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1 Why Stopping Inflation May Be Costly: Evidence from Fourteen Historical Episodes

Robert J. Gordon

Politicians looking forward to the next election, upon learning from pollsters that the public believes inflation to be the nation's most important economic problem, should be observed without exception to espouse and implement measures to eliminate inflation. Since inflation is defined as growth in the dollar (or "nominal") value of aggregate spending that exceeds the growth of real output, those measures would appear to involve achieving slower growth of nominal expenditures through budget cuts, tax increases, and tight monetary policy. If restrictive demand management policy were like a headache remedy that delivered an instant cure with no side effects, it would elicit little controversy and would be observed to be always and everywhere in place in any nation experiencing even a small amount of inflation. But the failure of most industrial nations consistently to pursue a restrictive policy suggests that a better analogy would be a powerful anticancer drug that has long-lasting and painful side effects.

Any reduction in the growth of nominal spending, no matter how it is achieved, must by definition be divided between a decline in the rate of inflation and a decline in the growth of real output. The success of restrictive demand policies depends largely on the speed with which inflation responds to a sustained reduction in nominal spending growth. An instant and complete response means that real output is insulated from the policies. But a slow and partial response means that real output must take up the slack, with a resulting drop in production, accompanying layoffs and unemployment, and bankruptcies of some individuals and firms. These painful side effects dampen the enthusiasm of politicians for

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restrictive policies and lessen the chances that they will actually be implemented. Often the temptation has been to avoid a painful cure for the basic causes of the inflation disease and instead to dull its pain with remedies, including financial reforms and indexation, that are aimed at reducing its costs rather than reducing its magnitude.

How does inflation respond to nominal spending changes? Pessimists assert that the first-year degree of responsiveness is only 10%; a deceleration of nominal spending growth from 10 to 0% would initially cause a 1% deceleration of inflation and a 9% drop in the growth of real output (Okun 1978). It is easy for proponents of this "1-to-9 split" to show that a serious attempt to stop inflation with restrictive demand management policy could involve more than $1 trillion in lost output. In contrast some argue that inflation can be stopped at a much lower cost. Fellner (1979) claims that inflation will respond more promptly to a "credible" (i.e. consistent and sustained) demand restriction than to the inconsistent and short-lived restrictions observed in historical data. Sargent (chapter 2 of this volume) points to the abrupt halt of four hyperinflations as evidence that drastic changes in policy can achieve instant results.

This paper assembles a wide variety of historical evidence on the speed and extent of response of the inflation rate to temporary and permanent changes in the growth rate of nominal spending. Rather than weaving a web of econometric equations to explain the data (a task performed elsewhere), we limit ourselves to a pictorial history that illustrates the highly divergent responses of inflation in six United States episodes since 1916, and in eight countries since the mid-1960s (West Germany, Switzerland, France, Japan, the United States, Italy, Brazil, and Israel). The primary purpose of the paper is to present the data in a novel graphical format in order to inform public discussion; a secondary purpose is to determine major differences among the fourteen examples that may help to identify those most relevant to the likely behavior of the United States in the 1980s.

1.1 Identities Linking Nominal Demand, Inflation, and Output

A few simple identities help to clarify the necessary relationship between price adjustment and the evolution of real output. Throughout we take the exogenous nominal aggregate demand variable to be nominal GNP. By definition the log of nominal GNP (Y) must be divided between the log of the GNP deflator (P) and the log of real GNP (Q):

$$Y \equiv P + Q. \tag{1}$$

Taking the derivative of (1) with respect to time and using the notation that percentage changes per unit of time are designated by lowercase letters, we have

$$y \equiv p + q, \tag{2}$$

which states that any change in nominal GNP must be divided between a change in the aggregate price level and a change in real GNP. Next we subtract from both sides of equation (2) the trend, or "natural," growth rate of real GNP (q^*) and use a "hat" to designate variables defined as the net of that trend growth rate of real output:

$$\begin{aligned} y - q^* &\equiv p + (q - q^*); \\ \hat{y} &\equiv p + \hat{q}. \end{aligned} \tag{3}$$

Thus any excess of nominal GNP growth over the trend growth of real output ($\hat{y}$), which we call "adjusted" nominal GNP growth, must be accompanied by some combination of inflation (p) and a deviation of real output from trend ($\hat{q}$). Since the latter must be zero in the long run, any permanent acceleration or deceleration of adjusted nominal GNP growth must be accompanied by exactly the same acceleration or deceleration of inflation (we neglect any feedback from output or price fluctuations to the natural growth rate of output). To the extent that the long-run growth rate of the money supply is the basic determinant of the long-run behavior of nominal GNP, and both money and nominal GNP are exogenous, equation (3) is a way of restating the claim that *in the long run* "inflation is always and everywhere a monetary phenomenon" (Friedman 1963).

Over shorter business-cycle frequencies, equation (3) states that fluctuations in nominal GNP growth must be divided between price and output fluctuations. Real GNP can be stable only if price changes exactly mimic the proportional change in nominal GNP, and any tendency for prices to adjust only partially to nominal GNP cycles *must* imply procyclical fluctuations in real GNP. For instance, if the rate of change of prices over the business cycle is always equal to some constant fraction (α) of the adjusted nominal GNP movement, then deviations of real GNP from trend must soak up the remaining fraction ($1 - \alpha$):

$$\begin{aligned} p &= \alpha \hat{y}, \\ \hat{q} &\equiv \hat{y} - p = (1 - \alpha)\hat{y}. \end{aligned} \tag{4}$$

Can one proceed from the identity expressed in (4) to the significant proposition that an economy with relatively sticky prices (a small α) must exhibit correspondingly larger fluctuations in real output? That would follow, other things being equal, except insofar as the responsiveness of prices themselves influenced the amplitude of fluctuations in nominal GNP.

1.2 A Graphical Representation of Alternative Adjustment Paths

Because the top line of equation (4) is a relation between only two variables, the inflation rate (p) and adjusted nominal GNP growth ($\hat{y}$), it

can be displayed on a simple diagram that plots p on the vertical axis and $\hat{y}$ on the horizontal. If the price adjustment coefficient (α) were unity, then inflation would respond instantly and completely to changes in the growth of aggregate spending, and the locus of inflation rates accompanying different rates of demand growth would appear to lie along a 45 degree line, as in figure 1.1*a*. Because inflation would absorb all of the variation in nominal demand, there would be no divergence of real output from its trend growth path ($\hat{q} = 0$). In contrast figure 1.1*b* plots a completely unresponsive inflation rate that remains at zero whether adjusted demand growth is + 5, − 5, or 0%. Because the adjustment coefficient (α) is zero, equation (4) states that all variations in nominal demand growth are completely absorbed in deviations of real GNP from trend. The vertical distance between the 45 degree line and the horizontal line in figure 1.1*b* shows changes in detrended output growth. For instance, a 5% growth rate of adjusted nominal GNP would be reflected in 5% growth of

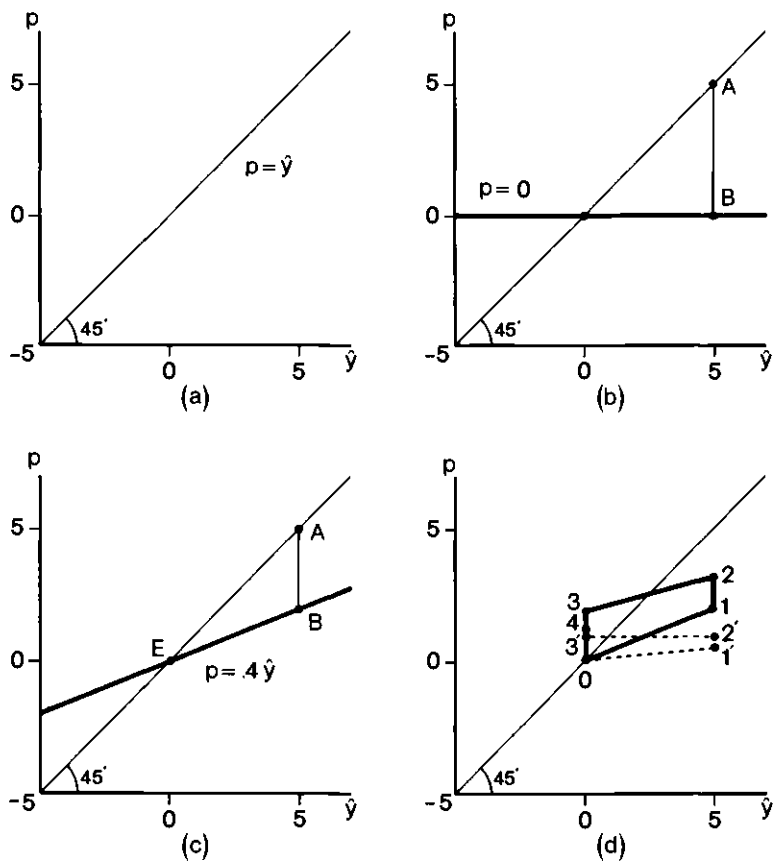


Fig. 1.1 Hypothetical relations between inflation and demand growth.

real output in excess of its trend, as represented by the line segment marked AB.

An intermediate case depicted in figure 1.1*c* exhibits partial price adjustment, with the coefficient α equal to 0.4 rather than unity or zero. From an initial situation at point E with both inflation and adjusted nominal demand growth equal to 0%, a temporary acceleration of demand growth to 5% would raise inflation to 2% at point B, with the remaining 3% absorbed by real output growth in excess of trend (this is the distance AB). Similarly, negative demand growth would be split between negative inflation (an actual drop in the price level) and a decline in real output relative to trend.

So far we have examined only *instantaneous* responses to inflation—with a complete response in figure 1.1*a*, no response in figure 1.1*b*, and a partial response in figure 1.1*c*. More realistic is an adjustment that is both partial and gradual, with the response in the initial period augmented by a further reaction in the second and subsequent periods if demand growth remains above its initial level. A simple dynamic adjustment process, that allows inflation fully to absorb all of nominal demand growth in the long run, can be written

$$p_t = \alpha \hat{y}_t + (1 - \alpha) p_{t-1}, \tag{5}$$

where the subscripts distinguish variables measured in the current period (t) from those applying in the last period ($t - 1$). Equation (5) states that current inflation is a weighted average of this period's adjusted nominal demand growth and last period's inflation rate, with weights adding up to unity. In one extreme case when $\alpha = 1$, inflation responds completely to current demand growth, past inflation is irrelevant, and the inflation-demand relation lies along the 45 degree line, as in figure 1.1*a*. In the opposite extreme case when $\alpha = 0$, inflation stays at the same rate forever and demand growth is irrelevant, as in figure 1.1*b*. Between the extremes inflation exhibits a gradual and delayed adjustment to changes in demand. If, for instance, $\alpha = 0.4$ and demand growth temporarily were to increase from 0 to 5% for two periods and then return to zero, we would have the situation shown in table 1.1.

This gradual adjustment path is plotted as the solid line in figure 1.1*d*, and the numbers on the solid line indicate the economy's location in each of the first four time periods. The column in table 1.1 labeled $\hat{q}_t$ shows the detrended growth rate of real output, i.e. adjusted nominal demand growth minus inflation, and $\hat{Q}_t$ shows the cumulative departure of real output from its trend ($\hat{Q}_t$ is the log of a ratio and thus equals zero when output is on its trend). The temporary acceleration of nominal GNP growth causes above-normal output growth, followed by below-normal output growth, that eventually returns the level of output to its trend. Now compare the "box" formed by the solid line in figure 1.1*d* with an

Table 1.1 **Response of Inflation to a Temporary Acceleration in Nominal Demand Growth**

Time Period	$\hat{y}_t$	p_t	$\hat{q}_t$	$\hat{Q}_t$
0	0.0	0.0	0.0	0.0
1	5.0	2.0	3.0	3.0
2	5.0	3.2	1.8	4.8
3	0.0	1.9	−1.9	2.9
4	0.0	1.2	−1.2	1.7
.	...	...	...	...
.	...	...	...	...
∞	0.0	0.0	0.0	0.0

alternative box formed by the dotted lines that represent the adjustment to the same nominal demand disturbance when α is set at 0.1 instead of 0.4. The larger is α and thus the more complete is the short-run response of inflation, the steeper are the top and bottom sides of the box.

An important failing of the adjustment equation (5) is that it allows output to depart permanently from trend when there is a permanent acceleration or deceleration in demand growth. Consider a case in which adjusted nominal GNP growth accelerates permanently from 0 to 5%, roughly what occurred in the United States in the 1960s. At first, according to (5), inflation will accelerate by less than 5% , but eventually will reach a 5% rate. This means that initially output grows faster than its trend, eventually reaching its trend, but never falls below trend. Thus the *level* of output remains permanently above trend by an amount which equals 7.5% in this example when $\alpha = 0.4$. In short, equation (5) violates the "natural rate hypothesis" that the level of real output is independent in the long run of the rate of growth of nominal demand.

A more realistic adjustment equation would allow inflation to respond not only to the rate of growth of nominal demand but also to last period's deviation of real output from trend:

$$p_t = \alpha\hat{y}_t + \beta\hat{Q}_{t-1} + (1-\alpha)p_{t-1}. \tag{6}$$

The adjustment of inflation to a permanent increase in the rate of nominal demand growth includes a temporary period of overshooting during which inflation exceeds its long-run value and real output growth falls below its trend, thus eliminating the initial bulge in the level of output.

1.3 Stopping Inflation in Pictures

Since the main interest of United States policymakers is in stopping an ongoing inflation of about 10%, let us examine alternative paths of

adjustment of inflation to a permanent drop in adjusted nominal demand growth from 10 to 0%. If the adjustment parameter α were equal to unity, inflation would respond instantly and completely, and there would be no deviation of output from trend. Any value of α below unity, however, causes output to fall temporarily below trend, and causes the negative detrended level of output to pull down inflation by an amount which depends on the β coefficient in equation (6).

Two basic approaches have been suggested to stop inflation through restrictive demand management policy. The first, sometimes called the "big bang" or "cold turkey" technique, would instantly drop adjusted nominal demand growth to zero, the rate compatible with stable prices in the long run. Such an approach would eventually bring the inflation rate to zero, according to equation (6), but would impose a cost in lost output if the adjustment coefficient (α) were less than unity. Let us imagine that the response of inflation to an output gap (β) is 0.2 and the length of a time period is a year, so that a 5% shortfall of output below trend would cause a one percentage point slowdown in the inflation rate each year. For any given value of this β coefficient, the speed of the economy's adjustment to the "cold turkey" remedy would then depend on the value of α. Table 1.2 shows for two sample values of α (0.4 and 0.1) the enormous difference in the economy's adjustment path when adjusted demand growth is held at zero from the first year onward.

The "cold turkey" policy cures inflation quickly in both cases, in the third and fourth years, respectively. But the output cost is severe, with a maximum drop of the detrended output level of 8.2 and 16.7%, respectively, from the initial period. And worse yet, the apparently stable policy of maintaining nominal demand growth at zero creates enormous instability in the economy, with continuing cycles in inflation and real output. When $\alpha = 0.4$ these cycles damp out after a decade, but when $\alpha = 0.1$ the inflation rate overshoots to a value of *minus* 7 percent in year 7, and the enormous shortfall of inflation below nominal demand growth propels

Table 1.2 **Economy's Adjustment Path in Response to "Cold Turkey" Nominal Demand Policy**

	$\alpha = 0.4$			$\alpha = 0.1$		
	Year	p_t	$\hat{Q}_t$	Year	p_t	$\hat{Q}_t$
First period	1	6.0	−6.0	1	9.0	−9.0
Period of minimum output ratio	3	−0.2	−8.2	4	−1.2	−16.7
Period of maximum overshooting of p_t	5	−2.3	−4.1	7	−7.0	1.1
Period of maximum overshooting of $\hat{Q}_t$	10	−0.0	1.4	10	−1.4	12.6

real output into an enormous boom that pushes it from 16.7% below trend in year 4 to 12.6% below trend in year 10, comparable to the 1939–43 explosion of real output in the United States.

The smaller the α adjustment coefficient, the greater the degree of instability created by a "cold turkey" policy, and hence the less likely that any such policy will actually be implemented. A less drastic alternative would be a "gradualist" policy that reduces the rate of nominal demand growth by, say, two percentage points a year, from an initial 10% to 0% in year 5. As shown in figure 1.2 (which continues to assume that $\beta = 0.2$), the relatively high α adjustment coefficient of 0.4 in the upper frame makes the inflation rate "cling" relatively closely to the 45 degree line and minimizes the output cost of stopping inflation. The maximum output shortfall below trend in the top frame is 6.7% in year 5, less than with the "cold turkey" policy; the cost of this advantage is a two-year delay in achieving zero inflation. Along the dotted line in the bottom frame, where $\alpha = 0.1$, the maximum output loss reaches -14.2%, the inflation rate overshoots to -5.6% in year 9, and the output ratio overshoots to $+10\%$ in year 12.

1.4 The Scissors of Demand and Supply

Economists are used to treating every economic relationship as involving a trade-off between benefits and costs. From the point of view of policymakers, however, figures 1.1 and 1.2 illustrate that the phenomenon of gradual inflation adjustment (a small α) involves only costs, no benefits. Even for society as a whole, the benefits are obscure. Some

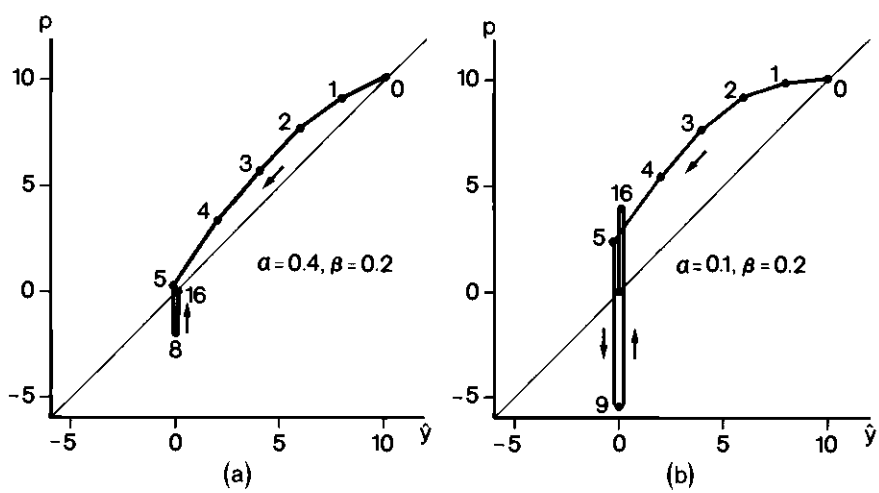


Fig. 1.2 Alternative responses to gradualist disinflationary policy.

analysts trace gradual price adjustment in the United States to three-year staggered union wage contracts, in which case the benefits might appear to be a reduction in the costs of negotiations and strikes, but there is ample evidence that the phenomenon long antedates modern labor contracting institutions (Gordon 1981*a*).

The historical examples presented in the next sections suggest that prices exhibit a speed of adjustment that varies over time and across countries. In some examples it is possible to discern patterns that display striking similarities to the simple examples displayed in figures 1.1 and 1.2. But other patterns appear as well. In the 1970s the inflation rate in the United States and some other countries exhibited variations that cannot be attributed solely to prior changes in the rate of demand growth. Imagine a situation in which an increase in the relative price of oil temporarily boosts the inflation rate while policymakers adopt a "neutral" policy stance, maintaining a constant rate of nominal GNP growth. The plot of the inflation-demand relation in our diagram would exhibit a vertical movement, first north and then south. Similarly, the imposition of price controls together with a neutral demand policy would cause a vertical movement to the south, and then back to the north if prices rebounded after controls were abandoned.

Other patterns are possible as well. Monetary accommodation in response to a supply shock would lead to an initial movement to the northeast, moving along the 45 degree line itself in an economy like Israel with very rapid price adjustment. The opposite of accommodation, an extinguishing monetary policy, would lead to a northwest movement following an oil shock, as in the United States in 1973–74, and a southeast movement following the imposition of price controls, as in the United States in 1971–72. Graphs for the 1970s in the United States are strikingly different in appearance from those in earlier decades and in the hypothetical cases of figures 1.1 and 1.2, providing vivid evidence that the inflation experienced by the United States during the past decade must be understood as resulting from an interaction of supply and demand shocks, not as a delayed adjustment to demand shocks alone.

1.5 Examples from United States History

There are no examples in United States history before the 1950s of a conscious attempt by policymakers to stop an ongoing inflation. Nevertheless earlier episodes are of interest, since they reveal evidence of the same basic obstacle facing current United States policymakers—the phenomenon of gradual price adjustment. For each period since 1916 during which there was important variability of the inflation rate, we display graphs arranged like figures 1.1 and 1.2. All the plotted figures for the United States are four-quarter moving averages of quarterly data; e.g.

the first observation plotted in figure 1.3 represents a rate of growth for the GNP deflator of 6.7% and for adjusted nominal GNP of 14.0%, respectively, in the four quarters ending in the first quarter of 1916, "1916:1" (these pre-1947 quarterly data are developed and analyzed in Gordon 1981*b*, and Gordon and Wilcox 1981; all figures use as the output trend the "natural output" series from Gordon 1981*c*, appendix B).

1. *A unique example of rapid price adjustment, 1916–24.* The plot of the 1916–24 experience in figure 1.3 combines several different subepisodes, but the major impression is of extremely flexible prices. The plotted four-quarter rates of inflation varied from + 24.3 to − 21.7%, an enormous range, and the economy in both the peak and trough quarters for inflation adhered quite closely to the 45 degree line. In just a year and a half, between 1920:1 and 1921:3, the four-quarter inflation rate fell from + 20 to − 26% and real output fell only 8% relative to trend, so that about 85% of the drop in nominal GNP was absorbed by lower prices and only the remaining 15% by lower real output. Another period with very

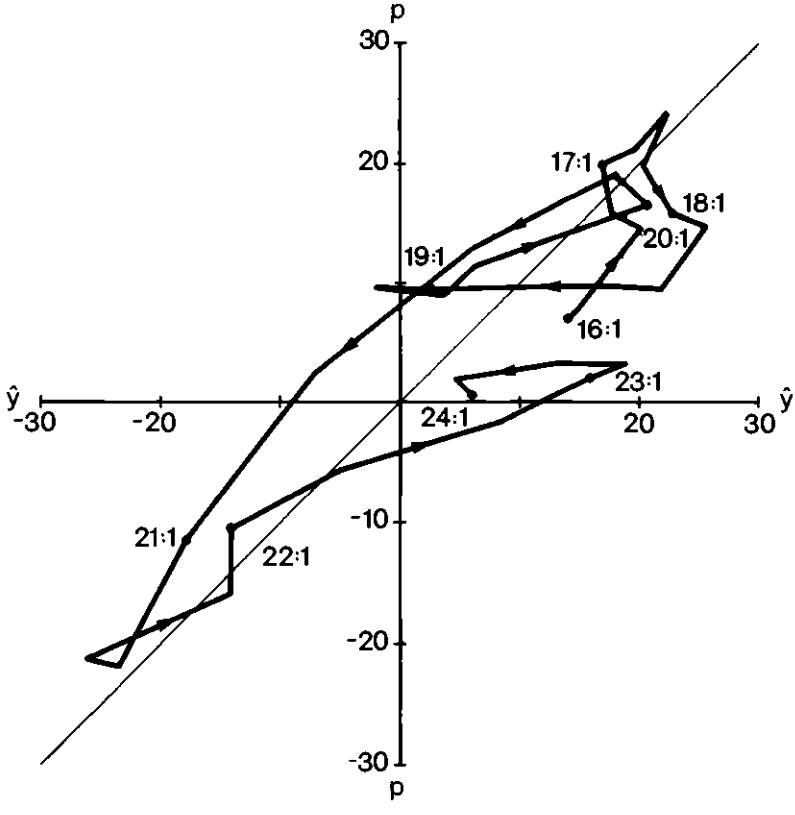


Fig. 1.3 United States, 1916–24.

flexible prices was between 1916:1 and 1917:3, when the path traced by the observations in figure 1.3 is actually *steeper* than a 45 degree line.

Between the 1916–17 increase in inflation and the 1920–21 collapse in prices, there was an intermediate period that reflects government intervention in the price-setting process. Beginning in early 1918 partial price controls were implemented (Rockoff 1980), and this pushed the adjustment path in a vertical downward direction. Then in 1919 as the rate of nominal demand growth fell rapidly, the inflation rate remained almost constant, probably reflecting a partial postcontrols "rebound" effect, as occurred again in 1946 and 1974.

Starting in early 1922, the price adjustment path becomes visibly flatter. between 1922:1 and 1923:2 inflation absorbed only 40% of changes in nominal demand, against expressed as four-quarter changes, and over the following three quarters only 20%. As we shall see, these flat partial adjustment paths have been typical of United States experience since 1922 (and also before 1916—see Gordon 1981*b*). The 1916–22 experience of rapid price adjustment seems to be a historical aberration, reflecting the ability of economic agents to change their price-setting practices when they are universally aware of a special event (wartime government purchases and deficit spending) that has a common effect on costs and prices. The 1920–21 decline in price presumably reflects a widespread belief that the wartime price "bubble" had ended as occurred after the War of 1812 and the Civil War. Price behavior returned to its usual gradual adjustment path after 1922, reflecting a general belief that normal peacetime conditions had returned and that local industry-specific disturbances to costs and prices were now large relative to any common aggregate disturbance.

2. *The Great Depression, 1929–37.* During the dramatic years that followed 1929, the four-quarter rate of adjusted nominal GNP growth was even more variable than during World War I and ranged from − 36% in 1932:2 to + 26% in 1934:1. Yet the response of inflation was much more like the peacetime expansion of 1922–23 than the World War I experience. The four quarters of maximum nominal spending decline (ending in 1932:2) were accompanied by a "price absorption" amounting to only 33%, with 67% absorbed by real output. Over the entire period of fourteen quarters between the economy's 1929:3 peak and 1933:1 trough, prices absorbed only 38% of the nominal spending decrease. The plot in figure 1.4 thus appears to resemble the hypothetical cases drawn in figure 1.1*c* and 1.1*d*, which assume an absorption of 40%.

Just as the inflation rate displayed vertical jumps in 1918 when price controls were introduced, so the inflation rate jumped in the last half of 1933 as a consequence of the National Recovery Act. The southeast movement of the plotted line between mid-1934 and late 1935 can be interpreted as the gradual elimination of the initial impact of the NRA,

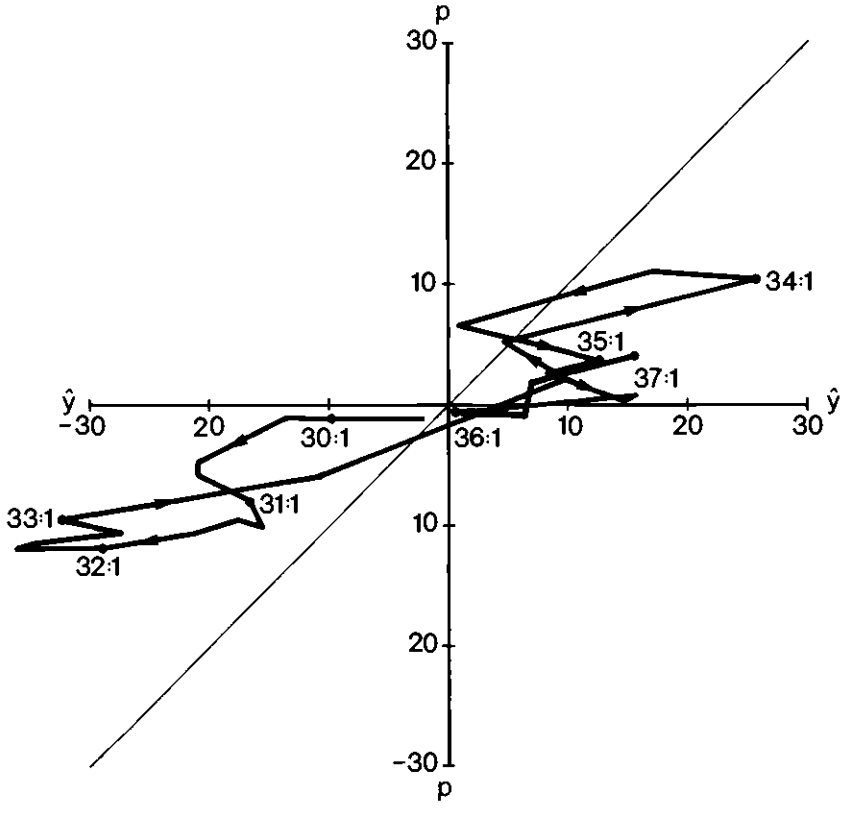


Fig. 1.4 United States, 1929–37.

which was declared unconstitutional in mid-1935. Price adjustment continued to be gradual after the "price blip" connected with the NRA had faded away; adjusted nominal GNP growth in the four quarters ending in 1937:1 of 15.4% was reflected in an inflation rate of only 4.1%.

3. *World War II and its aftermath, 1940–49.* During the early period of accelerated United States war production, between early 1940 and early 1941, there was virtually no response of inflation to the spending boom, as illustrated in figure 1.5. In fact it is interesting to compare, as is done in table 1.3 two four-quarter periods in World Wars I and II having virtually identical rates of adjusted nominal GNP growth. The small response of inflation in late 1940 and early 1941 may provide evidence supporting an adjustment mechanism like equation (6) above, in which both the rate of nominal GNP growth and the level of the output gap have independent effects on the inflation rate. In the subsequent year ending in 1942:1, as a rapid expansion in output quickly eliminated the output gap, inflation surged ahead, absorbing 75% of adjusted nominal spending growth.

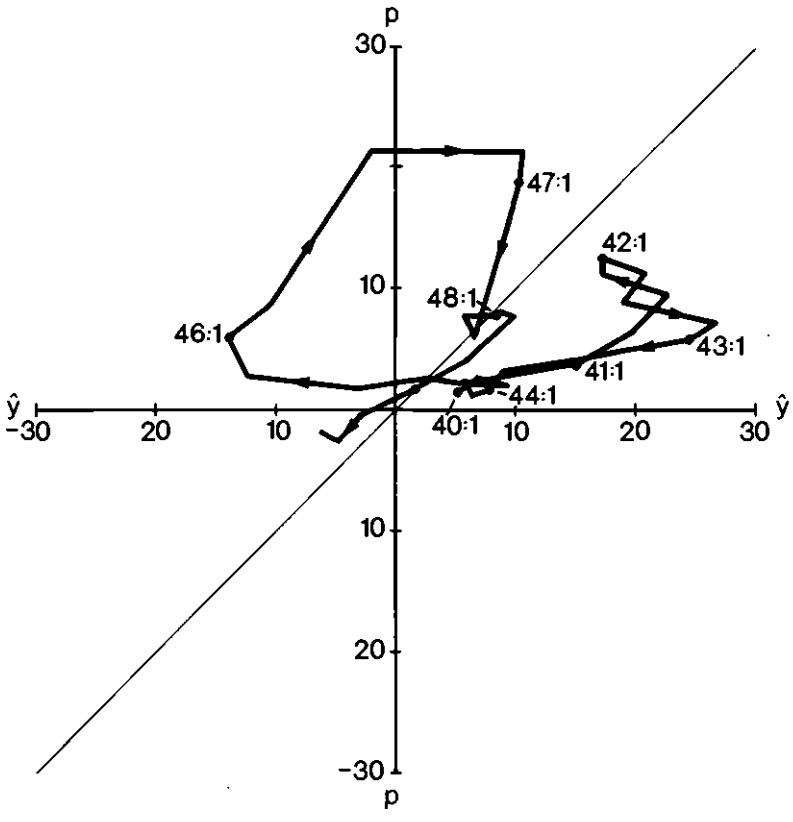


Fig. 1.5 United States, 1940–49.

After 1942:1 the economy was pushed in a southeastern direction in figure 1.5, reflecting the operation of stringent wartime price controls. Inflation was held below 5% in each four-quarter period between 1943:2 and 1945:4. Then prices exploded when the wartime controls were ended, rising at an annual rate of 52% in a single quarter, 1946:3. The 1946–47 price bulge was a much more extreme episode than 1919 and early 1920, reflecting the greater impact of price controls during World War II. But perhaps a more interesting difference between the two postwar periods lies in the more modest extent of the 1949 recession in nominal spending growth as compared to 1920–21, and in the relatively small 33% absorption of spending decline by price decline in the four quarters ending in 1949:4.

4. *The "flat fifties," 1953–59.* We skip the Korean War period, with its speculative boom in late 1950 and its amazingly low inflation rates in 1951–53 (the latter representing some combination of price-control effects and the end of the speculative commodity bubble). The next plot

Table 1.3 Values of Aggregate Variables at the Beginning of Two Wartime Episodes

Four Quarters Ending	$\hat{y}_t$	p_t	$\hat{q}_t$	$\hat{Q}_t$ at Start of Interval
1916:2	14.8	7.7	7.1	−9.0
1941:1	15.2	3.9	11.3	−22.9

(figure 1.6*a*) begins at the peak of the Korean War boom in 1953:2 and illustrates the low coefficients of price adjustment observed during the two recessions in 1954 and 1958. Although the pace of nominal GNP growth was much more irregular than in the simple example of figure 1.1*d*, it is possible to discern a pattern similar to the dotted "box" in that earlier diagram, with its flat top and bottom. Again using four-quarter changes, there was a drop in adjusted nominal GNP growth of 9.6 percentage points between 1953:2 and 1954:2, but a reduction in the inflation rate of only 0.7 points (an "absorption" of only 7%). In the next five quarters there was an increase of 11.7 percentage points in adjusted nominal GNP growth but a response in the inflation rate of only 1.1 points. Then a lagged adjustment began, as in figure 1.1*d*, pushing the economy above the 45 degree line in late 1956 and early 1957. In the five quarters following 1957:1, there was a drop in adjusted nominal GNP growth of 6.6

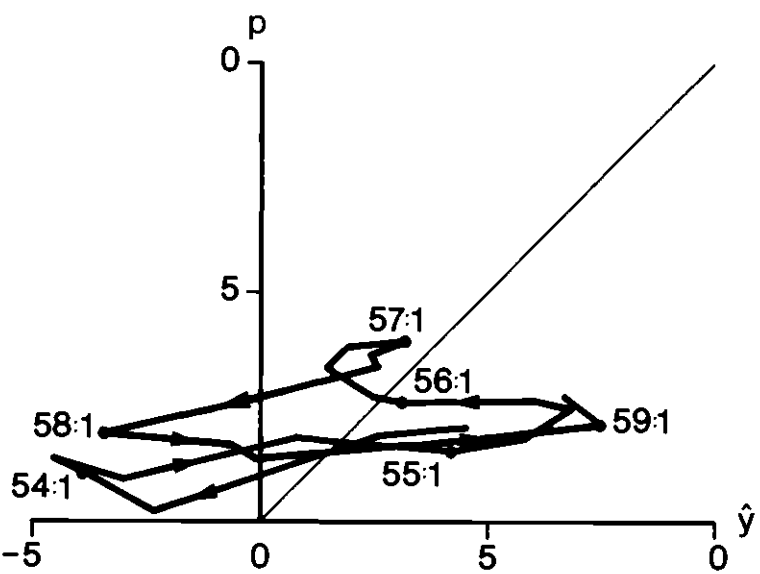
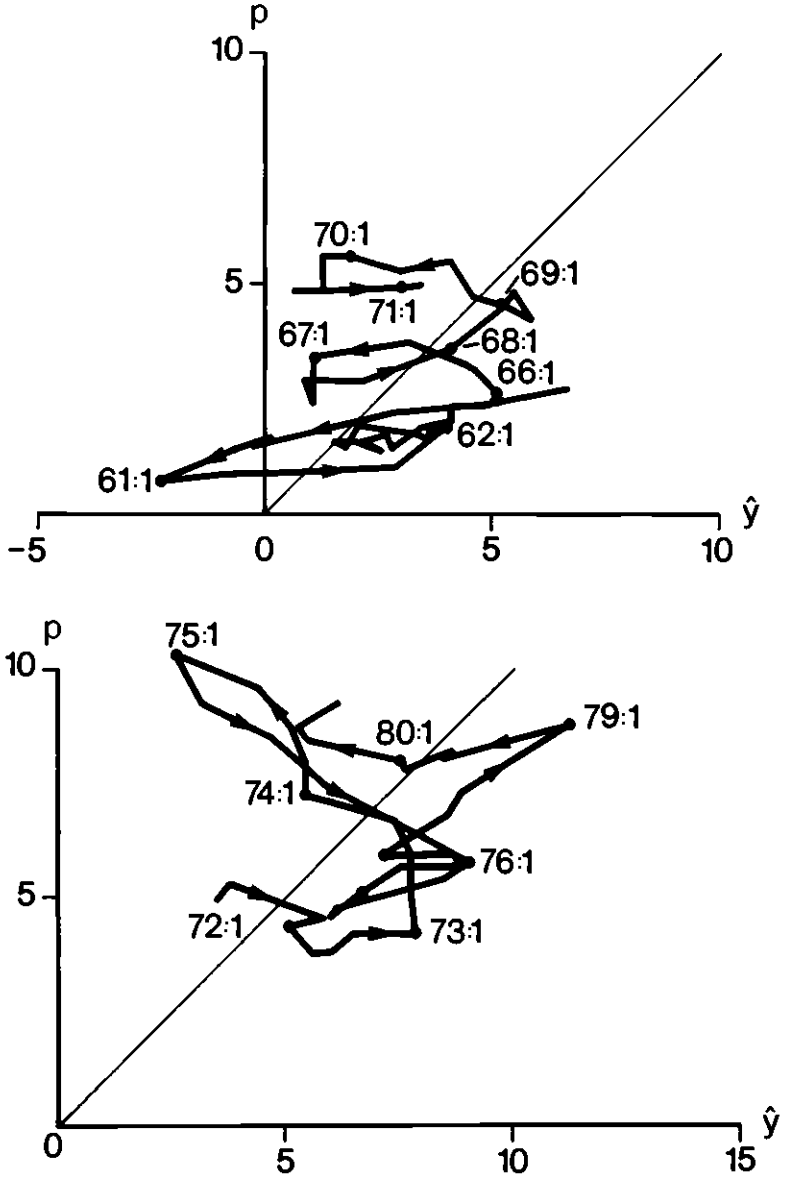


Fig. 1.6 (*a*) United States, 1953–59. (*b*) United States, 1959–71. (*c*) United States, 1971–80.

percentage points, and in inflation of 2.1 points, for an absorption ratio of 32%, closer to the experience of 1923 and the 1930s than to 1953–55. Finally, there was little change in the four-quarter inflation rate between early 1958 and early 1959, perhaps reflecting the offsetting impacts of positive adjusted nominal demand growth and a negative output gap.

5. *The classic period of gradual adjustment and overshooting, 1959–71.* The bulk of the existing econometric evidence on price adjustment in the



postwar United States is based on a statistical analysis of the period between 1953 and the present. The overwhelming consensus is that inflation adjusts very slowly to nominal demand shocks. It is easy from our diagrams to see that this pessimistic message is not an artifact of statistical technique but rather is embedded in the data, particularly for the interval between 1953 and 1971. Of the 11.3 percentage point swing in nominal GNP growth between 1959:2 and 1961:1, only 1.8 percentage points were absorbed in slower inflation. Then, of the 9.1 point swing from 1961:1 to 1965:4, only 1.9 points were absorbed in faster inflation. In the period between late 1962 and late 1965 any impact of the output gap in slowing inflation was completely offset by the impact of positive adjusted nominal GNP growth. Although some might interpret the 1963–65 evidence as supporting a downward impact on inflation of the Kennedy-Johnson wage-price guidelines, the adjustment paths do not seem to be appreciably different from the pre-1963 period when there were no guidelines.

After 1965:4 the inflation-demand relationship drifts upward in response to continued positive rates of adjusted nominal GNP growth, reflecting the process of lagged adjustment implied by equation (6). After early 1969 the inflation rate "overshot," rising above the 45 degree line, just as the adjustment process in the hypothetical cases of figure 1.2 carried the economy temporarily below the 45 degree line. The puzzling aspect of 1970–71 is the failure of the recession, which brought the level of real output from 4% above trend to 2.5% below trend, to have any effect at all in dampening inflation. It was the despair of the Nixon administration's economy policymakers at the rapid inflation rate of early 1971 that caused the startling policy reversal of 15 August 1971, when comprehensive price controls were introduced.

6. *Untangling demand and supply shocks, 1971–80.* Unlike the previous diagrams, where a clear southwest-to-northeast alignment of the plotted points can be discerned, the graph for the past decade has a chaotic appearance. The decade can be divided into two main parts, according to the main direction of movement, with a northwest-to-southeast orientation dominating the four-quarter periods between 1971:3 and 1976:1, and a "normal" southwest-to-northeast orientation occurring from then until late 1979. The decline in the inflation rate during late 1971 and most of 1972 reflects the initial impact of the Nixon controls, and the standard interpretation of 1972–76 (Gordon 1977*a*; Blinder 1979) is that the temporary positive effect on inflation of the postcontrol "rebound" in 1974–75 was combined with two other supply shocks that temporarily raised the inflation rate: the 1972–73 increase in the relative price of food and the 1973–74 increase in the relative price of oil. A permanent increase in the *level* of a relative price may only temporarily raise the inflation rate if its impact is dampened by restrictive

nominal demand policy and if the extent of cost-of-living escalators in wage contracts is relatively minor, both of which were conditions that were satisfied in the United States 1972–76. A contrasting situation is observed below for some foreign countries, where supply shocks have permanently raised the inflation rate.

The 1977–80 episode displays a pattern that exhibits some similarity to 1967–70. The upward drift of the inflation-demand plot in 1979–80 to some extent reflects the impact of the second OPEC oil shock, but also may provide evidence that the level of real output consistent with a stable inflation rate has been exaggerated by some investigators, including the Council of Economic Advisers. If this "natural" rate of output is overstated, then the corresponding "natural" unemployment rate may have been understated. My present estimate of a natural unemployment rate of 5.6% in 1979 (1981*c*, appendix B) may be understated by as much as a percentage point. A resolution of this issue depends on further econometric work that disentangles supply factors in the 1979–80 acceleration of inflation from the respective roles of the rate of growth and level of demand.

1.6 The Speed of Adjustment in Other Countries

The speed and extent of inflation's response to changes in nominal demand growth differs markedly across countries. We shall see that, in general, the inflation-demand relation clings more closely to the 45 degree line in foreign countries than in the United States. Before this evidence can be used to make a case that the rapid conquest of inflation is possible in the United States, however, we must determine whether the conditions necessary for fast responsiveness can be imported from abroad and whether this would require major changes in United States institutions.

Although a scattering of data is available that suggests a more rapid response of European than American prices during the interwar years (Gordon and Wilcox 1981), we limit the scope of the present paper to a study of foreign data since 1965 (or 1963 in cases where inflation decelerated between 1963 and 1965). The countries selected are the five major industrial nations besides the United States (Japan, Germany, France, Italy, and the United Kingdom), one small nation that has experienced very low rates of inflation in recent years (Switzerland), and two nations that have experienced relatively high rates of inflation (Brazil and Israel).[1] Annual rather than quarterly data are plotted, and the method of detrending real output growth is extremely crude—one trend is calculated for 1960–73 and a second trend for 1973–79. To the extent that the low 1973–79 trends in some countries reflect underutilization of resources rather than a slowdown in productivity growth, our calculations tend to

understate the shortfall of output below trend experienced since 1973. An important corollary is that a faster "true" output trend would shift observations that presently lie on the 45 degree line west of that line and might change our conclusion of easy painless adjustment to one of prolonged and painful adjustment.

7. *West Germany, 1965–80.* Economists in most industrial countries envy the low inflation rates experienced in West Germany in the last half of the 1970s. Although the success of restrictive monetary policy in the first few years of the flexible exchange rate era has been much discussed, an earlier episode of anti-inflationary restrictive policy in 1965–67 deserves attention as well. In a famous conference in June 1965, German trade unions and employers' associations made a tripartite "social contract" with the then-new Council of Economic Advisers that called for a coordinated slowdown in the growth of nominal wages by two percentage points by 1967, and an accompanying slowdown in the growth of government expenditure and the money supply that would be consistent with a two percentage point slowdown in inflation. As shown in figure 1.7*a*, the inflation target was almost precisely met; the previous "problem" rate, which was 3.0% in 1964 and 3.5% in 1965, was reduced to 1.4% in 1967. Economic historians sometimes fail to point out that there was a substantial output cost, due partly to the rejection by the government of the scenario for its own actions laid out by the council. Herbert Giersch has called the actual policy response a "Teutonic big bang." Nominal GNP growth came almost to a dead halt in 1967, and our measure of adjusted

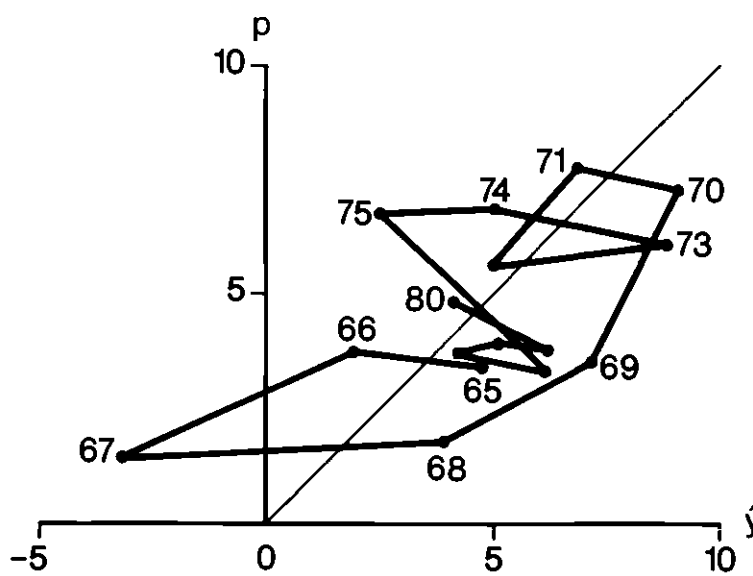
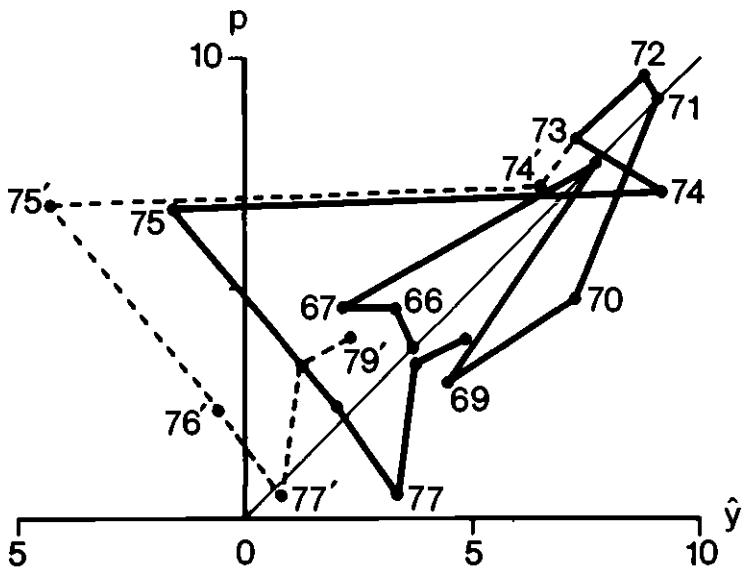
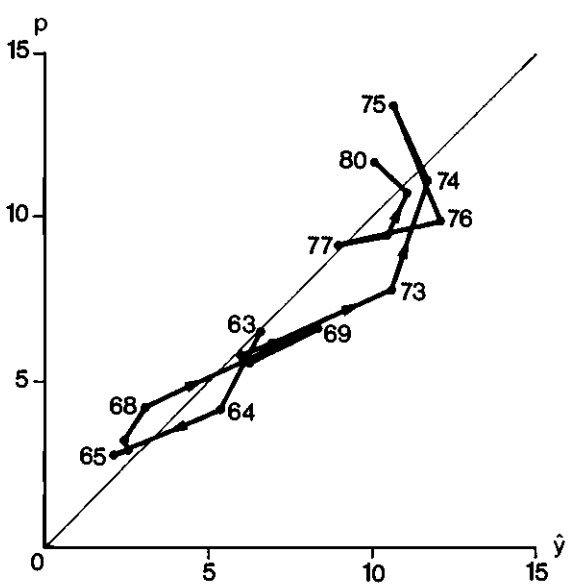


Fig. 1.7 (*a*) West Germany, 1965–80. (*b*) Switzerland, 1965–79. (*c*) France, 1963–80.

nominal GNP growth fell to − 3.2%. The economy's movement in figure 1.7*a* displays the same "flat" appearance as most United States episodes. The absorption of the 1965–67 deceleration of nominal GNP growth in slower inflation was just 26%, and of the 1967–69 acceleration just 20%.

The 1970 and 1971 experience can be interpreted as a lagged adjustment involving overshooting to the rapid demand growth of 1968–70 similar to that predicted by the inflation response mechanism written as





equation (6) above. While in 1972 and 1973 the economy adhered fairly closely to the 45 degree line, movements since 1973 display the northwest-to-southeast orientation that is expected when supply shocks are resisted by monetary policy. The loop that occurred in 1973 through 1976 appears to be almost identical to that in the United States but with a peak inflation rate of only 7% compared to the United States 1975 calendar-year peak of 9.3%. The difference partially reflects the absence in Germany of a postcontrols price rebound, as occurred in the United States in 1974–75, and the beneficial impact of the 1973 movement to floating exchange rates, which was followed by a 20% appreciation of the mark against the dollar between late 1972 and mid-1976. After 1976 the German experience is notable in contrast to the United States for modest growth in nominal GNP, allowing the economy to maintain itself close to the 45 degree line for most of the late 1970s. The cost of this policy was relatively slow output growth of only 2.3% between 1973 and 1979, compared to 2.8% in the United States. The deceleration in output growth as compared to 1960–73 was 2.2 percentage points in Germany, compared to 1.4 percentage points in the United States. The absence of any marked acceleration of inflation in Germany in 1979, when output growth was 4.5%, suggests that Germany may have operated beneath its "natural" level of real output throughout the late 1970s and that points in figure 1.7*a* for 1977–80 should be shifted slightly west of their plotted position.

8. *Switzerland, 1965–79.* The Swiss experience is similar to the German in most respects. Among the differences are the milder Swiss recession in 1967, the higher peak rates of inflation reached in 1971–72, and the much sharper recession experienced in 1975. The adjustment paths for Switzerland between 1965 and 1973 adhere quite closely to the 45 degree line, with the ratio of output to its trend ranging only between 97.1 and 101.6%. This story of stability ended after 1973 with a period of extreme monetary restriction when Swiss M1 actually fell in nominal terms during both 1974 and 1975; inflation decelerated from a peak of 9.7% in 1972 to only 0.4% in 1977. The cost of this "cold turkey" remedy was an incredible reduction in output which is disguised by the negative 1973–79 output trend used in figure 1.7*b*. Calculated with reference to the 1965–73 output trend of 4.0%, the ratio of output to trend fell from 100% in 1973 to 74.4% in 1979. Calculated with reference to a 3% trend, the same ratio fell to 80%.

Thus Switzerland managed to cure its inflation problem by creating a veritable depression in real output, an achievement that was feasible politically because of the freedom to export guestworkers back to Italy and other southern countries. The Swiss depression was considerably more severe than in Germany, where the output ratio fell to 87% in 1979 calculated at the 1965–73 trend and to 93% calculated at a more reason-

able 3% trend. On the same basis the respective United States ratios in 1979 were 94 and 99%. The plotted points after 1974 in figure 1.7*b* may make the Swiss adjustment process appear to have been deceptively painless, because they employ a *negative* rate of trend output growth of − 0.3% per annum. If we substitute instead the German 1973–79 trend of + 2.3% per annum, the Swiss experience follows the path of the dashed line after 1973, and we observe a continued failure to achieve trend output growth despite an acceleration of inflation from zero percent in 1977 to 4% in 1979.

9. *France, 1963–79.* Although much of the French literature on inflation minimizes the causal role of changes in the growth rates of nominal money and spending, and treats inflation entirely as the result of a struggle over income shares, the inflation-demand relation displayed in figure 1.7*c* clings more tightly to the 45 degree line than in any of the episodes discussed so far. As must occur by definition when a plot of inflation and nominal demand growth moves back and forth along the 45 degree line, the growth of real output in each year remains very close to its trend. Between 1960 and 1973 the French output trend grew at 5.6% per annum, and there was no year in which the actual growth rate of output fell short of 4.3% or exceeded 6.7%.

A close correlation between nominal demand and price changes does not imply that the direction of causation necessarily runs from the former to the latter. The regular relation observed between 1963 and 1973 in figure 1.7*c* might simply reflect autonomous changes in the rate of inflation due to variations in the intensity of the battle over income shares (or, more specifically, the timing of episodes of "wage push"), followed by prompt monetary accommodation of these pressures. In the language that I have used elsewhere, a "demand for inflation" may bring forth its own "supply of inflation" (Gordon 1975).

However plausible, the price-leads-nominal demand direction of causation is not supported by the evidence. The first episode of decelerating inflation between 1963 and 1965, roughly two years in advance of the similar German experience, was the direct result of a ceiling imposed on the rate of growth of bank credit between mid-1963 and mid-1965. The growth rate of French M1 dropped from 18% in 1962 to 8% in 1964. The inflation rate followed along a year later and fell by more than half, from 6.4% in 1963 to 2.7% in 1965. In a statistical study that attempted to allocate credit for this deceleration between monetary policy and incomes policy (of which a mild version was in effect in 1964 and 1965), I found a strong role for the former and almost no impact of the latter (Gordon 1977*b*).

The best-known single episode in the history of postwar French inflation occurred in June 1968, when the Protocole de Grenelle between the government and unions allowed manufacturing wages to jump. Yet this

clear episode of wage push was not backed by an accommodative monetary policy. After an initial burst of spending and inflation in 1969, as workers consumed their newly won gains, monetary policy turned quickly toward restriction (M1 actually fell in 1969). As a result, spending growth fell in 1970 and 1971 by enough to bring the economy back to the 45 degree line.

The evolution of the French economy in the 1970s exhibits interesting differences from the United States, German, and Swiss experiences. There was a modest accommodation of the first OPEC oil shock, with M1 growth jumping from 10% in 1973 to 15 and 12.5% in 1974 and 1975, respectively. Inflation doubled from 1973 to 1975, whereas inflation remained roughly at the same level in Germany and fell in Switzerland. The French authorities avoided an output bloodbath, as in Germany and Switzerland, and as a result endowed the economy with an inflation of about 10% during the 1976–80 period. The diagram of the French experience may give a misleading impression of an effortless adjustment, since the output trend used in the calculations dropped from 5.6% for 1960-73 to only 3.0% for 1973–79. The parallel upward movement of inflation and nominal demand growth between 1977 and 1979 does not suggest a major underutilization of capacity, however, if equation (6) has any relevance as a description of the French economy.

10. *Japan, 1965–80.* The Japanese export and productivity miracles have recently been joined by the Japanese inflation miracle; the GNP deflator rose only 2% in 1979 and by about the same amount in 1980. The plot of Japanese data in figure 1.8*a* illustrates a continual tilting of the inflation-demand relation, from a virtually horizontal slope in the expansion of nominal GNP growth between 1965 and 1970, to a slight upward tilt in the cycle between 1970 and 1972, to a 45 degree relation since then. Previous analyses of Japanese monetary policy in the fixed-exchange-rate era support an interpretation of an activist policy that promptly reduced the growth of the money supply in response to accelerations in output growth and deteriorations in the balance of payments. There was almost no response of the inflation rate to marked drops in nominal GNP growth in 1965 and again in 1971, and increases in the GNP deflator remained within the narrow range of 4.4 to 5.5% in every year between 1963 and 1972, with the single exception of 1970.

Japanese inflation broke out of its stable mold only once in the last two decades, when a 25% wage increase was granted in the 1974 spring wage offensive (Sachs 1979). While inflation ballooned in 1975, there was no monetary accommodation of the combined wage-oil shock. M1 growth dropped from 30% in 1970 to 11% in both 1974 and 1975. As in the case of Germany and Switzerland, the introduction of flexible exchange rates in 1973 allowed the Japanese to regain control of their money supply. The impact of restrained monetary growth on the exchange rate, which

appreciated against the dollar by 52% between 1972 and late 1978, helps to explain why the inflation rate in Japan continued to slow down while growth in real output proceeded at a steady 5.5 to 6.5% pace beginning in 1976. A remaining puzzle is how the Japanese avoided any acceleration of inflation as a consequence of the decline in the yen by roughly 10% between the last half of 1978 and the last half of 1980. A possible explanation is that the 4% rate of output growth used in figure 1.8*a* for the period 1973–79 (compared to 10.2% for 1960–73) substantially understates the true trend and that the deceleration of inflation in the late 1970s reflects a continuing adjustment to an underutilization of resources. Another possibility is that Japanese unions are exhibiting deliberate restraint now to avoid an inflationary response to the second 1979–80 oil shock (*Wall Street Journal*, 6 February 1981).

11. *United Kingdom, 1965–80.* Although a band of monetarists fights a rearguard action, nowhere as in Britain is the view so entrenched that inflation results from an autonomous struggle over income shares. Perry (1975) and I (1977*b*), in econometric equations that allow for an impact of aggregate demand on wages, have found convincing evidence of an alternating series of episodes of incomes policy followed by autonomous wage push. In the 1965–72 period the British inflation-demand relation marched quite firmly along the 45 degree line in figure 1.8*b*, with only minor fluctuations in the growth rate of output. Since there was no lag between demand and inflation (as in France in 1963–65 or Germany in 1965–69), it is plausible to conclude that monetary policy accommodated an autonomous inflation cycle caused by wage push and an accelerating inflation in world traded goods prices. The institutions of British monetary control (or "noncontrol") were firmly wedded to pegging interest rates and allowed monetary accommodation to occur without much thought about alternative responses.

Of all the cases studied thus far, the British shows the clearest evidence that the 1974–75 oil shock was accommodated. M1 growth jumped from 5% in 1973 to 19% in 1975, and nominal GNP growth (unadjusted) jumped from 10% in 1972 to 24% in 1975. This experience can be compared to unadjusted 1975 nominal GNP growth rates of 8% in the United States, 5% in Germany, and −1% in Switzerland. The movement down the 45 degree line in 1975 through 1978 reflects a coordinated policy reminiscent of Germany in 1965, with unions accepting lower wage increases under a "social contract," while monetary growth was decelerated under pressure from the International Monetary Fund. Monetary restriction in turn spurred a recovery in the value of the pound sterling from its low reached in October 1976, and the ensuing reduction in the inflation rate of import prices helped the social contract to remain in place until 1978. Finally, the 1979–80 acceleration of inflation traces a pattern in figure 1.8*b* that suggests a partial accommodation of supply shocks,

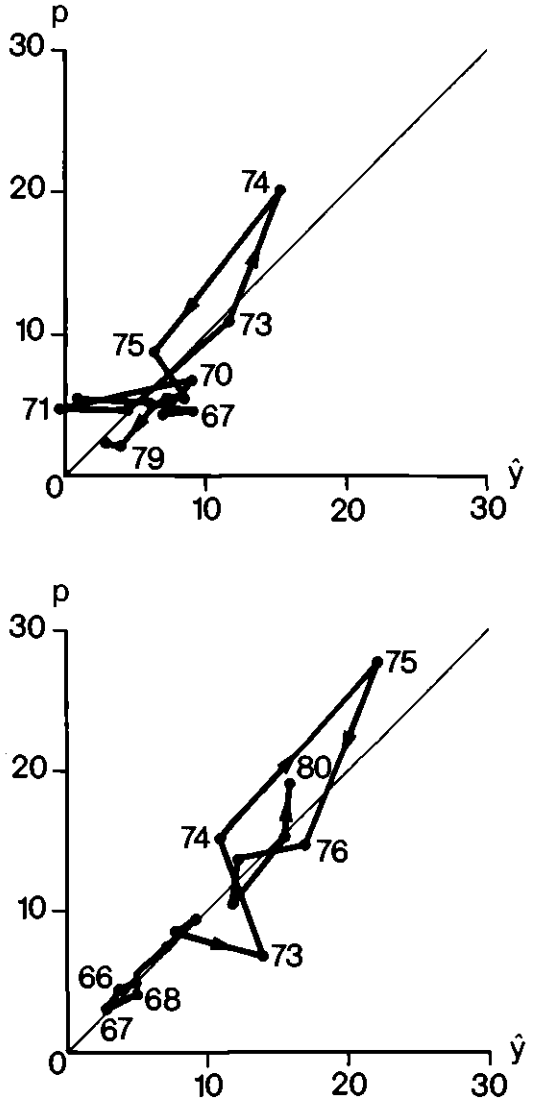


Fig. 1.8 (*a*) Japan, 1965–80. (*b*) United Kingdom, 1965–80.

consisting of excessive public-sector wage agreements granted by the departing Labor government in early 1979 and large increases in indirect taxes introduced by the new Conservative government in late 1979. These influences appear to have swamped the beneficial impact on inflation of the 30% appreciation in the pound sterling that occurred between mid-1978 and mid-1980.

12. *Italy, 1963–80.* The history of postwar Italian inflation is full of references to two major episodes of wage push, a so-called wage explosion in 1963 and a period of labor strife called "the hot autumn of 1969." My previous study (1977*b*) of quarterly wage and monetary change data found significant evidence of autonomous movements in wage rates in 1963 and the beginning of 1970. An important similarity between the two episodes was the anti-inflationary reaction of monetary policy, with the growth rate of M1 falling by more than half between 1962 and 1964, and by one-third between 1970 and 1971. The downward response of the inflation rate in 1963–66 in figure 1.9 follows a classic "loop" like those drawn in figure 1.2, with a cumulative decline in output relative to a trend of about 4.5%. In 1971–72 the response of inflation was almost nonexistent, possibly because of the ongoing acceleration of world traded goods prices. As a result the cumulative decline in detrended output between 1969 and 1972 amounted to about 6%.

Since 1973 Italy has moved back and forth along the 45 degree line in figure 1.9, with its rapid adjustment facilitated by the interaction of wage indexation (the *scala mobile*), flexible exchange rates, and monetary accommodation. The Italian response to the first oil shock of 1973–74 shows the permanent acceleration of inflation that we expect to occur when a supply shock strikes an economy that has a high degree of wage indexation. Several of the details of the Italian response after 1973 duplicate the British, so much so that in 1977 the *Economist* labeled Italy "Europe's other Britain." The inflation rate decelerated in both countries from a peak in 1975 to a trough in 1978, partly under pressure from the International Monetary Fund, and both experienced another acceleration of inflation in 1979 and 1980. In the case of Italy the 1979–80 acceleration was accommodated by monetary policy, perhaps reflecting the political weakness of the government, whereas the strong Parliamentary position of the Thatcher government allowed a partially successful attempt to slow down monetary growth. It will be interesting over the next two years to learn whether this political divergence between Britain and Italy will also cause a growing and permanent divergence in their inflation rates.

13. *Brazil, 1960–80.* The 1960–70 cycle in Brazil provides an example of a classic money-fueled aggregate demand inflation. After remaining in a range of 12 to 16% from 1947 to 1958, inflation began to accelerate in response to the heavy money-financed requirements of Kubitschek's 1959 "Target Plan." Although the source of accelerating inflation was recognized, no government before the April 1964 revolution had the political courage to carry out an effective stabilization plan for fear of causing recession, unemployment, and a drop in the growth rate of real income. There was also a belief that inflation was an effective mechanism for transferring savings to the industrial sector (Syvrud 1974). The output

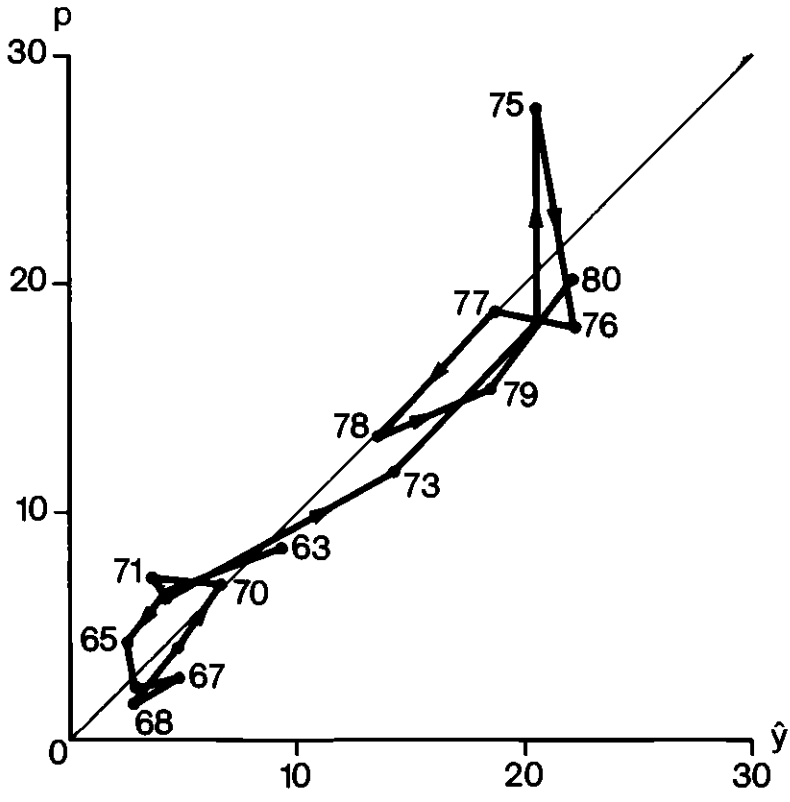


Fig. 1.9 Italy, 1963–80.

recession which actually occurred can be divided into two stages, an initial period before the 1964 revolution during which the nation's international bankruptcy, as well as the inefficiency caused by a near 100% inflation rate, had undermined the operation of the economy, and a second stage in which monetary and credit restriction led to bankruptcies and liquidity crises. Over the five years between 1963 and 1967 real GNP fell cumulatively 19.7% below its 1960–73 trend. This shortfall was gradually made up during 1968–73, when double-digit rates of real output growth were achieved in all years but one. The cost of the Brazilian experiment in price stabilization appears to be deceptively small in figure 1.10, but this reflects the enormous variance of inflation and correspondingly large scale of the diagram. After 1971 inflation steadily accelerated. Initially this may have occurred as a result of the exuberant growth of real output in 1972 and 1973, but since that year must have reflected (as in Italy) the insidious interaction of supply shocks, wage indexation, flexible exchange rates, and monetary accommodation.

14. *Israel, 1965–79.* As is well known, Israel recently entered the

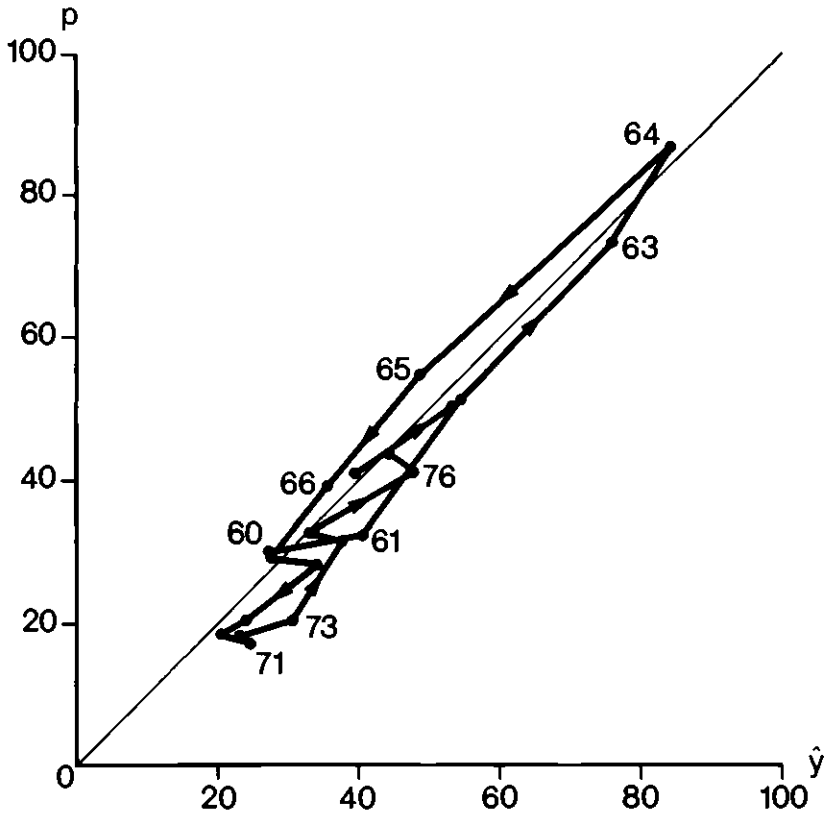


Fig. 1.10 Brazil, 1960–79.

territory of triple-digit inflation. This continues an acceleration process that began in 1970 and has been interrupted since then only during 1976. Figure 1.11 illustrates an interesting change from the flat adjustment relation displayed for 1965–69 to the 45 degree relation displayed since 1970. As in Brazil and Italy, the supply shocks of the 1970s, when combined with a high degree of wage indexation and flexible exchange rates, have forced governments to choose between large output losses and a continuing acceleration of inflation. The process will end only when politicians can convince their constituents to accept a decline in real income, as occurred in 1974–75 when Germany, Switzerland, and the United States used monetary restriction to battle the permanent inflationary consequences of supply shocks.

1.7 Conclusion

Throughout the twentieth century, with a single exception during and after World War I, United States inflation has responded slowly to

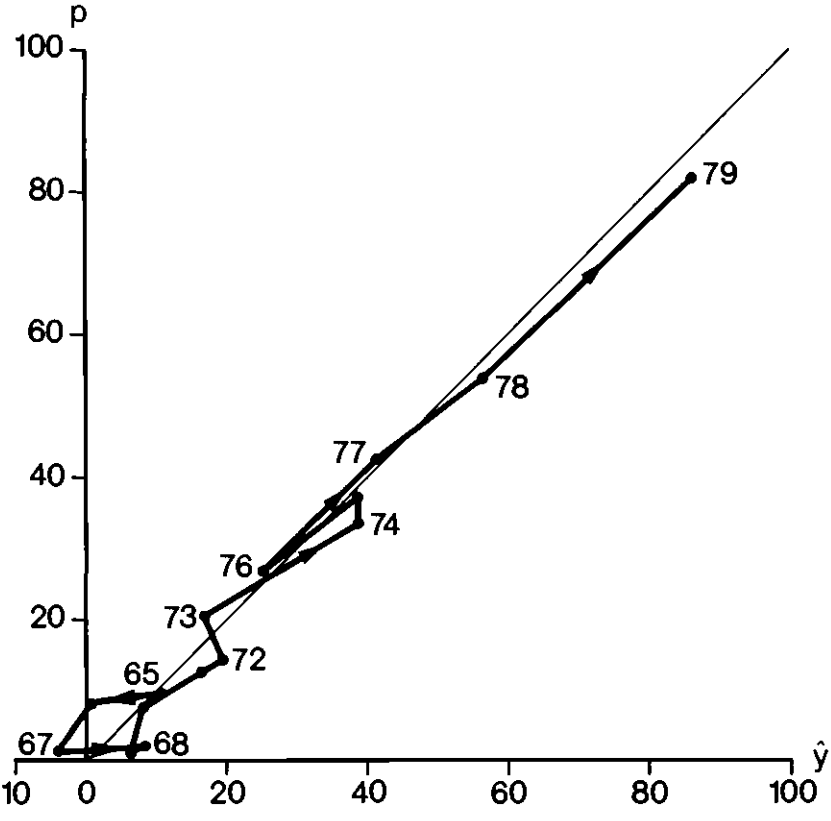


Fig. 1.11 Israel, 1965–79.

changes in the growth of nominal aggregate demand. Many commentators—including Fellner (1979) with his "credibility hypothesis," Lucas (1978) and his followers with their "policy ineffectiveness proposition," and some advisers to the new administration—accept as an article of faith that inflation will decelerate promptly in response to a sustained slowdown in the growth of nominal spending. Yet the wide variety of evidence for the United States arrayed in figures 1.3–1.6 demonstrates that the phenomenon of partial and gradual price adjustment transcends changes in "policy regimes" and has characterized the United States in every episode from Coolidge to Carter.

There is a widespread impression that inflation is more responsive to demand disturbances in foreign countries than in the United States. Yet there are only four episodes of those surveyed in this paper that exhibit all of the following characteristics: (*a*) a marked slowdown of inflation, (*b*)

achieved by restrictive demand policy, (*c*) and with only a "minor" loss in output:

1. United States, 1920–22 (where the price level itself was reduced)
2. France, 1963–66
3. Japan, 1976–80
4. Italy, 1963–68

There are no such episodes in the United States since 1922, and instead abundant evidence that only 10 to 40% of nominal demand changes are absorbed by the inflation rate in the first year after such changes. A more surprising conclusion is that there are no other examples of such successful low-cost episodes of stopping inflation in other countries. Restrictive policy slowed down inflation in Germany in 1965–67 and 1973–76, but only at the cost of a substantial loss in real output. The Swiss policy of tight money may seem socially costless to first-time tourists, but the 17% decline in manufacturing employment between 1974 and 1978 and the −0.3% annual real GNP trend recorded between 1973 and 1979 imposed a substantial cost on both current Swiss residents and now-departed guest workers. The Brazilian struggle to bring inflation from 90% in 1964 to 17% in 1971 required output to fall about 20% below trend during the period of adjustment. While the United Kingdom episode between 1975 and 1978 might be cited as a successful experiment, restrictive demand management policy was combined with a "social contract" between the Labor government and its labor union supporters; the relevance of this linkage for current United States policymakers, who are uniformly opposed to government intervention in the wage-price process, seems dubious at best. Finally, the experience over the past decade of France, Italy, Brazil, and Israel provides no guidance for stopping inflation, since all four countries accommodated the first OPEC oil shock and are still experiencing the permanent acceleration of inflation that resulted from their earlier policy decisions.

Not only are there few successful anti-inflationary episodes in the available historical evidence, leaving aside the hyperinflations reviewed by Sargent, but each of the four listed above has limited relevance to the United States in 1981. Our own experience during 1916–22 predated the advent of three-year staggered union wage contracts, which has introduced an extra delay into the responsiveness of the United States inflation process. The success of Japan since 1976 has resulted from a union bargaining structure in which contracts last only a year and expire simultaneously and in which unions appear to have entered into an implicit social contract with the monetary policy authorities. This would appear to leave the experience of France and Italy in the early 1960s as the last refuge of the optimist.

Note

1. Data through 1979 for other countries come from the *International Financial Statistics*, and 1980 estimates for some countries are from the *OECD Economic Outlook*, December 1980.

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