

# Policy Priorities And the Mexican Exchange Rate Crisis

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**T***his article considers factors that led to Mexico's December 1994 devaluation, examines why it seemed to surprise markets, and addresses financial market behavior in the wake of the peso devaluation. It is useful to consider factors that led to devaluation in the framework of the so-called impossibility theorem.*

Immediately following Mexico's December 20, 1994, devaluation of the peso, some observers expressed detailed support for the move. They conjectured that it would calm financial markets that had showed some signs of volatility.

Mexican officials themselves treated the devaluation as if it would have a stabilizing influence. In presenting the devaluation, they announced that the country's erstwhile crawling peg regime would remain in place, and that the devaluation would represent only a change in the weak-side edge of Mexico's exchange rate band.

In the United States, some analysts also accepted Mexico's initial devaluation as equilibrating. Then Acting International Monetary Fund Director Stanley Fischer noted Mexico's initiatives as "an appropriate policy response to recent market developments..."<sup>1</sup> MIT Professor Rudiger Dornbusch, who had for some time been advocating a Mexican devaluation, was quoted as saying that now was the time for "smart money" to move into Mexico, with the currency at appropriate levels.<sup>2</sup>

But instead of inducing stability in financial markets, the initial devaluation triggered a run on the currency. Foreign currency reserves fell markedly. Mexican interest rates rose rapidly. The exchange rate moved well beyond what advocates of Mexican devaluation had said they thought sufficient.

While subsequent exchange rate and interest rate reactions to Mexico's initial devaluation raised questions about how financial markets operate, financial events preceding Mexico's initial devaluation of the peso also offered anomalies. Financial markets typically sense impending devaluations. This time, despite concerns voiced occasionally that the peso was overvalued, reports were widespread that the timing had surprised financial markets<sup>3</sup> and even that investors felt betrayed.<sup>4</sup>

This article considers factors that led to the devaluation, examines why it seemed to surprise markets, and addresses financial market behavior in the wake of the peso devaluation. It is useful to consider factors that led to devaluation in the framework of the so-called impossibility theorem. Recall that this theorem claims that policy authorities cannot simultaneously and continuously follow the three objectives of free capital mobility, fixed exchange rates, and an independent monetary policy.

I detail why policymakers might reasonably conclude that Mexico could possibly pursue limited episodes of monetary indepen-

dence—even if the impossibility theorem ultimately could not be denied—and why the possibility could have been permitted to become a reality. Nevertheless, when witnessing a financial panic like Mexico's, it may require effort to recall that exchange rate devaluation is a matter of choice. A central bank can always maintain a pegged exchange rate. The price is contraction in the monetary base or, equivalently, a persistently high interest rate.<sup>5</sup>

This article outlines the rise of priorities that came to dominate the preservation of the Mexican exchange rate regime. Specifically, already high real interest rates, resulting increases in nonperforming loan rates, and the implications of all of these factors for commercial bank solvency seem in part to have motivated credit creation at times in 1994 while the United States was tightening credit.

### **Mexico's pre-devaluation exchange rate and monetary policy independence**

While the impossibility theorem posits that policy authorities cannot simultaneously and continuously follow the three objectives of free capital mobility, fixed exchange rates, and an independent monetary policy—the meaning of the term *continuously* complicates matters for anyone who wants to analyze Mexico. How continuous does continuous have to be?

Before the December 1994 devaluation, Mexico's exchange rate was essentially pegged to the U.S. dollar, but Mexico gave itself what appeared to be some room to maneuver. In pegging the peso to the dollar, Mexico was announcing its intent to cede some control over its monetary policy to the United States. One advantage of taking this step and then persisting with it is to establish credibility that, in general, noninflationary policies would be in place.

If Mexico had fixed its exchange rate policy hard and fast to the dollar, it would have been fully ceding its monetary policy to the United States. But in fact, Mexico permitted its exchange rate to fluctuate within a band whose weak-side edge devalued at 0.0004 pesos per dollar. With a band, Mexico's central bank could run expansionary or contractionary monetary policies different from those of the U.S. central bank—provided that the resulting movements in the exchange rate remained within the band—and still maintain exchange rate credibility.

An important detail of Mexico's monetary independence, however, involved what may be seen as its term structure. U.S. short-term rates appear not to have an influence on Mexican short-term or long-term interest rates, but U.S.

long-term rates seem to influence Mexican long-term interest rates.<sup>6</sup>

To the extent that these data suggested limited financial integration in short-term markets, Mexico may have perceived itself able to pursue a relatively independent monetary policy in the short run. In any case, as will be detailed, Mexico did pursue a monetary policy in the second half of 1994 that was inconsistent with the United States' increasingly restrictive approach to money market intervention.

The implications of the U.S. long-term debt to Mexican long-term debt relations suggest that Mexico's monetary policy could not remain independent in the longer term—at least not in a pegged exchange rate regime. Once the United States moved its long rates, Mexico would have to follow quickly or face large capital outflows. There is much to suggest that political factors contributed to the day-to-day changes in capital outflows that ultimately occurred but, in the end, monetary policy in Mexico was not consistent with reversing them.

### **Tensions within Mexico's exchange-rate-based stabilization plan**

**Incomes policies.** Exchange-rate-based stabilizations are very difficult to pursue effectively over protracted periods. In programs like Mexico's, devaluation is not unusual, even when care is taken to address their typical problems by using exchange rate pegging as only a part of the overall program. In Mexico, pegging was an important element of a broader program that included reduced government spending, tax reform, deregulation, privatization, and significant trade liberalization—including rapid reductions in tariffs and quotas and entry into the General Agreement on Tariffs and Trade (GATT) and later into the North American Free Trade Agreement (NAFTA).

Fiscal stabilization preceded the exchange-rate-based stabilization efforts. The history of exchange-rate-based stabilization in the Southern Cone countries had suggested that a single nominal anchor—such as the exchange rate—could be inadequate to motivate quick disinflation. Policy incredibility (that firms would not believe the exchange rate regime would persist) as well as backward indexation and nonsynchronized price-setting could lead to persistent inflation (Calvo and Végh 1992).

Accordingly, an important component of Mexico's stabilization policy was the *Pacto*. Under this government-organized accord, representatives of the business community agreed to limit price increases, the government made com-

mitments about the exchange rate and public-sector prices, and labor representatives agreed to limit wage increases.

Although there are historical exceptions, exchange-rate-based stabilization programs that also include incomes policies—like the Pacto—fairly commonly result in a specific dynamic of consumption and investment patterns, current account movements, and exchange rate pressures. The typical pattern (Calvo and Végh 1992 and Kiguel and Liviatin 1992) includes the following:

1. Despite reductions in inflation, the real exchange rate rises because some inflation remains and is not offset by nominal exchange rate movements.
2. The trade and current account balances deteriorate.
3. In the early stages of the program, capital inflows finance the excess of consumption and investment over domestic production, allowing a boom to ensue, but the inflows ultimately reverse.
4. With this reversal, the growing current account deficit can no longer be financed, and the consumption boom ends.

In recognition of this instability, a literature has developed to suggest that exchange rate pegging ought to be a temporary stabilization tool, ultimately followed by a managed float (McLeod and Welch 1991) or that, if pegging is done at all, the exchange rate crawl should be partially indexed to a measure of domestic prices (Kamin 1991). Ultimately, it has been argued, “As useful as exchange rate pegging is at the outset, it is equally important to eliminate it as soon as possible” (Dornbusch and Werner 1994, 281).

**Trade and capital flows.** Although Mexico’s program of exchange rate stabilization *cum* incomes policy and trade liberalization contained elements particular to the country, the ensuing economic trajectory was typical of heterodox programs. Consistent with the intentions of such plans, inflation fell markedly—from 159.2 percent in 1987 to 8 percent in 1993. By the third quarter of 1994, the annualized inflation rate had declined to 7 percent.

Mexico’s trade liberalization was a part of this disinflation effort. Oligopoly typifies the organization of domestic markets in Mexico, and price controls could risk product shortages. Mexico used trade liberalization to enforce price discipline—so as to hold down inflation and to lower the likelihood of product shortages.

Moreover, the country’s exchange rate policy played a disinflationary role in the con-

**Figure 1**  
**Real Peso–Dollar Exchange Rate**



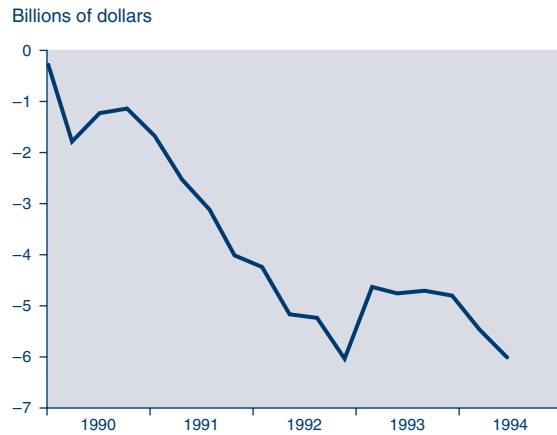
text of trade liberalization. The government consistently depreciated the peso more slowly than the rate of inflation—or than the difference between the U.S. and Mexican inflation rates. Consequently, as is common in exchange-rate-based stabilization programs, real exchange rate appreciation was chronic. Since real exchange rate appreciation meant that foreign products were increasingly cheaper than Mexican products, this exchange rate policy motivated domestic producers—at least of tradable goods—to resist the temptation to raise prices.

Figure 1 depicts a simple real exchange rate measure—wholesale prices in Mexico relative to those in the United States, both as measured in dollars. By the end of 1993, Mexico’s real exchange rate exceeded the maximum rate that preceded Mexico’s megadevaluation episodes of 1982.

Partially because of this tension between inflation and the pace of exchange rate depreciation, the nation’s merchandise trade balance grew increasingly negative (*Figure 2*). As may be expected in an economy that had reoriented itself toward a market system—and had deregulated, privatized, and generally rationalized its policies toward the private sector—a significant portion of Mexico’s current account deficit reflected purchases of capital goods. The increased productivity and efficiency that these purchases imply resulted in steady increases in exports. But the capital imports share of total imports was still only 16.9 percent in 1993, versus 71.1 percent for intermediate goods and 12 percent for consumer goods.

The trade and current account deficits were possible because the rationalization of Mexico’s fiscal, monetary, and exchange rate policies had

**Figure 2**  
**Merchandise Trade Balance**



helped stimulate large inflows of foreign investment funds through early 1994. These flows also gave Mexico the reserves it would need to defend the peso later, if exchange rate pressures required it.

Increased capital inflows are common to chronic inflation countries that introduce exchange-rate-based stabilization programs. Most of these flows (*Figure 3*) into Mexico involved portfolio investment—inflows typically for the purchase of bonds and stocks—rather than foreign direct investment. While portfolio investment permitted Mexican enterprises to fund privately owned toll roads, the recently privatized telephone company, and some manufacturing operations, the focus of this investment on the production of nontradables made inflows and outflows susceptible to concerns of devaluation risk.

But to the extent that capital is not perfectly mobile, Mexico's chronically low and, in the 1990s, falling saving rate meant that the country's investment and growth were more susceptible to external financial events. There is much to suggest that capital flows into Mexico did not occur solely because of Mexico's policies. During the early 1990s, foreign capital began to flow into Latin America generally, despite wide differences in macroeconomic policies and economic performance among countries there. An important reason appears to be low U.S. interest rates, suggesting that increases in U.S. interest rates might have the opposite effect.<sup>7</sup>

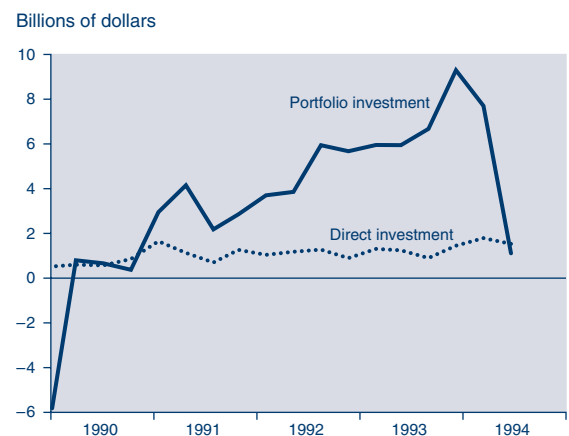
**Central bank policy and the financial sector.** One reason tensions surfaced between Mexico's exchange rate regime and other policies is that international elements of

Mexico's disinflation programs—trade liberalization, real exchange rate appreciation, and a trade deficit financed by foreign capital inflows—collectively weakened Mexico's financial sector.

Three factors converged to impose pressures on Mexico's financial sector. First, differences between the pricing performance of the nontradables and tradables sectors damaged the latter. The increased international competition held down prices in the tradable goods sectors. But even with the Pacto, prices of nontradable products, including real estate and some services, rose relative to prices of tradables. This disparity imposed profit squeezes on tradables firms because they often used nontradables as inputs, and because nontradables producers could bid up wages of workers for whom tradables firms had to compete. The direct effects of trade liberalization and real exchange rate appreciation had, of course, also imposed cost-price-squeeze pressures on some of these firms. These pressures were expressed in increasing loan defaults by tradables firms.

Second, to maintain inflows of foreign capital, real interest rates began to increase starting in 1992, even though nominal rates were falling at this time. During the early 1990s, Mexico's commercial banking system did not, at least by developed country standards, behave very competitively.<sup>8</sup> Spreads between cost of funds and loan rates were large. So were return on assets, return on equity, and other income statement ratios (Mansell Carstens 1993; Gruben, Welch, and Gunther 1994). Bank lending rates were typically very high by the standards of developed countries, in any case. But increases

**Figure 3**  
**Capital Account**



in real rates made it particularly difficult for some firms to compete with foreign producers from countries where financial costs happened to be lower.

Third, to take advantage of the consumption boom of the early 1990s, Mexico's financial institutions had issued many more credit cards—to the wrong borrowers. By the standards of developing companies, the reporting of consumer credit histories was relatively sketchy and unorganized in Mexico. Defaults became common.

These factors converged to pressure Mexico's banking system.<sup>9</sup> Just between the fourth quarter of 1992 and the third quarter of 1994, the percentage of nonperforming loans rose from 5.6 percent to 8.3 percent.<sup>10</sup> Moreover, between December 1991 and September 1994, the ratio of high-risk assets to bank net worth rose from 51 percent to 70 percent.

Banking system problems like these take on special significance anywhere a central bank is both monetary authority and, as in Mexico, administrator of the deposit insurance system. As Heller (1991) argues, to the extent that a central bank is not only the nation's monetary authority but also is responsible for the health of the banking system, policy tensions may exist. Even though central banks are typically committed to the restraint of monetary expansion, and Mexico's is, an incipient banking crisis may create incentives to expand credit to the banking system.

It is here that the tensions expressed in the impossibility theorem appear, since it holds that free movement of capital, independent monetary policy, and a pegged exchange rate are sooner or later incompatible. Mexico followed a sterilization rule for its inflows of foreign reserves. To impose a monetary stabilization rule atop the exchange rate based stabilization, accumulations of foreign currency reserves were sterilized via offsetting reductions in domestic credit the central bank created for the financial system. Conversely, outflows of foreign currency reserves were sterilized through offsetting increases in domestic credit.<sup>11,12</sup>

Recall that a central bank can always maintain a pegged exchange rate, but sometimes the price is otherwise undesirably tight monetary policy. Outflows of foreign currency reserves, even if for purely political reasons, can signal that a monetary contraction or interest-rate increase is in order.<sup>13</sup> Such policies can be inconsistent with the expansion of domestic credit as an offset to capital outflows, even if the policy is purely an act of sterilization.<sup>14</sup>

## The currency configuration of Mexican short-term debt

Mexico has simultaneously issued short-term, peso-denominated debt (*cetes*) and short-term dollar-indexed debt (*tesobonos*), but as 1994 progressed, Mexico radically altered the currency configuration of its short-term debt so as to strengthen the peso. In January 1994, the dollar value of *cetes* outstanding was \$12.9 billion, compared with \$302 million in *tesobonos*. By November, *cetes* outstanding had fallen to \$7.27 billion, while *tesobonos* had risen to \$12.9 billion.

An interesting characteristic of these debt issues, as demonstrated econometrically (Dornbusch and Werner 1994), is that the changes in spreads between their interest rates are not affected by changes in factors normally associated with exchange rate expectations. Dornbusch and Werner (1994) argue that changes in spreads between the interest rates of *cetes* and *tesobonos* are not explained by changes in the real exchange rate or in Mexico's trade balance because the government managed the composition of its domestic debt so as to respond to cost differentials. That is, as exchange rate risk rose, Mexico shifted its composition of short-term debt toward *tesobonos* and away from *cetes*. The authors argue that this shift reflects government responses to cost differentials. As rates on *tesobonos* fell relative to rates on *cetes*, the government replaced *cete* issues with *tesobono* issues.

If one advantage of a shift toward *tesobonos* was to save on interest expenses while gaining foreign exchange by selling debt to foreigners, it was not the only advantage. Mexico's increased issuance of *tesobonos* may also be seen as making its exchange rate regime more credible by imposing a clear and obvious fiscal penalty for devaluation.

Ize and Ortiz (1987) note that devaluation is tantamount to a default on domestic debt because, by raising the price level, the government erodes the debt's real value. Accordingly, a large overhang of domestic debt may be seen as a motivation to devalue, particularly when the debt is held by foreigners.

While this motivation may exist when a nation's domestic debt is denominated in the home currency, the motivation erodes if, as with the *tesobonos*, the debt instrument is indexed to the dollar. A shift out of *cetes* and into *tesobonos* is a shift out of an instrument for which outstanding real debt falls with devaluation and into an instrument for which devaluation means a real debt increase. This statement



holds whenever the subsequent rate of inflation does not match or exceed the rate of devaluation by the time the debt matures.

The tesobono shift's role in enhancing credibility that the exchange rate regime will persist may be indirectly measurable. Insofar as agents recontract for higher wages or higher purchase or selling prices now in anticipation of a generalized bout of price increases—so that present prices reflect expectations of future price increases—and insofar as a devaluation may be seen as triggering a future generalized bout of price increases, the implications of a shift into tesobonos as a commitment technology for the exchange rate regime may be expressed in current price increases.<sup>15</sup>

Preliminary econometric research by David Gould shows that, even when monetary base growth and other factors linked to inflation are included in a model of Mexican consumer price changes, a negative and significant relation exists between consumer inflation and the share of Mexican short-term debt that is indexed to the dollar. That is, with this credibility enhancement in place, the market seems to reduce its expectation of the devaluation and so of the inflation that typically follows devaluation.<sup>16</sup> It does not seem unreasonable to conjecture that this credibility enhancement could also have been seen as a potential enhancement for transitory monetary independence.

### Putting the pieces together

The implications of the general dynamics of heterodox exchange-rate-based stabilization programs, of the role of domestic credit expansion in addressing systemic bank crises and in triggering currency collapses, and of the use of tesobonos as a commitment technology become more dramatic when we consider the roles they played in Mexico in 1994.

Recall that typical patterns of exchange-rate-based stabilization programs include falling inflation, rising real exchange rates, consumption booms, capital inflows in the early stages that fund increasingly negative balances of trade and current account and, finally, capital outflows that ultimately induce currency collapses. Recall also that a typical characteristic of a currency collapse is not the impossibility of maintaining a pegged exchange rate, but a policy priority rearrangement in which the exchange rate is subordinated.

Finally, note that the intention of this article is not only to explain why the choices were made that triggered the devaluation, but to explain why its aftermath was explosive despite

prior claims that “the Mexican government would not lose credibility from a devaluation, because it would be recognized as a constructive response to a crisis.”<sup>17</sup>

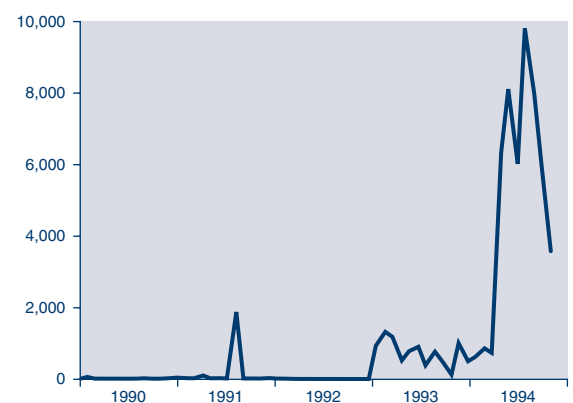
I noted earlier that one reason Mexican bonds and stocks attracted U.S. and other foreign investors was low U.S. interest rates. During first-quarter 1994, U.S. monetary policy began to tighten, raising U.S. interest rates and attracting capital back to the United States. While the increase in U.S. rates signified that factors pushing capital toward Mexico were diminishing, political events in Mexico weakened the country's pull effects for capital.

Chiapas rebels may not have threatened the nation's stability, but the assassination of Mexican presidential candidate Colosio in March 1994 was another matter to investors. After rising earlier in the year, reserves fell profoundly just after the assassination but stabilized in April. To hold foreign capital in the country, Mexico raised interest rates significantly, signaling that exchange-rate preservation remained important. But U.S. interest rates were also rising, and they continued to do so throughout the year. The exchange rate moved toward the weak edge of the band but remained within it.

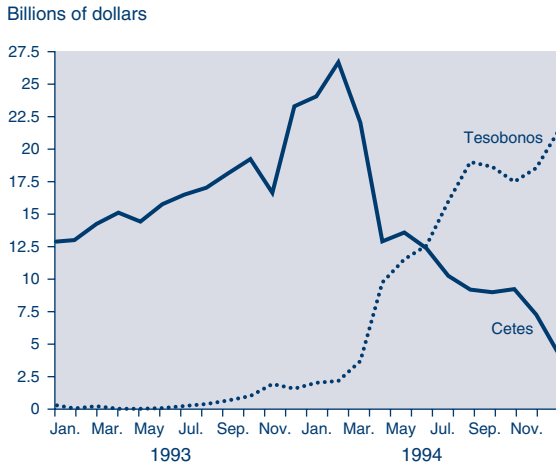
It is in this context of rising U.S. rates at a time when increasing financial problems offered motivations to lower or at least hold Mexican rates that the value of the tesobonos as a commitment technology can be appreciated. Instead of offering a commitment technology based on the accumulation of larger foreign currency reserves to defend the peso, when real rates were already at high levels, the issuance of tesobonos might be thought a reasonable substitute, at least temporarily.

Figure 4  
**Real Central Bank Domestic Credit To Commercial Banks**

Millions of 1990 new pesos



**Figure 5**  
**Tesobonos and Cetes Held by the Public**



When the Colosio assassination triggered a capital outflow, Mexico sterilized by raising domestic credit (Figure 4). At the same time, Mexico stepped up its substitution of dollar-indexed tesobonos outstanding for peso-indexed cetes outstanding (Figure 5). By midyear, tesobonos outstanding began to exceed cetes. The substitution increased through the rest of the year.

In the third quarter, Mexico began to relax its interest rate pressures, as can be seen from Figure 6. Interest rates remained considerably higher than they had been at the beginning of the year. But they were not high enough to restore reserves to the levels of the first quarter—not, at least, when U.S. rates were also rising.

Nevertheless, reserves remained relatively stable during the third quarter. One reason may be that, as the summer ensued, it became more obvious that substitute Institutional Revolutionary Party presidential candidate Ernesto Zedillo was likely to defeat the other candidates, whose abilities or policies may have inspired more investor uncertainty about future growth. Then, in August, he did win. But Gould's (1994) results on the negative influence of tesobonos' share of total short-term debt on inflation rates suggest that an exchange rate commitment technology also helped stabilize foreign currency reserves. The third quarter ended with foreign currency reserves as high as those with which it had begun.

As 1994 ensued, the differential between Mexican and U.S. interest rates began to fall, much as one might expect, other things being equal, as a reasonable policy response in the face of mounting problems in the Mexican financial system (Figure 7).<sup>18</sup> Nominal cetes

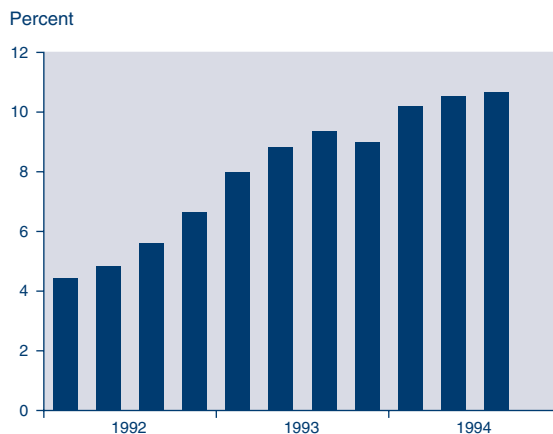
**Figure 6**  
**Real Interest Rate in Mexico**



rates fell absolutely in August and remained below their spring and summer highs until the devaluation.

In the fourth quarter, another political event preceded capital outflows from Mexico, but a concurrent economic event makes interpretation difficult. After the assassination of Institutional Revolutionary Party official Carlos Francisco Ruiz Massieu, his brother was appointed to investigate the case; in November he resigned, alleging that powerful officials were stymieing his investigation. Meanwhile, on November 15 the Federal Open Market Committee of the U.S. Federal Reserve System met and decided on policies that would lead to a 75-basis-point increase in the federal funds rate, its most restrictive monetary policy action since 1990.

**Figure 7**  
**Past-Due Loan Ratio**



NOTE: Data are quarterly.

Table 1  
**1995 Tesobonos Maturity Schedule**  
 (Billions of U.S. dollars)

January	\$ 3.626
February	3.487
March	3.159
April	1.858
May	2.723
June	1.907
Total	\$16.760

In sterilizing the subsequent outflow of foreign capital, Mexico's central bank again increased domestic credit to the banking system.<sup>19</sup> Mexican interest rates were not pushed up sufficiently to maintain reserves.

Perhaps as a result of the fiscal implications that the large overhang of tesobonos offered in the event of a devaluation, the exchange rate continued to show signs of credibility.<sup>20</sup> But this tesobono commitment technology had been imposed in a period of increasing risk to the financial system and of the additional trade balance pressures partially induced by the commencement of NAFTA in January 1994. Taken collectively, these factors meant that Mexico could be risking a financial crisis if it devalued the currency and allowed interest rates to go where they would, or if it defended the currency by raising interest rates.

On December 20, the tesobono overhang that had suggested exchange rate credibility now signified financial market as well as currency collapse. When the Mexican government announced that the peso would move from 3.47 pesos per dollar to 3.99, it also announced that the exchange rate pegging regime, in which the peso would devalue against the dollar at a rate of 0.0004 pesos per day, would persist. The band would simply be lowered.

But instead of settling markets, the announcement incited massive capital flight. Large increases in interest rates ensued. Perhaps the fiscal implications of the tesobono overhang, with a maturity schedule in which the value of tesobonos falling due within the first six months of 1995 exceeded the value of Mexico's foreign exchange reserves, were calculated by financial markets (*Table 1*). But given the moderate magnitude of the initial announced devaluation, the pure act of abridgment of such a commitment seems to have played an important role in and of itself.

## Conclusion

The chief problems Mexico faced in 1994 were that the controlled rate of depreciation of the peso was inconsistent with the persistent inflation rate differential between the United States and Mexico, that capital outflows drew down foreign exchange reserves that Mexico was using to defend the peso, and that, in the conflict between greater monetary tightness to support the exchange rate and less tightness to avoid further financial-sector problems and a downturn in the economy, the latter won out. While Mexico wished growth, it was caught in an episode of U.S. monetary tightening that only de facto monetary independence would have permitted it to avoid following with a vengeance—and in financially destabilizing episodes of political unrest.

Despite evidence that some monetary independence was available transitorily, as the short run grew into a longer run, independence and dependence collided with a result long since posited as the impossibility theorem. But while these factors are consistent with an ensuing devaluation, they alone are not consistent with the explosive nature of Mexico's financial crisis in the wake of the initial devaluation.

The explosive nature of the crisis seems to have been linked to reactions to the term structure and volume of Mexico's short-term dollar-indexed debt, even though there is little evidence to suggest that the tesobono debt was seen as problematic before the devaluation and that it had served as a positive commitment technology.<sup>21</sup> That the tesobono maturity schedule signified obligations in early 1995 that were considerably in excess of Mexican dollar reserves to cover them may have triggered the anticipation of a financial musical chairs game in which each investor began to fear that her or his tesobono would be the one left out of convertibility.

## Notes

<sup>1</sup> *Wall Street Journal* (1994).

<sup>2</sup> Fidler and Bardacke (1994).

<sup>3</sup> See, for example, Torres and Campbell (1994), Fidler and Bardacke (1994), and Tricks (1994).

<sup>4</sup> For a discussion of this last, see Lustig (1995).

<sup>5</sup> How does raising interest rates affect the exchange rate? Rising Mexican interest rates inspire foreigners to buy Mexican financial assets—triggering capital inflows, increasing the demand for pesos, and so bidding up the exchange rate. As foreigners trade dollars for pesos to buy peso-denominated assets or simply buy dollar-denominated assets from the Mexican financial sector, Banco de México accumu-



lates dollar reserves. If pressures to devalue arise, Banco de México can use its dollar reserves to buy up pesos—raising their dollar price. Also, squeezing monetary growth and raising interest rates lower Mexican inflation. Insofar as dollar prices of Mexican goods rise faster than dollar prices of U.S. goods, both Mexican and U.S. buyers are discouraged from buying Mexican products and encouraged to buy U.S. products. The resulting trade deficit increase means declining demand for pesos—as fewer Mexican products are bought—and rising demand for dollars—as more U.S. products are bought. Pressure arises to devalue the peso—which lowers the dollar price of Mexican products and raises the peso price of Mexican products, erasing the deficit. A tight monetary policy that includes raising interest rates dampens Mexican inflation, squeezes the differential between Mexican and U.S. inflation, and lowers pressure to devalue.

<sup>6</sup> Gruben, McLeod, and Welch (1995) show that three-month U.S. Treasury bill rates do not Granger-cause and are not Granger-caused by three-month Mexican Treasury bill (*cetes*) rates and that three-month U.S. Treasury bill rates do not Granger-cause and are not Granger-caused by Mexican Brady par bonds. However, thirty-year U.S. Treasury bonds do Granger-cause Mexican Brady par bonds, which, it should be noted, may be seen as long-term bonds. These results suggest that financial integration between Mexico and the United States can be significantly abridged in the short term but not in the long run.

<sup>7</sup> For a more complete discussion of external factors leading to such flows, see Calvo, Leiderman, and Reinhart (1993); Chuhan, Claessens, and Mamingi (1994); and Dooley, Fernandez-Arias, and Kletzer (1994). Most foreign capital flowing into Latin America did go to Mexico, however.

<sup>8</sup> With the exception of union-owned Banco Obrero and U.S.-owned Citibank, the entire Mexican commercial banking system was nationalized in 1982. With a series of consolidations, the original fifty-three nationalized banks were pared to eighteen. These eighteen institutions were privatized, one by one, in 1991 and 1992.

<sup>9</sup> For a fuller development of the links between Mexico's banking problems and the subsequent exchange rate crisis, see Calvo and Mendoza (1995).

<sup>10</sup> In the United States, once a loan goes into arrears, the entire remaining loan balance is considered in arrears. In contrast, Mexico's calculation procedure does not consider the entire remaining loan balance to be in arrears. For example, in Mexico, if a loan is three months in arrears, only the balance that had been contracted to be paid during those three months is calculated as in arrears. Any loan balance scheduled to be paid thereafter is not yet calculated as in arrears. Other things being equal, U.S. protocols would sometimes result in higher past-due loan ratios than Mexican protocols.

<sup>11</sup> Banco de México (1995, 64) notes that "the increase in domestic credit in 1994 occurred in response to reserve declines" and that reserves "did not fall because domestic credit was expanded" [author's translation].

<sup>12</sup> While I am presenting a case for the possibility of separation between reserve outflows and the domestic credit creation that is implied by sterilization, it is true that some argue that when central banks sell reserves, they must sterilize automatically.

<sup>13</sup> Kamin and Rogers (1995) offer econometric evidence to suggest that when interest rates did rise, they rose only moderately less than could be predicted by the authorities' standard reaction function. Kamin and Rogers argue that, to have maintained the peg, the authorities would have had to intensify their responses to exchange market developments. That is, policy-makers would have had to alter their reaction regime, and they would have had to at a time when concerns for the health of the banking system would have suggested a relaxation of monetary policy.

<sup>14</sup> While the merits and liabilities of currency boards are a subject beyond the scope of this article, one discipline they impose is that when foreign exchange reserves flow out, the resulting reduction in the stock of money is not offset. Although such boards may be seen as having significant liabilities, Argentina's peso (which is disciplined by a currency board) has maintained its nominal value over the past two years while Mexico's has not.

<sup>15</sup> Brown and Whealan (1993) offer econometric evidence to suggest, for example, that present oil prices reflect agent expectations of futures prices.

<sup>16</sup> Lustig (1995, 379) notes that "this dollarization of internal debt probably explains the surprising stability of international reserves before such adverse events as the increase of foreign interest rates and domestic political unrest" [author's translation]. Moreover, Banco de México (1995, 69) states that "the issuance of tesobonos was carried out in order to reduce exchange market pressures" [author's translation].

<sup>17</sup> Werner (1994, 310).

<sup>18</sup> Recall that inasmuch as a central bank can always preserve a pegged exchange rate through a sustained high interest rate or a contraction in monetary base, interest rates insufficient to prevent declining reserves suggest that other policies must dominate a commitment to a pegged exchange rate. Garber and Svensson (1994, 29) note that one of these policies may be "the preservation of solvency of a banking system."

<sup>19</sup> The capital outflows were not well-known, however, and a number of analysts have complained that something kept Mexico during the latter portions of 1994 from releasing data on central bank holdings of foreign reserves.

<sup>20</sup> Interest rates typically reflect nervousness about devaluations. Consider, for example, the movement of

yields on the twenty-eight day cetes auction for the following dates: November 9—13.49 percent, November 16—13.45 percent, November 23—13.95 percent, November 29—13.85 percent, December 7—13.30 percent, and December 14—13.75 percent.

<sup>21</sup> Calvo and Mendoza (1995) and Sachs, Tornell, and Velasco (1995) address other aspects of the sudden and explosive nature of Mexico's financial crisis that clearly deserve attention. Calvo and Mendoza argue that this phenomenon reflects, among other things, a trade-off between diversification and information that investors face when information is costly to acquire. As investment opportunities expand across countries, the payoff to purchasing information about a particular country declines. It becomes rational for investors to become sensitive to even "small" bad news, especially when it follows previous bad news, even if none of the news is related to fundamentals. In sum, the reduced incentives to acquire much information about Mexico in particular and Latin America in general motivated a herd behavior that triggered the tequila effect.

Sachs, Tornell, and Velasco (1995) argue that, while real disequilibria and reserve erosion lay the groundwork for the crisis, the timing and magnitude of the crisis came from a self-fulfilling panic after the government ran up its short-term tesobono debt and ran down gross reserves. That is, like Calvo and Mendoza (1995) and those cited at the beginning of this article, Sachs, Tornell, and Velasco (1995, 7) do not believe that the crisis was fully consistent with fundamentals. Instead, they conclude, "the panic was self-fulfilling in that expectations of a run on both pesos and tesobonos by other agents led each individual investor to engage in the same kind of speculative behavior."

## References

Banco de México (1995), *Informe Anual 1994*.

Brown, S. P. A., and Kelly Whealan (1993), "Oil Price Expectations and U.S. Oil Conservation," Paper presented at the North American meetings of the International Association for Energy Economics, October.

Calvo, Guillermo A., Leonardo Leiderman, and Carmen M. Reinhart (1993), "Capital Inflows and Real Exchange Rate Appreciation in Latin America," *IMF Staff Papers* 40 (March): 108–51.

———, and Enrique G. Mendoza (1995), *Reflections on Mexico's Balance of Payments Crisis: A Chronicle of a Death Foretold* (College Park, Md.: Center for International Economics, University of Maryland).

———, and Carlos A. Végh (1992), "Inflation Stabilization and Nominal Anchors," IMF Paper on Policy Analysis and Assessment, December.

Chuhan, Punam, Stijn Claessens, Nlandu Mamingi (1994), "Equity and Bond Flows to Asia and Latin America: The Role of Global and Country Factors," The World Bank.

Dooley, Michael P., Eduardo Fernandez-Arias, and Kenneth M. Kletzer (1994), "Recent Private Capital Inflows to Developing Countries: Is the Debt Crisis History?" National Bureau of Economic Research Working Paper Series, no. 4792, July.

Dornbusch, Rudiger, and Alejandro Werner (1994), "Mexico: Stabilization, Reform, and No Growth," *Brookings Papers on Economic Activity* 1: 253–97.

Fidler, Stephen, and Ted Bardacke (1994), "Nervous over Deficit and Dissidence: Stephen Fidler and Ted Bardacke Assess the Devaluation Yesterday of the Mexican Currency," *Financial Times*, December 21, 5.

Flood, R. P., and P. Garber (1984), "Collapsing Exchange Rate Regimes: Some Linear Examples," *Journal of International Economics* 17, 1–13.

Garber, Peter M., and Lars E. O. Svensson (1994), "The Operation and Collapse of Fixed Exchange Rate Regimes," National Bureau of Economic Research Working Paper, no. 4971, December.

Goldberg, Linda S. (1994), "Predicting Exchange Rate Crises: Mexico Revisited," *Journal of International Economics* 36 (May): 413–30.

Gould, David M. (1994), "Forecasting Mexican Inflation," Federal Reserve Bank of Dallas, unpublished manuscript, August.

Gruben, William C., John H. Welch, and Jeffrey W. Gunther (1994), "U.S. Banks, Competition, and the Mexican Banking System: How Much Will NAFTA Matter?" Federal Reserve Bank of Dallas Working Paper, no. 94–10, May.

———, Darryl McLeod, and John H. Welch (1995), "Propagation Mechanisms Between U.S. and Mexican Financial Markets," Paper presented at the meetings of the Council on Foreign Relations, New York, March.

Gurria, Jose Angel (1993), "Capital Flows: The Mexican Case," Paper prepared for ECLAC-IDRC Workshop II, New Private Flows Into Latin America, December.

Heller, Heinz Robert (1991), "Prudential Supervision and Monetary Policy," in Patrick Downes and Reza Vaez-Zadeh (eds.), *The Evolving Role of Central Banks*, (Washington, D.C.: International Monetary Fund).

Ize, Alan, and Guillermo Ortiz (1987), "Fiscal Rigidities, Public Debt, and Capital Flight," *IMF Staff Papers*, 311–32.

Kamin, Steven B. (1991), "Exchange Rate Rules in Support of Disinflation Programs in Developing Countries," International Finance Discussion Paper, no. 402, Board of Governors of the Federal Reserve System.

———, and John H. Rogers (1995), "Monetary Policy in the End-Game to Exchange-Rate Based Stabilization: The Case of Mexico," Board of Governors of the Federal Reserve System.

Kiguel, Miguel, and Nissan Liviatan (1992), "The Business Cycle Associated with Exchange Rate-Based Stabilizations," *The World Bank Economic Review* 6 (May): 279–305.

Lustig, Nora (1995), "Mexico y la crisis del peso: lo previsible y la sorpresa," *Comercio Exterior* 45 (May): 374–82.

Mansell Carstens, Catherine (1993), "The Social and Economic Impact of the Mexican Bank Reprivatization," paper presented at Institute of the Americas, La Jolla, January.

McLeod, Darryl, and John H. Welch (1991), "North American Free Trade and the Peso," Federal Reserve Bank of Dallas Working Paper, no. 9115.

Sachs, Jeffery, Aarón Tornell, and Andrés Velasco (1995), "The Mexican Peso Crisis: Sudden Death or Death Foretold?" (Paper presented at the conference "Speculative Attacks in the Era of the Global Economy: Theory, Evidence, and Policy Implications," Center for International Economics, University of Maryland at College Park, December).

Stiglitz, Joseph E., and Andrew Weiss (1981) "Credit Rationing in Markets with Imperfect Information," *American Economic Review* (June): 393–410.

Torres, Craig, and Paul B. Campbell (1994), "Mexico Reverses Currency Policy: Peso Falls 12.7 Percent," *Wall Street Journal*, December 21, p. A3.

Tricks, Henry (1994), "Mexican Markets Panic After Peso Devaluation," *Reuter European Business Report* (Reuters Limited), December 21.

*Wall Street Journal* (1994), "Mexico Drops Effort to Prop Up Peso, Spurring 15% Fall and Eroding Credibility," December 23, A3.

Werner, Alexandro (1994), "Comments and Discussion," in William C. Brainard and George L. Perry (eds.), *Brookings Papers on Economic Activity*, 1, 310.