

---

---

**IS FOREIGN-CURRENCY INDEXED  
DEBT A COMMITMENT TECHNOLOGY?  
SOME EVIDENCE FROM BRAZIL AND MEXICO**

William C. Gruben  
Darryl McLeod

**Research Department  
Working Paper 9913**

**Center for Latin American Economics  
Working Paper 0299**

**December 1999**

---

---



**FEDERAL RESERVE BANK OF DALLAS**

Is Foreign-Currency Indexed Debt a Commitment Technology? Some Evidence  
from Brazil and Mexico

William C. Gruben  
Federal Reserve Bank of Dallas

Darryl McLeod  
Fordham University

PRELIMINARY PAPER

We examine the effects of foreign currency-indexed debt upon inflationary expectations in Brazil and Mexico. Conjecturing that markets will view increasing overhangs of foreign currency-indexed debt as a commitment technology that fiscally punishes devaluation – we test whether increasing such overhangs will attenuate the effect of monetary growth upon inflationary expectations. We find some econometric confirmation of these conjectures in both the Brazilian and Mexican cases. Finding that the results are consistent with the notion that increasing the share of dollar indexed debt may also permit some temporary monetary independence even under pegged exchange rate regimes, we present some evidence of independent policy behavior during periods when are model results would suggest it.

Opinions expressed in this paper do not reflect the opinions of the Federal Reserve System or Fordham University.

Although the literature of the last fifteen years has devoted much attention to credibility problems and to commitment technologies, the role of foreign currency-denominated or foreign-currency indexed debt has not received much note. Even so, there is not only evidence to suggest that such debt may be a commitment technology, but that countries with pegged exchange rates and relatively open capital markets have treated it as a medium that would allow them temporarily to pursue monetary independence.

We offer tests of dollar-indexed debt as a commitment technology in Mexico during the early 1990s and in Brazil in the late 1990s. We present evidence to suggest that this debt may have been a sufficiently strong commitment technology that it significantly offset the effects of monetary growth upon rates of price increase in both countries. That is, rates of monetary growth that would otherwise have caused price inflation would not be inflationary if accompanied by increasing levels of debt indexation

Consistent with the notion that debt choice may affect monetary independence, at the times Brazilian and Mexican foreign currency indexed debt were increasing as shares of total debt, the two countries appear to have pursued monetary policies that were not fully consistent with those of the United States. At those times, each country's currency was pegged to the dollar.

### **Foreign Currency Indexed Debt as a Policy Instrument**

A typical reaction among analysts when a country suddenly begins to issue large quantities of debt that is denominated in or indexed to a foreign currency is that this step is a last resort. That is, analysts may guess that the country's domestic currency denominated debt has become expensive because of market fears of exchange rate risk

under a pegged exchange rate regime, and that the country is issuing foreign currency denominated debt to avoid paying the exchange risk premium.<sup>1</sup>

Consistent with this reasoning, it is in fact not unusual to see interest rates on domestic currency denominated bonds increase significantly while foreign currency interest rates for the same stressed sovereign debtor do not. But while foreign currency indexed debt may sometimes be viewed as a debt instrument that investors will accept as a way to avoid exchange rate risk, this debt can also be seen as a policy instrument or - more narrowly - an instrument of commitment.

This debt can serve as a commitment instrument because of the punishment such debt inflicts on debtor countries that devalue. Recall that a devaluation increases the real domestic currency value of foreign currency indexed debt. If issuance of this debt increases the cost of devaluation, then an issuing country may be more likely to avoid policies that could lead to devaluation – including monetary instability and fiscal imbalance.

To highlight the penalizing implications of foreign currency denominated debt, consider in contrast the fiscal impacts of devaluation upon domestic currency denominated debt. A burst of inflation typically follows a nominal devaluation, reducing the real value of debt that is denominated in the domestic currency.<sup>2</sup> In fact, the reduction may be seen as the purpose of the devaluation.<sup>3</sup>

---

<sup>1</sup> Note that if the market's concerns solely involved default risk that was unconnected to exchange risk, the use of foreign currency indexed bonds would not result in any interest rate differential. That is, foreign currency indexed debt would not have a different interest rate than domestic currency denominated debt if foreign exchange risk were not the problem.

<sup>2</sup> For much fuller development of this notion see, for example, Ize and Ortiz (1987). For inflation to reduce the real value of domestic currency denominated debt, of course, the debt must not be indexed to inflation.

<sup>3</sup> On a related note, the devaluation may also be seen as a way of increasing the domestic currency value of foreign exchange reserves. This approach to accounting is based on the notion that these reserves could

Because of the penalizing effects of foreign currency denominated debt when a devaluation occurs, the presence of such debt could affect market interpretations of what a government's tactics may imply at some given point in time. With such a commitment technology in place, what might otherwise look like the beginning of a disturbing pattern of monetary expansionism might be interpreted as a temporary blip that will be followed by a return to monetary stability. Foreign capital may be expected to remain longer in the country, *ceteris paribus*, and devaluation may become less likely. It may take longer than otherwise for the market to decide that a government is pursuing a persistently expansive monetary policy, or pursuing an expansive monetary policy at all.

As a result, it may even appear that such debt might permit a country with a pegged exchange rate to pursue an independent policy temporarily with impunity – despite the usual concerns about monetary independence in a regime with pegged exchange rates and open capital markets. If the payoff to a transitory deviation toward independence were sufficiently large – or compelled by a negative shock that seemed only temporary – a country might use the issuance of such debt as a sort of shield against investor concerns to allow some monetary independence.

### **Testing for a Commitment Interpretation: The Inflation Equations**

To test whether the market interprets foreign currency denominated debt as a commitment technology we begin with equations that link changes in prices to changes in other variables, including foreign currency denominated debt's share of total debt. The idea behind using prices may be seen in the work of Brown and Whealen (1993), which offers econometric and survey evidence to suggest that current changes in prices reflect

---

be used to retire the debt holdings of foreign creditors who wish to exchange domestic currency denominated debt for the creditors' own currency. .

changes in agent expectations of future prices. Using equations for Brazil and Mexico that include inflation on the left hand side, and monetary growth and the share of foreign currency denominated debt (among other variables) on the right hand side, we find that the share of foreign currency debt in total debt offsets the effect of monetary growth on prices. Consistent with the findings of Brown and Whealan, this result can be interpreted as signifying that increasing the share of foreign currency denominated debt to total debt would offset the (positive) effect of a given rate of monetary growth on price (and ultimately, devaluation) expectations.

If increases in the share of foreign currency denominated debt offset market expectations of the inflationary impact of increases in monetary growth, then markets may be interpreting this debt as assuring that the country will not persist in monetary expansionism long enough and sufficiently to accelerate inflation. That is, even though a given increase in monetary growth without an increase in foreign currency denominated debt would suggest inflation, the same increase with an increase in foreign currency denominated debt need not suggest it. This conclusion would be consistent with a notion expressed by Sachs, Tornell, and Velasco (1995, p.9) concerning Mexico's application of this commitment: "The move toward dollar denominated debt was greeted with enthusiasm by the financial markets: only a government that would never devalue could contemplate borrowing in a foreign currency."

In contrast, if increases in the share of foreign currency denominated debt did not offset the impact of monetary growth on inflationary expectations, the market must not be interpreting foreign currency denominated debt issuance as a commitment technology.

That is, if the market thought a given increase in money stock implied a given increase in expected inflation regardless of the issuance of such debt, then the market clearly would not be interpreting foreign currency denominated debt as meaning the country would not inflate significantly.

To test for this relationship between inflation expectations, monetary growth, and the share of foreign currency denominated debt in total debt we began with a very simplified inflationary expectations model similar to Gould (1994). We use month-over-month inflation rates as the dependent variable and apply measures of growth in monetary aggregates as an independent variable.<sup>4</sup>

Consistent with what could be expected in a money demand equation, which this equation somewhat resembles before rearrangement of variables on the two sides of the equation, we also applied a domestic interest rate variable on the right hand side. Specifically we used the rates on the most common three-month government bonds in each country – rates on *Selics* in Brazil and on *Cetes* in Mexico.<sup>5</sup> In the case of a model that attempts to characterize inflationary expectations the interest rate variables may be expected to be positively related to the dependent variable, however, as the market expresses its concern about increases future inflation by increasing interest rates now.

Finally, we applied measures of the ratio of foreign exchange indexed debt for each of the two countries. It should be noted that the periods we model are different for the two countries. Brazil's use of foreign currency denominated debt was heaviest during

---

<sup>4</sup> We used first differences of logs – growth rates - for these variables because raw measures of both CPI and money stock tested out (both Augmented Dickey Fuller and Phillips Perrone) as having unit roots.

<sup>5</sup> The similarity of this equation to a money demand equation also motivated us to include growth in industrial production as an independent variable in preliminary testing. However, neither contemporaneous nor lagged industrial production variables ever proved significant even at the .30 level – much less the .10, .05 or .01 levels, and we accordingly removed these from later estimates.

Table 1

	<i>BRAZIL</i>	<i>BRAZIL</i>	<i>MEXICO</i>	<i>MEXICO</i>
Constant	0.001976 (0.395440)	-0.000375 (-0.067121)	0.001644 (0.596397)	0.001025 (0.415284)
$\Delta M_1(-1)$	0.031624 (2.626720)***		0.052031 (7.173744)***	
$\Delta M_1(-2)$	0.005639 (0.489852)		0.024062 (3.222305)***	
$\Delta M_2(-1)$		0.032242 (0.793373)		0.101615 (7.019095)***
$\Delta M_2(-2)$		0.026162 (0.718586)		0.038792 (2.648751)***
Dollar Debt	-0.000712 (-2.669234)***	-0.000633 (-2.316516)**	-0.000270 (-1.381641)	-0.000300 (-1.684613)*
Bond Rate	0.000373 (3.453491)***	0.000395 (3.933624)***	0.000390 (3.458252)***	0.000371 (3.700687)***
Colosio			-0.002705 (-0.837409)	-0.003778 (-1.106342)
Aguinaldo			0.004533 (2.945348)***	0.005279 (3.483274)***
AR(1)	0.291086 (1.855453)*	0.178705 (1.086964)	0.572315 (5.037573)***	0.507544 (4.991106)***
$\bar{R}^2$	0.614910	0.565006	0.818835	0.809620
$\bar{R}^2$	0.564241	0.507770	0.796586	0.786240



the latter 1990s. We use the period January 1995 – December 1998 to allow the considerable variation in the role of foreign currency indexed debt after the initiation of the *Real* plan in 1994 but before Brazil's major devaluation in January of 1999. We use August 1989 through December 1994 to give a period during which Mexico's foreign currency denominated debt went from a very small portion of total debt to a very large one.

The results can be seen in Table 1, where  $\Delta M_1(-1)$  and  $\Delta M_1(-2)$  represent month over month percentage changes in  $M_1$  lagged once and twice respectively and  $\Delta M_2(-1)$  and  $\Delta M_2(-2)$  represent the same lags for  $M_2$ . Dollar Debt refers to the share of foreign currency indexed debt to total debt, inasmuch as the debt of both Brazil and Mexico in the respective periods under analysis were indexed to the dollar. Bond Rate refers to the interest rate on three-month government paper, Selics in the case of Brazil and Cetes in the case of Mexico. The AR(1) variable is simply an autoregressive term used to accommodate autoregressive disturbances. Finally, two dummy variables are used for Mexico. Aguinaldo refers to the practice of the same name in Mexico of giving an thirteenth month of salary to workers each December, which may be seen as affecting the relation between monetary growth and prices. Colosio refers to a three-month period following the assassination in 1994 of Partido Revolucionario Institucional presidential candidate Luis Donaldo Colosio, when financial markets were particularly disrupted.

Interestingly, while the relation between  $M_1$  growth and inflation is positive and significant in both Mexico and Brazil, the relation between  $M_2$  and inflation is positive in both countries but significant only in Mexico. Certainly a positive relation between growth in monetary aggregates and inflation is to be expected, since inflation is too much

money chasing too few goods, although this connection is sometimes less clear in other countries.. With respect to the absence of statistical significance in the case of Brazilian  $M_2$ , the disconnection between  $M_2$  and inflation may be more tenuous in Brazil because of measurement peculiarities. Unlike that of Mexico, Brazilian  $M_2$  includes certain types of security holdings which may signify that this measure is farther removed from a medium of exchange role not only than Mexican  $M_2$  but than  $M_2$  in most countries

In contrast, the ratio of dollar denominated debt to total debt, as expressed in the Dollar Debt variable, is negative and significant (at least at the .10 level) for both Brazilian equations but for Mexico is significant only for the  $M_2$  equation. Indeed, the Dollar Debt variable was significant at only the 0.1725 level of significance. In any case, Dollar Debt and the monetary aggregate variables were of the expected and opposite signs and both were significant in the cases of Brazilian  $M_1$  and Mexican  $M_2$ . These models offer evidence of opposite and significant effects of monetary growth and of the share of debt that is foreign currency (specifically dollar in these countries) denominated.<sup>6</sup>

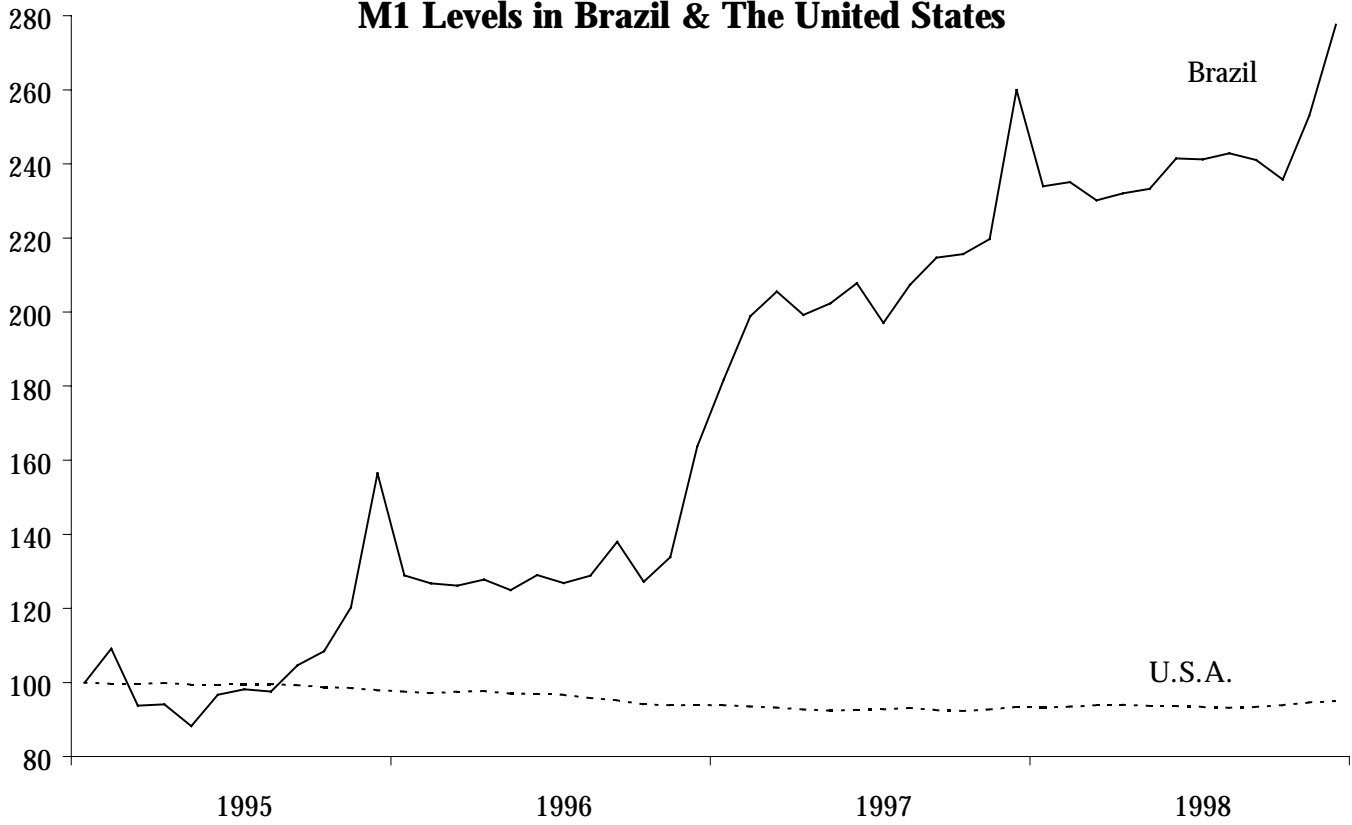
What these equations signify is that it is possible to offset the effect of monetary growth upon inflationary expectations – perhaps only temporarily – by increasing the share of foreign currency denominated debt. That result was not only a conjecture of this paper, but is implied in the statement of Sachs, Tornell and Velasco (1995,b) with respect to the Mexican case. It should be noted that the time period under consideration includes the same period to which Sachs, Tornell and Velasco applied their remark.

---

<sup>6</sup> In various equation configurations using Mexican  $M_1$  growth and growth rates of the share of dollar denominated debt, we derived significance for both variables, but the relationship did not hold for Brazil.

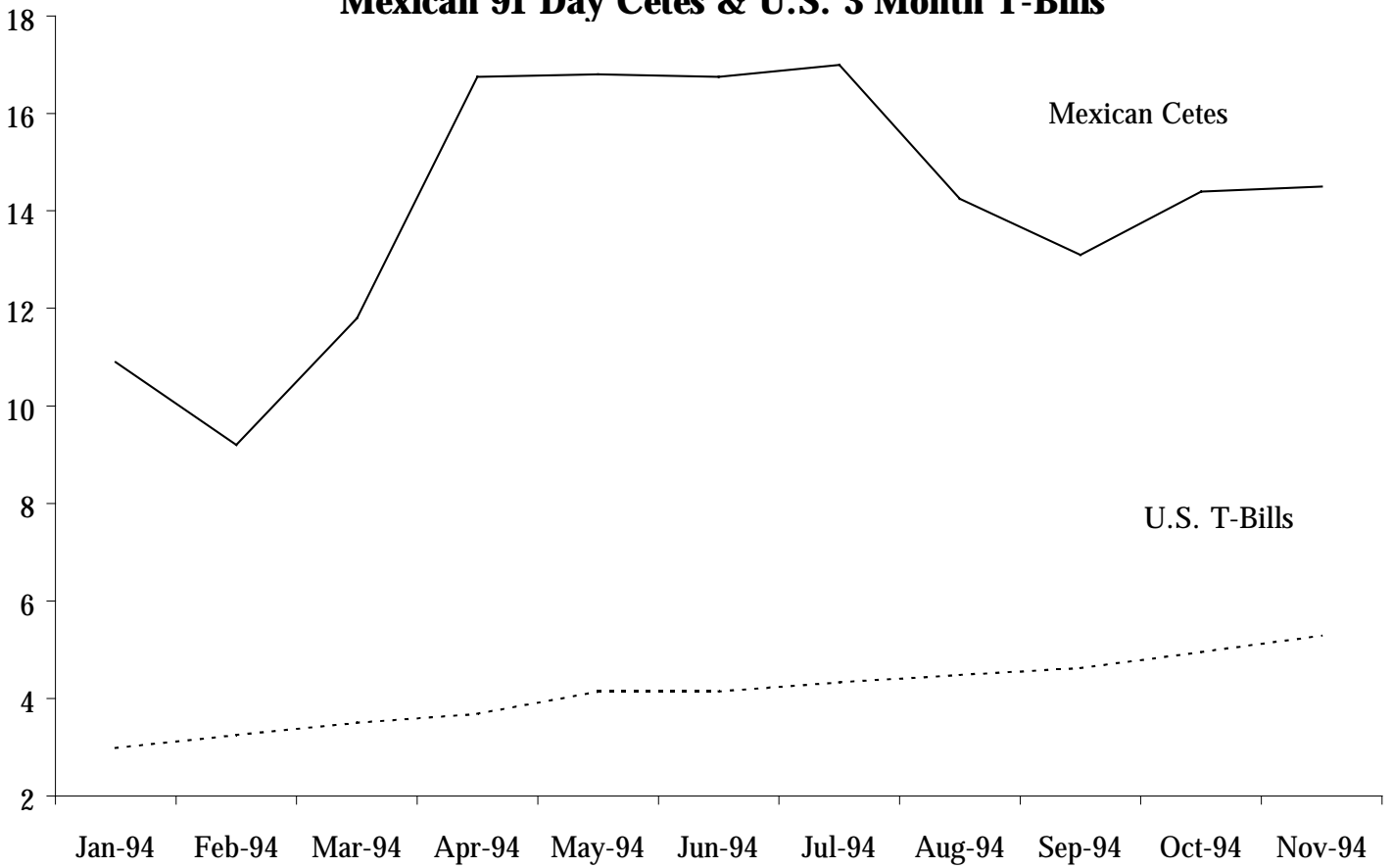
Index  
Jan. 1995 = 100

**Chart 1**  
**M1 Levels in Brazil & The United States**



Interest  
Rate

**Chart 2**  
**Mexican 91 Day Cetes & U.S. 3 Month T-Bills**



## **Interpreting Monetary Policy Under Foreign Currency Indexed Debt Regimes**

Some aspects of monetary policy in Brazil and Mexico may at least be tentatively interpreted as consistent with the policy implications of the results in Table 1. In the wake of Brazil's implementation of its *Real* plan in 1994, for example, Brazilian  $M_1$  expansion far outstripped that of the United States (Chart 1) despite the pegging of Brazil's currency to the dollar. The presence of an increasing share of dollar denominated debt particularly in 1997-1998 is certainly not the only explanation for this differential in growth. Drastic reductions in inflation, as occurred after the inception of the Real plan, typically motivate increases in the demand for domestic currency. After all, a currency can serve the function of a store of value in periods of low inflation far more than during high inflation. However, both countries in this study offered examples of what might be interpreted as monetary-policy-related performance that was inconsistent with U.S. performance during the same period.

In the case of Mexico, for example, following the assassination of Luis Donaldo Colosio in March of 1994, Mexican interest rates increased rapidly both in relation to U.S. rates and in absolute terms. However, in June 1994, rates were caused to fall and they remained low until the December 1994 devaluation pushed them up rapidly. While U.S interest rates moved up steadily throughout 1994, as can be seen in Chart 2, Mexican rates softened after middle of the year. Central bank credit to the nation's financial sector went up markedly. The expansion was presented as an offset to falling foreign currency reserves, the decline of which was seen as taking place because of political factors. As one motivation, Mexico's central bank cited incipient problems in the commercial banking system that would have worsened if interest rates had been increased (Mancera,

1995). While this conjecture about the effect of increased Mexican interest rates on Mexican commercial bank asset quality would likely meet with little disagreement from any analyst, the central bank's perception that lowering interest Mexican rates while U.S. rates were increasing might raise questions.<sup>7</sup> Our econometric results suggest that the increasing share of Mexican dollar-indexed debt to total Mexican debt during this period would, however, be consistent with greater options for independent monetary policy, at least temporarily. Moreover, if there were a time when monetary independence might be particularly attractive, 1994 would be it.

### **Conclusion**

We offer preliminary and tentative evidence to suggest that foreign currency denominated debt offered a commitment technology not only consistent with Sachs, Tornell and Velasco's assessment in the Mexican case during the early and middle 1990s, but in Brazil in the late 1990s. That is to say, foreign currency denominated debt serves other functions than allowing a country to borrow money at less expensive interest rates than domestic currency denominated debt would permit, particularly during periods of financial stress.

Our results permit the conclusion that central banks that are motivated to pursue monetary independence despite a pegged exchange rate regime may reasonably guess that increasing the nation's share of foreign currency denominated debt might allow such independence temporarily. The problem, of course, is that it is difficult to know how temporary *temporary* is. At the end of the periods we evaluated econometrically, both Brazil and Mexico faced capital outflows large enough to motivate devaluation.

---

<sup>7</sup> The Federal Open Market Committee of the U.S. Federal Reserve System acted to push up Federal Funds interest rates by more than 300 basis points during 1994.

Moreover, in the case of Mexico, it will be remembered that the devaluation resulted in considerable economic destabilization.

What we have presented so far in this preliminary study can be seen only as cases of circumstantial econometrics. We have not shown that countries increase their foreign currency indexed debt because they wish to pursue independent monetary policies. However, we have shown evidence to suggest that foreign currency denominated debt does influence market expectations about prices and that foreign currency denominated debt can temper the effect of monetary growth on price expectations. Despite some circumstantial evidence, whether central banks definitely act on the basis of such knowledge remains to be demonstrated.

## References

- Brown, Steven 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 of Energy Economics (October).
- Gould, David M. (1994), "Forecasting Mexican Inflation," Federal Reserve Bank of Dallas mimeo, (August).
- Ize, Alan and Guillermo Ortiz (1987), "Fiscal Rigidities, Public Debt, and Capital Flight," *IMF Staff Papers*, 311-332.
- Kamin, Seven B. and Karsten von Kleist (1999), "The Evolution and Determinants of Emerging Market Credit Spreads in the 1990s," Bank for International Settlements Working Paper No. 68 (May).
- Mancera, Miguel (1995), "Don't Blame Monetary Policy," *Wall Street Journal*, A-20 (January 31).
- Sachs, Jeffrey, Aarón Tornell, and Andrés Velasco (1995), "The Mexican Peso Crisis: Sudden Death or Death Foretold?" (Center for International Affairs, Harvard University and C.V. Starr Center for Applied Economics, New York University).