

John H. Rogers

Assistant Professor of Economics
Pennsylvania State University

Ping Wang

Visiting Senior Economist
Federal Reserve Bank of Dallas and
Assistant Professor of Economics
Pennsylvania State University

High Inflation: Causes and Consequences

Although cases of very high inflation and hyperinflation may at first seem like unusual events, in recent years these economic scourges have been all too common. Using the conventional definition of hyperinflation as a monthly inflation rate of more than 50 percent, there were no hyperinflations in the world between 1950 and 1983 but seven in the second half of the 1980s. Furthermore, the 1980s brought approximately twenty episodes of high inflation (rates exceeding 100 percent in a twelve-month period), originating in nine Latin American countries.

In this article, we try to answer a series of questions that can at least offer some guidance for understanding the economics of high inflation. First, what are the costs of inflation compared with the costs of lowering inflation? Second, why is inflation chronically high in most Latin American countries? The fact that Latin American countries have suffered high and chronic inflation throughout most of the past three decades may suggest some commonality in the processes that determine inflation. Third, what are the main causes of these inflationary episodes? Finally, why have some countries successfully lowered inflation while others have not? Successful stabilization by some governments but not others probably reflects the perception that the costs of inflation have become unacceptable to those societies that stabilized. We try to understand what creates such a change in perception.

In Table 1, we summarize the inflationary experiences of four Latin American countries—Argentina, Bolivia, Brazil, and Mexico—beginning in the mid-1980s. All four experienced high inflation, with periods of hyperinflation in Argentina during 1989, in Bolivia during 1985, and in Brazil during 1990. Success in stabilizing inflation in the

four countries has been mixed, as Table 1 indicates. Argentina made several unsuccessful attempts at stabilization before initiating its April 1991 program, which still endures; Bolivia enjoyed an immediate and lasting end to inflation in mid-1985; and Mexico experienced a gradual and lasting end to inflation, while Brazil has yet to control inflation for any substantial length of time. Table 1 also provides figures on the changes in real economic activity taking place around each of the inflationary episodes. Each successful stabilization, regardless of whether it came about in a gradual or a short-lived fashion, has been accompanied by no worse than a temporary drop in output.

Economists generally accept the view that inflation is ultimately a monetary phenomenon. Nevertheless, there are rather divergent opinions on the short- and long-run interactions between the monetary and the real sectors. So far, there has been no theoretical consensus on the macroeconomic trade-offs, if any, between inflation and output. Moreover, it is difficult to discriminate empirically between alternative views on inflation—output trade-offs.

For a simple example, consider the “child’s game” in Figure 1, in which we plot inflation and

We thank Mike Cox, Greg Huffman, Eric Leeper, John Welch, Mark Wynne, and, especially, Evan Koenig and Ellis Tallman for very helpful comments on earlier drafts of this article, as well as Steven Prue for excellent research assistance and Rhonda Harris and Monica Reeves for careful editorial review. Any remaining errors are our own responsibility.

Table 1
Summary of High-Inflation Episodes

Country	Inflation rate (Percent)		Output Growth Around Stabilization (Percent)	
Argentina	434	(1983)	-.67	(1985:2)
	688	(1984)	-5.39	(1985:3)
	Peak inflation rates (per episode):		13.5	(1985:4)
	31 percent (June 1985),	82 (1986)	4.1	(1987)
	190 percent (1989:3)	175 (1987)	-5.2	(1988)
		388 (1988)	-4.1	(1989:3)
	Success in stabilizing:		-4.5	(1989)
	very temporary (before April 1991)	4,145 (1989)	.4	(1990)
		1,629 (1990)		
		923 (1991)		
	22 (1991:2–1992:2)			
Bolivia	276	(1983)	33.3	(1985:2)
	1,281	(1984)	-25.7	(1985:3)
	Peak inflation rate:		15.2	(1985:4)
	66 percent (June 1985)	8,175 (1985)	-2.9	(1986)
		14.6 (1986)	2.1	(1987)
		16.0 (1987)	3.0	(1988)
	Success in stabilizing:		3.2	(average 1989–1991)
	yes, immediate	16.5 (1989)		
		17.4 (1990)		
		16.2 (1991)		
Brazil	178	(1983)	-2.5	(1983)
	197	(1984)	5.7	(1984)
	Peak inflation rates (per episode):		8.3	(1985)
	20 percent (February 1986),	227 (1985)	7.6	(1986)
	24 percent (June 1987)	145 (1986)	3.6	(1987)
	33 percent (January 1989),	225 (1987)	-0.1	(1988)
	59 percent (March 1990)	1,038 (1988)	3.3	(1989)
	Success in stabilizing:		-4.1	(1990)
	only temporarily	1,759 (1989)		
		1,658 (1990)		
	494 (1991)			
	1,147 (1992)			
Mexico	29	(1981)	-.6	(1982)
	99	(1982)	-4.2	(1983)
	Peak inflation rates (per episode):		3.6	(1984)
	11 percent (August 1982),	81 (1983)	2.6	(1985)
	15 percent (December 1987)	59 (1984)	-3.7	(1986)
		64 (1985)	1.6	(1987)
	Success in stabilizing:		1.4	(1988)
	very temporary (before December 1989)	106 (1986)	2.9	(1989)
		159 (1987)	4.9	(1990)
		45 (1988)	3.9	(1991)
	20 (1989)			
	24 (1990)			
	19 (1991)			
	12 (1992)			

NOTES: Any rate quoted for a given month is a monthly rate, for a quarter is a quarterly rate, and for a year is an annual rate. Attempted stabilization occurred on the date following each peak inflation noted in the table. The sources of the data are as follows, where *IFS* denotes that the data are from various issues of the International Monetary Fund's *International Financial Statistics*.

Argentina (*IFS*): consumer price inflation, line 64; and real GDP in 1978 prices, line 99bp.

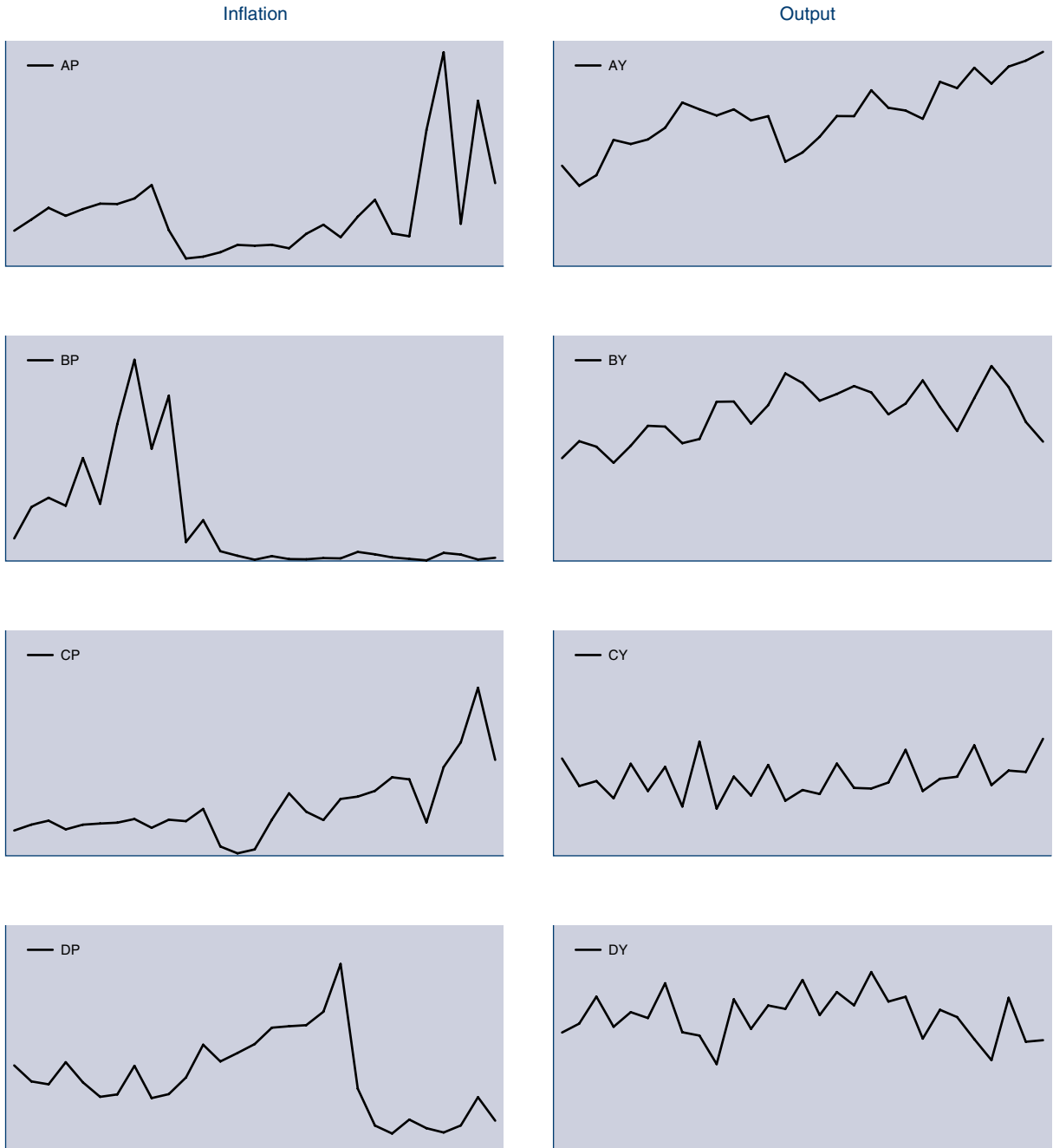
Bolivia (*Bulletin of the Central Bank of Bolivia*): consumer price inflation; and real GDP in 1980 prices.

Brazil (*IFS* and *Boletim Mensal do Banco Central do Brasil*): consumer price inflation, line 64; and general industrial production index, 3/86=100.

Mexico (*IFS* and the Central Bank of Mexico's *Economic Indicators*): consumer price inflation, line 64; and industrial production, base year = 1980.

Figure 1
Inflation–Output Trade-Offs: A Child’s Game

Below are plots for real inflation and output for four different countries over a ten-year period. The game is to match each country’s inflation series with its output series.



output series for four countries over a period of thirty quarters. The inflation series are plotted in a random order in the left panels and are labeled AP, BP, CP, and DP; the output series are plotted in a different order in the right panels and are labeled AY, BY, CY, and DY. The object of the game is to select pairs (say, for example, AP and BY) that correctly match each country's inflation series with its output series. (Answers are given in the concluding section.) As the reader may find, ocular inspection offers no clues to the correct answers, which indicates that even in the short run, there have been no apparent gains in output growth as a result of increased inflation.

Explaining why different societies end up with different inflation rates is a difficult task that has largely been left unaccomplished by economists. To glean the similarities and differences between inflation experiences, we briefly review the experiences of Argentina, Bolivia, Brazil, and Mexico. The inflationary processes and the failed attempts at stabilization reflect three common features:

1. no apparent gains in output growth as a result of increases in inflation,
2. high fiscal deficits, and
3. public skepticism about the government's commitment to fighting inflation.

Successful stabilization, on the other hand, combined fiscal adjustment with some set of policies that enhanced the credibility of the government:

1. outward commitments to fixed exchange rates,
2. increased independence of the central bank, or
3. "social pacts" that spread the burden of adjustment across sectors and imposed commitment on the government's actions.

Finally, we give theoretical content to these conclusions. Specifically, we look at the relationship between money printed to finance government deficits and inflation. We find that more than one outcome is possible. Typically, one outcome involves high inflation and the other involves low inflation. A successful move from the high inflation outcome to the low inflation outcome involves not only reducing government deficits and money creation but also convincing the public that the government is strongly committed to lower inflation.

Historical experiences with high inflation

Argentina. Significant changes took place in the Argentine economy after 1975. Until 1991, inflation never fell below an annual rate of 100 percent, while the liberalization policies of 1977–80 brought increased indebtedness and capital flight. In the ten years before the 1985 Austral Plan, real gross domestic product (GDP) rose at an average annual rate of 0.5 percent, inflation was 11 percent per month, the fiscal deficit never fell below 5 percent of GDP, and external debt rose by \$42 billion. In 1983, a combination of events led to an upward adjustment in wages and acceleration of inflation to an annual rate beyond 400 percent.

The Austral Plan, announced in April 1985, was a "heterodox shock" program, in which the government took actions to contract aggregate demand and directly control wages and prices. Realigning relative prices was required if the program was to reduce inflation without severe shortages. Thus, it was announced that between April and June, controls on many industrial prices would be removed, utility rates and beef prices would rise, and there would be a real devaluation. During the stabilization, prices were to be frozen at levels prevailing on a specified date in June. An agreement was signed with the International Monetary Fund, and Argentina pledged to stop issuing money to finance the fiscal deficit, which would be financed entirely with external credit. The budget deficit was reduced through an increase in revenues, in part due to increased real activity following the freeze and reduced income tax postponement with lower inflation.

The effects on inflation were felt immediately. The wholesale price index, which rose 42.3 percent in June 1985, fell by 0.9 percent in the following month. These figures are testimony to the success in eliminating the inertial component of inflation. However, fundamental imbalances persisted and eventually drove inflation higher. In particular, relative prices fluctuated significantly, mostly as a result of higher prices for foodstuffs and services, which were initially frozen at levels well below equilibrium. The price freeze lasted nine months. An attempt in March 1986 to alter relative prices and save the plan failed within three months.

Inflation continued to grow in the late 1980s, until Argentina once again faced hyperinflation in

1989. Monthly inflation reached 196 percent for July 1989 under the new president, Carlos Menem, and gave rise to the Bunge–Born stabilization program. The attempted stabilization consisted of exchange rate stabilization, price “agreements” between producers, partial trade liberalization, and promised fiscal adjustment. Lack of true fiscal adjustment led to the collapse of the stabilization program in December 1989 and a return to hyperinflation. A subsequent program to refinance the government debt, dubbed the Bonex Plan, amounted to a forced confiscation of liquidity in the financial system. This caused real interest rates to rise dramatically, and depressed economic growth, but did not bring inflation down to a desirable level. In late 1990, a run on the currency moved Argentina back to hyperinflation.

In April 1991, a new stabilization package was put in place under the auspices of Economy Minister Domingo Cavallo. This plan included the elimination of the budget deficit, monetary stringency, privatization, and the introduction of a new currency—the peso—whose value would be rigidly fixed against the U.S. dollar. The plan achieved a dramatic reduction in inflation and has enjoyed continued success for two full years.

Bolivia. Unlike many of its neighbors, Bolivia did not suffer chronic inflation before 1982. However, by the end of 1981, Bolivia had an overvalued currency, a large fiscal deficit, and external debt. Consumption levels were maintained by recourse to new and expensive short-term loans. An abrupt reversal of the earlier net foreign resource inflows occurred in 1982 and set Bolivia on the path to hyperinflation.

The first of several stabilization programs was announced soon after the inauguration of the civilian president, Hernan Siles-Zuazo, in October 1982. The plan contained some standard measures designed to correct relative price imbalances, while other measures—such as price ceilings for essential goods and interest rates, a fixed exchange rate with exchange controls, and wage indexation—were heterodox. The plan failed almost immediately. By February 1983, the premium in the black market for foreign exchange was 100 percent. After March, inflation accelerated. Consequently, the price controls created excess demand and a thriving black market for basic items. Furthermore, the fiscal sector was adversely affected because


prices for publicly provided goods lagged behind inflation, because the overvalued currency impaired public enterprises producing for export, and because of the large deficit resulting from the administrative lag of tax collection. Central bank policies resulted in rapid money creation, and there was a buildup of arrears on the external and internal public debt.

Several other attempts at stabilization failed to prevent hyperinflation. Average monthly inflation between March 1984 and August 1985 was 43 percent; in February 1985, it was 182 percent. General economic decline accompanied the rise in inflation; real GDP growth was negative in 1983, 1984, and 1985 (and again in 1986), and the rate of investment (to GDP) sank to a record low of 6.5 percent in 1985.

Economic deterioration was so severe that by August 1985 Bolivia seemed ripe for stabilization. A new, center-right government led by Victor Paz Estenssoro ruled with the support of business. In addition, the real value of the money base was low, long-term peso contracts had virtually disappeared, wage indexation schemes were discredited (as were the unions), the economy was extremely dollarized, and there was strong social demand for stabilization, even for shock treatment. Supreme Decree 21060, the New Economic Policy (NEP), was declared on August 29, 1985. The NEP featured a fiscal package, market liberalization, exchange rate unification, a new currency, and the establishment of an anchor for inflation.

A fiscal stabilization package, including several dramatic measures on both the revenue and spending sides, was instituted along with market liberalization. There were sharp increases in the price of gasoline and other petroleum products produced by state-owned enterprises. Public-sector wages were frozen. Many state enterprises either were privatized or had drastic cuts in employment (23,000 of 30,000 miners were discharged, for example). In addition, public-sector investment and foreign debt servicing were temporarily frozen. Liberalization took the form of eliminating many price ceilings, opening the financial sector, reforming the labor market, and eliminating barriers to international and domestic trade.

The plan resulted in a dramatic drop in inflation. Except for first-quarter 1986, quarterly inflation remained below 8.1 percent. Output



declines accompanied the drop in inflation; in 1986, real GDP fell more than 3 percent, unemployment rose to 20 percent, and investment was near an all-time low. Exacerbating matters were adverse external shocks, such as the collapse of the tin market and the drop in natural gas sales, which contributed to unfavorable terms of trade in 1986.

Although Bolivia achieved positive real growth in 1987 and 1988, real GDP at the end of 1988 was still below the 1983 level (especially in per capita terms). While the official numbers exclude illegal and underground activities, the failure to achieve positive growth of real per capita GDP is surely the most disappointing feature of the NEP. But continued success in curtailing the fiscal deficit has allowed Bolivia to renew foreign sources of finance and moderately expand money growth, and is viewed as the key to sustaining the success of the plan. Inflation has remained under 20 percent at an annual rate, and GDP has grown modestly.

Brazil. Annual inflation in Brazil was approximately 30 to 40 percent for most of the 1970s. In 1978, imprudent policy measures, including more rapid adjustments in nominal wages from twelve to six months, contributed to an acceleration of inflation. Between 1980 and 1982, inflation was stable at around 100 percent, but a reacceleration took place in 1983 and 1984.

Following a short-lived reform package that accompanied a civilian government's passage into power in March 1985, three stabilization plans were attempted. The first and most famous of these, the Cruzado Plan, was implemented in February 1986. This plan was heterodox (like Argentina's and Israel's 1985 stabilization packages), calling for a price and wage freeze and imposing formulas for adjusting wages, rents, and mortgages. Notably, policymakers believed there was no need for fiscal adjustment, as the budget deficit amounted to only 0.5 percent of GDP. The plan was implemented in the midst of favorable external developments: Brazil had registered large trade surpluses in the previous two years, world oil prices and interest rates were falling, and the dollar was depreciating against major currencies. The initial results of the Cruzado Plan were favorable, as inflation was stopped in its tracks without a recession.

The euphoria that greeted the plan led to the ill-advised maintenance of the price freeze. However, prices were frozen at levels prevailing on a

given day (in this case, February 27, 1986), when there was no reason to believe that relative prices were in equilibrium. This policy ultimately created shortages and spurred black market activity. In mid-1986, demand was clearly overheated by the real wage increases and the budget deficit, which was nearly 5 percent of GDP by late 1986. The failure of the original Cruzado Plan led to Cruzado-II, which was announced on July 24, 1986. This attempt at fiscal reform was no more successful than its predecessor, nor were the Bresser Plan of June 1987 and the Summer Plan of January 1989.

A radical stabilization package, introduced by President Fernando Collor in March 1990, froze 80 percent of the financial liabilities of the financial system, putting them into an account at the central bank. Real interest rates rose dramatically due to a combination of liquidity confiscation and lack of government credibility in honoring its debts. Inflation fell, but never to acceptable levels. Meanwhile, the economy moved into its worst recession in history, largely because liquidity confiscation froze most of producers' working capital. Absent any real deficit reduction, inflationary pressures eventually mounted toward the end of 1990. Another income-based stabilization plan, Collor-II, was announced in January 1991, but lack of fiscal adjustment destroyed the program by March 1991.

The situation in Brazil, on the brink of hyperinflation, contrasts sharply with that of Bolivia recently. Inflation in Brazil has averaged well over 1,000 percent each year from 1988 through mid-1993. Although the government continues to struggle toward fiscal control, Brazil seems to be moving toward a more open trade regime and a deregulated business environment. In response, the stock market has boomed, but income inequality and inflation remain serious problems.

Mexico. With the discovery of vast oil reserves, the performance of the Mexican economy between 1978 and 1981 was impressive: annual GDP growth was never less than 8 percent, while the inflation rate stayed in the range of 20 percent. However, Mexico's return to statist policies became apparent. For example, public-sector expenditure increased in real terms by 97.7 percent from 1977 to 1981, for a jump from 29.5 to 41.3 percent of GDP. The budget deficit grew from 6.7 to 14.7 percent of GDP during this period, because failure to maintain public-sector prices in real terms prevented a

significant rise in tax revenue. The exchange rate, which was ostensibly flexible, rose at an average annual rate of only 3.6 percent during these years. The budget deficit and real appreciation led to a 128-percent rise in the volume of imported intermediate inputs. This increase coincided with higher output and employment and, eventually, problematic inflation rates, balance of payments deficits, and a burdensome foreign debt.

Failed attempts at adjustment in late 1981 and early 1982, amid several signs of serious economic problems, reflected the weakness of President José López Portillo's economic policy-making. A 67-percent devaluation in February 1982, new external loans, planned cuts in public spending, and increases in public-sector prices were not enough to stop the flight out of peso-denominated assets and Mexdollars. The economic crisis unfolded in August 1982 with a devaluation of nearly 100 percent, the introduction of a dual exchange rate system, price hikes on staples, and a forced conversion of Mexdollars into pesos. These were followed by the nationalization of the banks that September and a moratorium on foreign debt payments until a rescheduling agreement was reached in December 1982. In 1982 annual inflation reached 100 percent, while the real GDP growth rate was negative for the first time in 50 years.

President Miguel de la Madrid's administration began in 1983 with a wide-ranging program of stabilization and reform, along with negotiations over the foreign debt. Fiscal austerity, lower money growth rates, and improvement on the external accounts were prominent goals of the program, just as in 1976. During this time, Mexico achieved much success in meeting its targets. From 1982 to 1983, the public-sector deficit was halved (to 8.9 percent of GDP), money growth rates declined in both real and nominal terms, and the current account balance went from a \$6 billion deficit to a \$5 billion surplus, in large part due to tight controls on imports.

Success in meeting the targets initially was accompanied by a deep recession—real GDP growth was -5.3 percent in 1983—with only a slight drop in inflation to 80 percent. Furthermore, the effects of import compression—squeezing imports to reverse the current account deficit—and deep cuts in capital expenditures on long-term growth prospects were disconcerting. In

1984 and early 1985, real GDP growth improved modestly, inflation fell into the 60-percent range, and the current account remained in surplus. At the same time, the budget deficit began to rise slightly, and plans for a fiscal correction were announced in March 1985. Money growth was strictly controlled despite the fiscal deficits, which were financed by sales of government bonds (CETES) to the banking system and public.

In the second half of 1985, the economy slipped back into recession, as world oil prices fell, a huge earthquake hit Mexico City, and monetary policy was tight. Oil prices continued to fall in 1986, and the public-sector deficit rose to 16.3 percent of GDP, despite measures to cut spending and increase taxes. Monetary and fiscal contraction continued, and an increase in the rate of peso depreciation was implemented to cushion the blow falling oil prices could cause to the balance of payments. At the time, Mexico faced stagflation: real GDP growth was -3.8 percent, and the rate of inflation reached 106 percent in 1986. The economy's performance in 1987 was no better: although real GDP growth was positive, inflation rose to 160 percent. The *Pacto de Solidaridad Económica* program was undertaken in late 1987 under the de la Madrid administration. The peso was frozen at 2,281 per dollar for most of 1988 immediately after a severe devaluation in late 1987.

In late 1989, President Carlos Salinas de Gortari renewed the program as the *Pacto para Estabilización e Crecimiento Económico* by incorporating tax reform combined with exchange rate devaluation guidance. The administration's continuation of trade liberalization and normalization of relations with creditors produced benefits. Mexico became the first country to participate in the Brady Plan for debt restructuring and began negotiating the North American Free Trade Agreement with the United States and Canada. After 1989, inflation fell sharply, accompanied by a gradual appreciation of the peso. In 1990, capital started to flow to Mexico, and by 1992, the Mexican government had accrued a budget surplus of about 0.5 percent of GDP.

Summary. Historical experiences of four high-inflation Latin American countries suggest some common features of their inflationary processes and failed attempts at stabilization: no apparent gains in output growth as a result of increases in

inflation, high fiscal deficits, and public skepticism about government's commitment to fighting inflation. Conversely, successful stabilization in Bolivia in 1985 and, to a lesser degree, in Argentina in 1991 and Mexico in 1989 involved combined fiscal adjustment with credibility-enhancing policies through outward commitments to fixed exchange rates, increasing independence of central banks, or social pacts that negotiated the burden of adjustment across sectors and imposed commitment on the correspondent government actions.¹

Costs of inflation and stabilization

Since Milton Friedman and Walter Heller debated the welfare consequences of monetary policy, the real cost of inflation has become a central macroeconomic issue. Sargent's (1986) study of four episodes of hyperinflation, which indicates that real costs of stabilization are present but not large, has added to the controversy.² In this section, we investigate the welfare costs of inflation and discuss the real costs of stabilization. We draw empirical evidence from the high-inflation experiences of Argentina, Bolivia, Brazil, and Mexico.

Costs of inflation. Generally, four types of costs are associated with inflation created from monetary expansion. First, higher inflation raises money holding costs, thus encouraging more frequent

banking and exchanges. As a consequence, there will be larger transactions costs, including shoe-leather or wheelbarrow (transportation) costs for banking or making exchanges, information costs for conducting future trading, and time costs for traveling.³ Second, with higher inflation, sellers need to change menus and advertising, as well as their decisions about employment and investment, more frequently, adding to adjustment costs.⁴ Third, increased uncertainty about future trading will result from higher inflation and lead to larger risk premiums in various financial market returns.⁵ Finally, different opportunity costs associated with higher inflation and the different responses that result will lead to a misallocation of production inputs, goods outputs, and time devoted to various economic activities.⁶

In a traditional partial-equilibrium, monetary-exchange setup, the welfare costs of inflation can be measured by approximating the area under the money demand function (that is, the Harberger triangle).⁷ Fischer (1981) and Lucas (1981) apply this method to obtain estimates of the welfare cost of inflation to be between 0.3 and 0.45 percent of gross national product (GNP). Using a general-equilibrium cash-in-advance model that assumes cash is required prior to goods purchases, Cooley and Hansen (1989) find similar estimates. However, if distortionary taxes such as taxes on labor and capital income are considered, as in Cooley and Hansen (1991), inflation distortions combine with tax distortions, doubling the welfare loss. Wang and Yip (1993), on the other hand, allow monetary growth to affect the engine of economic growth by retarding the accumulation of human capital, and find a much higher welfare cost of about 3.6 percent of GNP, a number that is not negligible.

Without doubt, overexpansion of money supply leads to welfare reductions in the long run. Moreover, the Latin American experience suggests the absence of a short-run Phillips curve, implying that even the short-run gain of expansionary monetary policy may not be present. With this in mind, we consider the potential costs associated with ending inflation.

Costs of Stabilization. Efforts to end inflation almost always seem to be associated with recession. The lost output associated with inflation reduction is what is referred to as the "costs" of stabilization. Table 1 implies that this association, although

¹ For a more detailed historical review and statistical displays, the reader is referred to Bruno, Di Tella, Dornbusch, and Fischer (1987), Bruno et al. (1991), Welch (1991), McLeod and Welch (1991), Rogers (1992), and Rogers and Wang (1992).

² See Garber (1982) and Wicker (1986).


³ See Saving (1971) and Drazen (1979).

⁴ See Sheshinski and Weiss (1977), Rotemberg (1983), and Rotemberg and Summers (1990).

⁵ See Cukierman (1980) and Ball and Cecchetti (1991).

⁶ See Garber (1982), Rogers and Wang (1993), and Wang and Yip (1992), respectively.

⁷ The following welfare cost measures have been computed on U.S. data.



temporary, is prevalent in these high-inflation countries and was reinforced by casual empiricism of the low-inflation, developed countries in the 1980s. Stabilization, or disinflation, may be costly for several reasons. For simplicity, we break these explanations into the two camps discussed below.

First, New Keynesians emphasize costs arising from contractionary aggregate demand policies in the presence of nominal rigidities, or inertia in wages and prices, which arise because of staggered or backward-looking contracts and/or menu costs. Intuitively, with staggered price-setting behavior, some firms set prices before the announcement of a fully credible stabilization program. With these prices set for periods lasting beyond the program itself, prices are too high. A potentially long-lasting recession ensues because no cohort of price-setters desires to be the first to cut prices. This analysis is based upon the work of Taylor (1979) and Blanchard (1983).

These results suggest that stabilization programs should be implemented gradually. As applied to high-inflation episodes, this school recommends that incomes policies—in other words, some type of wage and price controls—be implemented. Stabilization programs that have followed such policies have come to be known as heterodox. Bruno, Di Tella, Dornbusch, and Fischer (1987) provide an excellent discussion of heterodox stabilization programs. They show that in Argentina, Brazil, and Peru, three heterodox programs failed, while in Israel (in mid-1985) and Mexico (in late 1989), heterodox methods were used with more success.

Second, the New Classical school emphasizes the problems in making a promised stabilization credible. The credibility problem is made more difficult, it is argued, by the implementation of policies. Instead, inflation may be reduced without much of a cost in terms of lost output if the government pursues an ambitious plan of attack centered on tightening domestic credit and eliminating the budget deficit. This is the so-called shock-treatment approach to stabilization. Without the frictions of the New Keynesian models, New Classical analysis asserts that only orthodox measures, such as fiscal and monetary discipline, are necessary to end inflation, as long as the program achieves credibility.

Sargent (1986) presents evidence that the ends of four major episodes of inflation were associated

with real costs, though not nearly as large as was predicted by the believers of the inflation–output trade-offs. Sargent elaborates on the inflation–output trade-offs by concluding that in the Austrian case, the “cost in increased unemployment and foregone output was minor compared with the \$220 billion GNP that some current analysts estimate would be lost in the U.S. per one percentage point inflation reduction.” For the much-discussed German episode, Sargent states the reasons to expect real effects from stabilization: “There is little doubt that the ‘irrational’ structure of capital characterizing Germany after stabilization led to subsequent problems of adjustment in labor and other markets.” Garber (1982) and Rogers and Wang (1993) examine this by-product of stabilization.

More recently, Bolivia in 1985 eliminated a much higher inflation than had Israel or Mexico, and did so without employing any heterodox elements. In fact, the Bolivians actually deregulated almost all prices at the start of the stabilization program. What is common among each of these successful stabilization programs and the ongoing Argentine stabilization is strong budgetary adjustment. Historical experience has shown that drastically reducing or eliminating the budget deficit to ensure credibility for the tight-money policy is absolutely essential for successful stabilization, as the Brazilians have unfortunately discovered from the other side of the fence.

Finally, in several high-inflation episodes, governments delayed for some time before launching a coherent stabilization program. Examples of recent literature on the timing of stabilization policies include Sargent and Wallace (1986), Drazen and Helpman (1987, 1990), and Alesina and Drazen (1991). Given the need for credibility, there is widespread belief that the longer the government waits to attack inflation, the more damage to the economy, and hence, the more costly will be the policies needed to stabilize the economy.

Why, then, do governments delay stabilization? One answer may be that policymakers are irrational, but this conclusion is less than satisfactory because it might explain any behavior. For Alesina and Drazen (1991), the problem is distributional. In their model, the costs of stabilization are borne by heterogeneous groups that are not necessarily affected to the same degree. Because these groups are in competition to shift the burden

of stabilization onto others, stabilization is delayed by a “war of attrition.” Alesina and Drazen (1991) illustrate how the expected date of stabilization is affected by various characteristics of the economy, such as income inequality, political cohesion, and the extent of monetization of the budget deficit. Historical experience that shows extremely diverse stabilization outcomes lends support to the predictions of this line of research.

Summary. These considerations lead to four main conclusions. First, the short-run welfare or output gain of expansionary monetary policy may not be present. Second, by taking into account the plausible adverse growth effect of inflation through resources misallocation, the welfare costs of even moderate inflation may be very significant (perhaps as high as 3.6 percent of GNP). Third, though there were real costs associated with stabilization in several high-inflation episodes, such adverse macroeconomic effects have been mostly temporary. Finally, ensuring credibility is not only essential to controlling inflation but important in minimizing the corresponding real costs of stabilization.

Causes of inflation

Inflation is a long-term, persistent increase in the price level. From the quantity theory identity that money stock times velocity is equal to the price level multiplied by real output, one can specify the rate of inflation as *monetary growth + rate of change in velocity – output growth*. In an open economy, both domestic and foreign structural changes and policy alterations can affect inflation. For demonstration purposes, this article considers three types of policy instruments—fiscal, monetary (domestic credit), and external (nominal exchange rate)—in addition to structural output (domestic net of foreign) disturbances.

To study how these disturbances affect the rate of inflation, we construct a modified model of an inflation trap.⁸ Following the view that inflation in the long run is a monetary phenomenon, we focus primarily on the money market and its dynamic adjustment process.

⁸ Our model is a modification of that used by Bruno and Fischer (1990).

Money market equilibrium condition (MM).

We begin by considering a modified Cagan (1956) money demand model. This type of model has been broadly used in studies of high inflation or hyperinflation. Specifically, money demand (m^d) can be thought of as a decreasing function of the expected rate of inflation (π^e), since higher expected inflation reduces the real value of money. Unlike Cagan (1956), who restricted economic individuals to reliance on past information only, we assume that individuals have rational expectations and thus utilize all information available and form predictions with no systematic errors. Thus, letting expected inflation be primarily driven by the preannounced rate of money growth (μ), we can express money demand function as an exponential function of μ :

$$(1) \quad m^d = \exp(-\alpha\pi^e) = \exp(-\alpha\mu).$$

Money market equilibrium requires money demand be equal to (real) money supply, $m^d = m$, which implies

$$(2) \quad \mu = -[\ln(m)]/\alpha.$$

This relationship indicates that in money market equilibrium, money growth and real money balances are negatively related. After normalizing population and exogenous technological growth as zero, the actual inflation rate in the short run may deviate from the preannounced rate of money growth:

$$(3) \quad \pi = \mu + \theta = -[\ln(m)]/\alpha + \theta,$$

where θ denotes the deviation of inflation from the (preannounced) money growth rate. This deviation measure may depend on disturbances to productivity, the nominal exchange rate, government size, central bank credibility, and/or any other shifters, such as exogenous foreign shocks, oil-price shocks, and policy shocks that involve price and wage controls (fiats) during high-inflation episodes. Later, we shall refer to this negative relationship between inflation and real money balances, equation 3, as an MM (money market equilibrium) locus in (m, π) -space.

Steady-state equilibrium condition (SS). So far, we have not discussed how the dynamics of the inflationary process may reach a steady state. To

complete this analysis, we introduce a standard steady-state equilibrium condition, which requires the rate of change of real money balances to be zero—that is, $\dot{m}/m = 0$.

To account for inflationary finance, we follow Sargent and Wallace (1973) by incorporating the real government deficit, d , into the analytical framework. Rather than treating d as given, we specify it as

$$(4) \quad d = D(\pi) + \eta,$$

where D represents the ex ante real government deficit, η can be thought of as deviation of actual from ex ante real government deficit, and $dD/d\pi > 0$. An increase in the inflation rate reduces the real value of income tax revenue given the time lags involved in tax collections, thus enlarging the government budget deficit through an increase in D . This is usually referred to as the Olivera (1967)–Tanzi (1977) effect. For simplicity, we assume that the Olivera–Tanzi effect is not strong enough to alter the structure of the dynamic system. More specifically, we require that the inflation elasticity of government deficit (ϵ), which is, for analytic convenience, assumed to be constant, is strictly less than unity; for an alternative case, the reader is referred to Bruno and Fischer (1990). The deviation of actual from ex ante real government deficit, on the other hand, may respond to changes in productivity and the size of government.

Since income or sales taxes have been considered in the above relationship, the deficit must be financed ex ante by the inflation tax in the short run—that is, $d = \mu m$, where the rate of nominal money supply growth, μ , can be thought as the ex ante rate of the inflation tax, and real money balances, m , can be reinterpreted as the inflation tax base. Therefore, the government will adjust money supply according to the following equation that specifies the evolution of real money balances as the difference between the nominal money supply growth rate and the inflation rate:

$$(5) \quad \dot{m}/m = \mu - \pi = d/m - \pi.$$

Substituting the government deficit specification, equation 4, into the real money balances adjustment equation, equation 5, we obtain the following steady-state equilibrium condition:

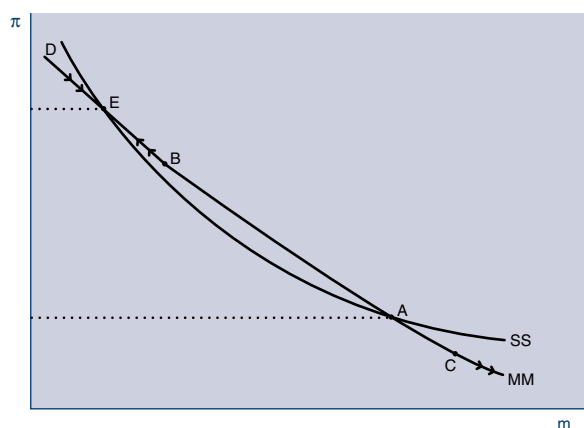
$$(6) \quad \pi m = D(\pi) + \eta.$$

Given the deviation term, η , inflation and real money balances are negatively related, provided that the Olivera–Tanzi effect is not too strong. This relationship, equation 6, will later be referred to as the SS (steady-state equilibrium) locus in (m, π) -space. Notably, this SS curve approaches the horizontal and vertical axes asymptotically.

Determination of the full dynamic equilibrium. We are now prepared to illustrate the full dynamic equilibrium using the MM and SS loci, equations 3 and 6, in Figure 2. Recall that the SS curve approaches the two axes asymptotically. To ensure the existence of a full dynamic equilibrium, we assume that the government deficit is not too large. Then the MM curve must intersect the SS curve at least once, and a full dynamic equilibrium therefore exists.

The next question is whether the full dynamic equilibrium is unique. To proceed, we need to assume that even when the rate of inflation approaches zero, there is an upper bound on real money holdings, m_{\max} , which is finite. Furthermore, we assume that as inflation becomes uncontrollable, real money holdings approach zero faster than inflation—that is, πm approaches zero as π goes to infinity. Under these two assumptions, we are able to express the ex post Laffer curve of the inflationary tax in Figure 3, which plots the ex post government deficit, $d = \pi m^d$, against the ex post

Figure 2
Full Dynamic Equilibrium



inflation tax rate, π . As the reader can see, for a given level of deficit, d_0 , there are two corresponding rates of inflation, π_1 and π_2 . In fact, the same conclusion can be reached by depicting the inflation rate, π , against logged real money balances, $\ln(m)$. One can easily show that the relationship described in equation 3 is now a straight line with a negative slope and positive intercepts, while the relationship displayed in equation 6 is a downward-sloping curve, convex toward the origin. Provided that the government deficit is not too large, the presence of two full dynamic equilibria can again be verified. Thus, examining Figure 2 in the (m, π) -space, we learn that the MM and SS curves in this case must intersect twice such that one deficit level can correspond to two different rates of inflation (see points A and E, for example).

We now turn to studying the local stability property of the model. We assume that in transition to a steady state, the money market is always in equilibrium. Thus, dynamic movements after any perturbation must be along the MM curve. Consider an initial position at point B, which lies above the SS curve. For a given level of inflation, real money balances are higher than the steady-state level and from equation 5, \dot{m}/m must be negative. This implies that the dynamic adjustment must be to reduce m and hence to move toward point E. By contrast, if the economy starts from an initial point below the SS curve, say C (or D), then the dynamic adjustment process must be to increase m and hence to move away from A (or toward E).

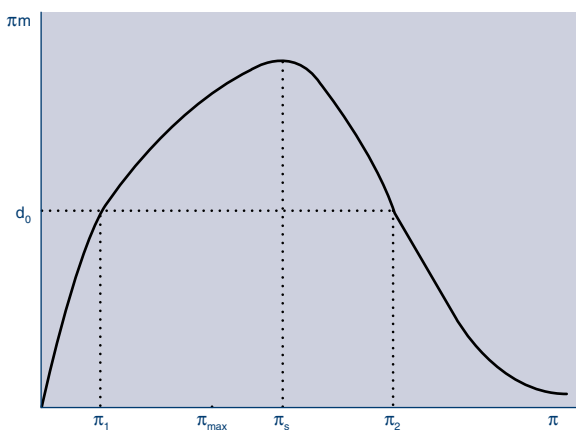
The discussion above indicates that point A, which is associated with a lower inflation rate, is unstable—that is, any disturbance will lead the dynamics away from A. On the contrary, point E, which exhibits higher inflation, turns out to be a stable full dynamic equilibrium. In other words, a country in this circumstance may end up in an “inflation trap” (point E) in which inflation is persistently high. This may explain why the four Latin American countries have experienced chronically high inflation.

By affecting the two deviation terms, θ and η ,

a policy that either tightens money supply growth with enhanced credibility, or retains the foreign exchange value of the currency,⁹ or imposes fiats (price control or wage freeze) may shift the two curves such that the MM curve intersects the SS curve only once, and from below. The possibility of a unique intersection can be readily seen using Figure 3. With a credible tight-money policy, it may set an upper bound for the rate of inflation, say $\pi_{\max} < \pi_s$, which ensures a one-to-one relationship between d and π , corresponding to the upward-sloping portion of the ex post Laffer curve. In this case, one can avoid the inflation trap and free the economy from a sustained high rate of inflation.

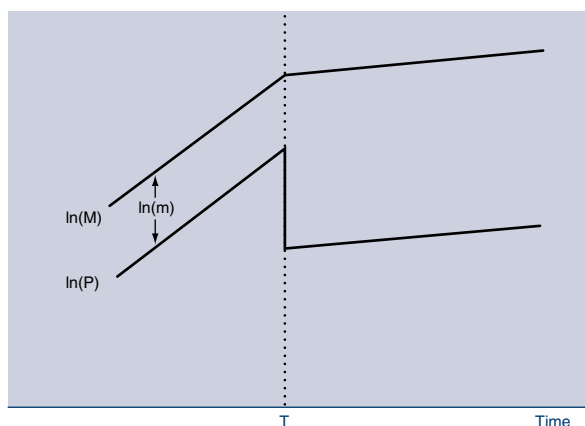
In Figure 4, we illustrate this sort of successful tight-money policy by examining the paths of logged nominal money stock and logged price level. The slope of the logged nominal money stock measures the (nominal) money growth rate, while the slope of the logged price level measures the (actual) inflation rate. In the long run, these two paths are parallel to each other, as indicated by equation 3 with $\theta = 0$. The vertical difference then measures logged real money balances. Given ensured credibility, a tight-money policy imposed at time T makes the path of nominal money flatter. As a consequence, real money demand, m , increases because of the reduction in anticipated inflation, as indicated in equation 1, leading to an instantaneous drop in the price level. Upon accomplishment of this successful anti-inflation policy, the economy will thereafter face a permanently lower inflation

Figure 3
Ex Post Laffer Curve



⁹ See Chen (1973) and Rogers (1992) for further elaboration on currency substitution and its macroeconomic consequences.

Figure 4
Stopping High Inflation



rate, as reflected by the flatter path of the price level.

Summary. These considerations lead to two main conclusions. First, a country may end up in a high-inflation trap, thus lending theoretical support to the chronically high-inflation experiences faced by the four Latin American countries for some periods. Second, some stabilization policies may not break up the inflation-trap structure, as in Argentina (before April 1991), Brazil (even into 1993), and Mexico (by late 1989), where the success of their stabilization programs, if any, was at best temporary; conversely, a successful stabilization that ensures credibility and restores market mechanism may move an economy quickly out of the inflation trap, as witnessed in Bolivia after its 1985 hyperinflation. In summary, our model explains the rather diverse stabilization outcomes reflected in Table 1 and demonstrates that a country without a properly specified, well-executed stabilization program may never be able to control inflation for a substantial length of time.

Conclusions

Recalling Figure 1, we provide the reader with the answers to the child's game: Argentina (AP and DY), Bolivia (BP and CY), Brazil (CP and BY), Mexico (DP and AY). As the reader can see, there is no clear-cut trade-off between inflation and output, even in the short run, except on some occasions after stabilization.

We began this article by posing four ques-

tions, and our discussion has led to their answers. First, why is inflation an issue worth considering? We answer this question by examining the real costs of inflation and stabilization. We point out that by taking into account the plausible adverse growth effect of inflation through resource misallocation, the welfare costs of even moderate inflations may not be negligible. We also recognize the real costs associated with stabilization in several high-inflation episodes but find these adverse macroeconomic effects to be mostly temporary.

Our second question was, Why has inflation been so chronically high for several Latin American countries? We found the answer by constructing a model to show that the spiral-like adjustment of the government budget deficit and monetary expansion may result in an inflation trap, which represents a dynamically stable equilibrium with persistently high inflation.

The third question asked was, What are the main causes of those inflationary episodes? For the answer, we hypothesize that the main causes of chronically high inflation include continuous fiscal and monetary expansion, a productivity slowdown, a systematic undervaluation of the domestic currency, and diminished credibility.

Finally, in attempting to answer the last question—why some of these countries have been able to stabilize inflation successfully, while others have not—we note that stabilization succeeded in ending the hyperinflationary episode of Bolivia in 1985, essentially because of a tight-money policy that was made possible by a budgetary adjustment and market liberalization program that ensured credibility, and by a proper anchor for inflation that used the (unified) nominal exchange rate. In terms of our model, this stabilization program fundamentally changed the equilibrium money market relationship, thus enabling the Bolivian economy to jump out of the inflation trap. A similar stabilization story emerged to a certain degree over the past two years in Argentina. Yet note that, in common with the most successfully stabilizing nations, both countries attempted several programs before stabilization succeeded, implying that both an appropriate prescription and proper timing are necessary for success. Not all stabilization programs have that combination, however, and thus some economies remain in the inflation trap for extended periods.

References

- Alesina, Alberto, and Allan Drazen (1991), "Why Are Stabilizations Delayed?" *American Economic Review* 81 (December): 1170–88.
- Ball, Laurence, and Stephen Cecchetti (1991), "Inflation and Uncertainty at Short and Long Horizons," *Brookings Papers on Economic Activity*, no. 1: 215–54.
- Barro, Robert J. (1989), "The Neoclassical Approach to Fiscal Policy," in *Modern Business Cycle Theory*, R.J. Barro, ed. (Cambridge, Mass.: Harvard University Press).
- Bils, Mark (1987), "The Cyclical Behavior of Marginal Cost and Price," *American Economic Review* 77 (December): 838–55.
- Blanchard, Olivier J. (1983), "Price Asynchronization and Price-Level Inertia," in *Inflation, Debt, and Indexation*, R. Dornbusch and M. Simonson, ed. (Cambridge, Mass.: MIT Press).
- Bruno, Michael, Guido Di Tella, Rudiger Dornbusch, and Stanley Fischer (1987), *Inflation Stabilization* (Cambridge, Mass.: MIT Press).
- , and Stanley Fischer (1990), "Seigniorage, Operating Rules, and the High Inflation Trap," *Quarterly Journal of Economics* 105 (May): 353–74.
- , ———, Elhanan Helpman, and Nissan Liviatan with Leora R. Meridor (1991), *Lessons of Economic Stabilization and Its Aftermath* (Cambridge, Mass.: MIT Press).
- Cagan, Philip (1956), "The Monetary Dynamics of Hyperinflation," in *Studies in the Quantity Theory of Money*, M. Friedman, ed. (Chicago: University of Chicago Press).
- Chen, Chau-nan (1973), "Diversified Currency Holdings and Flexible Exchange Rates," *Quarterly Journal of Economics* 87 (February): 96–111.
- Cooley, Thomas, and Gary Hansen (1991), "The Welfare Costs of Moderate Inflation," *Journal of Money, Credit, and Banking* 23 (August): 483–503.
- , and ——— (1989), "The Inflation Tax in a Real Business Cycle Model," *American Economics Review* 79 (September): 733–48.
- Cukierman, Alex (1980), "The Effects of Wage Indexation on Macroeconomic Equilibrium: A Generalization," *Journal of Monetary Economics* 6 (April): 147–70.
- Dornbusch, Rudiger, and Stanley Fischer (1986), "Stopping Hyperinflations Past and Present," *Weltwirtschaft Archives* vol. 122: 1–47.
- , Federico Sturzenegger, and Holger Wolf (1990), "Extreme Inflation: Dynamics and Stabilization," *Brookings Papers on Economic Activity*, no. 2: 1–64.
- Drazen, Allan, and Elhanan Helpman (1990), "Inflationary Consequences of Anticipated Macroeconomic Policies," *Review of Economic Studies* 57 (January): 147–67.
- , and ——— (1987), "Stabilization and Exchange Rate Management," *Quarterly Journal of Economics* 52 (August): 835–55.
- Drazen, Allan (1979), "The Optimal Rate of Inflation Revised," *Journal of Monetary Economics* 5 (March): 231–48.
- Fischer, Stanley (1981), "Towards an Understanding of the Costs of Inflation," *Carnegie-Rochester Conference Series on Public Policy* 15: 5–42.
- Frankel, Jeffrey (1984), "Monetary and Portfolio-Balance Models of Exchange Rate Determination," in *Economic Interdependence and Flexible Exchange Rates*, J.S. Bhandari and B.H. Putnam, ed. (Cambridge, Mass.: MIT Press).
- Friedman, Milton (1968), "The Role of Monetary Policy," *American Economic Review* 58 (March): 1–17.
- Garber, Peter M. (1982), "Transition From Inflation to Price Stability," *Carnegie-Rochester Conference Series on Public Policy* 16: 11–42.
- Lucas, Robert E., Jr. (1981), "Discussion of 'Towards

- an Understanding of the Costs of Inflation,'” *Carnegie–Rochester Conference Series on Public Policy* 15: 43–52.
- (1980), “Equilibrium in a Pure Currency Economy,” *Economic Inquiry* 18 (April): 203–20.
- (1972), “Expectations and the Neutrality of Money,” *Journal of Economic Theory* 4 (April): 103–24.
- McCallum, Bennett (1979), “The Current State of the Policy-Ineffectiveness Debate,” *American Economic Review* 69 (June): 240–45.
- McLeod, Darryl, and John H. Welch (1991), “North American Free Trade and the Peso: The Case for a North American Currency Area,” Federal Reserve Bank of Dallas Research Paper no. 9115 (Dallas, August).
- Olivera, Julio (1967), “Money, Prices, and Fiscal Lags: A Note on the Dynamics of Inflation,” *Banca Nazionale del Lavoro Quarterly Review* 20: 258–67.
- Rogers, John H. (1992), “The Currency Substitution Hypothesis and Relative Money Demand in Mexico and Canada,” *Journal of Money, Credit, and Banking* 24 (August): 300–19.
- (1990), “Foreign Inflation Transmission Under Flexible Exchange Rates and Currency Substitution,” *Journal of Money, Credit, and Banking* 22 (May): 195–208.
- , and Ping Wang (1993), “Sources of Fluctuations in Relative Prices: Evidence From High Inflation Countries,” *Review of Economics and Statistics* (forthcoming).
- Rotemberg, Julio J. (1983), “Aggregate Consequences of Fixed Costs of Price Adjustment,” *American Economic Review* 73 (June): 343–46.
- , and Lawrence H. Summers (1990), “Inflexible Prices and Labor Hoarding’s Role in Explaining Procyclical Productivity,” *Quarterly Journal of Economics* 105 (November): 851–74.
- Sargent, Thomas (1986), “The Ends of Four Big Inflation,” in *Rational Expectations and Inflation*, T. Sargent, ed. (New York: Harper and Row), 40–109.
- , and Neil Wallace (1986), “Some Unpleasant Monetarist Arithmetic,” in *Rational Expectations and Inflation*, T. Sargent, ed. (New York: Harper and Row), 158–90.
- , and ——— (1975), “Rational Expectations, the Optimal Monetary Instrument, and the Optimal Money Supply Rule,” *Journal of Political Economy* 83 (April): 241–54.
- , and ——— (1973), “Rational Expectations and the Dynamics of Hyperinflation,” *International Economic Review* 14 (June): 328–50.
- Saving, Thomas R. (1971), “Transactions Costs and the Demand for Money,” *American Economic Review* 61 (June): 407–20.
- Sheshinski, E., and Y. Weiss (1977), “Inflation and the Costs of Price Adjustment,” *Review of Economic Studies* 54 (April): 287–303.
- Tanzi, Vito (1977), “Inflation, Lags in Collection, and the Real Value of Tax Revenue,” *IMF Staff Papers* 24 (March): 154–67.
- Taylor, John (1979), “Staggered Wage Setting in a Macro Model,” *American Economic Review* 69 (May): 108–13.
- Wang, Ping, and Chong K. Yip (1993), “Real Effects of Money and Welfare Costs of Inflation in an Endogenously Growing Economy with Transactions Costs,” Federal Reserve Bank of Dallas Research Paper no. 9311 (Dallas, March).
- , and ——— (1992), “Alternative Approaches to Money and Growth,” *Journal of Money, Credit, and Banking* 24 (November): 553–62.
- Welch, John H. (1991), “Hyperinflation and Internal Debt Repudiation in Argentina and Brazil: From Expectations Management to the ‘Bonex’ and ‘Collor’ Plans,” Federal Reserve Bank of Dallas Research Paper no. 9107 (Dallas, May).
- Wicker, Elmus (1986), “Terminatus Hyperinflation in the Dismembered Habsburg Monarchy,” *American Economic Review* 76 (June): 350–64.