International Financial Crises

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Outline

1. What Happened in Mexico in 1994-95? Why models like that of Krugman (1979) cannot account for the lead-up to the crisis or for its aftermath.

2. Self-Fulfilling Debt Crises. How we can build a dynamic stochastic general equilibrium model that can have a crisis like that in Mexico as an equilibrium outcome and how we can calibrate it. What we learn and what questions still remain unanswered.

3. What Happened in Argentina in 2001-02? A short economic/political history of Argentina focusing on the unique features of its current crisis.

4. What Lessons Can We Draw from the Crisis in Argentina? Challenges in using economic theory to understand crises like that in Argentina. The political economy of commitment. Is there a role for institutions like the International Monetary Fund?

1. What Happened in Mexico in 1994-95?

- What are the key features of simple models of financial crises? Krugman (1979) and Obstfeld (1996)
- What were the crucial events in Mexico in 1994 and 1995?
- Why do we need more than the simple models?

T. J. Kehoe (1996), "Comments on Krugman," *NBER Macro Annual 1996*.

P. Krugman (1979), "A Model of Balance of Payments Crises," *Journal of Money Credit and Banking*.

P. Krugman (1996), "Are Currency Crises Self-Fulfilling?" *NBER Macro Annual 1996*.

M. Obstfeld (1996), "Models of Currency Crises with Self-Fulfilling Features," *European Economic Review*.

Krugman's (1979) Model of Balance of Payments Crises

Key features of crisis:

- lack of fiscal discipline / monetization of deficit
- run on reserves by domestic agents
- perfect anticipation by financial markets

Model

small open economy, continuous time

one good, price $P=eP^*=e$

constant fiscal deficit, $G-T$

government monetizes deficit $\dot{M}=P(G-T)$

initial stock of reserves, $R(0)=R_0$

demand for money $M/P=L(\dot{P}/P)$ where $L'(\dot{P}/P)<0$

Two possibilities

1. Government fixes exchange rate, e=1, and sells reserves:

$$\dot{P}/P=0$$

$$M/P=L(0)$$

$$\dot{R}=-(G-T).$$

2. Government lets exchange rate float:

$$\dot{M}=P(G-T)$$

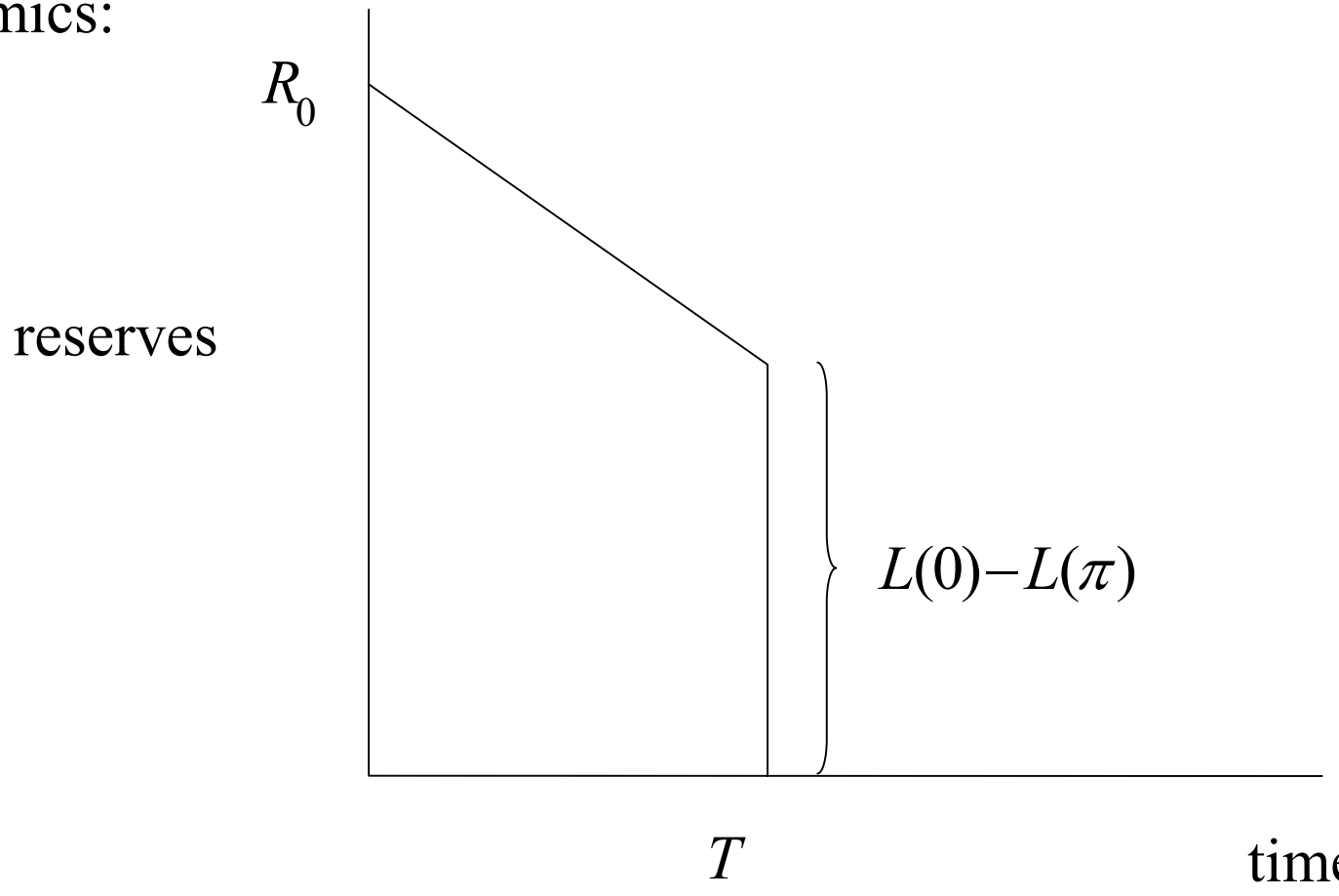
$$M/P=L(\dot{P}/P)$$

in stationary equilibrium, where $\dot{M}/M=\dot{P}/P=\pi$,

$$\pi L(\pi)=G-T$$

The government maintains the fixed exchange rate until it runs out of reserves. When the government is forced to float, the demand for money drops from $L(0)$ to $L(\pi)$

Dynamics:



Obstfeld's (1996) Model of Self-Fulfilling Currency Crises

Key feature:

- government's incentives to float depend on private agent's expectations

There is a time consistency problem of the sort studied by Kydland and Prescott (1977) and Barro and Gordon (1983).

Model

government minimizes loss function

$$\left[a(e_t^* - e_t) + b(e_t^E - e_t)\right]^2 + \delta C$$

$\left[a(e_t^* - e_t)\right]^2$ is the cost of deviating from the optimal exchange rate.

$\left[b(e_t^E - e_t)\right]^2$ is the cost of having private agents make decisions based on incorrect expectations.

δC is the cost of breaking the commitment to maintain a fixed exchange rate $e_t = \bar{e}$. ($\delta = 1$ if devaluation, $\delta = 0$ otherwise.)

Suppose that $e_t^E = e_t^*$. Then the government devalues, setting $e_t = e_t^*$, if

$$(a+b)^2(e_t^* - \bar{e})^2 > C.$$

Suppose that $e_t^E = \bar{e}$. Then the government devalues, setting $e_t = (ae_t^* + b\bar{e})/(a+b)$ if

$$a^2(e_t^* - \bar{e})^2 > C.$$

If

$$(a+b)^2(e_t^* - \bar{e})^2 > C \geq a^2(e_t^* - \bar{e})^2,$$

there are two equilibria, one of which is a self-fulfilling crisis.

Events in Mexico in 1994

1994 was an election year. The government wanted honest elections, but it also wanted the ruling *Partido Revolucionario Institucional* to win.

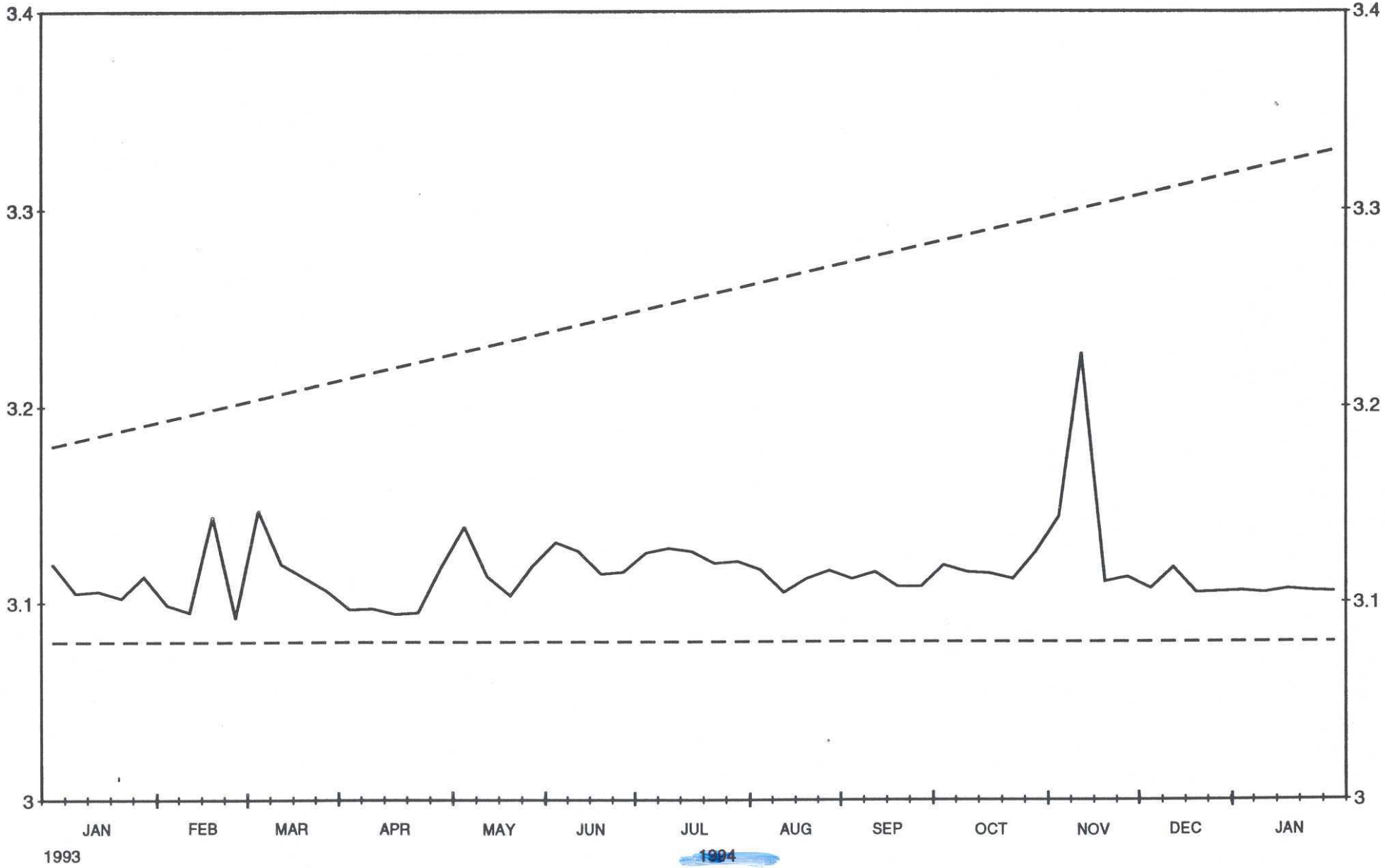
There was enormous political uncertainty following the assassination of the PRI candidate in March.

Every time there was bad political news, more investors moved their investments out of Mexico.

The government gambled with its monetary policy and debt policy that the political situation would stabilize and that capital inflows would resume. A similar gamble had been successful in 1993. **This time the government lost the gamble.**

PESOS per DOLLAR EXCHANGE RATE*

JANUARY 1993 - JANUARY 1994

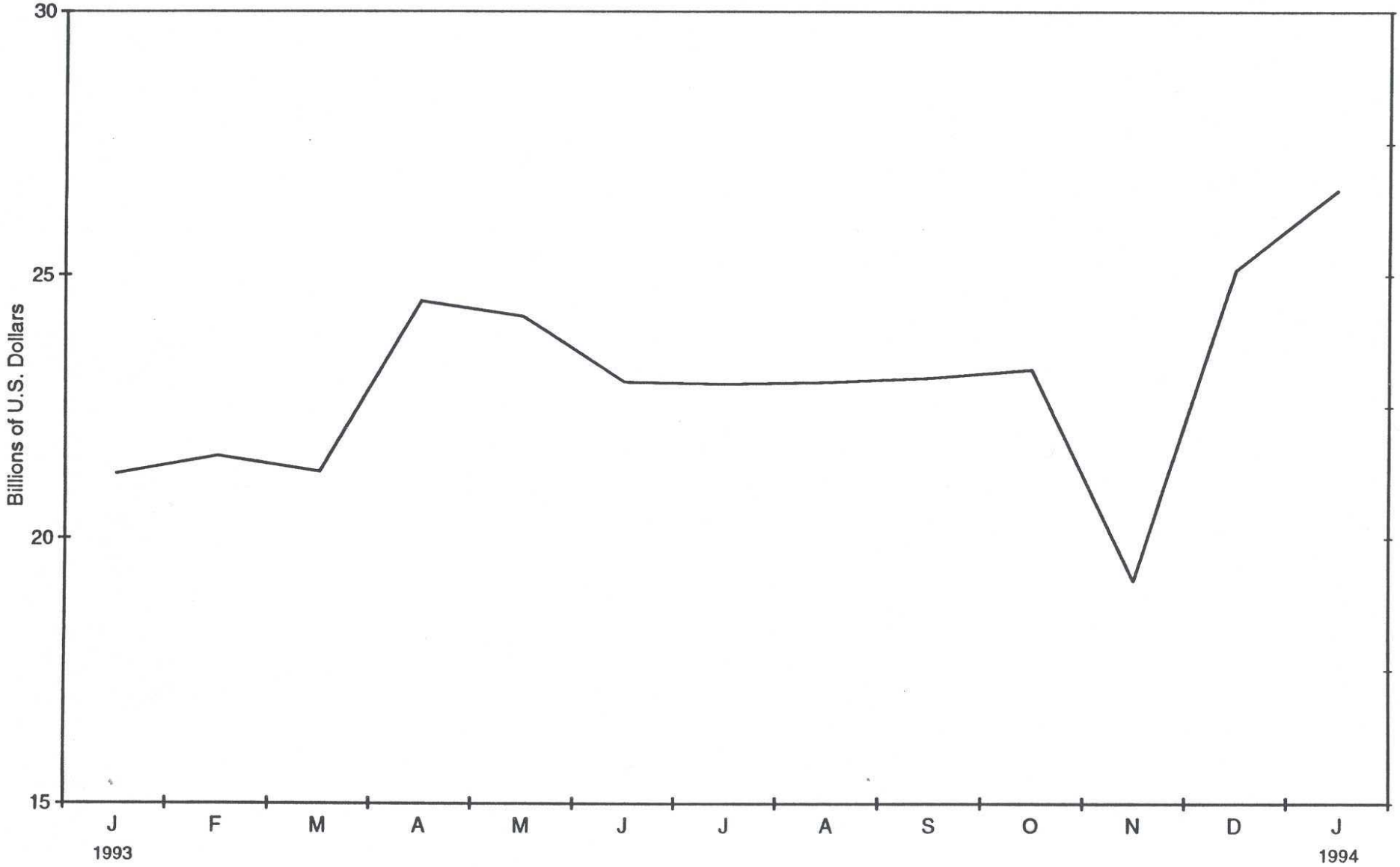


* New York market. Average rate on last day of the week.

Source: Tradeline International

MEXICAN INTERNATIONAL RESERVES*

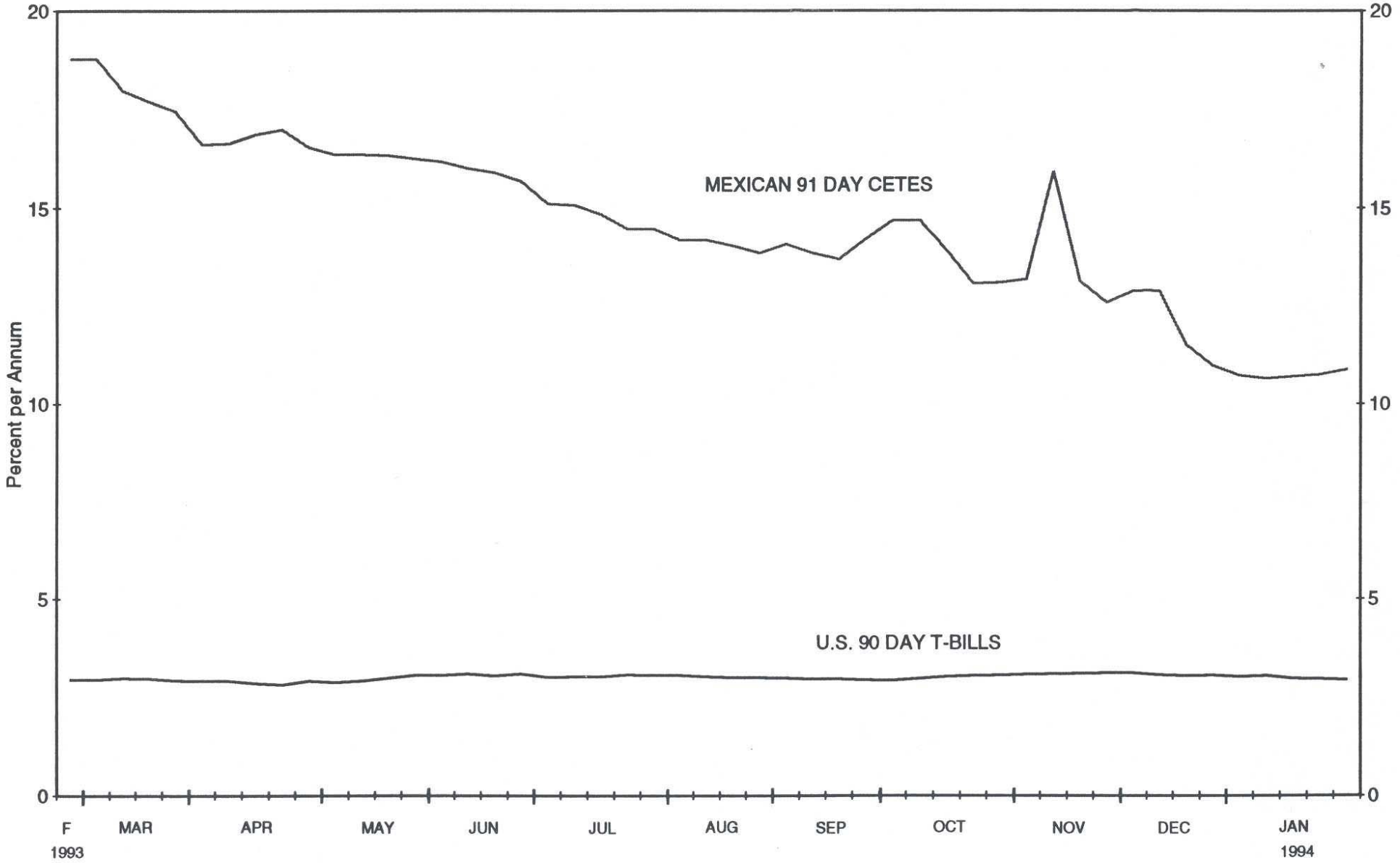
JANUARY 1993 - JANUARY 1994



* Monthly data.

Source: IMF; International Financial Statistics

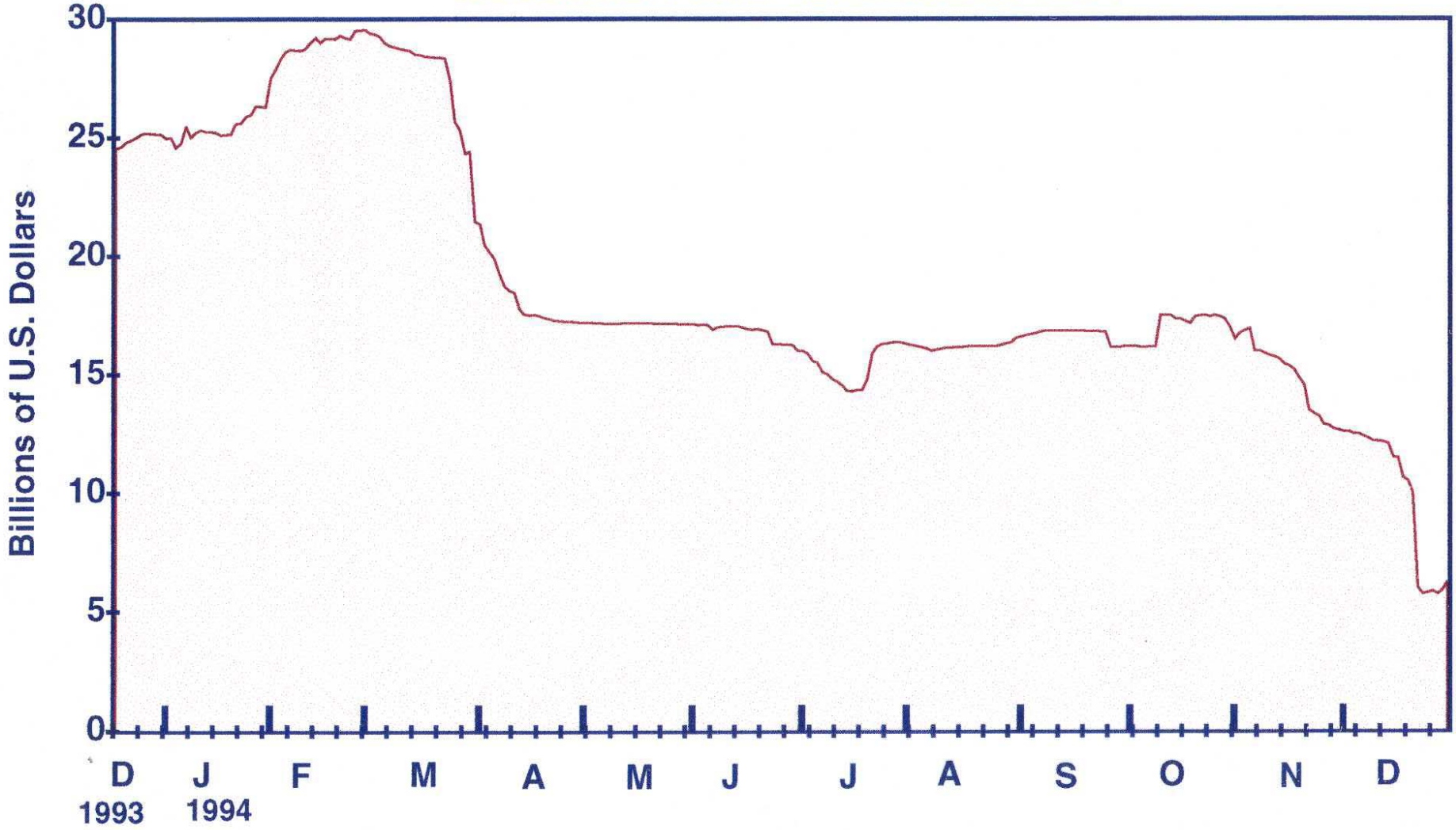
INTEREST RATES*
MEXICAN - U.S. GOVERNMENT BONDS
1993:2/26 - 1994:1/28



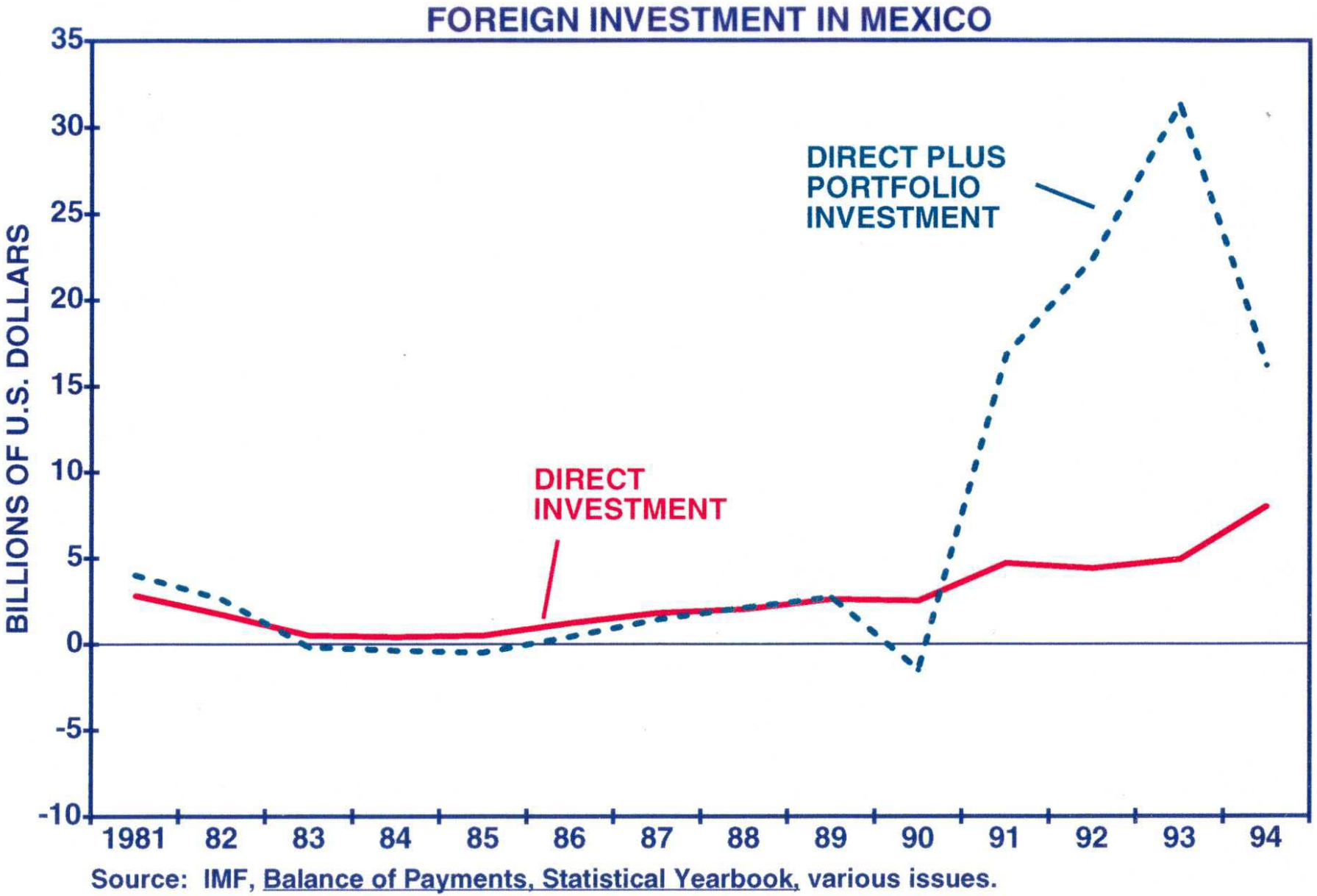
* Weekly data

Source: Bloomberg Financial Market

MEXICAN INTERNATIONAL RESERVES*
DECEMBER 1993 - DECEMBER 1994

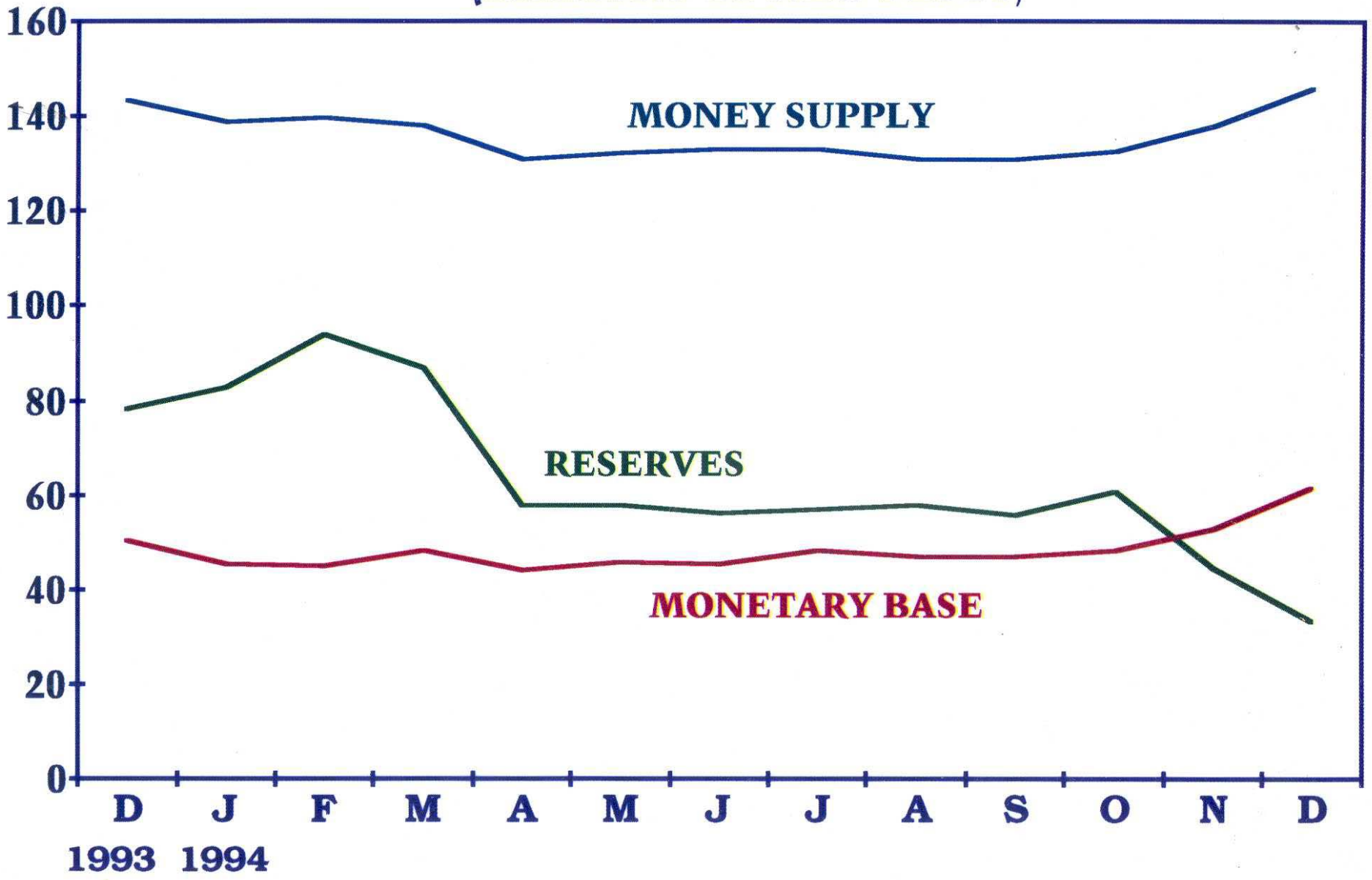


* Daily data.
Source: Mancera, Wall Street Journal, 31 January 1995.

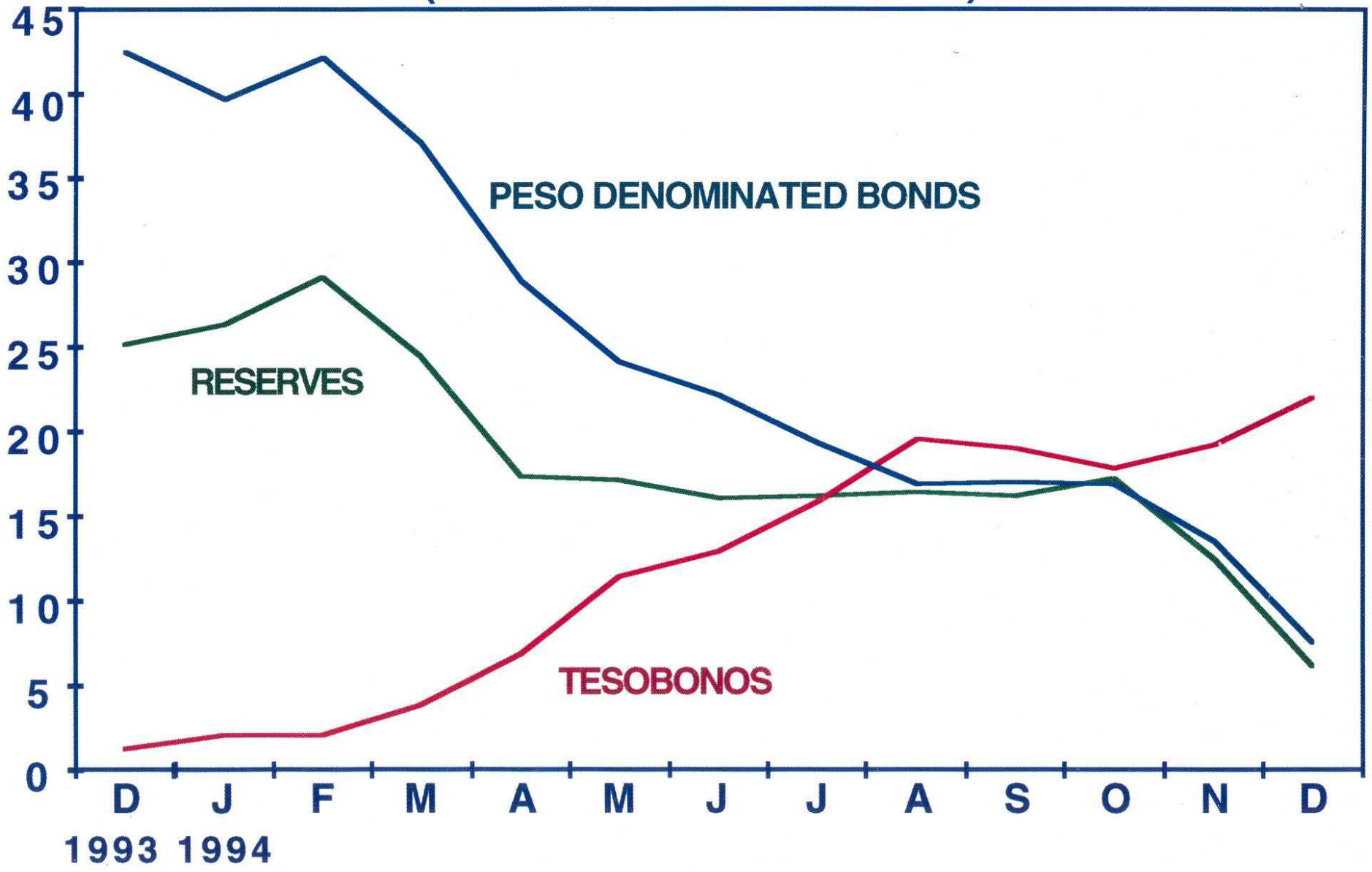


Source: IMF, Balance of Payments, Statistical Yearbook, various issues.

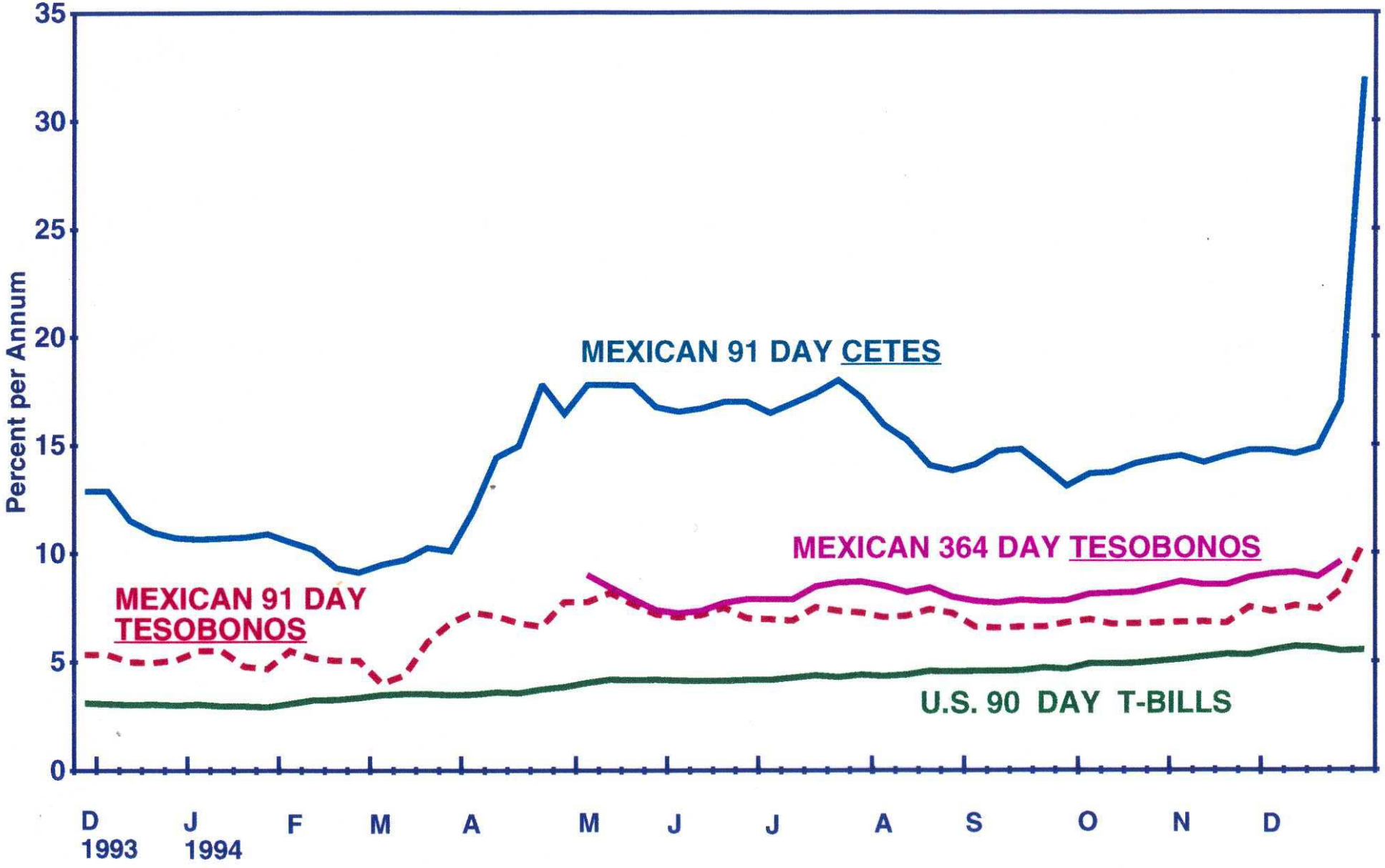
INTERNATIONAL RESERVES VS. MONEY SUPPLY
(BILLIONS OF NEW PESOS)



INTERNATIONAL RESERVES VS. GOVERNMENT BONDS
(BILLIONS OF U.S. DOLLARS)



INTEREST RATES
MEXICAN - U.S. GOVERNMENT BONDS
DECEMBER 1993 - DECEMBER 1994



Source: Bloomberg Financial Market

2. Self-Fulfilling Debt Crises

- Can we build a dynamic stochastic general equilibrium model that can have a crisis like that in Mexico as an equilibrium outcome?
- Can a calibrated model have a crisis when the government has as low a level of debt as did Mexico in 1995?
- What questions remain unanswered? Problems with maturity of debt, role of reserves, and role of private banks

H. L. Cole and T. J. Kehoe (1996), "A Self-Fulfilling Model of Mexico's 1994-95 Debt Crisis," *Journal of International Economics*.

H. L. Cole and T. J. Kehoe (2000), "Self-Fulfilling Debt Crises," *Review of Economic Studies*.

3. What Happened in Argentina in 2001-02?

- What were the crucial events that occurred in 2000-02?
- What role did the Convertibility Plan and its abandonment play?
- Can we separate the economics of the crisis from the politics?

G. A. Calvo, A. Izquierdo, and E. Telvi (2002), "Sudden Stops, the Real Exchange Rate, and Fiscal Sustainability: Argentina's Lessons," Inter-American Development Bank.

A. De la Torre, E. Levy Yeyati, and S. L. Schmukler (2002), "Argentina's Financial Crisis: Floating Money, Sinking Banking," World Bank.

T. J. Kehoe (2002), "What Can We Learn From the Current Crisis in Argentina?" University of Minnesota.

G. Perry and L. Servin (2002), "The Anatomy of a Crisis: Why Was Argentina Special and What Can We Learn from It?" World Bank.

The economy of Argentina finds itself submerged in a great depression that, even if though began four years ago, deepened after mid 2001 with average quarterly falls of deseasonalized GDP with respect to the previous quarter of 5 percent for the last two quarters of 2001 and the first of 2002. This violent deepening of the recession occurred just at the moment that economic agents, almost universally, became convinced of the impossibility of sustaining the Convertibility Plan.

Dirección Nacional de Coordinación de Políticas Macroeconómicas, Secretaría de Política Económica (2002)

What Happened in Argentina in 2001-2002?

The Brazilian devaluation did not lead to problems for the Argentinian current account — both exports and the trade surplus in fact grew.

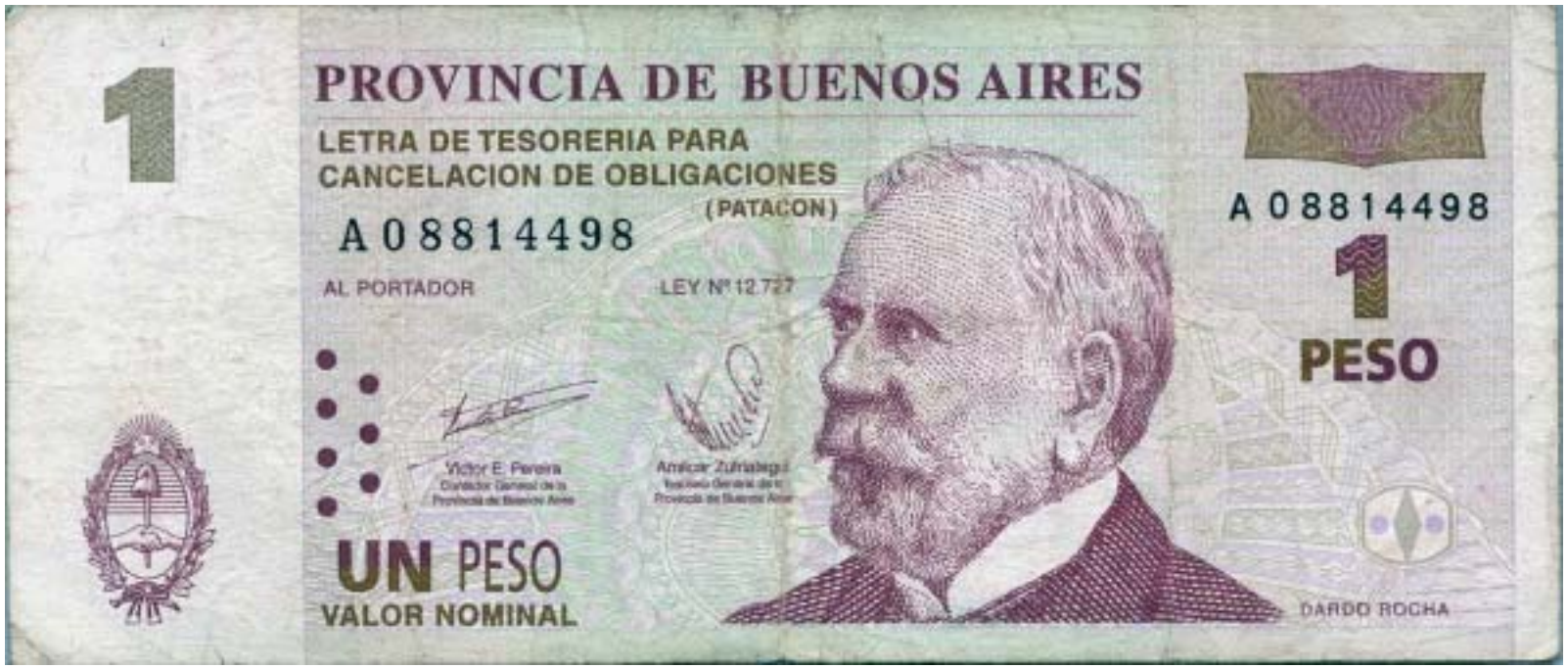
March 16 2001: President De la Rúa rejected the plan presented by the Minister of the Economy, Ricardo López Murphy, to reduce the fiscal deficit.

After López Murphy's resignation, De la Rúa appointed Domingo Cavallo, the architect of the Convertibility Plan during the first Menem administration, as Minister of the Economy.

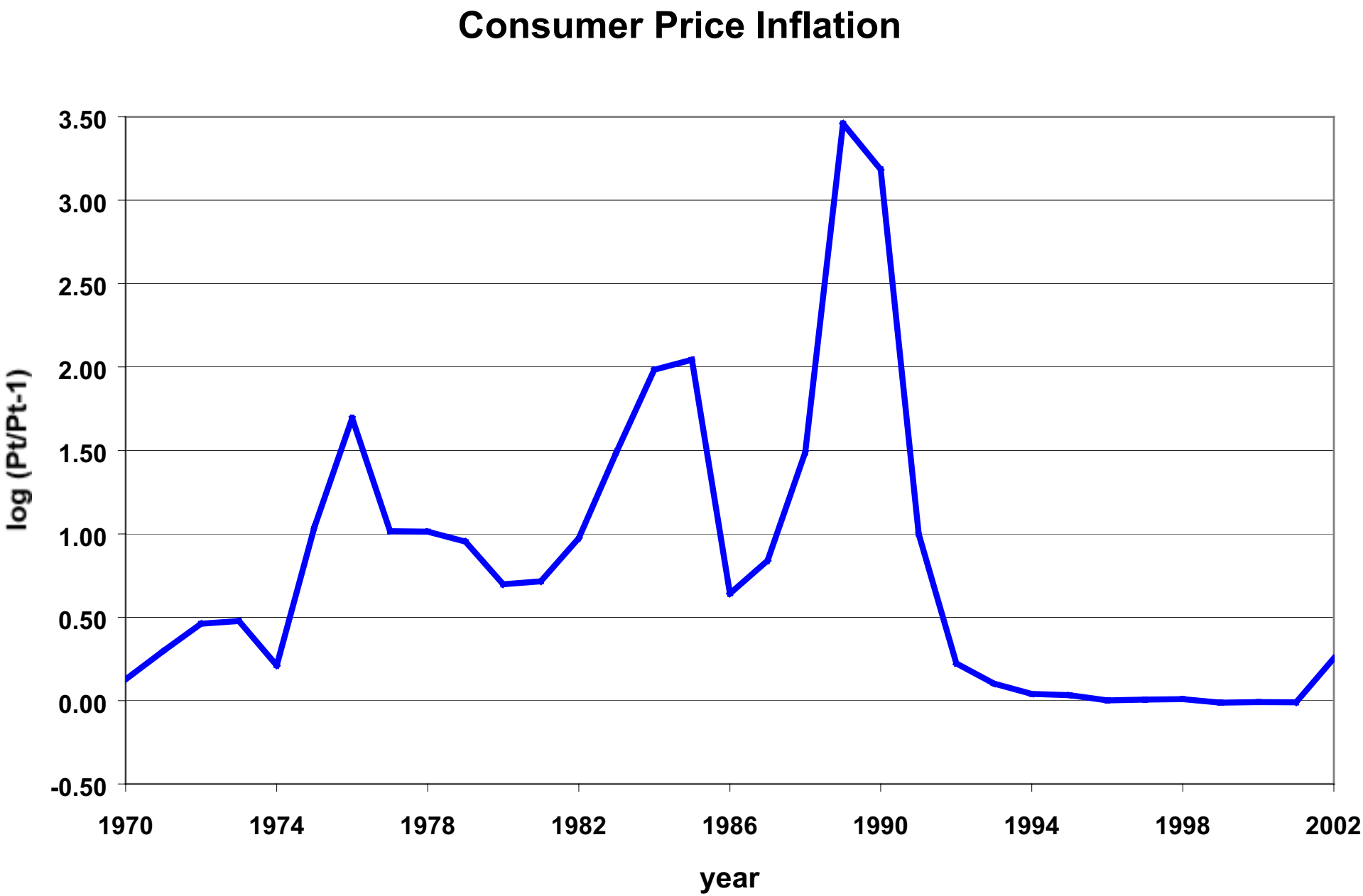
Cavallo presented a new economic plan in the lower house of Argentina's congress. On 28 March, the congress refused to allow Cavallo to cut government salary and pension costs, and the government sold debt to cover the deficit.

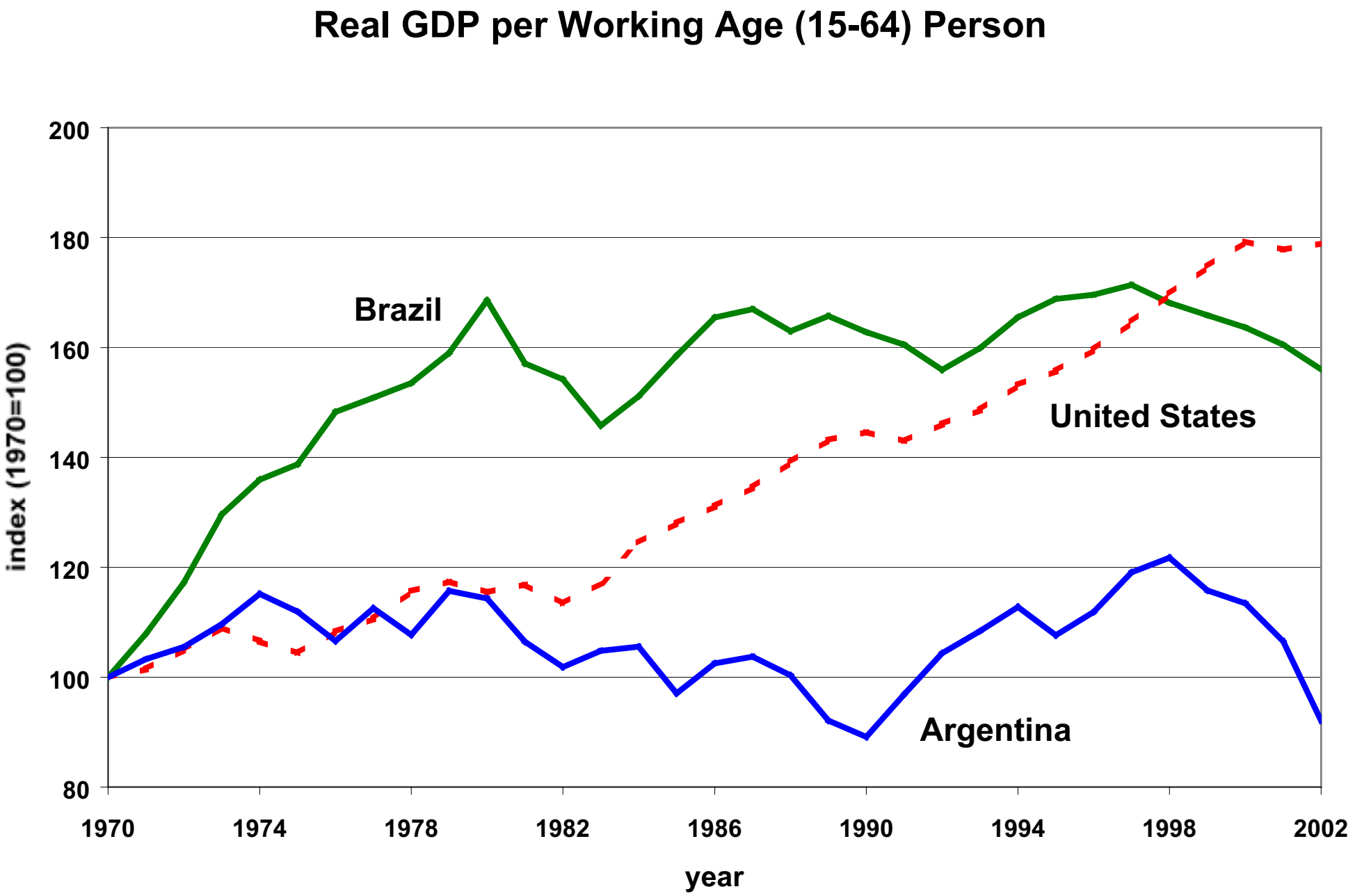
Cavallo's alternative: La Ley de Déficit Cero (Zero Deficit Act): Quasi Monies

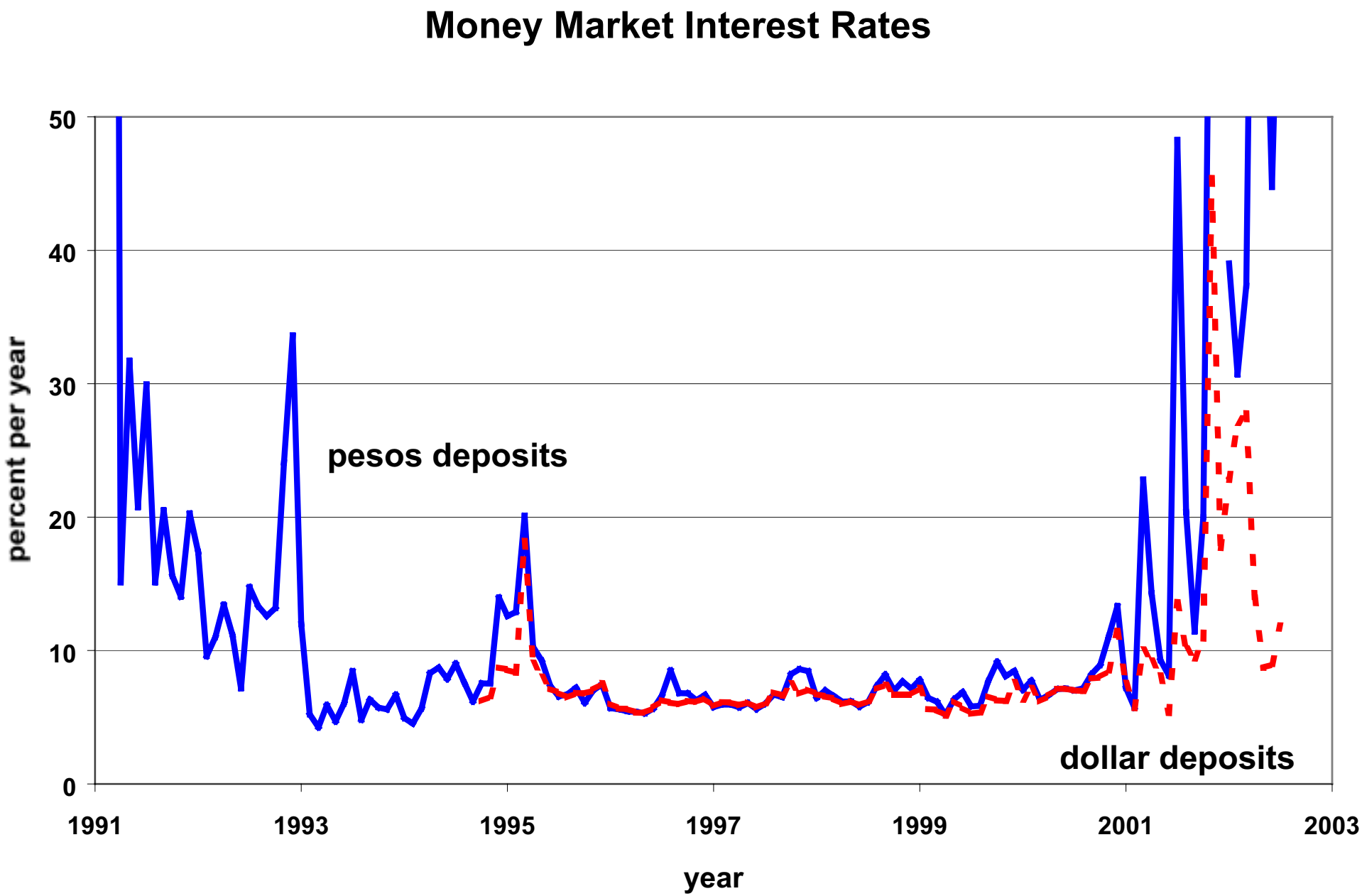
In December 2001, the government defaulted on its debt and, in January 2002, it abandoned the Convertibility Plan.

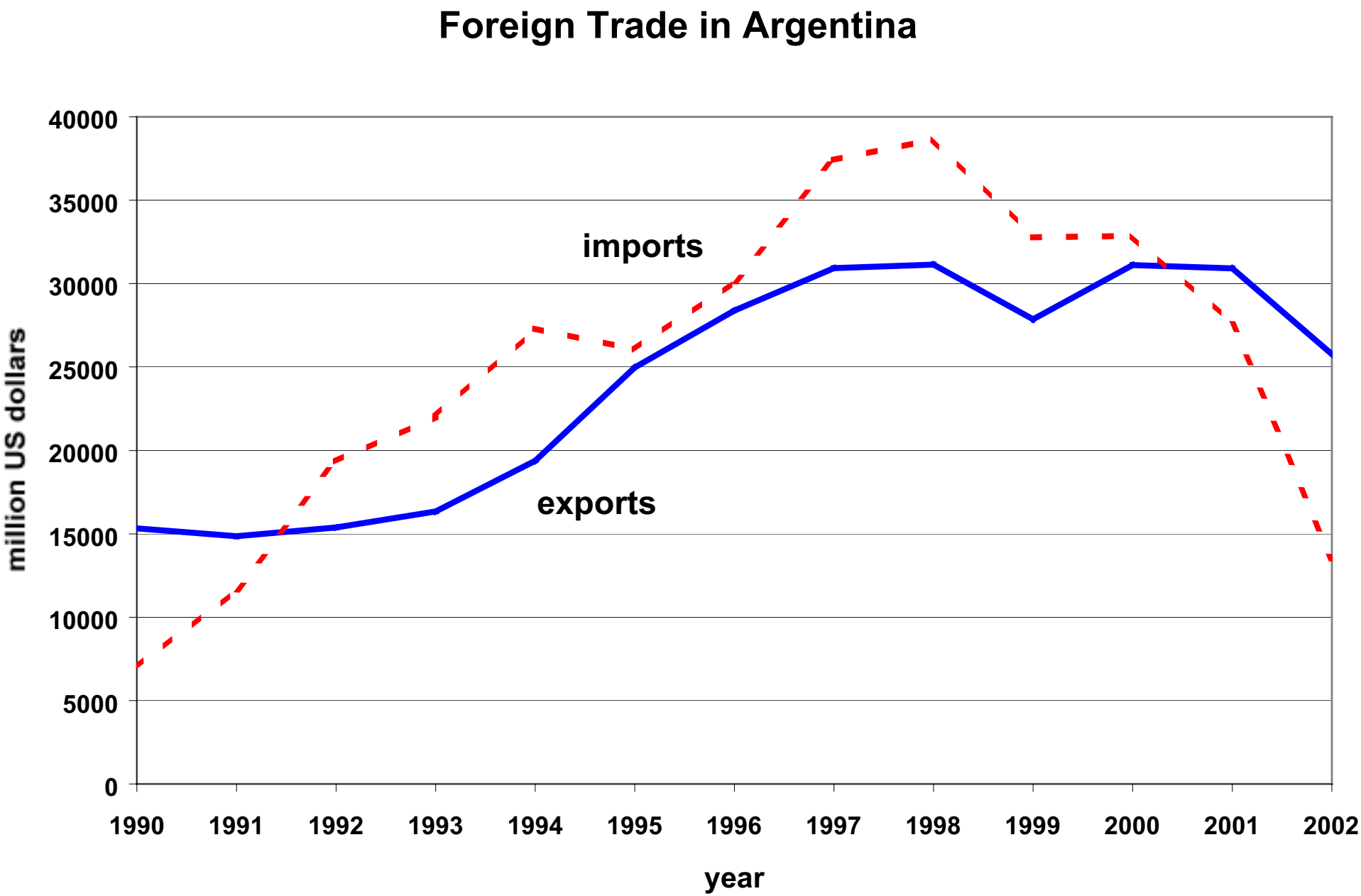

1
PROVINCIA DE BUENOS AIRES
LETRA DE TESORERIA PARA
CANCELACION DE OBLIGACIONES
(PATACON)
A 08814498
AL PORTADOR
LEY Nº 12.727
Víctor E. Pereira
Aníbal Zubialegui
UN PESO
VALOR NOMINAL
A 08814498
1
PESO
DARDO ROCHA

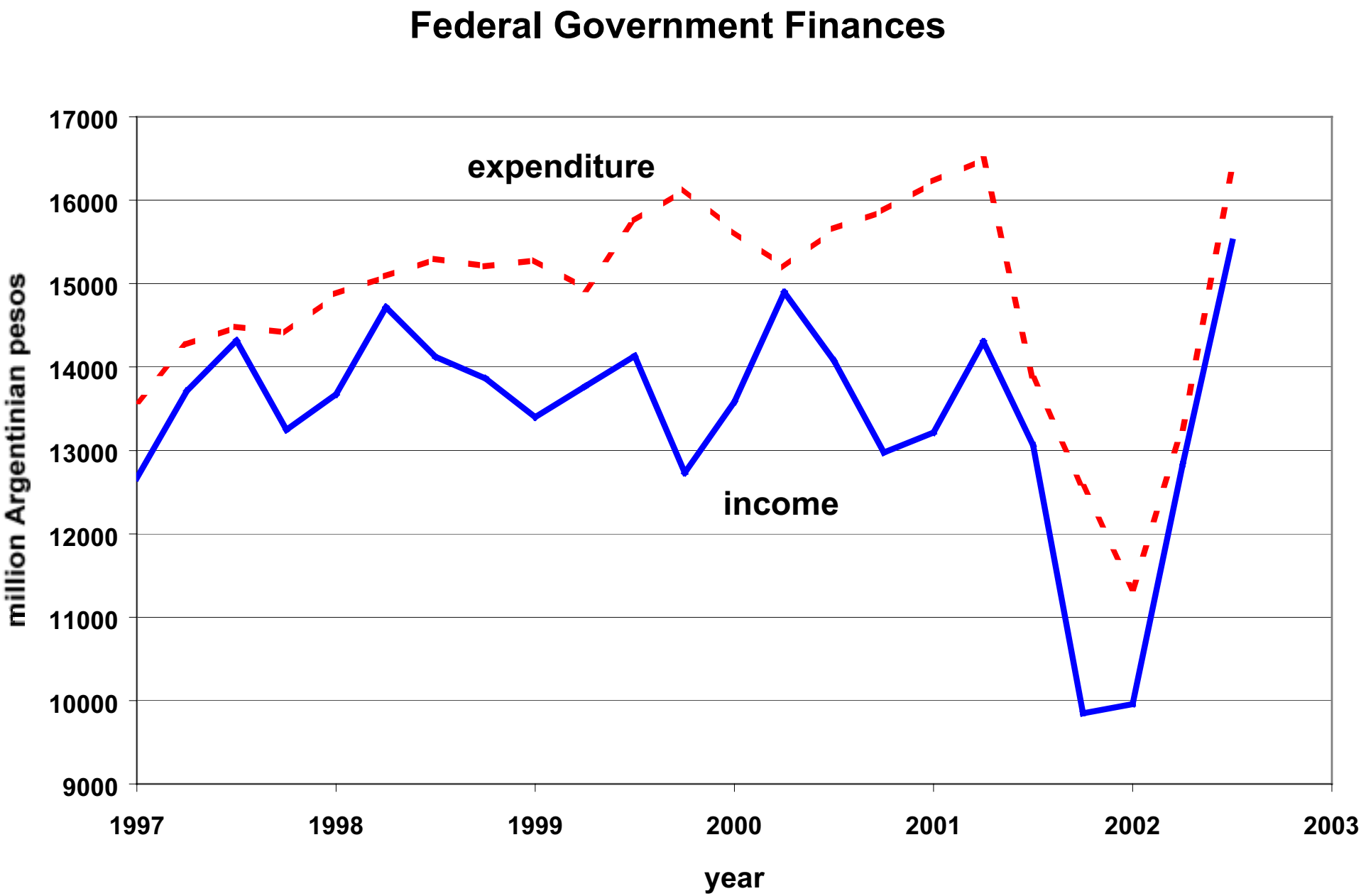

1
LEY Nº 12.727
ARTÍCULO 1º : "Declárese en estado de emergencia administrativa, económica y financiera al Estado Provincial..."
ARTICULO 7º : "Apruébase la emisión de Letras de Tesorería para Cancelación de Obligaciones, las que se denominarán "Patacón"... Los títulos serán emitidos bajo las modalidades de los Artículos 742, 744 y 745 del Código de Comercio."
ARTICULO 8º : "Las Letras de Tesorería para Cancelación de Obligaciones pagarán el ciento siete por ciento (107%) de su valor nominal el 25 de julio de 2002... Las Letras de Tesorería serán nominadas en pesos..."
ARTICULO 11º : "El pago efectuado al acreedor mediante Patacones o Bonos de Cancelación de Obligaciones, importará la extinción irrevocable de los créditos por los que se efectúe la entrega."
1
PESO

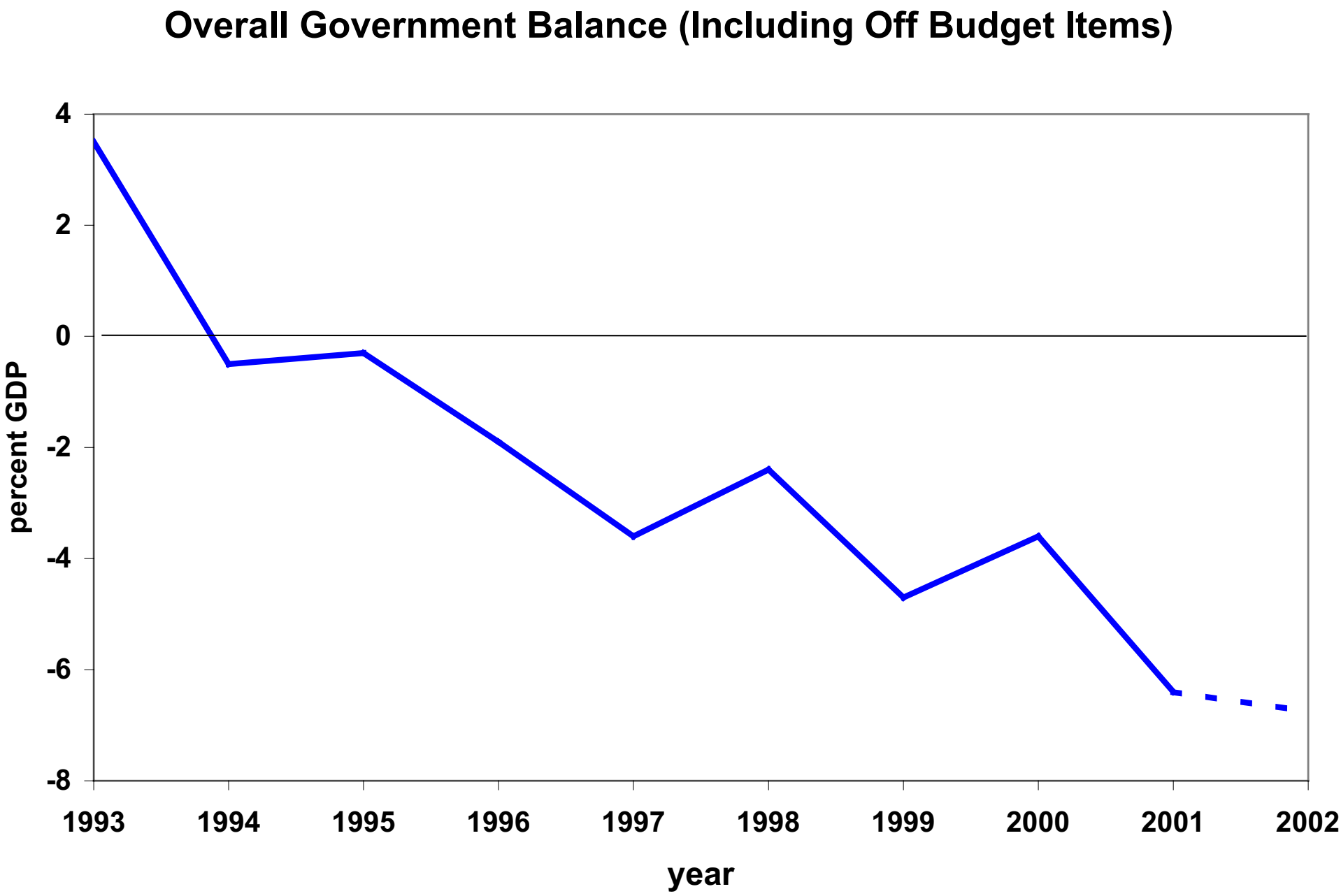

Consumer Price Inflation
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
-0.50
log (Pt/Pt-1)
1970
1974
1978
1982
1986
1990
1994
1998
2002
year


Real GDP per Working Age (15-64) Person
index (1970=100)
200
180
160
140
120
100
80
1970
1974
1978
1982
1986
1990
1994
1998
2002
year
Brazil
United States
Argentina


Money Market Interest Rates
50
40
30
20
10
0
percent per year
pesos deposits
dollar deposits
1991
1993
1995
1997
1999
2001
2003
year


Foreign Trade in Argentina
40000
35000
30000
25000
20000
15000
10000
5000
0
million US dollars
imports
exports
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
year


Federal Government Finances
expenditure
income
million Argentinian pesos
17000
16000
15000
14000
13000
12000
11000
10000
9000
1997
1998
1999
2000
2001
2002
2003
year


Overall Government Balance (Including Off Budget Items)
4
2
0
-2
-4
-6
-8
percent GDP
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
year

4. What Lessons Can We Draw from the Crisis in Argentina?

- Do economic theory and the data provide clues to where the severity of the crisis comes from?
- What does it mean to "commit" to a monetary policy?
- What features would a good model of the crisis in Argentina have?

R. Bergoeing, P. J. Kehoe, T. J. Kehoe, and R. Soto, "Decades Lost and Found: Mexico and Chile Since 1980," *Federal Reserve Bank of Minneapolis Quarterly Review.*

J. M. Da Rocha, E. L. Giménez, and F. X. Lores (2002), "Devaluation Beliefs and the Argentinian Debt Crisis," Universidade de Vigo.

T. J. Kehoe (2002), "What Can We Learn From the Current Crisis in Argentina?" University of Minnesota.

T. J. Kehoe and E. C. Prescott (2002), "Great Depressions of the Twentieth Century," *Review of Economic Dynamics*.

T. J. Sargent and N. Wallace (1981), "Some Unpleasant Monetarist Arithmetic," *Federal Reserve Bank of Minneapolis Quarterly Review*.

Growth accounting

Production function:

$$Y_t = A_t K_t^{\alpha} L_t^{1-\alpha}$$

Capital accumulation:

$$K_t = (1-\delta)K_t + I_t.$$

$\alpha = 0.30,\ \delta = 0.05.$

Decomposition of changes in output

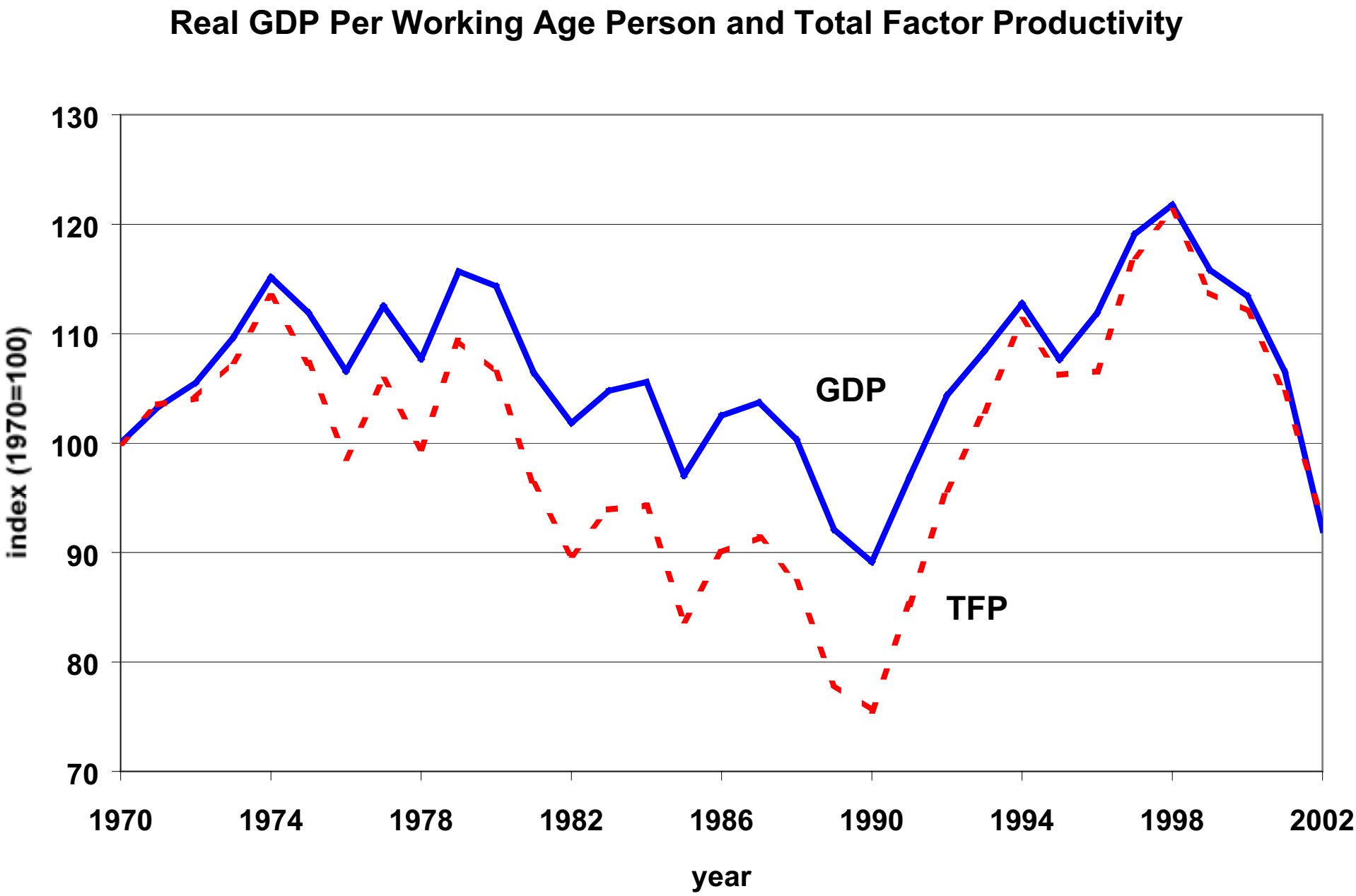
$$\log\left(\frac{Y_t}{N_t}\right) = \log A_t + \alpha \log\left(\frac{K_t}{N_t}\right) + (1-\alpha)\log\left(\frac{L_t}{N_t}\right)$$

$$\log\left(\frac{Y_t}{N_t}\right) = \frac{1}{1-\alpha}\log A_t + \frac{\alpha}{1-\alpha}\log\left(\frac{K_t}{Y_t}\right) + \log\left(\frac{L_t}{N_t}\right)$$

$$\left[\log\left(\frac{Y_{t+s}}{N_{t+s}}\right) - \log\left(\frac{Y_t}{N_t}\right)\right]/s = \frac{1}{1-\alpha}\left[\log A_{t+s} - \log A_t\right]/s$$

$$+ \frac{\alpha}{1-\alpha}\left[\log\left(\frac{K_{t+s}}{Y_{t+s}}\right) - \log\left(\frac{K_t}{Y_t}\right)\right]/s$$

$$+ \left[\log\left(\frac{L_{t+s}}{N_{t+s}}\right) - \log\left(\frac{L_t}{N_t}\right)\right]/s.$$


Real GDP Per Working Age Person and Total Factor Productivity
index (1970=100)
130
120
110
100
90
80
70
1970
1974
1978
1982
1986
1990
1994
1998
2002
year
GDP
TFP

Applied dynamic general equilibrium model

The representative consumer maximizes

$$\sum_{t=1980}^{\infty} \beta^t \left[\gamma \log C_t + (1-\gamma) \log(\bar{h} N_t - L_t) \right]$$

subject to

$$C_t + K_{t+1} - K_t = w_t L_t + (r_t - \delta) K_t .$$

Feasibility:

$$C_t + K_{t+1} - (1-\delta) K_t = A_t K_t^{\alpha} L_t^{1-\alpha} .$$

Calibration

First order conditions:

$$\frac{1}{C_{t-1}} = \frac{\beta}{C_t}\left(1 + r_t - \delta\right)$$

$$\frac{1-\gamma}{\bar{h}N_t - L_t} = \frac{\gamma\, w_t}{C_t}.$$

Estimate $\beta = 0.96$, $\gamma = 0.30$ 1960-1970 data.

Model with Adjustment Costs

$$C_t + X_t = A_t K_t^{\alpha} L_t^{1-\alpha}$$

$$K_{t+1} = (1-\delta)K_t + \phi(X_t / K_t)K_t$$

where

$$\phi(X/K) = \left[\delta^{1-\eta}(X/K)^{\eta} + (\eta - 1)\delta\right]/\eta.$$

For $0 < \eta \leq 1$, $\phi'(X/K) > 0$, $\phi''(X/K) \leq 0$, $\phi(\delta) = \delta$, $\phi'(\delta) = 1$.

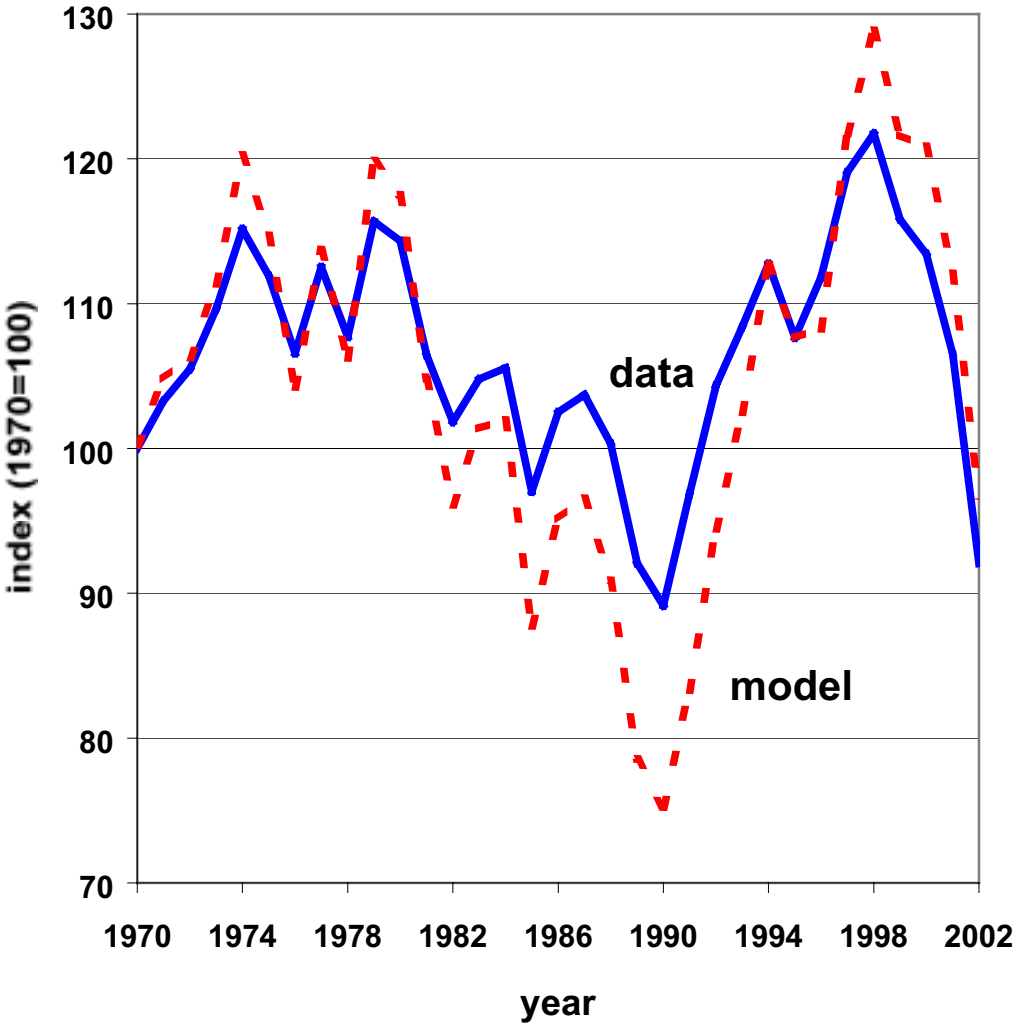
The model without adjustment costs is the special case $\eta = 1$.

In numerical experiments $\eta = 0.8$.

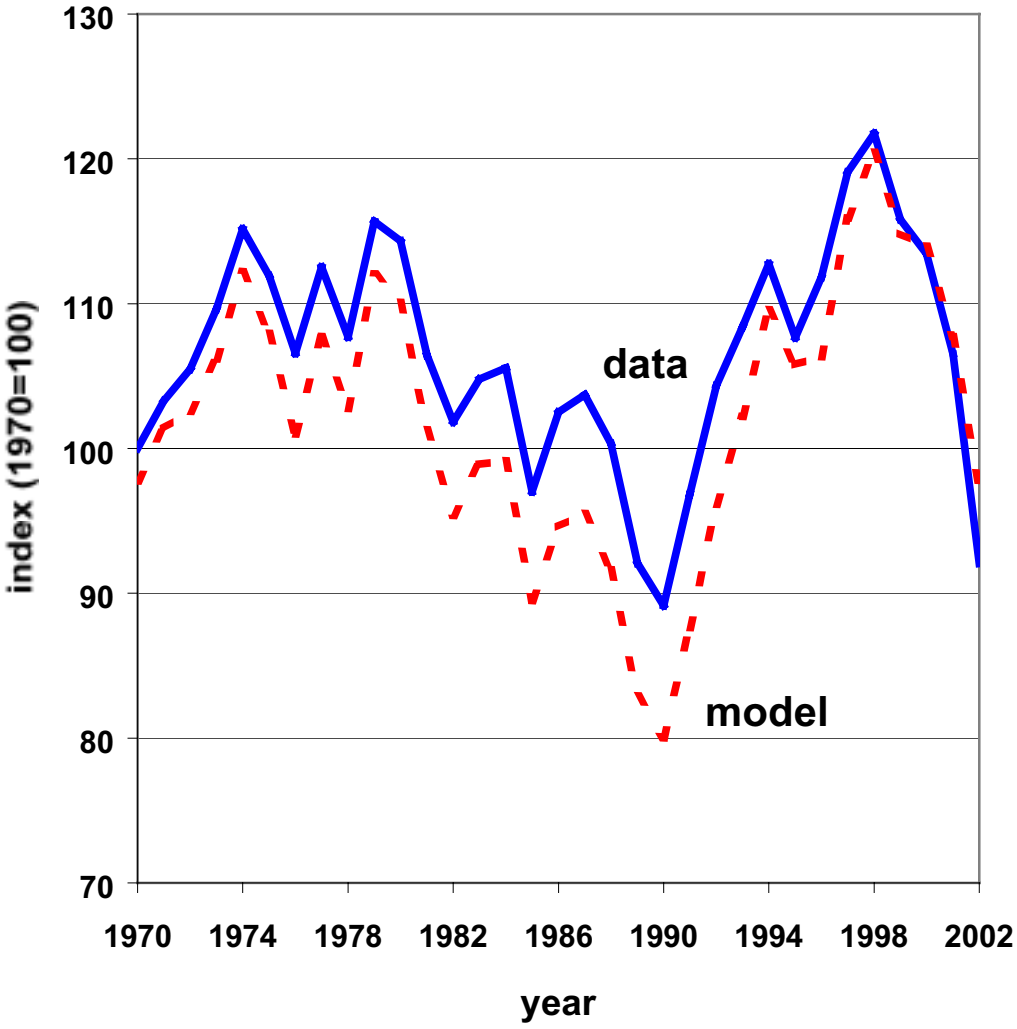
Should we model rigidity in the labor market (instead)?

Real GDP per Working Age Person

Base Case Model

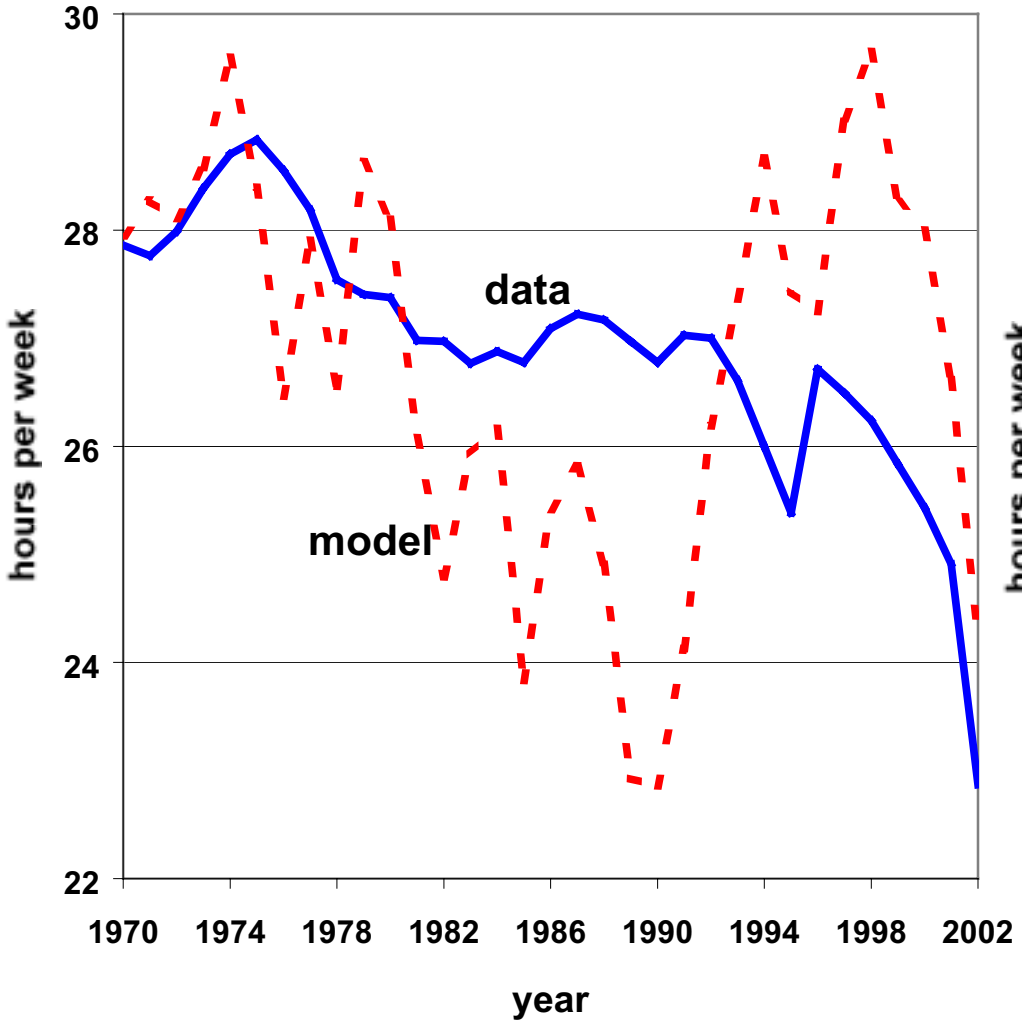


Model with Adjustment Costs

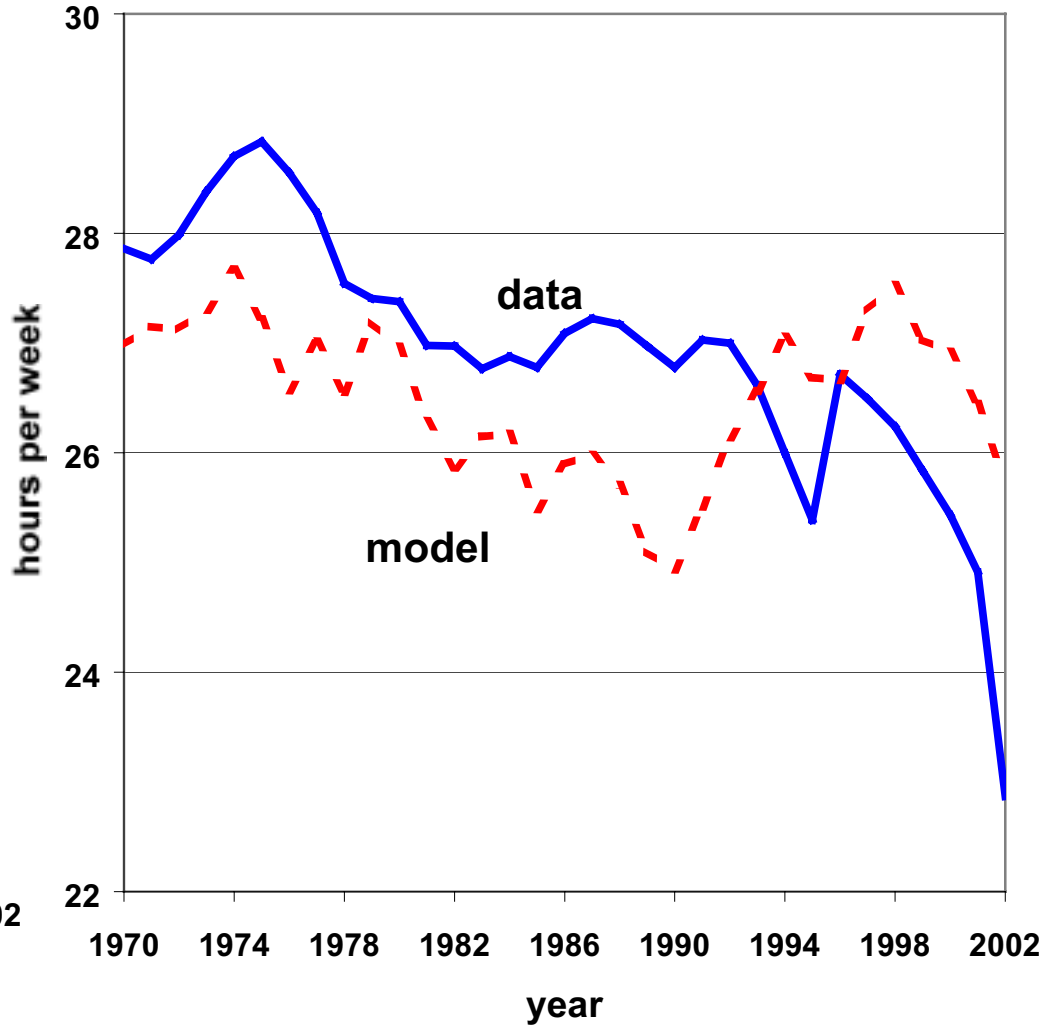


Hours Worked per Working Age Person

Base Case Model

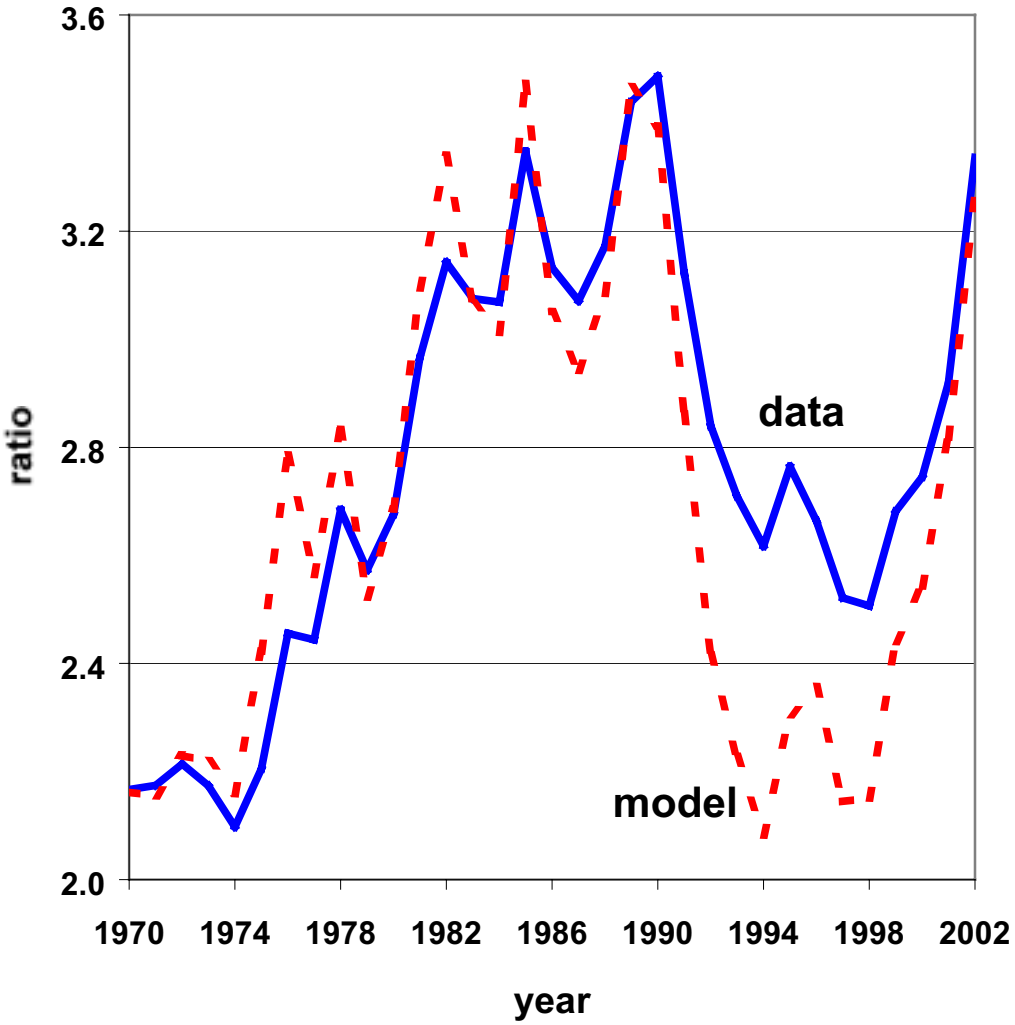


Model with Adjustment Costs

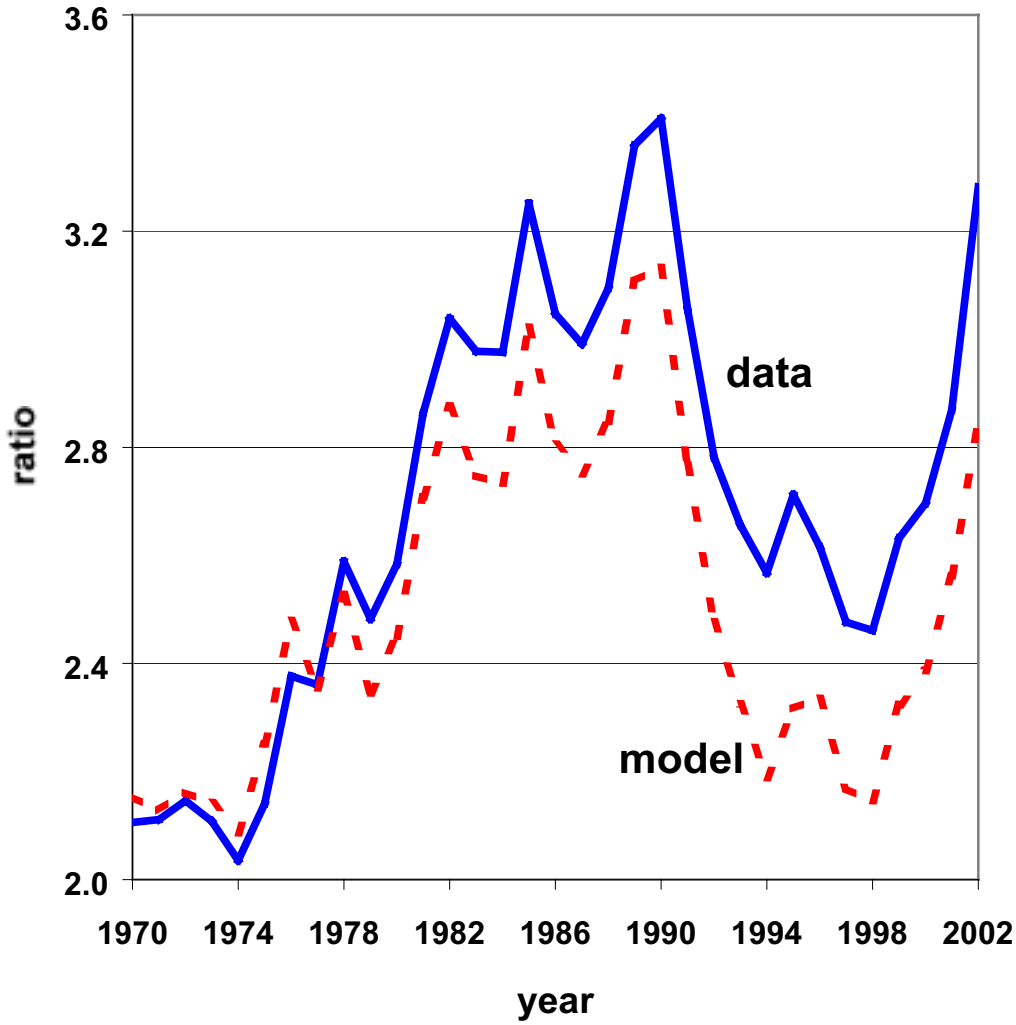


Capital-Output Ratio

Base Case Model

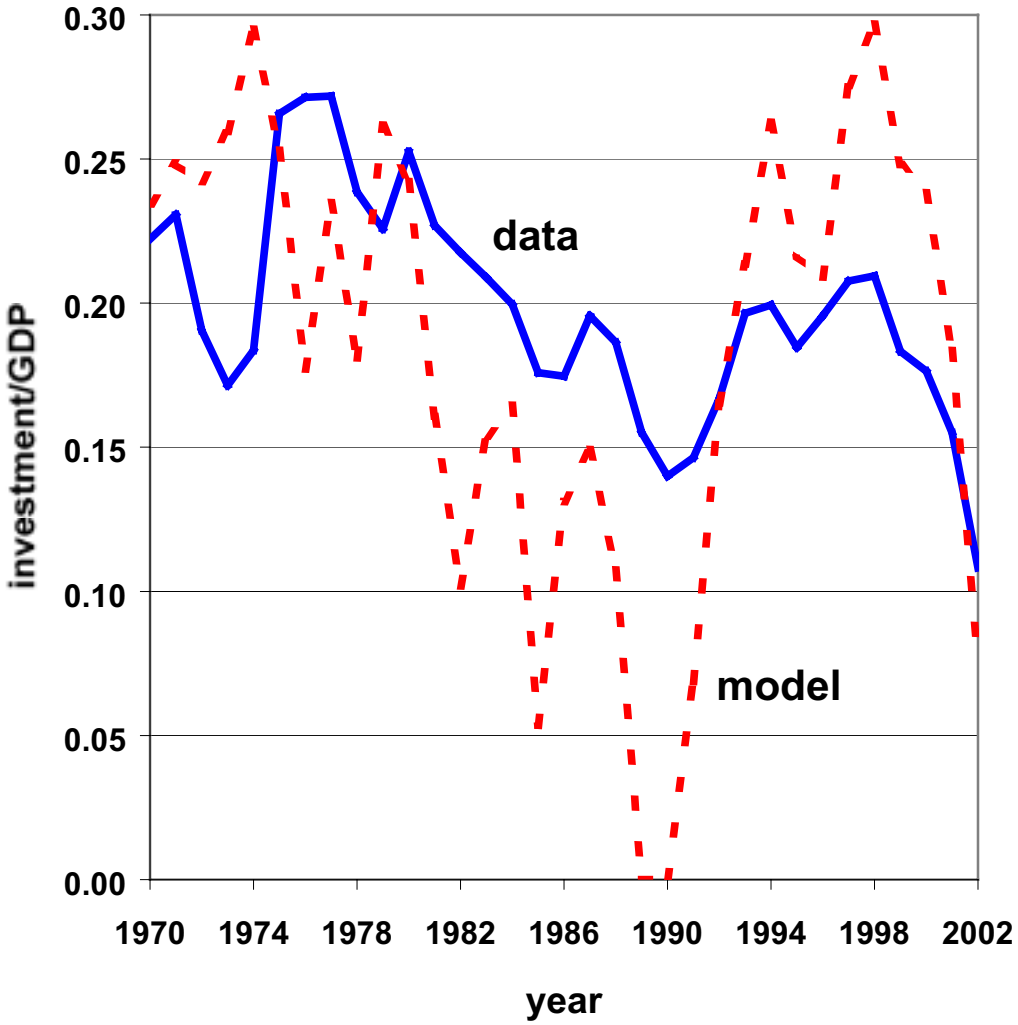


Model with Adjustment Costs

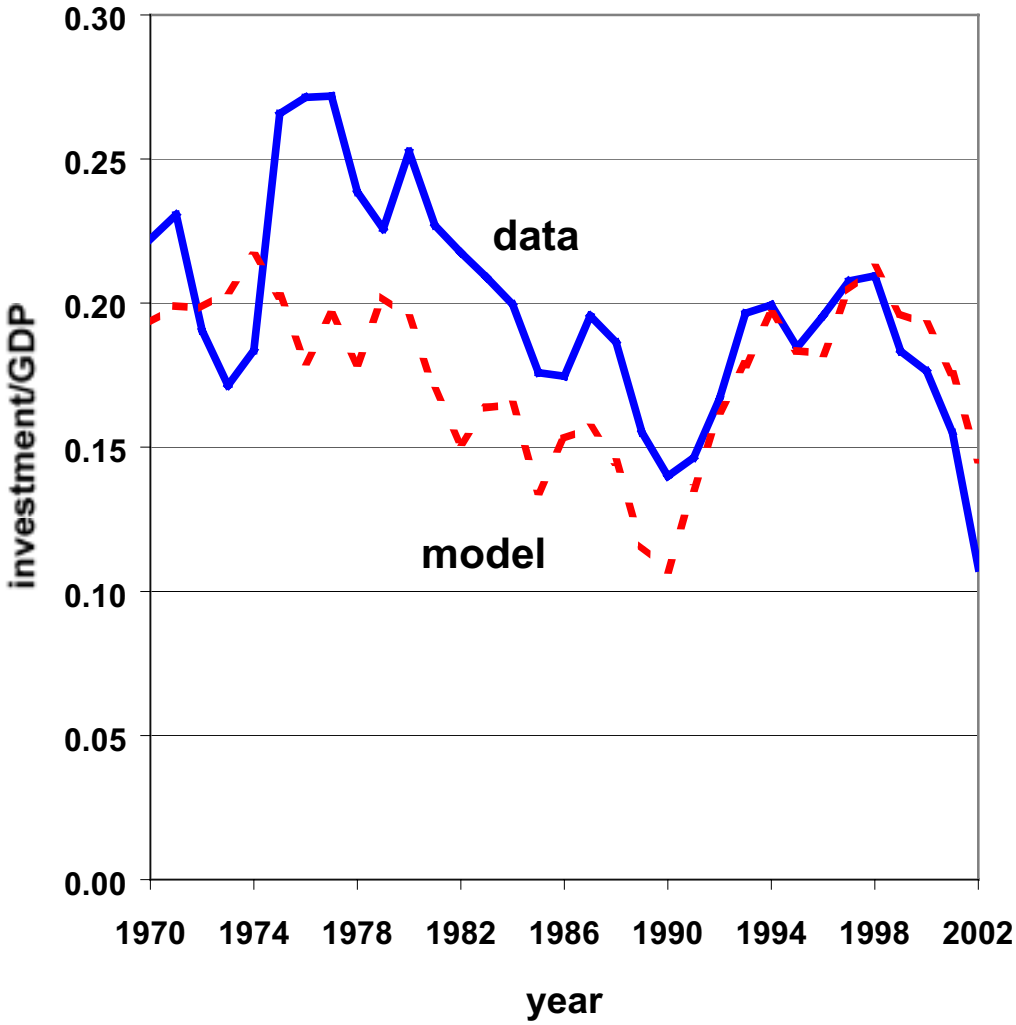


Investment Rate

Base Case Model



Model with Adjustment Costs



Sargent-Wallace Model of Unpleasent Monetarist Arithmetic

[I]magine that fiscal policy dominates monetary policy. The fiscal authority sets its budgets, announcing all current and future deficits and surpluses and thus determining the amount of revenue that must be raised through bond sales and seignorage. Under this … coordination scheme, the monetary authority faces the constraints imposed by the demand for government bonds, for it must try to finance with seignorage any discrepancy between the revenue demanded by the fiscal authority and the amount of bonds that can be sold to the public.

Monetary and fiscal policy are not independent instruments!

Da Rocha-Giménez-Lores Model of Devaluation and Default in Argentina

Expectations of devaluation can lead domestic consumers to invest in assets abroad rather than in domestic capital. This gives the government an incentive to devalue.

Devaluation can increase the value of government debt denominated in dollars relative to domestic GDP and the government's ability to repay the debt, pushing the economy into the crisis zone.

What drives the results in this model is that the nominal devaluation expected by domestic consumers turns out to be a real devaluation that pushes the economy into the crisis zone.

Lessons for monetary policy

Increasing the costs of abandoning a policy can reduce the set of conditions under which a crisis can occur. If these increased costs do not rule out a crisis completely, however, they can backfire in making the economy far worse off if things do go wrong.

Rogoff's (1985) (and, more recently, Woodford's 2002) proposal to reduce the dynamic consistency problem in monetary policy making is to employ a "conservative" central banker, one whose social welfare function puts far more weight on price stability than does the general population's. This is what the De La Rúa administration tried to do in bringing in Domingo Cavallo as Economics Minister in early 2001.

Dynamic consistency problems are pervasive because commitment is not easy. Lack of political consensus both within the federal government and between the federal and the provincial governments in Argentina made it impossible to resolve fiscal imbalances. In this environment, "unpleasant monetarist" arithmetic doomed the Convertibility Plan to failure. Measures that the administration had put in place to make the Convertibility Plan more credible are imposing severe costs on the economy now that the plan has failed.

A final note

They say that every dark cloud has a silver lining, but it is hard to have much optimism about the Argentinian economy. Nevertheless, the pervasiveness of time consistency problems may soon produce one favorable for Argentina: Up until recently, both the Bush administration and the International Monetary Fund in the person of its new Managing Deputy Director Anne Krueger claimed to be committed to a policy of "no more bailouts" for countries like Mexico and Korea that run into financial crises of their own making. Early last month, however, the IMF, with the backing of the U. S. government, announced large loan packages for Brazil and Argentina. Negotiations for another package for Argentina are currently underway.