december 1987 ended up being fully justified- albeit for different reasons than those motivating the initial outflows. That is, in spite of the fact that the abrupt exchange rate depreciation was produced by the implausibility to defend the value of the Peso in view of massive capital outflows, and not by a deliberate action of Central Bank authorities, the returns on peso denominated bonds were well below those expected by their holders. Stated differently, given expectations that a further acceleration in exchange rate depreciation could be in its way, and with the aim to move before the Central Bank did it, asset holders initiated the capital outflow fearing that returns would, once again be below what they were expecting to obtain. As the speculative attack gain momentum, an abrupt devaluation was forced, thereby inducing capital losses well above what they feared.

In the empirical analysis of this paper we work with a Markov-switching model

---

[7]The main analytical problem with models of speculative attacks not fully justified by macroeconomic fundamentals, (as it is also the case with their flexible exchange rate analog of speculative bubbles), is that they lack of an explain of what could get speculation started. The Mexican case considered here is not subject to this critique, since the credibility loss associated to the realignment and other associated effects constitutes the explanation.

for describing exchange rate behaviour in Mexico[8] during the 24 months before the exchange rate crisis of 1994-1995 . Exchange rates are therefore modelled as switching between two distributions. One that holds at stable times and the other that holds in volatile times. For this purpose we rely on Hamilton's algorithm and approach to estimate our model. These results enable us to address a number of hipotheses.

The paper is structured in two more sections. In section 2 we contrast the 1987 peso devaluation with the one preceeding it in 1985. In the final section we present a number of characteristics of the evolution of the Mexican economy that contributed to the vulnerability of its Balance of Payments at the end of 1994, we also present there our analytical interpretation of the reasons for the exchange rate crisis in 1994-1995 and our empirical analysis.

II. Exchange Rate crisis during the last ten years in Mexico.

The unsustainable fiscal deficits and high levels of public foreign indebtedness resulting from the so-called "polpulist" conduction of Macroeconomic policy during 1971-1982, (Bazdresch, C. and Levy, S (1991), together with major adverse terms of trade effects (oil prices) are the major factors explaining the exchange rate crisis of 1976 and the debt crisis and abrupt devaluation of 1982 in Mexico. After what was considered to be an initial "overshooting" of the real exchange rate at the end of 1982, and under an IMF-sponsored program, the Central Bank was able to mantain the nominal exchange rate under control for almost three years. By mid 1985, in spite of the apparent reversion of macroeconomic imbalances, a capital outflow prompted a devaluation that caused a 20% lost in the value of the peso in July 27.

As opposed to the perceived deteriorating trend in the current account of the balance of payments which preceded the devaluations of 1985 and 1994, during 1987 net exports were having a very good performance and international reserves were at a historical peak. However, with unprecedented yearly rates of inflation above 100% in 1987, monetary policy consisted in allowing the nominal exchange rate to depreciate at a rate controlled by the authorities. In an attempt to use the exchange rate as a nominal anchor to reduce domestic inflation, the daily rate of depreciation was reduced relative to the first six months of the year, during July and October. We argue below that, by continuosly accelerating the rythm of the crawling-pec, and thereby signalling during five weeks their attempt to correct the effect of cumulative domestic inflation on export competitiveness, the conditions were created for an episode in which the selfulfilling expectations of an exchange rate depreciation determined the resulting events.

---

[8]See Engel, CH. (1994).

In December 1994 -as in previous cases in the last decade - massive capital outflows led the Mexican monetary authorities to withdrew support of the peso in foreign exchange markets. The conjectures of speculators that, foreseeing a balance of payments crisis, fled from Mexican assets in search of safe heaven were proved correct: the exchange rate depreciations associated with these speculative attacks implied large capital losses on assets not converted into foreign currency[9].

We argue below that the reason for the exchange rate depreciation that ocurred in 1985 was not different to that explaining the episodes of 1976 and 1982, namely it was also the result of massive capital outflows reacting to the perception that the fiscal program was no longer sustainable[10].

We also demonstrate that - as opposed to what happened in 1985 and 1994- the predominant reason of the run-off from peso into dollar denominated assets in december 1987 were fears that the monetary authorities would trigger a devaluation as an attempt to undo the effect that cumulative domestic inflation was having in competitiveness. In a final section we address the causes of the 1994 exchange rate crisis.

II.1 The devaluation in 1985: consequence of an unsultainable fiscal program.

Unlike what happened in the 1987 and 1994-95 episodes, available evidence points out that during 1985 a pessimistic perception of the sustainability of the macroeconomic program was the predominant reason motivating capital outflows. As argued below, this kind of perception held by market participants was, in turn, linked to the observed and expected evolution of fiscal and current account imbalances.

The first half of 1985 was characterized by a relaxation of fiscal accounts, relative to what happened during the two years of the IMF-sponsored program which

---

[9]According to some estimates, as result of the peso crisis of 1994, the lossses of foreigners who invested in the Mexican stock market, CETES, Tesobonos and Brady bonds were over US$ 25 billion.

[10] *Cfr.* Ize and Ortiz (1984) Buiter (1986) and Van Wijnbergen (1988)- for papers presenting analytical developments to explain exchange rate devaluations as a result of private sector perceptions of unsustainable fiscal accounts. Two empirical studies, consistent with these analytical developents, have been applied to assess the collapsing exchange rate regime experiences in Mexico; Blanco and Garber (1986) for 1982 Goldberg, L. (1994) for 1982 and 1985.

followed the 1982 debt crisis. As it is shown in the work of Werner (1992), public debt as a share of GDP and other indicators related to potential government insolvency were rising during this year. In what follows we refer to a number of factors which determined a perception, among financial market participants that the authorities would or could not change their expenditure and income patterns for that period and for the subsequent ones; and that the resulting deficits could not be financed consistently with the announced exchange rate movements.

a) Oil exports revenue - lower than in previous years- still represented 26% of public sector income in 1985[11] (equivalent to 8% of GDP) and prevailing uncertainty in oil markets made of this an unstable source of public sector revenue. In addition a lack of confidence prevail due to the belief that the the reduction in public expenditure would be transitory and that the role of the state in the economy would not really change. This perception - as it is argued by Alberro y Cambiaso (1986)- originated in the fact that that between 1983 and 1985 public expenditure was reduced across the board, instead of eliminating or consolidating state functions.

b) when inflation turned out higher than anticipated, real tariff income to state owned companies was reduced, leading to further deterioration of the primary surplus;

c) interest payments on domestic public debt had also been underestimated, because of the higher than expected inflation and domestic real interest rates which were themselves a sign that the currency risk-premium had increased.[12]

e) negotiations on the payment of interest and amortization of the public foreign debt were still taking place and were not expected to come to a favorable conclusion.

The problems that the financing of the fiscal deficit implied for the viability of the intended management of the exchange rate during 1985 were not the only factors determining the nervousness of financial markets. The forward-looking perception of potential problems with the current account of the balance of payments contributed as well: a) previous improvements in current account were linked to sharp drops in imports due to the reduction in GDP -as growth of GDP picked up in

---

[11]This share contrasts with the percentages below 12% that have been registered since 1988.

[12]According to the annual report of the Bank of Mexico, during 1985 interest payments as a share of GDP turned out to be 1.8 points above what was originally programmed.

1984, so did imports; b) non-oil exports were stagnating -during the first three quarters of 1984 they grew at an average of 53.4%, 27.5% and 16.1% with respect to their level a year before, while in the the last quarter of 1984 and the first two of 1985 they fell by 5.5%, -8% and -6%, respectively[13] and c) a lack of clear signaling of the transition form an import-substitution to a committed export oriented policy meant that investment in sectors with export potential was still very limited.

As a consequence of these perceptions, devaluation was expected to in effect involve a 'debt repudiation' due to the *ex-post* real returns on the holdings on domestic debt turning out much lower than had been expected on purchase; in addition to an inflation tax corresponding to the monetization of part of the fiscal deficit. Such an interpretation also implied doubt as to the availability of further foreign financing for the debt and as to the willingness of the authorities to increase the domestic level of interest rate sufficiently to place the expected increase in domestic debt.[14]

II.2 1987 devaluation; consequence of signalling that the exchange rate can be used an as instrument to make-up for lost in export competitiveness.

A substantial improvement -relative to 1985 and 1986- in the share that the primarily fiscal surplus represented in GDP was registered in 1987.[15] Changes in the composition of fiscal accounts and a program of privatization appear to have materially altered perceptions of fiscal solvency and thus the feasibility of announced exchange rate programs. This was reinforced by the fact that the share of public debt in GDP was no longer rising, as it had been in 1985. In addition, joining GATT in 1986 and the reduction of import tariffs constituted clear signals to the private sector that structural changes geared towards integrating the economy with world markets were permanent in nature.

---

[13]It was only in the fourth quarter of 1985, that is after the devaluation took place, that non-oil exports exhibit a positive real rate of growth (13%).

[14]Although the real level of the domestic exchange rate was initially allowed to increase as an attempt to stop capital outflows, *Cfr.* Gurría (1993) p.62, the authorities opted for the abandonment of the foreign currency market for the devaluation to occur.

[15]Fiscal surplus, compared to the corresponding figure for 1986, resulted 3 percentage points more of GDP in 1987, and 1.8 above the figure for 1985.

In a clear contrast to events registered in 1985 too, the balance of payments was presenting very good results. As opposed to the perceived deteriorating trend in the current account of the balance of payments which preceded the 1985 devaluation, during 1987 net exports were having a very good performance. During each of the three first quarters of the year the Central Bank increased the level of international reserves. As one of the key policy makers in this period points out:

"It is paradoxical that financial crisis should have occurred when international reserves were at a historical peak [at the end of 1987] and the balance of payments was recording a substantial surplus. But there is also little doubt that the inflationary environment amplified the nervousness of financial markets. Once more it became apparent that, in times of high inflation, expectations are extremely volatile and can easily destabilize what appeared to be an otherwise sound financial situation." [16]

Available evidence suggest that, in contrast to what happened in 1985 and 1994, the dominant reason for the flight from the Peso into dollar denominated assets in December 1987 was fear that the monetary authorities would deliberately trigger an abrupt exchange rate depreciation in an attempt to correct the effect of cumulative domestic inflation on export competitiveness.

Two factors resulted in a perception among financial market participants that a surprise exchange rate depreciation, induced by the Central Bank, would soon follow; (a) Rising inflation during the first eleven months of 1987, which partly reflected the increasing frequency of wage and cost adjustments during 1987[17], was reducing export competitiveness. (b) by unexpectedly depreciating the exchange rate faster than markets were anticipating[18], the monetary authorities

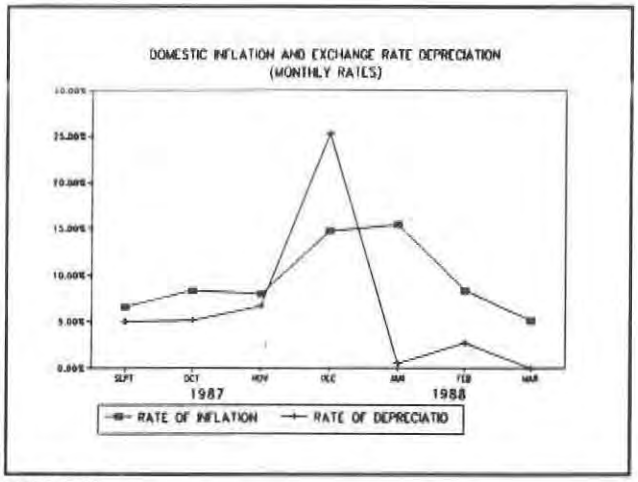
---

[16] Ortiz (1991) p. 289.

[17]The monthly rate of inflation was not only increasing, but also resulting consistently higher than the corresponding rate a year before. In turn, not only the number of "emergency wage increases" was higher in 1987 than those of previous years, but also the difference between these and the cumulated inflation was substantially reducing -thereby leading the system into a fully indexed process.

[18]With yearly rates of inflation above 100% in 1987, monetary policy consisted in allowing the nominal exchange rate to depreciate at a rate controlled by the authorities. In an attempt to use the exchange rate as a nominal anchor to reduce domestic inflation, during July and October the daily rate of depreciation was reduced relative to the first six months of the year. In a clear change of policy, during the six weeks before the

signalled, during five consecutive weeks, that the exchange rate was no longer used as nominal anchor to achieve disinflation[19].



GRAPH 1

In order to pre-empt the adverse effects of the anticipated movement by the Central Bank, private firms hasten to pre-paid foreign liabilities and other private agents to convert their assets from domestic into foreign-currency denominated assets, thereby forcing the very devaluation they feared.

In theory, as in a model developed by Obstfeld (1989), the monetary authorities can provoke a speculative attack to the balance of payments when they lead agents to believe that they are prepared to use the exchange rate as an instrument to make-up for lost in export competitiveness.

Obstfeld showed that the following is possible: When forward-looking speculators think that the monetary authorities are prepared to use the exchange rate if and when inflation hits a threshold, the result can be a devaluation-inflation process whereby such an inflation threshold, or a higher rate is actually registered. However this happens not because inflation actually hits the threshold and motivate the Bank to act, but because a speculative attack of agents anticipating the behavior of the Bank, forces an abrupt depreciation before inflation actually approached the limit.

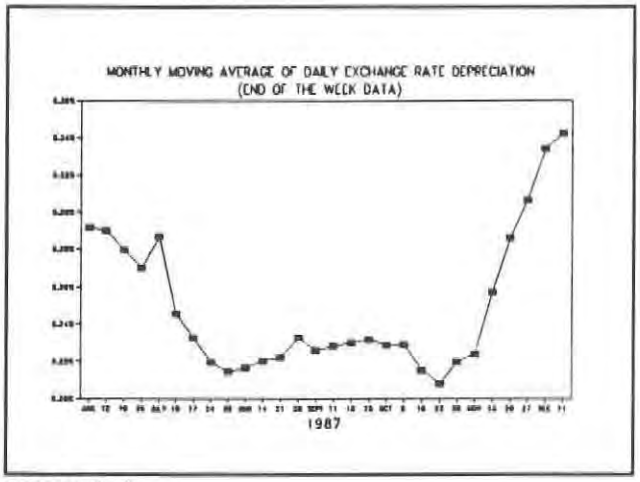
---

devaluation took place, the monetary authorities increased the rhythm of nominal exchange rate depreciation to rates without precedent in that year.

[19]In addition, with the explicit objective of having enough international reserves to defend against speculative attacks, the authorities allowed a parallel market with a freely floating exchange rate. This rate differed in november 18 by more than 30% from the rate controlled by the Central Bank. The pronouncements by the monetary authorities were that the former would appreciate towards the level of the controlled exchange rate. However, by depreciating the controlled exchange rate at a faster speed they signalled that the opposite could actually happen.

When monthly rate of inflation increased from 6.6% to 8.3% in october 1987[20], the monetary authorities accelerated the rate of nominal exchange rate depreciation in november, thereby catching-up partly with lost competitiveness due to the faster rate of domestic inflation (See graph 1) This acceleration in the nominal rate of exchange depreciation during november 1987 -and its upward trend- can be assessed better by means of graph 2. After the daily nominal depreciation speeded up from 0.22% to 0.34% in less than forty days, a 21% devaluation of the Peso took place in december 14. As a result of this, the monthly rate of inflation mounted to almost 15%- a percentage almost twice as high the average monthly rate of inflation of the previous eleven months[21].

This exchange rate depreciation episode in Mexico appears to constitute an empirical case of the above referred model by Obstfeld. This episode can also be analyzed by focusing on an additional piece of evidence, which refers to the other side of the coin of the argument presented by Obstfeld. Namely, how, by speeding-up the exchange rate depreciation at a faster rate that the one expected by financial market participants, returns on domestic public debt ended up below what market expectations. The analysis of this evidence will enable us to substantiate that, as a result of successive surprises of this kind, the run-off of the Mexican peso was intensified as assets holders attempted to pre-empt another movement by Central Bank in the same direction.



GRAPH 2

To substantiate the analysis consider in table 1 the ex-post return of 28-days Cetes, during the last four months of 1987 (i.e. the return that this peso-denominated public debt had, when

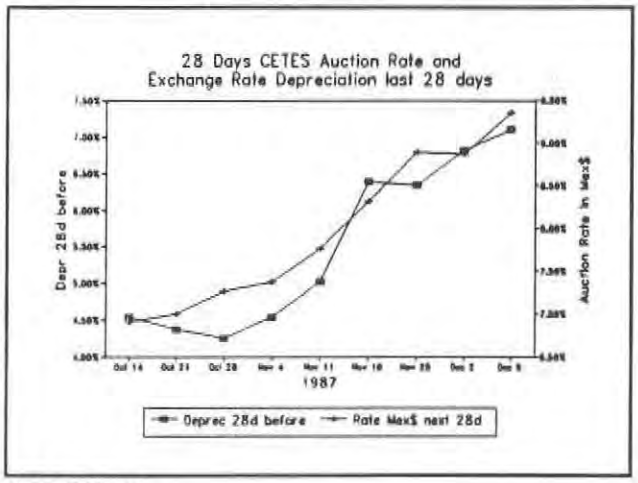
[20] The yearly rate of inflation for each of the months of 1987, which has an increasing trend also speeds up in october and november.

[21] As from this experience, policy switched to the strict fulfilling of announcements related to future levels for the exchange rate. Aiming to reduce interest rates by a cumulative process of 'reputation building', and to disinflate the economy, no further surprise depreciation was allowed by the Central Bank during the succeeding eight years, until the 1994 abrupt depreciation occurred.

measured in U.S. dollars). For this calculation , we subtracted the corresponding 28 days observed nominal exchange rate depreciation from the nominal interest rate offered for this instrument[22]. These two variables are presented in graph 3.

In contrast, during those months in which exchange rate depreciation was not unexpectedly accelerated by the Central Bank - which we posit to be July, August and September 1987- investors were receiving an annualized rate of return, in U.S. dollars, of around 30% (24 points above comparable bond in international markets). In the absence of a major change in underlying fundamentals we posit that this average return can be considered to represent a 'norm' for the ex-ante rates of return that asset holders were demanding in November.

By the first week of November (five weeks before the speculative attack of december 14 succeeded in forcing a devaluation) the monthly rate of exchange rate depreciation was not only above the highest one registered during the year, but was also presenting a clear accelerating trend. As a reflection of these changes in monetary policy which surprised asset holders, dollar ex post return on peso-denominated debt acquired a month before turned out lower than they were expecting - i.e. resulted lower than the previously established norm, as it can be seen in the last four rows of Table 1. We therefore interpret that these results reflect that markets expectations underestimated nominal exchange rate depreciation during five consecutive weeks.



GRAPH 3

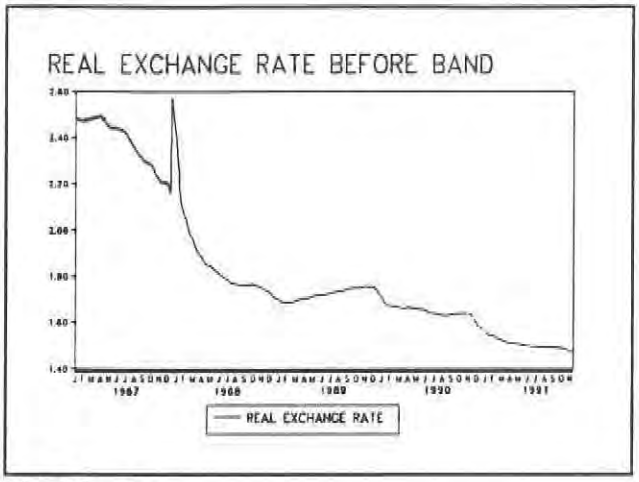
In order to consider how this phenomenon affected the levels of the monthly nominal interest rates, we can see since October 26 each date in table 1 has a higher rate than the previous week. This upward trend from the second half of october onwards is consistent with the explanation of this being, given a norm of the ex-ante dollar return demanded for this kind of asset,[23] a response to two factors; (a) at each

---

[22]We concentrate on dates of primary offers which take place once a week.

[23]Whereas the foreign interest rate did not increase, the factors determining country risk in Mexico, if any contributed towards a revised upward rate. (e.g. 1988 was a year of presidential elections).

successive week expectations about the monthly rate of exchange rate depreciation were further revised upwards and (b) a lower credibility in the announcements of monetary authorities was the consequence of depreciating the exchange rate faster than what market participants were expecting 28 days earlier, i.e. when the bond expiring that day was bought, . As a result, an extra return was demanded to compensate for the risk that rates of return will become, again, unexpectedly low in terms of US dls.



Graph 4

To be more specific, consider october 21, when nominal interest rate increase. This increase could be interpreted as reflecting expectations that the exchange rate would depreciate faster than a month before - hence, for a rate of return in dollars to result equal to that of previous weeks, a higher nominal interest rate had to be offered. As this bond matured four weeks latter -november 18- the ex-post rate of return in dollars resulted only 0.57%. That is, less than one forth of the average rate obtained during the four weeks previous to the date in which the bond was bought. Hence, this lower return was the result of the monetary authorities depreciating the exchange rate 1.83 points faster than what they led investors to believe when they bought the bond. The same story can be told for the three successive auctions[24].

As shown in graph 2, between October 21 and November 18, the monetary authorities increased the monthly exchange rate depreciation from 4.4 to 6.4%. As a result of this, a substantial increase in nominal interest rate with respect to the previous week had to be offered, in order to allocate the new issue of bonds in november 18 (which were to mature in december 16). As a consequence of the exchange rate depreciation on mid December, the annualized rate of return in dollars of this bond was minus 200%, thereby more than justifying fears that a low or even negative rate of return could eventually happen.

Fears of asset holders seeking safe heaven against potential capital losses of the Central Bank actions ended up being fully justified- albeit for different reasons than those motivating the initial outflows. That is, in spite of the fact that the abrupt

---

[24]This is under the assumption that market participants were demanding similar returns in U.S. dollars during October and November.

exchange rate depreciation was produced by the implausibility to defend the value of the Peso in view of massive capital outflows, and not by a deliberate action of Central Bank authorities, the returns on peso denominated bonds were well below those expected by their holders. Stated differently, given expectations that a further acceleration in exchange rate depreciation could be in its way, and with the aim to move before the Central Bank did it, asset holders initiated the capital outflow fearing that returns would, once again be below what they were expecting to obtain. As the speculative attack gain momentum, an abrupt devaluation was forced, thereby inducing capital losses well above what they feared[25].

In a clear contrast to what happened in 1994-1995, after the exchange rate depreciation of more that 20% at the end of 1987, no further real exchange rate depreciation occurred in subsequent months. That is, the exchange rate initially "overshot" its real level and - because of the ensuing increase in inflation- three months latter the real level of the exchange rate was already overvalued with respect to its pre-devaluation figure, as it is shown in graph 4.

[25]Since the december 1987 speculative attack was also produced by private firms pre-paying foreign debt, the argument presented here can also be stated in terms of evolving expectations of what would the real rate in pesos paid for this debt would be, and how, in view of signals send by monetary authorities, a portfolio composition occurred to avoid ending up paying high financial costs.

TABLE I

CETES Auction Date	Ex Ante Nomianl Rate of Return in Pesos (for the following 28 days)	Ex-post Rate of Return in US dollars of the 28 days bond that matured in that day.
02-SEP-87	6.98	2.31
09-SEP-87	6.95	2.22
16-SEP-87	7.00	2.14
23-SEP-87	7.05	2.10
30-SEP-87	6.97	2.06
07-OCT-87	6.90	2.18
14-OCT-87	6.90	2.36
21-OCT-87	7.00	2.57
28-OCT-87	7.26	2.61
04-NOV-87	7.37	2.26
11-NOV-87	7.76	1.79
18-NOV-87	8.31	0.57
25-NOV-87	8.89	0.87
02-DIC-87	8.88	0.51
09-DEC-87	9.36	0.61

Notes: This figures represent 28 days returns and not annualized rates.

CETES Auction Date	Exchange Rate Depreciation 28 days before (%)	Exchange Rate Depreciation 28 days latter (%)	Ex-post Rate of Return in US$ 28 days latter. (%)
01 Julio	5.54	4.43	2.54
08 Julio	5.24	4.46	2.51
15 Julio	4.96	4.52	2.46
22 Julio	4.69	4.57	2.42
29 Julio	4.43	4.63	2.38
05 Agosto	4.46	4.66	2.31
12 Agosto	4.52	4.70	2.22
19 Agosto	4.57	4.75	2.14
26 Agosto	4.63	4.79	2.10
02 Sept.	4.66	4.82	2.06
09 Sept.	4.70	4.67	2.18
16 Sept.	4.75	4.54	2.36
23 Sept.	4.79	4.37	2.57
30 Sept.	4.82	4.25	2.61
07 Oct.	4.67	4.54	2.26
14 Oct.	4.54	5.03	1.79
21 Oct.	4.37	6.39	0.57
28 Oct.	4.25	6.34	0.87
04 Nov.	4.54	6.82	0.51
11 Nov.	5.03	7.11	0.61
18 Nov.	6.39	28.19	-15.50
25 Nov.	6.34	26.89	-14.19

02 Dic.	6.82	24.68	-12.68
09 Dic.	7.11	22.48	-10.72

II 1994-1995 Balance of Payments Crisis.

II The Mexican Economy before the 1994 devaluation.

As stated in the previous section, the Mexican authorities ended 1987 with an abrupt exchange rate depreciation resulting from a speculative attack and not from a deliberate policy action. As it has already been shown, this attack was motivated by lack of credibility on the authorities intentions to use the nominal exchange rate lower the rate of domestic inflation, and not to increase export competitiveness. Since the abrupt depreciation made the indexation of the economy more likely, the authorities reaction was to launch a tripartite agreement -called the "Economic Solidarity Pact". This Pact introduced measures designed to break inertial factors in the process of wage and price determination and to coordinate expectations of future inflation. In essence, it combined minimum welfare guarantees with nominal guidelines to anchor the exchange rate, wages and key prices.

The authorities adopted as a central element of their new program the announcement of their commitment to maintain a fixed nominal exchange rate throughout 1988. This commitment was fulfilled and -perhaps as an attempt to avoid repeating what we interpreted to be the determinants of capital outflows in 1987- the subsequent commitment were also rigurously observed. As of january 1989 the nominal exchange rate was subject to a pre-announced daily depreciation -crawling peg- until november 1991. As shown in graph 4 and 5, this exchange rate policy had as a result an apreciating real exchange rate due to the prevailing rithm of the domestic rate of inflation.

The objectives sought with the strict adherence from 1988 onwards to the announced management of the nominal exchange rate were: first, the provision of a credible nominal anchor for the disinflationary program; and second, the reduction of uncertainty about exchange rate movements so as to deter speculative attacks to the balance of payments.

Two important differences exist between these announcements -and their commitments to avoid surprise devaluations- and the corresponding announcements during previous years. First, the management of exchange rate was considered to be part of the 'Pact'- that is a government commitment as a counterpart to the private sector commitment to wage and price controls. Second,

the authorities were committed to a contractionary fiscal stance, in order to make the announced exchange rate trajectory plausible.

As a result of a number of events generating political turmoil and nervousness in financial markets along 1994 (peasant uprising in the south of the country, political unrest due to the assassination of a presidential candidate, elections etc) foreign funds stop flowing into Mexico. Instead of increasing the level of domestic interest rates to stop capital outflows, the monetary authorities opted first to swap domestic debt from peso into dollar-denominated instruments -Tesobonos- and to allow exchange rate reserves to fall.

By mid december 1994, not only most of the domestic debt was short term dollar-denominated but also it surpassed the level of international reserves. Some authors, most noticeable Sachs et al. (1995) have suggested that this financially vulnerable position was a major detonator of the exchange rate depreciation. According to them, "[i]liquidity exposed Mexico to a self-fulfilling panic. Investors realized that if other investors stopped lending money to the Mexican Government, the Government would be unable to repay its debt -particularly the dollar-denominated Tesobonos- as they fell due. Therefore, each individual investor could do no better than to withdraw its funds when other investors started to withdraw their funds"[26].

Krugman (1995) has also suggested that a self-fulfilling prophesy can partly explain the severity of the Mexican crisis. According to him, excessive market optimism on how the reforms adopted in Mexico would generate a growth takeoff led to a temporarily self-fulfilling prophesy along with a "more subtle political process through which the common beliefs of policymakers and investors proved mutually reinforcing".[27] He posits that the enthusiasm for investing in Mexico was partly a classic speculative bubble. Large capital gains and financial returns for those few investors who had been willing to put money at the early phase of the heterodox program led other investors to jump in, thereby driving prices still further up and allowing for attractive financial returns. In 1994, according to his

---

[26]Sachs et al. (1995) p.2.

[27]Krugman, P. (1995) p.30. In spite of the success of the heterodox program in reducing inflation, expected effects of the reforms on economic growth recovery were not happening. Krugman suggests that these expectations were based on hope, rather that well-founded expectation. According to him, the disparity between the glittering prize promised by the reforms and the fairly dreary reality was bound to produce a revolution of falling expectations somewhere along the line.

explanation, the thought by investors that the currency might be devalued (because of an overvalued exchange rate and by loosing up government spending) generated the currency crisis.

In following parragraphs we present an alternative explanation for the severity of the balance of payments crisis (which is not incompatible with the ones just mentioned above). Since this is based on effects atributed to low levels of private savings, we review next a number of related stylized facts.

Unlike previous balance of payments crisis in Mexico, the one in 1994-95 occurred after six years of low levels of private saving. As pointed out by most reports, this explains -by identity- the large current account deficits, in view of a relative vigorous response of private investment and of a sequence of fiscal surplus (as opposed to what happened in 1976, 1982 and 1985, fiscal accounts were not contributing, this time, to a give the impression that the macroeconomic situation was unsustainable).

In addition, the 1994 exchange rate crisis occured after seven years in which the monetary authorities conducted an exchange rate policy with no surprise discrete change in the exchange rate. That is it occurred, after a long-period of reputation building and of observing a commitment to disinflate using the exchange rate as a nominal anchor. This contrasts with what happened in 1987. Not only was then the current account in surplus, and not in a deficit 7% of GDP as in 1994, but also the Central Bank was contributing to the perception that the economy was heading towards an inflation-devaluation spiral.

The sound fiscal accounts and low levels of public debt[28] during the first half of the 1990's were taken to be among the solid economic grounds that encourage investors to hold mexican assets that led the authorities to believe that the defense of the peso was possible. In spite of current account deficits at unprecedented levels by 1994, the official policy view[29] -and the idea of most foreign investors in Mexican paper- was that the current account results were not a matter of major worry: it was considered to be the reflection of private domestic agents transferring resources from the future to the present.

In order to consider why the low levels of private savings should have been a matter for policy concern, we consider economic conditions which resulted from

---

[28]The share in GDP of total net debt of the public sector (consolidated with the Central Bank) increased from 51% in 1981 to a peak value of 78% in 1986, falling to 63.5% in 1988. The corresponding figure before the 1994 devaluation was only 22.5%.

[29]See Aspe, P. (1993) and Mancera (1991).

them. We posit that these enhanced the vulnerability of the Mexican balance of payments by the end of 1994.

We highlight and discuss in this section two phenomena that, already before december 1994, were pointing towards a vulnerable balance of payments situation and that, with the benefit of hindsight, contribute to the understanding of the reasons for the magnified financial debacle that occurred during the first half of 1995:

On the one hand, savings by households were not only sustained at low levels for six years, but, as a consolidated sector, resulted as well consistently lower than their expenditures in residential construction. From a macroeconomic perspective this implies that, as a consolidated aggregate, they drew on their previously accumulated financial assets (i.e liabilities issued by other sectors) in order to sustain their pattern of net dissavings. This, in turn had as a consequence that a major change occurred in the financing of public sector and private enterprises: the net increase in liabilities of these two sectors during the period 1988-1994 was not even partly acquired by domestic households- as it had previously been the case.[30] Hence the share of Mexican financial assets held by foreigners at the end of 1994 achieved an unprecedent high value[31].

One the other hand, the household sector which had always been a net debtor with the domestic commercial banking system, turned into a net creditor in 1993. This was the result of a boom in expenditures in houses and durable consumption goods[32], which in turn was propelled by a financial liberalization wave that occurred since 1989 and by the availability of funds resulting from the withdrawal of public debt (due to a privatization program and fiscal accounts in surplus) and by

---

[30]It is suggested hear that holdings of domestic financial assets by foreign funds lends itself to a more volatile situation, to the extent that these- and not domestic residents- have available (and are constantly seeking for) substitutable investment opportunities in other countries to which they can quickly move into.

[31]This problem was aggravated by the fact that expectations for 1995 were that, with the recent membership to the OECD, among other factors, Mexican liabilities would be subject to a lower risk qualification by international grading companies. That is to say, domestic entrepreneurs and economic authorities were expecting interest rates to be lower. As a result, most debt was in short-term maturity. See García-Moreno (1995).

[32]See Buira, A. (1994).

renewal access to international markets by Mexican firms and commercial banks[33]. As a consequence, the balance sheet of the domestic commercial banking system was starting to exhibit signs of potential fragility by Septembre 1994.

Before 1988, the household sector in Mexico had traditionally been a net lender of financial resources to private firms and to the public sector -i.e. households had historically been saving enough resources to finance not only their investment in new housing but also to add to their holdings of assets issued by firms and by the public sector.

In 1981, for example, households saved almost seven points of GDP more than their investment requirements in housing during that year. This enabled them to finance, in addition to the equivalent account of the investment by domestic private firms that was not financed with their profits, almost seven points of GDP of the 1981 fiscal operational deficit. This pattern was no longer continued during the administration of president Salinas (1989-1994): during these years savings of households were not enough to finance their own expenditure in housing during this period. As a consequence, their holdings of cumulated net indebtedness by private firms and public sector were reduced substantially by 1994.

During the years corresponding to the administration of president Salinas (1988-1994), results opposite to those preceeding them were registered: On the one hand, the holdings of net financial assets by households registered a decline of 37 billion dollars. On the other hand, net indebtedness of the country with the rest of the world increased by 72 billions U.S. dollars. That is, this latter level increased not only by an amount that financed -by 35 billion dollar- the variation in the sum of net indebtedness by private firms and public sector. The level of indebtedness of the country with the rest of the world had an additional increase to compensate for the reduction of net holdings of assets by the household sector during these years.

In a nutshell, the share of the sum of net indebtedness of firms and public sector held by households fell from 44.1% in 1988 to 11.2% by September 1994. Hence, the corresponding share of the foreign sector increased- by identity net indebtedness of private firms and public sector that is not held by domestic households is held by the rest of the world. On top of this pattern, removal of restictions on foreign residents holdings of Mexican government paper implied that internal public debt was, by mid-1994 held almost entirely by foreign funds.

One of the indicators suggested to asses external sustainability of a country is the actual and expected evolution of the coefficient of net external debt to GDP,

---

[33]See Calderón-Madrid, A. (1995a)

the corresponding coefficient for the Mexican economy for the period before the 1994 devaluation was low for international standards.

During the period 1988-1994, not only a substantial reduction of public debt was achieved, another important change was the creation of conditions for the return of private firms and Mexican commercial banks to international capital markets[34]. As a result of this, In september 1994 the level of indebtedness by private firms in foreign currency only -direct credit and indirect financing through domestic banks and money market- was 58.8 billion dollar[35], more than 55% of the corresponding figure for the public sector[36].

Financial Liberalization and Private Expenditure Boom.

A number of factors explain why was the behavior of the private sector during the period 1989-1994 so different from the one exhibited in the preceding six-year period. Conspicuous among them was an unprecedented increase in loans to households by the commercial banking system. This phenomenum played a major role in the sharp fall in their saving rate, thereby constituted one of the main determinants of the large current account deficit of the balance of payments.

As part of the package of reforms intended to laid the foundations for an economic takeoff, a radical process of financial liberalization was started at the end of 1988 with three measures: commercial bank's reserve coefficient was reduced from 52% to 30%, ceiling on commercial bank's deposits interest rates were abolished and government owned commercial banks were privatized.

The credit boom, absorbed mainly by households, was created not only by the liberalization in the banking system and capital markets, but also by the reduction of public domestic debt. This reduction implied less borrowing requirements from comercial banks by the public sector. Also private firms required relatively less

---

[34]*Cfr.* Ortiz, G. (1991). OECD (1992). Oks, D. and Van Wijnbergen, S. (1992). Mansell Carstens, C. (1994).

[35]This level was, in 1988, only 14.5 billion dlls.

[36]Adding the domestic commercial bank loans granted to private firms in dollars to the loans obtained directly by them in world markets we get a figure of 10% of GDP in 1994 before the exchange rate devaluation. This proportion contrasts sharply with a corresponding share of 5% for 1988. To this difference, a further 2.37% of GDP must be added to the 1994 figures. It corresponds to the amount that firms obtained in the money markets -i.e. foreign portfolio investment (not equities) in private firms.

financing from domestic commercial banks, because of the return of private firms to international financial markets.

In only four years, as shown in table 2 -from the end of 1989 to the end of 1993- the stock of credit of commercial banks to the household sector increased its share of GDP from 4.9% to 14.7%. In addition, since financial assets held by households in domestic currency did not increase its share of GDP, this sector became a **net borrower** with commercial banks since the end of 1993.[37]

TABLE 2

STOCKS OF COMMERCIAL BANKS
(AS SHARE OF GDP)

YEAR	CREDIT TO HOUSEHOLDS COMMERCIAL BANKS	HOUSEHOLDS' DEPOSITS ON COMMERCIAL BANKS*
1981	6.25	16.66
1985	3.04	11.28
1989	4.87	10.36
1990	6.45	10.25
1991	8.92	10.71
1992	12.42	12.83
1993	14.68	11.97
1994	15.92	10.82

*Figures for 1994 correspond to the end of september, the other to the end of december .

III. Analytical Explanation and Statistical Testing of Data Generated.

a) An Analysis of Exchange Rate Crisis with Multiple Equilibria.

[37]This kind of phenomenum has also been registered in other countries. For example, Australian households held negative net liquid assets, for the first time in the postwar period, at the end of 1980. See Lattimore, R. (1994).

'he first and only re-alignament in the bounds of the exchange rate band established y the monetary authorities in 1991 in Mexico turned out to be the last one too. In 994, after ten months in which the exchange rate was close to or at the upper ound and capital outflows diminished by almost 40% the amount of international eserves with which the Central Bank attempted to defend the peso within established and limits, a 15% increase in the upper bound of the band for the Mexican peso vas announced. This measure, announced in December 19, 1994, effectively onsisted in a depreciation of the exchange rate since it jumped immediately to the ew bound. Moreover, far from reverting capital outflows, the speculative attack to ne balance of payments intensified with a vigor that forced the Central Bank to adopt freely floating exchange rate regime.

.s the Central Bank withdrew from the foreign exchange market a further 25% xchange rate depreciation occurred by the end of the succeeding week. In contrast o what happened in previous exchange rate crisis, two and a half months latter the alue of the Mexican Peso continued its downward trend: by march 15, 1995 the ominal exchange rate had already registered a depreciation of 100% with respect to s level three months earlier- and, due to a domestic inflation rate which was kept nder control, the real exchange rate depreciation was then of the order of 70%[38].

was not until the biggest-ever international financial rescue package was offered to lexico, that financial markets tended to stabilize. That is, it was not until news of nis package, together with that of an accompanying severe adjustment program eached the market, that a perception still prevailed, among market participants, that ne financial situation could further deteriorate.

Vith the 15% exchange rate depreciation implied by the december initial attempt to e-aligne the upper bound of the band and 10% movement from the bottom to the pper part of the band that occurred nine months before, the real exchange rate in ecember 19 had already a level equal to that of december 1993. If this real exchange ate depreciation was required to compensate for lack of export competitiveness, the uestion is: Why did such a financial debacle ocurred after the initial re-alignament ccurred. Why, capital did outflows intensified after the realignament of 15% with espect to the upper bound of the band?

Ve posit that the main detonator of the severe crisis experienced by the Mexican

---

[38]This result contrasts with previous episodes in which the ominal exchange rate initially "overshot" its level and no urther real exchange rate depreciation occurred. (In the articular case of 1987, three months after the devaluation the eal exchange rate had already an overvalued level with respect o its pre-devaluation figure).

economy after december 22 1994 was determined by a number of concomitant factors. That these factors contributed to multiple possible equilibria arising from the very role played by capital outflows.

In the previous subsection is was shown how, by the end of 1994 household domestic residents had a very low percentage of the holding Mexican financial assets. The importance that this factor had in exacerbating the crisis, as has been suggested by a Wall Street Journal editorial: is that "[w]hen a country's finances depend on fickle capital flows from abroad, the bottom can fall away with alarming speed....[in Mexico] the problem isn't the presence of foreigners as the absence of locals.[39]"

Hence we suggest here that holdings of domestic financial assets by foreign funds lends itself to a more volatile situation, to the extent that these- and not domestic residents- have available (and are constantly seeking for) substitutable investment opportunities in other countries to which they can quickly move into.

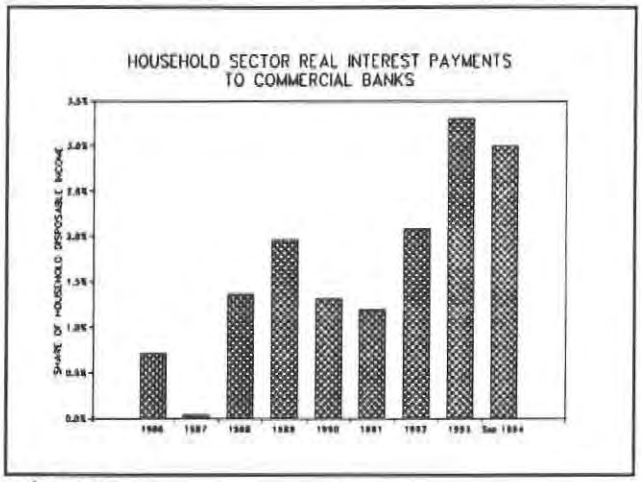


Figure 1

It must be emphasized that this vulnerability was aggravated by the fact that expectations for 1995 were that, with the recent membership to the OECD, among other factors, Mexican liabilities would be subject to a lower risk qualification by international grading companies. That is to say, domestic entrepreneurs and economic authorities were expecting interest rates to be lower. As a result, most debt was in short-term maturity[40].

As a key element of our alternative explanation for the severity of the balance of payments crisis, we must consider that, even before the exchange rate realignment of December, Mexican banks were already experiencing worrying levels of non-performing loans. The ratio of overdue credit to bank reserves was 53% at the end of September 1994, rising to 57% by the end of

---

[39]Carrington, Tim. "Mexico Set to Build Local Capital Base, Wean Itself From Relying on Foreigners". The Wall Street Journal. January 5, 1995.

[40] See García-Moreno (1995).

that year[41]. Another result that helps to explain the concern for the vulnerability of the domestic banking system is that, as a consequence of the credit boom to households, at the end of in 1993 personal interest payments represented already a share in household disposable income that was more than twice as high as the corresponding data for 1991[42]. As shown in figure 1, the high shares that interest payments for these loans represented on households disposable income partly reflected the potential difficulties to meet obligations in september 1994[43].

Our explanation of the severity of the crisis emphasizes the way in which commercial banks balances sheet -as they were at the end of 1994- contributed to the possibility of more than one expectation-led equilibrium[44]. We posit that financial market

---

[41]In addition, the prices of houses and buildings, some of which were financed by mortgage credits were registering levels beyond any plausible relationship to a corresponding fundamental value.

[42]In 1982 after a major exchange rate devaluation, president López Portillo expropriated commercial banks in an attempt to stop capital flows and to alleviate the domestic financial crisis. This experience, as well as the 1993-banking crisis in Venezuela, were probably kept in mind by most investors.

[43]Household disposable income was calculated by adding private consumption to data of household savings. The rate used to estimate interest payments was the so-called average cost of term deposits of banks (CPP) plus five points.

[44]The exchange rate band realignment of december 19 took place almost three weeks after a change in presidential administration. The new president as well as the incoming economic cabinet were clearly identified with the continuity of the economic program of the period 1987-1994. Because of this, no doubts appeared to have existed among portfolio managers and private investors about the genuine intention of the incoming administration to continue with the disinflationary policy of its predecessor, using the exchange rate as a nominal anchor. This situation could have led investors to believe that a skillful handling of the economy during the first months of the new administration could reestablish access to international capital markets thereby helping to recover credibility on the continuity of the economic program. In addition, since political problems appeared to have been already getting under control by December, there were good reasons to believe that domestic interest rates were not going to increase more and that the exchange rate would be within the established limits and perhaps even return to a lower position in the band. This suggest that an "optimistic" expectations-led equilibrium existed, in which no attack to the

paricipants perceived that the state of the banks balances reduced the room of manoeuvre[45] that the authorities had for avoiding an abrupt exchange rate depreciation. As this constraint was perceived in financial markets, it gave place to the conjecture that a speculative attack due to fears of an exchange rate depreciation would have a self-fulfilling character, in spite of the authorities' attempts to continue with their disinflatinary policy.

As discussed in the previous section, the devaluation of december 1994 ocurred one month after a six-year presidential administration which substanciallly reduced the level of public debt and that achieved unprecedented surplus in fiscal accounts and in which no surprise devaluation took place, in spite of overvaluation.
Among market participants, no doubts appeared to exist about the genuine purposes of the incoming administration to continue with a disinflationary policy. The incoming administration signalled a credible commitment that it will continue with the policy of their predecesor.

We also suggest that due to a self fulfilling prophesy, but of a different nature, namely one associated with the fragility of the domestic banking system, the balance of payments crisis of 1994 turned out having such a large dimension[46].

The very little room of manouvre left to the authorities can be illustrated by considering what could happen in the event of a speculative attack, once reserves are no longer sufficient to face it and the domestic banking system is vulnerable to a widespread failure:

If the authorities attempt to maintain the exchange rate within established limits by means of contractionary monetary and fiscal policies, a local banking crisis could eventually be produced -skyrocketing interest rates and a domestic recesion would escalate loan defaults and this could result in some banks becoming insolvent. In a situation like this an exchange rate devaluation more abrupt than the one the authorities attempted to avoid in the first place could be produced. This is due to the outflow of deposits associated with bank-panics and because emergency situations in which the stability of the banking system is threatened are generaly accompanied

---

balance of payments occured because there were no fears that the balances of banks could increase their non-performing loans.

[45]This was in clear contrast to the one they had during the first stage of the heterodox programme section 5.3.2.

[46]See Calderón-Madrid, A. (1995a) for further details.

by an expansion of money supply to bail out banks in problems[47]. Hence, in this case the fears of an abrupt depreciation that initially produced the speculative attack would prove justified.

On the other hand, if the authorities opted instead for not defending the currency in the event of a speculative attack and allow for the exchange rate to depreciate, the financial health of the Mexican banking system, as it was at the end of 1994, was also bound to be threatened. As a direct effect the devaluation would make some banks experience capital inadequacy because of both, credit lines obtained in foreign currency and loans granted by them in dollars. In addition, not only domestic interest rates would increase because of the implied loss in credibility, but also access to international capital markets to finance large current account deficits will be restricted. This access was a prerequisite for the health of the domestic banking system; growth potential associated only with the low levels of household and private firms savings would worsen the problem of overdue credits and increase the likelihood of a banking crisis.

According to our interpretation, when the authorities opted in december 19 for a realignment of 15% of the upper bound of the exchange rate band, they reinforced the perception held by market participants that a selfulfilling exchange rate crisis, associated with the potential for bank failures, could occurr. At an analytical level, our explanation for the speculative attack is not along models that merely explain it as an anticipation of events that would eventually occur. It is within models in which the attack provokes events that would not occur in its absence. Eichengreen and Wyplosz (1993) use this model to explain devaluations in the European Monetary system. It must be emphasized that, as stated by these authors, for this kind of model to be compelling, there must be an intrinsic reason why monetary policy would shift only in the event of an attack. In their analysis, the Maastricht treaty provides that reason. In ours, as stated above, the reason was widespread domestic banks failure and the way in which monetary expansion would occur in the event that the monetary authorities bailing out the banks.

This would explain why the speculative attack intensified immediately after the realignment was announced and two days latter the Central Bank, having lost almost 50% of its remaining international reserves[48], was forced to allow the exchange rate

---

[47]Not only because of the implications due to an expected increase in domestic inflation, but also due to the deterioration in perceived government solvency that these actions would have. (Among other repercussions, the payment of both Tesobonos and Cetes in hands of foreigners could have been difficult).

[48]The lost of international reserves in december 21 1994, was greater than the total lost of reserves during the period November 18-December 18. As stated by Lustig (1995, typically

to float freely.

Hence, speculative attacks due to fears of a sharp fall in the value of the peso prove to be justified; as the Central Bank withdrew from the foreign exchange market a further 25% exchange rate depreciation occurred by the end of the succeeding week. In contrast to what happened in previous exchange rate crisis, two and a half months latter the Peso continued its downward trend: by march 15 1995 the nominal exchange rate had already registered a depreciation of 100% with respect to its level three months earlier- and, due to a domestic inflation rate which was kept under control, the real exchange rate depreciation was of then of the order of 70%.

It was not until the biggest-ever international financial rescue package was offered to Mexico, that financial markets tended to stabilize. That is, it was not until these news reached the market, that a perception still prevailed, among market participants, that the financial situation could further deteriorate. One of the counterfactual questions that this study raises is: if the international financial rescue package had not arrived on time to Mexico, would a widespread bank failure had occured? The affirmative answer would support our explanation that the dramatic effects of the december depreciation can be attributed to a selfulfilling crisis, which in turn was motivated by the vulnerability of the domestic banking system.

For most observers and public officials, the reason of the severe consequences of the speculative attack on the currency that occurred after the december 19 depreciation was that markets merely anticipated further balance of payments problems due the unprecedented large current account deficits, which were, in turn, associated with an overvalued real exchange rate level.

With the same postmortem spirit of those who posit that an earlier devaluation would have been beneficial, we arrive at another, different, conclusion. Namely, that the exchange rate crisis of 1994-95 would have not been as severe, if those in charge of economic policy had taken measures in other fronts, as early as 1991. Among them those oriented to reduce the speed of loan expansion to the private sector, a more active regulation and supervision of the already potential mounting levels of unsound loans granted by domestic commercial banks to households and to firms in non-tradables sectors. These actions would have reduced the perception of the potential risk of banking difficulties. Other early measures, such as changes for additional bank capitalization programs and clarification of the rules of what would happen to those

---

capital flight occurs before a devaluation and not after. According to this author, "The December devaluation triggered a financial crisis because foreign investors felt tricked and feared a default. In addition, the lack of competence and the absence of a coherent plan at the time the devaluation was announced, added significantly to the climate of uncertainty".

bank facing problems would have also contributed in this direction.

When the biggest-ever international financial rescue package was offered to Mexico financial markets and hence the nominal exchange rate tended to stabilize.

Empirical Estimations.

As it has been mentioned by Garber and Svensson (1994), "it is difficult to distinguish (empirically between situations in which multiple equilibria may be present and situations in which exogenous policies inevitably lead to a collapse of a fixed exchange rate." In spite of these difficulties, we consider that the Mexican experience lends itself to an empirical analysis along the following lines.

For our empirical analysis we consider a Markov-switching model for describing exchange rate behaviour in Mexico[49]. Exchange rates are therefore modelled as switching between two distributions. One that holds at stable times and the other that holds in volatile times. For this purpose we rely on Hamilton's algorithm and approach to estimate our model.

As it is explained by this author, the regime at any given rate is presumed to be the outcome of a Markov chain whose realizations are unobserved by the econometrician. The task facing the econometrician is to characterize the two regimes and the law that governs the transition between them. These parameter estimates can then be used to infer which regime the process was in at any historical date and provide forecast for future values of the series. The intuition behind this model is as follows: We consider a variable y_t whose stochastic process is given by:

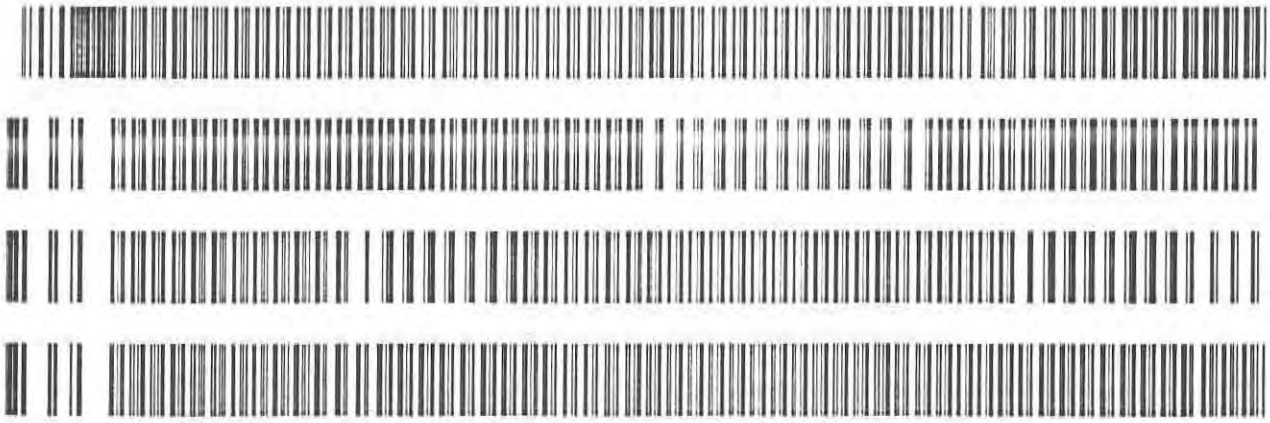
with $v \sim$ i.i.d. N(0,1) and $[1-\Phi_1 Z^1 - \Phi_2 Z^2 - \ldots\ldots\ldots - \Phi_m Z^m]$ different from zero for al Z.

The regime is indexed by the discrete-valued variable S_t ; for example $S_t = 1$ means that the process was at regime 1 at date t (i .e. no devaluation at time t).

The assumption in this model is that foreign exchange market participants recognize the possibility of changes in regime and incorporate this into their forecast for the future. Therefore S_t is modelled as the outcome of an unobserved discrete-time, discrete two-state first order Markov process, viz:

---

[49]See Engel, CH. (1994).



The process for S_t is presumed to depend on past realizations of y and s only through S_{t-1}.

We follow closely Hamilton's (1990) development and incorporate both, exchange rates, denoted by the variable e and expresed in logarithms, and the discrepancy between the interest rates in peso-denominated and in dollar-denominated bonds (Cetes and Tesobonos), denominated by the variables i and i^* respecitvely, to estimate the parameters of a model for expected devaluation of the peso, $e^{\bullet}_{t-1} - e_t$.

That is, given the following equations,

$$i_t - i_t^* = P_{11}\mu_1 + (1-P_{11})\mu_2 + U_t, \quad \text{when } S_t = 1.$$

$$i_t - i_t^* = P_{22}\mu_2 + (1-P_{22})\mu_1 + U_t, \quad \text{when } S_t = 2.$$

we set out to estimate the expected peso depreciation according to:

$$E_t(e_{t+1} - e_t) = P_{11}\mu_1 + (1-P_{11})\mu_2 \quad \text{when } S_t = 1.$$

$$E_t(e_{t+1} - e_t) = P_{22}\mu_2 + (1-P_{22})\mu_1 \quad \text{when } S_t = 2.$$

given the assumption of uncovered interest rate parity condition . Notice that we use tesobonos and not U.S. treasury bill as the dollar-denominated asset in order to avoid having to deal with changes in country risk-premium.

On the basis of the analytical arguments presented in the previous sections, we can address the following hypotheses:

a) The authorities considered two possible policy reactions to the drop in reserves registered on december 19: an initial exchange rate realignment of 15% or to allow the market to determine a new exchange rate level within a free floating regime. They

opted for the former, in the expectations that market participants would act as if no further depreciation was required. Ex-post we know that this policy reaction proved unsuitable, since two day later the Central Bank had to widrew support of the peso in the foreign exchange market.

Would the statistical model reject the following conjecture? (which presumably was in the mind of the monetary authorities when they opted for the first option instead of allowing for a free float without attempting a 15% realignament of the upper bound of the band):

There would be a high probability for the exchange rate to be in a stable state inmediately after a period in which the exchange rate was in an unstable state (i.e after the initial exchange rate realignment). That is, the model would not generate a high probability of a further depreciation in the observation inmediately after the realilgnment of december 19, 1994[50].

b) An argument, associated to the work of Drazen and Masson (1994), is related to the credibility of monetary authorities in their announcements to defend the value of the Mexican peso. According to this view, "by not devaluing in March, 1994 the government may have increased rather than decreased the expected rate of devaluation"[51]

In terms of testable hypothesis, this argument states that the probability of being in an unstable state inmediately after a period in which the exchange rate was in an stable state., was high in observations comprised between March and December 1994.

c) As a result of a number of events generating political turmoil and nervousness in financial markets along 1994 (peasant uprising in the south of the country, political unrest due to the assassination of a presidential candidate, elections etc) a number of observations of our sample presents what Svenson (1991) calls lack of credibility in the exchange rate band. These observations correspond to those dates registered in graph 5 in which the expected level of the exchange rate (as measured by implicit arbitrage between Cetes and Tesobonos) is above maximum possible devaluation within exchange rate band. We can also detect periods of nervousness in foreign

---

[50]In some statistical models, such as the one applied by Chen, Z and Giovannini, A (1993) to the behaviour of European exchange rates, have found evidence consistent with the statement that large revaluation expectations occur immediately after devaluations.

[51]Sachs, J. et al (1995) p.15

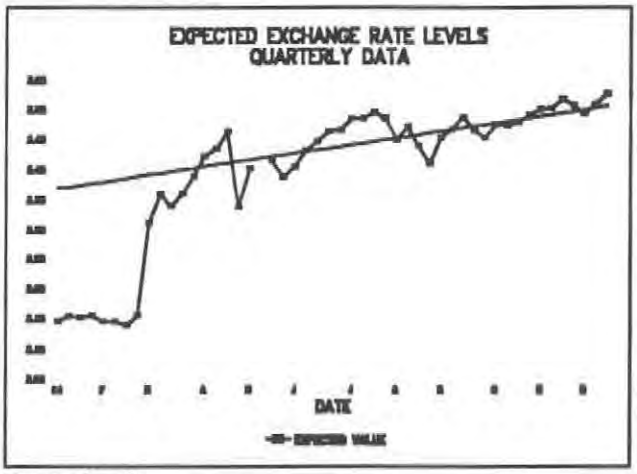
exchange rate market by means of weekly losses in international reserves, as reported by the Bank of Mexico.

Would the statistical model coincide in detecting these periods as unstable, moreover, as can be appreciated in these graphs, unstable periods tend to cluser would these "stilyzed facts" be captured by our statistical model.

d) One of the counterfactual questions that this study raises is: if the international financial rescue package had not been offered to Mexico in March 1995, would fears of widespread bank failure intensified and hence exchange rate depreciation would have continued? An affirmative answer would not reject our explanation, according to which the financial debacle that followed the December exchange rate depreciation can be attributed to a crisis motivated by the vulnerability of the domestic banking system.

The statistical model used here, enable us to consider what would the probability of no further exchange rate depreciation had been (at the date when the news of the availabiliy of the financial package reached the markets), given that the exchange rate had already registered an exchange rate depreciation during the previous period. (i.e. probability of the exchange rate belonging to a distribution of stable times given that, in the previous period, it belonged to a distribution that holds in volatile times).

Our results, using quarterly data from june 1993 to december 30 1994 are presented in table 4. From this table we deduce that the predicted value for i_t-i_t*, when $S_t = 1$, based on univariate estimate of $P_{11}\mu_1 + (1-P_{11})\mu_2$, is 2.93060 and the predicted value for the same interest differential based on univariate estimate of $P_{22}\mu_2 + (1-P_{22})\mu_1$ is 46.24040.



Graph 5

In turn, the predicted value for a change in i_t-i_t*, when the state changes from 2 to 1, based on univariate estimate of $(-1 + P11 + P22)(\mu_1-\mu_2)$ is -43.30980.

These estimates, indicate that the probability of expecting a further depreciation, given that a first realigment had already ocurred, was high. This implies that our first hypothesis is rejected. The model does not support the conjecture that, presumably was in the mind of the monetary authorities when they opted for a relaignament of the upper bound of the exchange rate band instead of allowing for a free floating regime.

They also indicate, since a similar result is obtained for march 1995, that the financial package was required in order to avoid further fears of widespread bank failure and hence of an even more severe exchange rate crisis.

TABLE 4

ESTIMATES OF $y_t = [(e_t - e_{t-1}), (i_t - i_t^*)]'$
e_t = Log of the exchange rate X 100 (in pesos per dollar)
i_t = Interest rate

PARAMETERS	VALUES
μ_1 $\mu_1(2)$	2.31452 (0.549216) -8.28485 (0.300825)
μ_2 $\mu_2(2)$	50.1248 (3.93862) -7.30787 (0.219882)
p_{11}	0.987114 (0.0129963)
p_{22}	0.918754 (0.0701758)
Ω_1	20.1120 -2.57788 (3.58718) (1.38775) -2.57788 6.17321 (1.38775) (1.05684)
Ω_2	202.008 -4.01728 (81.5240) (3.31217) -4.01728 0.674821 (3.31217) (0.255725)

Notes: Standard errors are in parentheses. $\mu_1(2)$ is the mean interest differential when the process is in state 1, and $\mu_2(2)$ is the mean interest differential when the process is in state 2.

Finally, since the results of this model indicate that, before december 1994 a low

probability was attributed to the exchange rate belonging to an unstable period, given that the previous period was not characterized by a devaluation, the conclusion that, by not devaluing in March, 1994 the government may have increased rather than decreased the expected rate of devaluation is not supported.

These results suggest that the empirical analysis must be, at a next stage of research, developed along a number of lines. Firstly, along those suggested by Engel, Ch. and Hakkio (1994). That is, incorporating information contained in "outliners." We also conclude that probabilities of devaluation would be estimated more accurately if, in addition to the bi-variate series analysis presented here could be modeled as dependent[52] on expected values of policy instruments such as the determinants of the variance of domestic credit expansion, as it is done in Goldberg, L. (1994).

[52]This analyisis is the next stage of the present research and is currently being conducted along the lines suggested by Diebold et al (1994).

REFERENCES

Bazdresch, C. and Levy, S. (1991) "Populism and Economic Policy in Mexico, 1970-1982". in Dornbusch, R. and Edwards, S. (eds) "The Macroeconomics of Populism in Latin America." Chicago: University of Chicago Press.

Buiter, W (1986) "Borrowing to Defend the Exchange Rate and the Timing and Magnitude of Speculative Attacks." in Journal of International Economics, Vol 23 November. p. 221-39.

Blanco, H. and Garber, P. (1986) "Recurrent Devaluation and Speculative attacks on the Mexican Peso". Journal of Political Economy 94, NO 1, p.148-166.

Calderón-Madrid, A. (1995a) "Incomplete Adjustment: Fiscal Policy, Private Savings and Current Account Deficits in Mexico since 1982" en Jansen, K. y Vos, R. eds. (1995) "External Finance and Adjustment, Failure and Success in the Developing World" In Print, McMillan Publisher London.

Calvo, G. (1995) "Varieties of Capital-Market Crises" Paper presented at the Inter-American Seminar on Economics.Bogotá, Colombia, november.

Calvo and Mendoza (1995) "Reflections on Mexico´s Balance of Payments Crisis: A Chronicle of a Death Foretold" August 7. Mimeo.

Chen, Z. and Giovannini, A. (1993) "The Determinants of Realignament Expectations Under the EMS: Some Empirical Regularities" NBER Working Paper No 4291

Diebold, F. X. et. al. (1994) "Regime Switching With Time-varying Transition Probabilities" in Hargreaves, C. (1994) ed. "Nonstationary Time Series Analysis and Cointegration" Oxford University Press.

Dornbusch, R. et al (1995) "Currency Crisis and Collapses" Mimeo M.I.T.

Flood et. al. (1995) "Collapsing Exchange Rate Regimes: Another Linear Example" IMF Staff Papper. August. WP/95/

García Moreno, C. (1995) "La Perspectiva de los Mercados Voluntarios de Capital Para México" May. Mimeo. Paper presented at the "Consultations for the Plan for National Development" SHCP. Mexico City.

Goldberg, L. (1994) "Predicting Exchange Rate Crisis Mexico Revisited" Journal of International Economics 39. p. 413-430. North Holland.

Krugman, P. (1995) "Dutch Tulips and Emerging Markets" in Foreign Affairs. July/August.

Krugman, P. and Rotemberg, J. (1992). "Speculative Attacks on Target Zones" in: Krugman, P. and Miller, M. eds. "Exchange Rate Targets and Currency Bands" C.U.P. Press Cambridge. p. 117-132.

Eichengreen, B. and Wyplosz, C. (1993) "The Unstable EMS" Brookings Paper on Economic Analysis, 1:51-124.

Engel, CH. (1994) "Can the Markov switching model forecast exchange rates? " Journal of International Economics 36. p. 151-165. North Holland

Engel, CH. and Hamilton, James D. (1990) "Long swings in the dollar: Are they in the data and do markets know it ?" The American Economic Review 80. p.659-713.

Engel, CH. and Hakkio (1994) " The Distribution of the Exchange Rates in the EMS" NBER Working Paper No 4834. August.

Garber, P and Svensson, L. (1994) "The Operation and Collapse of Fixed Exchange Rate Regimes" NBER Working Paper No 588. December.

Hamilton, J. (1989) "A New Approach to the Economic Analysis of Nonstationary Time Series and the Business Cycle" in Econometrica, Vol 57, No 2. March p. 357-384.

Lattimore, R. (1994) "Australian Consumption and Saving" Oxford Review of Economic Policy, Vol 10, No 2.

Lustig, N. (1995) "The Mexican Peso Crisis: The Foreseeble and the Surprise" Brookings Discussion papers in International Economics. No114. June 1995.

Mansell Carstens, C. (1994). "The Internationalization of the Mexican Financial System" Paper presented at "The Global and Comparative Analysis of Financial Institutions" Rockefeller Foundation. Bellagio Conference and Study Center. May.

Masson, P. and Drazen, A. (1994) "Credibility of Policies Versus Credibility of Policymakers" Quarterly Journal of Economics, August.

Obstfeld, M. (1995) "Competitiveness, Realignment, and Speculation: The Role of Financial Markets" in Giavazzi, F. et. al. (1988) "The European Monetary System" C.U.P.

Obstfeld, M. (1995) "Models of Currency Crises with Self-fulfilling Features" NBER Working Paper No 5285. October.

OECD (1992) "Mexico" OECD Economic Surveys. Paris.

Oks, D. and Van Wijnbergen, S. (1992). "Mexico in the World Capital Market" World Bank Working Paper. December.

Ortiz, G. (1991) "Mexico Beyond the Debt Crisis: Toward Sustainable Growth with Price Stability" en "Lessons of Economic Stabilization and Its Aftermath. MIT Press.

Ize, A. and Ortiz, G. (199) "Fiscal Rigidities, Public Debt and Capital Flight" in IMF Staff Papers.

Sachs, J., Tornell, A., Velasco, A. (1995) "The Collapse of the Mexican Peso: What Have We Learned?", mimeo.

Svenson, L.E.O. (1994) "Fixed Exchange Rates as a Means to Price Stability: What have we learned?" in European Economic Review 38 p. 447-468.

Svenson (1991) "Target Zones and Interest Rate Variability" Journal of International Economics 31, p.27-54.

Van wijnbergen, S. (1991) "Fiscal Deficits, Exchange Rate Crisis and Inflation" in Review of Economic Studies 58, p. 81-92.